

ANNUAL REPORT

2017-18



BOTANICAL SURVEY OF INDIA

Ministry of Environment, Forest & Climate Change

ANNUAL REPORT 2017-18



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Botanical Survey of India

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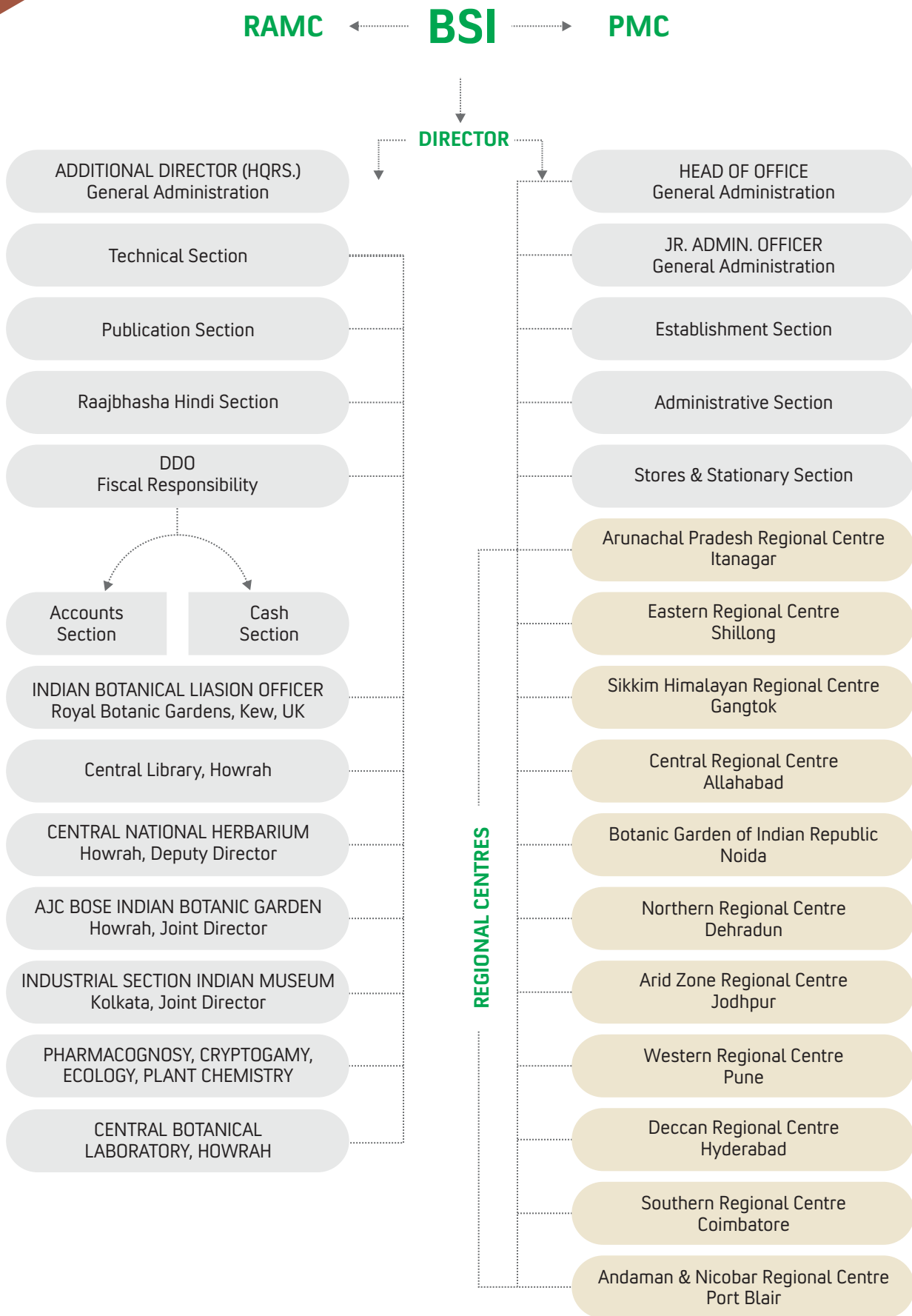
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ORGANOGRAM



From the DIRECTOR'S Desk



A.A. Mao
Director
Botanical Survey of India

It is a great pleasure and honors for me to present the 2017-18 Annual Report of Botanical Survey of India (BSI), Kolkata the apex research organization in Ministry of Environment, Forest & Climate Change. Similar to the previous years, during the year 2017-18, BSI too excelled in its research programmes, floral inventory, development of e-resources, quality research & book publications, infrastructure development and outreach programmes. During 2017-18, extensive survey and documentation of floral diversity was done in all major biogeographic zones of India including 23 protected areas, 01 fragile ecosystem, 01 sacred grove and 01 Ramsar site. A total of 117 field tours including 16 germplasm collection field tours were undertaken under 95 research projects. During this period, revisionary studies on the families Pyrenulaceae, Metzgeriaceae and the genera *Riccia*, *Adiantum*, *Gastrochilus* for Indian context and *Impatiens* for Sikkim & Darjeeling were initiated. Scientists of BSI have described one new genus, 84 new species and 03 varieties of plants as new to science and discovered one family, one genus, 24 species as new records for Indian flora during 2017-18.

In generating new knowledge, population study of 300 RET species of Orchids completed from Eastern Himalaya for the first time, ethno-botanical information were gather from Odisha, Gujarat and Maharashtra; nutlets of *Fimbristylis* and pollinia of south Indian Orchids were studies under SEM, cytological investigations of selected taxa of *Casiinae* and *Impatiens* were also completed. At par with the contemporary molecular systematics research, BSI officials have completed the phylogenetic analysis of 20 endemic species along with their phytochemical screening and DNA barcoding. On the programme, interpreting '*Icone Roxburghianae*'; three families (Leguminosae, Poaceae and Ebenaceae) were completed.

Towards fulfilling the GSPC target on *ex-situ* conservation, about 3550 accession numbers of Zingibers, Rattans, Bamboos, Orchids, medicinal and ornamental plants have been introduced in different experimental botanic gardens of BSI. During the year, 55,143 herbarium specimens have been digitized and barcoded

as part of herbarium digitization project. In continuation with development of e-resources, BSI achieved significantly in preparation of e-Flora of India, plant checklist database, digitization of rare holdings, BSI publications and online journal management portal. BSI witnessed a steady growth in its publication and visibility among scientific fraternity. More than 300 articles published by our scientists in different National and International journals of repute; the publication sections has published 10 books, four issues of periodicals, brochures, pamphlets etc. during the year. Besides, four new funded projects were sanctioned under National Mission for Himalayan Studies; two MoU signed between Burdwan University, West Bengal and Natural History Museum, UK for collaborative research activities. During the year, 2017 sixteen different awards were conferred to scientists of BSI for their outstanding achievements. I congratulate all the scientists and researchers for their significant contribution in the field of taxonomy.

During 2017-18, BSI also undertook a wide range of outreach training activities to disseminate knowledge which includes 'DNA barcoding-Molecular Analysis & Bioinformatics Approaches'; 'Basics of Plant Identification and Nomenclature'; 'Lichen Identification and Nomenclature'; 'Cytological Techniques'; 'Herbarium Techniques and Plant Nomenclatures'; 'Botanical Art Workshop'; Capacity building workshop on 'Long-term monitoring of Himalayan Biodiversity for Stakeholders of Himalayan region'; 03 exhibition on 'Science Express Climate Action Special Train (SECAS)'; 'Botanical Heritage of India'; 'Botanical Heritage Walk'; 02 National seminar on 'Himalayan Plant Diversity: Taxonomy, conservation and Sustainable utilization' and 'Status of Invasive Alien species of India'.

During the year 2017-18, BSI also organized number of training programmes under Ministries' Green Skill Development Programme (GSDP). These training have been successful in empowering the unemployed youth especially tenth or twelfth passed/dropout students by opening an opportunity for self-employment and income generation. During this period, a total number of 169 students were trained in 09 regional centers of BSI; of which many were employed in number of research projects, universities, gardens, parks and herbaria.

I acknowledge the untiring efforts and commitments of all the scientific and administrative colleagues towards fulfilling our organizational goal and targets. I wish in future also we will work in the same synergy and enthusiasm to bring excellent outcome in all our research programs. On behalf of BSI and on my own behalf, I extend my sincere thanks to Shri C.K.Mishra, Secretary, MoEF&CC; Shri A.K.Jain, Add. Secretary, MoEF&CC as well as officers of CS Division of Ministry for their constant encouragement and support.



