ANNUAL REPORT
2016-17

भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

Botanical Survey of India
Ministry of Environment, Forest & Climate Change

ANNUAL REPORT 2016-2017

Botanical Survey of India

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ISBN 818177098-6

Acknowledgements
All Regional Centers of Botanical Survey of India

Published by
The Director
Botanical Survey of India
CGO Complex, 3rd MSO Building
Wing-F, 5th & 6th Floor
DF - Block, Sector - I, Salt Lake City
Kolkata - 700 064 (West Bengal)
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Printed at
Print-Tech Offset, F-66/1 & 66/2, Chandaka Industrial Estate,
Bhubaneswar-751 024, Odisha, India

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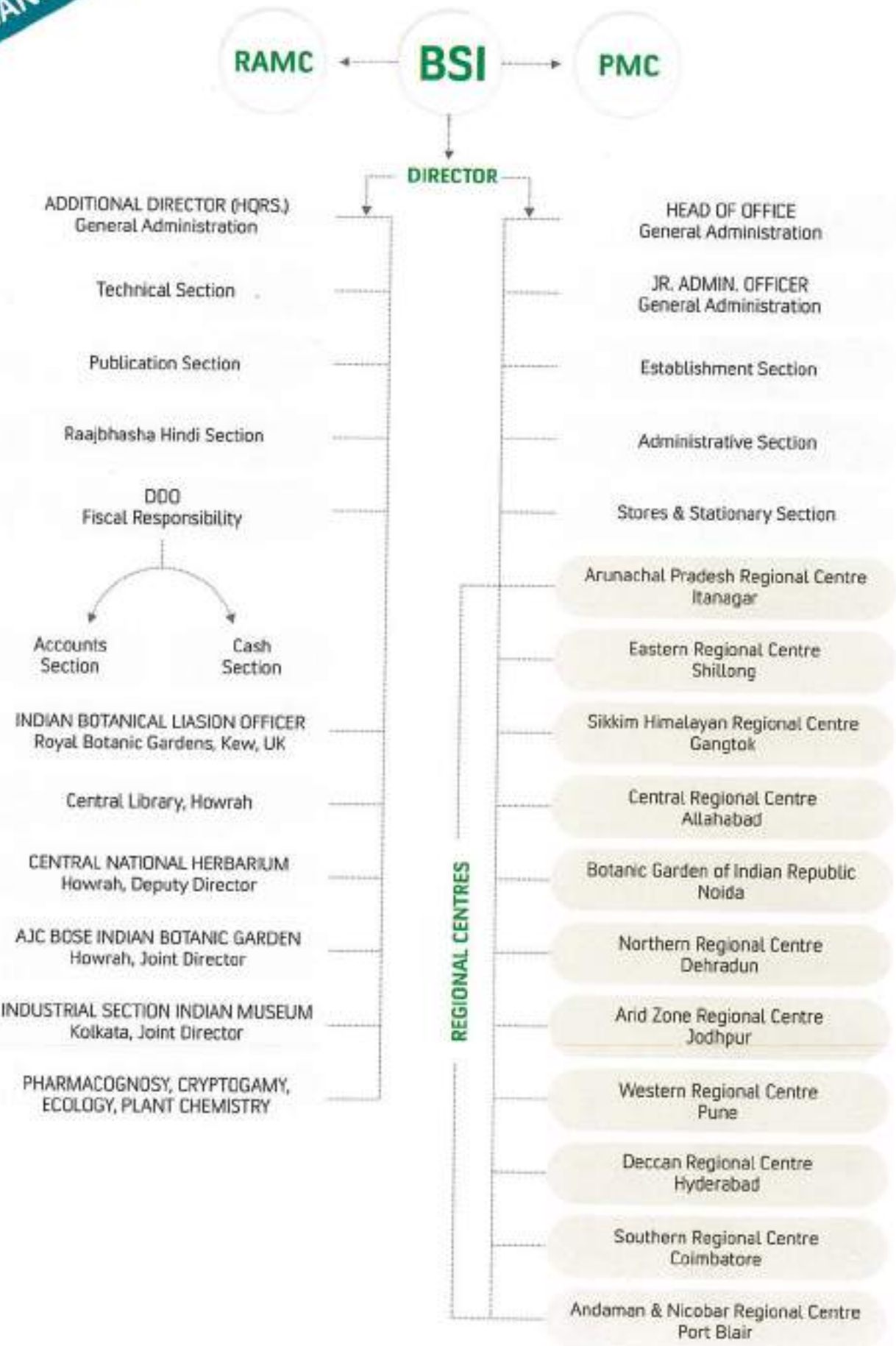
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Andaman & Nicobar Regional Centre
Port Blair

From the DIRECTOR'S Desk

Er. A. K. Pathak
Director (I/c)

Botanical Survey of India
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Kolkata-700064

In recent years, more and more attentions have been paid to the interface between science of biodiversity assessment and policy to ensure a holistic approach on conservation of biota. Since India became the signatory of the Convention of Biological Diversity (CBD), our commitment from inventory of plant diversity has been shifted for sustainable utilization of biodiversity, by utilizing all the information taken from biogeography, ecological status, climate induced phenotypic changes, wild relative status, other usefulness including its economic and ecological potentials. Accordingly BSI has strategized its annual research programmes ensuring commitments to a wider audience.

I am happy to present the Annual Report of BSI for the year 2016-17. The report showcases the research outcomes of Botanical Survey of India during the year 2016-2017. During this period, scientists of this organization carried out 98 extensive floristic surveys in different phyto-geographic regions which includes 42 protected areas, 17 Sacred Grooves and 01 Ramsar Site. Total of 33,743 plant specimens were collected out of which 28,791 specimens were identified to 14,408 taxa. Besides, a huge number of germplasm were also collected for introduction in its experimental gardens. Revisionary studies on the family Bignoniaceae, genera *Adiantum*, *Lepisorus*, *Fimbristylis*, subtribe *Sporobolinae* (Poaceae); Tree ferns, *Bambusoideae* (Poaceae) and family Metzgeriaceae were completed in Indian context while the taxonomic account of family Gesneriaceae in NE India, Genus *Impatiens* (Balsaminaceae) in Arunachal Pradesh, family Polypodiaceae in NE India were also completed. Flora for the state of Bihar, Jharkhand, Kerala, Sikkim and Uttarakhand were partially completed. Ethnobotanical information on 1,370 uses were documented from 12

districts of Odisha and collected 964 specimens of which 664 taxa were identified. Red listing of about 300 species of Orchidaceae completed as per IUCN Criteria. Besides, the pollen and seed morphology of 5 genera namely *Andrographis, Ficus, Eragrostis, Sporobolus, Tripogon* were studied under SEM. Chemical and nutraceutical analysis of 14 wild edible plants of NE India and pharmacognostic evaluation of Indian Cycads were also carried out.

To their credit, scientists of BSI published 41 species and 03 varieties as new to science and discovered 01 genus, 45 species, 02 subspecies and 02 varieties as new records for India. A total of 05 taxa were rediscovered after 50 years, 01 taxon each after 30 and 130 years respectively.

During this period, BSI organized several seminars, conferences, workshops, training programmes and capacity building programmes, which are detailed in the report. For the first time, an Annual Scientific Meet was organized during 14-16th February, 2017 at Central National Herbarium, BSI, Howrah.

I congratulate our scientists, who were honored with medals and awards by various Professional Institutes and Societies during 2016-17. I also commend all the scientific as well as the non-scientific officials of BSI for their sincere efforts, creativity and commitments in maintaining the proud legacy of this organization. I am also sure, the information provided in this of Annual report will not only showcase the scientific activities of BSI but also open up new arena for collaboration with other scientific organizations.

(A. K. Pathak)

INTRODUCTION

Botanical Survey of India has been the epicentre of taxonomic studies of India and SE Asia since its inception from 18th century. Taxonomy is an integral part for understanding the floristic diversity and for devising effective conservation, management strategies for sustainable utilisation of natural resources; Botanical Survey of India serves the Nation by documentation and conservation of wild plant resources of the country through survey and taxonomic studies. Since reorganization in 1954, Botanical Survey of India has established 11 regional circles at Dehradun, Pune, Coimbatore, Shillong, Itanagar, Sikkim, Allahabad, Port Blair, Noida, Jodhpur and Hyderabad with its headquarter at Kokata. Continuous survey and exploration in diverse ecosystems ranging from high altitude cold deserts to hot and humid coastlands, scientists of the organization have assembled enormous information on occurrence and distribution of plant species.

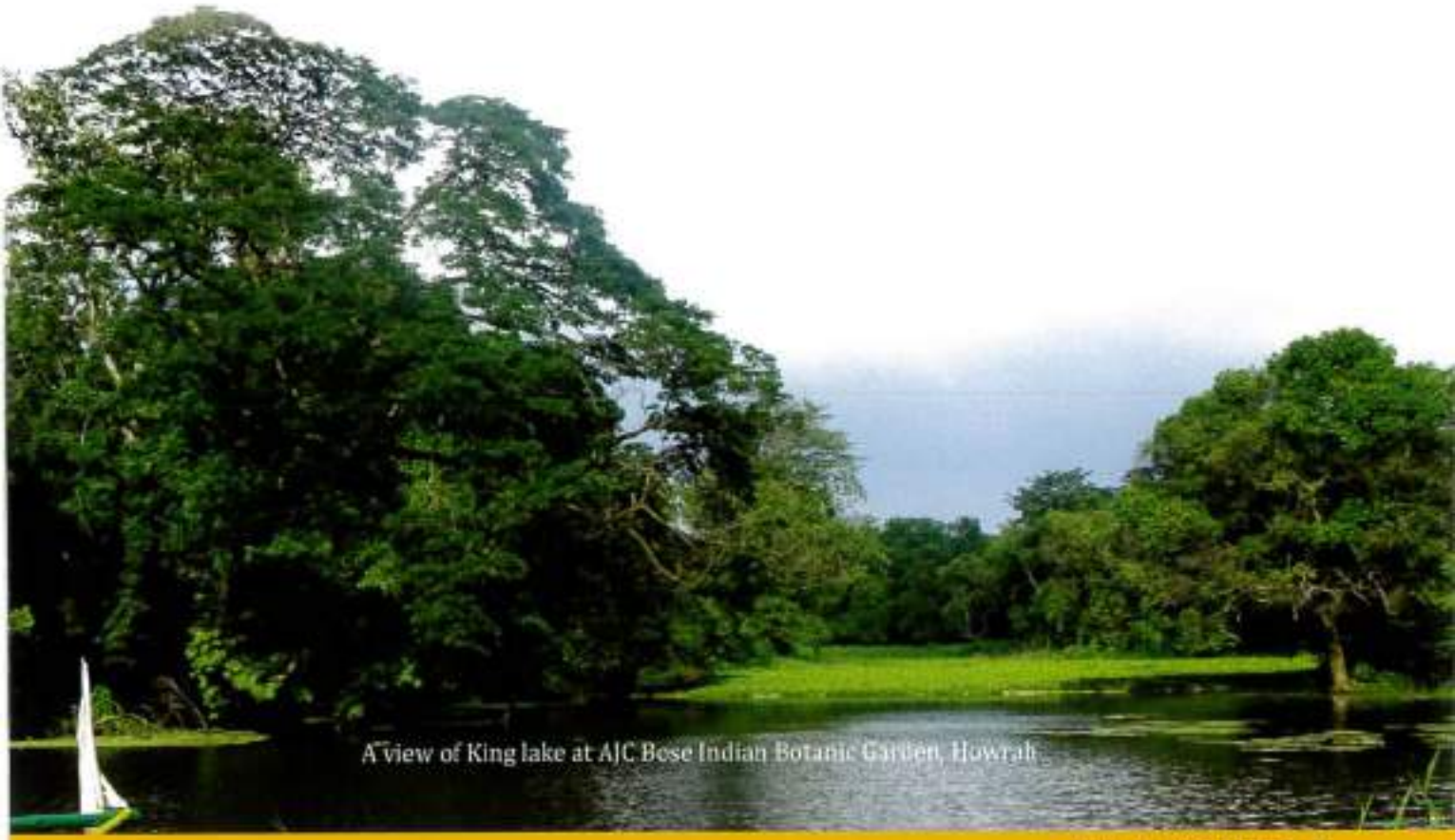
Botanical Survey of India has the following objectives:

Primary

- Exploration, inventorization and documentation of phytodiversity (including non-flowering plants) in India; 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 (ethnobotany) 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



A view of King lake at AJC Bose Indian Botanic Garden, Howrah

- 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

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 Botanic 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 and building the much desired inventory of the country's rich plant resources. The reorganisation plan, submitted by her was approved in 1954 and since then Survey was strengthened with focus to undertake intensive exploration surveys, to document the plant resources of the country, to act as a custodian of authentic collections in herbaria, for the advancement of taxonomic research in the country and act as a stakeholder in different strategies 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 54,500 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.

A view of A|C Bose Indian Botanic Garden, Howrah

Couroupita guianensis Aubl. (Lecythidaceae)

AJC Bose Indian Botanic Garden, Howrah: AJC Bose Indian Botanic Garden, established in 1790 by Robert Kyd on the bank of River Hooghly and erstwhile 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 the Double Coconut Palm (*Lodoicea maldivica*); Branching Palm (*Hyphaene thebaica*) 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 cainito*); The Cannon ball tree (*Couroupita guianensis*); the African Sausage Tree (*Kigelia pinnata*); the Mad Tree (*Pterygota alata*) and the 'Candle Stick Tree' (*Parmentiera cereifera*), are a few to mention. Its germplasm collections cover Bamboos, Bougainvillea, Citrus, Jasmine, Pandanus, Water Lilies, Palms and besides a Medicinal Plants Garden.

Victoria cruziana A.D. Orb. (Nymphaeaceae)

Central National Herbarium: The Central National Herbarium (CAL) is one of the oldest and largest herbaria

Adansonia digitata L. (Malvaceae)

in the world. Presently, the Central National Herbarium possesses about 2.6 million herbarium specimens belonging to nearly 350 families of angiosperms. Apart from these collections, good collection of drawings of Indian plants painted by natural dyes and many archival collections are in possession of CAL. This centre has also 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.

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.

REGIONAL CENTRES

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. The herbarium (ASSAM)of this centre has a holding about 2,60,000 specimens of flowering plants and about 11,000 specimens of non-flowering plants, including about 600 Type Specimens. The experimental Botanic Garden at Barapani, where a total of 756 species of angiosperms, 13 gymnosperms, 49 pteridophytes and 53 bryophytes of Northeast India are conserved.

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 this centre has about 1,33,000 specimens, including 687 Type Specimens; 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, Dehradun : The centre covers Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab and Uttarakhand, including Trans-Himalayan Cold Deserts of Western Himalaya. The herbarium (BSD) of this centre holding about 1,27,000 specimens of

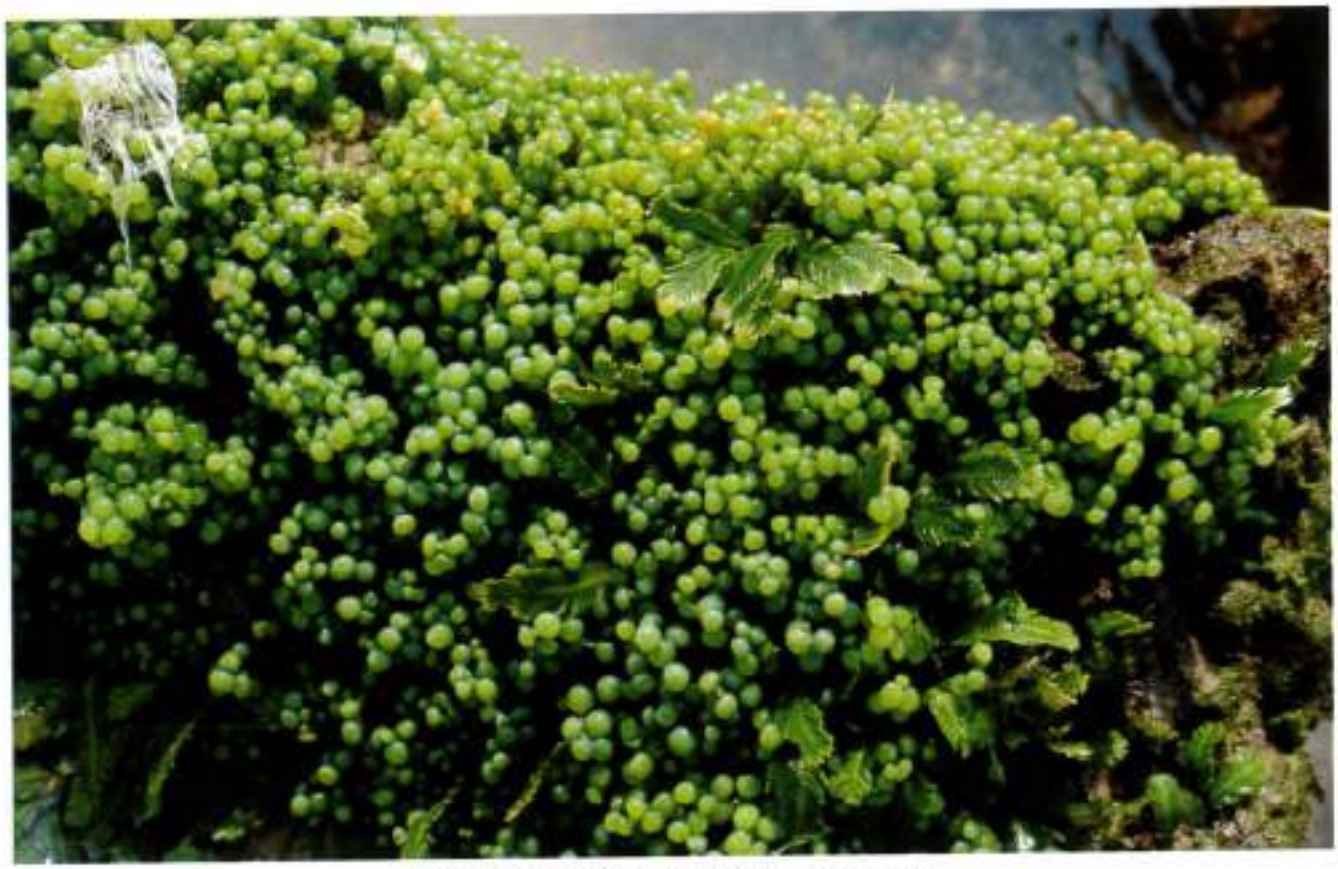
Swertia bimaculata (Siebold & Zucc.) Hook.f. & Thomson ex C.B. Clarke (Gentianaceae)

Cymbidium aloifolium (L.) Sw. (Orchidaceae)

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 Khirsoo, Pauri Garhwal maintain the National Gymnosperm collections.

Central Regional Centre, Allahabad : The centre covers Chhattisgarh, Madhya Pradesh and Uttar Pradesh. The herbarium (BSA) of this regional centre has about 79,000 (over (1,03,000) herbarium specimens, including 101 type specimens. In addition, it houses about 1,700 (3500) pteridophytes including 7 types and 5,000 (over 10,800) lichens including 58 type specimens and 36 type specimens of angiosperms. The associated garden maintains about 450 (600) species.

Arid Zone Regional Centre, Jodhpur : This centre was established on 18th 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) of this 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.



Caulerpa racemosa (Forsskal) J. Agardh (Caulerpaceae)

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 this regional centre has about 42000 herbarium specimens, including 400 Type Specimens. The associated Experimental Garden-cum-Arboretum at Dhannikhari maintains more than 400 plant species.

Arunachal Pradesh Regional Centre, Itanagar : The centre is exclusively devoted to the plant-rich Arunachal Pradesh and its herbarium (ARUN) has more than 30,000 specimens of vascular plants, including 62 Type Specimens, about 1100 specimens of bryophytes and more than 3500 specimens of pteriodphytes.

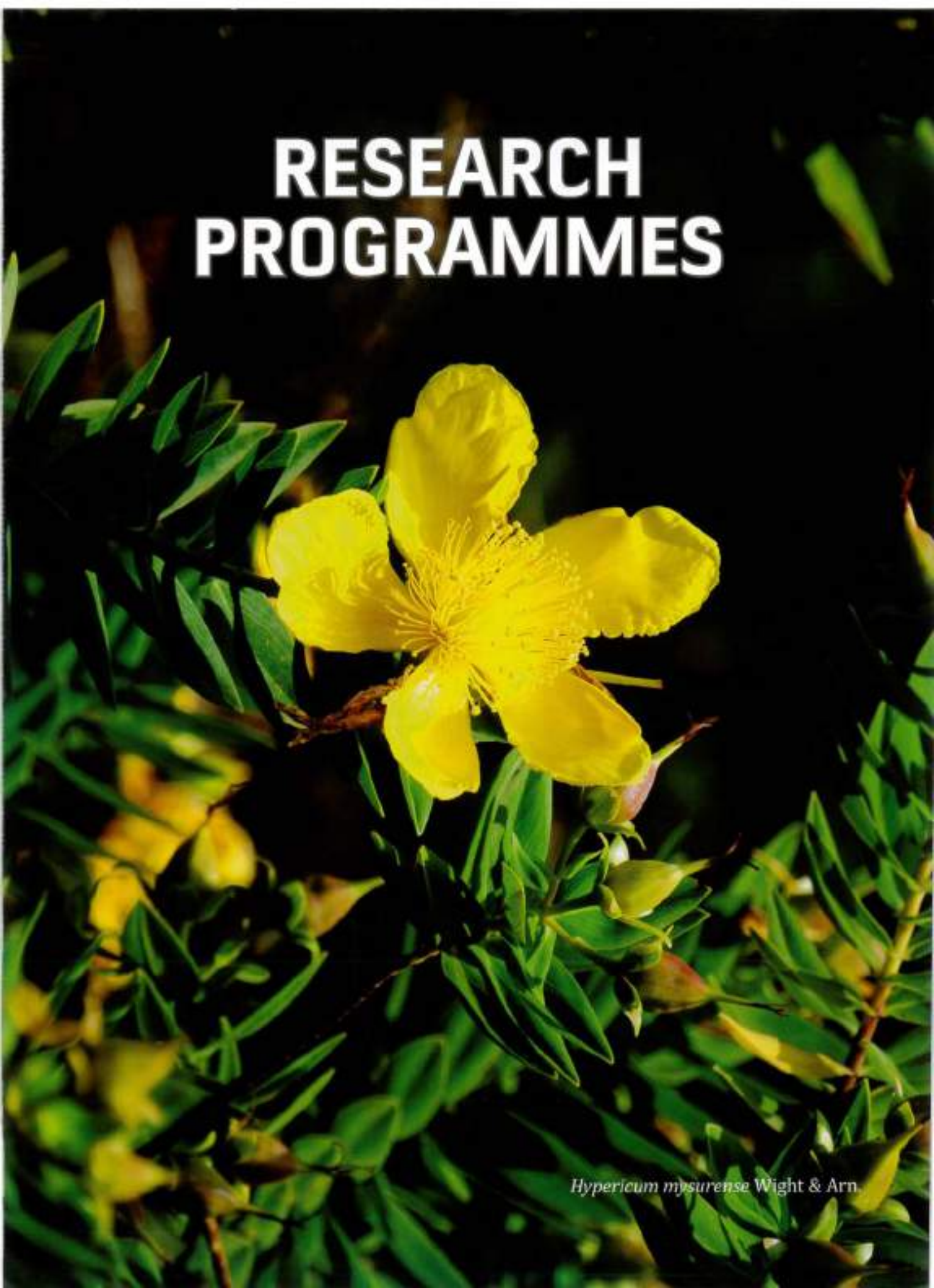
Sikkim Himalayan Regional Centre, Gangtok : The centre is exclusively devoted to the state of Sikkim and its herbarium (BSHC) has about 45200 specimens, which include 22 Type Specimens, besides, there are about 3700 pteridophytes, 1757 lichens and 215 macrofungi. The associated garden in the campus has about 310 species, mostly orchids from Sikkim region.

Botanic Garden of Indian Republic, Noida : Established in 2002 with a mandate to showcase 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, Telangana and Odisha states. The herbarium (BSID) of this centre has about 25000 specimens pertaining Andhra Pradesh, Telangana, and Odisha states and sizeable number of specimens from Tamil Nadu and Kerala, besides, the herbarium has 900 mangrove specimens.

Arrowroot 'The Great Banyan Tree' at AJC Bose Indian Botanic Garden, Howrah

RESEARCH PROGRAMMES



Hypericum mysurense Wight & Arn.

AJC BOSE INDIAN BOTANIC GARDEN, HOWRAH

PROJECT - 1

Collection, Introduction and multiplication of 20 endemic, threatened, medicinal, ornamental and economically important plants

Executing Official (s) : Dr. A. Pramanik, Dr. S.S. Hameed & Dr. B.K. Singh
Date of Initiation : April, 2012
Date to be completion : March, 2017

OBJECTIVE

ex-situ conservation and multiplication of endemic, threatened, medicinal, ornamental and economically important plants collected from different parts of India and to introduce and multiply in the Botanic Garden.

BACKGROUND

This project was initiated in 2012 to conserve selected endemic, threatened, medicinal and economic plants in AJCBose Indian Botanic Garden. During previous year, 13 endemic as well as other plants were collected for conservation purpose.

AREA AND LOCALITY

AJC Bose Indian Botanic Garden, Howrah

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, two field tours were conducted to Shillong and Arunachal Pradesh and various geographical regions of India covering South India (Western Ghats), North-East India, North India, Andaman & Nicobar Islands. During first tour, 47 plant saplings under 20 species were collected and planted at nursery-I for acclimatization. During second tour, 15 plants were collected for introduction purpose and 600 *species* of RET & Economic plants like Medicinal, Ornamental and Economic were collected for *ex-situ* conservation. Some of which are *Humboldtia sanjappae, Garcinia gummi-gutta, Flacourtia montana* etc.

PROJECT - 2

Development of Division No. 25 of AJC Bose Indian Botanic Garden

Executing Official (s) : Dr. A. Pramanik & Dr. S.P. Panda
Date of Initiation : April, 2012
Date to be completion : March, 2017

OBJECTIVE

To collection of important historical plants of garden

Lodoicea maldivica (J.F. Gmel.) Pers. (Arecaceae)

BACKGROUND

This project was initiated in 2012 to collect historically important plants of garden. During previous year, 65 plant saplings under 24 species were collected for introduction in garden from a field trip to Tripura.

AREA AND LOCALITY

Division no. 25 of AJC Bose Indian Botanic Garden

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, one tour was conducted to North Bengal and Tripura for collection of important plants of garden history and collected 65 plant saplings under 24 species and all planted at nursery 1 for acclimatization.

PROJECT - 3

Collection, Introduction and *ex-situ* conservation of rare & endemic Orchids of NE India

Executing Official (s) : Dr. M.U. Sharief & Dr. B.K. Singh
Date of Initiation : April, 2014
Date to be completion : March, 2017

OBJECTIVE

ex-situ conservation of rare and endemic Orchids of NE India in AJC Bose Indian Botanic Garden

BACKGROUND

This project was initiated in 2014. During previous year, 60 plant seedlings under 45 species were collected from Arunachal Pradesh.

AREA AND LOCALITY

North East India

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, four field tours were conducted to Tripura, Gangtok and Itanagar and collected saplings of 65 RET species of Orchids for *ex-situ* conservation in the AJC Bose Indian Botanic Garden. Some of the collected species are *Acampe praemorsa, Acrochaene punctata, Anthogonium gracile, Bulbophyllum bisetum, B. cauliflorum, Coelogyne fuscescens, C. nitida, C. ovalis, C. prolifera, Cymbidium eburneum, Dendrobium amoenum, D. chrysanthum, D. eriiflorum, D. macrostachyum, D. nobile, Epigeneium amplum, Eria acervata, E. bractescens, E. coronaria, Gastrochilus calceolaris, Liparis elliptica, L. resupinata, Luisia tristis, Malaxis acuminata, Oberonia falcata, Otochilus albus, Papilionanthe uniflora, Phalaenopsis lobbii, Pinalia bractescens, Pleione praecox, Vanda cristata, Vanda griffithii* and *Zeuxine longilabris* etc.

PROJECT - 4

GIS Phyto-mapping of Trees & Shrubs of AJC Bose Indian Botanic Garden

Executing Official(s): Dr. C.M. Sahapathy, Dr B.K. Singh & Dr. A. Pramanik
Date of Initiation : April, 2014
Date to be completion: March, 2017

OBJECTIVE

To gather information about trees and shrubs of AJC Bose Indian Botanic Garden and making digital plates of all the significant and identifying characters as per requirement.

BACKGROUND

This project was initiated in 2014. During previous year, around 2100 trees and shrubs were serially labelled in 7 divisions and around 90% were identified.

AREA AND LOCALITY

AJC Bose Indian Botanic Garden, Howrah

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, 3000 trees and shrubs of the botanic garden were labeled and marked by the GIS techniques. For the work of Total Station Survey, DGPS work for 14000 trees by outsourcing an authentic department i.e., Survey of India, Government of India was approached and the scope of work was explained. A self content note

along with the work estimate as well as amount of expenditure for the said work was submitted to BSI director for consideration and further necessary action.

PROJECT - 5

Herbaceous Flora (Dicots) of AJC Bose Indian Botanic Garden

Executing Official (s) : Dr. B.K. Singh
Date of Initiation : April, 2014
Date to be completion : March, 2017

OBJECTIVE

The objective of the project is documentation of herbaceous flora (Dicot) of AJC Bose Indian Botanic Garden

BACKGROUND

This project was initiated in 2014. During previous year, c. 400 herbaceous plants (Dicot)were documented along with enumeration.

AREA AND LOCALITY

AJC Bose Indian Botanic Garden, Howrah

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, relevant literature were consulted and documented c. 350 herbaceous plants (Dicot) of AJC Bose Indian Botanic Garden, Howrah. Most of them were photographed in the field. Popular enumeration of about 250 species was done. About 10-12 new herbs were also spotted in different seasons after de-siltation activities, giving hope to enrich the list of herbaceous plants growing in the botanic garden. Finalisation of manuscript is under process

PROJECT - 6

Collection & Introduction of Indigenous palms of India

Executing Official (s) : Dr. S.S. Hameed
Date of Initiation : April, 2012
Date to be completion : March, 2017

OBJECTIVE

To collection & introduction of 10 Indigenous palms of India

BACKGROUND

This project was initiated in 2012. During previous year, 15 species were collected from a field tour to Southern Western Ghats.

Branching palm *Hyphaene thebaica* (L.) Mart. (Arecaceae) at AJC Bose, Indian Botanical Garden, Howrah

AREA AND LOCALITY

India

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, two field tours *w.e.f.* 23.10.16 to 29.10.16 and 08.12.16 to 16.12.16 were conducted to the forest areas of Part of Sikkim, North Bengal, Kalimpong of Darjeeling district, Karnataka and Northern Part of Kerala during which 21 palm species were collected. Some of which are *Trachycarpus martianus, Phoenix pusilla, P. rupicola, Livistona jenkinsiana, Trachycarpus latisectus* etc.

MULTIPLICATION, RESTORATION, CONSERVATION, AND UPKEEP OF VALUABLE *EX-SITU* GERMPLASM COLLECTIONS IN AJC BOSE INDIAN BOTANIC GARDEN

Work done: Multiplication of plants in the nursery and Mist Chamber. A total of about 20,000 plants under 600 species including 110 species of RET & E, 330 tree/plant species having ornamental and economic value (some species even represented by a single number in the garden), 120 species of medicinal plants and 40 species of others were multiplied in the mist chamber and nursery from 2003-2011. Techniques were developed for obtaining maximum rooting in some species such as *Maerua apetala, Pittosporum tobira, Sarcocephalus cordatus, Tectona hamiltoniana etc.* grown in Mist Chamber.

***ex-situ* Conservation**:More than 400 saplings/ propagules of 118 species of indigenous palms, orchids, medicinal and other economically important plants were collected from five tours undertaken to South India, Meghalaya, Sikkim, Odisha and introduced for conservation in the garden.

Upkeep of *ex-situ* collections: Effective advice provided to the field and technical staffs and monitored the progress from time to time for the scientific up-keep of valued germplasm collection of about 1400 species of plants of the Garden. Special attention provided for the maintenance of Large Palm House and other allotted sections.

RESTORATION OF GIANT WATER LILIES (*VICTORIA AMAZONICA* & *VICTORIA CRUZIANA* IN AJC BOSE INDIAN BOTANIC GARDEN LAKES

Due to careless de-siltation of lakes carried out by CPWD during 2012-2013, a number of aquatic flora have been seriously damaged including the much precious 'Giant Water Lilies'. Disappearance of 'Giant Water Lilies' from garden lakes have been widely criticized by the media and the question was also raised by the 'Hon'ble High Court', Kolkata. It was even thought that the species got vanished for ever because of the reason that it was not seen in lakes for nearly last 2 yrs. With a great efforts, in order to relieve from the embarrassment the Dept. suffered, the said species have been revived from the very old stock of seeds with special germination techniques. Now both the species of Giant Water Lilies are observed in most of the lakes of garden.

BREEDING OF 'DOUBLE COCONUT' PALM (*LODOICEA MALDIVICA)* ININDIA

Longest living palm in the world is believed to have a life span of over 1000 yrs. A single palm conserved in India at AJC Bose Indian Botanic Garden planted in 1894. At present age of this plant is 122 years; first flowering occurred after 94 years of existence, and made fruit set through artificial pollination in 2013. Pollen first procured from Peradeniya Botanic Garden, Sri Lanka and later from Nong Nooch Tropical Garden, Thailand. Now the pollination procedure has been completely tuned and it gives a great hope to conservation world in the similar cases to multiply and conserve rare species of plants from extinction. This experiment took almost seven years to get success.

PROJECT - 7

Enrichment of medicinal plant section (Charak Udyan) of AJC Bose Indian Botanic Garden through survey and introduction of medicinal plants

Executing Official (s) : Dr. S.P. Panda
Date of Initiation : April, 2015
Date to be completion : March, 2018

OBJECTIVE

To enrich Charak Udyan, AJC Bose Indian Botanic Garden, Howrah

BACKGROUND

This project was initiated in 2015. During previous year, 45 seedlings of medicinal plants under 38 species were collected from a field tour to North Bengal.

AREA AND LOCALITY

Charak Udyan, AJC Bose Indian Botanic Garden

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

During 2016-17, two field collection tours were conducted to Darjeeling, Sukna, Rajabhatkhawa area under North Bengal and Kandhamal area (Eastern Ghats) during which 86 medicinal and RET species were collected and grown in the Nursery for introduction in the Charak Udyan. In addition, 5 species of *Ocimum* and 1 variety were collected and maintained. Some of the species collected are *Acacia catechu, Acorus calamus, Artemesia vulgaris, Bacopa monnieri, Bryophyllum pinnatum, Calotropis procera, Chamaecostus cuspidatus, Cissus quadrangularis, Clerodendrum indicum, Desmodium*

gangeticum, Evolvulus alsinoides, Gardenia jasminoides, Jasminum grandiflorum, Magnolia metabilis, Mentha arvensis, Nyctanthes arbor-tristis, Ochna obtusata, Ocimum americanum, O. basilicum, O. gratissimum, Phyllanthus emblica, Piper longum, Scindapsus officinalis, Terminalia chebula, Uraria rufescens etc.

PROJECT - 8

Flora of West Bengal: Arecaceae (New Project)

Executing Official(s) : Dr. S.S. Hameed & Dr. Mahua Pal
Date of Initiation : April, 2016
Unit from which allotted : CNH, Howrah

OBJECTIVE

To document Flora of West Bengal : Family Arecaceae

BACKGROUND

This is a new project.

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE

Description of 40 species has been completed.

OTHER PROJECTS - 1

Floral Diversity in Rabindra Sarobar Lake, Kolkata (Vide D/BSI order No. CNH/Tech.2016-17, dated 17.01.2017)

Executing Official(s) : Dr. Rajib Gogoi, Dr. R. K. Gupta, Sri D. L. Shirodkar, Sri M. E. Hembrom, Dr. B. K. Singh& Dr. Sudipta K. Das

Date of Initiation : January, 2017
Date to be completion : March, 2017

OBJECTIVE

To document floristic diversity of Rabindra Sarobar Lake, Kolkata.

BACKGROUND

Rabindra Sarobar, a lake of National importance, is the second largest waterbody in Kolkata, situated in the southern part of the city lies between 22°30'.30" - 22°30'.42" N, 88°21'-88°22' E. Originally known as Dhakuria Lake, in May 1958, CIT renamed the lake as Rabindra Sarovar, as a tribute to the great Bengali writer and Nobel Laureate, Rabindranath Tagore. The area around this excavated lake was later developed to build recreational complexes, which included children's parks, gardens and auditoria. The present project was initiated as a part of Rapid Environmental Impact Assessment in Rabindra Sarobar Lake vide O.A.136/2016/EZ of The Hon'ble National Green Tribunal, Eastern Zone Bench, Kolkata.

AREA AND LOCALITY

Rabindra Sarobar Lake, Kolkata, West Bengal

SUMMARY OF THE WORK DONE

During 2016-17, 04 survey and collection trips were conductedin Rabindra Sarobar Lake during dry winter season (January end to mid March-2017) to estimate floral diversity.

A View of Rabindra Sarovar Lake, Kolkata, West Bengal

ACHIEVEMENT/OUTCOME IN 2016-17

The present study results in the following observations: The Rabindra Sarobar Lake is consisting of 3 species of Pteridophyte from 3 families and 3 genera; 2 species of Gymnosperms from 2 families and 2 genera and 322 species of Angiosperms. The Angiosperms are represented by 86 families of both aquatic and terrestrial plants. The 10 most dominating families of the flora are Asteraceae (21); Euphorbiaceae (18); Poaceae (16); Fabaceae (15); Arecaceae (15); Moraceae (14); Caesalpiniaceae (11); Apocynaceae (11); Acanthaceae (10); Bignoniaceae (9); Malvaceae (9); Mimosaceae (9); Verbenaceae (8); Amaranthaceae (7); Rubiaceae (7) and Araceae (5). There are *c.* 295 species of terrestrial plants and 27 species of aquatic plants in the lake area.The habit wise classification of the flora cointains 124 species of trees, 140 species of herbs, 46 species of shrubs, 9 species of climbers and 8 species of lianas. A total of 22 algal taxa were identified from the lake samples which include 8 planktonic forms and 14 attached/benthic forms. The planktonic population in the lake is comparatively low than the benthic part of the lake, where *Lyngbya majuscula* grows luxuriously. species dominancy of the family Meruliaceae, Polyporaceae, Hymenochaetaceae, Phanerochaetaceae belonging to Basidiomycota was observed in almost all forest patches and human settlement areas. *Amylosporus, Auricularia, Cellulariella, Coriolopsis, Earliella, Flavodon, Phanerochaete, Phellinus, Scytinostroma* and *Trametes* are the dominant genera in these localities. Some Ascomycetes of genera *Daldinia, Hypoxylon* and *Xylaria* were also found colonizing on the dead and decaying woods of economically importance. The final report of "Floral Diversity in Rabindra Sarobar" was submitted to the Chairman of the Expert Committee on 25.03.2017 for communication to the Hon'ble Court.

OTHER PROJECTS - 2

Strengthening the Community Institution, Developing Criteria and Indicators for Participatory Biodiversity Monitoring for improvement of the Ecosystem Services, Sustainable Livelihood in particular (in collaboration with IBRAD)

Executing Official (s) : Prof. S.B. Roy, Dr. Raktima Mukherjee, Dr. B.K. Singh, Ms Arpita Saha, Mr. Sudipto Dey & Mr. Jayant Besra
Date of Initiation of the Project : December, 2016
Date to be completion : December, 2017

OBJECTIVE

Major objectives of the project are to study the baseline of the effectiveness of JFMCIEDC and document the impact of the efforts of community on conservation of the Mangrove biodiversity; to develop criteria to assess the effectiveness of JFMCIEDC as institution; to develop simple criteria and indicators for community participation in biodiversity monitoring; to involve community JFMC/EDC; to document the change in the status of biodiversity; to conduct training for the community for developing skills for livelihood based of their local resources; to document the process and impact of the endeavour of IBRAD at Dhanchi process.

BACKGROUND

The Sundarban 'Mangrove Wetlands' is a unique ecosystem in itself and plays a number of roles in the environment, principally water purification, flood control, carbon sink and shoreline stability. While we value its importance, there have been challenges in conservation. Although, we have series 'of scientific papers and several documents indicating the nature and extend of degradation and conservation of mangrove wetlands, except a few, we do not have many example of conservation and eco-restoration, monitoring of Mangrove biodiversity periodically through community support. One will appreciate the need of institution building of the JFMC/EDC, participatory bidiversity monitoring and convergence of the resources of the line departments for the livelihood of the community. This project was proposed to demonstrate IBRAD's Eco-Chain approaches to Ecosystem Based Institution Building for Participatory Biodiversity Monitoring to improve Ecosystem Services, livelihood in particular.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, attended a meeting with the Chairman, IBRAD to discuss the project and implementation strategy on 18.01.2017. Delivered a lecture on the "Methodology, of identification of Sunderban Mangroves" in one day workshop on "Challenging issues of participatory biodiversity conservation of the mangroves and sustainable development" jointly organized by Botanical Survey of India and IBRAD on 10.09.2016 at IBRAD Campus, Keshtopur, Kolkata. Few more meetings were held in connection with the above mentioned project to discuss the various approaches for study on Sunderban Biosphere Reserve.

ANDAMAN & NICOBAR REGIONAL CENTRE, PORT BLAIR

PROJECT - 1

(a)Collection and introduction of seeds and seedlings of 20 tree species, Zingibers, Rattans in the Dhanikhari Experimental Garden-cum-Arboretum (DEGCA), Nayashahar to raise Nursery and work on seed germination

(b) Phenological survey of tree species of Dhanikhari Experimental Garden-cum-Arboretum (DEGCA), Nayashahar

Executing Official (s) : Dr. Lal Ji Singh
Date of Initiation : April, 2014
Date to be completion : March, 2017

OBJECTIVE

The objectives of the project are tocollect and introduce seeds and seedlings of selected tree species, Zingers, Rattans in DEGCA, Nayasahar and to record flowering and fruiting of tree species in the garden.

Tuberous root *Zingiber pseudosquarrosum* L. J. Singh & P. Singh (Zingiberaceae)

BACKGROUND

This project was initiated in 2014. During previous year, seedlings/rhizomes/culms of 08 Rattans & Bamboos, 10 Zingers, 29 trees; seeds of 01 rattans, 22 trees and 34 other valuable taxa were collected from various forest areas of Andaman Islands. During this year (2015-16), seed germination for 07 tree species were documented.

AREA AND LOCALITY

Andaman Islands, c. 6408 sq. km

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, one field tour was conducted for collection of seeds and seedlings of tree species, Zingibers and Rattans. Following number of rare, endangered, threatened, endemic tree species, Zingibers and Rattans were collected from various forest areas of Andaman Islands and introduced in the Dhanikhari Experimental Garden -Cum -Arboretum (DEGCA, Nayashahar:

Seedlings/Rhizomes/Culms: Rattans & Bamboos : 02; Zingibers: 04; Trees species seedlings: 27

Seeds: Rattans : 01; Trees: 11

Other Valuable Taxa (Medicinal, Ornamental etc.): 11. Seed germination study for 16 tree species of Andaman and Nicobar Islands were documented for the first time. These are *viz., Artocarpus chapalasha, Cycas pschannae, Dipterocarpus turbinatus, Ganophyllium falcatum, Garcinia andamanica* var. *andamanica, Heritiera littoralis, Mangifera griffithii, Manilkara littoralis, Miliusa horsfieldii, Mimusops andamanensis, Myristica elliptica, Planchonella longipetiolata, Podocarpus nerifolius, Spondias pinnata, S. mangifera, Sterculiaalata.* The effect of habitats on seed germination and seedling survival of tree species of Andaman and Nicobar Islands were studied. Phenological surveys of 73 species of Dhanikhari Experimental Garden cum Arboretum were documented along with a nursery was raised. In addition, a Herbarium Consultation tour was also undertaken from 07.11.2016 to 11.11.2016 during which 174 specimens were identified.

ACHIEVEMENT/OUTCOME IN 2016-17

The above study discover *Zingiber pseudosquarrosum* L.J.Singh & P. Singh as new to science; *Diplazium proliferum* (Lam.) Thouars as new to India;*Courtoisina cyperoides* (Roxb.) Sojak, *Cyathea gigantea* (Wall. ex Hook.)Holttum, *Eleocharis spiralis*(Rottb.) Roem. & Schult., *Thelypteris polycarpa*(Blume) K. Iwats, *Trichomones bipunchtatum* Poir. and *T. minutum* Blume as new records for the state; *T. motleyi* (Bosch) Bosch was rediscovered after 130 years. Ethno-medicinal uses of some new taxa (*Musa indamanensis* L. Singh & *Zingiber pseudosquarrosum* L.J.Singh & P. Singh) in the Andaman and Nicobar Islands, India were documented for first time.

PROJECT-2

Lichens of the Nicobar Islands

Executing Official (s) :Dr. T.A.M. Jagadeesh Ram
Date of Initiation : April, 2014
Date of completion : March, 2017

OBJECTIVE

The objective of the project is to analyse the lichen diversity of Nicobar Islands

BACKGROUND

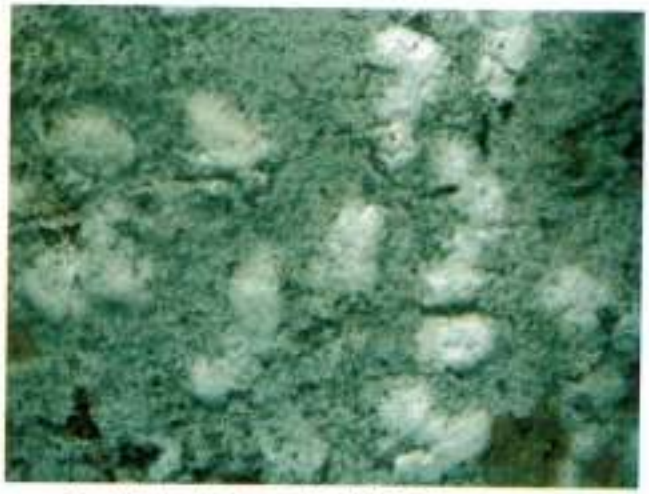
The project was initiated in 2014. During previous year (2015-16), a total of 784 specimens were identified into 94 species. Chemical profiles of 760 specimens were identified by TLC. A total of 1335 field numbers were mounted and all the identified specimens were incorporated in the herbarium.

AREA AND LOCALITY

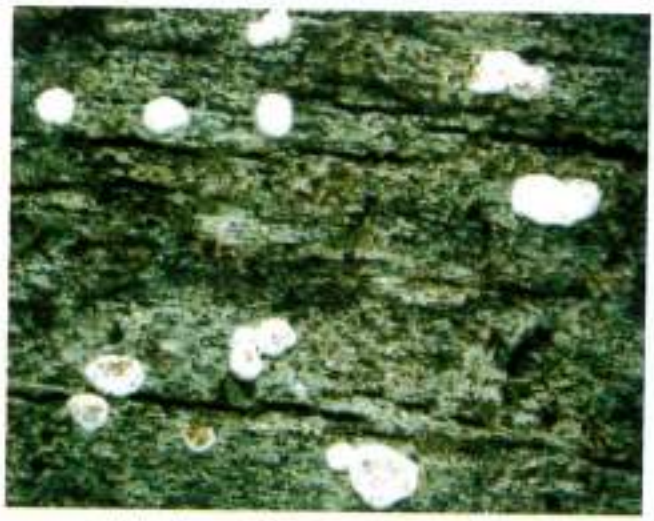
1841 sq. km

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, a total of 823 specimens were identified into 72 species. All the identified specimens were incorporated into the herbarium. Overall a total of 168 species in 56 genera and 20 families were recognized for the Nicobar Islands.



Cryptothecia elata Jagadeesh & G.P. Sinha (Arthoniaceae)



Myriostigma nicobaricum Jagadeesh & G.P. Sinha

ACHIEVEMENT/OUTCOME IN 2016-17

This study reports *Myriostigma nicobaricum* Jagadeesh & G.P. Sinha (Arthoniaceae) as new to science; *Alyxoria culmigena* (Lib.) Ertz (Lecanographaceae), *Cryptothecia aleurodes* (Nyl.) Makhija & Patw., *C. eungellae* G. Thor and *C. striata* G. Thor (Arthoniaceae) as new records for India.

PROJECT - 3

"*Ex-situ* conservation of RET species of Andaman & Nicobar Islands at Dhanikhari Experimental Garden Cum Arboretum and identification of unidentified angiosperm specimens in ANRC Herbarium"

Executing Official (s) : Dr. Sanjay Mishra
Date of Initiation: April, 2015
Date to be completion : On going

OBJECTIVE

The objectives of the project is to conserve RET species of Andaman & Nicobar Islands at Dhanikhari Experimental Garden Cum Arboretum, and identification of unidentified angiosperm specimens in ANRC Herbarium.

BACKGROUND

This botanic gardens are an essential network of botanical resource centres, vital for environmental conservation, large collections of endangered plants, but much more needed to be accomplished. Hence, this project was proposed in 2015. During previous year, 51 RET species and plants of medicinal and economic importance were collected from afield tour and introduced in the Garden.

Diplazium proliferum (Lam.) Thouars (Athyriaceae)

AREA AND LOCALITY

Andaman and Nicobar Islands, c. 8249 sq. km.

SUMMARY AND ACHIEVEMENTS OF THE WORK DONE DURING 2016-17

During 2016-17, one exploration tour was undertaken to Little Andaman *w.e.f.* 22.02.2017 to 01.03.2017 during which seeds/seedlings of 51 RET species and plants of medicinal and economic importance were collected and introduced in the Dhanikhari Experimental Garden -cum -Arboretum. Seeds /seedlings of 52 species which include RET and plants of medicinal and economic importance were collected and introduced in the Dhanikhari Experimental Garden cum Arboretum. Other than exploration tour 21 species of plants were introduced in the garden. 79 unidentified specimens of PBL were identified into 35 species.

PROJECT - 4

Flora of Kyd, Pitman & James Islands, South Andaman

Executing Official (s) : Dr. Sanjay Mishra, Dr. C. P Vivek.& Shri. Gautam Anuj Ekka
Date of Initiation: April, 2015
Date to be completion : March, 2018

OBJECTIVES

The objectives of the project are survey, collection and documentation of the flora of Kyd, Pitman and James Islands; conservation of rare, threatened, endemic and endangered plants of these Islands at Dhanikhari Experimental Garden-cum-Arboretum, Nayashar.

BACKGROUND

The project was initiated in 2015. During previous year, 155 field nos. were vouched along with GPS data and a total of 75 species were identified.

AREA AND LOCALITY

Kyd Island (c. 8.0 sq. km), Pitman Island (c. 1.27sq. km), James Island (c. 2.10 sq. km)

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, two field exploration tours were undertaken to Kyd, Pitman and James Islands of which first tour was conducted *w.e.f.* 08.08.2016 to 12.08.2016 during which a total 111 field numbers were vouched along with the GPS data and plants/seedlings of 26 species were introduced in the Dhanikhari Experimental Garden -cum- Arboretum. About 250 photos of Plants and forest views were taken. Second tour was undertaken *w.e.f.* 12.12.2016 to 16.12.2016 during which total 98 field numbers were vouched along with the GPS data and plants/seedlings of 28 species were introduced in the Dhanikhari Experimental Garden-cum Arboretum. About 250 photos of Plants and forest views were taken. During this period, a total of 105 specimens were identified of which 27 endemic, 30 medicinal plants, 35 economic plants, 06 rare plants and 02 endangered species were reported.

ARID ZONE REGIONAL CENTRE, JODHPUR

PROJECT - 1

Flora of Shoolpaneshwer Wildlife Sanctuary, Narmada District, Gujarat (India)

Executive Official(s): Dr. S.L. Meena & Dr. P. Hari Krishna
Date of Initiation : April, 2012
Date to be completion : March, 2017

OBJECTIVE

The major objectives of the project are inventorisation of the flora of Shoolpaneshwer Wildlife Sanctuary and its documentation, providing means of identification of floral components up to infra-specific level, standardization of nomenclature of plants according to the International Code of Nomenclature, determination of depleting plant species and their categorization, determination of the factors responsible for the depletion of plant species and strategies for the conservation of species and habitats.

BACKGROUND

This project was initiated in 2012. During previous year, 187 field no. comprising of 1122 specimens were collected and 387 field no. were identified.

AREA AND LOCALITY

607.7 sq. km

SUMMARY OF THE WORK DONE DURING 2016 – 17

During the period under report, one herbarium consultation Tour was conducted *w.e. f.* 29.05.2016 to 10.06.2016 to Botanical Survey of India (BSI), Pune, M.S. University (BARO), Vadodara and Sardar Patel University (SPU), Anand (Gujarat) and confirmed the identity of about 100 field nos. and also cited the specimens those were housed at BSI, BARO and SPU herbarium from the Shoolpaneshwer WLS (Narmada Dt.,) Gujarat. A botanical exploration tours to Shoolpaneshwer WLS *w.e.f.* 01.09.2016 to 14.09.2016 was undertaken and collected 117 field nos. comprising of 585 specimens. Besides this, GPS data and digital photographs of each plant and types of vegetation was carried out during the exploration. Also collected latest literature related to concerned study area from Forest Department, Rajpipla (Narmada Dt.) M.S. University, Vadodara and Sardar Patel University, Anand (Gujarat). During this period, atotal 537field nos. were identified and label writing was completed for 542 specimens collected during previous

Deciduous forest in Shoolpaneshwar WLS, Narmada district, Gujarat

Abelmoschus ficulneus (L.) Wight & Arn. (Malvaceae)

and latest tours. During the period under report, 203 species were documented which include species citation, short description, flowering & fruiting, ecological notes and specimens examined followed by locality, collector's name, field nos. and name of depository herbaria. A final list of the plant data base has been prepared which includes field nos., name of plant species, family, locality, and date of collection, altitude, latitude, longitude, remarks, habit and vegetation types for easy handling of the project and also prepared 20 plates for project report.

ACHIEVEMENTS/ OUTCOMES IN 2016 -17

This study reports 04 new records for state; ethnobotanical of 54 plant species were collected from the different ethnic groups residing within the study area. During the period under report, 28 plant saplings belonging to15 plant species were introduced in the Desert Botanic Garden for *ex-situ* conservation namely *Ensete superbum, Ougeinia oojeinensis, Pterocarpus marsupium, Firmiana colorata, Sterculia villosa, Casuarina equisetifolia, Crinum lorifolium, Gymnema sylvestre, Sterculia foetida, Ficus beghalensis* (= *F. krishnae*), *Butea superba, Couropita guianensis* and *Dendrobium barbatulum.*

PROJECT - 2

Flora of Navsari district, Gujarat

Executing Official (s) : Dr. Ramesh Kumar & Shri Vinod Maina
Date of Initiation : June, 2015
Date to be completion : March, 2020

OBJECTIVE

The main objective of the present study is to provide glimpses of flowering plants of Navsari district, Gujarat.

BACKGROUND

The project was initiated in 2015. During previous year, one field tour *w.e.f.* 15.10.15-03.11.15 was conducted to Navsari, Gujrat during which 671 field nos. were collected and a total of 153 species were identified.

AREA AND LOCALITY

Navsari district is bounded by Arabian Sea in the West, Surat district in North, Tapi and Dang districts in East and Valsad district in South. It comprises of 5 talukas by covering an area of 2211 sq. km. and supposed to be very significant and one of the richest site in reference to the plant diversity because of having four forest types *viz.* Tropical Moist deciduous, Littoral and swamp, tropical dry deciduous and tropical thorn forests.

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, two field tours *w.e.f.* 28th July – 14th August 2016 and 6th– 23rd January 2017 were undertaken to the study area and collected 623 field numbers of herbarium samples from three different habitats of the area. A total of 1800 sq. km. area was surveyed during which survey Grid map and GPS coordinates of different forest/vegetation patches were demarcated with the help of Satellite imagery by using GPS to explore and collect maximum number of plant species. During this period, 175 species belongs to 144 genera under 69 families were identified for the Flora of Navsari district. c. 500 photographs were taken and completed label writing of 266 identified herbarium sheets for the Flora of Navsari district, Gujarat. A total of 115 species belonging 85 genera under 33 families were documented.

Capparis deciduo (Forssk.) Edgew. (Capparaceae)

Rivulets in Gir National Park and sanctuary

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reported one new generic record (*Porteresia* Tateoka) for Gujarat; two new records (*Alysicarpus roxburghianus* Thoth. & Pramanik; *Porteresia coarctata* (Roxb.) Tateoka for the state; one variety was rediscovered *Pavonia arabica* var. *massuriensis*; documented ethnomedicinal information of 16 plant species; several RET & economic plants were reported namely *Ceropegia bulbosa* var.*bulbosa*, *C. bulbosa* var. *lushii*, *Commiphora wightii*, *C. stocksiana*, *Periploca aphylla*, *Ephedra foliata*, *Gloriosa superba*, *Careya arborea*, *Curculiago orchoides*, *Solanum trilobatum*, *Madhuca longifolia*, *Terminalia tomentosa*, *Euphorbia fusiformis*, *Desmodium giganticum*, *Asparagus recemosa* *Curcuma amada*, *C. inodora*, *Butea monosperma*, *Caryota urens*, *Bacopa monnieri*, *Dioscorea alata*, *Nervillia discolor*, *N. aragona*, *Desmostachya bipianata* etc.

PROJECT - 3

Flora of Sariksa Tiger Reserve, Alwar District, Rajasthan

Executing Official (s) : Dr. M.K. Singhadiya & Shri Ravi Prasad
Date of Initiation : April, 2015
Date to be completion : March, 2019

BACKGROUND

The project was initiated in 2015. In previous year, one botanical exploration tour was conducted to the study area during which 249 field no. were collected along with field photographs.

AREA AND LOCALITY

Sariksa Tiger Reserve, Alwar District., Rajasthan c. 1281 sq. km

SUMMARY OF THE WORK DONE DURING 2016-17

During the period under report, one botanical exploration tour was conducted *w.e.f.* 18.09.2016 to 02.10.2016 to Sariska Tiger Reserve, Alwar District, Rajasthan during which a total of 391 field numbers (803 plant specimens) were collected from different parts of Sariska Tiger Reserve, and also collected *Pandanus odoratissimus* (2 live plants) & cones of *Pinus roxburghii* (4 specimens). Besides, GPS data and digital photographs of 250 plant specimens and vegetation types were noted down during the exploration work. Identified 223 plant specimens from the Sariska Tiger Reserve, Alwar district, Rajasthan.

ACHIEVEMENTS/OUTCOME IN 2016-17

All the live plants collected during field tour were successfully introduced into Botanic garden of BSI, AZRC.

PROJECT - 4

Flora of Todgarh-Raoli Wildlife Sanctuary, Rajasthan

Executing official(s) : Dr. C. S. Purohit
Date of Initiation : June, 2015
Date to be completion: March, 2020

BACKGROUND

This project was initiated in 2015. During previous year, 01 herbarium consultation tour was conducted to RUBL, Department of Botany, University of Rajasthan, Jaypur, studied and documented 358 herbarium specimens of 107 species collected from the study area.

AREA AND LOCALITY

Todgarh-Raoli Wildlife Sanctuary (73°40'-74°10' E and 25°20'-26°00' N).Total Geographical area of the Sanctaury is 495.27 sq. km.

SUMMARY OF THE WORK DONE DURING 2016-2017

During this period, one field tour was undertaken *w.e.f.* 26.07.16- 16.08.16 to the study area and explored c. 390 sq. km area of this sanctuary including Core region. During the survey, 434 collection numbers of herbarium samples were collected. During field survey, Grid map and GPS coordinates of different forest/vegetation patches were demarcated with the help of satellite imagery by using GPS to explore and collect maximum number of plant species in buffer and core zone of the sanctuary and may be important for retrieval of RET species and forest planning and collected 434 field numbers from Todgarh-Raoli Wildlife Sanctuary along

Melhania magnifolia Blatt. & Hallb. (Malvaceae)

Pavonia arabica Hochst. ex Steud. var. *massuriensis* Bhandari (Malvaceae)

with 250 photographs. Identified 192 species belonging to 133 genera and 52 families collected from Todgarh-Raoli Wild Life Sanctuary, Rajasthan. Documented 25 species belonging to 7 families. Beside, local Herbarium consultation tours *w.e.f.* from 11.04.16 -12.04.16 and 17.05.16 – 30.05.16 to CAZRI, Jodhpur and JAC, Department of Botany, Jai Narayan Vyas University, Jodhpur were also conducted during which listing done for 69 Herbarium sheets collected from Ajmer, Pali & Rajsam and 79 Herbarium sheets from Ajmer, Pali & Rajsam.

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study reports one species (*Calligonum comosum* L'Her.) as new to India; one genus (*Porteresia coarctata* (Roxb.)Tateoka (Poaceae) and two species [*Alysicarpus roxburghianus* Thoth. & Pramanik (Fabaceae); *Porteresia coarctata* (Roxb.)Tateoka (Poaceae)]as new records for state. *Pavonia arabica* Hochst. ex Steud. var. *massuriensis* Bhandari (Malvaceae) was rediscovered after a long gap.

PROJECT - 5

Ex-situ conservation of RET and economically important species of the Arid region in the experimental Garden of AZRC and documentation of phenological data on flowering & fruiting

Executing official(s) : Shri Vinod Maina, Dr. Ramesh Kumar, Dr. C.S. Purohit, Dr. M.K. Singhadiya, Dr. P. Hari Krishna & Mr. Ravi Prasad
Date of Initiation : Ongoing

OBJECTIVE

The main objectives of the present study are to provide information of the RET species of the area and suggestions for conservation strategies

BACKGROUND

During 2015-16, 109 live plants belonging to 27 RET and

Ephedra foliata Boiss. ex C.A.Mey. seedlings in Experimental garden, BSI, Jodhpur

Medicinal plants were collected and introduced in the Desert Botanical Garden.

AREA AND LOCALITY

Rajasthan & Gujarat.

SUMMARY OF THE WORK DONE DURING 2016-17

The existing Experimental Botanic Garden (Arid Zone Botanic Garden), established in 1994 in the office premises with an area of c. 8 acres, is in the process of introduction / acclimatization and paying considerable attention towards maintenance of germ plasm collection, growing and multiplication of rare / endangered / threatened plant wealth of North-West India in order to save them from extinction. About 300 species of vascular plants and 4 gymnosperms of North-West India have already been conserved here. Many of them are rare, endemic to this region and economically important. During the above period, 05 germplasm collection tours were conducted to Luni river side (10.04.2016), Navsari, Gujarat (28.07.16-14.08.16), Machiya Biological Park, Jodhpur (08.09.16 - 11.09.16, 13.09.16, 26.09.16 - 29.09.16, 04.10.16-13.10.16) and Great Runn of Kutchh Biosphere Reserve, Gujarat (23.03.17-29.03.17) during which following RET, medicinal, economic and ornamental plants were collected namely *Ceropegia bulbosa* var.*bulbosa*, *Ceropegia bulbosa* var. *lushii*, *Commiphora stocksiana*, *C. wightii*, *Periploca aphylla*, *Ephedra foliata*, *Oxystelma paniculata*, *Radermachera xylocarpa*, *Ensete superbum* and *Gloriosa superba*, *Careya arborea*, *Curculiago orchoides*, *Solanum trilobatum*, *Madhuca longifolia*, *Terminalia tomentosa*, *Euphorbia fusiforrmis*, *Desmodium giganticum*, *Asparagus recemosa*, *Curcuma amada*, *C.inodora*, *Butea monosperma*, *Caryota urens*, *Bacopa monnieri*, *Dioscorea alata*, *Desmodium oojeinense*, *Pterocarpus marsupium*, *Firmania colorata*, *Ficus elastica* and 15 variants of winter annuals. Besides 09 botanically interesting plants (*Nervillia aragona*, *N. discolor*, *Crinum lorifolium*, *Acacia concinna*, *Butea superba*, *Bombax ceiba* and *Dendrobium microbulbon*), ethno-religious plants (*Ficus benghalensis* var. *krishnae*, *Desmostachya bipinnata* and *Couroupita guianensis*) were also collected.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

During this period, seedlings of *Tephrosia villosa*, *T. collina*, *T. falciformis*, *Indigofera tinctoria*, *Moringa oleifera*, *Psoralea corylifolia*, *Citrullus colocynthis*, *Centratherum anthelminticum*, *Abrus precatorius*, *Adnanthera pavonina*, *Luffa acutangua* var. *amara*, *Lagenaria siceraria*, *Uraria picta* and *Cassia alata* were raised in nursery and planted in Experimental Botanic Garden, Jodhpur; collected seeds of *Acacia jacquemontii*, *Cadaba fruticosa* to raise seedlings in the nursery of Desert Botanic Garden, BSI, Jodhpur; collected fruits of *Dregea volubilis* and two type of *Lagenaria siceraria* for display in museum; Phenological data of c. 94 existing plant species of Desert Botanic Garden of BSI, AZRC, Jodhpur were recorded. During 2016-17, 10 RET species; 21 medicinal plants; 9 species of botanical interests; 4 economically important species; 16 ornamental species and 3 ethno-religious plants were introduced in Arid Botanic Garden for conservation purpose.

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

PROJECT - 1

Grass Flora of Arunachal Pradesh

Executing Official(s) : Dr. Manish K. Kandwal
Date of initiation: April, 2012
Date to be completion: March,2017

OBJECTIVE

The objective of the project is to document the Grass diversity of the Arunachal Pradesh.

BACKGROUND

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. Keeping the fact in mind, the state Arunachala Pradesh whole is taken for survey of grass flora in 2012. During previous year (2015-16), two field tours were conducted to Lohit, Changlang, Tirap & Zero and to Kurum Kumey districts of Arunachal Pradesh during which a total of 270 field nos. were collected of which 130 field nos. were identified to 35 species.

AREA AND LOCALITY

Arunachal Pradesh, c. 83,743 sq.km

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, two field tours *w.e.f.* 01.05.2016 - 07.05.2016 and 27. 08. 2016 – 16.09.2016 were conducted to Nagajiji in East Kameng district and in different localities of Anjaw and Lohit districts. A total of 10 specimens and a total of 152 field numbers were collected from Nagajiji area along with more than 50 photographs. Description prepared for 115 species; 215 field numbers collected in previous tour were identified during this period. A total of 1301 specimens were identified into 120 species. In addition, two herbarium consultation tours was conducted *w.e.f.* 17.02.2017-27.02.2017 to CAL Herbarium and 31.03.2017-14.03.2017 to ASSAM Herbarium and studied about 94 herbarium specimen.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports two new species and one new record for India; one new record of bamboo was published in *Nelumbo*.

OTHER WORKS DONE

In addition to Annual Action Plan project, Dr Manish Kandwal also has completed the 'Grass Flora of Uttrakhand Vol-V' which dealsof 475 species 326 species.

PROJECT - 2

Flora of Pakhui Wild Life Sanctuary, East Kameng District, Arunachal Pradesh

Executing Official(s) : Dr. P. Satyanarayana & Shri B.B.T. Tham
Date of initiation : April, 2012
Date to be completion: March,2017

OBJECTIVE

The objective of the project are to document the Floral diversity of the vascular plants of the Sanctuary and to highlight the plant wealth of the protected area along with threats and conservation measures proposed.

AREA AND LOCALITY

Pakhui Wild Life Sanctuary and Tiger Reserve East Kameng district, Arunachal Pradesh, 862 sq.km

BACKGROUND

The present assignment is an intensive 'Flora Documentation Project' to highlight the Floral Wealth of Pakhui Wild Life sanctuary and was initiated in 2012. During previous year, one herbarium consultation tour was conducted to ASSAM Herbarium; 229 specimens were identified and documentation completed for 235 species.

Strobilanthes echinata Nees (Acanthaceae)

Terminalia myriocarpa Van Heurck & Müll. Arg. (Combretaceae)

SUMMARY OF THE WORK DONE

During 2016-17, manuscript of the 'Flora of Pakhui Wild Life Sanctuary' which deals with a total of 592 species belonging to 387 genera under 134 families was prepared for submission of a final project report.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

Final manuscript of this project was completed and submitted as a project report with a total of 592 species belonging to 387 genera under 134 families.

PROJECT - 3

Taxonomic study of Polypodiaceae of North East India

Executing Official(s) : Dr. Vineet Kumar Rawat
Date of Initiation : April,2012
Date to be completion:March,2017

BACKGROUND

The present project, aims at to document the diversity of members of Polypodiaceae of North Eastern India, was initiated in 2012. During previous year (2015-16),one field tour was conducted to different districts of Arunachal Pradesh and a total of 255 field numbers were collected of which 232 field nos. were identified.

AREA AND LOCALITY

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 2016-17

During this period, one field tour *w.e.f.* 30.03.17 to 08.04.15 was conducted to West Kameng district of Arunachal Pradesh. (Total area covered-c. 1600 sq. km) and collected 187 field nos.; finalised the description of 56 species along withkeys. Total 200 field numbers were identified during this period. Also collected 24 fields no. during local field tours. All the plant materials collected during earlier tours were processed. Till date a total of 1065 specimens were identified into 123 species. All the identified specimens were incorporated into the herbarium. Overall a total of 123 species in 25 genera within this family recognized for the North-East India were documented.

Drynaria quercifolia (L.) J. Sm. (Polypodiaceae)

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports two new records for state {{*Arthromeris nothoiaenoides* V. K. Rawat & Fraser-Jenk.; *Microsorum subhemionitideum* (Christ) Fraser-Jenk.}}; 04 rediscoveries {*Arthromeris tatsienensis* (Franchet & Bureau in Christ) Ching; *Arthromeris lungtauensis* Ching;*Pichisermollodes malacodon* (Hook.) Fraser-Jenk.; *Drynaria delavayi* Christ); ethnobotanical of 23 species were gathered and datasheet of 18 RET plants was prepared along with initiation of conservation measures.

PROJECT - 4

Flora of Lohit district and Flora of Kamlang Wildlife Sanctuary, Arunachal Pradesh

Executing Official(s) : Dr. Souravjyoti Borah
Date of Initiation: April, 2013
Date to be completion:March,2017

OBJECTIVE

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

BACKGROUND

This project was initiated in 2013. During previous year, 178 field no. were identified, 194 species were described along with nomenclatural update of 275 species.

AREA AND LOCALITY

The Lohit district of Arunachal Pradesh,c. 5,212 sq. km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-2017

During this period, onefield tour *w.e.f.* 27.08.2016 to 16.09.2016 to different localities of Lohit district was undertaken. A total of 152 field numbers were collected with more than 120 photographs. The specimens collected were processed and mounted on herbarium sheets. One herbarium tour was conducted to CAL and identified 35 species. Updated nomenclature of about 400 species. More than 340 descriptions were prepared and finalization of manuscript is in progress. Also one herbarium consultation tour *w.e.f.* 19.01.2016 to 05.02.2016 was undertaken to ASSAM, BSI-ERC, Shillong during which 178 field no. were identified. A total of 208 herbarium sheets, collected from Lohit district, Assam, were studied and 194 species were described along with nomenclature update of 275 species. Re-poisoning of 75 herbarium sheets was done.

Pyrrosia lanceolata (L.) Farw. (Polypodiaceae)

Rhynchotechum vestitum Wall. ex C.B. Clarke (Gesneriaceae)

ACHIEVEMENTS/ OUTCOMES IN2016-17

Final Manuscript of the project is under process and this will be submitted within July, 2017.

PROJECT - 5

Flora of East Kameng district, Arunachal Pradesh

Executing Official(s) : Dr. Umesh Kumar L. Tiwari
Date of Initiation: April, 2015
Date to be completion:March,2019

OBJECTIVE

The objectives of the project are to document the floral diversity of the vascular plants and to highlight the plant wealth of the district along with threats and conservation measures proposed.

BACKGROUND

This project was proposed in 2015 and during previous period (2015-16), one field tour was conducted to study area during which 272 field no. of 900 plant specimens were collected of which 47 species were identified and described. A master checklist of 29 families, 100 genera and 338 taxa for East Kameng district was prepared.

AREA AND LOCALITY

East Kameng district, Arunachal Pradesh

PROGRESS OF THE WORK DONE IN 2016-2017

During this period, two field tours *w.e.f.* 05.07.16-29. 07. 16 and19.09.16-06.10.16 were undertaken to the study area (tour was conducted to East Kameng district and area surveyed near Bana, Yashing basti, Chijang basti, Pitchang basti; Chayang, kamke basti, Sollung basti via Langta, Keyang basti, Soshi Bameng basti via Along Pao, Khenewa to Warrom-Safew, Khazu Long to Sekang and Jarken) and 486 (255+ 231) field numbers were collected (around 900 plant individuals). Of which 113 field numbers were collected. During the study of old

Hydrangea robusta Hook. f. & Thomson (Hydrangeaceae)

Pleione praecox (Sm.) D. Don (Orchidaceae)

herbarium specimens housed in ARUN, Itanagar, 71 accessioned specimens of 28 species were identified. Besides Herbarium consultation tour was conducted *w.e.f.* 07.12.2016-23.12.2016 to Assam and Sikkim during which about 1256 specimens were studied covering 56 families. During the course of herbarium study, determinavit slips were attached for 203 accessions covering 25 families of 47 genera.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

During this period, a master checklist comprising 29 families, 100 genera and 338 taxa for East Kameng dist., was prepared.

OTHER WORKS DONE

Identification was done for plant specimens collected under the NHPC project covering of 57 accession numbers and 19 species.

PROJECT - 6

Red Listing of Orchids of Arunachal Pradesh as per IUCN criteria

Executing Official(s) : Dr. Krishna Chowlu
Date of initiation : April, 2015
Date to be completion : March, 2019

OBJECTIVES

Major objectives of this work are to solve the taxonomy and nomenclature of Orchids of Arunachal Pradesh; to evaluate the population of Orchids in natural habitats; to study herbarium specimens of Arunachal Orchids in respect of their identity, localities, assigning geo-coordinates and entry in the excel sheet for mapping; to conduct survey in different districts of Arunachal and to introduce the live specimens in the campus for further studies and *ex-situ* conservation.

BACKGROUND

This project was initiated in 2015. During 2015-16, 90 field no., collected from one field tour, were processed.

AREA AND LOCALITY

Arunachal Pradesh

SUMMARY OF WORK DONE DURING 2016-2017

During 2016-2017, three field tours were conducted to

Sub-tropical evergreen forest at Arunachal Pradesh

Papilionathe teres (Roxb.) Schltr. (Orchidaceae)

Namsai, Lohit & Anjaw districts (05.06.2016 to 01.07.2016), West Kameng & Tawang districts (20.08.2016 to 29.08.2016), West Kameng & Kurung Kumey districts (03.11.2016 to 13.11.2016) in Arunachal Pradesh; 63 collection numbers were processed for herbarium and identified 34 species from fresh as well as herbarium specimens, 07 specimens were kept for further study, 24 specimens were taxonomically worked out. Germplasms of 159 field numbers were introduced in the campus garden for further studies and *ex-situ* conservation. All the taxa were characterized through digital, macro-microscopic photo-plates. 19 specimens of APRC were studied in respect of their identity, label data, assigning geo-coordinates and entried into excel sheet for plotting of map. 63 specimens were incorporated in the Herbarium during the study.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

During this period, several orchid species were rescued from fallen trees in and around Itanagar. During field tour to West Kameng Dist., a lithophytic orchid, *Diplomeris pulchella*, the population of which was observed decreasing day by day, was collected in flowering.

Project - 7

Introduction, Conservation of Germplasms of Musa, Bamboos & Zingibers and documentation of Phenology of Garden plants

Executing Official(s) : Sri B.B.T. Tham
Date of Initiation : On going

OBJECTIVE

Germplasms to be collected in regular tours and introduced at APRC, Itanagar or at Barapani, Shillong. Documentation of Phenology of flowering and fruiting.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

During the period 2016-17, live plants collected during field tour by different scientists of the Centre were introduced in the garden as part of *ex-situ* conservation and observation of phenology in garden; flowering/ fruiting of 40 tree species growing in garden were recorded.

BOTANIC GARDEN OF INDIAN REPUBLIC, NOIDA

PROJECT - 1

Phenological Studies of Flowering and Fruiting of Plants of Botanic Garden of Indian Republic, Noida

Executing Official (s) : Dr. Kuldip.S. Dogra
Date of Initiation : April,2013
Date to be completion : On going

OBJECTIVE

The objective of the project is to collect the data of flowering and fruiting of the plant species introduced at BGIR.

BACKGROUND

A large number of plant species (trees, shrubs, herbs and climbers) were introduced at BGIR as a part of ex-situ conservation programme. These plants were introduced from different parts of the India. This study was initiated in order to find out any variation among the plant species introduced at BGIR as compared to their native areas.

ACHIEVEMENTS OF THE WORK DONE IN 2016-17

During 2016-17, a total of 43 species were reported under bud stage, 60 under flowering stage and 58 under fruiting stage. The bud, flower and fruit of some species shed or fall before attaining the maturity were listed in table along with possible reason behind it.

NUMBER OF SPECIES (43) UNDER BUD (INITIATION TO FLOWERING) DURING THE PERIOD

Acacia catechu, A. nilotica, Aegle marmelos, Albizia lebbeck, Alpinia calcarata, Annona sequomosa, Aristolochia indica, Azadirachta indica, Cannabis sativa, Cassia fistula, Ceiba petandra, Clitoria ternatea, Delonix regia, Elaeocrpus sphaericus, Fernandoa adenophylla, Glycosmis pentaphylla, Guzuma ulmifolia, Gymnema sylvestre, Hemidesmus indicus, Hibiscus rosa-sinensis, Holarrhena pubescens, Litsea glutinosa, Mentha spicata, Millatia pinnata, Mimusops elangi, Mitragyna parvifolia, Morinda citrifolia, Ocimum tenuiflоruim, Oroxylum indicum, Phyllanthus emblica, Pithecellobium dulce, Psoralea corylifolia, Pterospermum acerifolium, Rauvolfia serpentina, R. tetraphylla, Schleichera oleosa, Syzygium cumnii, Tectona grandis, Terminalia arjuna, T. bellerica, Toona ciliata, Vitex negundo and *Wrightia tinctoria.*

NUMBER OF SPECIES (60) UNDER FLOWERING (INITIATION TO FRUIT FORMATION) DURING THE PERIOD

Acacia nilotica, Aegle marmelos, Albizia leebeck, Alpinia calcarata, Annona sequomosa, Azadirachta indica, Barleria prionitis, Broussonetia papyrifera, Cannabis sativa, Cassia fistula, C. glauca, Ceiba petandra, Citrus medica, Clitoria ternatea, Dalbergia sissoo, Delonix regia, Ehretia accuminata, Elaeocrpus sphaericus, Fernandoa adenophylla, Glycosmis pentaphylla, Gmelina arborea, Guzuma ulmifolia, Hibiscus rosa-sinensis, Holarrhena pubescens, Kalanchoe lacinita, Lannea coromandelica, Litsea glutinosa, Mentha spicata, Millatia pinnata, Mimospus elangi, Morinda citrifolia, Morus alba, Murraya

Development of lotus pond in Botanical Garden, Noida

Ayur vatika - A Medicinal plants garden

koenigii, Nerium indicum, Ocimum tenuiflorum, Oroxylum indicum, Pithecellobium dulce, Plumeria alba, Prunus persica, Psoralea corylifolia, Punica granatum, Putranjiva roxburghii, Rauvolfia serpentina, R. tetraphylla, Saraca asoca, Schleichera oleosa, Spathodia campanulata, Spilanthus acemella, Spondias pinnata, Syzygium cumnii, Tectona grandis, Terminalia arjuna, T. bellerica, Thevetia peruviana, Toona ciliata, Trewia nudiflora, Tylophora indica, Vitex negundo and *Wrightia tinctoria.*

NUMBER OF SPECIES (58) UNDER FRUITING (INITIATION TO SEED FORMATION/ RIPENING) DURING THE PERIOD

Acacia catechu, A. nilotica, Adhatoda vasica, Aegle marmelos, Aloe vera, Azadirachta indica, Barleria prionitis, Bauhinia purpurea, B. varigata, Bombax ceiba, Cassia fistula, Ceiba petandra, Citrus medica, Dalbergia latifolia, D. sissoo, Desmodium gangeticum, D. oojenesis, Diploknema butyrcea, Dodonea viscosa, Ehertia laevis, E. accuminata, Eucalyptus globules, E. torelliana, Glycosmis pentaphylla, Gmelina arborea, Guzuma ulmifolia, Hardwickia binnata, Holoptelia integrifolia, Kalanchoe lacinita, Lannea coromandelica, Malinkara hexandra, Mangifera indica, Millatia pinnata, Mimusops elangi, Mitragyna parvifolia, Moringa oleifera, Morus alba, Murraya koenigii, Nerium indicum, Oroxylum indicum, Pithecellobium dulce, Plumbago zeylanica, Prunus persica, Psoralea corylifolia, Punica granatum, Putranjiva roxburghii, Pyrus communis, Schleichera oleosa, Spathodia campanulata, Spondias pinnata, Sterculia urence, Terminalia arjuna, T. bellerica, Thespasia populina, Thevetia peruviana, Withania somnifera and *Wrightia tinctoria.*

Table 1: Buds, flowers and fruits of following plant species shed without attaining maturity up-to next stage

S. No.	Name of plant species	Possible reason	Month
1.	*Clerodendrum infortunatum*	Flower of the plant shed without producing fruit	April
2.	*Pterospermum xylocarpum*	Flowers shed without producing fruits due to some climatic reasons	April
3.	*Trewia nudiflora*	Bud shed due to the heavy storm during the month	May
4.	*Adhatoda vasica*	This time flowers shed but no certainreason	May
5.	*Saraca asoca*	Flowers shed without producing fruits	May
6.	*Albizia lebbeck*	Flower shed due to storm	May
7.	*Broussonetia papyrifera*	Flower shed due to storm	May
8.	*Bauhinia purpurea*	Fruit shed due to storm	May
9.	*B. varigata*	Fruit shed due to storm	May
10.	*Desmodium oojeinense*	Fruit shed due to storm	May
11.	*Glycosmis pentaphylla*	Fruits spoiled due to the insect infection	May

Development of Economic plant section at BGIR, Noida

Hildegardia populifolia Schott & Endl. (Malvaceae) : A rare species growing in garden woodland

12.	*Guzuma ulmifolia*	Fruits shed without maturity	May
13.	*Psoralea corylifolia*	Fruit shed before collection	May
14.	*Ehretia accuminata*	Fruit shed due to some physiological changes or due to some environmental factors	June
15.	*Hardwickia binnata*	Fruit shed due to storm	June
16.	*Plumbago zeylanica*	Older plants uprooted along with fruit	June
17.	*Prunus persica*	Fruit shed due to some physiological changes or due to some environmental factors	June
18.	*Spathodea campanulata*	Fruit shed due to storm	July
19.	*Ehretia laevis*	Fruit shed due to storm	July
20.	*Litsea glutinosa*	Flowers shed due to the storm	August
21.	*Trewia nudiflora*	Flower shed due to some environmental factors	August

Phenological observations and plant identification during the period:

During this period, flowering was observed first time in *Saraca asoca*, a tree species previously introduced in the woodland; *Swietenia macrophylla* was correctly identified with the help of HOO, WRC, Pune. Besides, first time fruiting was also observed on single tree of this species at BGIR. Bud and flowering was observed in *Holarrhena pubescens* (EPS, BGIR). This plant was wrongly tagged as *Wrightia arborea* in the EPS section. Close observation of its flower, leaves and other characters identified the plant as *Holarrhena pubescens* of family Apocynaceae to which *Wrightia arborea* belongs.

PROJECT - 2

Development of Database of Seeds of Indigenous Trees of BGIR, Noida

Executing Officials(s) : Dr. Kuldip. S. Dogra
Date of Initiation : April,2013
Date to be completion : On going

OBJECTIVE

The main objective of the project is to create data of seeds regarding their collection time at BGIR, their drying and storage at seed bank.

BACKGROUND

There were number of tree species introduced at BGIR under the *ex-situ* conservation programme to preserve them. The project was undertaken to collect the seeds of these tree species and to prepare a database of the same under the introduced environmental conditions.

ACHIEVEMENTS OF THE WORK DONE

During the year 2016-17, seeds of 16 tree species (*Mimusops elangi, Holoptelea integrifolia, Dalbergia latifolia, Bombax ceiba, Cassia fistula, Sterculia urence, Toona ciliata, Gmelina arborea, Malinkara hexandra, Diploknema buterycea, Pithecellobium dulce, Acacia catechu, Oroxylum indicum, Azadirachta indica, Moringa oleifera* and *Ceiba petandra*) were collected. These seeds were stored at seed bank after proper drying under the sun light. Database for 10 tree species was prepared. In addition, colour of the seeds were also noted along with the length and width of seeds of different tree species and prepared a database.

PROJECT - 3

Protocol Development for Germination of Selected tree species of BGIR, Noida

Executing Official (s) : Dr. Kuldip. S. Dogra
Date of initiation : April,2013
Date to be completion : On going

OBJECTIVE

The main objective of the project is to select tree species introduced at BGIR to develop suitable method for their germination to raise seedlings/saplings.

BACKGROUND

There are number of tree species introduced in the BGIR from different parts of India. There are around 125 tree species growing in the woodland (Wd. 1 to Wd. 8), economic plant section, medicinal plant section and in fruit section. As a part of *ex-situ* conservation, the saplings of tree species raised from the seeds. Due to the seed dormancy, seeds of some species required some treatment to produce viable seedlings.

PROGRESS OF THE PROJECT

During 2016-17, 12 tree species were selected out of the

Ceiba pubiflora (A.St.-Hil.) K.Schum. (Malvaceae)

introduced tree species at BGIR. The seedlings were raised from the seeds collected from the BGIR.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

Germination trials for 12 seeds of tree species were conducted during the period and a total of 85 plant saplings were developed. The germination trials were successfully conducted for *Acacia catechu, Albizia lebbeck, Bauhinia variegata, B. accuminata, Cassia fistula, Dalbergia latifolia, Desmodium oojeinese, Mimusops elangi, Moringa oleifera, Pterospermum acerifolium, Putanjiva roxburghii* and *Sterculia urence*.

PROJECT - 4

Seed Storage Behaviour of Seeds of Various Plant species Growing in BGIR and their *ex-situ* Conservation

Executing Official(s) : Dr. Kuldip.S. Dogra
Date of initiation : April,2013
Date to be completion :On going

OBJECTIVE

The main objective of the project is to collect the seeds of different plant species introduced at BGIR and to store them on long term basis at BGIR after proper drying.

BACKGROUND

The project was undertaken to study the seed storage behaviour of the plant species introduced at BGIR and their *ex-situ* conservation at seed bank on long term basis. This includes collection of seeds, their drying and storage under available conditions.

AREA AND LOCALITY

BGIR, Noida

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The seeds of 17 plant species were (*Mimusops elangi, Holoptelea integrifolia, Dalbergia latifolia, Bombax ceiba, Cassia fistula, Sterculia urence, Toona ciliata, Gmelina arborea, Malinkara hexandra, Doodonea viscosa, Diploknema buterycea, Pithecellobium dulce,Acacia catechu, Oroxylum indicum, Azadirachta indica, Moringa oleifera* and *Ceiba petandra*) collected, dried and stored at seed bank during the study period. Out of 17 plant species, 16 were tree species and 1 was shrub. The length and width of these seeds were also measured along with the available amount (in kg/gram) of seeds at seed bank of BGIR.

OTHER WORKS DONE

As In-Charge of Seed Bank (BGIR, Noida),taken, edited and arranged photographs of 200 types of seeds of different plant species stored at seed bank in alphabetical order. Data for 79 types of seeds of different plant species stored at seed bank was prepared according to the format provided by the HOO in January, 2016.The photographs, including whole plants, buds, flowers, fruits and seeds of 38 plant species were edited and compiled the data.A proposal along with sketch/diagram was submitted for the new net house near the seed bank office to HOO (9th June, 2016). Around 200 kg of organic compost was prepared during the period.

CENTRAL BOTANICAL LABORATORY, HOWRAH

PROJECT - 1

Ethnobotany of Nuapada district, Odisha

Executing Official(s): Dr. Harish Singh, Sri R. Saravanan & Dr. P. A. Dhole
Date of Initiation :April,2015
Date to be completion : March, 2017

BACKGROUND

After going through the available ethnobotanical literature, it is found that the district Nuapada has only few publications. Keeping this fact in mind, the project was initiated in 2015. In the previous year, 178 field no. were collected along with 215 ethnobotanical information. 07 ethnobotanical exhibits were procured to incorporate in CBL Museum.

AREA AND LOCALITY

c.1800 sq. km

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 62 tribal villages & forests areas of Khariar, Boden, Sinapali and Komna ranges of Khariar Forest Division of Nuapada district, Odisha were surveyed *w.e.f.* 12.09.2016 to 26.09.2016 and interacted with several tribal groups namely Gond, Shabar, Kondha, Bhunjia etc., Scheduled Caste and General Caste people in Nuapada district. A total of 368 field numbers (in duplicate) were collected with a total of 516 ethnobotanical information (Medicine-319, Edible-67, Veterinary-5, Alcoholic Drink-3, Oil-9, Gum-3, Fodder-9, Fuel-1, Dye-3, Rope-1, Wood-12, Mosquito repellent-1,

Collection of ethnobotanical data by BSI Scientist

A view of forest of Ranimunda chaura, Nuapada, Odisha

Traditional method of storing paddy seeds (Bhent) at Mathiapadar, Rajana, Nuapada, Odisha

Insecticide-14, Broom-5, Toothbrush-7, Plate-3, Fish poison-6, Magico-religious-26, Detergent-2, socio-religious-9; miscellaneous-11); Eight ethno botanically important exhibits procured for incorporating in CBL museum; one live ethno botanically important plant collected for pergola garden; GPS data observed and noted for 32 localities in study area. More than 300 digital photographs were taken during the said tour and a total of 368 field numbers (in duplicate) were collected and identified 308 specimens.

HIGHLIGHTS OF THE COLLECTIONS

Collected and ethnobotanical information were gathered for the following plants:

Acanthospermum hispidum - All parts (Panchang) is boiled with leaves of *Nyctanthes arbor-tristis* (Ganga siwali), *Cissampelos pareira* (Akan bindu) and given to cure prolong fever.

Biepharispermum subsessile - Root (5 gm) is taken with water in joint pain & arthritis. Roots are added during the cooking of meat and the bones will be separated from flesh. It is very rare and sold in market @ 5000-7000/kg.

Byttneria herbacea - Leaf paste is applied on boils to suppress and remove the pus. Leaves and tubers are cooked and eaten as vegetable.

Edible tender shoot of Bamboo (Karadi) at Kamkeda, Nuapada, Odisha

Tylophora rotundifolia - Roots are pasted and applied on chest pain for 2-3 days. Leaves are fried with ghee and given to reduce pain. If anybody crosses the plant unknowingly, it will lead to forget the way and direction.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 01 species (*Physalis pruinosa* L.) new to the state Odisha; a total of 516 ethnobotanical information (Medicine-319, edible-67, Veterinary-5, Alcoholic Drink-3, Oil-9, Gum-3, Fodder-9, Fuel-1, Dye-3, Rope-1, Wood-12, Mosquito repellent-1, Insecticide-14, Broom-5, Toothbrush-7, Plate-3, Fish poison-6, Magico-religious-26, Detergent-2, socio-religious-9; miscellaneous- 11) have been collected; compiled both years (2015-16 and 2016-17) report and prepared a comprehensive report on 'Ethnobotany of Nuapada distric', comprising 339 plant species belonging to 90 families under 270 genera. A total of 985 ethnobotanical information e.g. medicine (685), edible (96), fodder (16), socio-religious and magico-religious beliefs (35), dye (4), gum (6), timber (20), pisicide (9), toothbrush (16), fibre (8), bio fencing (9), veterinary (7), broom (5), fuel wood (7), worship (14) miscellaneous including agricultural implements, ornamental, plates, thatching etc. (47) are mentioned in the report. It is analysed that habit wise the maximum percentage of herbs (111) followed by trees (103), shrubs (72), climbers (37) and liana (16) are collected during the ethnobotanical study. GPS data (altitude, longitude, latitude etc.) of 54 localities were also recorded.

PROJECT - 2

Ethnobotanical study of Odisha Phase II (Malkangiri)

Executing Official(s) : Dr. K. A. Sujana, Dr. Monika Mishra & Dr. Pankaj Arvind Dhole
Date of Initiation : April,2015
Date of completion : March,2017

BACKGROUND

The project was initiated in 2015. In 2015-16, a total of

Bonda Tribal Woman at Malkangiri, Odisha

Casearia glomerata Roxb. (Salicaceae)

383 field no. were collected along with 515 ethnobotanical information.

AREA AND LOCALITY

Malkangiri district, Odisha

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, a field tour *w.e.f.* 23.07.16 to 05.09.16has undertaken to Malkangiri district of Odisha and collected 254 field numbers with 391 ethnobotanical information (Medicine-156, veterinary- 12, edible-76, fibre/rope-09, fodder- 31, agriculture implements – 12, small timber – 21, fuel- 32, brooms-6, plates-2, insecticide-08, oil/resin-14, miscellaneous- 12). All the specimens collected from the district were processed, identified and documented. A final report has prepared after compilation of information collected previous year. The project completion report of 'Ethnobotanical information of Malkangiri district of Odisha' containing data on 389 taxa belonging 96 families with their ethnobotanical uses are in process. A total of 644 ethnobotanical information have been collected from the district. Among them 233 are ethnomedicine, 134 edible, 11 rope/fibre, 20 timber/tools/implement, 51 fodder, 08 bio-fencing, 36 magico-socio-religious, 08 plates/baskets, 24 brush/brooms, 05 insect repellent, 24 oil/lac/resin/gum, 05 shampoo/soaps, 40 fire wood, 07 beverages, 05 piscicides, 12 ethno-veterinary, 05 spices, 08 bio-fence, and 06 miscellaneous andalso taken 224 photographs.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 01 species (*Jatropha nana* Dalzell & A.Gibbson) as new record for the state Odisha; 01 species (*Toxocarpus longistigma* Wight & Arn. ex Steud.) was rediscovered; 391 ethnobotanical importance of 254 field numbers were noted down. 02 RET plants, *Toxocarpus longistigma* Wight & Arn. ex Steud. and *Jatropha nana* Dalzell & A.Gibbson were collected and planted in pots at roof top garden of CBL/BSI.

PROJECT - 3

Ethnobotanical study of Boudh district, Odisha

Executing Official(s) : Sri A. C. Halder, Sri P. K. Baske, Dr. Monika Mishra & Sri Somnath Gangully
Date of Initiation : April, 2015
Date to be completion : March, 2017

BACKGROUND

Literature survey revealed that only few ethnobotanical works has been done in some tribal pockets in the district (Sahu and Nayak, 2013). Therefore a project on ethnobotany among entire tribal populated areas has beenproposed in 2015. During previous year, 162 ethnobotanically important species were collected along with 211 ethnobotanical information.

AREA AND LOCALITY

Boudh district, c. 3098 sq. km. Out of five forest ranges of this forest division, ethnobotanical survey was carried

Mallotus philippensis (Lam.) Muell-Arg. (Euphorbiaceae)

out in four forest ranges. Total areas surveyed is c. 1600 sq. km.

SUMMARY OF THE WORK DONE DURING 2016-17

This is the first time Ethno-botanical survey of the whole Boudh district in Odisha, particularly different tribal populated areas and villages of four different forest ranges, Boudh forest division of Boudh district were visited, namely Purnakatak, Madhopur, Kantamal, Manamunda. Major tribes of these area are, namely Kondha, Gond, Sabar (Soura), Bhulya and Pano. During the period mentioned, one field tour was undertaken *w.e.f.* 20.11.2106 to 03.12.2016 and 182 nos. of ethnobotanical interested species in duplicate voucher specimens were collected and 170 photographs of different plant specimens and tribal habitation were taken. With the help of medicine man (Baidya or elder village people) from different tribal populated village areas at Boudh district, about 235 ethnobotanical uses were recorded. Out of 235 uses 161 are as medicinal, 32 food, 01 veterinary medicine, 02 tooth brush, 02 Basket making, 02 rope making, 01 country liquor and 10 other purposes. GPS was used and recorded data of location of different places. 70 plant specimens identified in 2016-17.

HIGHLIGHTS OF THE COLLECTIONS

Some of the ethnomedicinal plants, collected are mentioned with their uses:

Trichodesma zeylanicum (Boraginaceae): Whole plant is pasted. Luke warm paste is applied on hurt spot to cure swelling and relief pain.

Canscora alata (Gentianaceae): Whole plant along with turmeric is pasted and made into tablet. One tablet is given in empty stomach for seven days to cure malarial fever and also skin diseases.

A view of a Kondh village at Mahukana, Gania Forest Range, Nayagarh, Odisha

Capparis zeylanica L. (Capparaceae)

Rauvolfia tetraphylla L. (Apocynaceae)

Dendrophthoe falcata (Loranthaceae): Bark powder is applied on wound for healing. One tea spoonful bark powder is given for seven days to cure menstrual disorder.

Drimia indica (Asparagaceae): Bulb is soaked in lukewarm Jara (*Ricinus communis*) oil. It is then used for compressing on the swelling part of the shoulder of cattle to cure swelling and relieve them from pain.

Acanthospermum hispidum (Asteraceae): Seed paste is given two tea spoons thrice daily after complete menstruation for 7 days to conceive.

Merremia gangetica (Convolvulaceae) : Tender leaves are used as vegetable.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

During this study, 182 nos. of ethnobotanically interested species (in duplicate voucher specimens) were collected with about 235 ethnobotanical uses. Out of 235 uses 161 are as medicinal, 32 food, 1 veterinary medicine, 2 tooth brush, 2 Basket making, 2 rope making, 1 country liquor and 10 other purposes.

PROJECT - 4

Ethnobotanical study of Nayagarh district, Odisha

Executing Official(s): Sri A.C. Halder, Sri P.K. Baske, Dr.P. A. Dhole & Sri S.N. Ganguly
Date of Initiation : April,2015
Date to be completion: March,2017

BACKGROUND

Literature survey has revealed that only few ethnobotanical works has been done in some tribal pockets in the district (Prusti and Mishra, 2005; Panda & al., 2014). This study was initiated in 2015. During 2015-16, 181 ethnobotanically important species were collected along with 216 ethnobotanical information.

AREA AND LOCALITY

Nayagarh forest division, Nayagarh district, c. 2500 sq. km

SUMMARY OF THE WORK DONE DURING 2016-17

An ethnobotanical field tour was conducted *w.e.f.*6.02.2017 to 17.02.2017 to Nayagarh forest division in Nayagarh district and surveyed c. 2500 sq. km. Tribal populated areas and villages of seven forest ranges, Nayagarh forest division of Nayagarh district were visited, *viz.* Mahipur, Gania, Panchirida, Odagaon, Khandapada, Dasapala, Nayagarh. A total of 160 field numbers were collected along with duplicate voucher specimens, all the specimens were poisoned, dried properly and mounting work is going on. Identified and documented 32 plant specimens. GPS was used and recorded data of location of different places. About 150 photographs of different plant specimens and tribal habitation were taken by digital camera. Out of 181 collected specimens, 174 plants were documented.

HIGHLIGHTS OF THE COLLECTIONS

The study reports ethnobotanical uses of the following plants:

Tridax procumbens (Asteraceae): 15-20 leaves are pasted and mixed with curd. It is given twice daily for 15 days to cure leucorrhoea.

Nyctanthes arbor-tritis (Oleaceae) : 3-4 teaspoon leaf juice with 8 peppers (*Piper nigrum*) powder is given in empty stomach thrice daily for 15 days to relieve joint pain.

Mimuspos elengi (Sapotaceae) : Dried epicarp is made into powder. Powder is used as tooth powder to cure toothache.

Tridax procumbens (Asteraceae): 15-20 leaves are ground and mixed with sour curd. It is given twice daily for 15 days to cure leucorrhoea.

Mimosa pudica (Mimosaceae): 12 leaves with six peppers (*Piper nigrum*) are ground. It is given twice daily for 15 days to cure piles.

Careyra arborea (Lecythidaceae): The inner bark is used for making loincloth by the saints.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This work reports 228 ethnobotanical uses from 160 species collected. Out of 228 uses 158 were as medicinal, 36 food, 03 veterinary medicine, 07 tooth brush, 01 basket making, 03 rope making, 01 country liquor, 02 Insect repellent, 03 Dye making, 01 vermilion, 01 Gum, 01 fish poison and 11 other purposes. Compiled two years' (2015-2016 and 206-2017) achievements which recorded about 444 ethnobotanical uses. Out of 444 uses 374 are as medicinal, 90 food, 07 veterinary medicine, 10 tooth brush, 04 insect repellent, 06 dye making, 06 rope making, 03 plate making, 03 country liquor, 01 vermilion, 01 gum, 01 fish poison, 01 basket making and 27 other purposes.

PROJECT - 5

Survey and documentation of economical and ethnobotanical uses of endemic trees of India (New Project)

Executing Official(s) : Dr. K.A. Sujana & Mr. R. Saravanan
Date of Initiation : Aril, 2016
Date to be completion : March, 2019

BACKGROUND

Endemic trees of India are one of the important groups of plants susceptible to endangerment due to narrow distribution and rarity. The Botanical Survey of India is carrying out floristic studies on wild plant resources and documenting traditional knowledge and ethnobotanical data associated with plants. There is no comprehensive account on economic and ethnobotanical information on endemic trees of India. So this work intends to document endemic trees of India with local names, distribution pattern, threat status and phenology. It is planned to conduct investigation on economical, ethnobotanical, and socio-cultural values of endemic trees of India highlighting different vernacular and tribal names of plants, uses in day to day life, medicinal uses, NTFPs, tribal culinary practices, and timber values.

Martynia annua L. (Martyniaceae)

Callesia exarillata A. Robyns (Malvaceae)

Pterocarpus dalbergioides DC. (Fabaceae)

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE DURING 2016-17

As part of reviewing of literature on endemic trees of India, information was collected on 177 scientific works on endemic trees of North East India, Eastern Ghats & Western Ghats. All the data were documented in prescribed format in MS Excel consisting of scientific names, family, vernacular names, habits, uses, and distribution. Data on 69 endemic trees of Kerala were documented. A questionnaire prepared for interviewing knowledge holder for collecting information. A total of 05 endemic trees were collected from Odisha during ethnobotanical tour to Malkangiri district of Odisha. A field tour *w.e.f* 24.11.2016 to 02.12.2016has undertaken to Andaman & Nicobar Islands and collected 105 field numbers with 139 ethnobotanical information (Medicine-24, edible-19, fiber/rope-04, fodder- 08, furniture- 16, agriculture implements – 14, timber – 28, fuel- 14, plates-2, oil/ resin-04, miscellaneous- 06). All the specimens were mounted on herbarium and identified 18 specimens collected from Andaman &Nicobar Islands. Field data of 05 specimens were collected from Andaman and Nicobar Islands under the project. Survey and documentation of economical and ethnobotanical uses of endemic trees of India were documented in prescribed format. 110 Number of Photographs were taken during the tour. A total of 105 field numbers were collected of which 18 plant specimens were Identified.

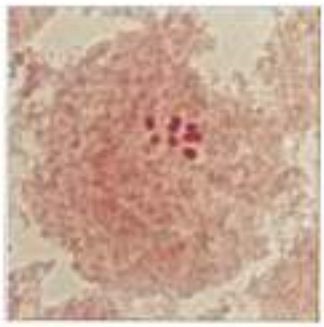
ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study gathered a total of 139 ethnobotanical information (Medicine-24, edible-19, fiber/rope-04, fodder- 08, furniture- 16, agriculture implements – 14, timber – 28, fuel- 14, plates-2, oil/ resin-04, miscellaneous- 06)

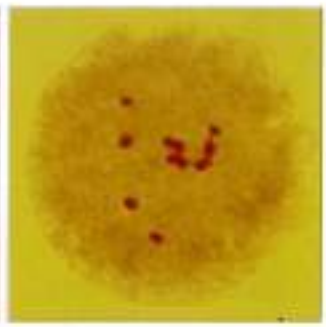
PROJECT - 6

Cytological investigation of some selected Angiosperms of AJC Bose Indian Botanic Garden, Howrah(New Project)

Executing Official(s): Dr. (Mrs.) Monika Mishra

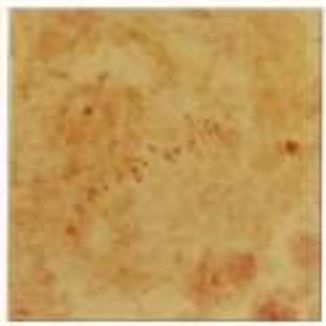


Pollen mother cell showing 9 bivalents at metaphase I in *Atalantia monophylla* (Rutaceae) (n =9)

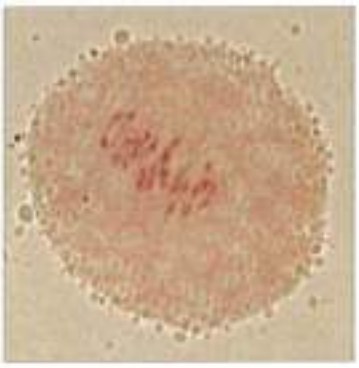


Pollen mother cell showing 11 bivalents at metaphase I in *Gliricidia sepium* (Leguminosae) (n=11)

Pollen mother cell showing 13 bivalents at metaphase I in *Asystasia indica* (Acanthaceae) (n=13)

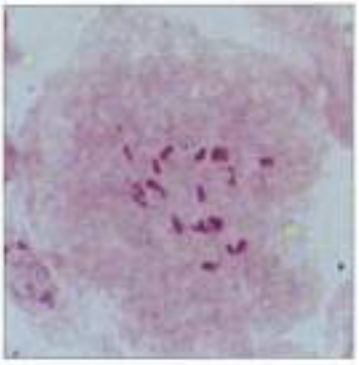


Pollen mother cell showing 24 bivalents at metaphase I in *Clerodendrum splendens* (Lamiaceae) (n=24)



Pollen Mother Cell showing 15 bivalents at Metaphase I (n=15) in *Cleome rutidosperma* DC. (Cleomaceae)

Pollen Mother Cell showing 20 bivalents at Metaphase I (n=20) in *Trema orientalis* (L.) Blume (Cannabaceae)



Pollen Mother Cell showing 22 bivalents at Metaphase I (n=22) in *Canthium coromandelicum* (Burm.f.) Alston (Rubiaceae)

Pollen Mother Cell showing 26 bivalents at Metaphase I (n=26) in *Clerodendrum infortunatum* L. (Lamiaceae)

Date of Initiation : April,2016
Date to be completion : March, 2018

BACKGROUND

Chromosome number is of great importance in taxonomic studies whereby, data of chromosome counts may be useful in standard reference purpose in the differentiation of different plant species. Usually all the individuals within a species possess the same chromosome number and so variation and constancy in the chromosome number, within taxa of different categories, prove to be important characters for taxonomic grouping and standard characterization on the basis of chromosomal count. Analysis of chromosome numbers, morphology, their behaviour and structure at meiotic phase of cell division has been used to evaluate the evolutionary and taxonomic relationship in diverse groups of plants. Chromosome number indicates occurrence of ploidy and denotes differences in the basic chromosome number among plants, which may be reflect in their phylogenetic arrangement. The Botanic Garden preserves one of the best collections of native and exotic plants and a large number of curious and RET species of which numbers of species are either cytologically less explored or need to be explored, this indicates scope for cytological studies in plants growing in garden. These cytological investigations will be helpful for strengthening of chromosome data base and better understanding of evolutionary relationship of selected plant species.This type of work has been done earlier in CBL and published by Botanical Survey of India in Chromosome Atlas of Flowering Plants of Indian Subcontinent, Vol. I & II (Virendra Kumar and B. Subramaniam). So this project was taken up for updating the information available on chromosome number of selected IBG plants.

AREA AND LOCALITY

AJC Bose Indian Botanic Garden

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, vegetative and reproductive characters of 10 plant species collected from AJC Bose Indian Botanic Garden was done, floral buds were collected and cytological investigation was carried out for 10 species [*Solanum americanum* (Solanaceae) 2n=24; *Solanum torvum* (Solanaceae); 2n=24;*Canthium coromandelicum* (Rubiaceae) 2n=44; *Cleome rutidosperma* (Cleomaceae) 2n=30; *Asystesia gangetica* (Acanthaceae) 2n=52; *Cleome viscosa* (Cleomaceae) 2n=20; *Rivina humilis* (Phytolaccaceae) 2n=108;*Syzygium zeylanicum* (Myrtaceae) 2n=22; *Clerodendrum infortunatum* (Lamiaceae) 2n=52a and *Trema orientalis* (Cannabaceae) 2n=40]

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports chromosome count for *Syzygium zeylanicum* (Myrtaceae) *i.e.*,2n=22is the first report on the chromosome number of this species.

CENTRAL NATIONAL HERBARIUM, HOWRAH

PROJECT - 1

Flora of Seshachalam Biosphere Reserve, Andhra Pradesh

Executing Official(s) : Dr. P. V. Prasanna & Sri Nagaraju Siddabathula
Date of Initiation : April,2012
Date to be completion : March,2017

BACKGROUND

Floristically, Seshachalam Biosphere Reserve is under explored, therefore the present project has been proposed in 2012. During previous year (2015-16), 211 field no. were collected of which 185 species were documented along with nomenclature update.

AREA AND LOCALITY

c. 4755.99 sq.km

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, all the identified specimens collected from the reserve were inventoried, arranged all the photographs taken hitherto in the respective families; field books were completed in all respects. Besides two herbarium consultation tours were undertaken *viz.*, one to Yogi Vemana University, Kadapa from 07.10.2016 to 08.10.2016, examined around 400 specimens and other to MH, Coimbatore from 08.12.2016 to 22.12.2016, examined around 2800 specimens.

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study reports 03 species [*Tripogon tirumalae* (Poaceae); *Glochidion tirupathiense* (Phyllanthaceae); *Brachystelma annamacharyae* (Apocynaceae)] as new to science; 04 species [*Euphorbia seshachalamensis* (Euphorbiaceae); *Glochidion zeylanicum* var. *arborescens* (Phyllanthaceae); *Glochidion talakonense* (Phyllanthaceae)] as new record for state.

PROJECT - 2

Revision of the genus *Fimbristylis* of family Cyperaceae under Flora of India

Executing Official(s) : Dr. V.P. Prasad
Date of Initiation : April, 2013
Date to be completion : March, 2017

OBJECTIVE

The primary objective of the study is to compile all the available information on the genus in the country from literature and by studying the specimens of all the species in different herbaria, and the ultimate aim is to bring out an up-to-date taxonomic account of the genus *Fimbristylis*.

BACKGROUND

Thisproject on revision of this genus *Fimbristylis*was initiated in 2013.During previous year (2015-16), 25 field no. of Cyperaceae were collected of which 10field no.

Tropical dry Evergreen forest of
Seshachalam Biosphere Reserve, Andhra Pradesh

Moist deciduous forest of
Seshachalam Biosphere Reserve, Andhra Pradesh

were identified. Besides 80 field no., collected by fellow scientists of CNH and research scholars were also identified.

AREA AND LOCALITY

Indian context

SUMMARY OF THE WORK DONE DURING 2016-17

During this period,one herbarium consultation tour was conducted to PBL during which identity of all the available specimens of *Fimbristylis* was checked and the label data of about 800 representative specimens of each Island was recorded. Also corrected the identity of about 50 specimens kept in PBL. Distribution of other members of Cyperaceae (44 species) was also recorded based on the available specimens in PBL. During the herbarium consultation at PBL, it was noticed that few taxa are reported erroneously from the Islands and specimens of few species which are not yet reported from Andaman & Nicobar Islands were also found. In addition, field tours to nearby wetlands in South Andaman were undertaken and collected 25 field numbers of Cyperaceae. Also visited the regional centre BSI, Pune for consulting the herbarium *w.e.f.* 10.11.2016 to 14.11. 2016. A total number of about 350 specimens of different species of the genus *Fimbristylis* were checked and recorded the label data of about 270 specimens. The state-wise distribution data of 16 species of *Scirpus* (*sensu lato*) were also recorded. Description of 11 taxa was prepared by studying the specimens deposited at CAL (63 till date).

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 01 new species of *Bulbostylis*; 01 species (*Carex capillaris* L.) as new to India; 01 species (*Fimbristylis merrillii* J. Kern) as new record for the state; 05 new combinations (*Cyperus eglandulosus* (Govind. & Ramani) V.P.Prasad & Govaerts, *C. kanarensis* (V.P.Prasad & N.P.Singh) V.P.Prasad & Govaerts, *C. mahadevanii* (Govind.) V.P.Prasad & Govaerts, *C. pyramidalis* (Govind.) V.P.Prasad & Govaerts, *C. munnarensis* V.P.Prasad & Govaerts); 11 new synonyms (*C. pentobracteatus, C. curvibracteatus* Govind., *C. latovaginatus* (*latovaginata*) Govind., *C. plumbeonucea* Govind., *Kyllinga pluristaminea* Govind. & Ramani and *K. eglandulosa* Govind. & Ramani, *Pycreus apiculatus* Govind., *P. opulentus* Govind., *P. palghattensis* Govind., *P. plicatus* Govind., *P.similinervulosus* Govind.); lectotypification of 02 species (*Cyperus blatteri, C.macer* C.B. Clarke)was done.

PROJECT - 3

Study of *Impatiens* L. of Arunachal Pradesh

Executing Official(s) : Dr. Rajib Gogoi
Date of Initiation : April,2013
Date to be completion : March,2017

Impatiens pseudocitrina Hareesh, M.Sabu & Gogoi (Balsaminacese)

BACKGROUND OF THE PROJECT

The project was initiated in 2013 to document the *Impatiens* species diversity of the state Arunachal Pradeshwhich is considered as treasure house of Indian Biodiversity, harbours a good numbers of *Impatiens* species. During previous year, 03 species of *Impatiens* was studied along with documentation of 13 species.

AREA AND LOCALITY

Arunachal Pradesh.

SUMMARY OF THE WORK DONE DURING 2016-17

During the period 2016-17, description and illustrations were completed for 22 sp. One Herbarium Consultation Tour was conducted to BSI, Sikkim herbarium (BSHC) *w.e.f.* 27.03.2017 to 04.04.2017and studied c. 300 specimens and 81 determinavit slip was pasted for 21 species in Balsaminaceae and 50 herbarium images were

Impatiens spirifera Hook f. (Balsaminaceae)

Impatiens sulcata Wall. (Balsaminaceae)

taken. 07 plant specimens were identified *viz., Impatiens stenantha* (unknown collector 28032, CAL), *I. arguta* (unknown collector 28051, 26623, CAL), *I. cythula, I. stenantha, I. spirifera, I. arguta, I. radiata* and *I. discolor*and 62 specimens were incorporated in the herbarium during the study tour. Description and illustration of 22 species of *Impatiens* were finalised for the final manuscript.

ACHIEVEMENTS/ OUTCOMESIN2016-17

The present work described 06 species as new to science *viz., Impatiens albopetala* Gogoi & Borah, *I.dibangensis* Gogoi & Borah, *I. rugosipetala* Gogoi & Borah, *I. tatoensis* Gogoi & W. Adamowski, *I. zironiana* Gogoi, Hareesh & W.Adamowski, *I. pseudocitrina* Hareesh, M.Sabu & Gogoi; 01 species (*I. duclouxii* Hook.f.) as new to India; 02 species (*I. spirifera*Hook.f. & Thomson, *I. racemulosa* Wall. ex Hook.f. & Thomson.) were rediscovered; 04 names were (*I. racemulosa* Wall. ex Hook.f. & Thomson, *I. tripetala* Roxburgh ex de Candolle, *I.trilobata* Colebrooke, *I. spirifera* Hook.f. & Thomson) lectotypified; 02 later homonym (*I. konchigandhiana* Rasingam, Karthig. & Gogoi, *I. nicolsoniana* Gogoi & Arisdason) were resolved. Ethnobotanical Information of *I. prainii* (as vegetable) wasgathered.

PROJECT - 4

Angiospermic flora of Neora Valley National Park, Darjeeling,W.B. (New Project)

Executing Official(s) : Dr. Vinay Ranjan, Dr. Gopal Krishna and Anant Kumar
Date of Initiation : April,2016
Date to be completion : March,2021

Rhopalocnemis phalloides Jungh. (Balanophoraceae)

BACKGROUND

Neora Valley National Park (NVNP), lies between 26°52' 3" - 27°7'3" N latitude and 88°45' - 88°50' E longitude was established in 1986 for the *in-situ* conservation of biodiversity and covers an area of 159 sq. km of varied altitudes ranging from 300m to 3100msl. For sustainable use of the forest products, an inventory of the floral wealth of the said area is necessary. So, it is important to collect the baseline data on the floristic diversity to assess the plant wealth of the area through extensive survey, collection of plant material and documentation of the flora. Moreover, to enrich the CAL with representative plants of Eastern Himalayan region, this project was formulated.

AREA AND LOCALITY

Neora Valley, West Bengal (Area: c. 159 sq. km) Locality: Ruka, Chichu, East Nar, Mo, Kolbong, Lava, Reshit, Rhenok, Pankhasari, Ambiok, West Nar, Rechila, Rechila Chak, Thusum, Sakam.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, two field tours *w.e.f.* 20.09.2016 to 05.10.2016 and 14.12.2016 to 24.12.2016 were undertaken while, third field tour is in progress (30.03.17 to 15.04.17) as per approved Annual Action Plan 2016-17. The field tours were undertaken specifically in northrange of Neora Valley National Park to explore all the forest ranges in different seasons and 621 field numbers were collected so far in two field tours. GPS data of each plant have been noted down and photographs of each plant and country side were also taken. All the plants of field tours were processed and 85 field numbers deals with 53 species were identified.

ACHIEVEMENT

During the survey, one curious rare root parasite (*Rhopalocnemis phalloides*, Balanophoraceae) readily noticeable by its yellowish-brown, large, thick rhizome was collected.

PROJECT - 5

Survey and Assessment of Growing Stock of Economic Bamboos of West Bengal

(In Collaboration with West Bengal State Council of Science & Technology & RKMV University, Narendrapur, Kolkata)

Executing Official(s) :Dr. Pushpa Kumari
Date of Initiation : April,2014
Date to be completion : March,2017

AREA AND LOCALITY

West Bengal

BACKGROUND

This project was initiated in 2014. During previous year, 09 field nos. were collected of which 06 species were identified and documented.

SUMMARY OF WORK DONE AND ACHIEVEMENTS/ OUTCOMES

During this period,two field trips were undertaken to 24 Parganas and 01 to Midnapore district and collected 43 field numbers for 08 species growing in the non-forest areas of the North and South 24- Parganas districts. Identified 43 species and documented 08 species.

PROJECT - 6

Taxonomic Revision of Poaceae: Bambusoideae in India

Executing official (s) : Dr. Pushpa Kumari
Date of Initiation : April,2014
Date to be completion : March,2017 (Applied for extension up to March 2018)

BACKGROUND

For the taxonomic revision of Bamboos in India, this project was initiated in 2014. During previous year (2015-16), 50 samples of bamboo species were collected and a total of 60 field nos. were identified. During field survey, 12 species were collected in flowering/fruiting condition.

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, the endemic bamboo species of India were listed and studied for the assessment of their conservation status. During the field surveys, more than 30 species of bamboos have been collected in flowering/ and fruiting: *Ampelocalamus patellaris, Bambusa balcooa, B. bambos, B. multiplex, B. pallida, B. teres, B. tulda, B. vulgaris, Cephalostachyum capitatum, C. pergracile, Dendrocalamus brandisii, D. calostachyus, D. giganteus, D. hamiltonii, D. sahnii, D.stocksii, Melocalamus compactiflorus, Gigantochloa andamanica, Ochlandra travancorica, O. wightii, Pseudostachyum polymorphum, Schizostachyum andamanicum, S. kurzii, Teinostachyum beddomei*and *Thamnocalamus aristatus*. Specimens collected in flowering have been studied and dissected parts have been illustrated. Many of the species are very little known and represented only by the types and even for some of the species the types are not traceable. During these field tours the type localities of such species were visited and also some of the newly described species were collected: *Bambusa pseudopallida, B. mastersii, B. manipureana, Cephalostachyum fuchsianum, Dendrocalamus sahnii, D. manipureanus, Melocalamus gracilis, Schizostachyum seshagirianum, Stapletonia arunachalensis,* and *Thamnocalamus arunachalensis*. Description of c. 90 species, illustrations of c. 80 species were completed. Besides, leaf under surface of c. 45 species was studied and photographed under Scanning Electron Microscope.

ACHIEVEMENTS/ OUTCOMES IN 2014-17

Samples of 30 species of bamboos were collected during these years which were not collected previously during the AICOPTAX project.

PROJECT - 7

Flora of Betla National Park, Latehar, Jharkhand

Executing Official(s) : Sri Partha Pratim Ghoshal
Date of Initiation : April, 2015
Date to be completion:March,2019

BACKGROUND

For exploration, inventorization and documentation of the Flora of Betla National Park, Latehar, Jharkhand. This project was initiated in 2015.

AREA AND LOCALITY

Betla National Park, Latehar, Jharkhand.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, three extensive field tours were undertaken to the allotted areas and collected c. 1000 specimens under 421 field numbers and also taken c. 2000 relevant digital images of habitat, habit and close ups of different parts of the plants. Coordinates of the different places visited during the field tours were noted. Drying, poisoning and mounting of 900 collected plant specimens werecompleted.

Identifications of a total 97 sp. were completed, some of which are *Abelmoschus crinitus, Abrus precatorius, Acacia torta, Ampelocissus tomentosa, Anagallis arvensis, Androsace umbellata, Anogeissus latifolia, Begonia picta, Blepharis maderaspatensis, Boerhavia diffusa, Bombax ceiba, Butea monosperma, Chlorophytum tuberosum, Cissampelos pareira, Corchorus olitorius, Cordia dichotoma, Crotalaria albida, Cyperus cyperoides, Cyphostemma auriculata, Datura stramonium, Desmodium gangeticum, Ehretia laevis, Elephantopus scaber, Eranthemum purpurascens, Euphorbia macrophylla, Evolvulus nummularius, Ficus mollis, F. racemosa, Firmiana simplex, Glinus lotoides, G. oppositifolius, Gloriosa superba, Grewia hirsuta, Hedyotis herbacea, Helicteres isora, Hemidesmus indicus, Hemigraphis latebrosa, Hesperethusa crenulata, Hibiscus lobatus, Lagascea mollis, Leea macrophylla, Leucas decemdentata,Miliusa velutina, M. tomentosa, Monochoria hastata, Mukia madraspatana, Murdannia*

Retnwardtia indica Dumort. (Linaceae)

Tephrosia purpurea (L.) Pers. (Fabaceae)

spirata, Nelsonia canescens, Nyctanthes arbor-tristis L., *Ottelia alismoides, Persicaria glabra, Petalidium barlerioides, Phoenix acaulis, Phyllanthus rheedei, Piliostigma malabaricum, Polygala crotalarioide, Premna herbacea, Rauvolfia tetraphylla, Richardia scabra, Sida cordifolia, Sigesbeckia orientalis, Solena amplexicaulis, Spermacoce articularis, Spermadictyon suaveolens, Stachytarpheta indica, Syzygium cumini, Terminalia arjuna, Urena lobata, Ventilago denticulata, Verbascum chinense, Vitex negundo, Woodfordia fruticosa, Wrightia tinctoria, Ziziphus oenopolia* etc.

A report of the 1st tour which includes a list of 41 identified plant has also been sent to PCCF, CWLW, Jharkhand. Prepared a 'List of fodder plants for elephants recorded in Betla National Park, Jharkhand', that included a total 34 no. of species so far with vernacular names and has been sent to the Field Director, Palamau as desired. Images of selected plants have been sent to BSI ENVIS centre for publication in BSI Newsletter. A working map of the BNP has also been procured.

Desmodium oojeinense (Roxb.) H.Ohashi (Fabaceae)

PROJECT - 8

Bamboos of India: *ex-situ* conservation

Executing Official (s) : Dr. Pushpa Kumari
Date of Initiation : April,2012
Date to be completion: March,2017

OBJECTIVE

The objective of the project is *ex-situ* conservation of maximum number of bamboos from different parts of the country and enriching the existing Bambusetum in AJCBIBG.

BACKGROUND

This project was initiated in 2012. During previous year (2015-16), more than 10 bamboo species were collected for introduction in the garden.

AREA AND LOCALITY

All major bamboo growing areas of India mainly including NE States, Western Ghats, Andaman and Nicobar Islands.

SUMMARY OF THE WORK DONE DURING 2016-17

Project was taken up in 2012 with an aim of introducing at least 10 species per year in the AJCBIBG and establishing them in the Bambusetum of this botanic garden which is one of the earliest established Bambuseta in Asia. Since 2012 a total of 61 bamboo species was collected from Sikkim, Arunachal Pradesh, Andaman, Manipur, Tripura, Meghalaya and Kerala initiation taken to introduce in bambusetum of AJCBIBG.

ACHIEVEMENTS/ OUTCOMES IN 2012-17

The present work rediscovered *Bambusa pseudopallida* Majumdar, a very little known species and even synonymized under *B. pallida*, collected from Meghalaya after type collection. *Schizostachyum kurzii*, a rare bamboo species was collected from Andaman Islands 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.

PROJECT - 9

Assessment of floristic diversity in Baraila Lake Salim Ali Jubba Sahni Bird Sanctuary, Vaishali district, Bihar (New Project)

Executing Official(s) : Dr. Kumar Avinash Bharati
Date of Initiation : April,2016
Date to be completion : March, 2018

OBJECTIVE

The objective of the project is to document the floristic wealth of Baraila Lake Salim Ali Jubba Sahni Bird sanctuary.

Lippia alba (Mill.) N.E.Br. ex Britton & P. Wilson (Verbenaceae)

BACKGROUND

The Baraila lake wet land was declared as bird sanctuary in 2015. The sanctuary is of immense ecological and environmental importance by way of performing hydrological and wetland and aquatic ecosystem functions of riverine zone in Gangetic plains and habitat of various aquatic flora and fauna. The current project was undertaken to document the floristic wealth of the sanctuary.

AREA AND LOCALITY

The Baraila lake Salim Ali Jubba Sahni Bird Sanctuary, Vaishali district, Bihar has aggregate area of 12.7 Km^2 located in between 25°45'58" & 25°45'37" North latitude and between 85°31'48" & 85°34'50" East longitude.

SUMMARY OF WORK DONE DURING 2016-17

During this period, threefield tours were undertaken during which 240 field numbers were collected and 60 species were identified so far. A total of 150 field photographs were taken.

STATE FLORA

PROJECT - 10

Flora of Bihar, Volume-II & Flora of Jharkhand, Volume-II (Rosaceae – Convolvulaceae)

Date of Initiation : April,2015
Date to be completion : March,2017

OBJECTIVE

The objective of the project is to document flora of Bihar and Jharkhand (Rosaceae-Convolvulaceae), Vol. -II

Dr. Rajib Gagoi (Families: Stylidiaceae, Campanulaceae, Lobeliaceae, Sphenocleaceae, Vacciniaceae, Plumbaginaceae, Primulaceae, Myrsinaceae, Theophrastaceae, Sapotaceae (c.37 sp.).