(A.A. Mao)
Director

RESEARCH PROGRAMMES



Dendrobium salaccense (Blume) Lindl.

AJC BOSE INDIAN BOTANIC GARDEN, HOWRAH

PROJECT-1

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

Executing Scientist: Dr. S.P. Panda
Date of Initiation: April, 2015
Date of completion: March, 2018

OBJECTIVE

To enrich Charak Udyan, AJCBIBG, Howrah with introduction of medicinal plants

AREA AND LOCALITY

Charak Udyan, Medicinal plant section, AJCBIBG, Howrah



Bridelia retusa (L.) A.Juss.



Pterocarpus santalinus L.f.

SUMMARY AND ACHIEVEMENT

De-weeding cleaning, tree pruning, hedge trimming and pond cleaning works in Charak Udyan was done; the growth of medicinal plants in the garden monitored regularly in Charak Udyan as well as in the curatorial lawn. During this period, medicinal plants collected from N. Bengal (2016-17) were also introduced in Charak Udyan. Finalization of the Mss. of the project 'Development of Division 25 of AJC Bose IBG' is under process.

During the period, two collections tours were undertaken to Eastern Ghats of Odisha and collected 45 species of medicinal plants.

PROJECT-2

Collection, documentation & ex-situ conservation of Aromatic plants. (New Project)

Executing Scientists: Dr. M.U. Sharief & Dr. B.K. Singh
Date of Initiation: April, 2017
Date of completion: March, 2020

OBJECTIVE

To collect, document and conserve aromatic plants.

AREA AND LOCALITY

NA

SUMMARY AND ACHIEVEMENT

Literature consultation was done during the period.



Aromatic Plants garden under preparation

PROJECT-3

Herbaceous Flora of AJC Bose Indian Botanic Garden (Monocot excl. Cyperaceae, Poaceae) (New Project)

Executing Scientist: Dr. B.K. Singh

Date of Initiation: April, 2017

Date of completion: March, 2019



Gloriosa superba L. (Colchicaceae) a monocot climber in AJCBIBG



Zephyranthes citrina Baker (Amaryllidaceae) a monocot weed with ornamental value growing in AJCBIBG

OBJECTIVE

Documentation of Herbaceous Flora (Monocot) of AJC Bose Indian Botanic Garden

AREA AND LOCALITY

AJC Bose Indian Botanic Garden, Howrah

SUMMARY AND ACHIEVEMENT

Literature survey was carried out.

PROJECT-4

Introduction of Mangrove Associate plants in AJC Bose Indian Botanic Garden, Howrah (New Project)

Executing Scientist: Dr. B.K. Singh

Date of Initiation: April, 2017

Date of completion: March, 2019



Carring of saplings of Mangrove species in green house of the Garden

OBJECTIVE

To introduce Mangroves Associate plants in AJCBIBG, Howrah

SUMMARY AND ACHIEVEMENT

Literature survey was carried out

PROJECT-5

A re-assessment and re-validation of Phoenix loureiori Kunth and its variants in India (New Project)

Executing Scientist: Dr. S.S.Hameed

Date of Initiation: April, 2017

Date of completion: March, 2019

BACKGROUND

A thorough study of this species in India by assessing its morphological and ecological variations and examining the herbarium collections and literature in regional Centres of BSI and CAL is to be done for a re-assessment and re-validation study and as well as to clear the ambiguity on the species. Live plants, seeds, seedlings etc., of the variants are also to be collected, introduced and conserved in AJCBIBG for future reference and study

OBJECTIVE

To re-assess and re-validate Phoenix loureiori Kunth and its variants in India



Phoenix loureiri Kunth- Habit



Phoenix loureiri Kunth- in fruiting

SUMMARY AND ACHIEVEMENT

As a preliminary and vital requisite, a systematic scrutiny of herbarium collections of the said species housed in CAL has been made thoroughly. A thorough literature survey was also made by consulting published literature from the central library of BSI as well as through online options. The details information on the occurrence,

distribution, evolutionary trend; variability and ecological niche of the species under varying climatic regimes in the country gathered in order to undertake adequate field trips as the next phase of the study in the year 2018-2019.

PROJECT-6

Documentation of woody climbers of AJC Bose Indian Botanic Garden, Howrah (New Project)

Executing Scientist(s): Smt. Nita Sarkar & Dr. B.K. Singh

Date of Initiation: April, 2017

Date of completion: March, 2019

OBJECTIVE

To document woody climbers of AJC Bose Indian Botanic Garden, Howrah

SUMMARY AND ACHIEVEMENT

Literature survey, documentation and photography of the woody climbers of AJCBIBG is in progress. Approximately 30 climbers were documented from the various divisions of the garden.



Caesalpinia bonduc (L.) Roxb.



Mansoa alliacea (Lam.) A.H.Gentry



Strophanthus caudatus (L.) Kurz

PROJECT-7

Study of Microalgae and monitoring of water quality of Leram Lake of AJCBIBG (New Project)

Executing Scientist: Dr. Pratibha Gupta

Date of Initiation: April, 2017

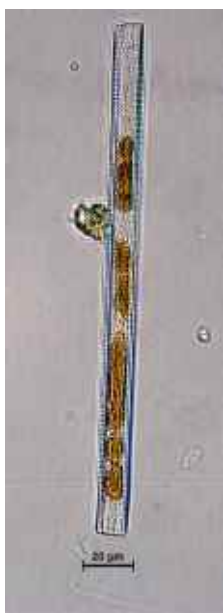
Date of completion: March, 2019

OBJECTIVE

To Study of Microalgae with emphasis on monitoring of water quality of Leram Lake of AJCBIBG

SUMMARY AND ACHIEVEMENT DURING 2017-18

Water samples collected from King Lake, Prain Lake, Diwan Lake, Janardan Lake, Shadir Lake, Leram Lake etc. of AJC Bose Indian Botanic Garden to assess all physico-chemical and biological parameters and possibility of implementation of Grander Technology for revitalisation of the Garden Lakes. Three Grander units – Grander, LWS Double Cylinder Energy Rod Model Brdz were



Ulnaria ulna (Nitzsch) Compere



Lepocinclis spirogyroides
B.Marin & Melkonian

successfully installed in different locations of Leram Lake in submerged position. During the year 12 visits to garden was made and more than 200 field photographs taken. During Microscopic studies, from 62 water samples 27 species were identified; some of which are *Achnanthes minutissima* var. *saprophila*, *Achnanthes trigibba*, *Cyclotella meneghiniana*, *Fragilaria rumpens*, *Gomphonema constricta* var. *capitata*, *Gomphonema parvulum*, *Nitzschia capitellata*, *Ulnaria ulna*, *Chlorococcum humicola*, *Cladophora glomerata*, *Gloeocystis major*, *Scenedesmus arcuatus*, *Lepocinclis tripteris*, *Trachelomonas acanthostoma*, etc. The study revealed a decrease of water pollution indicators species, which were found abundantly previously in these waterbodies.

PROJECT-8

Introduction and ex-situ conservation & monitoring of indigenous plants of India at AJCBIBG

Executing Scientist(s): On going project

OBJECTIVES

To introduce, ex-situ conservation & monitoring of indigenous plants of India at AJCBIBG

SUMMARY AND ACHIEVEMENT

Plantation of about 150 valuable plants including RET & economic plants in the respective divisions on Environmental Day, Van Mahotsava Week Celebration, during the visit of dignitaries, VIPs from MoEF & CC, New Delhi, other occasions like Independence Day, Republic Day. Besides Dr. S.P. Panda visited Regional Plant Resource Centre (RPRC), Bhubaneswar on 14.06.2017 and collected 17 rare cactus species for introduction in the glass house of AJCBIBG.