Description of the following 11 taxa completed and final report will be submitted shortly: *Aegialitis rotundifolia, Anagallis pumila, Lysimachia candida* subsp. *obovata, Primula umbellata, Embelia basaal, E. robusta* var. *ferruginea, Dipioknema butyracea, Manilkara hexandra, Manilkara zapota, Mimusops elengi, Xantolis tomentosa.*

Dr. Anand Kumar (Families:Aizoaceae, Molluginaceae, Begoniaceae, Cactaceae): One species belonging to family Aizoaceae, 5 species belonging to Molluginaceae, one

Passiflora foetida L. (Passifloraceae)

species belonging to Begoniaceae and 7 species belonging to Cactaceae were enumerated. 2 species belonging to Cactaceae of Bihar were listed under cultivated species. One species belonging to family Aizoaceae, 4 species belonging to Molluginaceae, 2 species belonging to Begoniaceae and 3 species belonging to Cactaceae were enumerated. 2 species belonging to Cactaceae of Jharkhand were listed under cultivated species.

Dr. Shyam Biswa (Vahliaceae, Crassulaceae, Haloragidaceae, Callitrichaceae, Rhizophoraceae, Combretaceae c. 24 species) Description of c. 24 spp. belonging to Vahliaceae, Crassulaceae, Haloragidaceae, Callitrichaceae, Rhizophoraceae, Combretaceae will be completed. Studied and annoted the herbarium specimens at CAL belonging to family Droseraceae. Description completed for 3 species of Droseraceae and 6 species of Combretaceae. Made key to the species and key to the genera.

Dr. Saurabh Sachan (Asteraceae c. 33 spp.):Scrutinizing the availability of concerned voucher specimens in Hall No.2, belonging toBihar and Jharkhand state. Inventorization and re-examining of all concerned specimens. Sorting of concerned voucher specimens from recent collection of touring parties. Review of literature and reference citation for finalization of the manuscript.

Dr. Kumar Avinash Bharati (Asteraceae- Six tribes, 18 genera and 41 species): Documented 41 species of Family Asteraceae of Bihar and Jharkhand some of which are*Anaphalis adnata, A. busua, A. contorta, Gnaphalium flaccidum, G. pensylvanicum , G. polycaulon, G. purpureum, Gnomophalium pulvinatum, Athroisma laciniatum, Pseudognaphalium hypoleucum,* Laphangium luteoalbum, Pseudognaphalium affine, Laphangium luteoalbum subsp. *affine, Tagetes erecta, Grangea maderaspatana, Dichrocephala chrysanthemifolia, Cyathocline purpurea, Erigeron aegyptiacus, Conyza japonica, Erigeron trilobus, Floveria trinervia , Centipeda minima, Glebionis coronaria, Chrysanthemum indicum, Cotula anthemoides, C. hemisphaerica, Artemisia capillaris, A. indica, A. japonica, A. nilagirica, Chrysanthellum americanum, Bidensbiternata, B. pilosa, B. sulphurea, Glossocardia bidens, Cosmos bipinnatus, C. caudatus.*

Dr. Vijay Kumar Mastakar Sorted out the herbarium specimens from Hall No. 3 belonging genera of family Myrtaceae, Lecythidaceae & Melastomataceae of Bihar and Jharkhand state and making the genera and species folder separately state wise and pasted determination slip on the herbarium specimens *viz.* accepted current botanical names with family. Studied on the basis of herbarium specimens examined, existing published literature and field images, prepared the genera and species key and description for submitting the final manuscript.

PROJECT - 11

Flora of Bihar, Vol. III & Flora of Jharkhand , Volume-III (Cuscutaceae-Ceratophyllaceae)

Date of Initiation : April, 2015
Date to be completion : March, 2018

OBJECTIVE

The objective of the project is to document flora of Bihar and Jharkhand (Cuscutaceae-Ceratophyllaceae)

Dr. V. Sampath Kumar (Family: Lamiaceae)

This is the part of the ongoing Floras of Bihar and Jharkhand. One herbarium consultation tour conducted to Bhaglapur University herbarium (BHAG) and recorded the data sheets.

Dr. K. Karthigeyan: Herbarium study and literature survey was carried out for revision of the family Acanthaceae (c. 94 spp.) for 'Flora of Bihar and Flora of Jharkhand'. Descriptions for 30 species wascompleted.

Dr. O.N. Maurya (Family Cuscutaceae, Scrophulariaceae, Orobanchaceae, Lentibulariaceae, Gesneriaceae, Pedaliaceae):One herbarium consultation tour was conducted to Bhagalpur University Herbaria (BHAG) & one to Ranchi University Herbaria.

Dr. Subir Bandyopadhyay (Solanaceae):Already finished the work and manuscript submitted to the office in 2016.

Dr. Avishek Bhattacharjee (Family Apiaceae, Araliaceae & Alangiaceae): Completed floristic accounts of 12 genera, 19 species for Bihar and 15 genera, 24 species, 4 varieties for Jharkhand. Described *Heteropanax fragrans, Seseli diffusum, Trachyspermum stictocarpum, T. roxburghianum, Trevesia palmata.*

Dr. Mahua Pal (Family Verbenaceae): Description of 8 genera, 18 species and 4 variety was completed. Description of the genus *Gmelina* L. (*Gmelina arborea* and *G. asiatica*), members of genus *Holmskioldia*, genus *Lantana* (*Lantana camara, L. camara* var. *splendens, L. indica, L. trifolia*), genus *Lippia* (*Lippia alba*), genus *Phyla*(*Phyla nodiflora*), genus *Premna*(*Premna barbata, P. bengalensis, P. hamiltonii, P. latifolia* var. *latifolia, P. latifolia* var. *viburnoides, P. scandens, P. tomentosa, P. herbacea*), genus *Stachytarpheta* (*Stachytarpheta jamaicensis* and *S. mutabiiis*), genus *Symphorema* (*S. involucratum*) was completed.

CENTRAL REGIONAL CENTRE, ALLAHABAD

PROJECT - 1

Floristic Diversity of Parvati Aranga Wildlife Sanctuary and adjoining Tikri forest area, Gonda, Uttar Pradesh

Executing Official (s) : Mr. Vineet Kumar Singh & Dr. S.K. Srivastava
Date of Initiation : April, 2014
Date to be completion : March, 2017

OBJECTIVE

The objective of the project isto document the flora of Parvati Aranga Wildlife Sanctuary and adjoining Tikri forest area, Gonda, Uttar Pradesh.

BACKGROUND

The project was started in 2014. During previous year (2015-16), one field tour was undertaken to the assigned area and a total of 150 field numbers were collected in triplicate including some rare and economically important plant species *viz. Habenaria plantaginea, Oroxylum indicum, Hymenodictyon orixense* and *Curculigo orchioides* etc. A total of 168 field numbers were identified and description of 21 species were Completed.

AREA AND LOCALITY

Total area- c. 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 2016-17

During 2016-2017, two field tour were undertaken to the assigned area in the month of May and December, 2016 respectively for survey and collection of the plant specimens. A total of 166 field numbers in triplicate were collected. A total of c. 300 live photographs were taken. A total of 130 field numbers were identified. Completed description of 64 species with different field numbers collected from the study area. Listing of the invasive alien species, identification and description of remaining field numbers are under progress.

PROJECT - 2

Flora of Chattisgarh (Dicot. Vol. I; c. 1750 species)

Executing Official(s) : Dr. A. N. Shukla & Dr. A.P. Tiwari
Date of Initiation:April, 2014
Date to be completion: March, 2017

OBJECTIVE

The objective of the project is to document theflora of Chattisgarh (c. 1750 species of Dicot.)

BACKGROUND

To study floristic diversity of the state, this project was

A view of Parvati Aranga Wildlife Sanctuary, Uttar Pradesh

Signature bird of U.P. Wetlands- *Sarus crane* family near Parvati Aranga wetland, Gonda, Uttar Pradesh

initiated in 2014. In 2015-16, 02 field tours were conducted during which 422 field nos. including 1300 plant specimens were collected.

AREA AND LOCALITY

The state lies between 17°46' - 24°5' N latitude and 80°15' - 84°20' E longitude, comprising 27 districts, extends 700 km from north to south and 435 km from east to west, is bounded in the north by Uttar Pradesh and Jharkhand, in the east by Odisha, in the south by Andhra Pradesh and in the west by Madhya Pradesh and Maharashtra.

This study reports four angiosperm taxa as a new record for the state *viz.*, *Achyranthes bidentata* Blume, *Crotalaria nana* Burm.f., *Alternanthera bettzickiana* (Regel) Nicholson and *Limnophyla heterophylla* (Roxb.) Benth.

PROJECT - 3

Flora of Chhattisgarh (Monocots.), Vol. -II (New Project)

Executing Official(s) : Dr. G.P. Sinha, Dr. Arti Garg, Dr. N.K. Gautam, Dr. A.K. Verma, Dr. Bhawana Joshi, Sri Rasanand Kar, Sri V.K. Singh & Dr. Nitisha Srivastava
Date of Initiation : April, 2016
Date to be completion :March,2018

OBJECTIVE

The objective of the project is to document the flora of Chattisgarh (Monocot.)

BACKGROUND

New project started from April, 2016.

SUMMARY OF WORK DONE DURING 2016-17

Dr. G.P. Sinha, Family Orchidaceae (Target– 69 species):Taxonomic descriptions of 69species*viz. Dendrobium aphyllum, D. crepidatum, D. fimbriatum, D. formosum, D. herbaceum, D. macrostachyum, D. moschatum, D. nobile, D. regium, D. transparens, D. wightii, Cymbidium aloifolium, C. ensifolium* var. *haematodes, C. macrorhizon, Eria pubescens, Eulophia cullenii, E. explanata, E. graminea, E. herbacea, E. mackinnonii, E. nuda, E. ochreata, Acampe congesta, A. papillosa, A. praemorsa, Acanthephippium bicolor, A. striatum,Aerides maculosum, A. multiflorum, A. odoratum, Ascocentrum micranthum, Bulbophyllum triste, Gastrochilus inconspicuus, Geodorum densiflorum, Habenaria barbata, H. commelinifolia, H. dentata, H. digitata, H. diphylla, H. furcifera, H. marginata, H. plantaginea, H. roxburghii, Liparis bituberculata, L. nervosa, L. viridiflora, Luisia brachystachys, Malaxis latifolia, M. rheedii, Nervilia aragoana, Oberonia falconeri Pelatantheria insectifera, Peristylus constrictus, P. goodyeroides, P. lawii, P. plantagineus, Pholidota imbricata, Platanthera susannae, Pomatocalpa ramosum, Rhynchostylis retusa, Thunia alba, Tropidia angulosa, Vanda cristata, V. tessellata, V. testacea* and *Zeuxine strateumatica* were completed.

Mixed Dry Deciduous forest, Raigarh, Chhattishgarh

Nymphaea nouchali Burm. f. (Nymphaeceae)

Nymphoides hydrophylla (Lour.) Kuntze (Menyanthaceae)

Dr. A. Garg, Family Poaceae (Target – 120 species):Taxonomic description of following 29 species [*viz. Heteropogon contortus, Ophiuros exhaltatus, O. burmanni, O. compositus, Themeda triandra, Thysanolaena maxima, Tragus roxburghii,Vetiveria zizanioides, Eriochloa procera, Eulalia hirtifolia, Eulaliopsis binata, Garnotia tenella, Gigantochloa hasskarliana, Hackelochloa granularis, Hemarthia compressa, Heteropogon contortus, H. triticeus, Hordeum vulgare, Hygrorhyza aristata, Hymenachne pseudointerrupta, Imperata cylindrica* var. *major, Isachne globosa , I. miliacea, Ischaemum indicum, I. rugosum, Iseilema anthephoroides, I. laxum, I. prostratum*] were completed.

Dr. N.K. Gautam, Family – Flagellariaceae to Aponogetonaceae and Zannichelliaceae (Target – 47 species):Taxonomic description of 47 species [*viz. Juncus bufonius, J. prismatocarpus* subsp. *leschenaultii , Borassus flabellifer, Caryota urens, Livistona chinensis, Phoenix acaulis, P. loureirii, P. sylvestris, Roystonea regia, Pandanus odoratissimus, Typha angustifolia, Acorus calamus, Alocasia macrorrhiza, Amorphophalius bulbifer, A. paeoniifolius, A. sylvaticus, Arisaema decipiens, A. griffithii, A. tortuosum, Caladium bicolor, Colocasia esculenta, Cryptocoryne retrospiralis, Monstera deliciosa, Pistia stratiotes, Plesmonium margaritiferum, Theriophonum minutum, Typhonium trilobatum, Lemna gibba, L. minor, L. perpusilla, Spirodela polyrhiza, Wolffia arrhiza, W. globosa, Caldesia oligococca* and *C. parnassifolia, Limnophyton obtusifolium, Sagittaria guayanensis, S. trifolia, Butomopsis latifolia, Najas graminea, N. indica, N. minor, Aponogeton crispus, A. natans, Zannichellia palustris*] were completed.

Dr. A. Verma, Family Potamogetonaceae, Eriocaulaceae and Cyperaceae (Target–122 species): Taxonomic description of 122 species , [*viz. Potamogeton crispus* L, *P. nodosus, P. perfoliatus, P. pectinatus, P. malaianus, P. octandrous, Eriocaulon achiton, E. breviscapum, E. cinereum, E. cuspidatum, E. hamiltonianum, E. longicuspis, E. martianum, E. quinquangulare, E. truncatum, Eriocaulon nepalense, E. pariflora, E. raipurensis, E. rajendrababui, E. trilobum, Bulbostylis barbata, B. densa, Carex baccons, C. cruciata, C. filicina, C. myosurus, C. phacota, C. stramentitia, C. speciosa, C. praelonga, Cyperus alopecuroides, C. alulatus, C.brevifolius, C. castaneus, C. cephalotes, C. compactus,C. cuspidatus, C. cyperoides, C. pilosus, C. leucocephalus, C. difformis, C. distans, C. dubius,C. exaltatus,C. flavidus, C. halpan, C. iria, C. latespictus, C. melanospermus, C. compressus,C. corymbosus, C. digitatus,C. kyllingia, C. laevigatus,C. metzii, C. michelianus, C. niveus,C. nutans, C. pangorei,C. platystylis, C.polystachyos, C. procerus, C. pseudokyllingioides, C. pulchellus, C. pumilus, C. pygmaeus, C. rotundus, C. sanguinolentus, C. squarrosus, C. tenuispica, C. triceps, Eleocharis acutangula, E. atropurpurea, E. acutangula, E. congesta, E. geniculata, E. palustris, E. retroflexa, E. spiralis,Fimbristylis acuminata, F. aestivalis, F. alboviridis, F. argentea, F. bisumbellata, F. cinnamometorum, F. complanata, F. dichotoma, F. dipsacea, F. eragrostis, F. falcata, F. ferruginea, F. fusca, F. hookeriana, F. intosa, F. littoralis, F. miliacea, F. ovata, F. schoenoides, F. squarrosa, F. tetragona, F. tomentosa,Fuirena ciliaris, Lipocarpha chinensis, L. sphacelata, Rhynchospora longisetis, R. rubra, Scirpus articulatus, S. grossus, S. juncoides, S. lateriflorus, S. maritimus, S. microcephalus, S. mucronatus, S. squarrosus, S. tuberosus, Scleria annularis, S. biflora, S. levis, S. lithosperma, S. pergracilis* and *S. terrestris*] were completed.

Dr. B. Joshi, Family Dioscoriaceae to Pontederiaceae and Commelinaceae (Target – 57 species):The official remained absent throughout the period.

Sri R. Kar, Family Poaceae (Target - 55 species):The official resigned and left the department in August 2016.

Sri V.K. Singh, Family Hydrocharitaceae to Burmanniaceae and Xylariaceae (Target - 52 species):Taxonomic description of following 41 species [*viz. Blyxa aubertii, B. echinosperma, B. octandra, Lagarosiphon alternifolia, Ottelia alismoides, Burmannia coelestis, Costus speciosus, Phrynium placentarium, P. pubinerve, Ensete superbum, M. rosacea, M. paradisiacal, Canna indica, Belamcanda chinensis, Crinum asiaticum, C. defixum, Curculigo capitulata, C. orchioides, Tacca leontopetaloides, Xyris indica, X. paucifolia, Agave cantala, Dracaena elliptica, Furcraea foetida, Sansevieria hyacinthoides, Yucca aloifolia, Y. gloriosa, Alpinia malaccensis, Amomum dealbatum, Curcuma amada, C. angustifolia , C. aromatica, C. ferruginea, C.longa, C. petiolata, C. pseudomontana* and *C. zeodoaria, Globba marantina, G. orixensis, G. racemosa, Hedychium coronarium* and *Zingiber capitatum*] were completed.

Dr. N. Srivastava, Family Poaceae (Target- 48 species): Taxonomic description of following 32 species [*viz. Acrachneracemosa, Alloteropsis cimicina, Apludamutica, Apocopis vaginata, Aristida adscensionis, A. cumingiana, A. dipressa, A. redacto, A.setacea, Arthraxon lancifolius, A. prionodes, Arundinella bengalensis, A. ciliata, A. holcoides, A. pumila, A. setosa, Arundo donax, Avena sativa, Bambusa arundinacea, B. teres,B. vulgaris, Bothriochloa glabra, B. intermedia, B. kuntzeana, B. pertusa, Brachiaria deflexa, B. distachya, B. eruciformis, B. reptans, Capillipedium assimile, C. filiculme, C. huegelii*] were completed.

PROJECT - 4

Flora of Chandra Prabha WLS, Chandauli, U.P.

Executing Official (s) : Dr A. N. Shukla&Dr. Nitisha Srivastava
Date of Initiation: April, 2015
Date to be completion: March, 2017 [Requested 6 months extension].

Iphigenia indica (L.) A. Gray ex Kunth (Colchicaceae)

Drosera burmanii Vahl (Droseraceae)

OBJECTIVE

The objective of the project is to evaluate floristic diversity of Chandara Prabha Wildlife Sanctuary.

BACKGROUND

For the purpose of evaluation of Chandara Prabha Wildlife Sanctuary, this project was initiated in 2015. During previous year (2015-16), 400 plant specimens were collected from 01 field tour.

AREA AND LOCALITY

Chandara Prabha Wildlife Sanctuary, Chandauli district, Uttar Pradesh.

SUMMARY / PROGRESS OF THE WORK DONE DURING 2016-2017

During this period,survey and plant collection tour *w.e.f.* 19.12.16 to 26.12.16 was conducted to Chandra Prabha Wildlife Sanctuary during which a total of 177 field numbers of plant specimens have been collected. The data on the distribution of each species and ecological notes were also collected. Nearly 300 photographs of the habit of plant, flowers and landscape vegetation were taken. During 2016-17, 118 species were identified and 102 species were described along with updated nomenclature and ecological notes. A total of 50 medicinal plants were collected; seedlings of *Drosera burmanii, Vanda tessellata* and *Curculigo orchioide* were collected for multiplication in CRC, Botanical garden.

PROJECT - 5

Lichen of Rajasthan, Kutch and Gujrat

Executing Official (s): Dr G.P. Sinha and Sri Rasanand Kar
Date of Initiation: April, 2012
Date to be completion:March, 2017

OJECTIVE

The objective of the project is to document lichen diversity of Rajasthan and Kutch, Gujrat

Roccella montagnei Bel. (Roccellaceae)

Different crustose lichens at Pirotan Island

BACKGROUND

This project was initiated in 2012 and a total of 534 Field Nos. were collected till date.

SUMMARY OF THE WORK DONEDURING 2016-17

Out of these 534 Field Nos. collected during last 04 years, 475 taxa were identified in to 90 species.

ACHIEVEMENTS/ OUTCOMES IN 2016-2017

During this period, a total of 98 specimens were identified into 64 species which include *Rinodina cana* (Arnold) Arnold as a new record for Indian lichen flora and nine species viz., *Buellia subdisciformis* (Leight.) Jatta, *Cresponea flava* (Vain.) Egea & Torrente, *Dermatocarpon meiophyllizum* Vain., *Endocarpon pusillum* Hedw., *Lepraria lobificans* Nyl., *Lepraria vouauxii* (Hue) R.C. Harris, *Phylliscum testudineum* Henss., *Toninia cinereovirens* (Schaer.) A. Massal as new record for Rajasthan.

PROJECT - 6

Floristic Diversity of Kishanpur Wildlife Sanctuary, Lakhimpur Kheri, U.P. (New Project)

Executing Official(s) : Dr. Neelam Gautam & Dr. Arjun Prasad Tiwari

Date of Initiation: April, 2016
Date to be completion:March, 2019

OBJECTIVE

The objective of the project is to estimate floristic wealth of Kishanpur Wildlife Sanctuary, Lakhimpur Kheri, U. P.

BACKGROUND

The project has been planned to make inventory of floral diversity and to study endangered and endemic species of the area. Under the project ethnomedicinal uses of the species collected and conservation status of biological diversity and ecosystem of the area will be monitored.

AREA AND LOCALITY

Kishanpur Wildlife Sanctuary, a part of Dudhwa tiger reserve, is the only left out forest range in Terai region. The study area is located near Mailani at 28°22'10.01"N 80°24'48.48"E and 30 km away from Dudhwa National Park. The sanctuary lies on the western bank of river Sharda and spreads in an area of 204 sq. km.

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016-2017

During this period, two field exploration tours *w.e.f.* 21.9.2016 to 29.09.2016 and 24.02.2017 to 02.03.2017 were undertaken for survey of floristic diversity of Kishanpur Wildlife sanctuary. Various areas of the sanctuary under Kishanpur Range and Mailani Range *viz.*, Phuta Kuan, Kataiya, Chaltua, Jhadi Taal; 7 Beats of Mailani Range etc., were surveyed and collected a total of 376 field numbers along with GPS data and 250 field photographs. A total of 88 specimens were identified during this period.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports some rare, endemic and important species, collected from the area *viz.*, *Cymbopogan osmostonii*, *Gymnopetalum chinense*, *Barringtonia acutangula*, *Ophioglossum reticulatum*, *Curculigo orchicoides* and *Piper longum* etc.

PROJECT - 7

Floristic Diversity of Bhoj Ramsar Site, Madhya Pradesh (New Project)

Executing Official(s) : Dr. Arti Garg
Date of Initiation : April, 2016
Date to be completion : March, 2018

OBJECTIVE

The objective of the project isto study floristic diversity of Bhoj Ramsar Site.

BACKGROUND

Wetlands are such regions which remain saturated with

water creating wet conditions and are responsible for determining the dependent life forms, both plants and animals. Plants adapted for survival in such conditions are termed as wetland plants. All wetlands construct lands which are transitional between the terrestrial and aquatic eco-systems, and their habitats are in succession from open water to land and vice versa with distinct ecosystems and specific ecological characteristics, functions and values. They provide numerous ecological services and act as migratory corridors for flora and fauna with a rich collection of resident and migratory birds. Wetlands vegetation therefore, is predominantly hydrophytic in nature with water logged hydrated soil substrate, which sometimes becomes non-soil and water saturated or covered by shallow waters. These aquatic habitats often preserve primitive and highest evolved plants. The Ramsar convention takes a broad approach in determining the wetlands which come under its aegis. The wetlands enlisted under the ramsar sites, are internationally significant regions with rich biodiversity, but generally exposed to various kinds of threats in form of sewage disposal, drainage, land reclamation, cultivation, burial activities at the banks, pollution and over-exploitation of their resources etc. These threats are detrimental for their biodiversity, whether directly or indirectly, cause severe impact on their sustenance and sustainable utilization of their natural resources. Documentation of floristic diversity and ecological status of wetlands therefore is of significance in terms of their management, conservation and long term sustenance for uninterrupted availability of natural floristic resources.

Only sporadic works were done earlier on the aquatic vegetation of Bhoj lake, wherein 23 species were reported by Sahadevan & al. Little works on algal contents was also done by S.L. Gupta, however there is a complete lacuna on floristic diversity of the Bhoj Ramsar Site. This project was initiated to fill up this gap areas.

AREA AND LOCALITY

The 'Bhoj wetland', Madhya Pradesh.

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016–2017

During this period, literature survey and mapping of the area were completed; one field tour *w.e.f.*01.12.17 to 9.12.2017 was conducted to the study area, c. 380 sq km area was surveyed during which 275 field numbers were collected and about 940 photographs were taken of which about 60 field numbers were identified into 60 species. During 2016-17, a Herbarium Consultation Tour was undertaken to SFRI, Jabalpur and Sagar University Sagar.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports two species as new for the state of Madhya Pradesh *viz. Desmodium scorpiurus* (Sw.) Desv. and *Hygrophila ringens* (L.) Steud.

Bhoj Ramsar Site, Madhya Pradesh

CRYPTOGAMIC UNIT, HQRS., KOLKATA

PROJECT - 1

Algal flora of Jharkhand

Executing Official(s) : Dr. R. K Gupta
Date of initiation : April, 2012
Date to be completion : March, 2017

BACKGROUND

This project was initiated in 2012. During this period,all the 24 districts of Jharkhand, viz. Gharwa, Palamu, Latehar, Chatra, Hazaribagh, Koderma, Giridih, Ramgarh, Bokaro, Dhanbad, Lohardaga, Gumla, Simdega, Ranchi, Khunti, West Singhbhum, Saraikela Kharsawan, East Singhbhum, Jamtara, Deoghar, Dumka, Pakur, Godda, Sahebganj were surveyed. Manuscript was submitted.

AREA AND LOCALITY

All freshwater lentic as well as lotic habitats of 24 districts of Jharkhand.

SUMMARY/ PROGRESS OF THE WORK DONE DURING 2016-2017

During this period, one field tour was conducted to study area during which 89 specimens were collected out of which 65 specimens were identified and incorporated, 175 specimens were documented. A total of 75 photographs were taken.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

Specimens were collected from various habitat *viz.*, pool puddle, pond (lentic water bodies) rivers (lotic water bodies) and barks. Special attention was given to Tataha Balhal Hot spring to document algal diversity of such habitat.

PROJECT - 2

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

Executing Official (s) : Dr. Kanad Das
Date of Initiation : April, 2014
Date to be completion : March, 2019

BACKGROUND

This project was initiated in 2014. During previous period (2015-16), 27 field no. belonging to 18 species were collected and identified.

AREA AND LOCALITY

c. 714 sq. km; East and South districts of the state of Sikkim being located in Eastern

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, one macrofungal survey *w.e.f.* 13.08.2016 to 27.08.2016 to South and East districts of

Russula indoarmeniaca A. Ghosh, K. Das & Bhatt (Russulaceae)

Sikkim was undertaken. During this tour Rabongla, Damthang, Tendong, Tinkitam, Kewzing, Maenam Wild Life Sanctuary, Namchi, Jorethang, Gangtok, Churten, Kyangnosla, Tamje were surveyed and 68 field nos. belonging to 60 species were collected along with 50 field photographs. All the materials are well preserved and are under study. 24 field numbers belonging to 22 species were identified during this period. 18 species *viz. Russula indoarmeniaca, R. indoalba, R. pseudoamoenicolor, Lactifluus rajendrae* have been documented along with preparation of microscopic illustrations for 10 species. SEM studies of 07 samples were undertaken.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 10 species as new to science (*Russula indoarmeniaca* A. Ghosh, K. Das & R. P. Bhatt, *R. indoalba* A. Ghosh, Buyck, A. Baghela, K. Das & R.P. Bhatt, *R. pseudoamoenicolor* A. Ghosh, Buyck, K. Das, A. Baghela & R.P. Bhatt, *Lactifluus rajendrae* Uniyal & K. Das, *Ramaria subalpina* K. Das & A. Acharya, *Lactarius dirkii* Uniyal, K. Das, A. Baghela & R.P. Bhatt, *Cyanoboletus hymenoglutinosus* D. Chakr., K. Das, A. Baghela, S.K. Singh & Dentinger, *Leccinellum indoaurantiacum* D. Chakr., K. Das, A. Baghela, S.K. Singh & Dentinger, *Lactarius rajmahalensis* Hembrom, K. Das & A. Parihar, *L. rajmahalensis* Hembrom, K. Das & A. Parihar, *Boletus indoedulis* D.Chakr., K.Das, A.Baghela, S.Adhikari & Halling) and 04 species as new to India (*Lycoperdon rupicola* Jeppson, E. Larss. & M.P. Martín, *Retiboletus kauffmanii* (Lohwag) N.K. Zeng & Zhu L. Yang, *Pulveroboletus auriflammeus* (Berk. & M.A. Curtis) Singer and *Bovista nigrescens* Pers.

Lactifluus rajendrae Uniyal & K. Das (Russulaceae)

PROJECT - 3

Studies on the macrofungi of AJC Bose Indian Botanic Garden

Executing Official (s): Dr. Kanad Das, Shri M.E. Hembrom & Shri Arvind Parihar
Date of Initiation : April, 2015
Date to be completion : March, 2017

BACKGROUND

Aacharya Jagdish Chandra Bose Indian Botanic Garden (AJCBIBG), Howrah is a 227 years old historic botanic garden located on the Southern bank of river Ganges in Shibpur (Howrah), harbours about 12000 trees, shrubs and climbers either native or exotic are expanded in 273 acres (22°33'15.9"N–22°33'46.6"N & 88°17'02.2"E–88°18'00.9"E). The combination of living plants, litters, dead & decaying trunk, soil and most importantly moist condition provided by 24 lakes as well as river Hooghly at southern boundary forms unique habitat for growth of fungi. Fungi of these garden cause important stages of lignin decomposition and breakdown of cellulose, tannin, etc., hence play important role in recycling of complex organic materials produced by the plants. This project was initiated in 2015. During previous year, 12 field nos. belonging to 10 species were identified and 01 species was documented.

AREA AND LOCALITY

c.273 acres

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, routine macrofungal survey to different parts of the studied area was undertaken throughout the year especially, during pre to late monsoon and 82 field nos. were collected along with 25 field photographs. 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. Macromorphological charecterization of all the samples were completed. Identification of 40 samples was done; 29 field nos. were identified up to species level, while 11 field nos. were

Mycorrhaphoides stalpersii
Hembrom, Nilsson, A. Parihar, K. Das, A. Baghela & S.K. Singh (Meruliaceae)

identified up to genus level. A total of 10 specimens were incorporated in the Herbarium during study.

ACHIEVEMENT/ OUTCOME IN 2016-17

This study reportsone novel genus *Mycorrhaphoides* and one novel species *M. stalpersii*.

PROJECT - 4

Wood rotting fungi of Rajmahal hills, Jharkhand

Executing Official (s) :M.E. Hembrom
Date of Initiation :April, 2013
Date to be completion :March, 2017

BACKGROUND

Wood-rotting macrofungi are responsible for causing rot and serious damage to various kinds of wood. Taxonomically, wood rotting fungi are highly artificial group who shares similar fruiting body organization, occupy similar habitat in nature and are wood inhibiting decomposes cellulose, hemicelluloses and lignin from the substrate *i.e.* plants. The enormous macro- and micromorphological diversity of these fungi forms the basis for identification. Rajmahal hills are one of the oldest mountain ranges of the world and famous for fossils and cover about 3000 sq. km of hilly areas lying between 24°15'–25°15'N and 87°20'–87°45'E in the state of Jharkhand (India). From Mycological point of view these hills are always remain neglected except few sporadic reports made by Sulpiz Kurz then curator of Indian Botanic Garden Howrah (Curry 1874); Paul Olaf Bodding (1925–1940) a Norwegian missionary and Panigrahi (1966) a scientist of Botanical Survey of India. This project was initiated in 2013 for detail survey, documentation and identification of wood rotting fungi of Rajmahal hills. During previous year (2015-16), 75 field nos. of various wood rotting macrofungi were collected of which 24 species were identified and 05 species were documented.

AREA AND LOCALITY

Rajmahal Hills, Jharkhand

SUMMARY OF THE WORK DONE DURING 2016–17

During this period, one field tour *w.e.f.* 30.10.2016 – 10.11.2016 was undertaken to Dumka and Surroundings, Hinjala and surroundings, Dumka block, Dumka, Ramgarh block, Kakani, Dumka, Rangamatia and Lasapara surroundings, Masanjore dam area, Maslia block, Dumka, Kairabani, Dumka block, Dumka dist, Taljhari block, Karanpurato-Chapal dumri area, Mandro-block, Chaldhi, Sahibganj and Borio-Block, Pir baba, Paharpur area. Macromorphological characterization was made with the fresh basidiomata in the field or in

Lactarius rajmahalensis K. Das & A. Parihar (Russulaceae)

Craterellus shorea Hembrom, K. Das, A. Parihar & Buyck (Cantharellaceae)

base camp. During this period, 48 field numbers were collected out of which 48 plant specimens were identified, 15 Plant species were documented; 20 specimens were incorporated in herbarium. A total of 170 field photographs of these fresh basidiomata were taken. Sun drying and mild heat preservation (temperature range of 45°C–55°C with the help of 200W electric bulb as heat source in field dryer) were done and they were processed for further identification and documentation in the Institute. All the collected samples (80) have been properly preserved, numbered and brought to CNH, BSI, Howrah. Species dominancy of the family Meruliaceae, Polyporaceae, Hymenochaetaceae, Phanerochaetaceae belonging to Basidiomycota was observed in almost all forest patches and human settlement areas. *Amylosporus, Auricularia, Cellulariella, Coriolopsis, Earliella, Flavodon, Hymenochaete, Lentinus, Phanerochaete, Phellinus, Scytinostroma* and *Trametes* are the dominant genera in these localities. Some Ascomycetes of genera *Daldinia, Hypoxylon,* and *Xylaria* were also found colonizing on the dead and decaying woods of economically importance.

ACHIEVEMENTS/ OUTCOMES IN 2016–17

This study reports two species (*Craterellus shorae* Hembrom, K. Das, Parihar & Buyck and *Lactarius rajmahalensis* Hembrom, K. Das & Parihar) as new to science.

PROJECT - 5

Revision of family *Metzgeriaceae* in India and data-basing liverwort and hornwort specimens in CAL.

Executing Official (s) : Dr. Devendra Singh
Date of Initiation : April,2015
Date to be completion : March,2018

Metzgeria lindbergii Schiffn. (Metzgeriaceae)

Metzgeria conjugata Lindb. (Metzgeriaceae)

BACKGROUND

This project was proposed to study detail morphological characters of the members of the family Metzgeriaceae in India including the scanning electron microscopy on the basis of own collection and that from different Indian and forgien herbaria including the type/aunthetic specimens of each species. During previous year, database of 166 specimens of liverworts deposited in CAL has been prepared, identified 28 specimens belonging to six species, illustrated and described.

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, one field tour was conductd to Dzukou Valley (Kohima) and surveyed the major locality *viz.* Khonoma-1, Khonoma-2, Khonoma-3, Dzokou-1, Dzokou-2, Dzokou-3, Dzokou-4, Dzokou-5, Dzulardi-1, Dzulardi-2, Dzulardi-3, Jotsoma, Tuhiba, Dzuyiekie, Kouvju, Terhostiese and Jotsoma and collected 166 specimens of Bryophytes including 26 specimens of Metzgeriaceae in particular. A total of 200 photographs were taken of which 40 photographs were identified upto species lavel which have been provided separately in the CD. A total of 16 species have been documented on the basis of loaned specimens from different herbaria and own collection. During this study, 282 specimens were incorporated in the herbarium. In addition, one herbarium consultation tour was conducted to Lucknow, NBRI (LWG) and Lucknow University (LWU) and studied 24 type/authentic specimens of Metzgeriaceae.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study reports 02 (*Riccardia lachungensis* D. Singh & D.K.Singh and *R. udarii* D. Singh & D.K.Singh) as new to science; 03 species (*Metzgeria crassipilis* (Lindenb.) A.Evans, *Cololejeunea subocelloides* Mizut., *Drepanolejeunea laciniata* Qiong He & R.L.Zhu) and 02 species (*Metzgeria conjugata* Lindb., *M. lindbergii* S.K. Das and D. Singh) as new to the state Nagaland.

PROJECT - 6

Liverworts and Hornworts Flora of Darjeeling district, W.B. (New Project)

Executing Official (s) : Dr. Monalisa Dey
Date of Initiation : April,2016
Date to be completion : March,2021

BACKGROUND

Drepanolejeunea laciniata (Lejeuneaeae)

In 'Notes on Indian Hepatics', Chopra (1938) listed 123 species of liverworts and 2 species of hornworts from Darjeeling district of West Bengal. Later, Hattori (1966, 1971, 1975) reported 126 species from the area. Zhu and Long (2003) reported 6 liverworts from the district. Ghosh (2006) published a preliminary checklist of the Hepatics of West Bengal based on previous reports and a few of his own collections and reported 211 species of liverworts and 2 hornworts. However, all these are checklists and do not contain description and illustration of the taxa and doesn't provide any understanding about the taxonomic boundaries of the species and are not helpful in the identification of the species. Recently, Dey and Singh (2012) described 34 species of epiphyllous liverworts from the area. However, most of the areas of the district have not been surveyed for its liverwort and hornwort diversity and a complete floristic account of the Liverworts and Hornworts of Darjeeling district of West Bengal has not been done. Therefore the project 'Liverworts and Hornworts flora of Darjeeling district, West Bengal'was initiated in 2016.

AREA AND LOCALITY

Darjeeling District, West Bengal, c. 3,149 sq. km.

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, two field tours *w.e.f.* 31.08.2016 – 09.09.2016 and 25.02.2017 – 11.03.2017 were conducted and collected 316 field numbers, 97 unidentified specimens belonging to 25 species from Darjeeling district, West Bengal were identified. Study, camera lucida illustration and microphotography of 06 species, *viz. Drepanolejeunea laciniata, D. pentadactyla, Lejeunea curviloba, L. tuberculosa, Ptychanthus striatus, Radula obscura* were completed along with study of 18 specimens obtained on loan from various herbaria. SEM study was done for 10 species.

ACHIEVEMENTS/OUTCOMES IN 2016-17

The present study reports 01 species (*Cololejeunea andamanensis* M.Dey & D.K.Singh) as new to science and 03 species (*Cololejeunea pseudoschmidtii* Tixier, *Radula anceps* Sande Lac, *R. nymanii* Steph.) as new to India.

A view of ideal habitat for cryptogams in alpine Himalaya

DECCAN REGIONAL CENTRE, HYDERABAD

PROJECT - 1

Flora of Nagarjunasagar Srisailam Wildlife Sanctuary (Tiger Reserve)

Executing Official(s) : L. Rasingam, M. Sankara Rao and S. Nagaraju
Date of Initiation : April,2012
Date to be completion : March, 2017

BACKGROUND

Nagarjunasagar Srisailam Tiger Reserve is the largest Tiger Reserve of India, spreads in 05 districts *viz.*, Nalgonda, Mahaboobnagar, Kurnool, Prakasam and Guntur of Andhra Pradesh and Telangana states. Few scattered floristic explorations were made during 19th century by R.H.Beddome, J.S.Gamble, C.A.Barber and C.E.C. Fischer. In latter part of 20th century, Thothathri explored the northern part of the Wildlife Sanctuary, the Nagarjunakonda hills and enumerated 251 species. Ellis partially explored the Kurnool part of sanctuary and published the Flora of Nallamalai, that dealt with 743 taxa. Still, many areas in Mahaboobnagar, Guntur, Prakasam and Nalgonda districts remain unexplored. Hence, a project was taken up to explore the unexplored areas in 2012. During previous year (2015-16), 186 field no. were collected and 156 species were documented.

AREA AND LOCALITY

Nagarjunasagar Srisailam Tiger Reserve, Andhra Pradesh, c. 3568 sq. km

Capparis brevispina DC. (Capparaceae)

Ipomoea clarkei Hook. f. (Convolvulaceae)

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, one field tour was undertaken to the study area and collected total 82 field no. In addition, one herbarium consultation tour was conducted to Central National Herbarium from 6.12.2016 - 12.12.2016 and checked identity of many unidentified species. All the collections from the study area were identified and documented. The preparation of final technical report is in progress.

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study reports 02 species (*Leucas lanata* var. *candida* & *Cyperus pulchellus*)as new record for the state. In addition, rare, endangered and economic important plants were collected and details of conservation initiations were taken.

PROJECT - 2

Sacred Groves of Andhra Pradesh – Conservation Assessment

Executing Official (s) : Dr. M. Ahmedullah and Dr. J. Swamy
Date of Initiation : April,2012
Date to be completion : March,2017

BACKGROUND

The project on sacred groves of Andhra Pradesh was initiated during 2012 and was envisaged for assessing the sacred groves of the state for the purpose of

conservation. During previous year (2015-16), 13 prioritised sacred grooves of the state was surveyed and 428 field no. were collected of which 257 were identified. A total of 557 species were documented.

AREA AND LOCALITY

The 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 latitude and 76° 45'E - 84° 46'E longitude. The entire area comprises three major physiographic regions: (i) the Nallamalai and Eramalai hill ranges of Rayaalseema 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 rivers and the sea coast.

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, the sacred groves from eleven (11) districts of Nellore, Anantapur, Cuddapah, Kurnool, Guntur, Mahabubnagar, Adilabad, Rangareddi, Medak, Nizamabad and Warangal were prioritised and targeted for study during this period. A total of forty (40) prioritised sites in the above mentioned four districts were covered in 2016-2017. The sacred groves covered are: Siddeswara Kona, Penchala Kona, Bairagula Kona, Stambala Kona, Siddulaiah Kona and Narasimha Konda in Nellore district; Kona Malleswaram, Vankarakunta Ashram, and Katam in Anantapur district; Agasthyeswarakona, Nityapooja Kona and Polathala in Cuddapah district; Upper Ahobilam, Paladhara-Panchadhara, Hatakeswaram, Sikharam, Sri Kolanu Bharathi in Kurnool District; Nagarjunakonda in Guntur district; Mallayyaloddi, Umamaheshwaram, Saleswaram, Mallela Theertham, Akkamahadevi caves, Kadalivanam and Manyamkonda in Mahabubnagar district; Gandhari Vanam, Gandhari Khilla, Gudigutta, Basar, Pochera, and Kuntala in Adilabad district; Anantagiri in Rangareddi District; Edupayala Durga Bhavani, Sri Raja rajeswara and Rekulakunta in Medak district; Sarangapur, Badapahad, Sri Siddirameswara and Sri Bimeswara in Nizamabad district; Komuravelli in Warangal district. Eight (8) field tours were undertaken during 2016-17, resulted in 540 herbarium collections with another about 1000 plant species being recorded from the areas. In this study, eight (8) heritage trees, *Ficus benghalensis* measuring 10 m to 60 m in girth, age about 150 years to 500 years and covers up to 1 acre land were recorded from three districts; Seven (7) *Adansonia digitata*

Pterocarpus santalinus L.f. (Fabaceae)

Bulbothrix isidiza (Nyl.) Hale (Parmeliaceae)

Parmotrema saccatilobum (Taylor) Hale (Parmeliaceae)

measuring 10 m to 40 m in girth, age about 100 years to 200 years were recorded from three districts. 02 specimens were incorporated in herbarium. During field tour, an endemic species, *Cyathocline manilaliana* C.P. Raju & R.R.V. Raju were collected from Pochera sacred grove.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study reports *Cylindropuntia fulgida* var. *mamillata* as new to India; *Desmodium zonatum* (Leguminosae: Papilionoideae) and *Dipcadi montanum* var. *Madrasicum* (E.Barnes & C.E.C. Fisch.) Deb & S. Dasgupta as new record for the state.

PROJECT - 3

Inventory of Macrolichen diversity of Odisha

Executing Scientist(s) : Dr. Swarnalatha Ginnaram
Date of Initiation : August, 2015
Date to be completion : March, 2018

BACKGROUND

As far as, macrolichens of Odisha is concerned there are about 24 species belonging to 10 genera have been reported mostly in revisionary work/general studies.No detailed studies on macrolichens from the state is available. However, there are still vast areas in Odisha which remains unexplored with respect to macrolichens and moreover the precise diversity of inventory of macrolichens of Odisha is available. To provide thorough and comprehensive account of macrolichens of the state, this project was initiated in 2015. During previous year (@015-16), 114 lichen specimens were collected.

AREA AND LOCALITY

Odisha, one of the Indian state, is located on the east coast of the country and lies between 81°22' E to 87°29' E longitude and 17°47' N to 22°34' N latitude. The total geographical area of the state is about 155,707 sq. km. Politically the state has been divided into 30 administrative districts. The recorded forest area of the state is about 58,136 sq. km, which is 37.34% of its geographical area (India State of Forest Report, 2011). The state has one Biosphere Reserve, two National Parks and 19 Wildlife Sanctuaries.

SUMMARY OF THE WORK DONE DURING 2016-17

During the period of report, three field tours were undertaken in different parts of Odisha state. As a result, total 520 lichen specimens were collected (including microlichen specimens) of which 70 macrolichen specimens were studied (morphological, anatomical and chemical details) and identified them into 20 species under nine genera.Habit micro-photographs of 39 macrolichen specimens have been taken. During this study, total 50 lichen specimens were incorporated in the lichen herbarium (including 19 Microlichen specimens). Further, the specimens collected during the field tours were processed and transferred them to the herbarium packets after drying. The field data of those specimens was entered in the lichen accession register. One herbarium consultation tour was under taken to Department of Botany, Utkal University, Bhubaneswar, Odisha.

EASTERN REGIONAL CENTRE, SHILLONG

PROJECT - 1

Flora of Yangoupokpi Lokchao Wildlife Sanctuary, Chandel district, Manipur

Executing Official (s) : Dr. A. A. Mao & Shri L. R. Meitei
Date of Initiation : April, 2014
Date to be completion : March,2017

OBJECTIVE

The objective of the project is to document the floral diversity of Yangoupokpi Lokchao Wildlife Sanctuary, Chandel district, Manipur

BACKGROUND

The project was initiated in 2014. During previous year (2015-16), 16 species were described along with consultation of relevant literature. All the previously collected specimens were processed and deposited in ASSAM Herbarium.

AREA AND LOCALITY

Yangoupokpi Lokchao Wildlife Sanctuary, Chandel district, Manipur c. 184.80 sq. km.

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, one field tour *w.e.f.* 29.10.2016 to 08.11.2016 was undertaken to the study area covering Lai Lok, Khujai Lok, Govajang, Laiching, Forests near Moreh, Maantum Village, Sahei Village, Sijang Village and Lokchao forest areas and collected 117 Field no. for herbarium specimens, 163 live plant species along with 450 field photographs. A total of 54 species were identified and 79 taxa were documented. In addition, live plant saplings of 163 plant species were collected from the study area and planted in Experimental Botanical Garden, Barapani (Umiam). During field tour, 450 photographs were taken of which 320 photographs were identified

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 09 species (*Cleisostoma paniculatum, Dendrobium mannii, Epipogium roseum, Eria lasiopetala, E. tomentosa, Eulophia graminea, Gastrochilus obliquus, Micropera rostrata* and *Saccolabiopsis pusilla*) as new records for Manipur. Besides, 49 RET species were collected and conservation initiation taken by planting in

Lokchao Forest, Manipur

the Experimental Botanical Garden, Barapani; some of which are *Acampe ochracea, Adiantum edgeworthii, Aerides multiflora, A. odorata, Aleuritopteris bicolor, Artabotrys hexapetalus, Asplenium ensiforme, Bulbophyllum careyanum, B. gamblei, B. odoratissimum, Calanthe biloba, Celosia argentea, Cepholantheropsis obcordata, Cleisomeria pilosulum, Coelogyne flaccida, C. viscosa, Cycas pectinata, Dendrobium acinaciforme, D. anceps, D. chrysotoxum, D. delacourii, D. densiflorum, D. falconeri, D. formosum, D. infundibulum, D. jenkensii, D. lituiflorum, D. longicornu, D. moschatum, D. nobile, D. ochreatum, D. pulchellum, D. transparens, Elaphoglossum marginatum, Eria amica, E. biflora, E. lasiopetala, E. pannea, E. tomentosa, Gastrochilus calceolaris, Panisea uniflora, Papilionanthe teres, Pholidota articulata, Platycerium wallichii, Renanthera imschootiana, Rhyncostylis retusa, Saccolabiopsis pusilla, Thunia alba* and *Vanda coerulea.*

Dendrobium densiflorum Lindl. (Orchidaceae)

Eria lasiopetala (Willd.) Ormerod (Orchidaceae)

PROJECT - 2

Flora of Amchang Wild Life Sanctuary, Kamrup, Assam

Executing Officials (s) : Dr. A.A. Mao & Mrs. Nandita Sarma
Date of Initiation : April, 2014
Date to be completion : March, 2017

OBJECTIVE

The objective of the project is to document the floral diversity of the Amchang Wild Life Sanctuary, Kamrup, Assam.

BACKGROUND

Amchang Wildlife Sanctuary,located in the Kamrup district of Assam,comprises three Reserve Forests — Amchang RF (53.18 sq.km) , South Amchang RF (15.50 sq.km) and Khanapara RF (9.96 sq.km). Geographically the area is a continuation of the Khasi and Jaintia hills of Meghalaya and forms a part of Shillong Plateau. As there is no proper data available regarding the flora of the sanctuary, this project was started in 2014. During previous year (2015-16), 45 species were identified and 16 species were documented.

AREA AND LOCALITY

Amchang Wildlife Sanctuary, Kamrup district of Assam. The total area of the sanctuary is 78.64 sq. km and altitudinal ranges are 60.42 m to 312.15 m.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 31 species for Flora of Amchang Wildlife Sanctuary viz. Amaranthaceae: *Alternanthera sessilis, Amaranthus spinosus;* Angiopteridaceae: *Angiopteris helferiana;* Asteraceae: *Sonchus arvensis;* Athyriaceae: *Diplazium esculentum;* Costaceae: *Cheilocostus speciosus;* Cyatheaceae: *Cyathea henryi;* Cyperaceae: *Cyperus cyperoides;* Dennstaedtiaceae: *Microlepia speluncae;* Gleicheniaceae: *Dicranopteris lanigera;* Lamiaceae: *Ocimum tenuiflorum, Pogostemon benghalensis;* Lygodiaceae: *Lygodium flexuosum;* Malvaceae: *Abutilon indicum;*Marsileaceae: *Marsilea quadrifolia;* Melastomaceae: *Melastoma malabathricum;* Polypodiaceae: *Pyrossialanceolate;* Pteridaceae: *Cheilosoria tenuifoli, Pteris ensiformis, P. cameroonіana;* Selaginellaceae: *Selaginella ciliaris, S. semicordata;* Stemonaceae: *Stemona tuberosa;* Thelypteridaceae: *Cyclosorus aridus, Thelypteris procera, T. nudata* were identified and documented.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports *Globba rahmanii* (Zingiberaceae) as a new record for the flora of India; ethnobotanical importance of 11 species (Amaranthaceae: *Alternanthera sessilis* [dysentery, malaria fever], *Amaranthus spinosus* [Cold, cough], Malvaceae: *Abutilon*

Hedychium coccineum Buch.-Ham. ex Sm. (Zingiberaceae)

Impatiens chinensis L. (Balsaminaceae)

indicum [bone fracture, cooling agent, and cough], Asteraceae: *Sonchus arvensis* [injuries], Lamiaceae: *Ocimum tenuiflorum* [cold &cough], *Pogostemon benghalensis* [wounds], Melastomaceae: *Melastoma malabathricum* [cuts, smallpox], Pteridaceae: *Pteris ensiformis* [gland swell on neck], Dennstaedtiaceae: *Microlepia speluncae* [fever], Athyriaceae: *Diplazium esculentum* [constipation], Lygodiaceae: *Lygodium flexuosum* [cough, fever, jaundice], collected from study area, were noted down.

PROJECT - 3

Taxonomic Revision of genus *Riccia* (Marchantiophyta) in India

Executing Official (s) : Dr. S. K. Singh
Date of Initiation : October, 2014.
Date to be completion : March, 2019

OBJECTIVES

The objectives of the project are survey and collection of the genus *Riccia* from different selected pockets of the country, identification and taxonomical characterization of specimens collected, SEM iStudies of sporoderm pattern and documentation in form of a detailed, illustrated flora.

BACKGROUND

This project was initiated in 2014. During previous year (2015-16), 14 species of *Riccia* were collected and taxonomic description of 5 species were completed.

AREA AND LOCALITY

Entire India

SUMMARY OF THE WORK DONE IN 2016-17

During this period, a field tour was conducted to Kamakhya hill, Guwahati for collection of members of the genus *Riccia* and a total of 07 species were collected; a field tour to Riwai village was undertaken on 24.12.2016 and a total of 03 species of *Riccia* were collected along with 60 nos. of other liverworts and hornworts. Participated in Omaling Lake expedition, West Kameng Arunachal Pradesh *w.e.f.* 01.05.2016 – 05. 05. 2016 and collected 321 samples of bryophyte specimensincluding many rare liverworts like *Pleurozia*, *Anastrophyllum herbertes* etc. A field trip *w.e.f.* 22.07.2016-24.07.2016 was undertaken to Ukhrul, Manipur during which 02 species of *Riccia*, 01 species of *Anthoceros*, 01 species of *Notothylas* were collected. A short trip on 2.07.2016 was arranged to Umsaw Nongbri Village, Nongpoh, Meghalaya and 06 samples of liverwort and hornworts including a species of *Riccia* were collected. A field tour on 12.07.2016 was conducted to Tyrshi Falls, Jowai and collected 33 liverwort specimens including several Ljeuneaceae. Additionally, live plants of c. 25 species of Pteridophytes, Orchids and other flowering plants were also collected. During this period, a total of 34 field no. were collected along with 20 photographs of which 23 were identified. All the specimens were incorporated in herbarium. 11 plant species were documented, namely *Riccia beyrichiana* Hampe, *R. biliardieri* Mont. & Nees, *R. cavernosa* Hoffm., *R. discolor* Lehm. & Lindenb., *R. frostii* Aust., *R. glauca* L. var. *glauca*, *R. grollei* Udar, *R. huebeneriana* Lindenb., *R. personii* Khan, *R. sorocarpa* Bisch., *R. stricta* (Gottsche, Lindenb. & Nees) Perold. Sporoderm of 17 samples of *Riccia* belonging to 10 species were studied under Scanning Electron Microscope. Survey of literature related to *Riccia* was continued.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

Documentation of 11 species is made, detailed nomenclature of 10 species is checked. The results include some new findings *viz.*, *Riccia cavernosa* Hoffm., *R. huebeneriana* Lindenb. and *R. frostii* Aust., as new to Jharkhand and *R. personii* Khan as new to Meghalaya.

PROJECT - 4

Bryoflora (Hepaticae & Anthocerotae) of Mizoram

Executing Official (s) : Dr S.K. Singh
Date of Initiation : April, 2008
Date of completion : September, 2014 (extended up to March 2017)

BACKGROUND

The present project is pioneer work as there were no previous report of Liverwort and hornwort from the state except the few publication made by the author during the present work (Barbhuiya & Singh 2011a, b; Singh & Barbhuiya, 2011, 2012a, b, 2013; Singh & Dey, 2014; Singh & Majumdar, 2015a,b; Singh & Pócs, 2016, Singh & Kumar, 2016c). Documentation ofthe liverwort flora is very much needed to fulfil gap of knowledge towards this primitive group of plants. This project was initiated in 2008. During previous year (2015-16), taxonomic description of 22 species was completed.

AREA AND LOCALITY

Mizoram, c. 21,081 sq. km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-17

During 2016-17, rechecking of 1100 samples of liverworts from Mizoram was completed along with taxonomic description of 58 species namely *Asterella khasyana* (Griff.) Pande, K. P. Srivast. & Sultan Khan, *A. multiflora* (Steph.) Pande, K.P. Srivast. & Sultan Khan ex Kachroo, *A. wallichiana* (Lehm. & Lindenb.) Pande, K. P. Srivast. & Sultan Khan ex Grolle, *Calypogeia arguta* Nees & Mont. ex Nees, *C. lunata* Mitt., *Cephalozia kashyapii* Udar, *Cephaloziella crispata* N.Kitag., *C. meghalayensis* Udar & Ad. Kumar, *Chiloscyphus chinnarensis* C.N. Manju, K.P. Rajesh & Madhusoodanan, *Conocephalum conicum* (L.) Dumort., *Cyathodium aureonitens* (Griff.) Mitt., *C. tuberosum* Kashyap, *Cylindrocolea mizoramenisis* Sushil K. Singh *sp. nov. Dumortiera hirsuta* (Sw.) Nees, *D. hirsuta* (Sw.) Nees, *Herbertus dicranus* (Taylor) Trevis, *Heteroscyphus bescherellei* (Steph.) S.Hatt., *H. hyalinus* (Steph.) Abha Srivast. & S.C. Srivast., *H. palniensis* Abha Srivast. & S.C.Srivast., *H. pandei* S.C. Srivast. & Abha Srivast., *H. planus* (Mitt.) Schiffn., *Notoscyphus darjeelingensis* Udar & Ad. Kumar var. *darjeelingensis*, *N. pandei* Udar & Ad. Kumar, *Odontoschisma denudatum* (Mart.) Dumort., *Plagiochila indica* Mitt. ex Steph., *P. javanica* (Sw.) Nees & Mont., *P. parvifolia* Lindenb., *P. salacensis* Gottsche, *Pl. sciophila* Nees ex Lindenb., *P. secretifolia* Mitt., *P. semidecurrens* (Lehm. & Lindenb.) Lindenb. var. *semidecurrens*, *P. vexans* Schiffn. ex Steph., *Plicanthus birmensis* (Steph.) R.M. Schust., *P. hirtellus* (F.Weber) R.M.Schust., *Saccogynidium irregularospinum* C.H.Gao, T.Cao & M.J. Lai, *Solenostoma ariadne* (Taylor ex Lehm.) R.M.Schust. ex Váňa & D.G. Long, *S. truncatum* (Nees) R.M. Schust. ex Váňa & D.G. Long var. *truncatum*, *S. virgatum* (Mitt.) Váňa & D.G. Long, *Talareana mizoramensis* Sushil K. Singh *sp. nov.* etc.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 13 taxa (*Cololejeunea khawanglungensis* Sushil K. Singh *sp. nov.*, *C. murlenensis* Sushil K. Singh *sp. nov.*, *Cylindrocolea mizoramensis* Sushil K. Singh sp. nov., *Drepanolejeunea mizoramensis* Sushil K. Singh *sp. nov.*, *Lejeunea bukpuiensis* Sushil K. Singh *sp. nov.*, *L. eifrigii* Mizut. var. *indica* Sushil K. Singh var. *nov.*, *L. kolasibensis* Sushil K. Singh *sp. nov.*, *Leptolejeunea mizoramnsis* Sushil K. Singh *sp. nov.*, *Metzgeria mizoramensis* Sushil K. Singh & D.Singh, *sp. nov.*, *Plagiochila dampaensis* Sushil K. Singh *sp. nov.*, *P. mizoramensis* Sushil K. Singh *sp. nov.*, *Spruceanthus semirepandus* (Nees) Verd. var. *indicus* Sushil K. Singh var. *nov.*, *Talareana mizoramensis* Sushil K. Singh *sp. nov.*) as new to science; 11 species (*Acrolejeunea emergens* (Mitt.) Steph., *Cheilolejeunea diversifolia* Augier, *C. ryukyuensis* Mizut., *Cololejeunea kodamae* Kamim., *C. tranninhiana* Tixier, *Colura corynephora* (Nees, Lindenb. & Gottsche), Trevis., *Heteroscyphus planus* (Mitt.) Schiffn., *Lejeunea mizutanii* Grolle, *L. patriciae* Schäf.-Verw., *Mastigolejeunea auriculata* (Wilson & Hook.) Steph., *Plagiochila bicornuta* Steph.) as new records, 03 species (*Cheilolejeunea obtusifolia* (Steph.) S. Hatt., *Cololejeunea tenella* Benedix and *Frullania gracilis* (Reinw., Blume & Nees) Dumort.) as new to India mainland, 17 species (*Riccia grollei* Udar, *Acrolejeunea fertilis* (Reinw., Blume & Nees) Spruce ex Schiffn., *Ceratolejeunea belangeriana* (Gottsche) Steph., *Cheilolejeunea ghatensis* G. Asthana, S.C. Srivast. & A.K. Asthana, *Chiloscyphus chinnarensis* C.N. Manju, K.P. Rajesh & Madhusoodanan, *Cololejeunea epiphylla* G.Asthana & A.Shukla, *C. hyalina* G. Asthana & S.C. Srivast., *Colura lerati* (Steph.) Steph., *Drepanolejeunea pentadactyla* (Mont.) Steph., *Folioceros amboinensis* (Schiffn.) Piippo, *F. mangaloreus* (Steph.) D.C. Bharadwaj, *Frullania riojaneirensis* (Raddi) Spruce, *Leptolejeunea maculata* (Mitt.) Schiffn., *Plagiochila arbuscula* (Brid. ex Lehm. & Lindenb.) Lindenb., *P. ghatiensis* Steph., *P. javanica* (Sw.) Nees & Mont. and *P.junghuhniana* Sande Lac.) as new to Himalayan regions, 05 species (*Notothylas kashyapii* D.K. Singh, *Plagiochila korthalsiana* Molk. ex Sande Lac., *P. salacensis* Gottsche, *Porella densifolia* (Steph.) S.Hatt. subsp. *densifolia* and *Radula tabularis* Steph.) as new to eastern Himalaya and 233 species as new to Mizoram. Additionally, seven species *viz.*, *Lejeunea pallide-virens* S. Hatt., *Mastigolejeunea indica* Steph., *Schiffneriolejeunea pulopenangensis* (Gottsche) Gradst., *S. tumida* (Nees) Gradst. were recorded for the first time from Himalayan region. Three taxa namely, *Frullania campanulata* Sande Lac., *Porella campylophylla* (Lehm. & Lindb.) *Trevis.* subsp. *lancistipula* (Steph.)

S.Hatt., *P. chinensis* (Steph.) S.Hatt. var. *chinensis* are new to east Himalayan bryogeographical territory.

PROJECT - 5

Flora of Eastern Nagaland (Mon, Tuensang, Kiphire and Longleng districts

Executing Official (s) : Dr. Nripemo Odyuo & Dr. Ranjit Daimary
Date of Initiation : April, 2014
Date to be Completion : March, 2019

OBJECTIVE

The objective of the project is to document the Flora of Eastern Nagaland

BACKGROUND

Eastern Nagaland, rich in plant diversity, is still unexplored. If the area is fully explored then there are chances of discoveries of many new species. This project was initiated in 2014. During previous year (2015-16), 102 live plants were collected, 142 species were identified and 136 species were taxonomically described.

AREA AND LOCALITY

The total geographical area of eastern Nagaland is 8335 sq.km. The project comprise four districts of eastern Nagaland *viz.* Mon, Tuensang, Kiphire and Longleng.

SUMMARY OF WORK DONE DURING 2016-17

During 2016-17, two field tours were undertaken, first *w.e.f.* 24.04. 2016 to 15. 05. 2016 to Mon district and second *w.e.f.* 4.10.2016 to 25.10. 2016 to Mon and Tuensang districts and collected a total of 760 field numbers out of which 125 plant species were identified and documented. Also taken 800 photographs of which 24 photos were identified.

ACHIEVEMENTS/OUTCOMES IN 2016-17

The present study reports 03 species [*Coelogyne caicicola* Kerr (Orchidaceae), *Panisea panchaseensis* Subedi (Orchidaceae) and *Liparis formosana* Rchb.f. (Orchidaceae)] as new record for India. 195 rare live plants were collected and introduced at Botanical garden, BSI, Shillong and Experimental Botanical Garden, Borapani.