PROJECT-9

GIS Phyto-mapping & Digitization of Shrubs & Trees in AJC Bose Indian Botanic Garden (AAP 2015-18)

Executing Scientist(s): Dr. C.M. Sabapathy, Dr. B.K. Singh & Dr. A. Pramanik & Dr. M.U. Sharief

Date of Initiation: April, 2014

Date of completion: March, 2017 (Extnd. Upto 2018)

OBJECTIVES

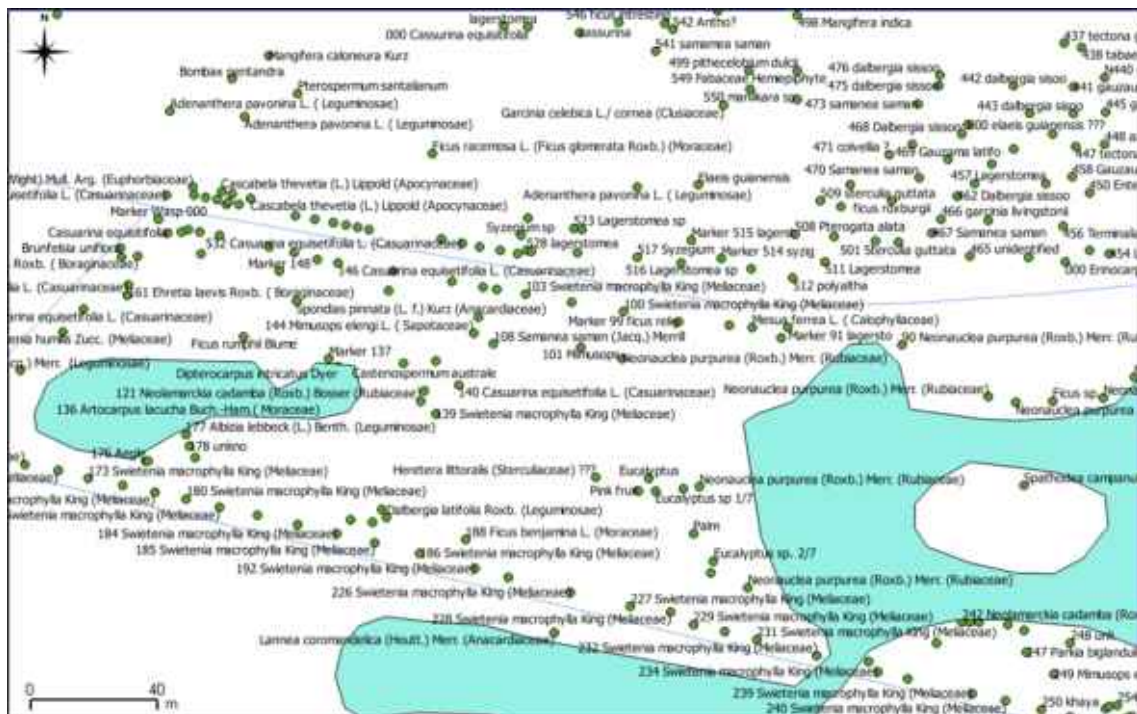
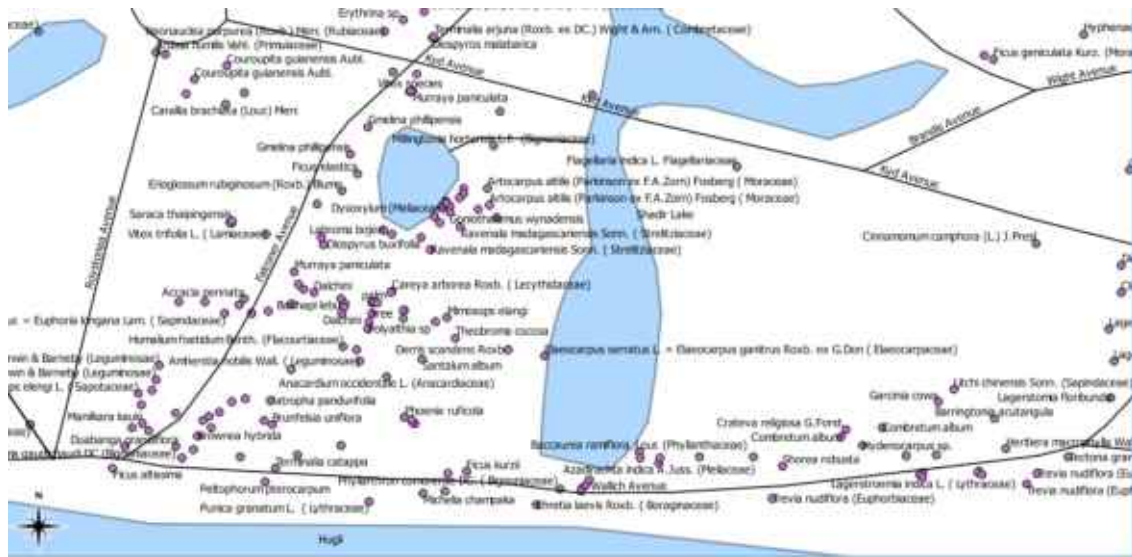
Mapping & Digitization of Shrubs & Trees in AJC Bose Indian Botanic Garden

SUMMARY AND ACHIEVEMENT

Necessary training on GPS and recording data along with its application techniques was imparted to students of Green Skill Development Programme (GSDP) and Junior Project Fellows, BSI. Process of recording coordinates with GPS and labelling is completed along with the

identification data. As per the directions of the D/BSI, development of an indigenous android application was suggested. A design template for designing the same necessary directions and guidance was provided to the software Geo Climate & Risk Solutions from time to time. The development of the mobile application is also briefed

to the JS, MoEF & CC at New Delhi. The plant labels were re-fixed in the conventional vertical way, temporary plant name tags were tied for important trees and shrubs. Cleared the fallen and dead trees inside the garden and prepared the map of the same.



Geographical coordinates of different plants at AJCB, Indian Botanical Garden (Representative)

ANDAMAN & NICOBAR ISLANDS REGIONAL CENTRE, PORTBLAIR

PROJECTS-1

I. Collection and introduction of Seeds and seedlings of 23 trees species, Zingibers & rattans in the Dhanikhari Experimental Garden-cum-Arboretum (DEGCA) (2017-2020)(New Project)

II. Phenological Survey of Tree Species of Dhanikhari Experimental Garden-cum Arboretum (DEGCA), Nayashahar (Ongoing)

Executing Scientist (s) : Dr. Lal Ji Singh

Date of Initiation : April, 2017

Date to be completion : March, 2020

OBJECTIVE

To document phenology of tree species of the DEGCA, Nayashahar and collection and introduction of seeds and seedlings

BACKGROUND

This project is of immense practical utility for the Andaman and Nicobar Islands in terms of conservation of phytodiversity especially tree species because trees play a vital role in maintaining the ecological balance and improving the livelihood of peoples. The knowledge of phenology of plants is also critical for the successful management of forest genetic resources and to understand the influence of phenological events on regeneration of trees.

AREA AND LOCALITY

Andaman Islands: c. 6408 sq. km.

SUMMARY AND ACHIEVEMENTS DURING 2017-18

One field tour was undertaken for collection and introduction of seeds and seedlings of trees, zingibers & rattans in the Dhanikhari Experimental Garden-cum-Arboretum (DEGCA). During the tour, besides taking 43 photographs, seedlings/plantlets of one Bamboo, one rattan, six Zingibers, one wild Musa, seeds of 23 trees, seedling of 19 other economic taxa were collected. Some of the the plants that are introduced during the year are *Amomum acculeatum*, *Amorphophallus blumei*, *Artocarpus chaplasha*, *Asplenium nidus* var. *nidus*, *Atalantia monophylla*, *Azadirachta indica*, *Calophyllum inophyllum*, *Carissa spinarum*, *Cycas pschannae*, *Dendrobium incurvum*, *Dillenia andamanica*, *Diospyros*



Cycas dharmrajii L. J. Singh

undulata, *Eria andamanica*, *Eulophia andamanensis*, *Ganophyllum falcatum*, *Garcinia cowa*, *Globba pauciflora*, *Makino oberonia*, *Mangifera andamanica*, *Musa paramjitiana*, *Myristica andamanica*, *Pajanelia longifolia*, *Pandanus lerum* var. *andamanensium*, *Planchonia andamanica*, *Pterocarpus dalbergioides*, *Syzygium samsrsngense*, etc. Phenology of 73 tree species of DEGCA were documented for the first time

ACHIEVEMENTS / OUTCOMES

The present study reported two (02) species (*Cycas dharmrajii* L. J. Singh & *Musa paramjitiana* L. J. Singh) as a new to science, two species (*Eleocharis atropurpurea* (Retz.) J. Presl & C. Presl and *Eleocharis acutangula* (Roxb.) Schult.) as new records for the state.