PROJECT - 6

Micropropagation, phytochemical screening of medicinal plants and molecular characterization of selected species complexes of North-east India (*Paris polyphylla* and *Pyrenaria khasiana*)

Executing Official(s) : Dr. Deepu Vijayan
Date of Initiation : April, 2014
Date to be completion : March, 2017

Panisea panchaseensis Subedi (Orchidaceae)

BACKGROUND

Collection of explants : Young leaves, mature seeds and rhizomes of *Paris polyphylla* collected from the Garden of Botanical Survey of India, Eastern Regional Centre, Shillong were used for the micropropagation studies. A plant collection tour was undertaken to Dullung Reserve Forest, North Lakhimpur, Assam and Bordering areas of Arunachal Pradesh (Panir Reserve Forest), Boginadi for collecting seeds/seedlings of *Pyrenaria khasiana* from 25.11.2015 to 01.12.2015 in connection with the approved Annual Action Plan of BSI, ERC, Shillong for the year 2015-2016. Mature fruits and young seedlings of *Pyrenaria khasiana* were collected from Dullung Reserve forest, North Lakhimpur, Assam and Bordering areas of Arunachal Pradesh (Panir Reserve Forest), Boginadi.

Media preparation for initiation of cultures: The explants (leaves, seeds and rhizomes) of *Paris polyphylla* were inoculated on MS basal medium supplemented with different concentrations of plant growth regulators for callus induction and direct shoot induction. The explants (seeds and *in vitro* raised leaves) of *Pyrenaria khasiana* were inoculated on Woody Plant Medium and MS medium supplemented with different concentrations of plant growth regulators for callus induction and direct shoot induction.

Standardization of tissue culture protocols for RET medicinal plants: Experiments with different explants like rhizomes, seeds and leaves of *Paris polyphylla* were used with different plant growth regulators in MS medium for callus induction and direct shoot induction and the work is in progress. 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 the best. Standardized a new protocol for successful direct shoot induction from seeds. Multiple shoot induction experiment for the species has been standardized. The rooting experiment studies have been standardized.

Pyrenaria khasiana R.N. Paul var. *lakhimpurense* N. Odyuo & D.K. Roy (Theaceae)

Pyrenaria cherraponjeana Mir. (Theaceae)

Phytochemical profiling of selected medicinal plants: *Aristolochia saccata, Paris polyphylla, Citrus indica, C. latipes & Curcuma aurantioca*-preliminary qualitative phytochemical analysis was completed with the leaf/rhizome samples of the selected medicinal plants. GC-MS analysis of all the selected medicinal plants has been completed.

DNA fingerprinting of selected species complexes were done

i) *Rhododendron formosum* var. *formosum* and *R. formosum* var. *inaequale*

ii) *Paphiopedilumvenustum* (Arunachal Pradesh) and *P. venustum* (Meghalaya)

Standardized a new DNA extraction protocol (SDS based) for getting high quantity and quality DNA from young leaf samples. DNA was extracted from leaf samples of some selected Rhododendrons (11 species). DNA was extracted from different species of *Paphiopedilum viz., Paphiopedilum venustum* (Arunachal), *P. venustum* (Meghalaya), *P. druryi, P. hirsutissimum, P. insigne, P. spicerianum, P. villosum, P. fairrieanum.* Completed PCR analysis of *Paphiopedilum venustum* (both Arunachal Pradesh and Meghalaya) using rbcL, matK, ITS and tnrH-

psbA primers. Purification of PCR products was done and sent for sequencing.

AREA AND LOCALITY

NE India

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-17

An efficient *in vitro* protocol was standardized for large scale propagation of *Pyrenaria khasiana* through tissue culture technique. Direct shoot induction from the callus, derived from leaves of *Paris polyphylla*, was observed and more experiments are being conducted to standardize the protocol. Experiments with different explants like rhizomes and leaves of *P. polyphylla* were used with different plant growth regulators in MS medium (both half and full strength) for callus induction and direct shoot induction.Quantitative analysis of medicinal plants (i)*Aristolochia saccata* ii) *Paris polyphylla* iii) *Citrus indica* iv) *C. latipes* v) *Curcuma aurantiaca* has been completed using GC-MS analysis. Completed PCR analysis of *Paphiopedilum venustum* (both Arunachal Pradesh and Meghalaya) using rbcL, mat-K, ITS and tnrH primers. Completed PCR analysis of *Rhododendron formosum* var. *formosum* and *R. formosum* var. *inaequale* using rbcL, mat-K, ITS and tnrH primers. Purification of PCR products was done and sent for sequencing. During this period, 3 field tours were undertaken; in addition a plantation tour was conducted along with Head of Office on 24th May, 2016 to Naga Heritage Village, Kisama, Nagaland and planted around 200 saplings including two critically endangered species of Rhododendron *viz.*, *Rhododendron wattii* and *R. macabeanum*, *Taxus baccata*, *Gymnocladus assamicus*, *Agathis lanceolata* and *Aesculus assamica* in that area. Another plant exploration tour was undertaken to Tyrshii falls, Jowai along with Head of Office and other scientists on 13.07.2016. Conducted a tour along with Head of Office and other scientists to Nagaland *w.e.f* 18.11.2016 to 22.11.2016 and collected the following 29 plant species: *Acanthephippium* sp.; *Aeschynanthus* sp.; *Begonia* spp. (4 spp.); *Bulbophyllum* spp. (05 sp.); *Dendrobium acinaciforme*; *D. jenkinsii*; *Hedychium stenopetalum*, *Hedychium* spp. (5 sp.); *Eria coronaria*; *Etlingera* sp.; *Exacum* sp.; *Homalomena aromatica*; *Hoya* sp.; *Impatiens latiflora*; *Phaius mishmensis*; *Piper* sp.; *Tupistra* sp. and *Wallichia densiflora* and planted in Experimental Botanical Garden, Barapani and Shillong office garden.

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study reports 01 species [*Molineria garoense* (Hypoxidaceae) as new record for state; besides conservation of rare, endangered and economically important plants was initiated, collected and introduced the following plant species from Nagaland: *Acanthephippium* sp.; *Aeschynanthus* sp.; *Begonia* spp. (4 spp.); *Bulbophyllum* spp. (5 spp.); *Dendrobium acinaciforme*; *D. jenkinsii*; *Hedychium stenopetalum*, *Hedychium* spp. (5 spp.); *Eria coronaria*; *Etlingera* sp.; *Exacum* sp.; *Homalomena aromatica*; *Hoya* sp.; *Impatiens latiflora*; *Phaius mishmensis*; *Piper* sp.; *Tupistra* sp. and *Wallichia densiflora* and planted in Experimental Botanical garden, Barapani and Shillong office garden. Tissue culture raised plants of *Pyrenaria khasiana* was planted in Experimental Botanical garden, Barapani.

PROJECT - 7

Taxonomy, phylogeny and *ex-situ* conservation of Micro-fungal diversity from northeast India with special emphasis on fungi associated with endemic and threatened plants of Meghalaya

Executing Official(s) : Ashish Venkatesh Prabhugaonkar
Date of Initiation : August, 2015
Date to be completion: March, 2018

OBJECTIVE

The objective of the project is to document the Micro Fungal Diversity from N.E. India with special emphasis onendemic and threatened plants of Meghalaya.

Speiropsis Pedatospora : Conidiophore with Conidia, Conidial chains & its culture

AREA AND LOCALITY

Meghalaya, North East India

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, sterio-zoom microscope (Magnus MSZ-Bi) and a compound microscope (Olympus CX21i-Tr LED) with camera (Magnus DC 5MP) facility was established as part of establishment of facilities for fungal bio-diversity studies. Following host plants specimens were observed, *viz. Citrus letipes, Paramignya micrantha, Wallichia* sp., *Calamus* sp. and *Aquilaria khasiana* along with other plant litter from various habitats; identified and documented a total of 210 fungi species till date, namely *Agaricostilbum palmicola, Albosynnema* sp., *Alysidium resinae, Ascobolus* sp., *Beltraniopsis* sp., *Candelabrum brocchiatum, Chaenothecopsis* sp., *Cladosporium cladosporioides, Cladosporium* sp.., *Cryptophiale kakombensis* on Pinnanga litter, *Cyathus gayanus* Tul. & C. Tul., *Dendrostilbella* sp., *Dictyosporium elegans, Graphiopsis* sp., *Hansfordia* sp., *Haplotrichum* sp., *Helicoma* sp., *Hemicorynespora* sp., *Menisporopsis* sp., *Myrothesium* sp. from *Citrus letipes* litter, *Nakatopsis* sp. etc. A fungal culture collection with 171 fungal species in culture was being maintained at BSI-ERC, Shillong. Fungi isolated in culture during period are *Aspergillus* sp., *Aureobasidium pullulans, Bahusutrabeeja* sp., *Beltrania rhombica, Beuveria* sp. asoociated dead and necrotic nepenthes plant, *Circinotrichum* sp., *Clonostachys cylindrospora, Dendrosporium lobatum, Dendrosporium lobatum, Epicoccum nigrum, Gliocladium sagarensis, Microdochium caespitosum, Minimidochium setosum, Morchella isolate, Myrothecium* sp., *Paradictyoarthrinium* sp., *Periconia* sp., *Pestalotiopsis* sp. *Peyronelina glomerulata, Phialophora richardsiae, Phoma* sp. as endophyte of *Pinnanga sp., Piricauda cochinchinensis, Pithomyces flavus, Pseudogliophragma indica, Rhizopus* sp., *Setosynnema isthmosporum, Speiropsis pedatospora, Spiniger* sp., *Sporochiasma mirabile, S. saccardoi, Vermiculariopsiella indica, V. parva, Yuccamyces purpureus.* Durinng 2016-17, a total of 14 local tours were conducted in Khasi and Jaintia hills of Meghalaya and c. 200 species of fungi were documented/micro-photographs were taken using camera attached to microscope. A fungal herbarium with 142 specimens was established. Permanent microscopic slides of all species documented were sealed with DPX and stored for future reference in slide cabinet facility. Cultures were deposited at 'National fungal culture collection of India' at 'Agharkar Research Institute' Pune- *Psedotorula goaensis* (NFCCI 4040) and *Pseudocercosporidium subramanianii* (NFCCI 4039) and at 'Microbial type culture collection' at Institute of Microbial technology, Chandigarh- *Psedotorula goaensis* (MTCC 12620) and *Speiropsis pedatospora* (MTCC 12621). Besides *Trichoglossum rasum* Pat. FoF 02878, *Pseudotorula goaensis* Pratibha and Prabhugaonkar FoF 02876 Mycobank: MB819598 were deposited online. Deposited two sequences generated in 'genebank' and received deposition numbers: *Trichoglossum rasum* ITS: KY457226 (ITS1/ITS4); LSU: KY457227 (LROR/LR5).

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study successfully isolated *Speiropsis pedatospora* Tubaki in culture and studied for molecular phylogeny.06 fungal isolates in culture morphologically distinct from known fungi were sequenced for ITS and LSU gene regions. Manuscripts based on these were being prepared. Type materials were deposited in HCIO, IARI, New delhi and MTCC, IMTECH, Chandigarh. Three interesting fungal cultures namely of *Yuccamyces purpureus* Gour, Dyko & B. Sutton, *Setosynnema isthmosporum* D.E. Shaw & B. Sutton, *Dendrosporium*

Fungi Culture collection

lobatum Plakidas & Edgerton ex J.L. Crane were sent for molecular sequencing of ITS, LSU and SSU region to RFDF, RGCG, Thiruvanathapuram.

PROJECT - 8

Micropropagation of RET Plants of N. E. India, BSI, ERC, Shillong

Executing Official(s) : Dr. A. A. Mao & L. Ibemhal Chanu
Date of Initiation : May, 2015
Date to be completion : On going

BACKGROUND

To develop protocol of mass multiplication of 05 RET plants of N. E. India, this project was initiated in 2015. During previous year (2015-16), a total of 100 plants of *Rhododendron coxianum* was transferred to greenhouse; c. 1200 plants of *Armodorum senapatianum* were transferred from lab to land.

AREA AND LOCALITY

N.E. Region, India

SUMMARY OF THE WORK DONE DURING 2016-2017

During this period, callus of *Rhododendron coxianum* were subcultured in different concentration of 2ip for further experiment for chemical analysis, shooting and plants in greenhouse were maintained; c. 7000 seedlings of *Cymbidium tigrinum* were grownin culture room, c. 2000 seedlings were subcultured & c. 100 plants were planted in greenhouse; c.250 plants of *Armodorum senapatianum* were subcultured and experiment done for mass multiplication inside the culture room, c. 70 plants were planted in greenhouse; experiment on seed germination of *Illex khasiana*, *Paphiopedilum hirsutissimum* are in process; data analysis, interpretation, literature survey for *Armodorum senapatianum*, *Cymbidium tigrinum* are in progress.

ACHIEVEMENTS/ OUTCOMES IN 2016-2017

In the present study, 39 plants of *Rhododendron*

Cymbidium tigrinum C.S.P. Parish ex Hook. (Orchidaceae)

Rhododendron coxianum Davidian (Ericaceae)

*coxianum*were successfully grown in greenhouse, c. 7000 seedlings of *Cymbidium tigrinum* were grown in culture room, 100 plants were planted in greenhouse, c.250 plants were subcultured for mass multiplication inside the culture room and c. 70 plants were successfully planted in greenhouse.

PROJECT - 9

Flora of Nagaland(Vol. 1 & 2) (New project)

Executive Official(s) : Dr. A.A. Mao, Dr. N. Odyuo & Dr. D.K. Roy
Date of Initiation : April, 2016
Date to be completion: March, 2021

OBJECTIVE

The objectives of the project isdocumentation of the vascular plant resources (excluding Orchids and Ferns) in the state of Nagaland (Vol.I & II).

BACKGROUND

The state of Nagaland is situated in the north eastern region of India. It lies between the geographical coordinates of 25°6' and 27°4' North latitudes and 93°20' and 95°15' East longitude, bordering Myanmar in the East, Arunachal Pradesh in the North, Assam in the West and Manipur in the South. It comprises of 11 districts namely Mon, Longleng, Mokokchung, Tuensang, Wokha, Zunheboto, Kiphire, Phek, Kohima, Dimapur and Peren. It comes under the Indo-Burma Biodiversity Hotspot. Its altitudes range from 260 to 3840 meters above sea level and is covered by the vegetative growth of the evergreen tropical and the sub tropical forests. The state has one National Park (Intanki NP, 202 sq. km) and three Wild Life Sanctuaries namely Fakim WLS (6.41 sq. km), Puliebadze WLS (9.23 sq. km) and Rangapahar WLS (4.70sq. km). So far the state does not have the proper documented flora except *Ferns of Nagaland* (Jamir and Rao, 1988) and *Orchids of Nagaland* (Hyanniewta, 2000). Therefore, the said project has proposed for proper documentation of the vascular plant resources in the state of Nagaland in

two volumes (Flora of Nagaland, Vol. I & II) excluding Orchids and Ferns.

AREA AND LOCALITY

Nagaland ; c. 9,222 sq. km

SUMMARY OF THE WORK DONE DURING 2016-2017

During 2016-2017, intensive literature survey and consultation of herbaria were carried out and thus a total 2287 taxa of plants under 946 genera and 194 families have been recorded for the Flora of Nagaland. Two field explorations were carried out, one during 24.04.2016 to 15.05.2016 (for 22 days) and collected 412 field numbers of herbarium specimens along with 112 species of live plants and about 500 photographs of plants, landscape, vegetation, etc. were taken, another one during 04.10.2016 to 25.10.2016 (for 22 days) and collected 348 field numbers of herbarium specimens and 83 species of live plants along with 550 photographs of plants, landscape, vegetation etc.

ACHIEVEMENTS/ OUTCOME IN 2016-2017

The present study discovered 03 taxa [*Adenophora capillaris* Hemsley subsp. *dzukoensis* A.A. Mao, Nandita Sarma & D.K. Roy (Campanulaceae), *Molineria fakimense* N. Odyuo, D.K. Roy & Khamdi (Hypoxidaceae) and *Tupistra tupistroides* (Kunth) Dandy var. *nagarum* N. Odyuo, D.K. Roy, A.A. Mao & Aver. (Asparagaceae)] as new to science; 02 taxa [*Sauromatum horsfieldii* Miq. (Araceae) and *Pyrenaria diospyricarpa* Kurz var. *camelliiflora* (Kurz) S. X. Yang (Theaceae)] as new to India, 20 taxa of Orchids as new records for Nagaland state, 02 taxa [*Rhynchotechum alternifolium* C.B.Clarke (Gesneriaceae) and *Molineria prainiana* Deb var. *josephii* D.K. Roy, D. Verma and A.D. Talukdar] were rediscovered after a gap of 50 and 30 years respectively. Besides, about 195 live plant species of RET plants were introduced in the Garden of Botanical Survey of India, ERC, Shillong for *ex-situ* conservation. Seeds of *Pyrenaria diospyricarpa* Kurz var. *camelliiflora* (Kurz) S. X. Yang (Theaceae) given to Tissue Culture section, BSI, ERC, Shillong for multiplication.

PROJECT - 10

Flora of West & South-west khasi hills district of Meghalaya with reference to the sacred groves (New project)

Executing Official(s): Dr. Chaya Deori & Shri S. R. Talukdar
Date of Initiation : April, 2016
Date to be completion: March, 2019

OBJECTIVES

The objectives of the project are to conduct intensive botanical exploration in the whole West and South West Khasi hills district covering its sacred groves season wise for collection of floristic elements (including endemic, rare and threatened plant species) and to make a comparative account on the distribution of species occurring in the districts with special attention to the sacred groves. The nomenclature of each species with basionyms, synonyms, detailed description with up to date nomenclature following Tropicos, IPNI and keys to the genera and species accompanied with photo plates will be documented.

BACKGROUND

West Khasi Hills district is presently the largest district of Meghalaya,with 5,247 sq. km which is 23% of the total area of the state. The district lies in the central part of the state of Meghalaya and is situated between approximately 25°10' and 25° 51' N latitude and between 90° 44' and 91°49' east longitude with elevation upto c. 1900 m. The vegetation of the district comprises of tropical evergreen, Semi evergreen, Sal forest, Sub-tropical pine, Su-tropical degraded pine and small patches of moist mixed deciduous forest. Out of 5247 sq. km, 91 sq. km is very dense forest, 2551 sq. km is moderately dense and 1366 sq. km is open forest. The South West Khasi Hills district was carved out of the West Khasi Hills district very recently on 3rd August 2012. The district headquarter is located at Mawkyrwat. The district occupies an area of 1,341 sq km. Out of 79 sacred groves West and South West Khasi hills district has 11 numbers namely U Law Lyngdoh, U Lum Sanglia, U Law Blei, Law Lyngdoh, Law Kyntang, Law Kyntang, Nongsynrih Sacred grove, Law Adong Lyngdoh Mawlong (clan protected grove), Kyllai Lyngngun, Lyngdoh Mawnai sacred grove, Law Lyngdoh distributed in the following villages Nongkyngkin, Nonglang, Mawlangwir, Mawten, Nongsynrih, Mawlong, Mariam, Mawnai, Nonglait. These sacred groves are very rich in floristic composition.

AREA AND LOCALITY

West & South-west khasi hills district, Meghalaya

ACHIEVEMENTS/ OUTCOME IN 2016-2017

Exploration, inventorisation and documentation of districts floras and sacred groves have remained a part of the primary objective of BSI. The West Khasi Hills district (largest district of Meghalaya, 5,247 sq. km is 23% of the total area of the state) including South West Khasi Hills district and its sacred groves having rich floristic composition have been left out so far from intense survey and research as revealed from the depository of herbarium specimens in ASSAM, BSI, Shillong. The documentation of these unexplored biologically interesting areas (sacred groves) could provide many

Hedychium coronarium J. Koenig (Zingiberaceae)

additions to the floristic diversity of India in general and Meghalaya in particular.

METHOD: Botanical survey will be carried out in the districts as well as in the sacred groves noting down GPS coordinates of different localities and forest/vegetation patches.

AREA AND LOCALITY

West & South-West Khasi Hills district, Meghalaya

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016 – 2017, literatures pertaining to the two districts were consulted and 97 species were listed from literature. Two field tours *w.e.f.* 5.07.2016 to 9.07.2016 and28.11.2016 to 8.12.2016 were conducted during which a total of 624 field numbers (Field numbers (134201-134300, 134301-134400, 134401-134412; 134420-134500; 134501-134600; 134601-134700; 134701-134800; 134801-134836) were collected along with124 live species for introduction in the BSI, Botanical garden, Shillong; more than 1000 digital photographs were taken and identified 111 plant specimens so far.

Coulokaempferia secunda (Wall.) K.Larsen (Zingiberaceae)

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study reports 01 species (*Dendrobium tuensangense* N.Odyuo & C.Deori *sp.nov.*) as new to science; 02 species (*Coelogyne calcicola* and *Liparis formosana*) as new to India; 29 new records for the state; 01 species rediscovered after a long gap. During this period, economic and ethnobotanical of following economic plants were recorded, *viz. Asparagus racemosus, Nepenthes khasiana, Litsea* sp., *Pinus* sp., *Castanopsis* sp., *Mallotus* sp. *Ficus* sp., etc. Species of ornamental uses *viz., Arundina graminifolia, Brachycorthis galeandra, Bulbophyllum* sp., *Dendrobium heterocarpum, D.devonianum, Eriapaniculata, E. coronaria, Geodorum densiflorum, Habenaria acucifera, H. khasiana, Herminium lanceum, Peristylus goodyeroides, Pholidota articulata, Pleione maculata, Liparis* sp., *Oberonia* sp., *Thuniaalba* etc. were noted down from the study area. Ecological importance of *Impreta cylindrica* (Poaceae) which colonizes in the barren hill slopes and helps to bind the loose soil was reported this area.

PROJECT - 11

Ex-situ conservation and multiplication of endemic, rare, threatened and economically important plants of North-East India at Experimental Botanic Garden, BSI, ERC, Barapani (Umiam)

Executing Official(s) : Dr. M. Murugesan & Shri L. R. Meitei
Date of Initiation : Ongoing

OBJECTIVES

The objectives of the project are *ex-situ* conservation and multiplication of endemic, RET & economically important plants of North-East India; To record phenological data for the plants available in Experimental Botanical Garden (EBG); to enrich the flora of EBG, with particular reference to RET and other economically important plants and to develop gene pool for the plant groups - *Citrus, Musa, Rhododendron, Dioscorea, Piper, Zingiber* and other rare species of NE India in Botanical Garden at Barapani.

BACKGROUND

Collection of endemic, rare, threatened and economically important plants of North East India for *ex-situ* conservation and multiplication purpose in Experimental Botanic Garden, BSI, ERC, Umiam (Barapani). The existing Experimental Botanic Garden is located c. 22 km away from Shillong near Umiam Lake at Barapani, with an area of c. 25 acres at an altitude c. 1000m (3000ft.). It is in the process of introduction/ acclimatisation and paying considerable attention towards maintenance of germplasm collection, growing and multiplication of rare / endangered / threatened

Artobotrys hexapetalus (L.f.) Bhandari (Annonaceae)

plant wealth of North-east India in order to save them from extinction.

About 1300 species of vascular plants, 13 gymnosperms, 65 pteridophytes and 53 bryophytes of North-East India are conserved here.

AREA AND LOCALITY

Entire N.E., India

SUMMARY OF THE WORK DONE 2016-2017

During this period, four (4) field tours were undertaken, *viz.* 1. Omaling Lake in West Kameng district of Arunachal Pradesh and collected 28 live plant species, 2. Yangoupokpi Lokchao Wildlife Sanctuary, Manipur and collected 163 live plant species, 3. Doyang and Pangti of Wokha district, Nagaland and collected 29 plant species and 4. Tawi Wildlife Sanctuary, Mizoram and collected 110 plant species. Besides, also conducted 104 one day field tours to Sumer & nearby areas, Ri-bhoi district (collected 12 species); KBET Nongbri Forest, Ri-bhoi, Meghalaya (collected 16 species); Umroi forest, Meghalaya (collected 8 species); Jaintia Hills, Meghalaya (collected 14 species); Mawsynram, Khasi Hills (8 species); Cherrapunjee & Pynursula, Khasi Hills (collected 22 species); Pynursla & surrounding areas, Khasi Hills (collected 41 species); Arwah forest near Lumshynna cave, forest near Ramakrishrishna School and Khliehshnong forest of Sohra (Cherrapunjee) Meghalaya (collected 21 species); Mawsynram and nearby areas, Meghalaya (collected 37 species) and Nohkalikai Falls, Sohra, Meghalaya (collected 22 species). 1500 photographs were taken of which 800 photographs were identified. During this period, phenological data of flowering and fruiting of 236 plant species were observed from April 2016 to March 2017.

Caulokaempferia secunda (Wall.) K. Larsen (Zingiberaceae)

In addition, supervision and general maintenance of works were carried out in the Experimental Botanic Garden, BSI, ERC, Umiam (Barapani), distributed 157 numbers of plant seedlings/ saplings to various

Kaempferia galanga L. (Zingiberaceae)

Institutions, Forest Department and local people for planting; isssued fruits (50 nos) each of *Terminalia chebula* and *T. citrina* to different universities and colleges for research purpose. Tagged 430 name boards for trees and shrubs, Zingers planted in Zingiber plot, Medicinal plants and other economically important plants available in the garden. Also placed 09 information boards for Orchid houses, Fern houses, Bambusetum, Zingiber section, *Nepenthes khasiana*, *Taxus baccata*, tree ferns, *Bergenia ciliata* and Disocorea section. Some of the identified plant species collected from the field tours are *Acampe ochracea*, *Adiantum capillus*, *A. edgeworthii*, *Asparagus racemosus*, *Asplenium cheilosorum*, *A. ensiforme*, *A. phyllitidis*, *A. yoshinagae*, *A. yoshinagae* subsp. *indicum*, *Begonia hatacoa*, *Blechnum orientale*, *Brachycorythis obcordata*, *Brainea insignis*, *Bulbophyllum*

Phaius tankervillae (Banks) Blume (Orchidaceae)

careyanum, B. cauliflorum, B. gamblei, Coelogyne viscosa, Costus speciosus, Curculigo orchioides, Cyathea chinensis, Dendrobium acinaciforme, D. aphyllum, D. chrysotoxum, D. crepidatum, D. delacourii, D. densiflorum, Elsholtzia blanda, Eria acervata, E. amica, E. biflora, E. coronaria, E. lasiopetala, E. muscicola, Gastrochilus inconspicuous, Gnetum gnemon, Goodera procera, Habenaria aquifer, H. khasiana, Hedychium ellipticum, H. gardnerianum, H. gracile, H. spicatum, Lycopodiella cernua, Lygodium flexuosum, Microlepia firma, M. hancei, Microsorum membranaceum, Odontosoria chinensis, Panisea uniflora, Paphiopedilum fairrieanum, Papilionanthe teres, Phaius mishmensis, P. tancarvilleae, Pholidotaarticulata, P. imbricata, Physalis minima, Platycerium wallichii, Polystichum luctuosum, Pothos chinensis, Pteris aspericaulis, P. subquinata, P. tricolor, P. vittata, Pyrrosia costata, P. flocculosa, Renanthera imschootiana, Rhyacostylis retusa, Rubus ellipticus, Saccolabiopsis pusilla, Sauravia napaulensis, Selaginella hookeri, Selliguea oxyloba, Solanum anguivi, Tectaria polymorpha,

Platycerium wallichii Hook. (Polypodiaceae)

Thunia alba, Torenia violacea, Usenia hirsuta, Vanda coerulea,Vernonia volkameriifolia, Wallichia densiflora, Xantolis hookeri and *Zanthoxylum armatum.*

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 03 species as new to science, 01 species as new to India, 01 species as new record for the state, ethnobotanical importance of 19 plants were noted down in the field. Following RET & EET species were collected for conservation purposes, *viz.Acompe ochracea, Adiantum capillus, Aerides multiflora, A. odorata, Agrostophyllum brevipes, A. callosum, Aleuritopteris bicolor Anoectochilus brevilabris, A. roxborghii, Aquilaria khasiana, Brachycorythis obcordata, Bulbophyllum careyanum, B. cauliflorum, B. gamblei, B. odoratissimum, B. scabratum, Calanthe biloba, Cephalantheropsis obcordata, Cepholostachyum mannii, Cleisomeria pilosulum, Coelogyne flaccida, C. prolifera, C. viscosa, Cycas pectinata, Dendrobium acinaciforme, D. aphyllum, D. anceps, D. chrysotoxum, D. crepidatum, D. delacourii, D. densiflorum, D.eriiflorum, D. falconeri, D. formosum, D. gibsonii, D. infundibulum, D. jenkensii, D. lituiflorum, D. longicornu, D. moschatum, D. nobile, D. ochreatum, D. parcum, D. porphyrochilum, D. pulchellum, D. stuposum, D. transparens, D. wardianum, Eria acervata, E. amica, E. biflora, E. coronaria, E. lasiopetala, E. muscicola, E. pannea, E. stricta, E. tomentosa, Esmeralda cathcarthii, Gastrochilus calceolaris, G. inconspicuous, Goodera procera, Habenaria aquifera, H. khasiana, Liparis cordifolia, L. odorata, Panisea uniflora, Paphiopedilum fairrieanum, Papilionanthe teres, Phaius mishmensis, P. tancarvilleae, Pholidota articulata, P. imbricata, Platycerium wallichii, Renanthera imschootiana, Rhyncostylis retusa, Saccolabiopsis pusilla, Thunia alba* and *Vanda coerulea*falling under the rare/ threatened category were collected and planted in the garden; besides, *Abelmoschus esculentus, Ardisia macrocarpa, Arisaema album, Asparagus racemosus, Bambusa nutans, Bambusa* sp., *Begonia hatacoa, B. palmata, Begonia* sp., *Calamus floribundus, Calophyllum polyanthum, Citrus reticulata, Clerodendrum infortunatum, Cyathea chinensis, Dichroa februfuga Dioscorea alata, Elaeagnus pyriformis, Elsholtzia blanda, Hoya longiferia, Musa ornata, Musa* sp. *Piper nigrum, Piper* sp., *Rubus ellipticus, Sauravia napaulensis, Solanum anguivi, Torenia violacea* and *Zanthoxylum armatum* of economic/ medicinal importance were collected and planted in the garden.

OTHER WORKS DONE

During this period, 660 visitors including Deputy Secretary of MOEF & CC, Director, ICAR-CITH, Srinagar, Forest officers, scientists, academicians and researchers were attended and guided.

INDUSTRIAL SECTION INDIAN MUSEUM, KOLKATA

PROJECT - 1

Collection of economic plant materials for enrichment and replacement of exhibits of the botanical gallery (New project)

Executing Official (s) : Dr. A.K. Sahoo
Date of Initiation : April, 2016
Date to be completion : March, 2017 (Ongoing)

BACKGROUND

This is an ongoing project taken up for collection of samples of plant materials as root,bark, stem, leaf, flower, fruit, seed etc., economically used as food, oilseeds, medicines, gums, resins, fibres, narcotics, beverages etc. The collection of the new plant materials from different phytogeographical regions of India is usually added as exhibits of replaces with the older or damaged one in the Botanical gallery. The database on nomenclature, distribution and vernacular names of plant species is updated.

SUMMERY OF THE WORK DONE DURING 2016-17

During this period, one tour *w.e.f.* 22.11.2016-02.12.2016 was undertaken to Koraput and Raygada districts of southern Odisha and 47 plants mainly grains and millets were procured. The materials were processed for incorporations of exhibits of the botanical gallery.

PROJECT - 2

Collection of oilcrops, pulses and medicinal plant materials for enrichment and replacement of exhibits of the botanical gallery (New project)

Executing Official (s) : Mrs. Geeta Choudhury, Mr. B.C. Dey& Mr. S.K. Sharma
Date of Initiation : April, 2016
Date to be completion : March, 2017 (Ongoing)

BACKGROUND

This is an ongoing project taken up for collection of samples of plant materials economically used as foods, oilseeds, medicines, gums, resins, fibers, narcotics, beverages etc. The collection of the new plant materials from different phyto-geographical regions of India is usually added as exhibits of replaces with the older or damaged one in the Botanical gallery. The database on nomenclature, distribution and vernacular names of plant species is updated.

SUMMERY OF THE WORK DONE DURING 2016-17

During this period, 01 tour *w.e.f.* 14.12.16-20.12.16 was undertaken to Behrampur region of West Bengal and 04 varieties of silk cocoon, 02 varieties of silk yarn, 20 varieties of pulses, 15 varieties of oilseeds and 06 types of

ISIM, BSI, Building at Kolkata

vegetable oil were collected. Pulses varieties were displayed at Botanical Galleries and remaining materials are under process.

PROJECT - 3

Listing and identification of Monocot herbarium specimens at BSIS

Executing Official(s) : Dr. M. Bhaumik, Mr. D.L. Shirodkar & Mrs. K. Pagag.
Date of Initiation : April, 2013
Date to be completion : March, 2016 (extended upto 2017)

BACKGROUND

Aiming at preparation of catalogue of monocot economic herbarium collections deposited at BSIS, this project was initiated in 2013. During previous year (2015-16), 1417 specimens of monocot herbarium were documented.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 297 nos. of herbarium specimens were documented along with all relevant data written on herbarium sheets and nomenclatural corrections were made.

PROJECT - 4

Interpretation of the Family : Zingiberaceae in Icones Roxburghianae (New project)

Executing Official (s) : Dr. M. Bhaumik
Date of Initiation : April, 2016
Date to be completion : March, 2017

BACKGROUND

There are 68 entries of the family Zingiberaceae which will be interpreted

SUMMARY OF THE WORK DONE DURING 2016-17

During this period,68 entries of Zingiberaceae members in Roxburgh Icon were listed, names were analysed with current nomenclatural publications. There validity, relevant synonyms were studied. Descriptions prepared for all valid entries. Final report submitted.

PROJECT - 5

Interpretation of the Family: Moraceae & Myrtaceae in Icones Roxburghianae

Executing Official (s) : Dr. A. K. Sahoo and Ms. Kangkan Pagag
Date of Initiation : April, 2015
Date to be completion : March, 2017

BACKGROUND OF THE PROJECT

There are 89 entries of the families which will be interpreted. During previous year (2015-16), 15 species of *Eugenia* (Myrtaceae) and 50 species of the family Moraceae in Roxburgh's Icon were interpreted.

SUMMARY OF THE WORK DONE DURING 2016-2017

In Myrtaceae: 07 names were analysed from relevant literature, description prepared; in Moraceae: 06 names were analysed and description prepared. Final editing of Manuscript is going on for submission.

PROJECT - 6

Interpretation of the Family: Convolvulaceae & Cucurbitaceae in Icone Roxburghianae

Executing Official (s) : Dr. B. K. Sinha &Sudeshna Datta
Date of Initiation : April, 2015
Date to be completion : March, 2017

BACKGROUND

There are 71 entries of the families which will be interpreted. During previous period, 76 species of the family Cucurbitaceae and 60 species of the family Convolvulaceae in Roxburgh's Icone were interpreted.

SUMMARY OF THE WORK DONE DURING 2016-2017

During2016-17, interpretation of 76 species of the family Cucurbitaceae and 60 species of Convolvulaceae were completed. All the names comes under Family Cucurbitaceae and Convolvulaceae are analysed, described and final report submitted.

PROJECT - 7

Listing and Identification of dicot herbarium specimens at BSIS(New project)

Executing Official (s) : Mrs. Geeta Chaudhury, Mr. Bishnu Charan Dey & Mr. S.K. Sharma
Date of Initiation : April, 2016
Date to be completion : March, 2019

BACKGROUND

Preparation of catalogue of dicot economic herbarium collections deposited at BSIS. This work aims at documentation of dicot herbarium collections from different parts of India and surrounding countries deposited at BSIS to prepare a database which helps to conserve all the important informations written on the labels at the time of collection. These herbarium collections are now being preserved and digitized which will help future Botanists for further works on Economic Botany.

SUMMARY OF THE WORK DONE DURING 2016-2017

During 2016-17, 1380 nos. of herbarium specimens were documented during 2016 - 2017 with all relevant data written on herbarium sheets and nomenclatural corrections were completed.

PROJECT - 8

Nomenclature Update of digitized herbarium Specimens(9171nos.) at BSIS (New project)

Executing Official (s): Dr Manas Bhaumik, Dr A.K. Sahoo, Mrs Geeta Chaudhury, Ms. Kangkan Pagag, Ms. Sudeshna Datta, Sri B.C. Dey & Sri S.K. Sharma
Date of Initiation : April, 2016
Date to be completion : March, 2018

BACKGROUND

ISIM, BSI herbarium (BSIS) holds 9171 digital herbarium images. To update the metadata of digitized herbarium specimens with valid botanical names, synonyms and basionyms, this project was proposed.

SUMMARY OF THE WORK DONE DURING 2016-2017

During this period, 2396 metadata were updated.

NORTHERN REGIONAL CENTRE, DEHRADUN

PROJECT - 1

Floristic Diversity and Phyto-sociological study of Col. Sher Jung National Park, (Simbalbara National Park), Himachal Pradesh

Executing Official(s): Dr. M. R. Debta & Dr. S. K. Srivastava
Date of Initiation: April, 2014
Date to be completion : March, 2017

BACKGROUND

This project was initiated in 2014. Till now a total of 275 taxa were described spreading over 221 genera under 77 families. During previous period, 157 field nos. were collected in 02 field tours of which 80 species were identified and 57 species were documented.

AREA AND LOCALITY

Col. Sher Jung National Park, Himachal Pradesh (Area: 28 sq.km)

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-2017

During 2016-17,01 field tour was undertaken during which 47 field numbers were collected, 107 species were identified and 179 taxa were described; Phytosociological attributes were also studied to ascertain diversity, dominance and frequency of distribution of tree species in the mixed deciduous forests. Studies on Shannon-Weaver diversity index, Simpson dominance index along with importance value Index (IVI) was carried out.

PROJECT - 2

Flora of Sonanadi Wildlife Sanctuary, Pauri District, Uttarakhand

Executing Official(s): Dr. R. Manikandan
Date of Initiation : April, 2014
Date to be completion: March, 2017

BACKGROUND

This project was initiated in 2014 to document and identify floristic diversity of the study area. During previous year (2015-16), 543 species collected from the

Begonia picta Sm. (Bigoniaceae)

study area were described and updated nomenclatural citations, ecology and distribution data along with standardization of author citation. Beside a total of 49 live plants were collected for introduction purpose.

AREA AND LOCALITY

301 sq. km, Pauri district, Uttarakhand

Trichodesma indicum (L.) Lehm. (Boraginaceae)

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 174 species were identified and 360 species (including previously collected species) were described along with updated nomenclatural citations, ecology and distribution data and standardized author citation. In this period, one (01) field tours was conducted to the study area. In addition, an *ex-situ* collection tour *w.e.f.* 25.04.2016 to 30.04.2016 to Sonanadi Wildlife Sanctuary was undertaken and collected 213 field nos. (c. 180 species); 13 live plants including RET species were collected along with more than 100 photos. Area covered/surveyed: 90 sq. km. Consulted BSD and studied about 320 specimens during the last tours collections.

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study identified 128 species along with description of 130 species and updated nomenclatural citations for 84 species.

Abutilon persicum (Burm.f.) Merr. (Malvaceae)

PROJECT - 3

Flora of Nandhour Wildlife Sanctuary, Uttarakhand

Executing Official (s) :Dr. Kumar Ambrish
Date of Initiation : April, 2014
Date to be completion : March, 2017

BACKGROUND

This project was initiated in 2014. During previous year (2015-16),03 floristic survey tours were conducted during which a sum of 554 field numbers (c. 1112 plant specimens) including 8 RET species of live plants were collected, examined and field data were recorded. All the collected RET species were introduced in the Experimental Garden of BSI, NRC, Dehradun. Identified over650 specimens (c. 430 species) and described c. 340 species during the reporting period.

AREA AND LOCALITY

It is the 7th newly declared Wildlife Sanctuary in

A view of Nandhour Wild Life Sanctuary

Uttarakhand in August, 2013, which recently attained the status of Tiger Reserve due to increasing numbers of Tigers. [Area: c. 269.95 sq. km]

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-2017

During this period, identification of c. 430 species was completed with the help of literature and consultation of herbarium at BSD & DD. Described c. 330 species of the family Ranunculaceae to Urticaceae. Final manuscript is under progress.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 03 new report for the state of Uttarakhand [*Natsiatum herpeticum* Buch.-Ham. ex Arn. (Icacinaceae), *Hemigraphis latebrosa* Nees (Acanthaceae) and *Asystasia gangetica* (L.) T. Anders. (Acanthaceae).

PROJECT - 4

Revision of Tree Ferns (*Cyathea, Cibotium* and *Brainea*) of India

Executing Official(s) : Dr. B.S. Kholia
Date of Initiation : April, 2014
Date to be completion: March, 2017

BACKGROUND

This project was initiated in 2014. During 2015-16, protologues and pictures of types sheets received from different sources were studied or examined, thousands of digital images of tree ferns received from various sources were observed and data of 91 sheets were collected for compilation of the report. Descriptions of remaining species completed towards the compilation of final report. The specimens received from BSI, MH and self collection from PBL, Andaman and Nicobar Islands were dissected and studied for scales and spores. Updated nomenclatural citations, distribution data and author citation of all the species.

AREA AND LOCALITY

Indian Territory

Tree fern, a major component in sub tropical forest of Arunachal Pradesh

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-2017

During 2016-17, all the received herbarium sheets, digital images of type sheets and other sheets received from different sources were meticulously studied. The remaining species (*Cyathea albosetacea, C. nicobarica, C.crinita, C. contaminans, C. henryi, Braniea insignis* etc.) were dissected and studied. Updated nomenclatural citations and distribution data along with standardization of author citation of Indian species of tree ferns.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study reports 02 new species *Cyathea gigantea* and *C. contaminans* from Andaman and Nicobar Islands. After detailed field and herbarium study, it is also found that so far endemic species, *Cyathea nicobarica* is merely and juvenile form of *C. albosetacea* and validly merged here. Thorough field survey, herbaria and literature report that *C. contaminans* is one of the rarest species of *Cyathea* in India and a detailed search on its earlier Indian distribution was also published.

PROJECT - 5

Revision of genus *Adiantum* L. (Adiantaceae) in India (New project)

Executing Official(s) : Dr. Brijesh Kumar
Date of Initiation : April, 2016
Date to be completion: March, 2020

BACKGROUND

Revisionary study of the genus *Adiantum* L. in India. It is a new project.

AREA AND LOCALITY

India

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-2017

During this period, c. 35 taxa belonging to the genus *Adiantum* were listed; 28 Protologues and 10 type images were procured from various herbaria; 06 species were dissected & described; 05 species were illustrated; distribution data of 06 taxa was compiled; 50 herbarium sheets belonging to the genus *Adiantum*, housed at BSD was reconfirmed/ identified and 30 references were collected.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 09 new records: [Andaman & Nicobar Islands-3 [*Thelypteris polycarpa* (Blume) K. Iwats., *T. minutum* Blume, *T. bipunctatum* Poir.; Mizoram-6 [*Dryopteris pulvinulifera* (Bedd.) O. Ktze, *Pyrrosia costata* (C. Presl ex Bedd.) Tagawa & Iwats, *P. porosa* (C. Presl) Hovenk., *Pteris scabrigens* Fraser-Jenk., S.C. Verma & T.G. Walker, *P. semipinnata* L., *Selliguea oxyloba* (Wall ex Kunze) Fraser-Jenk]; rediscovery: 01. *Trichomanes motleyi* (Bosch) Bosch form Andaman & Nicobar Islands after 130 years of its first report from India).

PROJECT - 6

Trees of Dehradun city and its Vicinity (New project)

Executing Official(s): Dr. S.K. Srivastava & Mr. Virendra Kumar Madhukar
Date of Initiation: April,2016
Date to be completion: March,2019

BACKGROUND

It is a new project.

AREA AND LOCALITY

Dehradun city, Uttarakhand

SUMMARY OF THE WORK DONE DURING 2016-17

During this period,listing of 300 tree species growing in and around Dehradun city has been completed. Identification, updated nomenclature, brief descriptiion, phenology and images of 90 species have been completed. Consulted the BSD & DD herbaria.

PROJECT - 7

Assessment and status report on Threatened plants of Western Himalaya (New project)

Executing Official(s):Dr. Prashant K. Pusalkar and Dr. S.K. Srivastava
Date of Initiation:April, 2016
Date to be completion:March,2017

BACKGROUND

It is estimated that over 1000 Himalayan species are of rare occurrence and fall into various threat categories. Many efforts have been made towards the assessment of threatened plants of the area, which resulted in inclusion of 136 Himalayan plants in Indian Red Data Book and subsequent conservation initiatives taken for some of the species. The rich plant diversity of the Himalayan region is under great stress of alteration and depletion, due to various threats like deforestation, habitat degradation, livestock pressure, invasive species, tourism, exotic plantations, medicinal plants and NTFP extraction, developmental activities etc. As the threats to the Himalayan ecosystems are now better understood, what is needed is to be sincerely estimated; this project was initiated towards more detailed study, research and conservation programs based on detailed inventories.

AREA AND LOCALITY OF THE ALLOTTED PROJECT

Western Himalaya, India

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 02 field tours *w.e.f.* 28.6.16-7.7.16 and 28.9.2016- 5.10.16 were conducted and collected a total of 522 field numbers alongwith 200 photographs among which 480 plant specimens were identified, 200 species were documented and 422 specimens were incorporated in the herbarium. Preparation of detailed inventory and IUCN Red List status report for all threatened and vulnerable Western Himalayan plant species was completed.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 01 new genus [*Schizotechium* (Fenzl.) Rchb. *emend.* Pusalkar & S.K. Srivast. (Caryophyllaceae)], 03 new records for India [*Veronica anagaloides* Guss. (Plantaginaceae), *Ranunculus hirtellus* var. *humilis* W.T. Wang (Ranunculaceae), *Gentianopsis paludosa* (Munro ex Hook.f.) Ma var. *alpina* T.N. Ho [Gentianaceae]; 01 new record for Western Himalaya; 12 new records for states;13 new locality reports for vulnerable/point endemic species;01 new name[*Stellaria popovii* Pusalkar (Caryophyllaceae)]; 11 new combinations;04 rediscovery and recollection; new locality report for point endemic species: Rohtang, Himachal point endemic [*Ranunculus bikramii* Aswal & Mehrotra (Ranuculaceae)] is reported from 10 new localities in Uttarakhand, Jammu & Kashmir and Himachal Pradesh. 85 threatened/ rare/ endemic species were collected; 35 new localities for endemic/ threatened species have been spotted; 20 new hot-spots for threatened/ endemic species have been reported, rank assessment and reinstatement of 06 species have been completed; new locality for 08 threatened/endemic species have been reported.

PROJECT - 8

Flora of Sechu Tuan Nala Wildlife Sanctuary, Chamba district, Himachal Pradesh (New project)

Executing Official(s) : Dr. Puneet Kumar
Date of Initiation : April, 2016
Date to be completion : March, 2020

BACKGROUND

The Sechu Tuan Nala Wildlife Sanctuary covers an area of 390.29 sq. km which comes under the Trans-Himalayan zone and forms a part of the outer Himalayas. It is a renowned high altitude Wildlife Reserve which is located in Pangi valley, a subdivision of Chamba district, Himachal Pradesh at an altitude of nearly 2550 to 6072 m a.s.l. Due to inaccessibility and difficult geographic conditions, this area had not been included in the earlier floristic surveys of Chamba district. Keeping in view the fact that no systematic taxonomic exploration has been carried out in this unexplored and geographical isolated area, the present study has been proposed.

AREA AND LOCALITY

Sechu Tuan Nala Wildlife Sanctuary, Chamba district, Himachal Pradesh

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-17

During the period, a field tour *w.e.f.* 23.08.2016-05.09.2016 undertake to Sechu Tuan Nala Wildlife Sanctuary during which 238 field nos. of c. 700 plant specimens including 4 RET species were collected of which 61 species were identified and 28 species described. Besides, listing of species from earlier literature for Pangi valley was also done. Consulted and studied (Rosaceae, Brassicaceae Ranunculaceae, Annonaceae, Magnoliaceae and Papaveraceae) from earlier collections from Pangi valley in BSD and studied 50 species (75 specimens) belonging to 48 families in PUN, Punjabi University.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports description of 26species are completed and final manuscript has submitted.

PROJECT - 9

Micropropagation of critically endangered *Catamixis baccharoides* (Asteraceae) and *Incarvillea emodi* (Bignoniaceae) (New project)

Executing Official(s): Dr. Giriraj Singh Panwar

Tissue culture technique of *Catamixis baccharoides*

Date of Initiation: April, 2016
Date of to be completion: March, 2018

BACKGROUND

The North-Western Himalaya is a rich reservoir of plant biodiversity and harboring immense medicinal plant wealth of the country. Owing to increasing anthropogenic pressure, loss of habitat, global warming and increase in the peoples rely on herbal medicines, plant species are gradually dwindling from the wild and many more are in threatened category. Keeping the track of the threatened species, tissue culture technology is being practiced in the tissue culture laboratory at BSI, NRC. The laboratory has so far standardized the protocol for many threatened species and successfully planted them in the field *viz. Eremostachys superba, Pittosporum eriocarpum* and *Lilium polyphyllum.*

AREA AND LOCALITY

Western Himalaya, India

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-2017

During 2016-17, collection of *Catamixis baccharoides* and *Incarvillea emodi* seeds from the wild and properly sterilized seeds was germinated *in vitro* in basal MS medium. Shoot tip from the in vitro germinated seedlings of *Catamixis baccharoides* were used as explants for the shoot induction and proliferation. The well developed shoots were shifted into the root induction medium and well developed roots were obtained.

ACHIEVEMENTS/OUTCOMES IN 2016-2017

Proper shooting has been achieved in *Catamixis baccharoides* and incipient roots were also developed in *in-vitro* regenerated shoots.

Project - 10

Flora of Uttarakhand, Vol. 5. [Estt sp.: c. 1256] (Except Orchidaceae, Poaceae)

Executing Official(s): Dr. P. K. Pusalkar, Dr. Kumar Ambrish, Dr. R. Manikandan, Dr. Manas Ranjan Debta, Dr. S.K. Srivastava, Mr. Durgesh Verma, Sh. Sachin Sharma
Date of Initiation : April, 2015
Date to be completion : March, 2017

AREA AND LOCALITY

Uttarakhand State

BACKGROUND

State Flora of Uttarakhand

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-17

Mr. Durgesh Verma & Dr. S.K. Srivastava: Documented 67 species: *Aletris* (1/1), *Allium* (1/19), *Aloe* (1/1), *Asparagus* (1/5), *Eucomis* (1/1), *Asphodelus* (1/1), *Cardiocrinum* (1/1); *Clintonia* (1/1); *Cordyline* (1/1), *Paris* (1/1), *Dipcadi* (1/2), *Disporum* (1/1), *Drimia* (1/1), *Fritillaria* (1/1), *Gagea* (1/3), *Gloriosa* (1/1), *Hemerocallis* (1/1), *Iphigenia (1/1), Lilium* (1/4), *Notholirion* (1/2), *Lloydia* (1/2), *Maianthemum* (1/1), *Nomocharis* (1/1), *Ophiopogon* (1/1), *Polygonatum* (1/6), *Sansevieria* (1/1), *Ledebouria* (1/1), *Streptopus* (1/1), *Theropogon* (1/1), *Trillium* (1/1), *Tulipa* (1/1), belong to the families Hydrocharitaceae to Iridaceae; Hypoxidaceae to Liliaceae.

Mr. Sachin Sharma and Dr. S.K. Srivastava: Described 44 species of the family Cyperaceae (c. 105 sp.): *Schoenoplectus* (8 sps.), *Scirpus* (4 spp), *Scleria* (5 spp.), *Pycreus* (10 spp.), *Kyllinga* (4 spp.), *Kyllingiella* (1 sp.), *Lipocarpha* (1 sp.), *Mariscus* (7 spp.), *Rikliella* (1 sp.), *Eleocharis* (3 spp).

Dr. Kumar Ambrish: Described 65 species under 15 genera and 4 families (Smilacaceae 1/12; Pontederiaceae 2/3; Commelinaceae 10/26; Juncaceae2/24): *Smilax* (1/12), *Eichornia* (1/1), *Monochoria* (1/2), *Commelina* (1/11), *Cyanotis* (1/4), *Floscopa* (1/1), *Murdannia* (1/4), *Rohoeo* (1/1), *Rhopalephora* (1/1), *Streptolirion* (1/1), *Tinantia* (1/1), *Tonningia*(1/1), *Zebrina* (1/1), *Juncus* (1/20), *Luzula* (1/4). Studied c. 240 specimens in BSD and DD herbarium and finalization of manuscript is under progress. New records for Uttarakhand: *Juncus khasiensis* Buch.-Ham., *J. effusus* L., (Juncaceae).

Dr. R. Manikandan: Described 27 species under the following families viz., a. Amaryllidaceae- 7 species under 6 genera:; b. Potamogetonaceae-8 species under one genus; Najadaceae - 3 species under one genus; d. Alismataceae - 6 species under 3 genera; e. Butomaceae-monotypic species and Juncaginaceae- 2 species under one genus. Herbarium Study: Consulted and studied about 72 specimens or the above said families in BSD and RKT.

Dr. M.R. Debta and Dr. S.K Srivastava: Consulted herbarium for taxa belonging to the genus *Carex, Courtoisiana, Cyperus, Diplacrum, Eleocharis, Eriophorum* also consulted relevant literature. Apart from that described 54 species belonging to the family Cyperaceae.

Project - 11

Flora of Uttarakhand, Vol. 5. [Orchidaceae, Poaceae] from other centre

Executing Official(s): **Dr. Jeewan Singh Jalal,** BSI, WRC, Pune: Described 244 species under 70 genera belong to the family Orchidaceae has been completed and submitted the manuscript.

Dr. Manish Khandwal, BSI, Itanagar: The manuscript of the family Poaceae for Flora of Uttarakhand has been completed.

PHARMACOGNOSY UNIT, HQRS, KOLKATA

PROJECT - 1

Pharmacognostic studies on Indian Cycads (New project)

Executing Official(s) : Dr. A.B.D. Selvam
Date of Initiation : April, 2016
Date to be completion : March, 2021

BACKGROUND

This project was taken up to study members of Indian Cycads exhaustively on Pharmacognostic aspects. The genus *Cycas* has been included in the negative list of exports, and also in the Appendix I & II of CITES, which bans trade/export from wild collections.

AREA AND LOCALITY

Western Ghats, Eastern Ghats, North eastern parts of India and Andaman & Nicobar Islands

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, a field tour *w.e.f.* 04.06.16 to 13.06.16 was undertaken to different parts of Andhra Pradesh and collected 09 field numbers belonging to 03 species of *Cycas* (leaves, male and female cones). Besides, pharmacognostic studies on 03 species of *Cycas, viz., Cycas beddomei* Dyer, *C. circinalis* L. and *C. revoluta* Thunb., were completed on 04 different parameters on the leaves and pollen grains using Light & SEM microscopes. 15 photo plates of habit, leaf anatomy, Leaf surface features and Pollen morphology (under Light & SEM microscopes) were prepared. During this period, 39 crude drug samples were authenticated by pharmacognostical study of which14 samples pertaining to CITES and negative listed plants,which were received from Government departments, various Research Institutions and individuals. During this period, 09 field nos. were collected of which 03 plant specimens were identified and documented.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 03 *Cycas* species, collected, as endangered plant.

OTHER WORKS DONE

He has evaluated a Ph.D. thesis entitled "Assessment of Phytochemical Profile and Bioactive Potential of *Maerua apetala* (Roth) Jacobs (Capparaceae)" received from Manonmaniam Sundaranar University, Tirunelveli (Tamil Nadu). As per direction of D/BSI, he has provided a detailed information regarding NDF (Non-Detrimental Findings) study on Red Sanders (Red Sandal wood).

PLANT CHEMISTRY UNIT, HQRS, KOLKATA

PROJECT - 1

Chemical Composition and Nutritive Value of Wild Edible Plants of North-East Region in India (bioperspective assessment of phytodiversity)

Executing Official(s): Dr. Tapan Seal
Date of Initiation: April, 2008
Date to be completion : March, 2017

SUMMARY OF WORK DONE DURING 2016-17

During this period, 01 field tour *w.e.f.* 12.03.2017-17.03.2017 was conducted during which 14 No. of wild edible plants *viz. Heracleum nepalense* (Seeds)., *Perilla frutescens* (Seeds), *Guizotia abyssinica* (Seeds), *Laportea terminalis* (Leaves), *Nasturtium officinale* (Leaves), *Calamus erectus* (Fruits), *Oroxylum indicum* (Fruits), *Bauhinia variegata* (Flowers), *Cyphomandra betacea* (Fruits.), *Smilax zeylanica* (Stem), *Diplazium* sp. (Stem), *D. esculentum* (Leaves.), *Apium graveolens* (Leaves) and *Eleagnus latifolia* (Fruits)were collected. The proximate composition(ash, moisture, fat, fibre, protein, carbohydrate and energy content), mineral contents(Na, K, Ca, Mn, Mg, Fe, Zn and Cu), antioxidant properties(The total phenolic content, DPPH radical scavenging activities and ABTS assay, total flavonol content and flavonoid content) of (18) eighteen plants were carried outwith four different solvent extracts. Quantitative estimation of rutin, quercetin, kaempferol, apigenin, myricetin, gallic acid, catechin, ferulic acid, coumarin, naringin, p-hydroxybenzoic acid, protocatechuic acid, gentisic acid, vanillic acid, aesculin, caffeic acid, syringic acid, p-Coumaric acid, naringenin, salicylic acid, ellagic acid luteolin, and sinapic acid content in (4) four wild edible plants have been carried out using HPLC. Estimation of water soluble vitamin (Vit. C, Vit. B1, Vit. B2, Vit. B3, Vit. B5, Vit. B6 and Vit. B9)in (20) twenty plant sample has been carried out.

OTHER WORKS DONE

The incumbent official has guided Sagari Roy Chowdhuri BSI, CBL; Sudeshna Dutta BSI, ISIM and Anindita Banerjee, JRF, Dept of Physiology, Sreerampore College, University of Calcutta to conduct phytochemical studies of medicinal plants.

PUBLICATION SECTION, HQRS, KOLKATA

PROJECT - 1:

Interpretations of Roxburgh Icones in respect to current nomenclature: Family: Leguminosae

ExecutingOfficial (s) : Dr. Debasmita Dutta Pramanick and Dr. S.S. Dash
Date of Initiation : April, 2015
Date to be completion : March, 2018

OBJECTIVE

The objective of the project is to correct interpretation of the illustrations of Leguminous taxa entries in Roxburgh's Icon(c. 230)

BACKGROUND

'Icone Roxburghianae' is a collection of plates prepared under the supervision of William Roxburgh and accompanied by text from 'Flora Indica'. Out of 2533 plates illustrated in Roxburgh's Icons, the family Leguminosae is represented by about 230 species. Many of these Indian legume species mentioned in 'Icone Roxburghianae' require further interpretation in view of the correct nomenclatural changes (as per current ICN), as a good no. of species have either been merged or taxonomically changed. The present project on interpretation of Roxburgh's Icon in respect of family Leguminosae is dealing with correct interpretation of legume species illustrated in Roxburgh's Icon in conformity with present political boundary of India.

SUMMARY OF THE WORK DONE DURING 2016-17 AND ACHIEVEMENTS

During 2016-17, taxonomic interpretation and nomenclature of 120 taxa belonging to 15 genera, *viz. Arachis* L., *Butea* Roxb. ex Willd., *Caesalpinia* L., *Cassia* L., *Cicer* L., *Clitoria* L., *Crotalaria* L., *Dolbergia* L.f., *Dolichos* L., *Erythrina* L., *Flemingia* Roxb. ex W.T. Aiton, *Glycine* Willd., *Hardwickia* Roxb., *Leucocephala* Roxb., *Odina* Roxb., were completed. Illustrations kept in CAL were examined along with study of protologues and other authentic literatures to ascertain taxonomic identity of the taxa.

Cassia roxburghii DC. (Fabaceae)

Phanera semibifida (Roxb.) Benth. (Fabaceae)

SIKKIM HIMALAYAN REGIONAL CENTRE, GANGTOK

PROJECT - 1

Red listing of Orchids of Eastern Himalaya (Entire Sikkim, Darjeeling district of West Bengal and Arunachal Pradesh (excl. Changlang and Tirap) as per IUCN criteria

Executing Official(s) : Dr. D.K. Agarwala
Date of Initiation : April,2013
Date to be completion : March,2018

BACKGROUND

This project was initiated in 2013. During previous year, available literature pertaining to study area were consulted and 766 orchid taxa was listed along with the data on distribution and associated threats (if any). 12 field tours were conducted at different areas of Sikkim, Darjeeling district of West Bengal and Arunachal Pradesh; surveyed more than 1400 sq. km area; confirmed the presence and analysed population of over 300 taxa; collected 423 samples and introduced live specimens of over 400 samples in the campus garden for further studies and *ex-situ* conservation. Taxonomy and nomenclature of many orchid taxa were solved with the better understanding of characters studied from live specimens.

AREA AND LOCALITY

Eastern Himalaya (entire Sikkim, Darjeeling district of West Bengal and Arunachal Pradesh excluding Changlang and Tirap)

SUMMARY / PROGRESS OF THE WORK DONE IN 2016-2017

During this period, 03 field tours conducted in Sikkim and West Bengal; collected 39 field numbers (including the rescued ones) along with 30 photographs; 134 taxa from study of 215 specimens were identified. Population of all 70 taxa has been analysed during the tours. Germplasm of 42 taxa of orchids and medicinal plants has been introduced in the campus garden for further studies and ex-situ conservation. 34 taxa were characterized through digital, macro-microscopic photo-plates. 600 specimens of BSHC were studied in respect of their identity, label data, assigning geo-coordinates and entry into excel sheet for plotting of map. In this way, several unidentified and wrongly identified specimens at BSHC could be determined with correct identity. Label data entered in 100 specimens collected by self during different field tours in the study area. Orchids from fallen tree logs in and around Gangtok were rescued and introduced in the campus garden. 3000 photographs of herbarium specimens collected from OHT, ASSAM and CAL were sorted according to their name and identity checked. Geo-coordinates are to be determined for all specimens for plotting the map and calculating Extent of Occurrence (EOO) and Area of Occupancy (AOO). Technical expertise for IUCN red listing provided to Botany Department, Sikkim University and other Institutes/ Organizations.

Bulbophyllum paramjitii Agrawala, M.U. Sharief & B.K. Singh (Orchidaceae)

ACHIEVEMENTS/ OUTCOMES IN 2016-2017

This study reports 01 species (*Bulbophyllum paramjitii* Agrawala & al.) as new to science; 01 species as new to India (*Tropidia namasiae* C.K. Liao & al.); threat status evaluated for 03 taxa (*Neottianthe cucullata* var. *cucullata* (L.) Schltr. 'Endangered' [EN B2ab(iii)], *Neottianthe cucullata* var. *calcicola* (W.W. Sm.) Soo 'Endangered' [EN B2ab(iii)], *N. secundiflora* (Kraenzl.) Schltr. 'Endangered' [EN B2ab(iii)] and conservation initiatives taken.

PROJECT - 2

Flora of Sacred Groves of East Sikkim, Sikkim, India (New project)

Executing Official (s) : Dr. Sankararao Mudadla
Date of Initiation : April,2016
Date to be completion: March, 2017 (extended up to October 2017)

OBJECTIVES

The objectives of the project are to study the phyto-diversity and species composition of the sacred groves; to document the socio- religious events/ beliefs and their importance; to explore threatened species and to promote *in-situ* conservation there in.

BACKGROUND

This project was proposed for assessing the sacred groves of Rumtek Monastery and Gadi Central Pandam of East Sikkim for the purpose of conservation.