PROJECT-2

Revision of the lichen family Pyrenulaceae in India (New Project)

Executing Scientist (s) : Dr. T.A.M. Jagadeesh Ram

Date of Initiation : April, 2017

Date to be completion : March, 2022

OBJECTIVE

To revise members of the family Pyrenulaceae in India

BACKGROUND

The genus *Pyrenula* is a group of crustose lichens typically growing on smooth, shaded bark belongs to family Pyrenulaceae (Pyrenulales of Ascomycota). The family is third largest in India and comprises 4 genera; *Pyrenula* Ach. is the largest genus with 90 species, *Anthracotheicum* Hampe ex A. Massal. (24 species), *Lithothelium* Müll. Arg. (7 spp.) and *Pyrgillus* Nyl. (2 spp.). Aptroot (1991) monographed *Lithothelium* and *Pyrgillus*. The genera *Anthracotheicum* and *Pyrenula* had never been monographed, except some regional revisions. Several taxa described from India were treated under synonymy even not examining the types. Keeping all the above points, the family Pyrenulaceae was taken up for taxonomic revisionary studies.

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE DURING 2017-18

Alongwith literature survey, a total of 130 species was listed in 4 genera viz. *Anthracotheicum*, *Lithothelium*, *Pyrenula* and *Pyrgillus*. A total of 83 specimens of genus *Pyrenula* were examined and identified into 11 species. During this period, one field tour w.e.f. 27.2.2018 to



Arthonia speciosa Müll. Arg. Grube

18.3.2018 was conducted to Papum Pare, Lower Subansiri, Upper Subansiri, West Siang, Siang, Lower Debang Valley and Lohit districts of Arunachal Pradesh and West Khasi Hills, East Garo Hills, West Garo Hills and North Garo Hills districts of Meghalaya during which a total of 82 Field Numbers of family Pyrenulaceae and 56 Field Numbers of allied families were collected alongwith 520 photographs. All the collected specimens are being air dried for preservation.

ACHIEVEMENTS / OUTCOMES

This study revealed 05 species [*Arthonia speciosa* Müll. Arg.) Grube, *Arthopyrenia malaccitula* (Nyl.) Zahlbr., *Bactrospora leptoloma* (Müll. Arg.) Egea & Torrente, *Dictyomeridium campylothelioides* (Aptroot & Sipman) Aptroot *et al.* & *Stirtonia rhizophorae* Kalb & Mongkolsuk] as new to India; 33 species [*Anisomeridium anisobolobum* (Müll. Arg.) Aptroot, *Anisomeridium biforme* (Borrer) R.C. Harris, *Anisomeridium leptospermum* (Zahlbr.) R.C. Harris, *Anisomeridium tamarindi* (Fée) R.C. Harris, *Arthopyrenia analepta* (Ach.) A. Massal., *Chiodecton congestulum* Nyl. *Crypthonia palaeotropica* Frisch & G. Thor, *Diorygma pachygraphum* (Nyl.) Kalb, Staiger & Elix, *Dirinaria consimilis* (Stirt.) D.D. Awasthi, *Dirinaria consimilis* (Stirt.) D.D. Awasthi, *Graphis analoga* Nyl., *Graphis crebra* Vain., *Graphis duplicata* Ach., *Graphis pinicola* Zahlbr., *Graphis subserpentina* Nyl., *Graphis sundarbanensis* Jagadeesh & G.P. Sinha, *Graphis supracola* A.W. Archer, *Monoblastia pellucida* Aptroot, *Pallidogramme chrysenteron* (Mont.) Staiger & al., *Platygramme platyloma* (Müll. Arg.) M. Nakan. & Kashiw., *Porina rhodostoma* Müll. Arg., *Pyxine keralensis* D.D. Awasthi etc.] as new records for Andaman & Nicobar Islands.

PROJECT-3

Ex-situ conservation of RET species of Andaman & Nicobar Islands and Collection, introduction and multiplication of Orchids at Dhanikhari Exp. Garden cum Arboretum (New Project)

Executing Scientist (s) : Dr. Sanjay Mishra

Date of Initiation : April, 2017

Date to be completion : Ongoing

OBJECTIVE

To survey, collect and introduce the RET species with special emphasis on wild orchid species of Andaman & Nicobar Islands at Dhanikhari Experimental Garden Cum Arboretum.

BACKGROUND

The Dhanikhari Botanic Garden cum Arboretum at Dhanikhari, with an area of c. 30 h. of forest land established with a focus on *ex-situ* conservation of rare,



Dendrobium formosum Roxb. ex Lindl.



Dendrobium tenuicaule Hook. f.

endangered and endemic species of the islands which includes wild orchid, palms, nut Megs and economically important species of A&N Islands. This project especially aims enrich the conservation of the wild orchids of Andaman and Nicobar Islands Till now the garden housed total of 143 orchid taxa belonging to 66 genera.

AREA AND LOCALITY

Andaman and Nicobar Islands, c. 6408 sq. km.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS / OUTCOMES DURING 2017-18

One exploration tour was undertaken to Middle Andaman and collected of 42 species along with photographs.

PROJECT-4

Flora of Kyd, Pitman & James Islands, South Andaman

Executing Scientist (s) : Dr. Sanjay Mishra, Dr. C. P. Vivek & Shri. Gautam Anuj Ekka

Date of Initiation : April, 2015

Date to be completion: March, 2018

OBJECTIVE

Survey, collection and documentation of flora of Kyd, Pitman & James Islands alongwith ethnic knowledge.

BACKGROUND

This project was initiated in 2015. During previous year, two field exploration tours were undertaken to the study area and 209 field numbers were collected along with the GPS data. Live Plants/seedlings of 54 species were collected and introduced in the Dhanikhari Experimental Garden -cum- Arboretum. During this period, a total of



Lumnitzera littorea Jack Voigt



Pemphis acidula J. R. et G. Forst.

105 specimens were identified of which 27 endemic, 30 medicinal plants, 35 economic plants, 06 rare plants and 02 endangered species were reported.

AREA AND LOCALITY

Kyd Island (about 8.0 sq.km.), Pitman Island (about 1.27 sq.km.) & James Island (about 2.10 sq km.), are part of South Andaman. These group of Islands are situated between 11° 56' 28" - 11° 59' 20" N latitude to 92° 43' 34" - 92° 45' 01" E longitude.

SUMMARY OF THE WORK DONE DURING 2017-18

One exploration tour was undertaken to Kyd, Pitman and

James Island during which a total of 99 field numbers were collected along with the GPS data. Live plants or seedlings of 28 species were collected and introduced in the Dhanikhari Experimental Garden cum Arboretum. 164 species from previous tours were identified, by available literatures and authenticated or type specimens available in Indian as well as foreign herbaria. Photos of c. 200 plants have been captured in field.

ACHIEVEMENTS / OUTCOMES

This study results collection of 15 endemic, 10 medicinal, 35 economically important, 03 rare and 02 endangered plants from the study area.



Panoramic view of James Island, Andaman & Nicobar

ARID ZONE REGIONAL CENTRE, JODHPUR

PROJECT-1

Flora of Navsari District, Gujarat

Executing Scientist (s) : Dr. Ramesh Kumar & Shri Vinod Maina

Date of Initiation : June, 2015

Date to be completion : March, 2020

OBJECTIVES

To document the floral wealth of the district and to prepare a handbook on flowering plants of Navsari district, Gujarat to enable easy identification.

BACKGROUND

The project was initiated on 2015. During previous year, 623 field numbers were collected during 02 collection tours to study area, 175 species belongs to 144 genera



Acanthus ilicifolius L.



Curcuma inodora Blatt.



Holostemma ada-kodien Schult.

under 69 families were identified and 115 species belonging to

AREA AND LOCALITY

Navsari district, Gujarat, c. 2211 sq.km.

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, two field tours *w.e.f.* 05.09.17 – 19.09.17 and 02.02.18 – 15.02.18 were undertaken in the study area and 439 field no. specimens were collected. Identification, taxonomical citation and documentation of 153 species belonging to 36 families and label writing of 578 identified herbarium specimens were completed.

ACHIEVEMENTS / OUTCOMES

During this study, *Bolboschoenus planiculmis* (Cyperaceae) was recollected after 60 years. Ethnomedicinal information of 16 timber yielding plants collectes; leaf of *Bauhinia racemosa* (leaves used by Dang people for wrapping *Bidis*) and fruit of *Crescentia cujete* were also collected for display purpose in Museum of BSI, AZRC, Jodhpur. Besides, seedlings of 31 species of plants were collected to introduce in the Desert Botanic Garden of BSI, AZRC, Jodhpur. Some of which are *Commiphora caudata*, *Cullen corylifolium* (RET); *Acorus calamus*, *Alpinia calcarata*, *Curcuma angustifolia*, *Gymnema sylvestre*, *Piper longum*, *Zingiber rubens* etc. (medicinal); *Habenaria marginata* var. *fusifera*, *Habenaria plantaginea*, *Nervilia aragoana*, *Nervilia aragoana* (botanically curious plants), *Desmostachya bipinnata* (ethnoreligious plants).

PROJECT-2

Flora of Sariska Tiger Reserve, Alwar district, Rajasthan

Executing Scientists: Dr. M.K. Singhadiya & Shri Ravi Prasad

Date of Initiation: April, 2015

Date to be completion: March, 2019

OBJECTIVES

To document floristic diversity of Sariska Tiger Reserve, Alwar district of Rajasthan

BACKGROUND

During previous year, 391 field numbers were collected from one botanical exploration tour and 223 plant specimens were identified.

AREA AND LOCALITY

c. 1213.33 sq. km.

SUMMARY OF THE WORK DONE DURING 2017-18

During the period under report, two botanical exploration tours was conducted (w.e.f. 01.06.2017 to



Acacia senegal (L.) Willd.



Aerial view of *Anogeissus pendula* dominated forest



Mucuna pruriens (L.) DC.

18.06.2017 and collected 119 field numbers; w.e.f. 18.12.2017 to 06.01.2018 and collected 119 field numbers. Besides the GPS data and digital photographs of almost each plant and the field data were also documented during the study. Identified 151 field numbers collected during previous explorations to Sariska.

ACHIEVEMENTS / OUTCOMES

Two live plants of *Pandanus odorifer* were collected and introduced in Desert Botanic Garden, AZRC for *ex-situ* conservation; collected pods of *Mimosa himalayana* for sowing in Botanic garden; collected and deposited the Bark fiber of *Phoenix sylvestris* and fruits of *Aegle marmelos* in museum.

PROJECT-3

Flora of Tadgarh-Raoli Wildlife Sanctuary, Rajasthan

Executing Scientists: Dr. C.S. Purohit

Date of Initiation: June, 2015

Date to be completion: March, 2020

OBJECTIVES

To survey and document flora of Tadgarh-Raoli Wildlife Sanctuary, Rajasthan

BACKGROUND

This project was initiated in 2015. During previous year, 434 field numbers were collected along with 250 photographs, identified 192 species belong to 133 genera and 52 families.

AREA AND LOCALITY

Tadgarh-Raoli Wildlife Sanctuary, Rajasthan; c. 495.27 sq.km

SUMMARY OF THE WORK DONE DURING 2017-18

One herbarium consultation tour *w.e.f.* 21.05.17 – 30.05.17 was carried out to DCH, Department of Botany, Govt. Dungar College, Bikaner. Studied about 2500



Aravalli range in Tadgarh-Raoli Wildlife Sanctuary, Rajasthan



Opuntia elatior Mill.

herbarium specimens belonging to 325 species, field data collected in an excel sheet; listed the locations of 45 rare species from 167 herbarium sheets. 95 plant species including 11 rare species were identified at DCH, Bikaner. Herbarium specimens of 25 families deposited at BSJO were studied. In addition, one botanical exploration tour *w.e.f.* 9.11.17 to 28.11.17 was also undertaken and 244 field numbers were collected along-with their GPS data; out of which 173 field numbers were identified to 173 species. All the specimens are processed. 25 photoplates were prepared. Taxonomic description of 106 plant species was completed.

ACHIEVEMENTS / OUTCOMES

11 species were rare and endangered i.e. *Abelmoschus manihot* (L.) Medicus subsp. *tetraphyllus* (Roxb. ex Hornem.) Borssum, *Ammania octandra* L.f., *Anisomeles malabarica* (L.) R.Br. ex Sines, *Bacopa monerii* (L.) Wettst., *Ipomoea nil* (L.) Roth., *Ipomoea sinensis* (Desr.) Choisy subsp. *himalaica*, *Justicia vahlii* Roth., *Nepeta bombaiensis* Dalz. & Gibs., *Panicum walense* Mez., *Trichosanthes bracteata* (Lam.) Voigt., *Trichosanthes cucumerina* L.

PROJECT-4

Floral Diversity of Jambhughoda Wildlife Sanctuary, Gujarat (India) (New Project)

Executing Scientist: Dr. Sriman Lal Meena

Date of initiation: April, 2017

Date to be completion: March, 2020

OBJECTIVES

To study floral diversity of Jambhughoda Wildlife Sanctuary, Gujarat

BACKGROUND

This project has been initiated in April 2017.

AREA AND LOCALITY

Jambhughoda Wildlife Sanctuary, Gujarat, c. 130.38 sq. km.

SUMMARY AND ACHIEVEMENTS / OUTCOMES OF THE WORK DONE DURING 2017-18

During 2017-18, 02 botanical exploration tours *w.e.f.* 31.08.2017 to 19.09.2017 and 26.12.2017 to 09.01.2018 were conducted to Jambhughoda Wildlife Sanctuary (Panchmahal-Chhota Udepur districts), in Gujarat State during which 514 field numbers comprising to 1542 plant specimens were collected of which 264 field numbers were identified comprising to 792 plant specimens. Besides this, GPS data and digital photographs of almost each plant and vegetation types carried out during the exploration and literature



Aerial view of jambhughoda forest, Gujarat

collected from Jambhughoda and Vadodara forest department, Gujarat.

PROJECT-5

Vegetation Characterisation and Floristic studies in Bassi Wildlife Sanctuary, Rajasthan using Remote Sensing and GIS (New Project)

Executing Scientist: Dr. Peddi Harikrishna & Shri Ramesh Kumar

Date of initiation: April, 2017

Date to be completion: March, 2020

OBJECTIVES

To analyse vegetation profile of the Bassi Wildlife Sanctuary, Rajasthan and using Remote sensing, Geographic Information System and GPS technology to transfigure the species diversity characterisation at various levels.

BACKGROUND

Systematic conservation planning in protected areas is highly essential for the improvement and maintenance and sustainability. Recent studies has reported significant threat in protected areas of south Rajasthan, especially in Bassi, Phulwari, Sitamata, Mt. Abu, Kumbhalgarh, Sajjangarh, Jaisamand and Tadgarh Raoli Protected areas. Biological invasion of alien species also been considered as asignificant threat to native species. Characterization of vegetation types and flora of these protected areas will provide an insights need for conservaton strategy.



Crateva adansonii subsp. *odora* (Buch.-Ham.) Jacobs



Butea monosperma (Lam.) Taub. var. *lutea* (Witt.) Maheshwari



View of Savarna Lake, Bassi Wild Life Sancturay, Chittorgarh, Rajasthan

AREA AND LOCALITY

Bassi Wildlife Sanctuary (74° 45' to 74° 57' N and 24° 53' to 25° 06' E), Chittorgarh near Bassi village, Rajasthan ; c. 138.69 sq. km

SUMMARY AND ACHIEVEMENT OF THE WORK DONE DURING 2017-18

Two field tours *w.e.f.* 10. 08.2017 - 28.08.2017 and 14.03.2018-25.03.2018 were undertaken and 539 field numbers plant specimens were collected (of which 230 species were identified). During field tour, 5 live plants were collected for *ex-situ* conservation and introduced in botanic garden, AZRC, Jodhpur. Vegetational map and land use map was prepared by using Sentinel and Landsat satellite data and GIS. 17 quadrates (0.1 ha) were laid in different vegetations and phytosociological data was recorded. Grid wise analysis of field collections in the entire sanctuary area were done.

PROJECT-6

GIS mapping of EET (Endemic, Endangered & Threatened) species of Rajasthan (New Project)

Executing Scientist (s) : Dr. C. S. Purohit, Sh. V. Maina and Dr. Ramesh Kumar

Date of initiation : May, 2017

Date to be completion : March, 2020

OBJECTIVES

To prepare distribution map of Endemic, Endangered & Threatened) species of Rajasthan by GIS mapping

BACKGROUND

A significant loss of biodiversity in the state of Rajasthan is owed to overgrazing, unrestrained cutting, felling of plants and expansion of agriculture fields etc. There is need for know the distribution of Endemic, Endangered & Threatened) species of Rajasthan which is attempted in this project.