AREA AND LOCALITY

Rumtek Monastery and Gadi Central Pandam of East Sikkim

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, 08 field tours were undertaken to study areas during which 1115 field no. were collected and identified, 02 specimens incorporated in the herbarium. Ethnobotanical data of the following taxa were noted down, *viz. Arisaema* sp., *Ceologyne corymbosa, Mussaenda* sp., *Eria* sp., *Macaranga pustulata, Persicaria* sp., *Acmeli* sp., *Houtyunia* sp., *Ageratum conyzoides*. Besides 05 tours were undertaken to Gadi central and ethno-botanical data noted on the following plantsas :*Urena lobata, Desmodimsp., Oxyspora* sp., *Fimbristylis* sp., *Carex* sp., *Strobilanthus* sp., *Galium acutum, Daphne bholua,Peperomia* sp. , *Persicariahydropiper, Osbeckia stellata, Rubus paniculatus, Didymocarpus* sp., *Hedychium* sp. and *Glochidion* sp.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study reports *Cylindropuntia fulgida* var. *mamillata* Backeb. as new to India. In addition, two (02) heritage tree species, *viz. Ficus bengholensis* L.,eight (8) measuring 10 m to 60 m in girth, age about 150 years to 500 years and covers up to 1 acre land were recorded from three districts; *Adansonia digitata* L.,seven (7) measuring 10 m to 40 m in girth, age about 100 years to 200 years recorded from three districts.

PROJECT - 3

Digitization of BSHC Herbarium (New project)

Executing Official(s) : Dr. Sankararao Mudadla
Date of Initiation : April,2016
Date to be completion :March,2017

OBJECTIVE

The objective of the project is to supervise digitization of BSHC Herbarium

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 5653 sheets of the following families *viz.*, Menispermaceae, Berberidaceae, Papaveraceae, Fumariaceae, Brassicaceae, Caryophyllaceae, Hypericaceae, Malvaceae, Bombaceae, Balsaminaceae, Rutaceae, Icacinaceae, Vitaceae, Aceraceae, Sabiaceae, Anacardiaceae and Papilionaceae were digitized.

Gadi Sunakhari sacred grove entry path, East Sikkim

PROJECT - 4

Flora of Sikkim: Family- Onagraceae

ExecutingOfficial(s) :Dr. David Lalsama Biate and Dr. D.K. Agrawala
Date of Initiation : October, 2015
Date to be completion :March, 2017

SUMMARY/PROGRESS OF WORK DONE IN 2016-17

During this period, 03 local field tours to Kabi, Tamje, Karponang, Memaichu, Yakla and surrounding areas of Sikkim were undertaken during which a total of 19 field numbers of specimens of Onagraceae were collected, 17 taxa identified from 58 specimens, documented 32 species belonging to 04 genera, 06 taxa of Onagraceae were brought live to BSI, SHRC and introduced in the campus garden for *ex-situ* conservation. Besiode a comprehensive checklist of Onagraceae of Sikkim was prepared. 32/58 flowering calendar of Onagraceae of Sikkim was also prepared after comprehensive literature survey and verification of herbarium specimens. More than 400 digital images of herbarium specimens of Onagraceae present at CAL, ARUN and ASSAM were obtained for studies. Herbarium specimens of Onagraceae present at BSHC and CAL were studied and described. Flowers from dried herbarium sheets and live plants were worked out and photographs captured digitally. Preparation of final manuscript is under process.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study reports 10 species as new record for Sikkim and 01 record for Asia; *Epilobium angustifolium* and *E. conspersum* are treated under *Chamerion*, a subgenus of *Epilobium* in Flora of China.

SOUTHERN REGIONAL CENTRE, COIMBATORE

PROJECT - 1

Seaweed Flora of Karnataka coast

Executing Official(s) : Dr. M. Palanisamy and Dr. S.K. Yadav
Date to be completion : April, 2014
Date to be completion : March, 2017

OBJECTIVES

The objectives of the project are Survey and collection of all the seaweeds in different seasons, herbarium preparation and documentation of the seaweed resources of the coast. Study of the endemic, medicinally and economically important seaweeds. Liquid preservation of economically important seaweeds and seagrasses in BSI, SRC museum, Coimbatore. Study of associated and epiphytic seaweeds and seagrasses of the coast.

BACKGROUND

A perusal of literature pertaining to Karnataka coast revealed that the study on the algal flora, particularly marine macro algae (seaweeds) is very sporadic. This project was initiated in 2014 to survey and document seaweed diversity of Karnataka. During previous year (2015-16), a total of 684 field nos. of seaweed were collected of which 614 were identified.

AREA AND LOCALITY

c. 320 km long coastline, Karnataka

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 02 field tours *w.e.f.* 23.8.2016 to 03.09.2016 and 22.11.2016 to 03.12.2016 were undertaken to Karnataka coastal regions during which a total of 684 (289 + 395) field nos. were vouched and 188 field nos. of live specimens were preserved in wet form. During the field tours, GPS coordinates and nature of the coasts were recorded. 480 Number of photographs taken during two tours. Of the collected field nos., 665 field nos.

A view of Karnataka Coast

Acrosiphonia orientalis (J. Agardha) P.C. Silva (Ulotrichaceae)

of seaweeds have been identified. Description for all the identified taxa has been completead. 446 herbarium sheets were incorporated into the cryptogamic section of MH. Further, 188 field numbers of live specimens were preserved in wet form for lab studies. In the post monsoon season, seaweeds like *Enteromorpha compressa* (L.) Nees, *E. flexuosa* (Wulfen) J. Agardh, *E. prolifera* (O.F.Muell.) J. Agardh, *Ulva fasciata* Delile, *Chaetomorpha antennina* (Bory) Kuetz., *C. Linum* (O.F. Muell.) Kuetz., *Cladophoravagabunda*(L.) C. Hoek, *Porphyra* spp., *Gelidium micropterum* Kuetz., *G. pusillum* (Stackh.) Le Jolis, *Gracilaria corticata* J. Agardh, *Grateloupia lithophila* Boergesen, *G. filicina* (Lamouroux) C. Agardh, *Hypneaesperi* Bory, *H. Musciformis* (Wulfen) J.V. Lamour., *Centroceras* spp., *Centroceras clavulatum* (C. Agardh) Mont. and *Caloglossa leprieurii* (Mont.) G. Martens were dominantly available in several coastal localities *i.e.* Peribail, Someshwar, Mangalore port, Surathkal, Uchila, Kaup beach, Malpe, St. Mary's Island, Gangilli, Kunjakode, Maravanthe, Gorte, Mundoli, Talgodi, Madiyengri, Honnavar, Vannali, Om beach, Tadri, Serikuli, Belekeri, Karwar and Majali coasts. Similarly,

Padina pavonica (L.) Thivy (Dictyotaceae)

some species of seaweeds like *Enteromorpha intestinalis* (L.) Nees, *E. linza*(L.) J. Agardh, *Chaetomorpha spiralis* Okamura, *Caulerpataxifolia* (Vahl) C. Agardh, *Padina tetrastromatica* Hauck, *Gracilaria folifera* (Forssk.) Boergesen, *Grateloupia indica* Boergesen, *Chondracanthus acicularis* (Roth) Fredericq etc. were scantly distributed. 117 taxa of seaweeds and 02 sea-grass have been enumerated from Karnataka coast.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 04 new records for Kerala coast.

PROJECT - 2

Pollen and Seed Morphology of genus *Andrographis* Wall. ex Nees using SEM

Executing Official(s): Dr. Gnanasekaran
Date to be completion : April, 2012
Date to be completion: March, 2017

OBJECTIVE

The objective of the project is to study seed morphology of 03 species of pollen and 04 species of genus *Andrographis* Wall. ex Nees

SUMMARY/PROGRESS OF WORK DONE

Works completed and mss. submitted.

PROJECT - 3

Seed Morphology of *Ficus* L. using SEM

Executing Official(s) : Dr. J.V. Sudhakar
Date of Initiation : April, 2012
Date to be completion: March, 2017

BACKGROUND

This project was proposed in 2012 to study the micro morphological characters such as achenes along with morphological characters to delimit the genus *Ficus*. Seed morphology of 55 taxa has already been completed till now and results are being analysed. The taxa belong to subgenera *Urostigma*, *Pharmacosycea* and *Synoecia* show similar ornamentations and similarly the taxa belong to *Sycomorus*, *Sycidium* and *Ficus* shows identical ornamentation patterns. The species like *F. carica*, *F. exasperata*, *F. hispida*, *F. racemosa*, *F. squamosa* and *F. variegata* show constant features of seed morphology which can help in the delimitation of these species. These findings were reported for the first time on the genus *Ficus*.

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-17

During this period, 30 *Ficus* samples were collected for SEM study; 60 field nos. of *Ficus* species were collected from Andaman Islands, 20 species will be studied with SEM and 60 SEM images were taken. 60 SEM images were taken from the following 20 taxa *viz.*, *Ficus andamanica* Corner, *F. clavata* Wall. ex Miq., *F. hookeriana* Corner, *F. fistulosa* Reinwdt. ex Blume, *F. superba* (Miq.) Miq., *F.*

foveolata Wall. ex Miq., *F. laevis* Blume, *F. obscura* Blume, *F. dalhousiae* (Miq.) Miq., *F. beddomei* King, *F. hirta* Vahl, *F. prostrata* (Wall. ex Miq.) Miq., *F. punctata* Thunb, *F. fulva* Reinw. ex Blume, *F. ischnopoda* Miq., *F. nervosa* B. Heyne ex Roth subsp. *pubinervis* (Blume) C.C. Berg, *F. ampelas* Burm.f., *F. pubigera* (Wall. ex Miq.) Miq., *F. recurva* Blume, *F. gasparriniana* Miq. Beside conducted Herbarium consultation cum field tour to BSI, ANRC, Port Blair and Andaman Islands from 11.3.2016 and 30.3.2016. Collected achenes for SEM studies and leaf samples for DNA studies separately for all the field nos. During 2016-17, 130 accessioned herbarium specimens of PBL have been determined and 35 unidentified accessiones have been identified.

ACHIEVEMENTS/OUTCOME IN 2016-17

The present study reports *Ficus globosa* Blume as a new record to India and *Ficus talbotii* King as a new record to Andaman and Nicobar Islands.

PROJECT - 4

Study of Caryopsis in *Eragrostis*, *Sporobolus* and *Tripogon* genera of Poaceae using SEM

Executing Official(s) : Dr. K.A.A. Kabeer
Date of Initiation : April, 2012
Date to be completion: March, 2017

OBJECTIVE

The objective of the project is SEM studies on the caryopsis of 15 sp. of *Tripogon*

BACKGROUND

This project was initiated in 2012. During previous year (2015-16), SEM study of caryopsis of 16 species of *Sporobolus* of the family Poaceae was completed.

ACHIEVEMENTS/OUTCOMES IN 2016-17

During this period, SEM studies of 10 species of Genus *Tripogon* were completed.

PROJECT - 5

Study of Pollinia of south Indian Orchids using SEM

Executing Official(s) : Dr. G.V.S. Murthy
Date of Initiation : April, 2012
Date to be completion: March, 2017

OBJECTIVE

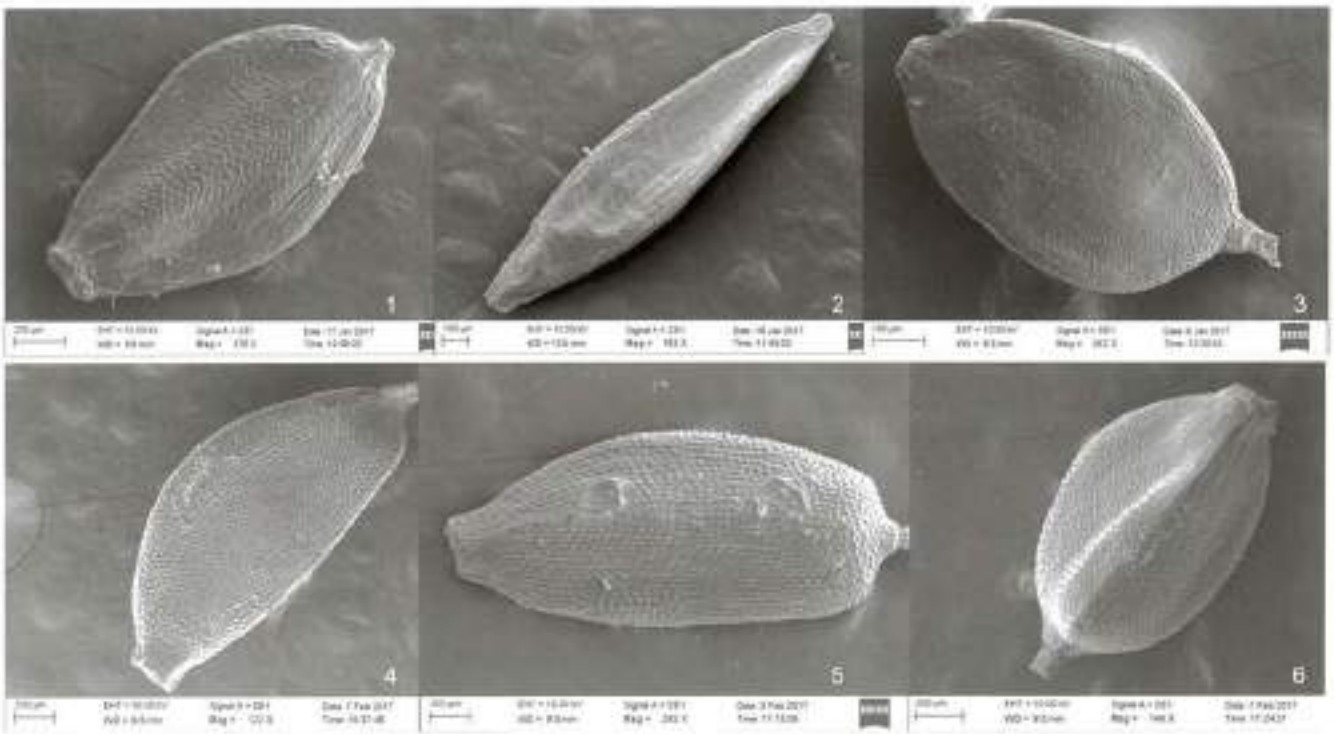
The objective of the project is Study of pollinia of 25 species of Indian Orchids

BACKGROUND

This project was initiated in 2012. During previous period(2015-16), pollinia of 61 species were studied using SEM and 122 images of pollinia were taken.

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-17

During this period, pollinia of 58 orchid species were studied under SEM.



SEM images of nutlets :1. *Kyllinga monocephala* Rottb., 2. *Cyperus corymbosus* Rottb., 3. *Cyperus exaltatus* Retz., 4. *Mariscus bulbosus* Clarke, 5. *Cyperus polystachyos* Rottb. and 6. *Cyperus javanicus* Houtt.

PROJECT - 6

Flora of Kodaikanal Wildlife Sanctuary, Tamil Nadu

Executing Official (s) : Dr. K. Althaf Ahamed Kabeer and Mr. A. Ravi Kiran
Date of Initiation : April, 2015
Date to be completion : Match, 2020

OBJECTIVE

The objective of the project is to prepare a detailed flora of the newly declared Kodaikanal Wildlife Sanctuary and to prepare the vegetation type map of the Wildlife Sanctuary for monitoring and conservation purpose.

BACKGROUND OF THE PROJECT

This pioneer project was started in 2015 to assess floristic diversity of Kodaikanal Wildlife Sanctuary. During previous year (2015-16), total 692 field nos., were collected along with 1100 photographs. A checklist of RET species that are found in KWLS was prepared.

AREA AND LOCALITY OF THE ALLOTTED PROJECT

SUMMARY/ PROGRESS OF THE WORK DONE IN 2016-17

During this period, a field tour *w.e.f.* 06.02.2017 to 11.02.2017 was conducted to NRSC-ISRO, Hyderabad for satellite image study and for preparing vegetation map of KWLS. A total of 02 field tours (25 days) to Kodaikanal WLS were undertaken this year. During these 02 exploration trips, a total of 231 field numbers were collected and total of 810 photographs of plants and habitat vegetation were also taken up. During this period, a total of 466 collected field nos. were identified (including previously collected specimens). Collected many endemic and rare species pertaining to this sanctuary. Nomenclature citations and writing of descriptions were initiated. Live specimens of Orchids, Carallumas and Zingibers were collected and sent to NOEG, Yercaud germplasm centre for conservation purpose and further studies. In addition, one herbarium consultation tour *w.e.f.* 31.10.2016 to 05.11.2016 has been taken up to Rapinat Herbarium, Tiruchirapalli for studying the old collections and type specimens of Prof. Matthew, deposited there. Poisoning and repoisoning work, segregation of duplicate specimens, mounting and stitching work of collected samples of two tours are completed. A checklist of RET species that are found in and around KWLS has been made.

ACHIEVEMENTS/OUTCOMES IN 2016-17

Following endemic species were collected during field tours*viz.*,*Impatiens campanulata* Wight, *I. viscida* Wight, *Pittosporum neelgherrense* Wight & Arn., *Actinodaphne bourneae* Gamble, *Phyllanthus chandrabosei* Govaerts & Radcl.-Sm., *Aeschynanthus perrottetii* A. DC., *Casearia thwaitesii* Briq.,*Crotalaria walkeri* Arn., *Leptodesmia congesta* (Wight) Benth. ex Baker, *Anaphalis travancorica* W. W. Sm., *Andrographis affinis* Nees and *Ceropegia thwaitesii* Hook. were collected.

Blooming of *Strobilanthes kunthiana* T. Anderson ex Benth. (Acanthaceae) at Kodaikanal Wildlife Sanctuary, Tamil Nadu

PROJECT - 7

Cyperaceae of Tamil Nadu

Executing Official(s): Dr. G.V.S. Murthy (Superannuated on 31.12.2016) and Mr. Yarraya, K. (Resigned in May 2016), Dr. C. Murugan, Dr. J. V. Sudhakar & Dr. S. Armugam
Date of Initiation : April, 2015
Date to be completion : March, 2020

OBJECTIVE

To finalise the family Cyperaceae of Tamil Nadu

SUMMARY / PROGRESS OF THE WORK DONE IN 2016-17

During this period, 04 field tours were conducted of which 01 local tour was undertaken to Valparai and Attakatti area and vouched 23 field numbers of Cyperaceae; 03 field tours *w.e.f.* 03.08.2016 to 12.8.2016, 23.9.2016 to 5.10.2016, and 12.12.2016 to 21.12.2016 were conducted to Meghamalai WLS respectively whereas one tour was conducted to Mukurthi National Park *w.e.f.* 01.02.2017 to 06.02.2017 and another tour to Namakkal and Salem districts *w.e.f.* 06.03.2017 to 11.03.2017. Collectively 129 Field numbers were vouched.

PROJECT - 8

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

Executing Official(s) : Dr. S. Kaliamoorthy and Dr. T.S. Saravanan
Date of Initiation : On going

OBJECTIVES

The objective of the project is *ex-situ* conservation of endemic, endangered and threatened plants of the region along with recording of the phenology of flowering/ fruiting of species in garden.

Coelogyne odoratissima Lindl. (Orchidaceae)

BACKGROUND

Silent valley, twelve kilometre from north to south and seven kilometre from east to west, is located between 11°03' to 11°13' N (latitude) and 76°21' to 76°35' E (longitude), is rectangular in shape. It is separated from the eastern and northern high altitude plateaus of the Nilgiris mountains by high continuous ridges including Sispara peak (2,206 m) at the north end of the park. The park gradually slopes southward down to the Palakkad plains and to the west it is bounded by irregular ridges. The altitude varies from 658 m to 2328 m at Anginda Peak, but most of the peaks lies within the altitude range of 880 m to 1200 m. Soils are blackish and slightly acidic in evergreen forests where there is good accumulation of organic matter. The underlying rock in the area is granite with schists and gneiss, which give rise to the loamy laterite soils on slopes. The valley areas of the park are having several threatened and endemic species. The flora of the valley include about a 1000 species of flowering plants, 108 species of orchids, 100 ferns and fern allies, 200 liverworts, 75 lichens and about 200 algae. A majority of these plants are endemic to the Western Ghats. Families best represented are the orchids with 108 species including the rare, endemic and highly endangered orchids *Ipsea malabarica*, *Bulbophyllum silentvalliensis* and Eria tiagii, Grasses (56 species), Legumes (55 species), Rubiaceae (49 species) and Asters (45 species). There are many rare, endemic and economically valuable species, such as cardamom *Ellettaria cardamomum*, black pepper *Piper nigrum*, yams *Dioscorea* spp., beans Phaseolus sp., a pest-resistant strain of rice *Oryza Pittambi*, and 110 plant species of importance in Ayurvedic medicine. Seven new plant species have been recorded from Silent valley, Impatiens sivarajanii, a new species of Balsaminaceae.

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016-17

During this period, 02 field tours to Silent Valley National Park, Kerala were conducted and total54 species belonging to 32 genera under the family Orchidaceae were collected and recorded GPS data. In addition, 09 local tours were conducted during period of report. The collected Orchid species were introduced into NOEG, Yercaud for *ex-situ* conservation. The following is the list of orchid species collected from Silent Valley National Park, Kerala. In addition, flowering phenology data was recorded for 223 (Orchids – 119; other Angiosperms - 104) and fruiting phenology data was recorded for 40 species (Orchids – 36; other Angiosperms - 04).

PROJECT - 9

Flora of Kanyakumari Wildlife Sanctuary, Tamil Nadu (New project)

Executing Official(s): Dr. J.H. Franklin Benjamin and Mr. R.G. Vadhyar
Date of Initiation: April,2016
Date to be completion: March,2021

OBJECTIVE

The objective of the project is to prepare a detailed Flora of the Kanyakumari Wildlife Sanctuary and submission of a complete report on Kanyakumari WLS in a flora format.

BACKGROUND

Kanniyakumari Wildlife Sanctuary with adjacent areas of Kalakkad Mundanthurai Tiger Reserve and Neyyar

Carallluma umbellata Haw. (Apocynaceae : Asclepiadaceae)

Wildlife Sanctuary of the state of Kerala constitutes the Southern most tip of Western Ghats. Lawrence, C.A. (1960) explored the vegetation of Kanyakumari district, Cape Comorin. Nayar, M.P. (1959) studied the vegetation of Kanyakumari District. B.D. Sharma & al. (1973) explored vascular flora of Mahendragiri hill and the surrounding regions, Kanyakumari and Tirunelveli districts. Henry, A.N. and M.S. Swaminathan (1981) published observations on the vegetation of Kanniyakumari district. Sacred groves in Kanyakumari are also floristically well documented by Sukumaran (2007). Wet land flora of Kanyakumari district is covered by Sukumaran & Jeeva (2011 & 2012). Recently Vascular Plant Diversity in the Tribal Homegardens of Kanyakumari Wildlife Sanctuary is published by Mary Suba & al. (2014) and they recorded 368 species based on economic importance. From literature it is seen that the flora of Kanniyakumari Wildlife Sanctuary has not been

Hypericum mysurense Heyne ex Wight Arn. (Hypericaceae)

studied in detail. This project was initiated in 2016 for detail study of floristic diversity of the WLS.

AREA AND LOCALITY

Kanniyakumari Wildlife Sanctuary, Kerala

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016-17

During this period, 02 field tours were conducted in different seasons for plant collection as well as observations on the habit, habitat and phenological events of the species. Of the five ranges of the sanctuary, two ranges have been explored in the field tours comprising 22 days. 450 number of photographs taken during the tour and all the photographs were identified. During these two exploration trips, a total of 362 field numbers were collected in quadruplicate of which 95 field numbers were identified. Out of 362 field numbers, label writing for 400 sheets were completed. Nomenclature citations for 40 species have been started. A checklist of RET species that are found in and around Kanniyakumari WLS was prepared. Label writing and study of the specimens is in progress, the specimens will be incorporated after the completion of the study.

Eulophia epidendraea (J.Koenig ex Retz.) C.E.C.Fisch. (Orchidaceae)

ACHIEVEMENTS/ OUTCOMES IN 2016-17

Ethnobotanical data of the following species, *Trichopus zeylanicus* Gaertn. ssp. *travancoricus* (Bedd.) Burkill ex Narayanan, *Ceropegia spiralis* Wight, *Cycascircinalis* L., *Semecarpus anacardium* L.f., *Caesalpinia bonduc* (L.) Roxb., *c. mimosoides* Lam., *Arenga wightii* Griff., were collected from local people especially the Kani tribe residing there. Rare, endangered and economic important plants collected and details of conservation initiations taken for *Trichopus zeylanicus* Gaertn. ssp. *travancoricus* (Bedd.) Burkill ex Narayanan (Trichopodaceae), *Ceropegia spiralis* Wight, an IUCN red-listed Vulnerable plant, endemic to Peninsular India. Beside *Tabernaemontana alternifolia* L. (Apocynaceae), an endemic to southern western ghats has been collected, *Actinodaphne salicina* Meisner, an endangered tree endemic to Southern Western Ghats, *Eulophia epidendraea* (Koenig ex Retz.) C.E.C. Fisch., a terrestrial orchid found only in India and Sri Lanka. *Gnetum edule* (Willd.) Blume (Gnetaceae) and *Cycas circinalis* L. (Cycadaceae) were also collected.

Project - 10

Floristic Assessment of Meghamalai Wild Life Sanctuary, Tamil Nadu (New project)

Executing Official(s) : Dr. C. Murugan and Dr. S. Arumugam
Date of Initiation : April,2016
Date to be completion: March,2020

OBJECTIVE

The objectives of the project are to undertake intensive floristic surveys and collect detailed information on the distribution, ecology and economic utility of plants in the Meghamalai Wildlife Sanctuary; to detail study about the occurrence of RET Plants and their present status; to find the species richness area within the Wildlife Sanctuary.

Impateins henslowiana Arn. (Balsaminaceae)

BACKGROUND

The Meghamalai Wildlife Sancturay has been declared as Wildlife Sanctuary in 26-06-2009 for the purpose of protecting propagating and developing Wildlife and its environment.

AREA AND LOCALITY

Meghamalai WLS, Tamil Nadu, c. 269.11 sq. km

SUMMARY/PROGRESS OF THE WORK DONE IN 2016-17

During this period, 03 botanical explorations tours *w.e.f.* 03-08-2016 to 12-08-2016, 23-09-2016 to 05-10-16-2016 and 12-12-2016 to 21-12-2016 were conducted

A view of Meghamalai Wildlife Sanctuary, Tamil Nadu

during which 755 field nos. were collected (133904 – 134184; 134185 – 134478 &134479 - 134658) of which 365 field nos. were identified so far.

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study reports 04 species as new to science.

PROJECT - 11

Study of Nutlets of tribe Cyperae and Fimbristyledeae from South India using SEM (New Project)

Executing Official(s): Dr. G.V.S. Murthy (Superannuated on 31.12.2016), Dr. G. Gnanasekaran (Resigned) and Dr. J.V. Sudhaka, Mr. K. Yarrayya (Resigned) and Ms. Ananthalakshmi
Date of initiation : April,2016
Date to be completion : March, 2020

OBJECTIVE

The objective of the project is SEM studies on the Nutlets of 50 spp. of Cyperae and Fimbristyledeae.

ACHIEVEMENTS/OUTCOMES IN 2016-17

SEM studies of 69 species of Cyperae and Fimbristyledeae were studies and 103 SEM images were taken. Description of 04 species were completed

PROJECT - 12

A taxonomic revision of the genera *Diotacanthus, Haplanthodes, Gymnostachyum* and *Phlogacanthus* (Andrographinae: Acanthaceae) in India including pollen and seed morphology using SEM (New project)

Executing Official(s):Dr. G.V.S. Murthy and Dr. G. Gnanasekaran
Date of initiation : April,2016
Date to be completion : March, 2020

ACHIEVEMENTS/ OUTCOME IN 2016-17

This project terminated due to resignation of Dr. G. Gnanasekaran, Bot. Asst. *w.e.f.* June, 2016.

PROJECT - 13

Flora of Kerala : Family-Bromeliaceae to Burmaniaeae (excluding Dioscoreaceae and Amaryllidiaceae) (New project)

Executing Official(s) : Dr. M.Y. Kamble & Dr. T.S. Saravannan
Date of Initiation : April, 2016
Date to be completion : March, 2017

BACKGROUND

Present project is a part of publication of Flora of Kerala, which includes study of families *viz.* Bromeliaceae, Haemodoraceae, Taccaceae, Smilacaceae, Agavaceae, Dracaenaceae, Hypoxidaceae and Burmanniaceae.

AREA AND LOCALITY

Kerala state

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016-17

During this period, herbarium specimens of following families housed in MH, Coimbatore were studied and descriptions prepared for 18 species *viz.*, Bromeliaceae (01 gen. & 01 sp.), Haemodoraceae (02 gen. & 02 sp.), Taccaceae (01 gen. & 01 sp.), Agavaceae (02 gen. & 02 sp), Hypoxidaceae (03 gen. & 03 sp.) and Burmanniaceae (01 gen. & 02 sp.); Prepared citations for 35 species (including planted species). Completion of manuscript is in progress. 13 rare, endangered and economic important plants were collected for conservation purpose.

PROJECT - 14

Flora of Kerala-Commelinaceae (c. 08 Genera & 55 Species) (New project)

Executing Official(s) : Mr. Rajeev Kumar Singh and Dr. Pradeesh
Date of Initiation : April, 2016
Date to be completion : March, 2017

BACKGROUND

It is a new project under Flora of Kerala (Volume 6) allotted for one year. Taxa under families Commelinaceae to be documented with help of existing herbarium specimens and literature. No separate field tours are approved for this project. Though 8 genera and 55 species are projected in annual action plan 2016-17, at present it is found to be 9 genera and 62 species distributed in Kerala(References: 1. Sasidharan, N.2004. Biodiversity documentation for Kerala,Part 6: *Flowering Plants*. KFRI, Peechi. 2. Nayar, T.S., Rasiya Beegam, A., Mohanan, N &Rajkumar, G.2006. *Flowering Plants of Kerala*. A Handbook.TBGRI, Trivandrum.)

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016-17

During this period, documentation of the family Commelinaceae distributed in Kerala was completed and finalised the manuscript based on Flora of Kerala Volume 1 & 2 format. In this period, 61 species belonging to 09 genera were documented *viz.*, *Aneilema* (04 species), *Belosynapsis* (02 species); *Commelina* (15 species); *Cyanotis* (14 species); *Floscopa* (01 species); *Murdannia* (19 species); *Pollia* (01 species); *Dictyospermum* (03 species) and *Amischophacelus* (02 species).

WESTERN REGIONAL CENTRE, PUNE

PROJECT - 1

Floristic diversity of Biligirirangaswamy Temple (BRT) Wildlife Sanctuary, Karnataka

Executing Official(s) : Dr. J. Jayanthi
Date of Initiation : April, 2013
Date to be completion : March,2017

OBJECTIVE

This project was undertaken to bring out a comprehensive floristic account on BRT Wildlife sanctuary and to identify endemic and threatened plant species protected in the sanctuary.

BACKGROUND

This project has been initiated in 2013. Since initiation of the project, a total of 06 field tours have been undertaken during which c. 1100 field nos. were collected of which so far 594 field nos. have been identified to 575 species. Descriptions were prepared for 116 species. Indexed a list of 1911 taxa from Mysore district based on literature study. Updated the nomenclature of 400 plant species mentioned in earlier works. Sorted out 1500 herbarium specimens for mounting of which mounting of 400 herbarium specimens were completed so far.

AREA AND LOCALITY

The Biligiri Rangaswamy Temple (BRT) Wildlife Sanctuary, Chamarajnagar District, Karnataka near Mysore.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 02 field tours were undertaken to different habitats of the sanctuary. A total of 330 field numbers were collecteda long with field photographs. Identified about 504 field numbers of plants collected in the earlier field tours. A total of 1000 specimens were mounted after processing. Conducted herbarium consultation tour *w.e.f.* 31.07.16 – 05.08.16 to University of Agriculture Sciences, Bangalore and Mysore University herbarium during the period and consulted 500 herbarium specimens of the family Acanthaceae, Loranthaceae, Viscaceae, Apocynaceae, Orchidaceae and specimens collected from BR hills.

A scenic view of Biligirirangaswamy Temple Wildlife Sanctuary, Karnataka

Barleria buxifolia L. (Acanthaceae)

ACHIEVEMENTS/OUTCOMES IN 2016-17

This study reported 12 endemic species. The survey tours resulted in finding of a neo-endemic species *Habenaria sahyadrica* K.M.P. Kumar & al., as a new distributional record for Karnataka state. About 27 plant species such as *Thunbergia mysorense, Thea* sp., *Aerides ringens, Bulbophyllum fuscopurpureum, Cymbopogon* sp., *Kalanchoe* sp., *Euphorbia* sp., *Pepperomia dindigulensis, Eria mysorensis, E. polystachya, E. pseudocalvis, Huperzia* sp., *Habaneria sahyadrica, Cymbidium bicolor, Coelogyne nervosa, Luisia tristis, Gastrochilus acaulis, Dendrobium heterocarpon, Oberonia brunoniana, Aeschynaanthus perottetiana, Vanilla walkarieae, Papilionanthe subulata, Hypericum mysorense, Aglaonema* sp., *Clausena indica, Caralluma umbellata, Kalanchoe bhidei*were introduced for *ex-situ* conservation in botanic garden of Western Regional Centre, Pune.

Agrostistachys borneensis Becc. (Euphorbiaceae)

PROJECT - 2

Ferns of Karnataka

Executing Official(s) : Dr. A. Benniamin
Date of Initiation : April, 2014
Date to be completion : March, 2018

OBJECTIVES

The objectives of the project are exploration, inventorisation and documentation of floristic diversity of plant resources of the district; survey, collection and preparation of herbarium specimens; identification of endemic species and also listing of the rare and threatened species and preparing computerised database on the above for storage and easy retrieval of information.

BACKGROUND

The project has been initiated in 2014. During previous

Adiantum capillus - veneris Linn. (Pteridaceae)

year (2015-16), 115 field nos. belonging to 95 species were collected. 14 live ferns belonging to 10 species were collected to introduce in garden. A total of 43 species, collected in earlier exploration, were identified.

AREA AND LOCALITY

Karnataka , c. of 1,92,204 sq.km.

SUMMARY/PROGRESS OF THE WORK DONE DURING 2016-17

During this period, 02 field tours have been undertaken to different parts of Karnataka. First tour to unexplored areas of Someshwara Wildlife Sanctuary, Kudremukh National Park and Bhadra Tiger Reserve were explored spending 14 days. Second field tour to unexplored are as of Bramagiri WLS and Talacauvery WLS spending 10 days. A total 192 field nos. belonging to 75 species were collected in this tour. 18 live ferns belonging to 9 species were also collected to introduce in the botanical garden.

During 2016-17, Scanning Electron Microscopic Study

(SEM) of the spore of fifteen species namely *Asplenium erectum, A. varians, Diplazium cognatum, D. muricatum, Actinopteris radiata, Parahemionitis arifolia, Dryopteris hirtipes, Leptochillus decurrens, Pteris longipes, P. pellucida, Lindsaea ensifolia, Ctenitis pausisora, Elaphoglossum beddomei, Cyathea spinulosa, Osmunda regalis* and *Oleandra musaefolia* were completed. Beside, 24 species identified for Dr. M. N. Reddy, Professor, Veena Narmad South Gujarat University, Gujarat; 05 species for Mr. Patel Mitesh, RGNP, Gujarat University, Gujarat; 10 species for Department of Botany, SPPU University, Pune; 3 species for Dr. Kiran R Ranadive, Asst. Professor, Department of Botany, Waghire College Saswad, Maharashtra.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 04 species *Elaphoglossum stigmatolepis, Pteris ottaria, Asplenium zenkeranum* and *Elaphoglossum beddomeias* new record for state of Karnataka; 07(*Angiopteris helferiana, Adiantum concinnum, Cyatheae spinulosa, Osmunda hugeliana, Asplenium indicum, Bolbitis presliana* and *Bolbitis semicordata*) rare, endangered and economic important plants were collected and details of conservation initiations. 45 % of plants introduced in office garden are growing in good condition.

PROJECT - 3

An assessment of Orchid diversity of Central Western Ghats: Goa

Executing Official(s) : Dr. Jeewan Singh Jalal
Date of Initiation : April, 2015
Date to be completion :March, 2017 (requested for two years extension)

OBJECTIVES

The objectives of the study are to explore the orchid diversity of Goa state, to identify and describe the orchid species collected in the region and compile a comprehensive inventory, threat assessment of endemic orchids and mapping of endemic orchids at regional scale and identifying sites or areas for conservation priority.

BACKGROUND

This project has been initiated in 2015.During previous year (2015-16), 117 field nos. were collected of which 55 field nos. were identified.

AREA AND LOCALITY

The proposed study area is the Western Ghats of Goa state, c. 3702 sq. km.

SUMMARY OF THE WORK DONE DURING 2016-17

Study area is divided into 2 sq. km grid cells of which 323 grid cells were selected for orchid sampling. These grid cells include all the protected areas and appropriate surrounding areas for sampling. Two field tours and one herbarium consultation tour were undertaken during this year. During the survey, two important Wildlife Sanctuaries *e.g.*Netravali Wildlife Sanctuary and Cotigaon Wildlife Sanctuary and their adjoining areas covering c. 110 sq. km area were surveyed. A total 87 field numbers and 150 photographs were also collected. Besides this 326 GPS locations were also taken for mapping of individual orchid species. In each location mature individual of each orchid species were counted for assessment. A total 42 species were recorded of which *Diplocentrum congestum, Habenaria elwesii, Habenaria rariflora, Nervilia crociformis, Oberonia mucronata* and *O. verticillata* were reported for the first time in Goa. A total 75 field nos. were identified. Label details were completed for 120 herbarium specimens (including previous tours also). During the herbarium consultation tour, genera such as *Peristylus, Smithsonia, Gastrochilus* and *Habenaria*were critically studied in Blatter Herbarium, St. Xavier's College, Mumbai.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

During this period, a total 42 orchid species were documented of which *Diplocentrum congestum, Habenaria elwesii, H. rariflora, Nervilia crociformis, Oberonia mucronata* and *O. verticillata*were reported as new addition for orchid flora of Goa.

PROJECT - 4

Floristic Survey of Someshwara Wild Life Sanctuary, Karnataka

Executing Official(s) : Dr. C.R. Jadhav
Date of Initiation : April, 2015
Date to be completion :March, 2017

OBJECTIVE

The objectives of the project are to document the floral diversity of Someshwara Wild Life Sanctuary, Karnataka and to highlight the plant wealth of the protected area along with threats and conservation measures proposed.

BACKGROUND

This project was started in 2015. During previous year (2015-16), 01 field tour was conducted to the study area during which a total of 261 field numbers wre collected.

AREA AND LOCALITY

Someshwara Wild Life Sanctuary, Karnataka, c. 88.40 sq. km

SUMMARY OF THE WORK DONE

Three field tours and one herbarium consultation tour proposed.

PROJECT - 5

Taxonomic studies of Microfungi of Sanjay Gandhi National Park, Maharashtra along with its 10% peripheral area (New project)

Executing Official(s) : Dr. Rashmi Dubey and Mr. Amit Diwakar Pandey
Date of Initiation : April,2016
Date to be Completion : March,2020

OBJECTIVES

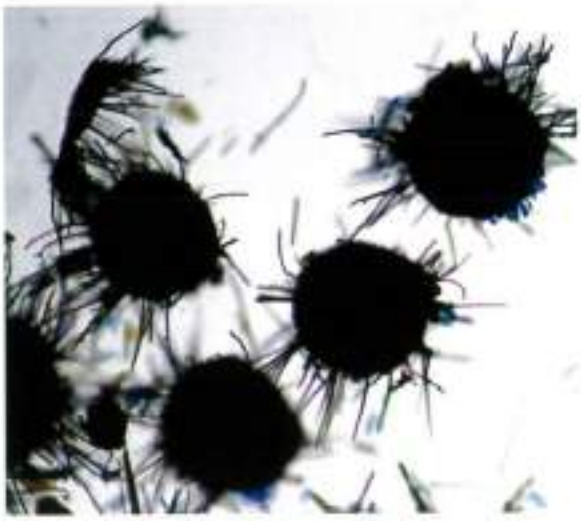
Major objevtives of the present work were taxonomic studies of micro fungi found in the phllyosheric region (roots, stems, leaves, fallen wooden logs, litter) of the National Park; studies of aquatic fungi found in fresh water lakes; taxonomic studies of microfungi associated with mangrove vegetation of NP; molecular sequencing for establishment of new genus/species; scanning electron microscopic studies of interesting and uncommon microfungi; to study the ecological factors responsible for the richness of the species; to isolate and preserve the fungal germplasm in *ex-situ* condition for further uses and to prepare and documentation of an inventory of fungi for ready references and analysis of specificity and relationship of microfungi in the National Park and its 10 % peripheral area

BACKGROUND

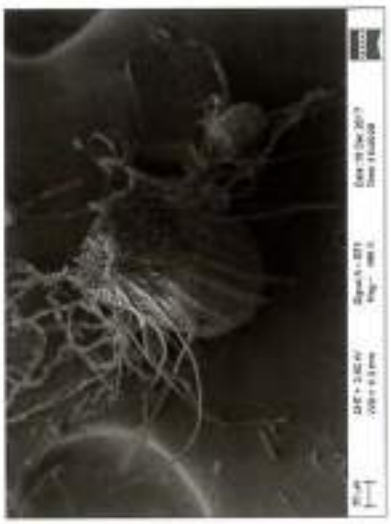
Sanjay Gandhi National Park (SGNP), Borivali, commonly known as Borivali National Park (BNP) or "Krishnagiri Upwan" is situated at the extreme north of Mumbai and is a part of spur of Sahyadri Ghats/Western Ghats range that shoots off westerly. Due to its proximity to the coast, numerous water courses and hilly terrain, the flora presents a vast picture ranging from dry and moist deciduous, semi evergreen, open scrub to halophytes.

Leptoxyphium glochidion
H. Yang & K.D. Hyde

Hyaloscypha microcarpa (Fuckel) Boud.



Chaetosphaerulina lignicola
(Sivan., Panwar & S.J. Kaur) J.L. Crane, Shearer & M.E.



SEM images of
Volutina concentrica Penz. & Sacc.

The forest of the National Park provides congenial environment for the growth of epiphytic and parasitic fungal species owing to humid climate and heavy rainfall. The moist tree trunks and branches facilitate the growth of many saprophytic fungi. 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 has been subjected to scientific scrutiny and mycologists have to unravel the unexplored and hidden wealth. A variety of microbial diversity exists in Sanjay Gandhi National Park and no comprehensive and systematic studies or any research work has been undertaken till now. All these factors motivated the scientists to select this area for the preparation of mycofloristic account.

AREA AND LOCALITY

Sanjay Gandhi National Park (longitude 72°53` to 72°58`E & latitude 19°08` to 19°21` N), Konkan, the coastal region of Maharashtra state, c. 103.36 sq. km.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 02 survey tours were conducted in different unexplored forest areas of Sanjay Gandhi National Park during which 114 field nos. were collected from litter (66 pkts), branches and twigs (101pkts), wooden logs (48pkts), water (12pkts) and soil samples and infected mangrove samples (04 pkts) along with 617 photographs. All the collected specimens were processed in mycological lab; isolation of fungal specimens were carried out on different media as PDA medium, oat meal agar media etc. A total of 69 dry specimens were examined and 300 slides were prepared. Microscopic measurements of 62 fungal specimens were done. During this period, 34 foliicolous specimens were incorporated in fungal herbarium. In addition, a herbarium consultation tour w.e.f. 19.12.16 to 24.12.16to Jawaharlal Nehru Tropical Botanical garden & Research Institute (TBGRI), Palode, Kerala were carried out.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The present study has noticed that the diseases like Powdery mildews, Rust, smuts, leaf spots and sooty mold diseases were frequently reported from the areas surveyed. It was also noticed that plants in this NP are not severely affected by the fungal diseases, but the soil and litter were rich in fungal diversity. In addition, The report incorporates morpho-taxonomic description of 336 species belonging to 188 fungal genera along with their micro-calibrations and respective host plants; many new findings *viz.*,01 new genus, 15 new fungal species, 01 new variety, 30 fungal taxa as new additions to Fungi of India. 114 fungal taxa as new to Fungi of Maharashtra and besides this, 387 new host records were also mentioned in this report.

PROJECT - 6

Floristic Diversity of Wan Wildlife Sanctuary (New project)

Executing Official(s) : Dr. Priyanka Ingle
Date of Initiation : April, 2016
Date to be completion : March, 2020

OBJECTIVES

The objectives of the project are to survey and document the floristic diversity of Wan Wildlife sanctuary and to collect Ethno-botanical data from different tribal communities resides in Wan Wildlife Sanctuary

BACKGROUND

The Wan Wildlife Sanctuary, situated in Akot Wildlife Division, Akot of Akola district, Maharashtra, contributes

Barleria gibsonii Dalzell (Acanthaceae)

Madhuca longifolia (J.Koenig ex L.) J.F.Macbr. (Sapotaceae)

211 sq. km area of Melghat Tiger Reserve. It lies between the longitudes 21°09'00"E to 21°19'00"E and latitudes of 76°44'16"N to 76°59'00"N. An area of 205.86 sq. km is actual forest area and 5.14 sq. km area is of cultivation and '*Gaothan*' area of seven ex-forest villages called as 'Medow'. The only village present in the sanctuary area is 'Talai'. Wan Wildlife Sanctuary is divided in two ranges, Wan range and Somthana range.

AREA AND LOCALITY

Wan WLS, Maharashtra, c.211 sq. km

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 02 field tours were undertaken to Wan Wildlife Sanctuary as per the annual action plan project. First field tour was conducted during 25.07.16 to 09.08.16 and second field tour during 30.03.17 to 14.04.17 and c. 200 sq. km area was explored. During 02 field tours, total 225 field nos. were collected in triplicates with their GPS coordinates, out of which 59 field nos. were identified and its description writing has been completed; c. 860 photographs of plants, habitats, village and tribal communities, etc. were taken. The data of economically important plants, ethno-botanical and ethno-veterinary data was collected from '*Rathi*' and '*Korku*' tribal communities which are the major tribal communities residing in the Wildlife Sanctuary area. The live plants such as *Ceropegia bulbosa*, *Chlorophytum* sp. and *Aerides maculosa* were collected from this sanctuary area and introduced in office garden of BSI, WRC, Pune for *ex-situ* conservation.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

The live plants of *Ceropegia bulbosa*, *Chlorophytum* sp. and *Aerides maculosa* were successfully introduced in office garden of BSI, WRC for *ex-situ* conservation.

PROJECT - 7

Biodiversity assessment of microalgae from thermal springs of Maharashtra, India (New project)

Executing Official(s) : Dr. Sukumar Bhakta
Date of Initiation : May, 2016
Date to be completion:March, 2019

BACKGROUND

Hot springs are specialized lotic environments distributed in widely separated geographical areas. Temperature is fairly constant near the source in these springs and lowered down to above ambient temperature depending on the volume of non-thermal water entering into the system from the surroundings. Thermal springs represent a pool of new strains possessing attractive biochemical pathways and unique metabolic products for biotechnological applications. In the late nineteen century a geological survey report showed a total of 286 hot springs located throughout the India (Oldham & Oldham 1882). Very few reports available on the systematic account of algae and cyanobacteria in the thermal springs of India (Prasad & Srivastava 1965; Vasishta 1968; Jana 1973; Prasad & al.1984; Sinha & Chaubey 1986; Jha & Kumar 1986; Bhardwaj & tiwari 2010; Pattanaik & Rao 1972, Rao & Pattanaik 1975, Adhikary & Sahu 1987), which is not significant enough to explore the biodiversity of the inhabitants of the extreme ecosystem. From the state of Maharashtra, the diversity of algae is recorded so far from only hot spring Unapdev of the state (Thomas & Gonzalves, 1965 and Patil & Deore, 2010).The possibility of occurrence of novel algal taxa is mostly expected as the harsh environment minimizes contamination risk and can provide buffering against fluctuations in temperature.

SUMMARY OF THE WORK DONE DURING 2016-17

During this period, 01 field tour *w.e.f.* 21.12.2016 to 31.12.2016 was conducted during which a total of 105 algal samples were collected of which 40 species were identified so far. Temperature and pH of the thermal water were recorded in the field during the time of sampling. The temperature of the hot springs ranging from 39-70°C extreme and pH of 6.8 to 7.2, which is just in normal range. During the survey it is observed that certain thermal spring like Koknere and Pimplas of Palghar district is highly threatened due to check dams resulting flooded of the thermal springs, whereas Ganga spring of Rajapur, Ratnagiri, Banganga of Thane and spring of Sahapur, Palghar were inexplicit habitat and needed to be updated in different sources. A total of 40 algal taxa under 25 genera were enumerated and identified so far with processing of other samples are under progress. The recorded genera were *Cyanobacterium* (1), *Synechocystis* (1),*Aphanocapsa* (2),*Chroococcus* (1), *Gloeocapsa*(1), *Myxosarcina*(1), *Jaaginema*(1), *Trichocoleus* (1), *Geitlerinema* (3), *Limnothrix* (3),*Pseudanabaena* (2), *Leptolyngbya* (1), *Lyngbya* (2), *Brasilonema* (1), *Cylindrospermum* (1), *Calothrix* (3), *Gloeotrichia* (1), *Nitzschia* (4),*Pinnularia* (2), *Navicula* (2), *Amphipleura* (1), *Neidium* (1), *Anomoeoneis* (1), *Achnanthes* (1), *Frustulia* (1). Of these species 21 taxa of nonheterocystous cyanobacteria recorded abundant and dominant over 5 heterocystous taxa and 13 taxa of Bacillariophyta. It is evident from the study that that the simple thallus organization could thrive maximum temperature stress rather than complex form.

PROJECT - 8

Flora of Pushpagiri WLS, Karnataka (New project)

Executing Official(s) : Dr. P. Lakshminarasimhan and Mr. Sameer Patil
Date of Initiation : April, 2016
Date to be completion : March, 2020

BACKGROUND

Floristic survey of Pushpagiri WLS and ecology study of high Montane grasslands of Pushpagiri WLS

AREA AND LOCALITY

Pushpagiri WLS, Karnataka

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-17, 03 field tours *w.e.f.* 12.09.16-30.09.16; 24.12.16-07.01.17; 29.03.17-11.04.17 were undertaken respectively to the study area during which a total of 439 field nos. were collected out of which c. 360 field nos. have been identified. A total of 2400 photographs were taken of which c. 1800 photographs identified till date. Details list of field numbers of plants collected along with GPS locations and identity of most plants have been provided in the field tour reports. A total of 600 plant specimens have been processed till date. During this period, few rare terrestrial and epiphytic orchids were collected.

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports several rare, endangered and economic important plants *viz. Nothapodytes*

Catunaregum spinosa (Thunb.) Tirveng. (Rubiaceae)

Temiloadia stinginosa (Retz.) Tirveng. & Sastre (Rubiaceae)

nimmoniana, Satyrium nepalense, Belosynapsis vivipara, Habenaria longicorniculata, Pectilis gigentia, Justicia santapavi, Saprosma glomeratum, Mycetia acuminate, Litsea josephii, L. wightiana Zeuxine longilabris, Myrstica magnifica, Anoectochilus elatus, Tainia bicornis, Zeuxine gracilis, Epipogium roseum.

PROJECT - 9

Pteridophytic Flora of Pushpagiri Wildlife Sanctuary, Karnataka with 10% Periphery (New project)

Executing Official(s) : D. Jesubalan and Dr. A. Benniamin
Date of Initiation : April, 2016
Date to be completion : March, 2020

BACKGROUND

This is a new project which will bring out a comprehensive floristic list of Pteridophytes in unexplored areas by extensive and intensive studies.

Blechnum orientale L. (Blechnaceae)

Asplenium decrescens Kunze (Aspleniaceae)

AREA AND LOCALITY

Pushpagiri WLS, Somwarpet taluka, Kodagu (Coorg) district, (Karnataka) (12°25' to 12°40' N latitude and 75°39' to 75°45' E longitude)

SUMMARY OF THE WORK DONE DURING 2016-17

During 2016-2017, 01 field tour *w.e.f.* 25.09.16 to 05. 10.16 was undertaken to Vanachale, Mandalpatti and Beedalli forests areas for exploration and documentation of floristic diversity of pteridophytic resources from Pushpagiri Wildlife Sanctuary, Karnataka. Altogether 67 field numbers were collected, and tentatively identified. The altitude, latitude and longitude were properly recorded for all the species. 09 species namely *Adiantum raddianum, A. concinnum, Pteris biaurita, Tectaria coadunata, Asplenium nidus, Elaphoglossum beddomei, Grammits pilifera, Pyrrosia lanceolata* and *Doryopteris concolar* were separately collected with rhizomes for *ex-situ* conservation. 60% of plants are growing well in the garden of Botanical Survey of Indian, Western Regional Centre, Pune.The present investigation leaded to find two interesting ferns namely *Elaphoglossum* and *Pellaea,* collected from Beedalli Anti-poaching camp of Pushpagiri Wildlife Sanctuary, Karnataka. The plant specimens were further identified as *Elaphoglossum beddomei* Sledge (Lomariopsidaceae) and *Pellaea boivini* Hook. (Sinopteridaceae). The distribution of these two species was restricted to south India, where it is present only in Kerala and Tamil Nadu. After the confirmation this has been reported as new addition to the pteridophytic flora of Karnataka, Central Western Ghats of India. Further, the spores of *Elaphoglossum beddomei* and *Pellaea boivini*were studied under Scanning Electron Microscope (SEM) for better understanding. All the plant specimens that have been collected during the field tour were further processed and the data preparation for the Pushpagiri Wildlife Sanctuary is on progress.As per the schedule,one herbarium consultation tour *w.e.f.* 31.03.17 to 08.04.17 was also undertaken to Mahatma Gandhi Memorial College (MGM), Udupi, Karnataka during which 325 specimens housed at the MGM College were consulted and identified 04 plant specimens from the field tour collection.

Pteris argyrea T. Moore (Pteridaceae)

ACHIEVEMENTS/ OUTCOMES IN 2016-17

This study reports 02 fern species as new records for the state of Karnataka, *viz. Elaphoglossum beddomei* Sledge (Lomariopsidaceae), *Pellaea boivini* Hook. (Sinopteridaceae). In the present study, 09 ERT species namely *Adiantum raddianum, A. concinnum, Pteris biaurita, Tectaria coadunata, Asplenium nidus, Elaphoglossum beddomei, Grammits pilifera, Pyrrosia lanceolata* and *Dryopteris concolar* were separately collected with rhizome for *ex-situ* conservation.

Uraria picta (Jacq.) DC. (Fabaceae)

NEW DISCOVERIES

Impatiens pseudocitrina Hareesh, M. Sabu & Gogoi

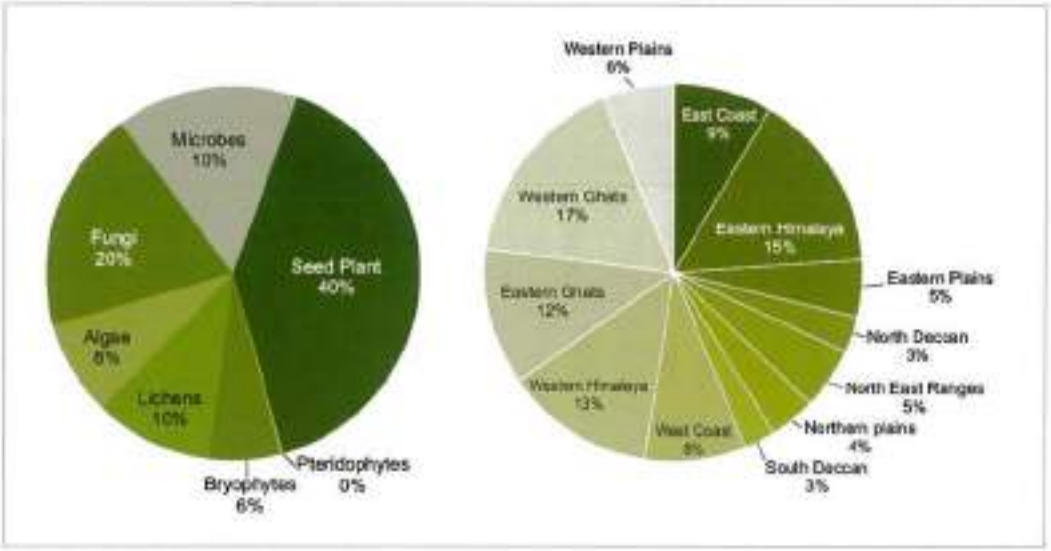
The floristic wealth of India is both rich and diverse due to wide range of variations in climate, altitude and ecological habitat. The diversity of flora is further compounded by the confluence of three major biogeographic realms, namely Indo-Malayan, the Indo-Arctic and Afro-tropical. The Indian floral element is further concentrated in four floristic hotspots viz., Himalayas, Western Ghats (incl. Sri Lanka), NE India and Andaman Islands (Indo-Burma)and Nicobar Islands (Sundalands). These regions show high degree of endemism and higher incidence of rare and threatened plant species.

Current estimation reveals a total of 18,386 species of Angiosperms, 79 species of Gymnosperms, 1289 species of Pteridophytes, 15,115 species of Fungi, 7,357 species of Algae, 2748 species of Bryophytes, 2511 species of Lichens and 1170 species of microbes India which is approximately 11.4 percent of total recorded plant species of the world. The group wise current status of number of species known from India is given below:

Group	No. of species in India	Percent of Indian Flora
Virus/Bacteria	1170	2.40
Algae	7357	15.12
Fungi	15115	31.08
Lichens	2511	5.17
Bryophytes	2748	5.65
Pteridophytes	1289	2.64
Gymnosperms	79	0.16
Angiosperms	18386	37.78
Total	**48655**	**100**

During 2016-17,scientists of BSI discovered 42 species and 5 varieties as new to science and discovered 1 genus, 48 species, 2 subspecies and 2 varieties as new distributional records for India. In this year, seed plants contributed the maximum with 37 percent of the discoveries followed by fungi by 20 percent, microbes by 16 percent, lichens by 11 percent, algae by 9 percent and bryophytes by 7 percent of the total discoveries. Pteridophytes diversity represents only a single new record for India.

The list of new discoveries are provided here on next page:



Plant discoveries made in diffrent plant groups and from diffrent physiogeographic zones from India during 2016

NEW TO SCIENCE

SEED PLANTS

NEW SPECIES

Afrohybanthus indicus S. K. Kamble & Patil, Phytotaxa 252 (1): 069. 2016. (VIOLACEAE):This new species has been discovered and described from the hill slopes of Sadashivgad, Karad, Satara district, Maharashtra, at 700m altitude.

Andrographis megamalayana Gnanasek., Karupp. & G.V.S. Murthy

Andrographis megamalayana Gnanasek., Karupp. & G.V.S. Murthy, Phytotaxa 244 (1): 89.2016. (ACANTHACEAE): This new species has been discovered and described from Maharajamettu, Megamalai Wildlife Sanctuary, Theni district of Tamil Nadu, India at 1560m.

Artabotrys manoranjanii M. V. Ramana, J. Swamy & K. C. Mohan, Nordic J. Bot. 34:413. 2016. (ANNONACEAE): This new species has been discovered and described from Lamiabay, Saddle Peak National Park, North Andaman Islands, Andaman and Nicobar Islands, at 10m altitude.

Barleria durairajii K. Ravik., D. Naras., Devanath. & Gnanasek., Rheedea 26(2): 136. 2016. (ACANTHACEAE): This new species has been discovered and described from Vallanadu beat, Srivaikundam range,Thoothukudi district, Tamil Nadu, at 60m altitude.

Brachystelma annamacharyae K. Prasad, Prasanna, Meve, Sankara Rao & T. Thulasaiah, Nordic J. Bot. 34: 360. 2016.(APOCYNACEAE): This new species has been discovered and described from Seshachalam hills, Rajampeta forest division, Kadapa district, Andhra Pradesh, at 506m altitude.

Bulbophyllum paramjitii Agrawala, M.U. Sharief & B.K. Singh, Phytotaxa 273 (1): 72. 2016. (ORCHIDACEAE): This new species has been discovered and described from Bhusuk, East district, Sikkim, 1550 m altitude.

Ceropegia ravikumariana Kambale & Gnanasek., Rheedea 26 (1): 57. 2016. (APOCYNACEAE): This new

Artabotrys manoranjanii M. V. Ramana, J. Swamy & K. C. Mohan

species has been discovered and described from Visthaara Mottai, Thirukurungudi Range of Kalakkad Mundanthurai Tiger Reserve, Naraikkadu, Tirunelveli district, Tamil Nadu, at 1368 m altitude.

Coelogyne mishmensis Gogoi, Richardiana 16: 375. 2016. (ORCHIDACEAE): This new species has been discovered and described from Mehao Wildlife Sanctuary, Lower Dibang Valley district, Arunachal Pradesh, India at 800 m altitude.

Dimeria andamanica Gosavi, M.Y. Kamble, Chandore & S.R. Yadav, Phytotaxa 270(4):296.2016. (POACEAE): This new species has been discovered and described from Chidiya Tapu, South Andaman, Andaman and Nicobar Islands, at 28m altitude.

Euphorbia seshachalamensis K. Prasad & Prasanna, Ann. Bot. Fenn. 53(1-2): 73. 2016. (EUPHORBIACEAE): This new species has been discovered and described from Seshachalam hills, Rajampeta forest division, Jandrapenta beat, Sanipaya forest range, Kadapa district, Andhra Pradesh, at 506 m altitude.

Exacum keralense Geethakum., K.M.P.Kumar, Pandur. & Deepuu, Botany Letters 1. 2016. (GENTIANACEAE): This new species has been discovered and described from

Exacum keralense Geethakum., K.M.P.Kumar, Pandur. & Deepuu

Elival hills, Muthikulam, Palakkad district of Kerala, at 1845m altitude.

Impatiens albopetala Gogoi & Borah, Webbia: J. Pl. Tax. Geog. 1. 2016. (BALSAMINACEAE): This new species has been discovered and described based on collections made from 65 point Mayodia, Lower Dibang Valley district of Arunachal Pradesh, India at 2200m altitude.

Impatiens dibangensis Gogoi & Borah, Webbia: Journal of Plant Taxonomy and Geography 3.2016. (BALSAMINACEAE): This new species has been discovered and described from Mayodia Pass, Lower Dibang Valley district of Arunachal Pradesh, India at 2600m altitude.

Impatiens pseudocitrina Hareesh, M.Sabu & Gogoi, Phytotaxa 282(3): 231. 2016. (BALSAMINACEAE): This new species has been discovered and described on the way to Walong from Hayuliang, Samdal, Anjaw district, Arunachal Pradesh, at 1000 m. altitude.

Miliusa manickamiana C. Murugan, Indian J. Forestry 34(4): 371. 2016. (ANNONACEAE): This new species has been discovered and described from Ayilandampillai Estate road,Thirukurungudi Hills, Tirunelveli district, TamilNadu, at c. 325m altitude.

Molineria fakimense Odyuo, D.K. Roy & Khamdi, Rheedea 26(2): 131.2016 (HYPOXIDACEAE):This new species has been discovered and described from Fakim village, Pongro subdivision, Kiphire district, Nagaland, at 2000m altitude.

Pedicularis artiae R. Kr. Singh, Kholia & Sudhakar, Kew Bulletin 71: 36. 2016. (OROBANCHACEAE): This new species has been discovered and described from Bridle Road, old Bansoi, Lachen, North Sikkim dist. of Sikkim, at 2300m altitude.

Psychotria vasudevae Murugan & Arisdason, Phytotaxa 258 (3): 295. 2016. (RUBIACEAE): This new species has been discovered and described from forest between Beechdera and Delhi Village, Katchal Island, Andaman and Nicobar Islands.

Rubus haridasanii Chand. Gupta & S. S. Dash, Phytotaxa 289(2): 176. 2016. (ROSACEAE): This new species has been discovered and described from Talley Valley, Lower Subansiri district, Arunachal Pradesh, at 1875 m altitude.

Sarcoglyphis manipurensis A. N. Rao, Vik. Kumar & H. B. Sharma, Nordic J. Bot. 34: 191. 2016. (ORCHIDACEAE): This new species has been discovered and described from Songpiyang Hills, Chandel district, Manipur, at 420 m altitude.