AREA AND LOCALITY

Rajasthan; 3, 42,274 sq.km

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, 03 botanical exploration tour *w.e.f.* 24.08.17 to 26.08.17, 01.10.17 to 08.10.17 and 23.03.18 to 29.03.18 were conducted to Desert National Park & Akal Fossil Park (Jaisalmer) and Kapoordi & Jalipa Lignite mine (Barmer), Jaisalmer district and Nagaur, Bikaner, Sriganganagar, Hanumangarh and Churu respectively and collected 56 field numbers were collected along with their geo-coordinates. Thirty five quadrates of 10 x 10 m were laid in 07 locations. A total of 26 field numbers were identified to 16 species. Taxonomic descriptions of 16 species were completed and 9 photo-plates prepared.

ACHIEVEMENTS / OUTCOMES

Distribution maps 21 EET species were prepared with the help of Arc-GIS software. Some of the species are *Acacia jacquemontii*, *Ammania desertorum*, *Blepharis scindica*, *Cadaba fruticosa*, *Cenchrus prieurii*, *Citrullus colocynthis*, *Commiphora wightii*, *Seddera latifolia*, *Tephrosia falciformis*, *Tribulus rajasthanensis*, *Withania*

coagulens, *Zygophyllum simplex* etc. 11 endemic, rare and endangered plants collected during the survey have been introduced in Botanical Garden for their *ex-situ* conservation i.e. *Anticharis glandulosa*, *Barleria prionitis* var. *dicantha*, *Caralluma edulis*, *Ceropegia bulbosa* var. *bulbosa*, *Ceropegia bulbosa* var. *lushii*, *Ceropegia hirsuta*, *Peganum hermala*, *Pavonia arabica* var. *massuriensi*, *Tephrosia falciformis*, *Tribulus rajasthanensis* etc. During the study, seed germination, seedling survival, growth behaviour, phenology and growth data of 9 EET species were recorded in Botanical Garden for their *ex-situ* conservation, i.e. *Ceropegia bulbosa* var. *lushii*, *Cullen plicata*, *Ephedra ciliata*, *Barleria prionitis* var. *dicantha*, *Pavonia arabica* var. *massuriensis* etc.

PROJECT-7

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 Scientist(s): Shri Vinod Maina, Dr. Ramesh Kumar, Dr. C. S. Purohit, Dr. M. K. Singhadiya, Dr. Peddi Harikrishna & Mr. Ravi Prasad

Date of initiation :

Date to be completion : Ongoing

OBJECTIVE

To collect RET and economically important species

germplasm, introduce in the experimental garden for *ex-situ* Conservation and their maintenance; to document phenological data of plants growing in Desert Botanic Garden.

BACKGROUND

The experimental Botanic Garden, Desert Botanic Garden of this centre has been established during 1994 with an area of c. 8 acres. About 300 species of vascular plants and 4 gymnosperms that includes endemic and economic important plants of Arid region.

AREA AND LOCALITY

Rajasthan & Gujarat

SUMMARY AND ACHIEVEMENTS / OUTCOMES DURING 2017-18

26 species of desingaed endemic and economic important plants, 30 species of Medicinal plants, 10 botanically curious plants, 01 ethno-religious plants and 15 economically important were collected and introduced in the Desert Botanic Garden. Besides, about 500 photographs were also taken. In addition, seeds of 14 species were collected for raising seedlings in nursery. 2500 saplings of 35 plant species of Arid and Semi-arid region of India were supplied to Botanic Garden of Indian Republic, Noida. Phenological data of existing plant species of Desert Botanic Garden was recorded throughout the year and flowering in 05 plant species observed first time after introduction.



Barleria prionitis L. ssp. *prionitis* var. *dicantha* Baltt. & Hallb.



Tecomella undulata (Sm.) Seem.



Commiphora wightii (Arn.) Bhandari



Rauwolfia serpentina (L.) Benth. ex Kurz

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

PROJECT-1

Taxonomic study of Polypodiaceae of North East India.

Executing Scientist: Dr. Vineet Kumar Rawat, Scientist-D

Date of Initiation: April, 2012

Date to be completion: September, 2017

OBJECTIVE

To study the family Polypodiaceae in North East India

BACKGROUND

This project was initiated in 2012. Of the 63 genera of the family Polypodiaceae, only 27 reported from India, of which 25 genera are reported from North-East India. During previous year, a total of 211 field numbers were collected of which 200 were identified along with description and keys of 56 species. All the previously collected materials were processed and incorporated in herbarium.

AREA AND LOCALITY

All the states of NE region

SUMMARY OF THE WORK DONE IN 2017-2018

108 field numbers were collected from local field tours, 289 field numbers of previously collected specimens were identified, field data incorporated in 180 herbarium sheets. Final Report comprising of keys and description of 123 species fewer than 23 genera has been prepared and submitted. A total of 1000 specimens were identified to 123 species and all the identified specimens were incorporated into the herbarium.



Asplenium nidus L.



Humata assamica (Bedd.) Diels

ACHIEVEMENTS/ OUTCOMES

This study reports 03 species as new record for Arunachal Pradesh.

PROJECT-2

Flora of East Kameng, Arunachal Pradesh

Executing Scientist (s): Dr. Umesh Kumar L. Tiwari

Date of Initiation : April, 2015

Date to be completion : March, 2019

OBJECTIVE

To document vascular plant diversity of East Kameng district, Arunachal Pradesh.

BACKGROUND

The project was initiated in 2015. During previous year, a



Luculia grandifolia Ghose



Senecio wightianus DC. ex Wight



Amorphophallus bulbifer (Roxb.) Blume

total of 486 field numbers were collected from two field tours of which c. 113 field numbers were identified. In addition, during herbarium consultation tours to ASSAM and BSHC, 1256 specimens were studied.

AREA AND LOCALITY

East Kameng district, Arunachal Pradesh

SUMMARY AND ACHIEVEMENTS/ OUTCOMES OF THE WORK DONE IN 2017-2018

Four field tours *w.e.f.* 26-09-2017 to 15-10-2017, January, 2018, 27.02.2018-12.03.2018 and 30.03.2018-18.04.2018 were conducted to Kasse bagang village in Chiyang Tajo block, Chiyang Tajo. Seppa to Pipu block, Loffa village, Pakhe Tiger Reserve, Upper Dibang Valley district, along Talong river till Maliney and Dri River valley up to Anini during which 455 field numbers were collected of which 252 field numbers were identified and description of 250 species were completed. In addition, 01 herbarium consultation tour was undertaken to ASSAM during which 153 unidentified specimens were

identified and determinate was placed on sheets.

PROJECT-3

Red listing of orchids of Arunachal Pradesh as per IUCN criteria.

Executing Scientist: Dr. Krishna Chowlu

Date of Initiation: April, 2015

Date to be completion: March, 2019

OBJECTIVE

To evaluate population of Orchid taxa in natural habitat. To confirm the identity of herbarium specimens of Orchidaceae lodged at ARUN.

BACKGROUND

This project was initiated in 2015. During previous year, 63 field numbers were collected from 03 field tours of which 34 species were identified and processed for herbarium, 24 specimens were taxonomically worked out. Germplasm of 159 field numbers were introduced in the campus garden for *ex-situ* conservation.



Cleisocentron pallens (Lindl.) Pears. et Cribb

AREA AND LOCALITY

Arunachal Pradesh

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-18

Two field tours w.e.f. 01.09.2017-20.09.2017 and 27.02.2018-19.09.2018 were conducted to West Kameng, Tawang districts and Dibang Valley districts of Arunachal Pradesh during which 109 field numbers were collected and pressed for herbarium, 32 specimens were taxonomically worked out. Germplasm of 50 field numbers has been introduced in the campus for further studies and *ex-situ* conservation. Taxa were characterized through digital and macro-microscopic photo-plates. 91 specimens of APRC were studied in respect of their identity, label data, assigning geo-coordinates and entry into excel sheet for plotting of map. During field tour, several orchid species were rescued from fallen trees in and around Itanagar, Arunachal Pradesh.

ACHIEVEMENTS/ OUTCOMES

This study discovered 04 new species namely *Oberonia jha* Chowlu & Rab, *Oberonia bopanna* Chowlu & Kumar, *Cymbidium hengbungense* A.N. Rao, K. Chowlu, H.B. Sharma, K.S. Thithila & D.S. Thokchom and *Impatiens dorjeekhandui* Chowlu, S. S. Dash & Gogoi. 02 species were recorded as new addition to flora of Arunachal Pradesh namely *Zeuxine reflexa* King & Pantl. and *Platanthera exelliana* Soó.

PROJECT-4

Introduction, conservation of germplasm of Musa, Bamboos & Zingibers and documentation of phenology of Garden plants

Executing Scientist : Mr. B.B.T. Tham

Date of Initiation : April, 2012

Date to be completion : Ongoing

OBJECTIVE

To collect germplasms of Musa, Bamboos & Zingibers

during regular field tours and introduce in the garden of APRC, Itanagar and at Barapani, Shillong; to document phenological information of these species.

BACKGROUND

This project was initiated in 2012. During previous year, germplasms of Musa, Bamboos and Zingibers were collected during field tours and introduced in the garden and phenological data of 40 tree species growing in garden were recorded.

AREA AND LOCALITY

North East India

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-18

One *ex-situ* collection tour w.e.f. 18.05.2017-20.05.2017 was conducted to Umiam, BSI, ERC, Shillong during which 103 live plants of the family Zingiberaceae and Musa plants were brought to BSI. A total of 149 observations were recorded during the period.

ACHIEVEMENTS/ OUTCOMES

This study discovered *Impatiens pseudolaevigata* from Western Arunachal Pradesh, India as new to science.



Caesalpinia cucculata Roxb.



Saraca asoca (Roxb.) De Wilde

BOTANIC GARDEN OF INDIAN REPUBLIC, NOIDA



view of the woodland

PROJECT-1

Collection of endemic plants for introduction and to develop the arboretum as per the forest types of India in BGIR

Executing Scientist(s): Dr. Sandeep Kr. Chauhan

Date of Initiation: April, 2017

Date to be completion: Ongoing

OBJECTIVES

To collect endemic plants for introduction and to develop the arboretum as per the forest types of India in BGIR

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During the Year 2017-18, 25 tree species of about 2650 plants and 32 species of about 2800 plants were collected from BSI-ARC, Jodhpur, Rajasthan and BSI, NRC, Dehradun respectively. Besides above, about 12000 plants of 60 species of trees, shrubs, and herbs as well

ornamental plants were collected from local Forest Nurseries of NCR, Meerut, Saharanpur, U.P.

PROJECT-2

Development of Database of Introduced Plants (Trees) of BGIR, Noida

Executing Scientist(s): Dr. Sandeep Kr. Chauhan

Date of Initiation: April, 2017

Date to be completion: Ongoing

OBJECTIVES

To prepare Database of introduced tree species of BGIR, Noida

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During 2017-18, Database of 35 tree species were developed as per the standard format depicting: Taxonomic classification, habit, habitat, morphology of leaf, flower, fruit, seed, seed germination methodology and economic uses.

PROJECT-3**Documentation of Phenological Data of Flowering and Fruiting of the endemic tree and medicinal plant species growing in BGIR**

Executing Scientist(s): Dr. Sandeep Kr. Chauhan & Dr. Manish K. Kandwal

Date of Initiation: April, 2017

Date to be completion: Ongoing

OBJECTIVES

To document phenological Data of flowering and fruiting of the endemic tree and medicinal plant species growing in BGIR

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During 2017-18, phenological data of 35 tree species and 15 medicinal plant species were recorded in respect of flowering period, fruiting and seed setting.

PROJECT-4**Propagation and multiplication of Threatened and Endemic Plants collected from various Lead and Small Botanic Garden under Assistance to Botanic Garden (ABG) Scheme**

Executing Scientist(s): Dr. Sandeep Kr. Chauhan & Dr. Manish K. Kandwal

Date of Initiation: April, 2017

Date to be completion: Ongoing

OBJECTIVES

To propagate and multiply threatened and endemic Plants collected from various Lead and Small Botanic Garden under Assistance to Botanic Garden (ABG) Scheme

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018:

During 2017-18, 15 threatened and endemic plant species were collected from the Lead & Small Botanic Gardens and placed in conservatories for acclimatization. A RET species plant block was prepared for conservation of about 80 RET plants to be collected in RET block of BGIR Noida.



Dolichandra unguis-catis (L.) L. G. Lohmann

CENTRAL BOTANICAL LABORATORY

PROJECT-1

Survey, documentation of economical and ethnobotanical uses of endemic trees of India

Executing Scientist (s): Dr. Sujana K. A. & Mr. R. Saravanan

Date of Initiation: April, 2016

Date to be completion: March, 2019

OBJECTIVE

To survey and document economical and ethnobotanical uses of endemic trees of India

BACKGROUND

The project was initiated in 2016. During previous year, information on 177 scientific works on endemic trees of NE India, Eastern Ghats & Western Ghats were collected. Data on 69 endemic trees of Kerala were documented. A total of 05 endemic tree species were collected from Malkangiri District, Odisha. A total of 105 field numbers



Cynometra travancorica Bedd.



Knema andamanica (Warb.) W.J.de Wilde

were collected among which 18 species were identified along with 139 ethnobotanical informations from Andaman & Nicobar Islands.

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE DURING 2017-18

Four field tours were undertaken to different phyto-geographical zones of country viz. Southern Western Ghats, Central and Northern Western Ghats, Assam, Arunachal Pradesh, Andhra Pradesh and Telangana and collected 590 field numbers with 841 ethnobotanical information. All the specimens are being processed. During this period, a total of 176 specimens were identified and field data incorporated in 83 plants in approved format. A total of 120 secondary data collected from different sources. A list of 608 endemic trees compiled from different sources.

ACHIEVEMENTS/ OUTCOMES

This study reports a total of 841 ethnobotanical information (Medicine-286, edible-131, fiber/rope-32, fodder- 53, Cart wheel-13, furniture- 63, agriculture implements – 53, timber – 82, fuel- 50, plates-2, oil/ resin-34, Aril-10, miscellaneous-10) and 2161 field photographs.

PROJECT-2

Ethnobotanical study of Odisha

Executing Scientist (s): Dr. Harish Singh, Dr. Sujana K.A., Sri A. C. Halder, Sri P. Baske, Sri R. Saravanan, Dr. Monika Mishra and Dr. Pankaj Arvind Dhole.

Date of Initiation: April, 2006

Date to be completion: March, 2017

OBJECTIVE

To document ethnobotanical uses of plants in the state of Odisha.

BACKGROUND

The project was initiated in 2006. During previous year, four field tours were conducted to different regions of Nuapada District, Malkangiri District, Boudh District and Nayagarh District of Odisha during which a total of 964



Research team in plant collection activity



Jatropha nana Dalzell & A.Gibson – New Record to Odisha

field numbers were collected of which 410 plant specimens were identified along with documentation of a total of 1370 ethnobotanical uses.

AREA AND LOCALITY

About 1 lakh sq. km. area covered.

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, all ethnobotanical data from the individual reports of 23 districts of the state of Odisha were compiled in a prescribed format and a comprehensive report was prepared. The manuscript was thoroughly checked and edited under sub-headings like botanical name, family, local name, habit and various ethnobotanical uses. All common uses were merged and rearranged them in plant parts wise in each utility group. All names of plants, their local names, localities were rearranged alphabetically. Plant names and family were updated with 'The plant list'. A total of 1,158 plant species under 615 genera belonging to 142 families have been provided along with more than 3000 digital photographs in the compiled report on Ethnobotanical Study of Odisha.

ACHIEVEMENTS/OUTCOMES

This study reports *Toxicarpus longistigma*

(Apocynaceae) & *Jatropha nana* (Euphorbiaceae) – as new addition to Flora of Odisha. A total of 1,158 plant species under 615 genera belonging to 142 families have been given in the report. A total of 8,718 ethnobotanical information were mentioned which are being used for different purposes. It is analysed that 637 ethnobotanical information are related to food, 6,140 to ethnomedicine, 184 to veterinary, 206 to fodder, 114 to fuel, 82 to rope, 20 to gum/ resin/ tannin, 56 to dye, 45 to oil, 69 to insect repellent, 19 to bio-insecticide, 14 to snake repellent, 21 to detergent, 33 to beverage, 21 to condiments/ spices/ fragrance, 37 to fish poison, 8 to fish catching instrument, 125 to household article, 09 to plates, 13 to baskets, 20 to brooms, 59 to toothbrush, 39 to agricultural implement, 76 to building / hut material, 32 to timber, 233 to magico-beliefs, 140 to religious, 37 to bio-fencing, 59 to sold in market and 166 species to other miscellaneous purposes collected during the study.