Themeda odishae Chorghe, K. Prasad, Prasanna & Y.V.Rao, Phytotaxa 245(2): 183. 2016.(POACEAE): This new species has been discovered and described from Mahendragiri Hills, Gajapati district of Odisha, India at 1393m altitude.

Impatiens dibangensis Gogoi & Borah

Themeda odishae Chorghe, K. Prasad, Prasanna & Y.V. Rao

Zingiber pseudosquarrosum L. J. Singh & P. Singh, Nordic J. Bot. 34: 423. 2016. (ZINGIBERACEAE): This new species has been discovered and described from Sabari, Rangat, Middle Andaman, Andaman and Nicobar Islands, at 57m altitude.

NEW VARIETY

Cyperus arenarius Retz. var. **nairii** K. Yarrayya, G.V.S. Murthy & P.K. Ratna Kumar, Taiwania 61(3): 221. 2016. (CYPERACEAE): This new variety has been discovered and described from Appa Island, Gulf of Mannar Biosphere Reserve, Tamil Nadu.

Justicia quinqueangularis K.D. Koenig ex Roxb. var. **kawalii** P.S. Annamma & P. Venu, Indian J. Forestry 39(2): 179. 2016.(ACANTHACEAE): This new variety has been discovered and described from Indhanpally Range, Jannaram Forest Division, Kawal Tiger Reserve, Adilabad district of Telangana, India at 563m altitude.

Luisia trichorrhiza (W.J.Hooker) Blume var. **flava** Gogoi, Richardiana 322.2016. (ORCHIDACEAE): This new variety has been discovered and described from Daisajan, Tinsukia district of Asssam, India at 118m altitude.

Memecylon lawsonii Gamble var. **pedicellata** M. Das Das, Sujana, A. Pramanik & D. Maity, NeBio 7(1):1.2016. (MEMECYLACEAE): This new variety has been discovered and described from Kurichyarmala, Wayanad district of Kerala, India at 1353 m altitude.

BRYOPHYTES

NEW SPECIES

Cololejeunea andamanensis M. Dey & D.K.Singh, Cryptogamie Bryologie, 37(2):150. 2016 (LEJEUNEACEAE): This new species has been discovered and described from Motor Bhanji, Chidiatapu, South Andaman of Andaman & Nicobar Islands, India at 17m.

Lejeunea liromobana Singh Deo & D.K. Singh, Indian Journal of Forestry 39(4).359.2016. (LEJEUNEACEAE): This new species has been discovered and described from Liromoba, West Siang district of Arunachal Pradesh, India at 550m.

Lejeunea mizoramensis Sushil K. Singh, Indian Journal of Forestry 39(4).69.2016. (LEJEUNEACEAE): This new species has been discovered and described from Lunglei, Thorangtland Wildlife Sanctuary, Mizoram, India at 609m.

NEW VARIETY

Plagiochila parvivittata Inoue var. **siangensis** Singh Deo & D.K.Singh. Plant Science Today 3(1): 64.2016. (PLAGIOCHILACEAE): This new variety has been discovered and described from Mechukha (between Zupuk and Damingla forests) West Siang district of Arunachal Pradesh, India at 3300m.

LICHENS

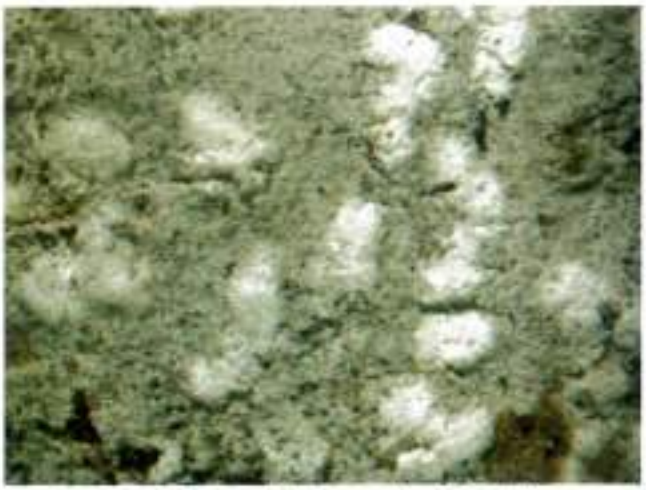
NEW SPECIES

Chiodecton norsticticum Jagadeesh, Phytotaxa 246 (4): 281. 2016. (ROCCELLACEAE): This new species has been discovered and described from Car Nicobar Island, Andaman and Nicobar Islands, India.

Cryptothecia albomaculans Jagadeesh & G.P. Sinha, Phytotaxa 266 (2): 104. 2016. (ARTHONIACEAE): This new species has been discovered and described from Wandoor beach forest, South Andaman, Andaman and Nicobar Islands, India.

Cryptothecia elata Jagadeesh & G.P. Sinha, Phytotaxa 266 (2): 105. 2016.(ARTHONIACEAE): This new species has been discovered and described from Gandhighat mangrove forest, Baratang Island, South Andaman, Andaman and Nicobar Islands, India.

Chiodecton norsticticum Jagadeesh



Cryptothecia superphyllinica Jagadeesh & G.P. Sinha

Cryptothecia elongata Jagadeesh & G.P. Sinha, Phytotaxa 266 (2): 107. 2016. (ARTHONIACEAE): This new species has been discovered and described from Nayadera mangrove forest, Baratang Island, South Andaman, Andaman and Nicobar Islands, India.

Cryptothecia superphyllinica Jagadeesh & G.P. Sinha, Phytotaxa 266 (2): 107. 2016. (ARTHONIACEAE): This new species has been discovered and described from Nayadera mangrove forest, Baratang Island, South Andaman, Andaman and Nicobar Islands, India.

Enterographa nicobarica Jagadeesh, Phytotaxa 246 (4): 283. 2016.(ROCCELLACEAE): This new species has been discovered and described from Katchal Island of the Nicobar Islands, Andaman and Nicobar Islands, India.

Gyrographa nigrofusca Jagadeesh, Phytotaxa 246 (4): 284. 2016. (ROCCELLACEAE): This new species has been discovered and described based on the collections made from North and Little Andaman Islands, Andaman and Nicobar Islands, India.

Myriostigma nicobaricum Jagadeesh & G.P. Sinha, Phytotaxa 266 (2): 108. 2016. (ARTHONIACEAE): This new species has been discovered and described from Little and Great Nicobar Islands, Andaman and Nicobar Islands, India.

Schmidleinema santiniketanense N. Keshari, Sudipta K. Das & S.P. Adhikary

Stigonema tagorum Sudipta K. Das, N. Keshari & S. P. Adhikary

ALGAE

NEW SPECIES

Schmidleinema santiniketanense N. Keshari, Sudipta K. Das & S.P. Adhikary, Phytotaxa 283 (2): 182.2016. (FISCHERELLACEAE): This new species has been discovered and described from lime-washed concrete building of Santiniketan Siksha Bhawan, Birbhum district of West Bengal, India at 52m altitude.

Stigonema tagorum Sudipta K. Das, N. Keshari & S. P. Adhikary, Nelumbo 58.153.2016. (STIGONEMATACEAE): This new species has been discovered and described from a Gandhi statue in Santiniketan, Birbhum district of West Bengal, India at 52m altitude.

FUNGI

NEW SPECIES

Colemaniella biligiriense Dubey and Sengupta, Curr. Res. Environ. App. Mycol. 6 (3): 199. 2016. This new hyphomycetous fungal species has been discovered and described from dried leaves of *Terminalia bellarica* (Gaertn.) Roxb., at moist deciduous forest of Biligiri Rangaswamy Temple Wildlife Sanctuary, Karnataka, India.

Cyathus thindii K. Das, Hembrom, A. Parihar & R.L. Zhao

Cyathus thindii K. Das, Hembrom, A. Parihar & R.L. Zhao, Turk. J. Bot. 40: 98. 2016. (AGARICACEAE): This new fungal species has been discovered and described from Bambusetum, Acharya Jagadish Chandra Bose Indian Botanic Garden, Howrah, West Bengal, India, at 5m altitude.

Lactifluus rajendrae Uniyal & K. Das, Phytotaxa 278 (3): 260. 2016. (RUSSULACEAE): This new fungal species has been discovered and described from Hariyali Devi Forest, Uttarakhand, India, at 1651m altitude.

Ramaria subalpina K. Das & K. Acharya, Phytotaxa 246 (2): 139. 2016. (GOMPHACEAE): This new fungal species has been discovered and described based on the collection made from subalpine forest, near Samthang, North district, Sikkim, India, at 3396m altitude.

Russula indoarmeniaca A. Ghosh, K. Das & R.P. Bhatt, Mycosphere 7 (6):779.2016 (RUSSULACEAE): This new fungal species has been discovered and described near Baniyakund, Rudraprayag district, Uttarakhand, at 2551m altitude.

Stigmina koyanensis Dubey & Sengupta, Plant Pathology & Quarantine 6(1): 55. 2016: This new fungal species has been discovered and described from dried and buried leaves in soil, at Koyana Wildlife Sanctuary, Maharashtra, India.

Tripospermum melghatensis R. Dubey, Journal on New Biological Reports 5(2):103. 2016: This new fungal species has been discovered and described from living leaves of *Terminalia* sp., from Melghat Tiger Reserve, Maharashtra, India.

Ramaria subalpina K. Das & K. Acharya

DISTRIBUTION RECORDS

SEED PLANTS

GENERA RECORDS

Beesia Balf. f. & Sm. (RANUNCULACEAE): This genus, earlier known from China and North Myanmar, has been reported for the first time from India based on the collection made from Pange-Talle Valley road, Lower Subansiri district, Arunachal Pradesh, India, at 2118 m altitude.

SPECIES RECORDS

Beesia calthifolia (Maximowicz ex Oliver) Ulbrich (RANUNCULACEAE): This species, earlier known from China and North Myanmar, has been reported for the first time from India based on thecollection made from Pange-Talle Valley road, Lower Subansiri district, Arunachal Pradesh, India, at 2118 m altitude.

Calligonum comosum L.'Her. (POLYGONACEAE): This species, earlier known from Pakistan, other parts of Western Asia and Africa, has been reported for the first time from India based on the collection made from Sattasar, Bikaner district, Rajasthan, India.

Impatiens mengtszeana Hook. f. (BALSAMINACEAE): This species, earlier known from China, Thailand and Vietnam, has been reported for the first time from India based on the collection made from sacred groves and reserve forests of Jaintia hills, Meghalaya, NE India.

Memecylon cerasiforme Kurz (MELASTOMATACEAE): This species, earlier known from Bangladesh, has been

Memecylon cerasiforme Kurz

Ranunculus hirtellus var. humilis W.T. Wang (Ranunculaceae)

reported for the first time from India based on thecollection made from Nalraja Garh,Chilapatha forest range, JaldaparaNational Park, Alipurduar district of West Bengal, India.

Oxygraphis delavayi Franchet (RANUNCULACEAE): This species, earlier known from China, has been reported for the first time from India based on the collection made from Sela Pass, Tawang District, Arunachal Pradesh, India, at 4108m altitude.

Veronica anagalloides Guss. (PLANTAGINACEAE): This species, earlier known from Afghanistan, China, Japan, Kazakhstan, Korea, Kyrgyzstan, Mongolia, Pakistan, Russia,Tajikistan, Turkmenistan, has been reported for the first time from India based on the collection made from Uttarakhandand Jammu & Kashmir.

SUB-SPECIES RECORD

Girardinia diversifolia (Link) Friis subsp. **suborbiculata** (C. J. Chen) C. J. Chen & Friis (URTICACEAE): This subspecies, earlier known from China and South Korea, has been reported for the first time from India based onthe collection made from Pauri, Garhwal region, Uttarakhand, at 1850m altitude.

VARIETAL RECORDS

Ranunculus hirtellus var. **humilis** W.T. Wang (RANUNCULACEAE): This variety, earlier known from China, has been reported forthe first time from India based on the collection made from Uttarakhand and Jammu & Kashmir.

Terminalia myriocarpa Van Heurck & Mull. Arg. var. **hirsuta** Craib (COMBRETACEAE): This variety, earlier known from China and Myanmar, has been reported for the first time from India based on thecollection made from Lower Sinche, Indira Bypass, Gangtok, Sikkim.

Diplazium proliferum (Lam.) Thouars (Athyriaceae)

FERNS AND FERN-ALLIES (PTERIDOPHYTES)

Diplazium proliferum (Lam.) Thouars (ATHYRIACEAE): This fern species earlier known from Africa, Mauritius, Rodriguez, Malaysia, Indonesia, Peninsular Thailand, Philippines,Polynesia and Queensland is first time recorded from India based on the collection made from White Surf Water Fall,Little Andaman, Andaman & Nicobar Islands at 23m.

BRYOPHYTES

Cololejeunea pseudoschmidtii Tixier (LEJEUNEACEAE): This species earlier known from China, Malaysia, Philippines and Vietnam has been reported for the first time from Indiabased on the collection made from Motor Bhanji, Chidiatapu, South Andaman of Andaman & Nicobar Islands, India at19m.

Cololejeunea subocelloides Mizut. (LEJEUNEACEAE): This species earlier known from China, Japan and Taiwan has been reported for the firsttime from India based on the collection made from Chittrey, West district of Sikkim at1988m.

Drepanolejeunea laciniata Qiong He & R.L.Zhu (LEJEUNEACEAE): This species earlier known from Thailand has been reported for the first time fromIndia based on the collection made from Thulung, North district of Sikkim at 2449m.

Herbertus ramosus (Steph.) H.A.Mill. (HERBERTACEAE): This species earlier known from Indonesia, Papua New Guinea, Philippines, Sri Lanka, Thailand and Vietnam has been reported for the first time from India based on the collection made on way to Tato (Mobu mountain) from West Siang district, Arunachal Pradesh at 3000m.

Lopholejeunea soae R. L. Zhu & Gradst. (LEJEUNEACEAE): The species earlier known from China and Thailand has been reported for the first time from India based on thecollection made from Payum, West Siang district of Arunachal Pradesh at 900m.

Radula chinensis Steph. (RADULACEAE): This species earlier known from Japan, Bhutan and China has been reported for the first time from India based on the collection made from on way to Melinza from Dichhu, Anjaw district of Arunachal Pradesh at 2000m.

Radula kojana Steph. (RADULACEAE): This species earlier known from China, Japan, Korea and Philippines has been reported for the first time from India based on the collection made from on way to Yasong from Menzong, Anjaw district of Arunachal Pradesh at 1000m.

Radula nymanii Steph. (RADULACEAE): This species earlier known from China, Fiji, Indonesia, Malaysia , Micronesia, New Caledonia , Papua New Guinea, Philippines, Samoa , Sri Lanka , Tahiti, Taiwan, Thailand, Vietnam and Australia has been reported for the first time from India based on the collection made from Navy Dera, Great Nicobar Island, of Andaman & Nicobar Islands at 48m.

Radula sumatrana Steph. (RADULACEAE): This species earlier known from China, Indonesia, Malaysia and Thailand has been reported for the first time from India based on the collection made from on way to Naying from Yapik, West Siang district of Arunachal Pradesh at 750m.

SUB-SPECIES RECORDS

Jubula hutchinsiae (Hook.) Dumort. subsp. **hutchinsiae** (JUBULACEAE): This species earlier known from Indonesia, Japan, Taiwan, Atlantic Europe and Macaronesia has been reported for the first time from India based on the collection made from Anjaw district, 8km from Hayuliang towards Holiang of Arunachal Pradesh at 820m.

LICHENS

Agonimia allobata (Stizenb.) P. James (VERRUCARIACEAE): This species earlier known from Europe and Northern America has been reported for the first time from India based on collections made near Majhola gaon, Barahi range of Mala Reserve Forest, Pilibhit district, Uttar Pradesh at 200m.

Alyxoria culmigena (Lib.) Ertz (LECANOGRAPHACEAE): This species earlier known from Africa, France, Galapagos Islands, Great Britain, Ireland, Malaysia, Papua New Guinea, South Korea, Tasmania and Thailand has been reported for the first time from India based on collection made from Car Nicobar Island, Andaman and Nicobar Islands.

Coenogonium aciculatum Lucking & Aptroot (COENOGONIACEAE): This species earlier known from Costa Rica, has been reported for the first time from India based on collections made from Garha range of Mahof Forest Reserve, Pilibhit district, Uttar Pradesh at 200m.

Graphis consanguinea (Mull. Arg.) Lucking

Malmidea bakeri (Vain.) Kalb, Rivas Plata & Lumbsch

Cryptothecia aleurodes (Nyl.) Makhija & Patw. (ARTHONIACEAE): This species earlier known from Mexico, Seychelles and Thailand has been reported for the first time from India based on Collection made from Great Nicobar Island, Andaman and Nicobar Islands.

Cryptothecia eungellae G. Thor (ARTHONIACEAE): This species earlier known from Australia, Java and Thailand has been reported for the first time from India based on collection made from Car Nicobar Island, Andaman and Nicobar Islands. The specimen is deposited in the HerbariumBotanical Survey of India,

Andaman and Nicobar Regional Centre, Port Blair (PBL).

Cryptothecia striata G. Thor (ARTHONIACEAE): This species earlier known from Europe, North and South America and Thailand has been reported for the first time from India based on collections made from North, South and Little Andaman Islands and Nicobar Islands, Andaman and Nicobar Islands.

Diorygma microsporum M. Caceres & Lucking (GRAPHIDACEAE): This species earlier known from Brazil, Colombia and Florida has been reported for the first time from India based on collection made from Nakkhola-Karachi Village, West Sikkim district, Sikkim.

Diploschistes microsporus Lumbsch & Elix (GRAPHIDACEAE): This species earlier known from Australia has been reported for the first time from India based on collection made from Mawmluh, Cherrapunjee of East Khasi Hill district, Meghalaya at 1300m.

Fissurina aggregatula Common & Lucking (GRAPHIDACEAE): This species earlier known from U.S.A. and Florida has been reported for the first time from India based on collection made from Setipool area, East Sikkim district, Sikkim.

Graphis consanguinea (Mull. Arg.) Lucking (GRAPHIDACEAE): This species earlier known from Brazil has been reported for the first time from India based on collection made from Armbi forest, Nilgiri district, Tamil Nadu.

Lithographa olivacea Fryday (TRAPELIACEAE): This species earlier known from New Zealand has been reported for the first time from India based on collections made from Neora Valley National Park, Darjeeling district of West Bengal.

Malmidea bakeri (Vain.) Kalb (MALMIDEACEAE): This species earlier known from Thailand, has been reported for the first time from India based on collections made fromMahof Forest Reserve, Pilibhit district, Uttar Pradesh at 200m.

Opegrapha trilocularis Mull. Arg. (ROCCELLACEAE): This species earlier known from Brazil, Gabon, Indonesia, Papua New Guinea, Philippines, New Caledonia, Rwanda and Zambia has been reported for the first time from India based on collections made from Nagdev forest, Pauri district, Uttarakhand.

Porina eminentior (Nyl.) P.M. McCarthy (PORINACEAE): This species earlier known from Australia, Brazil, New Guinea, New Caledonia, Tanzania and Thailand has been reportedfor the first time from India based on collection made from Baghmara-Sibbari Road, West Garo Hill district, Meghalaya.

ALGAE

Amphora inariensis Krammer (BACILLARIOPHYCEAE): This species earlier known from Canada Arctic Germany, Romania, Macedonia, Poland, U.S.A., Israel and Hawaiian Islands has been reported first time from India based on collection made from Madhuri Lake of Arunachal Pradesh.

Caloneis latiuscula (Kutz.) Cl. (BACILLARIOPHYCEAE): This species earlier known from Brazil, Britain, Germany, Romania and Israel has been reported first time from India based on collection made from Kyotso Lake and Nagula Lake of Arunachal Pradesh.

Centritractus ellipsoideus Starmach (XANTHOPHYCEAE): This species earlier known from Germany, Cuba and Brazil has been reported first time from India, based on collection made from Kyotso Lake and Madhuri Lake of Arunachal Pradesh.

Characiopsis columnaris Pascher (XANTHOPHYCEAE): This species earlier known from Netherlands and Romania has been reported first time from India, based on collection made from Nagula Lake of Arunachal Pradesh.

Chlamydomonas debaryana Gorozh. (CHLORAOPHYCEAE): This species earlier known from Britain, Germany, Romania, Spain, Brazil, Australia and New Zealand has been reported first time from India, based on collection made from Sela Lake of Arunachal Pradesh.

Decussata placenta (Ehrenb.) Lange-Bertalot & Metzeltin (BACILLARIOPHYCEAE): This species earlier known from Britain, Denmark, Germany, Spain, U.S.A. and Romania has been reported first time from India, based on collection made from a Lake near Y-junction of Tawang, Arunachal Pradesh.

Desmodesmus magnus (Meyen) Tsarenko (CHLORAOPHYCEAE): This species earlier known from Britain, Germany, Romania, Spain, Brazil, Turkey, Singapore, Hawaiian Islands, North America, Iran and Mexico has been reported first time from India, based on collection made from Maduri Lake of ArunachalPradesh.

Desmodesmus microspina (Chodat) Tsarenko (CHLORAOPHYCEAE): This species earlier known from Balearic Islands, Portugal Spain, Britain, Romania, Iceland and Cuba has been reported first time from India, based on collection made from Madhuri Lake and Sela Lake of Arunachal Pradesh.

Encyonema caespitosum Kutz. (BACILLARIOPHYCEAE): This species earlier known from Germany, Macedonia, Romania, Spain, Sweden, U.S.A., Turkey and Korea has been reported first time from India, based on collection made from Madhuri Lake of Arunachal Pradesh.

Eunotia inflata (Grunow) Norpel-Schempp & Lange-Bertalot (BACILLARIOPHYCEAE): This species earlier known from Britain, Germany, Spain, U.S.A., Singapore, Australia and Hawaiian Islands has been reported first time from India, based on collection made from Madhuri, Sela and Kyotso Lakes of Arunachal Pradesh.

Eunotia serra Ehrenb. (BACILLARIOPHYCEAE): This species earlier known from Britain, Germany, Spain, U.S.A., Singapore, Australia, Hawaiian Islands, Romania and Korea has been reported first time from India, based on collection made from Sela Lake of Arunachal Pradesh.

Gomphonema clavatum Ehrenb. (BACILLARIOPHYCEAE): This species earlier known from U.S.A., Australia, Denmark, Belgium, Germany, Macedonia, Romania and Turkey has been reported first time from India, based on collection made from Kyotso Lake of Arunachal Pradesh.

Pediastrum obtusum Lucksch (CHLOROPHYCEAE): This species earlier known from North America, Iran and Korea has been reported first time from India, based on collection made from Sela Lake of Arunachal Pradesh.

Tribonema viride Pascher (XANTHOPHYCEAE): This species earlier known from Britain, Czech Republic, Slovakia, Denmark, Germany, Netherlands, Romania, Spain, Portugal, Iceland, Argentina, U.S.A. and Australia has been reported first time from India, based on collection made from Madhuri Lake and Sela Lake of Arunachal Pradesh.

Trochiscia sporoides (Reinsch) Hansg. (CHLOROPHYCEAE): This species earlier known only from North America has been reported first time from India, based on collection made from Madhuri Lake of Arunachal Pradesh.

Ecbolium viride (Forssk.) Alston

Paphiopedilum fairrieanum (Lindl.) Stein

ex-Situ CONSERVATION

Botanical Survey of India, the apex research organization under the Ministry of Environment, Forest and Climate Change, Government of India, in the field of plant taxonomy, is actively engaged in *ex-situ* conservation programme through its chain of eleven Botanic Gardens established in different regional centres. All the gardens have been designed for collection, introduction, multiplication and maintenance of germplasms of orchids, bamboos, medicinal plants, palms, ferns, legumes, wild edible plants, insectivorous plants, gymnosperms and RET plants. Since their inception, all these gardens are doing excellent works in the field of *ex-situ* conservation, biodiversity conservation, education and awareness.

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

Ex-situ Conservation of Rare/ Threatened/Endemic Plants

A.J.C. BOSE INDIAN BOTANIC GARDEN, HOWRAH

During 2016-17, more than 400 saplings/propagules of 118 species of indigenous palms, orchids, medicinal and other economically important plants, collected from Sikkim, South India, Meghalaya and Odisha were introduced in the Garden. Details of plants collected and introduced are provided below: *Abies densa, Acampe praemorsa, Acrochaene punctata, Anthoganium gracile, Actinidia callosa, Arenga wightii, Bentinckia condapanna, Bucklandia populnea, Bulbophyllum bisetum, B. cauliflorum, Calamus baratangensis, C. erectus, C. vattayila, C. hookerianus, Cinchona pubescens,Coelogyne fuscescens, C. nitida, C. ovalis, C. prolifera, Cupressus cashmeriana, Cryptomeria japonica, Cymbidium eburneum, Cynometra travancorica, Dendrobium amoenum, D. chrysanthum, D. eriiflorum, D. macrostachyum, D. nobile, Dysoxylum malabaricum, Epigeneium amplum, Eria acervata, E.bractescens, E. coronaria, Eriobotrya petiolata, Gastrochilus calceolaris, Ginkgo biloba, Ipecacuanha officinalis, Jambosa formosa, Licuala rumphii, Liparis elliptica, L. resupinata, Livistona jenkinsiana, Luisia tristis, Malaxis acuminata, Magnolia campbellii, Michelia cathcarttii, Nephrosperma van-houtteanum, Nyssa javanica, Oberonia falcata, Otochilus albus, Papilionanthe uniflora, Phalaenopsis lobbii, Pinanga dicksonii, Phoenix rupicola, P. pusilla, Pinalia bractescens, Pleione praecox, Prunus campanulata, Quercus lamellosa, Q. lineata, Rhododendron arboretum, R. griffithianum, Taxus wallichiana, Trachycarpus martianus, T. latisectus, Vanda cristata, Vateria indica, V. macrocarpa, Vatica chinensis, Zeuxine longilabris* etc. In addition, several endemic and RET plants namely *Dipterocarpus indicus, Elaeocarpus floribundus, Kingiodendron pinnatum, Knema andamanica, K. attenuata, Terminalia myriocarpa, T. procera, Myristica andamanica, Pterocarpus dalbergioides* and *Vateria indica* etc, collected in earlier tours were also introduced in the respective Divisions of the garden. As part of *ex-situ* conservation programmes of AJC Bose Indian Botanic Garden, multiplication of a

total of 20,000 plants under 600 species including 110 species of RET & E, 330 tree/plant species having ornamental and economic values, 120 species of medicinal plants and 40 species of others were multiplied in the mist chamber and nursery since 2003. New techniques were developed for obtaining maximum rooting in some species such as *Maerua apetala, Pittosporum tobira, Sarcocephalus cordatus, Tectona hamiltoniana* etc. in mist chamber. Artifical pollination procedure of 'Double Coconut' Palm (*Lodoicea maldivica*) has been completely tuned and it gives a great hope to conservation world to multiply and conserve rare species of plants from extinction. This experiment took almost 07 yrs to get success. In order to revive Giant water lilies (*Victoria amazonica* & *V. cruziana*) in AJC Bose Indian Botanic Garden lakes from getting vanished, special germination technique to grow the plants from very old stock of seeds, were adopted which results successful regrowth of both the plant species.

ANDAMAN & NICOBAR REGIONAL CENTRE, BSI, DHANIKHARI EXPERIMENTAL GAEDEN-CUM-ARBORETUM, PORT BLAIR

During this period, a total of 1018 seedlings, bulbils, seeds, cuttings and rhizomes of 44 RET species (*Adonidia merrillii, Aerides emericii, Aglaia lawii, Areca triandra, Bentinckia condapanna, B.nicobarica, Calamus andamanicus, Caryota mitis, Cycas pschannae, C. zeylanica, Dillenia andamanica, Elaeocarpusganitrus, Eria andamanica, Euphorbia epiphylloides, Hyphaene thebaica, Korthalsia laciniosa, Luisia balakrishnanii, Mangifera andamanica, M.griffithii, Pandanus lerum* var. *andamanensium, Papilionanthe teres, Phoenix paludosa, Podocarpus neriifolius, Ptychosperma macarthurii, Schizostachyum andamanicum, Syzygium andamanicum, Terminalia manii etc*); 1046 seedlings, bulbils, seeds, cuttings, rhizomes of 49 medicinally important species (*Achyranthes aspera, Acmella paniculata, Albizzia lebbek, Alocasia decipiens, Aristolochia tagala, Artocarpus chaplasha, Bacopa monnieri, Butea monosperma, Cerbera manghas, Costus pictus, Crinum asiaticum, Dendrocalamus giganteus, Diospyros marmorata, D. pyrrhocarpa, Dipterocarpus turbinatus, Dracaena griffithii, Elephantopus scaber, Ganophyllum falcatum, Garcinia cowa, Heritiera littoralis, Hopea odorata, Hyptis suaveolens, Madhuca longifolia* var. *latifolia, Manilkara littoralis, Miliusa horsfieldii, Mucuna gigantea, Piper sarmentosum, Pongamia pinnata, Schizostachyum andamanicum, Scoparia dulcis, Semicarpus kurzii, Spodidias mangifera, Sterculia alata, Terminalia bialata, T. procera, Thottea tomentosa, Zingiber zerumbet* etc.) and a total of 214 seedlings, bulbils, seeds, cuttings, rhizomes of 35 ornamental species (*Aerides multiflora, Asplenium nidus, Bulbophyllum rufinum, B. careyanum, Coelogyne quadratiloba, Cycas rumphii, Dendrobium aphyllum, D. crumenatum, D. secundum, Epiphyllum oxypetalum, Geodorum densiflorum, Heterotis rotundifolia, Luisia tristis, Nervilia concolor, Nymphoides indica, Nymphaea pubescens, N. noucholi, N. omrana, Papilionanthe teres, Peristylus parishii, Pholidota imbricate, Pomatocalpa spicata, Rhynchostylis retusa, Thottea tomentose* etc.) were collected from various forest areas of Andaman & Nicobar Islands and introduced in the Dhanikhari Experimental Garden Cum Arboretum (DEGCA, Nayashahar).

ARID ZONE REGIONAL CENTRE, JODHPUR

During 2016-17, the following plants were collected and introduced in Desert Botanic Garden, Jodhpur, BSI.

RET plants: *Ceropegia bulbosa* var. *bulbosa, C. bulbosa* var.*lushii, Commiphora wightii, C. stocksiana, Periploca aphylla, Ephedra foliata, Oxystelma paniculata, Radermachera xylocarpa, Ensete superbum* and *Gloriosa superba*. **Medicinal plants**: *Careya arborea, Curculigo orchioides, Solanum trilobatum, Madhuca longifolia, Terminalia tomentosa, Euphorbia fusiformis, Desmodium giganteum, Asparagus racemosus, Curcuma amada, C. inodora, Butea monosperma, Caryota urens, Bacopa monnieri, Dioscorea alata, D. bulbifera, Chlorophytum borovillianum, Gymnema sylvestre, Sterculia foetida, S. villosa, Pedalium murex* and *Argenia indica*. **Plants of Botanical interests:** *Nervilia discolor, N. aragona, Crinum lorifolium, Acacia concinna, Butea superba, Bombax ceiba* and *Dendrobium microbulbon*. **Economically important plants:** *Desmodium oojeinense, Pterocarpus marsupium, Firmiania colorata* and *Casuarina equisetifolia*. **Ethno-religious plants:***Ficus benghalensis* var. *krishnae, Desmostachya bipinnata* and *Couroupita guianensis*.

Ornamental plants: *Ficus elastica* and 15 variants of other winter annuals. Besides, regarding *ex-situ* conservation programme, seedlings of *Tephrasia villosa, T. collina, T. falciformis, Indigofera tinctoria, Moringa oleifera, Psoralea corylifolia, Citrullus colocynthis, Centratherum anthelminticum, Abrus precatorius, Adenanthera pavonina, Luffa acutangula* var. *amara, Lagenaria siceraria, Uraria picta, Cassia alata* were raised in nursery and planted in Experimental Botanic Garden, Jodhpur. Seeds of *Acacia jacquemontii* and *Cadaba fruticosa* and fruits of *Dregea volubilis* and two types of *Lagenaria siceraria* were collected to raise seedlings in the nursery and for display in museum respectively.

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

During 2016-17, live plants collected during field tour by different scientists of the centre were introduced in the garden and phenological data were recorded.

BOTANIC GARDEN OF INDIAN REPUBLIC, NOIDA

As part of *ex-situ* conservation programme, several trees, shrubs, herbs and climbers were planted in BGIR, Noida.

These plants were introduced in BGIR from different parts of the India. The seedlings were raised from the seeds collected from all over the country. Germination trials for 12 seeds of tree species were conducted during the period and a total of 85 plant saplings were developed. The germination trials were successfully conducted for 12 species. The seeds of 17 plant species were collected, dried and stored at seed bank during the study period. Out of 17 plant species 16 were tree species and 01 was shrub. As a part of funded project, a total number of *Pittosporum eriocarpum* (2000), *Lilium polyphyllum* (500), *Ephedra gerardiana* (300), *Crepidium acuminatum* (1000) and *Skimmia anquetilia* (700) saplings were propagated in the nursery of BSI, NRC. Maintained *Swarna Jayanti Udyan* designated for *ex-situ* conservation of RET and economic plants; *Dhanvantari Aushadh Vatika*- designated as Medicinal plant garden and *Fernery*, recently established for conservation of RET, endemic and economically important ferns.

CENTRAL REGIONAL CENTRE, ALLAHABAD

During 2016-17, 03 species, namely *Drosera burmanii*, *Vanda tessellata* and *Curculigo orchioides* were introduced in the associated Botanic Garden of CRC, Allahabad. In addition, as part of *ex-situ* conservation programme, phenological data of *Saraca asoca*, *Phyllanthus acidus*, *Lannea coromadeliana*, *Strychnos nux-vomica*, *Melia azedarach*, *Phyllanthus emblica*, *Bombax ceiba*, *Tabebuia palmeri*, *T. rosea*, *Opuntia cochenillifera*, *Wrightia tinctoria*, *Moringa oleifera*, *Tabebuia argentea*, *Eranthemum pulchellum*, *Thespesia populnea*, *Morus alba*, *Justicia adhatoda*, *Annona muricata*, *Crotalaria spectabilis*, *Dombeya mastersii*, *Gmelina arborea* etc., were documented.

EASTERN REGIONAL CENTRE, SHILLONG

During 2016-17, as part of *ex-situ* conservation of endemic, threatened and economically important plants of the region and recording of phenological data on flowering and fruiting period of species growing in the Garden, several local field trips were conducted; received plants from different areas such as Sumer and nearby areas, Ri-bhoi, Meghalaya, NBPGR KBET Nongbrei forests; Umroi forests, Jaintia hills, Cherrapunjee, Mawsynram, Nagaland, Pynursula, Acharya Jagadish Chandra Bose Indian Botanic Garden, Kolkata and introduced following plants in Garden, namely *Abelmoschus* sp. (20 Fruits), *Acampe* sp. (8 Nos.), *Acanthephippium* sp. (8 Nos.), *Acanthephippium sylhetense* (2 individuals), *Acorus calamus*, *Adiantum* sp. (2 individuals), *Aerides* sp. (4 Nos.), *Aeschynanthus sikkimensis* (5 individuals), *Aeschynanthus* sp. (4 individuals); *Begonia* sp. (4 Nos.); *Agapetes odontocera* (1 individual and 5 cuttings), *Agapetes* sp. (10 individuals.), *Agrostophyllum brevipes* (2 individuals), *Agrostophyllum callosum* (2 individuals), *Agrostophyllum* sp. (6 Nos.), *Aleuritopteris* sp. (7 individuals), *Aleuritopteris subdimorpha* (4 Nos.), *Aloe vera*, *Alpinia* sp. (19 individuals), *Angiopteris indica* (1 individual), *Anoectochilus roxburghii* (3 individuals), *Anthogonium gracile* (4), *Aqilaria khasiana* (an endemic and critically endangered sp.) (3 Nos.), *Ardisia macrocarpa* (30 Seeds), *Areca nagensis* (3 individuals), *Arisaema album* (2 Nos.), *Arundina graminifolia* var. *revoluta* (22 individuals), *Arundinaria griffithii* (1 No.), *Asparagus racemosus* (3 Nos.), *Asplenium phyllitidis* (2 individuals), *Asplenium* sp. (40 Nos.), *Asplenium tenuifolium* (3 individuals), *A. yoshinagae* (8 individuals), *A. yoshinagae* subsp. *indicum* (4 Nos.), *Athyrium* sp. (3 individuals), *Bambusa* sp. (3 suckers), *Bambusa* sp. (12Nos.), *Begonia hatacoa* (2 Nos.), *B. palmata* (2 individuals), *Berginia ciliata*, *Blechnum orientale* (15 Nos.), *Blechnum* sp. (3 individulas), *Brachycorythis obcordata* (3), *Brainea insignis* (40 Nos.), *Bulbophyllum cauliflorum* (2 individuals), *B. helenae* (2 individuals), *B. odoratissimum* (6 individuals), *Bulbophyllum* sp. (13 Nos.), *Bulbophyllum* spp. (2 Nos.) (7 individuals); *Bulbophyllum* spp. (5 Nos.); *Calamus* sp. (3 Nos.), *Calophyllum polyanthum* (20 seeds), *Celogyne fuscescens* (2 individuals), *Celogyne* sp. (3 sp.) (50 individuals), *Cephalostachyum mannii* (3 Suckers), *Chimonocalamus griffithianus* (4 Suckers), *Chlorophytum* sp., *Citrus latipes* (4 individuals), *Citrus* sp. (6 Cuttings), *Clerodendrum infortunatum* (10 Cuttings), *Coelogyne prolifera* (6 Nos.), *Coelogyne* sp. (10 Nos.), *Crepidium* sp. (2), *Cyathea chinensis* (3 Nos.), *C. gigantea* (15 Nos.), *Cymbidium* sp. (6 individuals), *Davallodes* sp. (6 individuals), *Diplazium* sp. (5 individuals), *Dendrobium acinaciforme*; *D. aphyllum* (4 Nos.), *D. chrysotoxum* (4 Nos.), *D. crepidatum* (2 Nos.), *D. eriiflorum* (2 Nos.), *D. falconeri* (2 Nos.), *D. jenkinsii*; *D. longicornum* (2 individuals), *D. ochreatum* (4 Nos.), *D. parcum* (2 Nos.), *D. porphyrochilum* (3), *Dendrobium* sp. (20 individuals), *Dendrocalamus* sp. (3 individuals), *Dennstraedtia scabra* (3 individuals), *Dichroa febrifuga* (10 Cuttings), *Dienia ophrydis* (4), *Dioscorea alata* (2 Nos.), *Dioscorea* sp. (2 Nos.), *Diospyros lanceifolia* (20 Seeds), *Diplazium* sp. (5 individuals), *Disopyros virginiana*, *Dryopsis* sp. (5 individuals), *Dryopteris cochleata* (3 individuals), *D. juxtaposita* (2 individuals), *Dryopteris* sp. (3 individuals), *Dryopteris* sp. (3 individuals), *D. sparsa* (2 individuals), *Elaeagnus pyriformis* (10 Cuttings), *Elsholtzia blanda* (2 Nos.), *Entada rheedii* (4 Nos.), *Equisetum* sp. (15 individuals), *Eria acervata* (3 Nos.), *E. amica* (4 Nos.), *E. bambusifolia* (2 individuals), *E. coronaria* (9 individuals), *E. pannea* (8 Nos.), *Eria* sp. (16 Nos.), *Eria* spp. (3 spp.) (13 individuals), *Esmeralda cathcartii* (4 Nos.), *Etlingera* sp., *Exacum* sp., *Garcinia acuminata* (5 Nos.), *Gastrochilus inconspicuous* (2), *Gastrochilus* sp. (2 Nos.), *Gloriosa superba*, *Gnetum* sp. (1 No.), *Goodyera procera* (2 individuals), *Goodyera* sp. (4 individuals), *Habenaria aquifera* (4Nos.), *Habenaria khasiana* (4), *Haematocarpus*

validus (5 individual), *Hedychium* (2spp.), *Hedychium ellipticum, H. ellipticum, H. gracile* (8 Nos.), *H. spicatum* (var. *acuminatum*), *Hedychium* spp. (4 Nos.) (26 individuals), *H. stenopetalum, Histiopteris incisa,* (20 individuals), *Homalomena aromatica; Hoya lobbi* (2), *Hoya* sp. (2 Nos.), *Huperzia serrata* (5 individuals), *Huperzia squarrosum* (5), *Impatiens latiflora; Justicia gendarussa, Kaempferia rotunda, Kaempferia* sp., *Lepisorus scolopendrium* (3 Nos.), *Lepisorus* sp. (5 individuals), *Liculia* sp. (4 individuals), *Lindsaea odorata* (2 Nos.), *Liparis cordifolia* (2), *L. luteola* (30 individuals), *L. odorata* (5), *Lycopodiella cernua* (3 Nos.), *Lycopodium* sp. (3 Nos..). (15 individuals), *Mangifera* sp. (1 individual), *Otochilus* sp. (2 individuals), *Melastoma* sp. (4 individuals), *Microlepia firma* (3 Nos.),*M. hancei* (4 Nos.), *Micropera* sp. (4 Nos.), *Microsorum membranaceum* (3), *Microsporium* sp. (2), *Molineria* sp. (4 individuals), *Musa* (3sp.), *Musa* sp. (4 suckers), *Neogyna* sp. (6 Nos.), *Nepenthes khasiana* (1 individual), *Nephrolepis* sp. (2 sp.20 Nos.), *Oberonia* sp. (7), *Odontosoria chinensis* (2 Nos.), *Otochilus* sp. (6 Nos.), *Palm* sp. (3 individuals), *Panisea* sp. (7 individuals), *Paphiopedilum insigne* (2 individuals), *P. venustum* (1 individual), *Papionanthe teres* (4 Nos.), *Peranema aspidiodes* (2 individuals), *Phaius mishmensis* (22 individuals), *P. tancarvilleae* (27 individuals), *Phalaenopsis* sp. (2 Nos.), *Phoebe hainesiana, Phoebe* sp. (4 individuals), *Pholidota imbricata* (8 individuals), *Pholidota* sp. (13 Nos.), *Piper* (3 spp.) (20 Cuttings), *Polystachya* sp. (3 individuals), *Polystichum lentum* (3 individuals); *Polystichum* spp. (3 spp.) (45 individuals), *Porpax* sp. (4 Nos.), *Pothos chinensis* (6 Cuttings), *Pteris aspericaulis* (4 Nos.), *Pteris* sp. (12 individuals), *Pteris* sp. (3 sp. c. 30 Nos.),*Pteris tricolor* (2 Nos.), *Pyrenaria khasiana* (2 individuals), *Pyrrosia lingua* (4), *P. flocculosa* (2 Nos.), *Pyrrosia* sp. (10 individuals), *Rhynchostylis retusa* (1 individual), *Rhynchostylis* sp. (2 Nos.), *Rubus ellipticus* (10 Cuttings), *Saurauia napaulensis* (8 Cuttings), *Schoenorchis* sp. (3 Nos.), *Selaginella hookeri* (25 individuals), *Selaginella* sp. (30 Nos.), *Selliguea oxyloba* (3), *Selliguea* sp. (2 individuals), *Solanum anguivi* (100 seeds & 8 cuttings), *Spondias pinnata, Taxus baccata, Tectaria polymorpha* (2 Nos.), *Thelasis* sp. (2 individuals), *Thelypteris* sp. (2 Nos.), *Torenia violacea* (6 Nos.), *Tupistra* sp., *Usenia hirsuta* (8 individuals), *Vaccinium* sp. (3 individuals), *Valeriana* sp., *Vanda* sp. (4 Nos.), *Vernonia volkameriifolia* (10 Cuttings), *Victoria cruziana* (33 seeds), *Wallichia densiflora, Woodwardia* sp. (7 individuals), *Xantolis hookeri* (20 seeds), *Zanthoxylum armatum* (100 seeds & 10 cuttings), *Zeuxine* sp., *Zingiber* sp. (5 rhizomes). Beside Multiplication of following species has been done by seed germination/ seedlings/ stem cuttings *viz., Allamanda cathartica* (75 cutting), *Caryota urens* (35 seedling), *Clerodendrum indicum* (80 seeds and stem cutting), *Euphorbia cyatophora* (75 stem cutting), *Melastoma malabathricum* (75 stem cutting), *Mussaenda glabra* (80 stem cutting), *Nepenthes khasiana* (75 stem cutting) and maintained in Nursery Shed- I c. 250 cuttings of *Aquilaria malaccensis* planted in the rooting box for root development. *Oroxylum indicum* (3 Nos.). *Citrus* sp. (3 Nos.) and *Cymbopogon citratus* (3 Nos.)., *Adenanthera pavonina, Aesculus assamica, Agathis robusta, Citrus* sp., *Camelia japonica, Gymnocladus assamicus, Mesua ferrea, Ormosia pinnata, Ormosia robusta, Saraca asoca* and *Taxus baccata.* Under work of Flora of West and South West Khasi Hills, 87 live plants including orchids were collected for *exsitu* conservation in Botanical Garden, Shillong, namely *Acampe* (1sp.), *Acanthephippium* (1 sp.), *Aerides odorata, Agrostophyllum* (2 sp.), *Begonia* (1 sp.), *Bulbophyllum gymnopus, B. striatum, Bulbophyllum* (5sp.), *Calanthe* (1 sp.), *Cephalantheropsis obcordata, Colocasia* (1sp.), *Cleiesostoma* (1sp.), *Coelogyne barbata, Coelogyne* (4sp.), *Crepidium* (3sp.),*Cymbidium aloifolium, C. cochleare, C. cyperifolium, C. lancifolium, Dendrobium anceps, D. aphyllum, D. chrysanthum, D. cumulatum, D. devonianum, D. eriiflorum, D. heterocarpum, D. hookerianum, D. lindleyi, D. ochreatum, D. nobile, D. stuposum, D. longicornu, Epigeneium fuscescens, Eria bambusifolia, E. coronania, E. tomentosa, Eria* (2 sp.), *Flickingeria fugax, Eroides barbata, Eulophia* (1 sp.), *Goodyera procera, Impatiens latiflora, I. acuminata, Impatiens* (1 sp.), *Lasia* (1 sp.), *Liparis cordifolia, L. elliptica, L. luetola, L. resupinata, Micropera* sp.(1), *Nephelaphyllum*sp., *Oberonia* (4 sp.), *Otochilus* (2sp.), *Odontochilus, Pholidota imbricata, Pholidota rubra, Pholidota* (2 sp.), *Pleoine maculata, P. praecox, Rhomboda* sp., *Rhyncostylis retusa, Tainia* sp., *Thelasis* sp., *Thrixperma* sp., *Thunia alba, Uncifera acuminata, Vanda* (2 sp.), *Zeuxine affinis.* In addition, general maintenance works *i.e.,* potting/ repotting, pruning, regular watering, making beds for planting, clearing of weeds, etc. was carried out in the Experimental Botanic Garden, Botanical Survey of India, ERC, Umiam, Barapani. Name boards for various groups of plants such as tree species, Zingers planted in Zingiber plot, Medicinal plants and other economically important plants available in the garden were arranged. The information boards also placed for orchid houses, fern houses, Bambusetum, *Zingiber* section, *Nepenthes khasiana, Paphiopedilum, Taxus baccata,*Tree ferns, *Bergenia ciliata* and *Disocorea* section.

In the presence of the honourable Secretary Shri A.N. Jha, Joint Secretary Shri M.K. Singh and Additional Secretary Dr. M.M. Kutty of MOEF & CC, Dr. Paramjit Singh, Director of Botanical Survey of India, Dr. Kailash Chandra, Director of Zoological Survey India, a Fern House was inaugurated on 04.08.2016.

EXPERIMENTAL GARDEN, MUNDHWA

During 2016-17, 56 species were collected and introduced in Garden, *viz. Aerides crispa, A. ringens, A. maculosa,*

Bulbophyllum sterile, Cleisostoma tenuifolium,Cottonia peduncularis, Dendrobium crepidatum(= D. lawianum), Gastrochilus acaulis, Oberonia recurva, O. brononiana, O. verticillata, O. mucronata, Pholidota imbricata, Sirhookera lanceolata, Smithsonia maculata, Trias stocksii, Luisia tristis, L. trichorhiza, Smithsonia straminea, Barleria acanthoides, B. cristata, B. strigose, B. lawii, B. grandiflora, B. prionitis. Thunbergia mysorense, Bulbophyllum fuscopurpureum, Cymbopogon caesius, Kalanchoe floribunda, Euphorbia trigona, Peperomia dindigulensis, Habaneria sahyadrica, Drimia indica, Epipogium roseum, Pachystoma pubesens, Tainia bicornis, Cymbidium bicolor, Coelogyne nervosa, Dendrobium heterocarpom, Eria mysorensis, E. polystachya, E. pseudocalvis, Aeschynanthus perottetiana, Vanilla walkeriae, Papilionanthe subulata, Hyperisum mysorense, Clausena indica, Caralluma umbellata, Kalanchoe bhidei, Adiantum capillus, Actinopteris radiata, Angiopteris evecta, Osmunda hugeliana and *Cyathea gigantea*.

NATIONAL ORCHIDARIUM AND EXPERIMENTAL GARDEN, YERCAUD

As part of *ex-situ* conservation programme, 06 field tours were conducted to Silent Valley National Park, Kerala and collectively vouched 84 Orchid species. In addition, 05 local tours were undertaken in Yearcaud areas and collected a total of 326 live plants for the purpose of introduction in NOEG, Yercaud. Phenological database of 363 orchids and other plants was prepared.

NORTHERN REGIONAL CENTRE, DEHRADUN

During 2016-17, 01 *ex-situ* conservation tour was conducted to Sonanadi Wildlife Sanctuary and collected 18 live plants including 09 RET plants for introduction in Garden, NRC, Dehradun. Besides, as part of DBT funded project, 16 field tours were conducted in different regions of Western Himalayas to locate threatened species, *viz. Pittosporum eriocarpum, Lilium polyphyllum, Crepidium acuminatum, Skimmia anquetilia* and *Ephedra gerardiana*. The total number (within bracket) of *Pittosporum eriocarpum* (2000), *Lilium polyphyllum* (500), *Ephedra gerardiana* (300), *Crepidium acuminatum* (1000) and *Skimmia anquetilia* (700) saplings were propagated in the nursery of BSI, NRC.

***In-vitro*/Micropropagation of RET Plants**

EASTERN REGIONAL CENTRE, SHILLONG

During this period, callus of *Rhododendron coxianum* were subcultured in different concentrations of 2ip for further experiments for chemical analysis, shooting and plants were maintained in greenhouse; c. 7000 seedlings of *Cymbidium tigrinum* were grown in culture room, c. 2000 seedlings were subcultured and c. 100 plants were planted in greenhouse. About 250 plants of *Armodorum senapatianum* were subcultured and experiments were conducted for mass multiplication

ex-Situ conservations of *Lilium*

inside the culture room. Approx. 70 plants were planted in greenhouse. Seed germination experiments on *Ilex khasiana* and *Paphiopedilum hirsutissimum* are in process. As outcome of the experiments, 39 plants of *Rhododendron coxianum*, 100 plants of *Cymbidium tigrinum* and 70 plants of *Armodorum senapatianum* were successfully grown in greenhouse. An efficient *in vitro* protocol was standardized for large scale propagation of *Pyrenaria khasiana* through tissue culture technique. Direct shoot induction from the callus derived from leaves of *Paris polyphylla* was observed and more experiments are being conducted to standardize the protocol. Experiments with different explants like rhizomes and leaves of *Paris polyphylla* were used with different plant growth regulators in MS medium (both half and full strength) for callus induction and direct shoot induction. In connection with this, quantitative analysis of medicinal plants *viz., Aristolochia saccata, Paris polyphylla, Citrus indica, C. latipes* and *Curcuma aurantiaca* has been completed using GC-MS analysis.

Northern Regional Centre, Dehradun

During 2016-17, *Catamixis baccharoides* and *Incarvillea emodi* seeds were collected from wild habitat; properly sterilized seeds were germinated *in vitro* in basal MS medium. Shoot tips from the *in vitro* germinated seedlings of *Catamixis baccharoides* were used as explants for the shoot induction and proliferation. The well developed shoots were shifted into the root induction medium and well developed roots were obtained.

RESEARCH PUBLICATIONS

Catunaregam spinosa (Thunb.) Tirveng.

RESEARCH PUBLICATIONS

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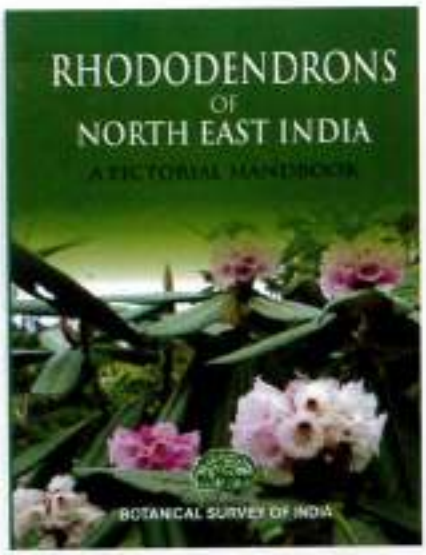
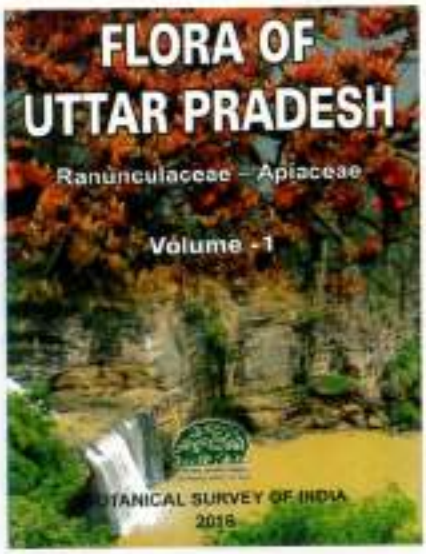
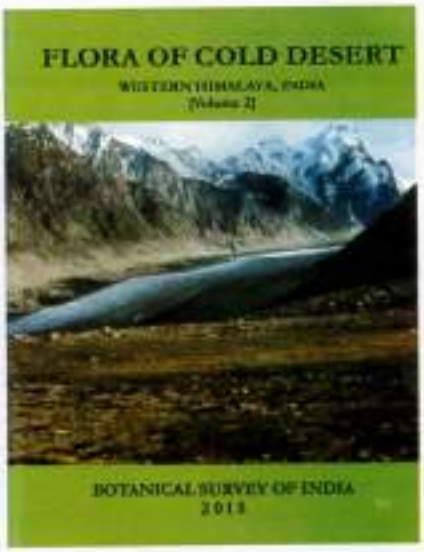
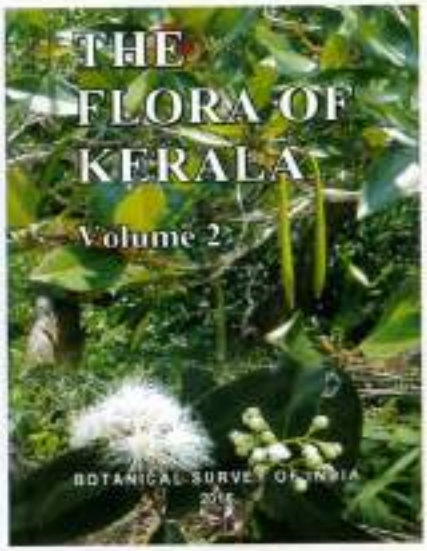
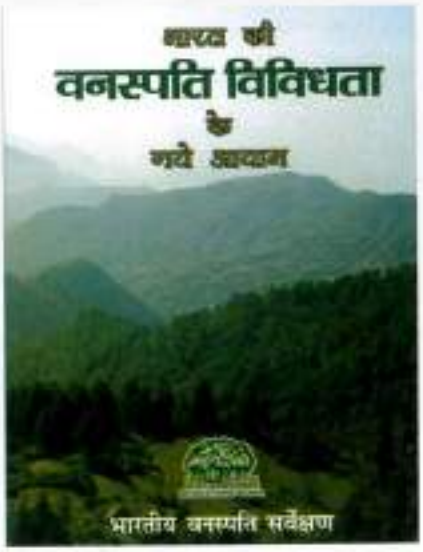
BOOKS PUBLISHED BY BOTANICAL SURVEY OF INDIA DURING 2016-17

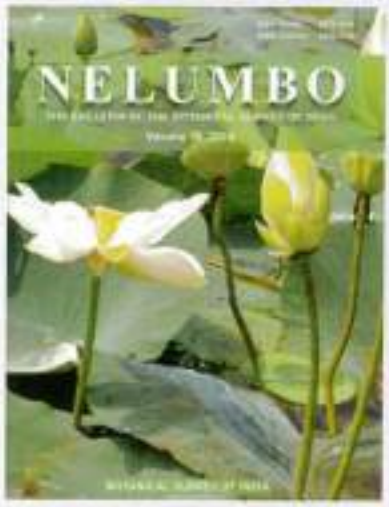


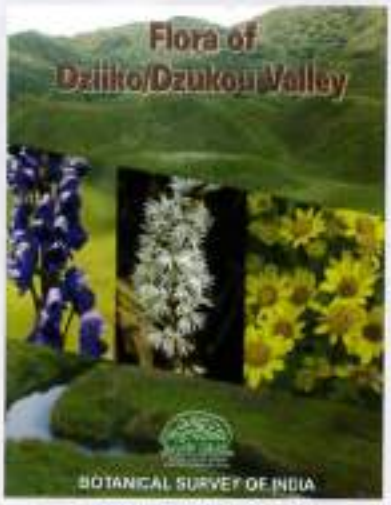


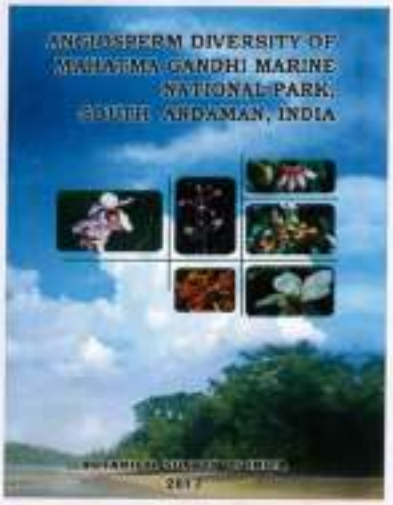


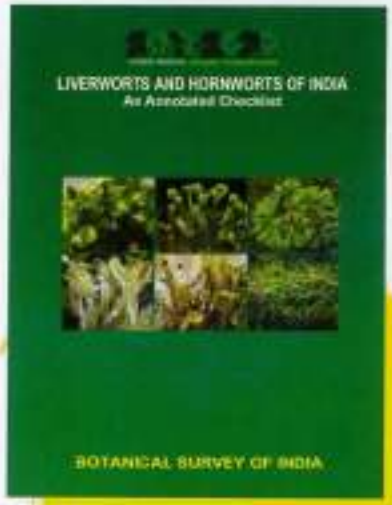


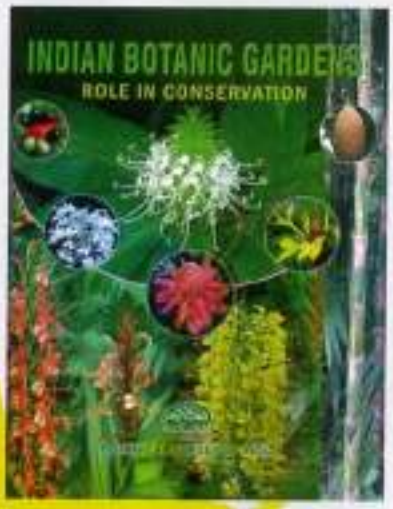



NELUMBO

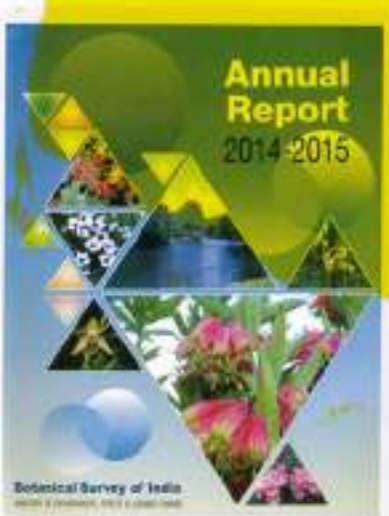

Flora of
Dzüko/Dzukou Valley
BOTANICAL SURVEY OF INDIA

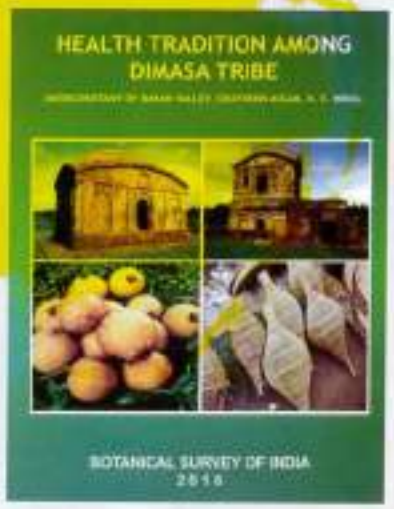

ANGIOSPERM DIVERSITY OF
MAHATMA GANDHI MARINE
NATIONAL PARK,
SOUTH ANDAMAN, INDIA

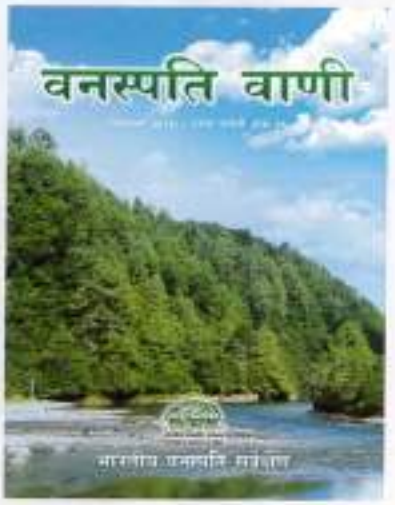

LIVERWORTS AND HORNWORTS OF INDIA
An Annotated Checklist
BOTANICAL SURVEY OF INDIA


INDIAN BOTANIC GARDENS
ROLE IN CONSERVATION


CHECK LIST
OF
FLORA OF NAGALAND


Annual
Report
2014-2015
Botanical Survey of India


HEALTH TRADITION AMONG
DIMASA TRIBE
BOTANICAL SURVEY OF INDIA
2016


वनस्पति वाणी

SEMINAR/SYMPOSIUM/ CONFERENCE/WORKSHOP/ TRAINING ATTENDED BY SCIENTISTS OF BSI

A view of Eagle Nest Wildlife Sanctuary, West Kameng, Arunachal Pradesh

SEMINAR / SYMPOSIUM / CONFERENCE / WORKSHOP / TRAINING ATTENDED BY SCIENTISTS OF BSI

Dr. A.A. MAO

Organised and attended a three days 'Botanical Nomenclature Workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended one day Photographic Training Programme on 9thJune, 2016 at BSI, ERC, Shillong and invited Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a lecture on Remote Sensing and GIS application in Forestry and Ecology on 19th October, 2016.

Attended National Seminar on Ethnobiology and Traditional Knowledge, from 01st - 03rd February,2017 at Assam University, Silchar. Dr. Mao delivered a keynote address entitled Some key issues on ethnobotanical studies in North East India.

Attended one day Capacity Building Workshop on "Conservation of Biodiversity through Implementation of Biodiversity Act" organised by Forest Department, Meghalaya at Multi Use Convention Centre NEHU on 16th December, 2016.

Attended a workshop organized by The State Council of Science, Technology & Environment Meghalay (SCSTE) in collaboration with BSI and ZSI on World Environment Day, on 5th June, 2016.

Attended a Training Programme on Digital Payments on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Delivered a Key Note address entitled 'Taxonomy in documentation of medicinal plant' in the National Seminar Role of AYUSH in Healthcare Management in NE India conducted by North Eastern Institute of Ayurveda & Homoeopathy (NEIAH), Shillong.

Delivered a talk at YETI conference organized by Tezpur University, 4-7th January, 2017.

Attended one day Taxonomic meeting organized by IBSD at DBT, New Delhi on 20th January, 2017.

Attended two days Global Sustainable Development Summit during 5th-6thDecember, 2016 towards United Nations Sustainable Development Goals at NEDFI Convention Centre, Guwahati, Assam and presented an invited lecture on Plant taxonomy and sustainable development of bio-resources' organized by Institute of Bioresources and Sustainable Development (IBSD), an autonomous Institute under the Department of Biotechnology, Govt. of India.

Attended stakeholder Consultation Meeting on 'State Biodiversity Strategy & Action Plan' on 13th December 2016 at the Conference hall of the Sylvan House, Lower lachumiere, Shillong.

Delivered Annual lecture for 'Botanical Society of Assam' at Annual Lecture Cum Annual General Body meeting and delivered a lecture on the topic 'Plant Taxonomy and Conservation'held at B. P. Chaliha College, Nagarbera, Kamrup on 1st October, 2016.

Attended International Conference on Global Biodiversity, Climate Change and Sustainable Development 2016 held at Rajeev Gandhi University, Arunachal Pradesh, India from 15th–18th Octber, 2016 and delivered an invited lecture on entitled 'Taxonomy, Biodiversity and Conservation' and also chaired a technical session.

Attended a plantation programme organized by BSI/ERC/Shillong in collaboration with SOS children's village, Shillong at SOS village, Umiam on 21st May, 2016 to celebrate International Biodiversity Day.

As Chief Guest, delivered a talk on 'The importance of biodiversity to agriculture' which was followed by tree plantation (saplings distributed by BSI) to celebrate International Biodiversity Day at Central Agricultural University, Barapani.

Delivered an invited lecture on 'Medicinal plants of North East India' for the students of Environmental Science, Martin Luther Christian University, Shillong on 28th April, 2016.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and participated in Annual Scientific Meet on 14th-16th February, 2016, venued at Central National Herbarium, Botanical Survey of India, Howrah.

Dr. A. PRAMANICK

Attended a seminar on 'Joseph Dalton Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University, Kew Garden on, U.K, on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended a seminar on 'Plant Science' organised by Hooghly Mohsin College, Chinsurah on 2nd December, 2016.

Attended a lecture by Prof. S.R. Yadav on *Aponogeton* sp. on 4th July, 2016, venued at CNH Committee room, Howrah.

Attended an International Conference on 'The Green Planet : Past, Present, and Future'from 21st -23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' from14th-15th January, 2017 at CNH, BSI.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and participated in Annual Scientific Meet from 14th-16th February, 2017 held at CNH, Botanical Survey of India, Howrah.

Attended a lecture on 'KAS PLATEAU: A Botanical Paradise' by Dr. M. Sanjappa, Former Director, BSI on 23rd November, 2016, venued at CNH Committee room.

Attended a lecture on 'Taxonomy and Ecology of Cyanobacteria and Algae from Polar Regions' delivered by Dr. Lubomir Kovacik, Assistant Professor, Department of Botany, Comenius University, Bratislava, Slovakia on 20th December, 2016, at CNH Committee room.

Attended an international Seminar on 'Sacred Groves of India' on 30th March, 2017 at Ashutosh Bicentenary Hall, Indian Museum, Botanical Survey of India.

Dr. A.K. SAHOO

Attended NCDDO meeting of implementation of BEMS held at Ministry of Environment, Forest & Climate Change, New Delhi, on 23rd January,2017.

Participated in International Mother Earth Day celebration held at Indian Museum, BSI, ISIM with 31 exhibits of Medicinal, Oilseeds, Gum & Resins and Fibre-yielding plants on "Bioperspective plants of India" on 22nd April, 2016.

Participated at 'Vision Vibrant Uttar Pradesh-2016' at Lucknow, UP from 26th-28thNovember, 2016.

Participated at Damodar Mela at Raspur, Amta, Howrah from 7th-13th December, 2016.

Participated at 'Vigyan Anyeswan Science Fair' at Santoshpur from 31st December, 2016 - 1st January, 2017.

Organised and participated a seminar on 'J.D.Hooker : Botanical trailblazer and the botanical Heritage of India' on 1st-2nd October, 2016 at Indian Museum, BSI, ISIM, Park Street, Kolkata.

Attended a National Seminar on 'Medico-religious belief and traditional use of some plants of tribal community of Odisha, India' organised by Centre of Excellence, Dept. of Oria, VisvaBharati, Shantiniketan and delivered a lecture from 2nd-4th March, 2017 and another National Seminar at North Orissa University, Baripada from 22nd-23rd March, 2017 and delivered a lecture on Traditional Knowledge in pursuit of conservation of some plants by tribal community in Odisha'.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February,2017 and participated in Annual Scientific Meet from 14th-16th February, 2017, held at CNH, Botanical Survey of India, Howrah.

Attended an International Seminar on 'Sacred Groves of India'on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Dr. A. BENNIAMIN

Attended a training on 'Essentials in Plant Revisionary Studies and Flora writing' organised by NGCPR in collaboration with BSI, WRC from 1st-3rd December, 2016.

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12thFebruary, 2017.

Participated in Annual Scientific Meet from 14th-16th February, 2017 at CNH, Botanical Survey of India, Howrah.

Dr. A.B.D. SELVAM

Attended a two days training programme on 'Training on basics on plant nomenclature' from 14th-15th January, 2017, organized by ENVIS Centre, BSI, Howrah, venued at auditorium of CNH, Howrah.

Participateda seminar on 'J.D.Hooker : Botanical trailblazer and the botanical Heritage of India' on 1st-2nd October, 2016 at Indian Museum, BSI, ISIM, Kolkata.

Attended and participated 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and Annual Scientific Meet from 14th-16th February, 2017 at CNH, Botanical Survey of India, Howrah.

Attended one day International seminar on 'Forests, Sacred Groves and the Environmental Heritage of India' held at Ashutosh Centenary Hall, Indian Museum, Kolkata on 30th March, 2017.

Dr. (Mrs.) ARTI GARG

Participated in 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Participated in Annual Scientific Meet from 14th-16th January, 2017 at CNH, Botanical Survey of India, Howrah.

Attended Northern 'Regional Workshop on Wetland Biodiversity: Restoration and Survival', at DBS College, Kanpur on 17th November,2016 and delivered a lecture on 'Floristic diversity and useful plant resources of Upper Ganga Ramsar Site'.

Dr. ACHUTA NAND SHUKLA

Participated in 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Participated in Annual Scientific Meet from 14th-16th February,2017 at CNH, Botanical Survey of India, Howrah.

Participated in 'Vision Vibrant Uttar Pradesh 2016' organized by Centre for Agriculture and Rural Development, New Delhi (CARD) at Indian Institute of Sugarcane Research, Lucknow (IISR) from26th- 28th November, 2016 and displayed BSI Exhibits in a stall.

Attended a National Seminar on 'Agro-forestry-An approach for Livelihood Improvement', held at Centre for Social Forestry and Eco-rehabilitation, Allahabad on 3rd March, 2017.

Attended and presented a paper entitled 'Flora of Cold Desert – Dicotyledons' in National Seminar on 'Plant Identification and Conservation' held at TRS Govt. P.G. College Rewa during 24th- 25th September,2016.

Presented a paper as resource person in a National Seminar entitled 'Conservation of Natural Resources: Challenges and Solution' held at Govt. Science College, Rewa, Madhya Pradesh on 12th-13th November, 2016.

Dr. ASHUTOSH VERMA

Participated in 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th - 12th February, 2017.

Participated in Annual Scientific Meet from 14th-16th February, 2017 at CNH, Botanical Survey of India, Howrah.

Participated in 'Vision Vibrant Uttar Pradesh 2016' organized by Centre for Agriculture and Rural Development, New Delhi (CARD) at Indian Institute of Sugarcane Research, Lucknow (IISR) from 26th- 28th November, 2016 and displayed BSI Exhibits in the BSI stall.

Attended a National Seminar on 'Agro-forestry-An approach for Livelihood Improvement, held at Centre for Social Forestry and Eco-rehabilitation', Allahabad on 3rd March, 2017.

Attended a training programme on 'Public Financial Management System (PFMS)' on 29th March, 2016, venued at Pay and Accounts Office, Kolkata.

Dr. AVISHEK BHATTACHARJEE

Attended a Workshop as resource person on 'Herbarium Technique & Methodology' by the ENVIS Centre on Floral Diversity, BSI on 2nd April, 2016 in CNH, Howrah.

Attended and Participated a training programme as resource person on 'Basics of plant identification and nomenclature' in BSI, ERC, Shillong from 7th–9th November, 2016 and delivered three lectures.

Participated a Workshop as resource person on 'Essentials in Plant Revisionary Studies and Flora writing' jointly organised by Botanical Survey of India, Western Regional Centre, Pune and Naoroji Godrej Centre for Plant Research, Shirval from 1st-3rd December, 2016 at BSI, WRC, Pune.

Participated a training programme as resource person on 'Basics of Plant Nomenclature' organized by ENVIS Centre on Floral Diversity, BSI in collaboration with CNH from 14th –15th January, 2017.

Participated an exhibition cum Seminar on 'Joseph Dalton Hooker: Botanical Trailblazer and the Botanical Heritage of India' jointly organized by Botanical Survey of India, University of Sussex, UK and India Museum, Kolkata from 1st- 2nd October, 2016 at Industrial Section, Indian Museum, Kolkata.

Attended 127th Foundation Day of BSI and Annual Scientific Meet, 2017 (13th - 16th February, 2017) at CNH, Howrah.

Delivered a lecture in UGC Sponsored National Seminar on 'Plant and Microbes in human welfare and sustainability' (NSPM-2017) on 24th February, 2017 in Midnapore College (Autonomous), Midnapore, Paschim Medinipur, West Bengal.

Dr. ASHISH VENKATESH PRABHUGAONKAR

Attended one day training program, as liaison officer for filling up of NPR forms of employees not having Aadhar number, Completed needful filling up of formson 2nd August, 2016.

Organised and attended athree days 'Botanical Nomenclature Workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended one day Photographic training programme on

9th June, 2016 at BSI, ERC, Shillong and attended a lecture by Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a lecture on 'Remote Sensing and GIS application in Forestry and Ecology' on 19th October, 2016.

Attended a Training Programme on Digital Payments on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Dr. B.K. SINHA

Attended a seminar on 'Joseph Dalton Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended an International Conference on 'The Green Planet : Past, Present, and Future' from 21st-23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Participated in 127th Foundation Day Programme of Botanical Survey of India and first Annual Scientific Meet from 14th-16th February, 2017 at CNH, Botanical Survey of India, Howrah.

Attended an international Seminar on 'Sacred Groves of India'on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Dr. C. MURUGAN

Participated in 127th Foundation Day Programme of Botanical Survey of India and first Annual Scientific Meet on 14th-16th February 2017 at CNH, Botanical Survey of India.

Attended Head of Office meeting at the Indian Museum, Botanical Survey of India, Kolkata on 17th February 2017.

Attended Regional Council Meeting at the Indian Museum, Botanical Survey of India, Kolkata on 17-02-2017.

Facilitated a visit of Shri Ajay Narayan Jha, Secretary, Ministry of Environment, Forest and Climate Change, New Delhi to the Botanical Survey of India, Coimbatore on 25-03-2017.

Attended one training programme on Service matter *w.e.f.* 5th to 9th September 2016 at the Regional Training Centre, Institute of Government Accounts and Finance, Kolkata.

Attended State Board for Wildlife meeting in the conference hall of Honble Chief Minister, Government Secretariate, Thiruvananthapuram on 27th December 2016.

Acted as Chief Guest and inaugurated the National Seminar on Biodiversity Conservation and Sustainable Utilization, organized by the Department of Botany, Bharathiar University, Coimbatore on 20-03-2017.

Dr.(Mrs.) CHAYA DEORI

Organised and attended a three days 'Botanical Nomenclature Workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November 2016.

Attended one day Photographic training programme on 9th June, 2016 at BSI/ERC/Shillong and invited Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a lecture on 'Remote Sensing and GIS application in Forestry and Ecology' on 19th October, 2016.

Attended a Training Programme on Digital Payments on the occasion of National Youth Day on 12th January 2017 at BSI, ERC, Shillong.

Dr. CHANDAN SINGH PUROHIT

Attended Annual Scientific Meet at Central National Herbarium from 13th to 16th February 2017 and also presented the progress of the work done from the joining of the Botanical Survey of India.

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February 2017.

Participatedin Vriksha Uttpad Mela cum Exhibition on 21st March, 2017, at AFRI, Jodhpur.

Attended one day Workshop cum training programme on UNICODE software in Hindi on 29th June 2016 at BSI, AZRC.

Attended one day Hindi Workshop on 'Vanaspati Anusandhan me Hindi ka Prayog' on 16th September 2016 organized by Hindi Dept., J.N.V. University, Jodhpur.

Attended one day Hindi workshop on " Rajbhasa Hindi ka Prashasan avum vigyan me uppyogita" on 24.11.2016 at BSI, AZRC.

Attended one day workshop on 'Voice typing in Hindi online through Microphone' by J.P. Yadav at BSI Conference Hall, Jodhpur.

Attended a Hindi workshop on 'Biotechnology and its uses in BSI office' on 31th March 2017 at BSI, AZRC.

Participated in Kishan Mela and represented BSI, AZRC stall in Krishi mela on 21st September, 2016 venued at CAZRI, Jodhpur.

Dr. DEVENDRA SINGH

Attended a conference on 'Joseph Dalton Hooker: Botanical Trailblazer and the Botanical Heritage of

India'organized in joint collaboration with the University of Sussex, U.K. and the Indian Museum at Industrial Section in Indian Museum, BSI on 2nd – 3rd October, 2016.

Attended a seminar on 'International Seminar on Forests, Sacred Groves and Environmental Heritage of India'organized in joint collaboration with the University of Sussex, U.K. and the Indian Museum at Industrial Section in Indian Museum, BSI on 30th March, 2017.

Attended the Annual Scientific Meet at Central National Herbarium from 13th to 16th February, 2017 and also presented the progress of the work done from the joining of the Botanical Survey of India.

Acted as a judge in Hindi Pratiyogita in Central National herbarium and Central Botanical Laboratory.

Performed the duties of HOO at BSIHQ as per the order of Director, Botanical Survey of India.

Dr. DINESH KUMAR AGRAWALA

Attended 4th Stakeholders Interaction Meeting on Orchids (Theme: Entrepreneurship Development in Orchid Marketing) at ICAR-NRCO, Pakyong on 19th April, 2016.

Attended One day seminar on 'Forest, Biodiversity and Plant science' organised by Department of Botany, Sikkim University on 5th May, 2016.

Attended the first quarter brain storming session of ENVIS centres for 2016 – 2017 for Eastern and North-Eastern ENVIS centres at Forest Department, Gangtok on 6th May 2016.

Attended Stakeholder consultation meeting on implementation phase of Khanchendzonga Landscape Conservation and Development Initiative, organised by GBPIHED and ICIMOD at Gangtok on 15.05.2016.

Organized International Biodiversity Day at BSI, SHRC and delivered the theme lecture on 'Mainstreaming bio-diversity: sustaining people and their livelihoods' on 22.05.2016.

Attended One day lecture on 'Measuring Eco-system level carbon flux over forest canopy' at Sikkim University on 2nd June, 2016.

Attendedtwo days Exhibition cum Seminar on 'Joseph Hooker: Botanical Trailblazer and the Botanical Heritage of India' during 1st– 2nd October,16 at ISIM, Kolkata.

Participated invalidation workshop on 'Development of UNDP/GEF project on securing livelihoods, conservation, sustainable use and restoration of high range Himalayan ecosystems' organised by FEWMD, Government of Sikkim at Mangan, North Sikkim on 8th September,2016.

Attended the foundation day cum 3rd popular lecture series of GBPIHED and delivered an invited lecture on 'Orchids-as the indicator of climate change' at Gangtok on 10th September, 2016.

Organised and attended 'Digital Payment Awareness' Workshop organised by BSI, SHRC on 6th December, 2016.

Organized the National Seminar on 'Understanding Himalayan phyto diversity in a changing climate' during 9th – 10th March, 2017 as the Convenor-cum-Organizing Secretary.

Organized and participated in the Capacity Building Workshop on 'Long term monitoring of Himalayan biodiversity for stakeholders of Himalayan region' under NMHS scheme jointly organized by BSI, ZSI and GBPNIHESD at Gangtok during 29-30 March, 2017.

Participated in the training programme as Invitee on 'Organic Farming/ Natural Farming and Cow-Based Economy' under Unnat Bharat Abhiyan on 24th March, 2017 organized by NRC-Orchids Pakyong.

Participated in the workshop as Invitee on Organic Farming organized by Hon'ble Chief Minister of Sikkim in connection with "One World Award" on 10th March, 2017.

Dr. DEEPU BIJAYAN

Attended a training regarding Service Matters at INGAF, Kolkata from 5th to 9th September, 2016 and reconciliation work at PAO, Kolkata *w.e.f.* 12th to 14th September 2016.

Organised and attended athree days 'Botanical Nomenclature Workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended one day Photographic training programme on 9th June, 2016 at BSI/ERC,/Shillong and invited Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a lecture on 'Remote Sensing and GIS application in Forestry and Ecology' on 19th October, 2016.

Attended a Training Programme on Digital Payments on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Delivered a lecture on 'Conservation of forest resources and biodiversity' on the occasion of "International Forestry Day" conducted by North East Regional Institute of Education, NCERT, Shillong on 21st March, 2017.

Delivered a lecture on 'Role of AYUSH in Healthcare Management in NE India' conducted by North Eastern Institute of Ayurveda & Homoeopathy (NEIAH), Shillong.

Dr. (Mrs.)DEBASMITA DUTTA PRAMANICK

Attended and participated in Group Discussion in an Awareness Workshop on Guidelines for Access to Biological Resources under the 'Biological Diversity Act 2002' on 24th June, 2016, organized by Biotech Consortium India Limited, Ministry of Science & Technology in collaboration with Centre for Biodiversity Policy and Law (CEBPOL), NBA, Govt of India, venued at Auditorium, Centre for Research in Nanoscience and Nanotechnology, University of Calcutta, Salt lake City, Kolkata.

Participated 2nd Botanical Nomenclature Course on 9th-12th February, 2017, organized by BSI, venued at IISER, Pune.

Attended and delivered a lecture in Annual Scientific Meet held on 14th-16th February, 2017, in Central National Herbarium, Howrah.

Delivered a lecture on "Biodiversity Conservation: Issues and Challenges" on the eve of International Biodiversity Day (22nd May, 2016) at GHGS School, Howrah.

Attended an International Seminar on 'Forests, Sacred grooves and environmental heritage of India' on 30th March, 2017, organized by BSI in collaboration with Sussex University, UK, in ABC Hall, Indian Museum.

Attended a Seminar cum Exhibition on 'J. D. Hooker-A Trailblazer and Botanical Heritage in India' at ISIM, BSI, Kolkata on 1st – 2nd October, 2016, organized by Botanical Survey of India. Narrated the botanical exhibits of "Rice germplasm (variables) from Southern Odisha, India" to the delegates and dignitaries.

Attended an International seminar on "The Green Planet: Past, Present and Future' on 21st-23rd December, 2016, organized by CAS, Department of Botany, University of Calcutta in collaboration with Probir Chatterjee Research Foundation and Botanical Survey of India, Kolkata venued at Auditorium, Centre for Research in Nanoscience and Nanotechnology, University of Calcutta, Salt Lake City, Kolkata.

Attended a training programme on 'Basics of Plant Nomenclature' on 14th-15th January, 2017, organized by 'Envis Centre on Floral Diversity', BSI in collaboration with Central National Herbarium, BSI, Howrah, venued at Auditorium, CNH, Howrah.

Dr. DAVID LALSAM BIATE

Attended and delivered a lecture in Annual Scientific Meet held on 14th-16th February, 2017, in Central National Herbarium, Howrah.

Attended a National seminar on 'Understanding Himalayan Phytodivesity in a changing climate' in BSI, SHRC, Gangtok.

Attended 'Digital Payment Awareness' workshop organised by BSI, SHRC on 6th December, 2016.

Dr. G.P. SINHA

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Participated in 'Vision Vibrant Uttar Pradesh 2016' organized by Centre for Agriculture and Rural Development, New Delhi (CARD) at Indian Institute of Sugarcane Research, Lucknow (IISR) *w.e.f.* 26th to 28th November, 2016 and displayed BSI Exhibits in a stall.

Attended a National Seminar on 'Agro-forestry-An approach for Livelihood Improvement', held at Centre for Social Forestry and Eco-rehabilitation, Allahabad on 3rd March, 2017.

Delivered a lecture entitled 'Researches on Taxonomical aspects of Flora of India with special reference to Central India' as a resource person in Refresher Course of Guru Ghasidas Vishwavidyalaya on 25th June, 2016.

Delivered 'Dr. J. P. Srivastava Memorial Lecture' at CMP College, Allahabad on the topic 'Lichenology in India: Present Status and Future Prospects' on 30th Januaray, 2017.

Dr. GIRIRAJ SINGH PANWAR

Attended 'IIRS-User Interaction Meet 2017' on 23rd February, 2017 organized by Indian Institute of Remote sensing, Dehradun, Uttarakhand.

Dr. H.S. MAHAPATRA

Attended and delivered a lecture in Annual Scientific Meet held on 14th-16th February, 2017, in Central National Herbarium, Howrah.

Dr. HARISH SINGH

Attended a training programme on 'Public Financial Management System (PFMS)' at Pay and Accounts Office, Kolkata, on 29th March, 2016.

Displayed and demonstrated 40 ethnomedicinal plant parts, 4 laminated photographs and 19 ethnobotanical artifacts in new gallery of ISIM, Kolkata during seminar and Hooker's exhibition on from 1st to 2nd October, 2016.

Participated in Annual Scientific Meet at CNH, Botanical Survey of India, from 14th to 16th February, 2017.

Attended and presented a paper in National Workshop entitled Promising Ethnobotanical plants and Prospects of plant based Cottage Industries in Tribal areas of Odisha, India' as a resource person in a National Workshop on "Participatory Natural Resource Management and integrated Tribal development in the context of Climate change" held at Indian Bio-social

Research and Development (IBRAD), Kolkata on 30th March, 2016.

Attended a National workshop on 'Participatory Biodiversity conservation for improved Ecosystem Services in the context of Climate change' and share the views with participants and other dignitaries of other state and Central Departments held at Indian Bio-Social Research and development (IBRAD), Kolkata on 9th to 10th May, 2016.

Delivered a lecture on "History and overall achievement of CBL" on 13th February, 2017 at CNH Howrah through power point Presentation.

Delivered a talk on 'Traditional Conservation of Some plants in Rural and tribal areas of India' in an International Seminar 'on Forests, Sacred Groves and Environmental Heritage of India' at Indian Museum, Kolkata on 30th March, 2017.

Delivered a presentation on 'Comparative study on Ethnomedicinal uses practiced by the ethnicgroups of Sundarhgarh, Mayurbhanj, Angul, Balangir and Deogarh Dist., Odisha' in a National Seminar on 'Conservation, cultivation, diseases and therapeutic importance of medicinal and aromatic plants' held at TNB College, Bhagalpur, on 21st to 23rd November, 16.

Dr. J. JAYANTHI

Attended the Annual Scientific Meet at Central national Herbarium from 13th to 16th February, 2017 and also presented the 'Progress of the work done from the joining of the Botanical Survey of India'.

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12thFebruary, 2017.

Attended a training on 'Essentials in Plant Revisionary Studies and Flora writing' organised by NGCPR in collaboration with BSI, WRC from 1st to 3rd December, 2016.

Dr. JAGADEESH RAM T.A.M

Attended the Annual Scientific Meet at Central National Herbarium from 13th to 16th February, 2017 and also presented the 'Progress of the work done from the joining of the Botanical Survey of India'.

Organized and attended 46th Foundation Day of BSI, Andaman and Nicobar Regional Centre will be organized on 30th March, 2017.

Attended two days Hindi workshop from 29th to 30th March, 2017 at BSI, ANRC, Port Blair.

Performed duties as Evaluation Committee Chairman for the competition held on the occasion of International Day for Biological Diversity Day at BSI Garden on 22nd May, 2016.

Attended the meeting of the State Level Steering Committee for Great Nicobar Biosphere Reserve (GNBR) which was held at the Secretariat, Port Blair to finalize the Management Action Plan for GNBR on 13th June, 2016.

Attended validactory function of '62nd Wildlife Week Celebration 2016' by the Department of Environment & Forests, Andaman and Nicobar Administration at Tagore Govt. College of Education Auditorium on 8th October, 2016.

Attended the National Seminar on 'Ethno-Medicinal Practices in Andaman and Nicobar Islands: Scope, Limitation and Prospective', organized by Regional Research Centre of Ayurveda, Port Blair at Anthropological Survey of India Auditorium on 11th to 12th November, 2016.

Dr. JEEWAN SINGH JALAL

Attended the Annual Scientific Meet at Central National Herbarium from 13th to 16th February, 2017 and also presented the 'Progress of the work done from the joining of the Botanical Survey of India'.

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Attended a training on 'Essentials in Plant Revisionary Studies and Flora writing' organised by NGCPR in collaboration with BSI, WRC from 1st to 3rd December, 2016.

Attended '3rd National Hindi Science Conference' organised by Vigyan Bharati at Rajasthan University, Jaipur, on 16th to 17th December, 2016 and delivered a powerpoint presentation in Hindi on 'Maharashtra Pradesh Ke Odipadapiya Orchids ki bartaman sthiti, bitaran and basasthan'.

Attended National Conference on "Recent Trends in Biology, Culture, Conservation, Commercialization, and Sustainable Utilization of Medicinally and Floriculturally Important Orchids", in The Orchid Society of India conference organized by The Orchid Society of India (TOSI) at Graphic Era University (GEU), Dehradun during 24th to 27th March, 2017 and presented a paper, 'Ecological Niche Modeling for Conservation of *Habenaria suaveolens* - an endemic Orchid in Western Ghats: A case study'.

Dr. J. HERALD FRANKLIN BENJAMIN

Attended 127th Foundation Day Programme of Botanical Survey of India and participated Annual scientific meet at

the Central National Herbarium, BSI Kolkata on 16th February, 2017.

Dr. KANAD DAS

Delivered an invited talk on "Shaping the passion of a mushroom hunter" during the session 'Biodiversity, Conservation & Climate Change (Non-Flowering)' on 22nd December, 2016 in the "International Conference on The Green Planet: Past, Present and Future" at University of Calcutta, Kolkata.

Delivered an invited talk on "Systematics and diversity of wild mushrooms" on 17th February, 2017 in the International Workshop on Plant Taxonomy at University of Calcutta, Kolkata.

Delivered an invited talk entitled "Diversity and conservation of wild Himalayan mushrooms" in the Department of Botany of Gurudas College, Kolkata on 24th Sept., 2016.

Delivered an invited talk entitled "Wild Mushrooms: Diversity, Threat and Conservation" at National Library on 6th June, 2016 during the celebration of World Environent Day.

Delivered practical demonstration on "preservation and identification of macrofungi" on 2nd April, 2016 in the training course on 'Herbarium Technique & Methodology' organized by ENVIS, BSI, Howrah.

Actively participated (as Chairman of the Reporting Committee) in the First Annual Scientific Meet during 13th-16th February, 2017 at Central National Herbarium; presented the scheduled talk and prepared and compiled the immediate report of that meet along with the other committee members.

Participated actively in the exhibition and conference on 'Joseph Hooker: Botanical Trailblazer and the Botanical Heritage of India' being held on 1st – 2ndOctober, 2016 at ISIM (BSI).

Dr. K.A. AHMED KABEER

Attended 127th Foundation Day Programme of Botanical Survey of India and participated Annual scientific meet at the Central National Herbarium, BSI Kolkata on 16th February, 2017.

Dr. KUMAR AMBRISH

Attended 'IIRS-User Interaction Meet 2017' on 23rd February, 2017 organized by Indian Institute of Remote sensing, Dehradun, Uttarakhand.

Dr. K. KARTHIGEYAN

Attended 127th Foundation Day of Botanical Survey of India and participated in Annual Scientific Meet at CNH, Botanical Survey of India, on 14th to 16th February, 2017.

Attended an exhibition cum Seminar on 'Joseph Hooker: Botanical Trailblazer and the Botanical Heritage of India' jointly organized by Botanical Survey of India, University of Sussex, UK and India Museum, Kolkata, at Industrial Section, Indian Museum, Kolkata, on 1st and 2nd October, 2016.

Attended the lectures of Dr. K.N. Gandhi on 'Articles of ICN' at the Department of Botany, University of Calcutta from 21st–23rd February, 2017.

Attended an International seminar on 'Forests, Sacred groves & the environmental heritage of India' at Industrial Section, Indian Museum, Kolkata, on 30th March, 2017.

Dr. K.A. SUJANA

Participated in Annual Scientific Meet at CNH, Botanical Survey of India, on 14th to 16th February, 2017.

Delivered a talk on 'Bio cultural perspectives of Sacred groves and serpentine worship' in an International Seminar on 'Forests, Sacred Groves and Environmental Heritage of India' at Indian Museum, Kolkata on 30th March, 2017.

Displayed and demonstrated 40 ethnomedicinal plant parts, 04 laminated photographs and 19 ethnobotanical artifacts in new gallery of ISIM, Kolkata during seminar and Hooker's exhibition on on 1.10.2016-02.10.2016.

Dr. KULDEEP SINGH DOGRA

Participated in the Biodiversity Day (22nd May, 2016) and World Environment Day (5th June, 2016) organized at BGIR, Noida during the period.

Participated in the 16th Foundation Training Programme for Scientists and Technologists conducted by Indian Institute of Public Administration (IIPA), New Delhi during November 21, 2016 to February 10, 2017.

Attended IIRS User Interaction Meet on 23rd February, 2017 at Indian Institute of Remote Sensing, ISRO Dehradun.

Dr.(Ms.) KRISHNA CHOWLU

Attended a seminar on 'Global Biodiversity, Climate Change & Sustainable Development' held on 15-18 October 2016 venued at Rajiv Gandhi University, Itanagar and delivered a lecture.

Attended a National seminar on "Understanding Himalayan Phytodivesity in a changing climate"in BSI, SHRC, Gangtok and delivered a lecture.

Attended a program on setting up of Orchidarium in IASST, Guwahati. 16th-17th March, 2017.

Dr. KUMAR AVINASH BHARATI

Attended the 'DST funded Foundation Training

Programme for Scientists and Technologists' organized by Indian Institute of Public Administration, New Delhi from November 21st 2016 to February 10th 2017.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at CNH, Botanical Survey of India.

Attended a National Conference on "Medicinal Plants: Cultivation and Marketing" on 17th March, 2017, organized by Dept. of Extension, ICFRE, Dehradun.

Dr. LALJI SINGH

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, venued at Indian Museum, ISIM, BSI.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at CNH, Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Co-organized an 'International Conference on Climate Change Adaptation and Biodiversity: Ecological Sustainability and Resource Management for Livelihood Security' at Port Blair from 8th to 10th December, 2016.

Attended Two days Hindi workshop organised from 29th to 30th March, 2017 at main office, BSI, ANRC, Port Blair and from 29th to 30th June, 2016.

Participated 16th meeting of the Advisory Committee for Ecosystem Research Programme (EcRP) at ZSI, ANRC, Port Blair from 20th to 22nd April, 2016.

Participated State Medicinal Plants Board Advisory Committee meeting at Office of the Chief Conservator of Forests, Research & Working Plan, Haddo, Port Blair on 5th May, 2016.

Participated State Medicinal Plants Board Advisory Committee meeting at Office of the Chief Conservator of Forests, Research & Working Plan, Haddo, Port Blair on 22nd June, 2016.

Participated Institutional Ethical Committee (IEC), Andaman and Nicobar Islands meeting at District Health Service (DHS), Port Blair on 22nd June, 2016.

Organized Environmental Awareness programme to mark the occasion of 67th Van Mahotsav, 2016 at Government Middle School, Humfrygunj, South Andaman on 22nd July, 2016.

Attended training programme on PFMS and &7thCPC fixation from 17th to 18th August, 2016. Shri Pradeep Kumar, AAO and Shri Nandal Tiwari, Accountant, Pay and Account Office BSI/ZSI, Kolkata were resource persons.

Delivered an invited lecture on 'Diversity of Forest Flora in Andaman and Nicobar Islands for Andaman Nature Club, Andaman and Nicobar Islands' organized by NCSTC-DST, Govt. of India, Port Blair on 20th August, 2016.

Attended the 5th Training Programme on 'Financial Management' at Indian Institute of Public Administration, New Delhi from. 3rd to 7th October, 2016.

Performed duties as a Co-Chairman of International Conference on 'Climate Change, Adaptation and Biodiversity: Ecological Sustainability and Resource Management for Livelihood Security' scheduled from 8th to 10th December, 2016 at Port Blair, Andaman & Nicobar Islands, India.

Attended National Seminar on 'Scientific and Technical Terminology in Biodiversity' and delivered an invited lecture on 'Plant diversity of Andaman and Nicobar Islands' organised by Commission for Scientific and Technical Terminology, Ministry of Human Resource Development, Govt. of India at Port Blair from 15th to 16th November, 2016.

Attended Silver Jubilee Workshop on 'Ecology and Conservation of Andaman and Nicobar Biodiversity' organised by Salim Ali Centre for Ornithology and Natural History(SACON), Coimbatore, Tamil Nadu at Port Blair from 24th to 25th November, 2016.

Participated the Innovation in Science Pursuit for Inspired Research Programme (ISPIRE Programme) at Pondicherry University Brookshabad Campus, Port Blair on 26th December, 2016.

Attended two days workshop on "Conservation of Biodiversity and Ecological Security" in commemoration of 50 years of Indian Forest Service in Andaman and Nicobar Islands at Port Blair from 9th to 10th February, 2017.

Dr. L. RASHINGAM

Attended Taxonomy workshop at Koti Womens College, Osmania University on 2nd November, 16.

Attended Andhra Pradesh state Biodiversity Board Meeting at Aranya Bhavan, Hyderabad on 11th November, 2016.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and participated in First Annual Scientific Meet on 14th to 16th February, 2017 venued at CNH, Botanical Survey of India.

Dr. M.U. SHARIEF

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, venued at Indian Museum, ISIM, BSI.

Attended a lecture on *Aponogeton* sp. by Prof. S.R. Yadav, venued at CNH Committee room.

Attended a lecture on "KAS PLATEAU: A botanical paradise" by Dr. M. Sanjappa, Form. Director, BSI on 23rd November, 2016, venued at CNH Committee room, BSI, Howrah.

Attended a lecture on "Taxonomy and Ecology of Cyanobacteria and algae from Polar Regions" delivered Dr. Lubomir Kovacik, Assistant Professor, Department of Botany, Comenius University, Bratislava, Slovakia on 20th December, 2016, at CNH Committee room, BSI, Howrah.

Attended an International Conference on "The Green Planet: Past Present and Future on 21st to 23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended an international Seminar on "Sacred Groves of India" on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at CNH, Botanical Survey of India.

Dr. MANAS BHAUMIK

Attended the exhibition and seminar on "Joseph Hooker: Botanical Trailblazer and the Botanical Heritage of India" organized in joint collaboration with the University of Sussex, U.K. and the Indian Museum, at Industrial Section in Indian Museum, BSI on 1st to 2nd October, 2016.

Attended and participated in the 127th Foundation Day and Annual Scientific meet of Botanical Survey of India from 13th to 16th February, 2017 at Central National Herbarium.

Attended an International Conference on "The Green Planet : Past Present and Future on 21st to 23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended an international Seminar on "Sacred Groves of India" on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Dr. M. PALANISWAMY

Attended and participated in the 127th Foundation Day and Annual Scientific meet of Botanical Survey of India from 13th to 16th February, 2017 at Central National Herbarium.

Attended one week training programme *w.e.f.* 15th to 20th June, 2016 on 'Geospatial training for biodiversity conservation in Western Ghats, India', at IIIT, Hyderabad, organised by OSGeo-India.

Attended an International Conference on "Sustainable utilization of Tropical Plant Biomass: Bioproducts, Biocatalysts and Biorefinery" held at TNAU, Coimbatore on 17th to 18th November, 2016 and presented a paper entitled "Seaweed resources of Kerala Coast and its economic potential".

Attended a National Conference on "Genomics and proteomics in Bioprospecting-Role in healthcare development" held at Dept. of Biotechnology, Dr. N.G.P. Arts and Science College, Coimbatore, on 21st December, 2016 and delivered invited lecture entitled "Sea weed resources of India Coast-Role in Bioprospecting".

Attended National conference on 'Biodiversity, Biology and Biotechnology of Algae' at CAS in Botany, University of Madras, Guindy campus, Chennai on 09th to 10th January, 2017 and delivered an invited lecture on "Seaweed of South Andaman Islands".

Attended training programme on Service matter at the Regional Training Centre, Institute of Govt. Accounts and Finance, Kolkata on 5th to 9th september, 2016.

Attended 5th training programme on 'Financial management in scientific organization for Scientists and technologists', conducted at IIPA, New Delhi on 3rd to 7th October, 16.

Dr. MAYUR YASHWANT KAMBLE

Attended and participated in the 127th Foundation Day and Annual Scientific meet of Botanical Survey of India from 13th to 16th February, 2017 at Central National Herbarium, Howrah.

Dr. MANISH K. KANDWAL

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Attended First Annual Scientific Meet on 13th to 16th February, 2017 at Central National Herbarium, Howrah.

Dr. MONALISHA DEY

Participated as a resource person during the training course on "Herbarium Techniques & Methodology"

organized by ENVIS Centre on Floral Diversity held on 2nd April, 2016 at Central National Herbarium and delivered practical demonstration on 'Preservation and identification of Bryophytes' to the participating students.

Participated as a resource person during the onsite training programme held at AJCBIBG, Howrah on 6th August, 2016 and provided practical training on 'Field collection methodologies and preservation techniques of Bryophytes' to the BSI research personnel under the NMHS funded project "Biodiversity Assessment through Long-Term Monitoring plots in Indian Himalayan Landscape".

Attended the exhibition and seminar on "Joseph Hooker: Botanical Trailblazer and the Botanical Heritage of India" organized in joint collaboration with the University of Sussex, U.K. and the Indian Museum, at Industrial Section in Indian Museum, BSI on 1st to 2nd October,2016.

Attended and participated in the 127th Foundation Day and Annual Scientific meet of Botanical Survey of India from 13th to 16th February, 2017 at Central National Herbarium.

Dr. M. MURUGESAN

Organised and attended athree days 'Botanical nomenclature workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended one day Photographic training programme on 9th June, 2016 at BSI/ERC/Shillong and invited Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a lecture on "Remote Sensing and GIS application in Forestry and Ecology" on 19th October, 2016.

Attended a Training Programme on 'Digital Payments' on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Dr. MANAS RANJAN DEBTA

Attended a National Conference on "Basics and applied researches in Plants and microbes" held at Punjabi University, Patiala, on 3rd to 5th November, 16.

Attended 'IIRS-User Interaction Meet 2017' on 23rd February, 2017 organized by Indian Institute of Remote sensing, Dehradun, Uttarakhand.

Dr. NRIPEMO ODYUO

Organised and attended athree days 'Botanical nomenclature workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended one day Photographic training programme on 9th June, 2016 at BSI/ERC/Shillong and invited Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a lecture on "Remote Sensing and GIS application in Forestry and Ecology" on 19th October, 2016.

Attended a Training Programme on 'Digital Payments' on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Attended a conservation programme 'Conservation Assessment and Management (CAMP) Prioritization Processing Using IUCN Red list categories and criteria for the wild medicinal plants of Tripura' organised by Medicinal Plant Board of Tripura(MPBT) in association with Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore at Geetanjali, Tripura Tourism Development Corporation Ltd. Kunjaban, Agartala *w.e.f.* 3rd to 5th August, 2016.

Dr. O.N. MAURYA

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended Vigilence Awareness week from 4th to 10th November, 2016 venued at Central National Herbarium, Howrah.

Attended 'Botanical Nomenclature Course' from 9th to 12th February, 2017 at Botanical Survey of India, WRC, Pune.

Attended 127th Foundation Day programme of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended a seminar organized on International Biodiversity Day at Central National Herbarium, Howrah.

Attended a conference on "Conservation, cultivation disease and therapeutic importance of Medicinal and Aromatic plants" organized by T.N.B. College, Bhagalpur on 21st to 23rd November, 2016 and delivered a lecture as resource person on "Role of micro-morphological studies in relation to taxonomy".

Dr. P.V. PRASANNA

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden,

U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Participated in CoP-13 and MoP-2 of Nagoya Protocol at MoEF&CC, New Delhi on 8th November, 2016.

Attended Vigilence Awareness week from 4th to10th November, 2016, venued at Central National Herbarium, Howrah.

Attended 127th Foundation Day programme of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended workshop on "Technical knowledge workshop for Bangladesh and India on vulnerability of Sunderban Biosphere Reserve in a changing climate' held at Ramakrishna Mission, Golpark, Kolkata and participated in the BSIs Heads of offices meeting and 82nd RCM held on 17th and 18th February, 2017 at ISIM.

Organised and attended a seminar on the eve of International Biodiversity day, 22nd May, 2016 on Biodiversity Day at Central National Herbarium, Howrah.

Dr. PRATIBHA GUPTA

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st to 2nd October, venued at Indian Museum, ISIM, BSI.

Attended a Conference on'International Cultural Coordination Forum' on 8th March, 2017 venued at Antarrashtriya Samrasta Manch and Rashtriya Swatantra Manch at The Indian Society of International Law, V. K. Krishnan Menan Bhawan, New Delhi.

Participated in a Seminar on "Genomic: Molecular to Ecosystem Level" on 9th December, 2016 venued at The Asiatic Society, Kolkata.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at CNH, Botanical Survey of India.

Participated in first Annual Scientific Meet on 14th to 16th February, 2017 venued at CNH, Botanical Survey of India.

Dr. P. LAKSHMINARASIMHAN

Participated in the National Celebration of International Day for Biological Diversity at Yashwantrao Chavan Auditorium, Mumbai on 22nd May, 2016 organised by The National Biodiversity Authority and Ministry of Environment, Forest & Climate Change in association with the Maharashtra State Biodiversity Board.

Attended first 'Pune Heritage Festival Meeting for Partners and Associates' at Indradhanushya Hall, Pune on 17th November, 2016.

Attended a conference on 'Western Ghats - Revisited' held at Van Bhavan, Pune on 30th November, 2016 and delivered two presentations on 'CITES and Plants' and 'An introduction to the Convention on Biological Diversity'.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at Botanical Survey of India.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Organised a thematic seminar on "Mainstreaming Biodiversity: Sustaining People and their Livelihoods" on 22nd May, 2016, at Botanical Survey of India, Western Regional Centre, Pune. More than 60 researchers and students participated in this programme.

Organised special drive by observing fortnight long 'Swachh Bharat Abhiyan / Mission' at BSI, WRC, Pune office and Experimental Garden of BSI at Mundhwa from 16th to 31st May, 2016.

Attended XXVI Annual Conference of Indian Association for Angiosperm Taxonomy and International seminar on "Conservation and sustainable utilization of Biodiversity" organised by Dept. Botany, Shivaji University, Kolhapur on 7th to 9th November, 2016 and delivered a lecture on 'CITES Plants'.

A plantation programme was conducted on 5th June, 2016 in Mundhwa Experimental Garden under the leadership of Dr. P. Lakshminarasimhan, Scientist 'E' & HoO.

Organised and attended International Day of Yoga on 21st June, 2016 for BSI, Pune at BSI, WRC office.

Organised 'Hindi Saptah' at WRC during the period 12th to 19th September, 2016, during which Shri. Jeet Singh, CCF(T), Pune Forest Department, Mrs. A.Chauhan, Director, Income Tax Department, Pune, Mrs. Seema Deshpande & Shri. R.Verma from Hindi Shikshan, Pune, Shri. Sunil Limaye, CCF (WL), Pune Forest Department were invited as guests on different days and events.

Organised and attended a collaborative workshop along with Naoroji Godrej Centre for Plant Research (NGCPR), Shirwal titled "Interactive talks and Workshop on Essentials in Plant Revisionary studies and Flora writing" at BSI, WRC, Pune from 1st to 3rd December, 2016.

Organised 2nd Botanical Nomenclature Workshop during 9th to 12th February, 2017 venued at IISER, Pune.

Organised a National symposium titled "The Genomic Age Challenges and Opportunities in Taxonomy and Biology of Indian Pteridophytes" at IISER, Pune from 3rd to 4th March, 2017.

Dr. PRASHANT KESHAV PUSALKAR

Attended 'Uttarakhand Biodiversity Board Meeting of Committee on Threatened Plants' on 3rd February, 2017 as BSI representative.

Attended 'IIRS-User Interaction Meet 2017' on 23rd February, 2017 organized by Indian Institute of Remote sensing, Dehradun, Uttarakhand.

Dr. (Ms.) PUSHPA KUMARI

Attended the DST funded 'Foundation Course Training Programme for Scientists and Technologists' organized by Indian Institute of Public Administration, New Delhi from 21stNovember, 2016 to 10thFebruary, 2017.

Dr. PUNEET KUMAR

Attended a seminar on 'Modern trends in applied Botany' organized by Dolphin Institute of Medical and Natural Science, Dehradun and delivered a Guest lecture on 'Cytology in relation to taxonomy or Cytotaxonomy' on 3rd December, 2016.

Attended 'IIRS-User Interaction Meet 2017' on 23rd February, 2017 organized by Indian Institute of Remote sensing, Dehradun, Uttarakhand.

Dr. PRIYANKA INGLE

Attended DST sponsored '16th Foundation Training Programme for Scientists & Technical Personnels' during 27th November, 2016 to 10th February, 2017 at Indian Institute of Public Administration, New Delhi.

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Attended a training on 'Essentials in Plant Revisionary Studies and Flora writing' organised by NGCPR in collaboration with BSI, WRC from 1st to 3rd December, 2016.

Dr. RAJIB GOGOI

Attended Exhibition cum seminar on 'Joseph Dalton Hooker: Botanical Trailblazer and the Botanical Heritage of India' organized by BSI, University of Sussex, UK and Indian Museum, Kolkata and displayed a poster on 'Macro marine algal herbarium on Algal diversity in India'.

Delivered a lecture on "Biodiversity of North East India" at Pub-Kamrup College, Baihata Chariali, Assam on 10th November, 2016.

Attended meeting on Rapid EIA of Rabindra Sarobar as expert committee member at Najrul Manch, KIT, Kolkata, on 7th February, 2017.

Attended and participated in the 127th Foundation Day programme and first Annual Scientific meet of Botanical Survey of India from 13th to 16th February, 2017 at Central National Herbarium, Howrah.

Attended Capacity Building Workshop on "Long Term monitoring of Himalayan Biodiversity for stakeholders of Himalayan Region" organized by BSI, ZSI and G.B. Pant Institute of Himalayan Environment & Sustainable Development at Gangtok on 29th March, 2017.

Dr. RAMESH KUMAR

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Attended one day Workshop cum Training programme on UNICODE software in Hindi on 29th June, 2016 at BSI, AZRC.

Attended one day Hindi Workshop on "Vanaspati Anusandhan me Hindi ka Prayog" on 16th September, 2016 organized by Hindi Dept., J.N.V. University, Jodhpur.

Attended one day Hindi workshop on "Rajbhasa Hindi ka Prashasan avum vigyan me uppyogita" on 24th November, 2016 at BSI, AZRC.

Attended one day workshop on "Voice typing in Hindi online through Microphone" by J.P. Yadav at BSI Conference Hall, Jodhpur.

Attended a Hindi workshop on 'Biotechnology and its uses in BSI office' on 31st March, 2017 at BSI, AZRC.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at CNH, Botanical Survey of India and First Annual Scientific meet.

Dr. R.K. GUPTA

Attended the seminar on 'Glimpses of Research work in Taxonomy and Ethnobotany' & Medal Award ceremony at National Botanical Research Institute, Lucknow, *w.e.f.* 14th to 17th November, 2016. A lecture provided on the topic 'Algal habitats in India with special reference to thermal springs'.

Attended Exhibition cum Seminar on 'Joseph Dalton Hooker: Botanical Trailblazer and the Botanical Heritage of India' organized by BSI, University of Sussex, UK and Indian Museum, Kolkata and displayed a poster and macro marine algal herbarium on Algal diversity in India.

Acted as a judge in Hindi Pratiyogita in Central Botanical Laboratory and AJC Bose Indian Botanic Garden.

Dr. R. MANIKANDAN

Attended 'IIRS User Interaction Meet 2017' Academia-Industry interface for Geospatial application on 23rd February, 2017 at IIRS, Dehradun, Uttarakhand.

Attended a National Conference on "Medicinal Plants: Cultivation and Marketing" on 17th March, 2017 organised by Dept. of Extension, ICFRE, Dehradun, Uttarakhand.

Participated in Hindi Karyashala organized in BSI, NRC, Dehradun on 30th June, 2016.

Attended In Foundation Day Programme, Plantation event, Inaugaral programme of Hindi saptah, Hindi Pakhwara organisedbyBSI, NRC, Dehradun and Executive Council meeting of APT.

Attended a National Conference on "Medicinal Plants: Cultivation and Marketing" on 17th March, 2017, organized by Dept. of Extension, ICFRE, Dehradun.

Dr. RESHMI DUBEY

Attended and participated in a training programme on "Fungal diversity and modern trends in taxonomy through DNA Barcoding and Chemo profiling" organised by Division of Plant pathology, Indian Agriculture Research Institute, ICAR, NEW DELHI from 26th to 16th October, 2016.

Attended a Nationl conference on 'Fungal Biotechnology' at Birla Institute of scientific Research (BISR), Jaipur, Rajasthan on 16th to 18th November, 2016 and delivered a lead lecture on 'Biodiversity of Microfungi of western Ghats of India'.

Attended a training on 'Essentials in Plant Revisionary Studies and Flora writing' organised by NGCPR in collaboration with BSI, WRC from 1st to 3rd December, 2016.

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Dr. S. L. MEENA

Attended 2nd Botanical Nomenclature Course organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at Botanical Survey of India and participated in First Annual Scientific Meet.

Attended one day workshop cum training programme on UNICODE software in Hindi on 29th June, 2016 at BSI, AZRC.

Attended one day Hindi workshop on "Vanaspati Anusandhan me Hindi ka Prayog" on 16th September, 2016 organized by Hindi Dept., J.N.V. University, Jodhpur.

Attended one day Hindi workshop on "Rajbhasa Hindi ka Prashasan avum vigyan me uppyogita" on 24th November, 2016 at BSI, AZRC.

Attended one day workshop on "Voice typing in Hindi online through Microphone" by J.P. Yadav at BSI Conference Hall, Jodhpur.

Attended a Hindi workshop on 'Biotechnology and its uses in BSI office' on 31st March, 2017 at BSI, AZRC.

Attended Forest Guard Trainee convocation programme on 15th December, 2016 held at Forest Training Centre, Jodhpur.

Dr. S.K. SINGH

Attended one day Capacity Building Workshop on "Conservation of Biodiversity through Implementation of Biodiversity Act" organised by Forest Department, Meghalaya at Multi Use Convention centre NEHU on 16th December, 2016.

Organised and attended athree days 'Botanical Nomenclature Workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended one day Photographic training programme on 9th June, 2016 at BSI/ERC/Shillong and invited Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended a locture on "Remote Sensing and GIS application in Forestry and Ecology" on 19th October, 2016.

Attended a training programme organized by Indian Institute Public Administration, New Delhi,on 29th August to 2nd September, 2016 on 'Knowledge Management & Knowledge sharing in Organization'.

Attended a Training Programme on 'Digital Payments' on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Delivered "Dr. Dan H. Nicolson Memorial Lectures" on 13th February, 2017 at Calcutta University, Kolkata during ,National workshop on Plant Systematics: Challenges and perspectives'.

Attended one day seminar cum workshop on 'Implementation of Biodiversity Act and rules in conserving biodiversity' organised by Forest Dept., Meghalaya at Multi Use Covention Centre, NEHU on 16th December, 16.

Dr. S.K. SRIVASTAVA

Attended one day seminar on "Glimpses of research work in ethno-botany and taxonomy" and Medal Award ceremony of SEB and APT on 15th November, 2016 at NBRI, Lucknow and delivered a lecture on 'Role of herbaria in taxonomic research'.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Dr. S.S. HAMEED

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, venued at Indian Museum, ISIM, BSI.

Attended a lecture on *Aponogeton*sp. by Prof. S.R. Yadav, venued at CNH Committee room.

Attended a lecture on "KAS PLATEAU: A botanical paradise" by Dr. M. Sanjappa, Form. Director, BSI on 23rd November, 2016, venued at CNH Committee room.

Attended a lecture on "Taxonomy and Ecology of Cyanobacteria and algae from Polar Regions" delivered by Dr. Lubomir Kovacik, Assistant Professor, Department of Botany, Comenius University, Bratislava, Slovakia on 20th December, 2016, at CNH Committee room.

Attended an International Conference on "The Green Planet : Past Present and Future" on 21st to 23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended an international Seminar on "Sacred Groves of India"on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Participated in first Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at Botanical Survey of India.

Dr. S.S. DASH

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016 venued at Indian Museum, ISIM, BSI.

Delivered an invited lecture "Research Methodology in special reference to Taxonomy and floristic studies" held at Department of Botany, Aurangabad University on 17.Oct. 2016.

Delivered the "Professor V. K. Naik memorial lecturer" in Baba Saheb Bhimrao Ambedkar University, Aurangabad on 18.Oct. 2016.

Delivered an invited lead Lecture "Endemism in Flowering Plants Of India: Perception, Distribution Patterns, And Current Status in International seminar on "Conservation and Sustainable Utilization of Biodiversity" held at Department of Botany, Shivaji University, Kolhapur on 2-9th Nov. 2016.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and participated in First Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Delivered a plenary lecture "Endemism in flowering plants of India" in National seminar on "Conservation of Forests and Energy for sustainable development" help in Dept. of Environmental Science, Fakir Mohan University, Balasore on 21st March 2017.

Delivered a plenary lecture "Plant Taxonomy in India: Challenges and opportunities" in National seminar on "Emerging trends in Plant Science Research: Challenges and opportunities" help in Dept. of Botany, North Orissa University, Baripada on 22-23rd March 2017.

Attended Capacity Building Workshop on "Capacity building workshop on Long-term Monitoring of Himalayan Biodiversity for stakeholders of Himalayan Region" organized at Gangtok, Sikkim from 29th – 30th March, 2017.

Dr. S. KALIAMOORTHY

Participated in the ICMR and DBT sponsored National conference on "Genomics and Proteomics in Bioprospecting-Role in Healthcare Development" on 21st December, 2016 and delivered invited lecture on "Plant Biodiversity and Conservation - with a special note on Orchids".

Participated and presented the Annual progress report (2016-2017) on 10th February, 2017 at BSI, SRC, Coimbatore.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at CNH, Botanical Survey of India.

Participated in first Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Invited as Chief Guest by Green Club, Department of Botany, Government Arts College, Ariyalur for Tree sapling plantation and followed by lecture on Recent advances in Conservation of Plant Genetic Resources on 6th March, 2017.

Participated the "Kerala State Biodiversity Expo, 2017" VIVIDHA held at Tagore Theatre, Thiruvananthapuram, Kerala from 22nd to 26th February, 2017.

Dr. SUBIR BANDOPADHYAY

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016 venued at Indian Museum, ISIM, BSI.

Attended Vigilence Awareness week from 4th to 10th November, 2016, venued at Central National Herbarium, Howrah.

Attended a 3 days workshop on "Training on Basics of Plant Identification and Nomenclature" at ERC, BSI as resource person, delivered three lectures and imparted training to the students and college teachers of NE regions.

Attended 127th Foundation Day of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended a conference on "Conservation, cultivation, disease and therapeutic importance of Medicinal and Aromatic plants" organized by T.N.B. College, Bhagalpur on 21st to 23rd November, 2016 and delivered a lecture as resource person on "Suggestive approach to involve students in using medicinal plants".

Attended the lectures of Dr. K.N. Gandhi on 'Articles of ICN' at the Department of Botany, University of Calcutta in Department of Botany, Calcutta University.

Delivered a lecture entitled 'Some correct and incorrect usages in plant taxonomy' on 18th February, 2017 in the workshop on 'Plant Systematics: Challenges and perspectives' and 'Dr. Dan H. Nicolson memorial lectures' organized by Department of Botany, University of Calcutta in Department of Botany, Calcutta University.

Dr. SITARAM PRASAD PANDA

Participated in one week course on Financial Management in Research Organisatins on 3rd to 7th October, 2016, venued at IIPA, New Delhi.

Participated in a training course on PFMS on 9th July, 2016 at Asst. Accounts Officer, PAO (BSI/ZSI), Kolkata.

Attended a lecture on *Aponogeton* sp. by Prof. S.R. Yadav, venued at CNH Committee room, Howrah.

Attended a lecture on "KAS PLATEAU: A botanical paradise" by Dr. M. Sanjappa, Form. Director, BSI on 23rd November, 2016, venued at CNH Committee room.

Attended a lecture on "Taxonomy and Ecology of Cyanobacteria and algae from Polar Regions" delivered by Dr. Lubomir Kovacik, Assistant Professor, Department of Botany, Comenius University, Bratislava, Slovakia on 20th December, 2016, at CNH Committee room, Howrah.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at Botanical Survey of India.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Dr. SANJAY MISHRA

Participated in Annual Scientific Meet on 14th-16th February, 2017 at CNH, Botanical Survey of India.

Attended and delivered a lecture on "Floristic diversity and endemism in Andaman & Nicobar Islands and its conservation" at Forest Training Institute, Wimberlygunj, South Andaman on 8th November, 2016.

Attended the National Seminar on 'Ethnomedicinal practices in Andaman and Nicobar Islands: Scope, limitation and prospective' organised by Rregional Research Centre of Ayurveda, Port Blair at Anthropological Survey of India Auditorium on 11th to 12th November, 2016.

Attended Silver Jubilee Workshop on 'Ecology and Conservation on Andaman & Nicobar Biodiversity' organised by Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore, TamilNadu at Port Blair on 24th to 25th November, 2016.

Dr. TAPAN SEAL

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Dr. UMESH KUMAR LALCHAND TIWARI

Participated '2nd Botanical Nomenclature Course' organized by BSI, WRC at IISER, Pune from 9th to 12th February, 2017.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Dr. V.P. PRASAD

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended Vigilence Awareness week from 4th to 10th November, 2016, venued at Central National Herbarium, Howrah.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended 127th Foundation Day programmes of Botanical Survey of India and participated in Annual Scientific Meet on 13th February, 2017 at CNH, Botanical Survey of India.

Attended an International Conference on "The Green Planet : Past Present and Future' on 21st to 23th December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended an international Seminar on "Sacred Groves of India"on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Dr. VINAY RANJAN

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended Vigilence Awareness week from 4th to 16th October, 2016, venued at Central National Herbarium, Howrah.

Attended 127th Foundation Day programme of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended an International Conference on "The Green Planet : Past Present and Future' on 21st to 23rd December,2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended an international Seminar on "Sacred Groves of India"on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Attended a conference on "Conservation, cultivation, disease and therapeutic importance of Medicinal and Aromatic plants" organized by T.N.B. College, Bhagalpur on 21st to 23rd November, 2016 and delivered a lecture as resource person on "Ethno-medico-botanical survey of Parasnath Wildlife Sanctuary, Giridih, Jharkhand".

Dr. V. SAMPATH KUMAR

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended Vigilence Awareness week from 4th to 10th November, 2016, venued at Central National Herbarium, Howrah.

Attended a 3 days workshop on "Training on Basics of Plant Identification and Nomenclature" at ERC, BSI as resource person, delivered four lectures and imparted training to the students and college teachers of NE regions.

Attended 127th Foundation Day programmes of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February,2017 at CNH, Botanical Survey of India.

Attended an International Conference on "The Green Planet : Past Present and Future' on 21st to 23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended an international Seminar on "Sacred Groves of India"on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Attended the 'National Workshop on ENVIS Centres: Summary Evaluation and Roll out of revamped ENVIS scheme' held on 17th and 18th March, 2017 at Gandhinagar, Ahmedabad, Gujarat.

Mr. VINOD MAINA

Attended COP -13 Side events from 10th to 14th December, 2016 at Cancun, Mexico.

Attended 127th Foundation Day programmes of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended a conference on "World Day to combat Desertification" on 16th June, 2016 at ENVIS Centre, CAZRI, Jodhpur.

Attended a meeting on ABG chaired by Smt. Nammita Prasad, Secretary on 11th November, 2016 at conference Hall, MoEF & CC, New Delhi.

Attended Rajasthan State wildlife Board meeting on 20th October, 2016, Jaipur.

Attended TOLIC meeting on 20th December, 2016.

Dr. VINEET KUMAR RAWAT

Attended National Symposium on "The genomic Age Challenges and Opportunities in Taxonomy and biology

of Indian Pteridophytes" held at BSI, Pune with Indian Fern society on dated 03-04 March, 2017.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Dr. W. ARISDASON

Attended in 127th Foundation Day programme of Botanical Survey of India and participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Dr. M.E. HEMBROM

Participated as a BSI representative in one day workshop held at Waghai Agriculture University, Dang, Gujrat entitled "Mushroom bio prospecting and its role in women empowerment and social upliftment in tribal area" on 30th November, 2016 organized in collaboration with Forest Department and Gujarat State Biodiversity Mission (GSBM).

Participated in three daysInternational Conference on "The green planet: past, present and future"on 21st–23rd December, 2016, organized by CAS Phase VII, Department of Botany, University of Calcutta in collaboration with Probir Chatterjee Research Foundation Department of Botany, University of Calcutta and Botanical Survey of India. Delivered one Oral presentation entitled "Hymenophoral diversity among wood-rotting macrofungi of Jharkhand" under theme: Biodiversity, Conservation & Climate change (non flowering plants) categories.

Attended two days Exhibition cum Seminar on "Joseph Hooker: Botanical Trailblazer and the Botanical Heritage of India" on 1st to 2nd October, 2016, organized by BSI, ISIM & University of Sussex, United Kingdom.

Attendedone day workshop on "Making payments digitally for day to day transaction" in connection with Cashless transaction was organized at CNH, BSI, Howrah and one presentation were delivered and explained the concept of "My mobile, my bank, my wallet" among Scientists, scientific and administrative staffs, including Director BSI.

Attended one day Jeev Board meeting held at Project Building, Dhurwa, Ranchi under the Chief Minister, Jharkhand, on 26th December, 2016 as a Botanical Survey of India representative.

Dr. M.K. SINGHADIYA

Attended a training programme on Service Matters from 5th-9th September, 2016 organised by Institute of Government Accounts & Finance, Ministry of Finance, Regional Training Centres, Kolkata.

Mr. Sanjay Kumar

Attended a Seminar cum Exhibition on 'J. D. Hooker-A Trailblazer and Botanical Heritage in India' at ISIM, BSI, Kolkata on 1st – 2nd October, 2016, organized by Botanical Survey of India. Display of various BSI publication in galleries.

Participated 2nd Botanical Nomenclature Course on 9th-12th February, 2017, organized by BSI, venued at IISER, Pune.

Attended and delivered a lecture in Annual Scientific Meet held on 14th-16th February, 2017, in Central National Herbarium, Howrah.

Attended the DST funded '10th capacity building programme for scientific personnel' organized by Indian Institute of Public Administration, New Delhi from 20th February, 2016 to 3rd March, 2017.

Delivered power point presentation on 'Use of Unicode and various online tools for Hindi Language Implementation' at committee room, BSI Head Quarter on 15th December, 2017

Dr. B.K. SINGH

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended a lecture on *Aponogeton* sp. by Prof. S.R. Yadav, venued at CNH Committee room.

Attended 26th State Level Steering Committee meeting for Central Sector Schemes for Sunderban Biosphere Reserve on 30th May, 2016, venued at State Forest Department, Aranya Bhawan, Salt Lake, Kolkata.

Participated Biodiversity conservation for improved ecosystem services in the context of Climate Change on 9th to 10th September, 2016, venued at Indian Institute of Bio-Social Research & Development (IBRAD), Kolkata.

Attended a lecture on "KAS PLATEAU: A botanical paradise" by Dr. M. Sanjappa, Form. Director, BSI on 23th November, 2016, venued at CNH Committee room.

Attended a lecture on "Taxonomy and Ecology of Cyanobacteria and algae from Polar Regions" delivered by Dr. Lubomir Kovacik, Assistant Professor, Department of Botany, Comenius University, Bratislava, Slovakia on 20th December, 2016, at CNH Committee room.

Attended an International Conference on "The Green

Planet : Past Present and Future' on 21st to 23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended a meeting on 'Sustainable Development of Sunderban: A comprehensive Agenda' on 25th January, 2017, at Observer Research Foundation in Collaboration with EnGIO & Institute for Defence Studies & Analysis.

Attended a Workshop on 'Strategy for National Action for Biosphere Reserve' on 19th to- 23rd February, 2017, at MoEF & CC at Pachmari, Madhya Pradesh.

Participated in a technical knowledge sharing workshop on 'Vulnerability of Sunderbans in a Changing Climate' for Bangladesh and India.

Attended an international Seminar on "Sacred Groves of India"on 30th March, 2017 at Indian Museum, Botanical Survey of India.

Participated in Annual Scientific Meet on 14th to 16th February, 2017 at CNH, Botanical Survey of India.

Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017, venued at Botanical Survey of India.

Dr. D.K ROY

Attended athree days 'Botanical Nomenclature Workshop' at Botanical Survey of India, ERC, Shillong from 7th-9th November, 2016.

Attended National Seminar on "Ethnobiology and Traditional Knowledge" from 1st to 3rd February, 2017 at Assam University, Silchar.

Attended a National Seminar at Assam University Silchar entitled Ethnobiology and Traditional Knowledge from 1st to 3rd February, 2017.

Attended one day Photographic training programme on 9th June, 2016 conducted at BSI/ERC/Shillong by Joseph Weilguny, Photographer cum Paintographer from Australia.

Attended an invited lecture on "Remote Sensing and GIS application in Forestry and Ecology" by Dr. S.P.S Kushwaha, Dean (Academics), Indian Institute of Remote Sensing, Dehradun on 19th October, 2016.

Attended a Training Programme on 'Digital Payments' on the occasion of National Youth Day on 12th January, 2017 at BSI, ERC, Shillong.

Dr. GOPAL KRISHNA

Attended a seminar on 'Joseph Hooker: Botanical Trailblazer and Botanical Heritage of India' organised by Indian Museum, Botanical Survey of India in collaboration with Sussex University and Kew Garden, U.K., on 1st-2nd October, 2016, venued at Indian Museum, ISIM, BSI.

Attended three-days workshop on 'Training on Basics of Plant Identification and Nomenclature' at ERC, BSI, Shillong from 7th to 9th November, 2016 as resource persons and delivered 2 lectures, 'How to prepare artificial keys?' and 'Important websites for students'.

Attended a conference on the topic "Conservation, Cultivation, Diseases and Therapeutic Importance of Medicinal and Aromatic plants" at T.N.B. College Bhagalpur from 21st to 23rd November, 2016 and delivered a lecture on "Ethno-medicinal Plants of Aurangabad districts, Bihar and its conservation" as resource person on 23rd November, 2016.

Attended a lecture on "KAS PLATEAU: A botanical paradise" by Dr. M. Sanjappa, Form. Director, BSI on 23rd November, 2016, venued at CNH Committee room.

Attended a lecture on "Taxonomy and Ecology of Cyanobacteria and algae from Polar Regions" delivered by Dr. Lubomir Kovacik, Assistant Professor, Department of Botany, Comenius University, Bratislava, Slovakia on 20th December, 2016, at CNH Committee room, BSI.

Attended an International Conference on "The Green Planet : Past Present and Future' on 21st to 23rd December, 2016, venued at CAS Phase VII, Department of Botany, University of Calcutta.

Attended a training programme on 'Rules of Nomenclature' on 14th to 15th January, 2017 at CNH, BSI.

Attended an international Seminar on "Sacred Groves of India"on 30th March, 2017 at Indian Museum, Botanical Survey of India.

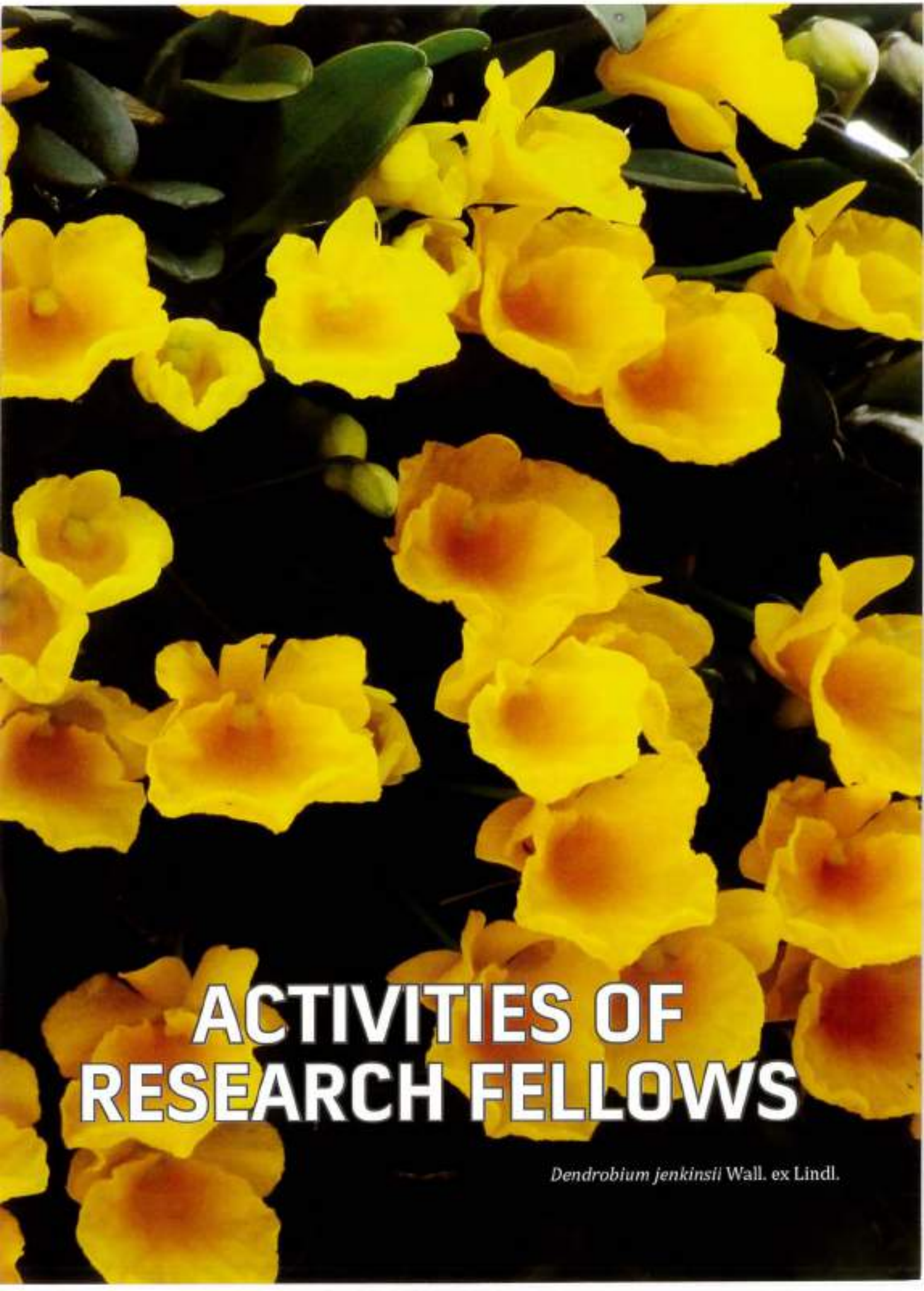
Attended 127th Foundation Day Celebration of Botanical Survey of India on 13th February, 2017 and participated in Annual Scientific Meet on 14th to 16th February, 2017 venued at CNH, Botanical Survey of India, Howrah.

AWARDS AND HONOURS

Dr. G.P. Sinha, Scientist-E/Head, BSI Central Regional Centre, Allahabad received Dr. J.P. Srivastava Memorial Award and Trophy at CMP College, Allahabad on 30th January 2017.

Ms. Sagari Chaudhury, SPF, BSI received T.R. Sahu Award for Best paper in Ethnobotany and Medicinal Plants.

Mr. Animesh Maji, SPF, BSI received S.R. Yadav Award for Best Poster presentation.



ACTIVITIES OF RESEARCH FELLOWS

Dendrobium jenkinsii Wall. ex Lindl.

ACTIVITIES OF RESEARCH FELLOWS

Revision of the subtribe Tripogoninae (Poaceae) in India by Dr. Sangita Das Chowdhury (Dey), AJC Bose Post Doctoral Fellow

The revision of the subtribe Tripogoninae is completed by consultation of fresh and herbarium specimens and it has been found that in India it is represented by 5 genera (*Desmostachya* Stapf, *Eragrostiella* Bor, *Melanocenchris* Nees, *Oropetium* Trin. and *Tripogon* Roem. & Schult.), 22species and 5 varieties. Occurrence of 18 taxa, including 8 endemics has been verified by fresh collections. *Tripogon*, the most polymorphic genus is reported to have 25 species in India but present study suggests it has only 11 species and 4 varieties. As many as 10 species, described on the basis of superficial morphological features, has been reduced to synonymy and 4 species has been given new varietal status. Apart from *Tripogon*, representation of other genera are *Desmostachya* (monotypic), *Eragrostiella* (4 species and 1 variety), *Melanocenchris* (3 species) and *Oropetium* (3 species). The subtribe shows high degree of endemism as 6 species and 4 varieties of *Tripogon*, 2 species of *Oropetium* and 1 species of *Eragrostiella* are endemic to India. During field tours in Dehradun and adjoining areas (August 2016) and Sikkim (September 2016) it has been observed that *Tripogon filiformis* Nees ex Steud., is one of the dominant species of both Western and Eastern Himalayas. Presence of endemic taxa *Tripogon capillatus* Jaub. et Spach. in Western Himalayas (Mussoorie) indicates its wide adaptability to both hot (Northern Western ghats, Maharashtra) and cold climatic zones.

During 2016-17, served as resource person in a training programme entitled "Training on basics of Plant Identification and Nomenclature" on 7th -9th November, 2016, organised by Botanical Survey of India, Eastern Regional Centre, Shillong.

Revisionary studies on family Ophioglossaceae Martinov in India by Dr. Pushpesh Joshi, AJC Bose PDF

During 2016-17, a field tour was conducted *w.e.f.* 6th – 17th June, 2016 and surveyed Tatan, Killad, Karyuni seri, Luj, Bagotu, Punto & Sural Bhatori during which 47 specimens were collected along with 120 field photographs, 18 specimens were fixed for cytological observation. In addition, routine maintenance of fern specimens in BSI, NRC, Fern house and Glass house was carried out. SEM studies were conducted for spores of 2 species. Documentation and finalization of Mss is under process.

Gingers of Nagaland by Dr. Moaakum, AJC Bose PDF

During 2016-17, previously collected specimens were processed by standard method and dried specimens were mounted on herbarium sheets along with entry of field data. Unidentified plant specimens collected during previous years, were identified with the help of types, protologues, literatures and authentic herbarium sheets. Plants growing in botanic garden were regularly monitored and fresh specimens were collected for dissection and illustration. Distribution map of gingers with reference to the localities visited during the exploration was prepared. Of the total collection, 40 taxa were identified up to species level belonging to 13 genera namely *Alpinia galanga, A.malaccensis, Amomum dealbatum, A.carnosum, A.corynostachyum, A.mizoramense, A. pauciflorum, A.subulatum, Boesenbergia kingii, Cautleya cathcartii, Curcuma angustifolia, C. longa, C.aromatic, C.zedoria, Etlingera linguiformis, Globba multiflora, G.orixensis, G.racemosa, Hedychium coccineum, H. coronarium, H.elatum, H. ellipticum, H.flavum, H.gardnerianum, H.greenii, H.longipedunculatum, H. marginatum, H.rubrum, H.spicatum, H.stenopetalum, H.villosum, Hornstedtia arunachalensis, Kaempferia parviflora, Larsenianthus careyanus, Mantisia spathulata, Stahlianthus involucratus, Zingiber pherimaense, Z. galanga, Z. zerumbet.*

Micropropagation and screening of secondary metabolites of six medicinal orchids in Meghalaya by Miss Gargi Prasad, SPF & Dr. A.A. Mao, Scientist-F

During 2016-17,shoot induction studies was initiated using leaf segments of *Aerides odorata* on MS nutrient medium containing different concentrations of growth regulators. *In vitro* raised plantlets were used to study multiple shoot induction on MS nutrient medium containing banana and different concentrations of plant growth regulators. 60 plantlets were successfully transferred to green house for hardening. Shoot induction studies of *Dendrobium chrysotoxum* was initiated using pseudobulb on MS nutrient medium containing different concentrations of growth regulators

and regular subculture of *in vitro* raised plantlets was maintained. Shoot induction studies of *Bulbophyllum odoratissimum* was initiated using nodal part of young shoots on plain MS nutrient medium. Regular subculture of *in vitro* raised plantlets on MS medium containing different concentrations of growth regulator was carried out. Shoot induction studies of *Malaxis acuminata* was initiated using pseudobulb of *in vitro* raised plantlets on MS nutrient medium containing different concentrations of growth regulators. Regular subculture of *in vitro* raised plantlets on fresh MS medium was carried out. Shoot induction using nodal portion of young shoots of *Cephalantheropsis gracilis* was initiated on plain MS nutrient medium. Regular subculture of *in vitro* raised plantlets on fresh MS medium was done. Shoot induction studies of *Dendrobium nobile* was initiated using leaf segments on MS nutrient medium containing different concentrations of growth regulators. Regular subculture of *in vitro* raised plantlets on fresh MS medium was undertaken. Total 180 plantlets were successfully transferred in green house for hardening. Multiple shoot induction using nodal portion of *in vitro* raised plantlets on MS nutrient medium containing different concentration of plant growth regulators was also carried out.

In *Aerides odorata*, seed germination studies showed high percentage of germination in all treatments (5% banana, 10% banana, 10% coconut water, 0.2% activated charcoal). In the shoot induction experiments, new shoot formation was observed within two weeks, is still surviving. The highest efficiency of shoot formation after 12 weeks observed in the medium containing BA (1mg/L) along with NAA (0.5mg/L).Approximately 400nos. *in vitro* raised plantlets of *A. odorata* has been transferred to green house for hardening. In case of *Bulbophyllum odoratissimum*, high rate of fungal contamination was observed in the shoot induction experiments. So far no response of multiple shoot is observed. In *Malaxis acuminata*, pseudobulbs were used as explants. Survival rate of explants was very low due to high rate of fungal contamination. Only 20% 0f explants showed response and attained a height of 3 cm after 4 months. Shoot induction studies of *Cephalantheropsis gracilis* had been set up which showed new shoot initiation from node within 3 weeks and attained a length of 1cm in 4 weeks. After 8 weeks of inoculation, it became 2.5 cm in height. More experiment will be set up to develop the protocol for micropropagation.

Taxonomic studies on Non Thelotremoid Graphidaceae, India by Dr. Pushpi Singh, SPF & Dr. K.P. Singh, PI, Emiretus Scientist

During 2016-17, 110species of family non Thelotremoid Graphidaceae collected earlier from Karnataka, Kerala, Andaman and Nicobar Islands, Meghalaya, Mizoram, Sikkim, Tamil Nadu, Uttarakhand and West Bengal, were identified and preserved in different herbaria (BSA and ASSAM) and Type specimens taken on loan from M and LWG were investigated morphologically, anatomically and chemically and identified up to species level. The present study reveals 12 species from Karnataka and 11 species from Meghalaya as new records to the states; 04 species are reported as new records for Indian Lichen biota. During this period, 03 research papers were published in peer reviewed journals.

Lichens of Terai Region of Uttar Pradesh by Dr. Pooja Gupta, SPF & Dr. G.P. Sinha, PI

During 2016-17, a total of 115 specimens were identified upto species level;*viz. Agonimia allobata* (Stizenb.) P. James, *Coenogonium aciculatum* Lücking & Aptroot and *Malmidea bakeri* (Vain.) Kalb, Rivas Plata & Lumbsch were reported as a new records for India. Ten species *viz. Arthonia tumidula* (Ach.) Ach., *Bacidia medialis* (Tuck. ex Nyl.) Zahlbr., *Fissurina cingalina* (Nyl.) Staiger, *Graphis caesiella* Vain., *G. filiformis* Adaw. & Makhija, *G. lineola* Ach., *G. pyrrhocheiloides* Zahlbr., *Letrouitia domingensis* (Pers.) Hafellner & Bellem., *Mycomicrothelia nonensis* (Stirt.) D. Hawksw. and *M. thelena* (Ach.) D. Hawksw. werereported as new to Uttar Pradesh. During this period also reported four species *viz. Bacidina apiahica* (Müll. Arg.) Vězda, *Byssoloma chlorinum* (Vain.) Zahlbr., *Calopadia fusca* Vězda and *Strigula nitidula* Mont. as new records for Assam. During this period also reported four species *viz. Bacidina apiahica* (Müll. Arg.) Vězda, *Byssoloma chlorinum* (Vain.) Zahlbr., *Calopadia fusca* Vězda and *Strigula nitidula* Mont.,as new records for Assam. 03 research papers were published in peer reviewed journals.

Taxonomic Studies on Lejeuneaceae, Schizostipae (Marchantiophyta) in Northeast India including Sikkim by Mr. Shasi Kumar, SPF & Dr. S.K. Singh, Scientist-D

During 2016-17, 03 tours were conducted *w.e.f.* 01.05.2016 to 06.05.2016 to Naga GG and Omaling Lake, West Kameng, Arunachal Pradesh, 12.11.16 to 21.11.16 to Nagaland, Kohima and surrounding forests and 14.02.17 to 21.02.17 to Bagmara Reserve Forest, Balpakram National Park (South Garo Hills), Nokrek National Park (West Garo Hills), Meghalaya during which 761 specimens were collected. Besides,09 local tours were conducted to Elephanta falls areas (collected 21 Lejeuneaceae Schizostiapae samples), Tyrshi Falls, Jowai (collected 33 samples), Mawsynram and Shillong Pick areas (collected total 43 Lejeuneaceae Schizostiapae samples), Shillong Peak (Meghalaya) (collected 25 Lejeuneaceae Schizostiapae specimens), Pynursla and Living root bridge (collected 15 Lejuneaceae Schizostiapae samples), Elephant falls (collected 34

Lejeuneaceae Schizostiapae specimens). During the above period, illustration, description and identification of 11 species, namely *Ceilolejeunea obtusifolia, C. vittata, C. subopaca, Colura acroloba, C. conica,Drepanolejeunea pulla, D. vesiculosa, Microlejeunea ulicina, M. punctiformis , Metalejeunea cucullata, Leptolejeunea balansae* were completed.Identification of more than 100 taxa were completed, *viz.Cheilolejeunea trapezia* (TSLI – 168), *C. vittata* (TSLI – 194, 195), *Lejeunea anisophylla* (TSLI – 204, 205), *L. obscura* (TSLI – 174, 200, 202, 203), *Cheilolejeunea trapezia* (TSLI – 232, 318, 322, 323, 326, 338, 341, 347, 348), *C. vittata* (TSLI – 215), *Lejeunea curviloba* (TSLI – 342), *L. exilis* (TSLI – 322), *L. flava* (TSLI – 322, 326, 330, 332, 333, 345, 347), *L. obscura* (TSLI – 214), *L. parva* (TSLI – 345), *L. subacute* (TSLI – 319, 331, 334, 339, 340), *L. flava* TSLI – 390, 430, 437, 439, 447, *L. japonica* (TSLI – 382, *L. tuberculosa* - TSLI – 1579, 1584, 1585, 1593, 1600, *Microlejeunea punctiformis* 764, 789, 705, *M. ulicina* 790, 791, 793, *M. punctiformis* - TSLI – 1579, 1580, 1587, 1591, 1595, 1596, 1598, 1599, 1600.

Microfungi of Biligiri Rangaswamy Temple Wildlife Sanctuary by Shreya Sengupta Chatterjee, SPF & Dr. Reshmi Dubey, Scientist-D

During 2016-17, a fungal exploration tour *w.e.f.* 12.12.2016 to 26.12.2016 was conducted in different unexplored forest areas of of Biligiri Rangaswamy Temple wildlife Sanctuary during which 12 infected follicolous plant specimens,18 samples of leaf litter and near about 121 decaying wood materials were collected from various sources such as - infected live plants, barks, leaf litter, branch litter, dried decaying plant specimens, water and soil. About 680 photographs were taken during this tour. During this period, a total of 139 specimens were examined, 591 slides were prepared, isolation of the endophytic and litter fungi was done by 3-steps sterilization process, particle filtration method respectively in different culture methods. Identification of 49 specimens was completed, *viz. Memnoniella* sp. (on branch litter), Field no. 202253 – *Monodictys* sp. (on branch litter), Field no. 202254 – *Diplocladiella* sp. (on stem litter), Field no. 202255 – *Monodictys* sp. (on branch litter), Field no. 202256 – *Torula* sp. (on branch litter), Field no. 202257– *Neopestalotiopsisasiatica* (Maharachch. & K.D. Hyde) Maharachch., K.D. Hyde & Crous (on leaf litter), Field no. 202258 – *Tetraploa* sp. (on branch litter).Field no. 202259 – *Tharoopama* sp. (on coir of *Cocos nucifera* L.), Field no. 202260 – *Deightoniella* sp. (on branch litter), Field no. 202261 – *Pleurophragmium* sp., *Periconia cambrensis* E.W. Mason & M.B. Ellis, *Epicoccum* sp., *Cordana* sp. (on stem *Bambusa bambos*(L.) Voss), Field no. 202262 – *Taeniolella scripta* (P. Karst.) S. Hughes(on stem litter), Field no. 202263 – *Sordaria* sp. (on branch litter), Field no. 202192– *Arthrinium urticae* M.B. Ellis(on branch litter), Field no. 202202 – *Cladosporium oxysporum* Berk. & M.A. Curtis(on branch litter), Field no. 202199 – *Akanthomyces* sp.(on branch litter),Field no. 202265 – *Gonytrichum macrocladum* (Sacc.) S. Hughes(on stem litter), Field no. 202265 – *Exosporium*sp.(on branch litter), Field no. 202266 – *Pestalotiopsis chrysea* Maharachchikumbura & K.D. Hyde (on leaf litter) etc. Preservation of host follicolous plant specimens by herbarium technique, dried bark and leaf litter in specimen envelope with proper field labelling was completed. During above mentioned period, 04 research papers were published in peer reviewed journals.

Ethnobotanical study of Lodha (A primitive tribal Group) of West Bengal and nutraceutical analysis of selected plant speciesby Sagari Chaudhury, SPF &Dr. Harish Singh, Scientist-D, CBL, BSI

During this tenure, three field tours were undertaken in 18 Lodha populated villages and forest areas of Alipurduar district, Bankura district and South 24 Parganas district of West Bengal in different seasons. A total of 120 specimens along with 160 ethnobotanical uses were documented. Identification of 100 specimens was done and Nutraceutical analyses of selected 6 plant species were carried out. Two papers were published on the Ethnozoological Data which were found during field tours.

Taxonomic revision of the family Fagaceae in India by Ms. Shankhamala Mitra, SPF & Dr. Vinay Ranjan, Scientist-D

During 2016-17, 01 field tour was conducted to Uttarakhand (Dehradun, Mussoorie, Dhanaulti, Chakrata, Lokhandi) and 04 species of Fagaceae were collected. Herbarium consultation tour to BSI, NRC and Forest Research Institute Herbarium (DD) was undertaken during which diterminavit slip was attached on unidentified and wrongly identified sheets.

A systematic study on the Tribe Ipomoeeae (Convolvulaceae) in India by Ms. S. Shalini, SPF & Dr. P. Lakshminarasimhan, Scientist-E

During 2016-17, study of the taxa belonging to the tribe Ipomoeeae was completed. Some species of tribe Ipomoeeae were collected in their natural habitats through conducting plant exploration tours. During this period, four herbarium consultation tours and plant exploration tours were conducted to various parts of India during which following taxa were collected: *Argyreia cymosa, A. hirsuta, A. kleiniana, A. sericea, Ipomoea carnea, I. hederifolia, I. marginata, I. nil, I. obscura* and *I. pes-caprae*. During this period, 920 herbarium specimens were studied, description of 60 species was completed, examined 50 specimens, illustration

completed for 04 species and 08 photoplates were prepared. In addition, seed morphology of 26 species of *Argyreia*, 4 species of *Ipomoea* and 1 species of *Stictocardia* was studied; study of pollen morphology of 23species of *Argyreia*, 05species of *Ipomoea* was completed. Leptotypification of 08 species of *Argyreia* was completed.

Taxonomic revision of *Pteris* (Pteridaceae) in India by Piu Das, SPF & Dr. P.M. Padhye, Scientist-F

During 2016-17, 02 tours were undertaken in Andaman and Nicobars Island and Maharashtra for collection of living *Pteris* species.During these field tours, 05 *Pteris* species were collected from different parts of Andaman and Nicobars Islands and Maharashtra. All the species collected were in fertile as well as in sterile forms and are listed below, *Pteris biaurita*, *P. ensiformis*, *P. vittata*, *P. pluricaudata*, *P. venusta*. During this period, more than 156 herbarium specimens, housed in PBL were examined, 15 species were identified, 21 species were described, prepared 15 illustrations and 03 photoplates. SEM studies for spores of available fertile *Pteris*species were carried out during the period under report.

Taxonomic Studies on the genus *Rubus* L. in India by Ms. Chandani Gupta, SPF & Dr. S.S. Dash, Scientist-D

During 2016-17, a field tour was conducted to Himachal Pradesh in April, 2016 where Kullu & Chamba districts were surveyed including the Great Himalayan National Park and collected 08 taxa of *Rubus* and total 84 specimens were vouched. During the tour, visited IHBT herbarium at Palampur where 52 specimens belonging to *Rubus ellipticus*, *R. saxatilis*, *R. pungens*, and *R. niveus* were studied, properly determined and annotated accordingly. Photographs were also taken for future references. During this period, Herbarium Consultation Tour was undertaken to Western Regional Centre, BSI, Pune (BSI); herbarium of Agharkar Research Institute, Pune; BLATTER herbarium, St. Xavier's College, Mumbai; herbarium of National Botanical Research Institute, Lucknow (LWG) and field data of all total of 584 specimens belonging to genus *Rubus* were recorded, specimens were properly identified whenever required and also annotated. SEM of pollen & seed of 15 species were done. 06 species of *Rubus* were dissected, described & illustrated. An updated list of Indian *Rubus* was also prepared. During this period, 02 papers were published in peer reviewed journals. Presented a paper entitled "An Assessment on the *Rubus acuminatus* (Rosaceae) Complex" in National Seminar on "Understanding Himalayan Phytodicersity on Changing Climate" from 9th to 10th March, 2016, BSI, Gangtok.

Hepaticae and Anthocerotae of Anjaw District, Arunachal Pradesh by Shuvadeep Majumdar, SPF & Dr. D.K. Singh, Retd. Scientist 'G'

During this period, 25 species were worked out and camera lucida drawings were prepared, 20 species were described, 50 line diagram plates and 30 photoplates were prepared, SEM study of 10 species were completed. Data entry done for 40 herbarium specimens. The present study reports 04 species as new to India, 01 species as new to Bhutan, 04 species as new record for the state Arunachal Pradesh. During this period, 05 papers were published in peer reviewed journals.

Taxonomic revision of the subgenus *Carex* of genus *Carex* L. (Cyperaceae) in India by Animesh Maji, SPF & Dr. V. P. Prasad, Scientist – D

During 2016-17, 03 collection tours were undertaken to Shimla, Upper and Lower Summer Hill areas, Potter Hill region, Narkanda, Hattu, Kufri area, Parts of Mandi District, Kullu District and North Sikkim like Chungthang, Mangang, Phodong, Lachung, Yumthang Valley, Shiva Mandir, Yumesamdong *w.e.f.* 20th – 29th July, 2016 and 21st– 27th September 2016 respectively. Besides, specimens were also collected from nearby areas of Junner District, Shivneri Fort area, Durgawadi Plateau of Khed District, Mahabaleshwar Temple hill slopes, Arthur Point and different high altitude areas of Maharashtra. A total number of *c.* 270 specimens of 90 field nos. including the other members of Cyperaceae were collected during these three tours. Out of these 90 field numbers 45 belongs to the genus *Carex*. c. 25 field numbers were identified including some interesting specimens having characters of both the species, treated as intermediate collection. Besides this field tours, one herbarium consultation tour was undertaken to BSI (Pune), Goa University (Taleigao Plateau, Goa), Blatter Herbarium (Mumbai) *w.e.f.* 3rd to 18th November, 2016 and consulted *c.* 150 specimens of *Carex*. Description and illustration of 10 species were completed by studying a total number of c.200 specimens deposited at CAL. This study reports 01 species as new to science; *Carex capillaris* L., as new distributional record for India which was reported from the Indian state Jammu and Kashmir. Another three species *viz. C. indica* L., *C. finitima* Boott and *C. asraoi* D.M. Verma were reported as a new distributional records for the state of Manipur; *C. sahnii* Ghildyal & U.C. Bhattach., reported as extinct species as per IUCN red data book, distributed at North Sikkim district of Sikkim. During this tenure of work, one paper was presented which entitled as "Taxonomic Studies on the genus *Carex* L. (Cyperaceae) in Manipur, India" during the 39th all India Conference of the Indian Botanical

Society & National Symposium on "New Approaches and Recent challenges in Botany" at University Department of Botany, Ranchi University, Jharkhand on 21st to 23rd October, 2016 and one poster was presented which entitled as 'Taxonomic Studies on the genus *Carex* L. (Cyperaceae) in Eastern Himalaya' during the 26th IAAT Seminar at Shivaji University, Kolhapur, Maharashtra on 08.11.2016 and awarded 'Prof. S.R. Yadav award for the Best Poster'.

Flora of Satkosia Tiger Reserve, Odishaby K. Chandramohan, SPF & Dr. P. V. Prasanna, Scientist-F

During this period, 04 field tours were conducted to Satkosia Tiger Reserve, Odisha during which 252 field nos. were collected of which 172 species were identified. In addition, 02 herbarium consultation tours were undertaken to RPRC, Bhubaneswar, Odisha and CNH, Howrah respectively.

During 2016-17, 12 research papers were published in peer reviewed journals.

Flora of Kawal Tiger Reserve & Two National Parks of Hyderabad (Telangana)by Annamma P. S. SPF & Dr. P. Venu, Scientist-F

During this period, 02 field tours were undertaken to Kawal Tiger Reserve,*w.e.f.* 25.07.2016 to 05.08.2016 and 20.12.2016 to 23.12.2016 and collected 34 field nos. Besides one herbarium consultation tour was conducted to Central National Herbarium (CAL), Howrah from January 30.01.2017 to 06.02.2017. 148 species were identified from earlier collection of the study area and a detailed description was made for about 120 taxa for the flora of Kawal Tiger Reserve. During 2016-17, 03 research papers were published in peer reviewed journals.

Pteridophytic flora of Kudremukh National Park, Central Western Ghats with 10% periphery" by Devendra Tripathi, SPF & Dr. A. Benniamin, Scientist-D

During 2016-17, two field tours *w.e.f.*12.09.2016-10.10.2016 and 20-11-2016 to 03-12-2016 were undertaken to different parts of National Parks, Karkala region,Mullodi, Kudremukh peak, Jodgudi, Bhagvathi Nature Camp, Kurinjal peak forest area, Kadambi falls forest area, Hanuman Gundi, Kerekatte, Malakibetta, Ganeshkatti, S K Border of Kudremukh National Park, Karnataka during which 350 specimens of Pteridophytes were collected, *viz. Huperzia phyllantha,H. squarrosa, Selaginella ciliaris, Osmunda hilsenbergii,Pteris argyraea,Mickelopteris cordata, Pityrogramma austroamericana, Adiantum latifolium* etc. In addition, a erbarium consultation tour *w.e.f.* 12.09.16-21.09.16 was conducted to St. Joseph College, Bangalore, IISC Bangalore, St. Aloysius College Mangalore and M. G. M. College, Udupi during which 265 specimens were examined. Spore morphology (SEM) of 18 species namely *Huperzia phyllantha, Botrychium daucifolium, Angiopteris helferiana,Osmunda hilsenbergii,Lygodium flexuosum, L. microphyllum, Pteris biaurita, P. pellucida, Aleuritopteris farinosa, Adiantum incisum,A. philippense,A. raddianum, Lindsaea heterophylla, Cyathea gigantea, C. spinulosa, Thelypteris terminus, Asplenium nidus,Dryopteris cochleata* were studied. The present study reports 02 species as new record for Karnataka. During this period, 01 research paper and 02 abstracts was published.

Studies on the families Agaricaceae, Boletaceae, Hygrophoraceae, Suillaceae and Cantharellaceae of East and South Districts of Sikkim By Dyutiparna Chakraborty, SPF & Dr. Kanad Das, Scientist-D

During 2016-17, a macrofungal collection tour was undertaken from 13.08.2016 to 31.08.2016 to different forested areas of South and East districts of Sikkim during which 61 field numbers were collected. All specimens were well preserved and are under study. During this period, micromorphological characterization and microphotography of 12 specimens were completed along with description and drawing; 08 species were identified, namely DC 15-028 as *Tylopilus felleus*(Bull.) P. Karst. (Boletaceae), DC 15-003 as *Cystoderma amianthinum* (Scop.) Fayod [Agaricaceae], DC- 16-013 as *Hygrocybe conica* (Schaeff.) P. Kumm., DC 16-29 as *Aureoboletus nephrosporus* G. Wu & Zhu L. Yang, DC 16-03 as *Clarkeinda* aff. *trachodes*, DC 16-35 as *Lycoperdon ericaeum* Bonord., *Phylloporus maculatus* N.K. Zeng, Zhu L. Yang & L.P. Tang, DC 16-58 as *Retiboletus kauffmanii* (Lohwag) N.K. Zeng & Zhu L. Yang. During this period, 06 papers were published in peer reviewed journals.

FUNDED PROJECT

Study& Documentationof Biodiversityof Dalma Wildlife Sanctuary (DWLS) & Saranda Forest Division (SFD) by Dr. P.V. Prasanna, Scientist-F & Dr. Vinay Ranjan, Scientist-D (sponsored agency: Jharkhand Biodiversity Board, Ranchi)

During this period, one field tour was conducted *w.e.f.* 09.03.2017-09.04.2017 to Dalma Wildlife Sanctuary and Saranda Forest Division. In both the areas, permanent quadrates (4 in DWLS and 4 in SED) were laid for quantitative study.

Inventorization of Indian *Calanthe* R. Br. (Orchidaceae) with Focus on Micro Morphology of Pollinia [SERB-YOUNG SCIENTIST PROJECT; DST NO: SB/FT/LS-397/2012] by Dr. Avishek Bhattacharjee, Scientist-B

This project was awarded by SERB-DST before appointment as Scientist 'B' in BSI. After a break for about

3 months (due to re-allocation of fund after appointment), the project was resumed and successfully completed.The project report was presented (in form of hard-copy and Power-Point presentation) before the expert committee of SERB-DST in the Group Monitoring Workshop (GMW) held on 12.08.16 at Manipal University, Manipal, Karnataka.

During 2016-17, 03 field tours were undertaken during which 04 species were collected along with field photographs. The details of field nos. collected and Plant specimens Identified are *Calanthe brevicornu* (*A. Bhattacharjee 62175*, CAL); *C. puberula* (*A. Bhattacharjee 62172*, CAL); *C. tricarinata* (*A. Bhattacharjee 62177*, CAL); *C. trulliformis* (*A. Bhattacharjee 62180*, CAL). One or two specimens for each species were collected due to its rarity and 06 specimens were incorporated in the herbarium during the study. During this period, following plant species were documented *viz.*, *Calanthe alismaefolia* Lindl., *C. biloba* Lindl., *C. densiflora* Lindl., *C. griffithii* Lindl., *C. mannii* Hook.f., *C. masuca* (D. Don) Lindl., *C. puberula* Lindl., *C. tricarinata* Lindl., *C. trulliformis* King & Pantl., *C. triplicata* (Willemet) Ames and *C. yuksomnensis* Lucksom.

The present study reports *Calanthe masuca* (D. Don) Lindl. and *C. sylvatica* (Thouars) Lindl., treated by many taxonomists/orchidologists as conspecific, are two different species supporting the treatment of Clayton & Cribb (2013). It has been observed that *Calanthe sylvatica* is not found in India. The Indian specimens of *Calanthe* identified as *C. sylvatica* are actually *C. masuca*. This study also confirms *Calanthe chloroleuca* Lindl. is a new synonym of *C. griffithii* Lindl. As per this study, the genus is now represented by 29 species (with 01 newly recorded species during the present work) in India.

Studies on Taxonomy, Phytogeographyand Conservation of South Indian *HABENARIA* (Orchidaceae) (SERB-DST PROJECT) by DR. K. Prasad, RA

During 2016-17, conducted 6 field tours to the study areas and collected 86 field numbers. One herbarium consultation tour*w.e.f.*21.02.17 – 11.03.2017were carried out to CNH, Howrah. During this period, 41 field nos., from the earlier collections, were identified and published 3 research papers.

Exploration and Evaluation of Cyto-Morphological Diversity in the Grasses of Cold Deserts of Pangi Valley by Mr. Harminder Singh, JRF & Dr. Puneet Kumar (PI), Scientist-B

During 2016-17, 02 field tours were conducted in different regions of the Pangi Valley, Chamba to locate the grass species during which total 106 field nos. were collected for cytological studies as per availability. The collected cytological materials were worked out at BSI, NRC along with identification of grass specimens. Literature and herbarium study of Grasses of adjoining areas of Pangi Valley, Chamba, Himachal Pradesh were done along with listing of number of grass species that were recorded from the nearby regions of the study site. During this period, 02 research papers were published in peer reviewed journals.

Diversityand Ecology of Cyanobacteriaand Algae in the Alpine Regionsof Eastern Himalayaby Dr. Sudipta Kr. Das

During 2016-17, a total of two field tours were conducted to Dibang Valley districts of Arunachal Pradesh and several localities of East Sikkim in which 142 samples of algae and cyanobacteria were collected from various freshwater and terrestrial habitats. A total of 64 taxa were identified belonging to 47 genera including 9 members of Cyanophyta, 15 Chlorophyta, 1 Chrysophyta and 39 Bacillariophyta.Two new cyanobacterial species were described, *i.e. Schmidleinema santiniketanense* N.Keshari, Sudipta K. Das & S.P. Adhikary and *Stigonema tagorum* Sudipta K. Das, N. Keshari & S.P. Adhikary, from stone monuments of Santiniketan, West Bengal. A new green algal variety, *i.e. Ecballocystopsis dichotomus* var. *lateharii* Sudipta K. Das & Raj. K. Gupta was also described from Jharkhand.The research findings were published in 5 research papers in peer reviewed journals like *Phytotaxa*, *Indian Journal of Traditional Knowledge*, *Feddes Repertorium* and *Nelumbo*.

Biodiversity Assessment Through Long-Term Monitoring Plots in Indian Himalayan Landscape (NMHS LARGE GRANT PROJECT) by Dr. Sudipta Kumar Das, Dr. Vikas Kumar, Dr. Dinesh Singh, Dr. Samiran Pandey, Ms. Natasha Srivastava, Mr. Arnab Banerjee, Mr. Subhajit Lahiri, Mr. Deep Sekhar Dash, Mr. Madhav Kr. Jha, Mr. Nikesh Kumar& Dr. P. Singh, Dir/BSI, (PI), Dr. B.K. Sinha, Scientist-F & Dr. S.S. Dash, Scientist-D (Co PI)

A new large grant project, entitled 'Biodiversity Assessment through Long-term Monitoring Plots in Indian Himalayan Landscape' was initiated as a joint venture of Botanical Survey of India and Zoological Survey of India, Kolkata, funded by MoEF & CC, Govt. of India under the scheme National Mission on Himalayan Studies (NMHS). The Principal Investigator of the project was Dr. Paramjit Singh with the Co-Principal Investigators, Dr. B.K. Sinha and Dr. S.S. Dash. Ten research staffs are currently working in the project. In 2016-17, altogether 08 field trips were conducted to 04 Himalayan states for sampling and screening of suitable sites for establishment of monitoring plots. A total of 1364 plant specimens were collected from different sites

of Neora Valley National Park (West Bengal), Gnathang Plateau (Sikkim), Tawang and Namdapha National Park (Arunachal Pradesh) and Great Himalayan National Park (Himachal Pradesh) out of which 784 plants were identified. About 112 monitoring plots were established in these sites for long-term study and assessment. A capacity building workshop for awareness and training of local stakeholders was conducted in Gangtok, Sikkim during 29.03.2017 to 30.03.2017. The research findings were communicated for publication in three reputed journals and were also presented in one conference/seminar.

Multidisciplinary Studies in Floristic Assessment, Ecological Analysis, Ecosystem Services, Conservation and Sustainable Management of Selected National Parks in Western Himalayas (NMHS, MG) by Mr. Rajni Kant, Mr. Kapil Kharkwal, Miss. Shalini Singh, JPFs & Dr. P. Singh, Dir/BSI, Dr. B.K. Sinha, Scientist-F, Dr. S.K. Srivastava, Scientist-E, Dr. Kumar Ambrish, Scientist-D and Dr. Chandrasekar, Scientist-D, G.B. Pant Institute of Himalayan Development (CO-PI)

Botanical Survey of India expertise concentrating on floristic survey, identification and documentation of all the groups of plants (Algae, Fungi, Lichens, Bryophytes, Pteridophytes and Angiosperms) represented in the National Parks along with ethno botanical uses, plant-human interactions and livelihood of the local communities. G.B. Pant Institue of Himalayan Environment and Development, expertise will focus on ecological studies with changes in climate, ecosystem services and analyzing impacts of recent disasters in Uttarakhand state, ecology and other environmental related issues in Himalayan region.

Objectives of the Project: Exploration and inventorisation of floristic diversity; estimation of endemism, categorization and reassessment of rare and threatened species based on revised IUCN guidelines, documentation of economic/socio-economic uses of plants. Ecological assessment of different groups of plants within the park and their role on the ecosystem along with functional dynamics and phenology; Impact of anthropogenic and other factors on the plants; to identify the change in vegetation and species population due to climatic change and natural hazards including the assessment and impact of invasive species on indigenous flora. The area of allotted project is Great Himalayan National Park (Kullu, Himachal Pradesh) and Valley of Flowers (Chamoli, Uttarakhand).

During 2016-17, baseline data on plant diversity of Valley of Flowers National Park and Great Himalayan National Park was prepared. About 660 specimens deposited in Herbarium are recorded from family Ranunculaceae to Lamiaceae (60% completed). 02 field tours were undertaken *w.e.f.* 24.11.16-04.12.16 to the Great Himalayan National Park during which 261 specimens were collected, examined and field data recorded from the GHNP including 204 Angiosperms, 20 Lichens, 14 Bryophytes, 14 Macrofungi and 08 micro fungi/ soil samples. Identified 156 species including 07 RET species. Another field survey was conducted by expertise of GBPNIHESD during 19-25th Sept., 2016 to the Valley of Flowers National Park for ecological assessment of floristic diversity and collected 78 specimens of Angiosperms (c. 29 families), 2 specimens of Gymnosperms (2 families) and 42 specimens of Lichens (c.15 families). The preservation and identification of specimens are in progress. Five threatened species were analyzed for status assessment and data was compared with earlier records to define the floristic changes. There was found massive decrease in the density of *Dactylorhiza hatagirea, Fritillaria roylei, Polygonatum verticillatum, Podophyllum hexandrum*, while the density of *Malaxis muscifera* was increased when compared to earlier recorded density. The diversity of *Polygonum polystachyum* was found in higher density and may be a major invasive plant

In the valley. One sapling of *Pinus wallichiana* was also recorded during exploration and considered as a new addition to Valley of Flowers National Park.

Preventing Extinction and Improving Conservation Status of Threatened Plants through applicationof Biotechnological Tools (DBT FUNDED PROJECT) by Dr. A. A. Mao, Scientist-E & H.O.O; Dr. Deepu Vijayan, Scientist-B, Smt. R.K. Nilasana Singha & Smt. Sangeeta Pradhan, JRFs and B Koshoni Pekosii, Feild Assistant

The project has successfully completed five years (2012-2017) and the Mss of final report is under process.

Preventing Extinction and Improving Conservation Status of Threatened Plants Through Application of Biotechnological Tools by Amber Srivastava, SRF, (DBT FUNDED PROJECT)& Dr. S.K. Srivastava, Scientist- E & HOO

During 2016-17, a total number of 16 field tours were conducted in different regions of the Western Himalaya to locate the threatened species, namely *Pittosporum eriocarpum, Lilium polyphyllum, Crepidium acuminatum, Skimmia anquetilia* and *Ephedra gerardiana*. A total number of *Pittosporum eriocarpum* (2000), *Lilium polyphyllum* (500), *Ephedra gerardiana* (300), *Crepidium acuminatum* (1000) and *Skimmia anquetilia* (700) saplings were propagated in the nursery of BSI, NRC. During this period, 02 research papers were published in peer reviewed journals.

ASSISTANCE TO BOTANIC GARDEN SCHEME OF MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE, NEW DELHI

Botanical Survey of India, one of the leading Research Institutes under Ministry of Environment, Forest & Climate Change, administer the funding of the ABG Schemes of MoEF & CC, New Delhi. According to the framed guidelines, every year, BSI receives and processes proposals to facilitate different leading agencies. After thorough scrutiny of the proposals, proper inspection of the proposed site is conducted and recommended to the Expert Groups. During Financial Year 2016-17, a fund of Rs. 21,900,439/-is released to strengthen the infrastructure of Botanic Gardens especially to conserve and preserve Orchids, Ferns, RET and EET plant species. Details of ABG GRANT-IN-AID, FUND DISBURSED in FY 2016-17 is provided in **Annexure –I.**

Annexure-I : ABG GRANT-IN-AID, FUND DISBURSED in FY 2016-17

Grant –In- Aid Available	Sl. No	Date of Sanction	Name of the Institution	Amount sanctioned in FY 2016-17	Balance Amount
	1	10/48/2008- CS/BG 21/06/2016	GKVK, Bangalore	14,63,676	2,05,36,324
	2	10/17/2014CS/BG 03/06/2016	Y. S. Parmar University, Solan	22,94,000	1,82,42,324
	3	10/13/2014-CS/BG 06/09/2016	IHBT, Palampur	33, 51, 400	1,48,90,924
	4.	10/20/2014-CS/BG dt. 21/09/2016	Botanical Survey of India, Eastern Regional Centre, Shillong	35,81,204	1,13,09,720
	5.	10/20/2014-CS/BG dt. 21/09/2016	Maharashtra Udayagiri Mahavidyalaya, Udgir	13, 92, 231	99,17,489
2,20,00,000/-	6.	10/09/2015-CS-BG dt . 08/12/2016	Feeds, Sylvan Botanic Garden, Manipur	34,11,640	65,05,849
	7.	10/07/2012-CS/BG dt. 27/12/2016	Calicut University, Kerala	12,80,018	52,25,831
	8.	10/02/2013-CS/BG dt. 27/12/2016	G.B. Pant Institute of Himalayan Environment and Development, Almora	10, 71, 367	41,54,464
	9.	10/21/2015- CS (BG) dt. 03/03/2017	Society for Conservation and Resource and development of Medicinal Plants, Ashok Vihar, Delhi	5,43,301	36,11,163
	10.	10/05/2014-CS/BG dt. 03/03/2017	Punjabi University, Patiala	15,88,551	20,22,612
		10/16/2016-CS/BG 31/03/2017	Yogi Vemana University, Kadapa	19, 23,051	**99,561**

Herbarium Information (2016-17)

Sl. No	Herbarium Maintenance	ANRC	AZRC	APRC	CNH	CRC	DRC	ERC	ISIM	NRC	SRC	WRC	Total
1	No. of Specimens mounted/ labelling	933/ 0	4599/ 3055	6271/ 2420	4119/ 3440	4112/ 3050	2173/ 0	1334/12 90	Nil/ 0	3069/ 0	3828/ 3389	900/ 0	**31,338/ 15,444**
2	No. of Herbarium sheets Stitched / poisoned	1120/ 10,400	2894/ 90	6271/ 551	2685/ 4119	4080/ 2367	200/ 3000	1397/ 1133	22/ 45	7538/ 3174	2678/ 4620	500/ 130	**29,385/ 29,629**
3	No. of Herbarium sheets accessioned	2837	1385	1458	Nil	1885	5128	1970	Nil	1320	241	528	**16,752**
4	No. of Specimens incorporated	282	1509	690	2666	2998	179	4772	Nil	3434	1227	7	**17,764**
5	No. of Specimens sent on loan	Nil	Nil	Nil	44 Images	Nil	Nil	14	Nil	30	Nil	Nil	**88**
6	No. of Specimens received on exchange/loan	Nil	17	Nil	91	23	39	Nil	Nil	Nil	38	Nil	**208**
7	No of specimens Identified	106	1288	Nil	251	483	1626	Nil	Nil	2248	11	Nil	**6,013**

Herbarium Digitization (2016-17)

Reg. Centre	ANRC	AZRC	APRC	CNH	CRC	BGIR	DRC	ERC	ISIM	NRC	SHRC	SRC	WRC	Total
Digitization	2487	Nil	Nil	1086	Nil	268	4568	Nil	Nil	2231	5653	3902	Nil	**20,195**

SERVICE RENDERED

A. Public Services Rendered

During this period, scientists of Botanical Survey of India identified and authenticated plant specimens and crude drug samples received from different Institutes; disseminated scientific information to public; assisted scientific fraternity in pursuing researches on plant taxonomy and allied disciplines. During 2016-17, c. 32,854 visitors including VIPs and dignatories, foreign delegates, scientists, academicians, researchers and students visited different botanical gardens, herbaria and musea of different regional Centres. Apart from that, more than 4.5 lakh general visitors exclusively visited AJC Bose Indian Botanic Garden, Howrah. 146 Queries on plant distribution, ecology, nomenclature, RET taxa etc were attended and solved by BSI experts.c. 1,886 Specimens of angiosperms, pteridophytes, bryophytes, fungi, lichens and algae, received from students/ scientists/researchers were identified and about 285 plant materials, saplings and seeds were supplied to different institutions. Students and research scholars of different Institutions and Universities were guided by capacity building and GSDP training courses. A total no. of 39 crude drugs were pharmacognostically authenticated of which 14 samples pertaining to CITES and Negative Listed Plants. During this period, different circles have distributed plant seedlings to different educational institutes and planted RET as well as EET plants in their natural habitats.

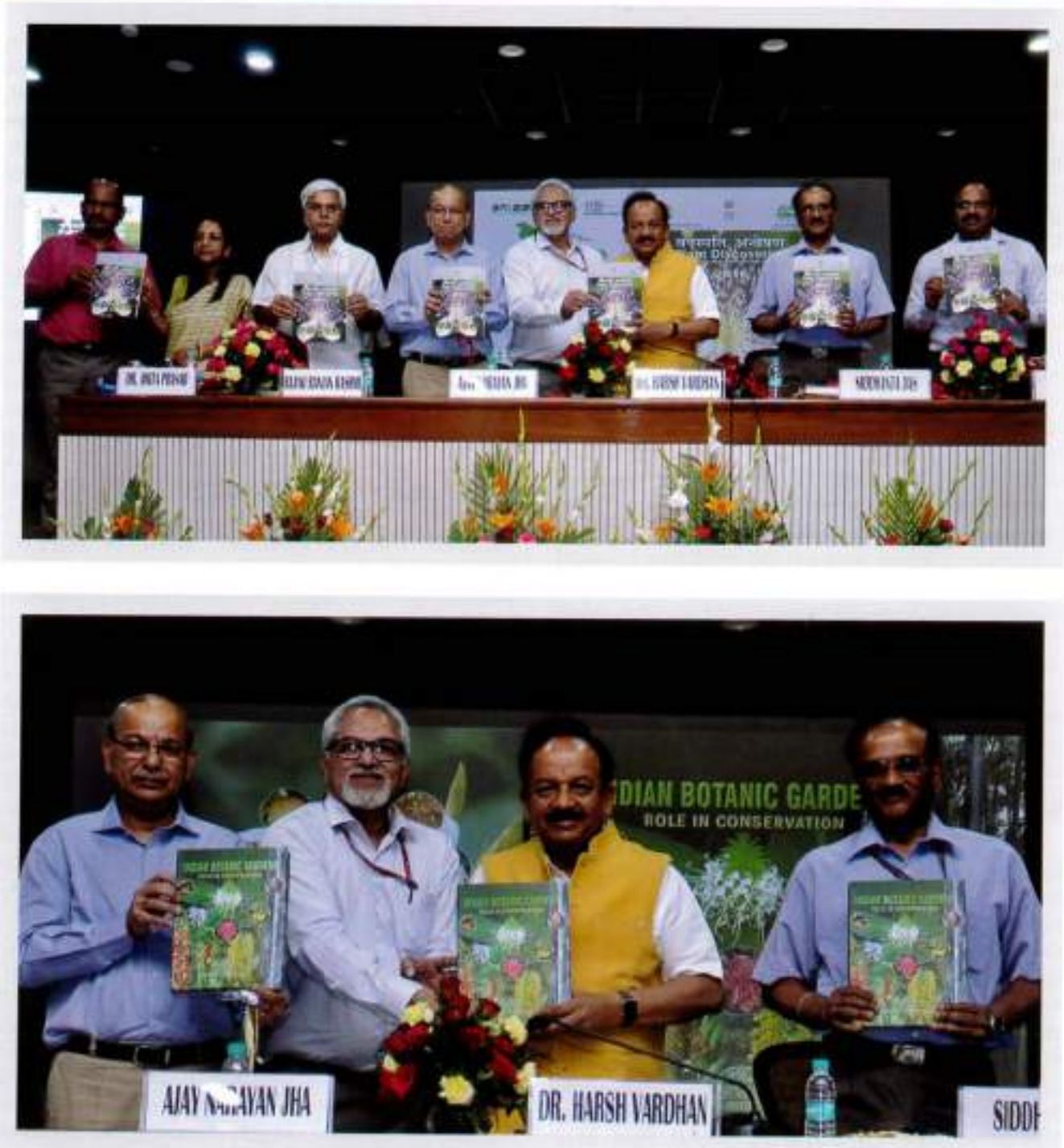
B. Scientific Workshop/Training/Seminar/ Conference organized

During this period, different regional centres of Botanical Survey of India organized thematic seminar on Biodiversity Day (22nd May, 2016); celebrated World Environment Day Programmes (5th June, 2016); International Yoga Day on 21st June; Environment Awareness Programmes during 'Van Mahotsav' on 7th July, 2016; Himalayan Day (9th September); Ozone Day (16th September); co-organised an International Conference on'*Climate Change Adaptation and Biodiversity: Ecological Sustainability and Resource Management for Livelihood Security*'at Port Blair from08.12.2016 to 10.12.2016;'*2nd Botanical Nomenclature Course*' on 09.02.17-12.02.17, venued at IISER, Pune; Seminar cum Exhibition on "*J. D. Hooker-A Trailblazer and Botanical Heritage in India*" at ISIM, BSI, Kolkata on 01.10.16-02.10.16; seminar on "*The Green Planet: Past, Present and Future*" on 21.12.16 -23.12.16, collaborating with CAS, Department of Botany, University of Calcutta, Probir Chatterjee Research Foundation; training programme on "*Basics of Plant Nomenclature*" on 14.01.17-15.01.2017, venued at Auditorium, CNH, Howrah and Botanical Survey of India, Kolkata; an International Seminar on"*Forests, Sacred grooves and environmental heritage of India*" on 30.03.17, organized by BSI in collaboration with Sussex University, UK, in ABC Hall, Indian Museum; three days training on '*Basics of plant identification and Botanical nomenclature*' on 07.11.16-09.11.16(organised by ERC, BSI); collaborative workshop on '*Interactive talks and workshop on essentials in Plant Revisionary Studies and Flora writing*' by WRC, BSI, Pune and Naoroji Godrej Centre for Plant Research (NGCPR); Vigilance Awareness Week on 04.11.16-10.11.16; capacity building workshop on "*Long term monitoring of Himalayan Biodiversity for stakeholders of Himalayan Regions*" by BSI, ZSI and G.B. Pant Institute of Himalayan Environment & Sustainable Development at Gangtok on 29.03.2017; training on'*Digital Payment and e-payment*' etc.All scientific staffs of BSI celebrated 127th Foundation Day programme venued at CNH, Howrah and participated in first Annual Scientific meet on 13.02.2016-15.02.2016. Different regional centres of BSI organised Hindi workshops and Hindi karyashala. All the staffs of Botanical Survey of India (including Regional Centres) participated in different competitions organized in Hindi Weeks (1st-15th September, 2016) and Hindi pakhwara.

C. Revenue Earnings

During this period, Botanical Survey of India earned total revenue of ₹. 6,278,415/- which include ₹. 122,500/- towards identification charges of plant specimens/crude drug samples, ₹. 3,51,581.00/- towards sale of BSI publications and rest amount towards miscellaneous services (Guest house charges, photocopy charges, entry fee in Botanic Garden, Photography charges etc.).

EVENTS AND ACTIVITIES



Hon'ble Minister MoEF&CC Dr. Harsh Vardhan releasing BSI Publications 'Plant Discoveries' and "Indian Botanic Gardens : Role in Conservation" during World Environment Day celebration at New Delhi

Dignitaries during inauguration of exhibition & conference on "Sir Joseph Dalton Hooker : Botanical Trailblazer and the Botanical Heritage of India" at IISM, Kolkata

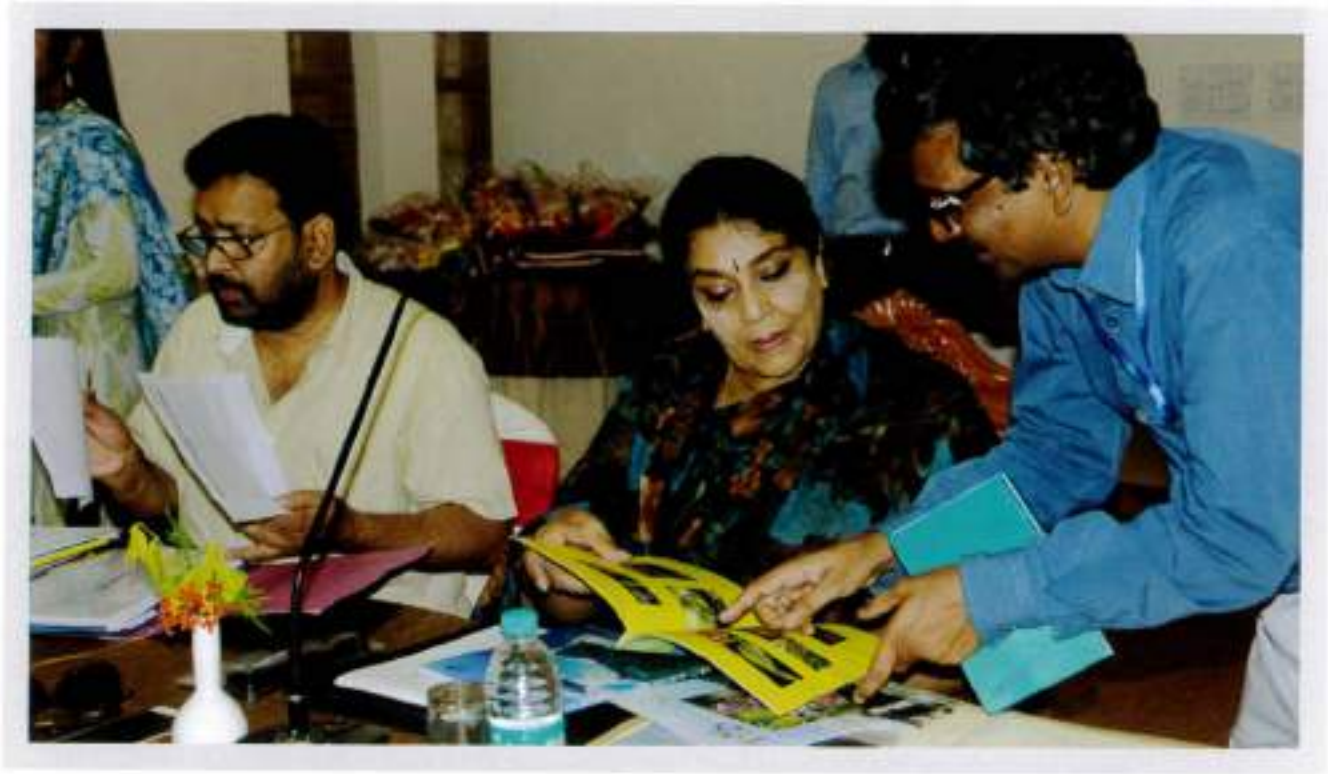
BSI officials during 1st Annual Scientific Meet (14th-16th Feb., 2017) at Central National Herbarium, Howrah

Participants of Green Skill Development Programme (GSDP) during inaugural session at CNH, Howrah

Group of participants and dignitaries during closing ceremony of 2nd Botanical Nomenclature Course held at IISER, Pune, from 9th to 12th Feb. 2017

Awareness rally on "World Ozone Day" 16th September 2017 held at CNH, Howrah

Sit and draw competition for school children on 5th June 2017
"World Environment Day" at AJC Bose Botanical Garden, Howrah



Members of Parliament Committee on official languages led by Mrs. Renuka Choudhury, during inspection Andaman and Nicobar Regional Centre, BSI, Port Blair

Sri M. Raju, Director, Geological Survey of India addressing the gathering and facilitating winners of drawing competition during Van-Mahotasva 2017

BUDGET

BOTANICAL SURVEY OF INDIA
GOVERNMENT OF INDIA

DETAILED DEMANDS FOR GRANTS OF MINISTRY OF ENVIRONMENT, FOREST& CLIMATE CHANGE FOR 2016-2017

Budget Estimates
2016-2017

(Rupees in thousand)

		Plan	Non-Plan	Total
Demand No.27				
3435	Ecology & Environment			
03	Environmental Research & Ecological Regeneration			
103	Research & Ecological Regeneration			
14	Survey & Research			
14.01	Botanical Survey of India			
Object Head				
01	Salaries	4,45,65	32,20,00	36,65,65
02	Wages	0	2,20	2,20
03	O.T.A.	0	19,35	19,35
06	Medical Treatment	12,15	49,00	61,15
11	Domestic Travel Expenses	1,02,48	22,60	1,25,08
12	Foreign Travel Expenses	2,50	50	3,00
13	Office Expenses	10,95,30	30,90	11,26,20
16	Publication	18,00	0	18,00
20	Other Administrative Expenses	0	4,00	4,00
21	Supplies & Materials	23,75	0	23,75
27	Minor Works	2,39,82	0	2,39,82
28	Professional Services	56,85	0	56,85
30	Other Contractual Services	2,23,50	0	2,23,50
31	Grant-in-aid	0	45	45
34	Scholarship & Stipend	80,00	0	80,00
	Total : BSI	**23,00,00**	**33,49,00**	**56,49,00**