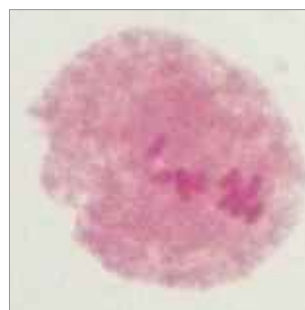
PROJECT-3

Cytological investigation of some selected Angiosperms of AJC Bose Indian Botanic Garden, Howrah

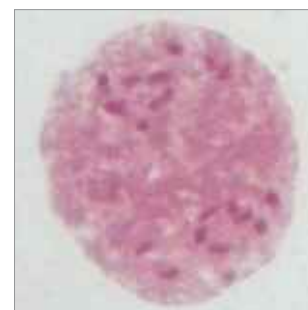
Executing Scientist (s): Dr. (Mrs.) Monika Mishra

Date of Initiation: July, 2015

Date to be completion: March, 2018



Pollen Mother Cell showing 9 bivalents at Metaphase I in *Clausena heptaphylla* (Rutaceae) (n=9)



Pollen Mother Cell showing equal segregation of chromosomes at Anaphase I in *Clausena heptaphylla* (Rutaceae) (n=9)



Pollen Mother Cell showing 13 bivalents at Metaphase I in *Tiliacora racemosa* (Menispermaceae) (n=13)



Pollen Mother Cell showing equal segregation of chromosomes at Anaphase I in *Tiliacora racemosa*

OBJECTIVE

To study chromosome count of some selected plants of AJC Bose Indian Botanic Garden, Howrah

BACKGROUND

This project was taken up for updating the information available on chromosome number of selected IBG plants. During 2016-17, vegetative and reproductive characters of 10 plant species collected from AJCBIBG were documented along with their cytological investigations.

AREA AND LOCALITY

AJC Bose Indian Botanic Garden, Howrah, c. 273 acres.

SUMMARY OF THE WORK DONE DURING 2017-18

Studies of vegetative and reproductive characters of 10 plant species were done. Floral buds were collected and cytological investigation was carried out for the following

species: *Tiliacora racemosa* (Menispermaceae) $2n=26$; *Gliricidia sepium* (Leguminosae) $2n=22$; *Clitoria ternatea* (Leguminosae) $2n=16$; *Memecylon ovatum* (Melastomataceae) $2n=14$; *Eugenia uniflora* (Myrtaceae) $2n=22$; *Atalantia monophylla* (Rutaceae) $2n=18$; *Asystasia indica* (Acantaceae) $2n=26$; *Glycosmis mauritiana* (Rutaceae) $2n=18$; *Clausena heptaphylla* (Rutaceae) $2n=18$; *Clerodendrum splendens* (Lamiaceae) $2n=48$.

ACHIEVEMENTS/ OUTCOMES

This study reports chromosome count for *Memecylon ovatum* (Melastomataceae) i.e. $2n=14$ and *Asystasia indica* (Acantaceae) i.e. $2n=26$ are the first report on the chromosome number of these species. Moreover Chromosome number for *Clausena heptaphylla* (Rutaceae) $2n=18$ is the new chromosome count for this species.



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

CENTRAL NATIONAL HERBARIUM, HOWRAH

PROJECT-1

Revision of the genus *Fimbristylis* of Cyperaceae under Flora of India (c. 120 sp. & 12 infra specific taxa)

Executing Scientist (s): Dr. V.P. Prasad

Date of Initiation: April, 2013

Date to be completion: March, 2018

OBJECTIVE

To revise the genus *Fimbristylis* of the family Cyperaceae under Flora of India

BACKGROUND

This project was initiated in 2013. During previous year, two herbarium consultation tours were conducted to PBL, Portblair and BSI, Pune. Identities of 1200 specimens were checked, corrected the identity of 50 specimens housed in PBL. Description of a total of 11 taxa was prepared by studying the specimens housed in CAL.

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

Two herbarium consultation tour were conducted to BSD, DD (Dehradun) and LWG (Lucknow) and BSA (Allahabad) during which checked the identity of about 2000 specimens, corrected identity of 250 Cyperaceae specimens, especially *Fimbristylis* sp. and also recorded field data of 940 specimens; collected 10 specimens from Dehradun. In addition corrected identity of 44 old taxa deposited in CAL; identified 65 field numbers of *Fimbristylis* for other scientists and institutions.

PROJECT-2

Revision of the genus *Gastrochilus* D. Don (Orchidaceae) in India (New Project)

Executing Scientist (s): Dr. Avishek Bhattacharjee

Date of Initiation: April, 2017

Date to be completion: March, 2020

OBJECTIVE

To revise the genus *Gastrochilus* D. Don (Orchidaceae) in India

BACKGROUND

This is a new project and has been proposed to study systematics of the members of the genus *Gastrochilus* D. Don (Orchidaceae) in India

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

Two field tours *w.e.f.* 18.11.17 - 28.11.17 and 28.02.18 - 14.03.18 were undertaken to different parts of South and West Sikkim and Lower Dibang Valley of Arunachal Pradesh during which a total of 05 species were collected in flowering. The specimens collected from the tours were studied in detail and descriptions as well as photo plates were prepared from the live-specimens. Beside documented 29 specimens sent from BM.

PROJECT-3

Flora of Betla National park, Latehar, Jharkhand

Executing Scientist (s): Shri Partha Protim Ghoshal

Date of Initiation: April, 2015

Date to be completion: March, 2019

OBJECTIVE

To study floristic diversity of Betla National park, Latehar, Jharkhand



Monochoria hastata (L.) Solms



Eranthemum purpurascens Wight ex Nees



Agapetes serpens (Wight) Sleumer

BACKGROUND

This project was initiated in 2015. During previous year, three field tours were undertaken during which 421 field numbers were collected along with 2000 relevant digital photo of habitat, habit and different parts of plants. A total of 97 species were identified.

AREA AND LOCALITY

Betla National park, Latehar, Jharkhand, c. 225.37 sq.km.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

One field tour *w.e.f.* 22.07.2017 - 04.08.2017 was undertaken to the study area during which 300 plant specimens under 125 field numbers were collected among which 60 species were identified.

PROJECT-4

Angiospermic flora of Neora Valley National Park, Darjeeling district, West Bengal

Executing Scientist (s): Dr. Vinay Ranjan, Sri Anant Kumar and Dr. Gopal Krishna

Date of Initiation: April, 2016

Date to be completion: March, 2021

OBJECTIVE

To study diversity of Angiosperm flora of Neora Valley National Park, Darjeeling district

BACKGROUND

This project was initiated in 2016. During previous year, two field tours were conducted to the study area during which 621 field numbers were collected along with GPS data and photographs of which a total of 53 species were identified.

AREA AND LOCALITY

Neora Valley National Park, Darjeeling district, West Bengal, c. 159 sq.km.



Pittosporum napaulense (DC.) Rehder & E.H. Wilson

SUMMARY OF THE WORK DONE DURING 2017-18

One field tour *w.e.f.* 12.02.2018 - 24.02.2018 was conducted to the study area during which 94 field numbers were collected of which 44 species were identified so far.

ACHIEVEMENTS/ OUTCOMES

This study reports four species [*Cardamine circaeoides* Hook.f. & Thomson; *Synotis rufinervis* (DC.) C. Jeffrey & Y.L. Chen; *Codonopsis gracilis* Hook.f. and *Synotis vagans* (Wall. ex DC.) C. Jeffrey & Y.L. Chen] as new addition to the state.

PROJECT-5

Assessment of floristic diversity in Baraila lake Salim Ali Jubba Sahni Bird Sanctuary, Vaishali District, Bihar

Executing Scientist (s): Dr. Kumar Avinash Bharati

Date of Initiation: April, 2016

Date to be completion: March, 2018



Ipomoea aquatica Forssk.



Ruellia prostrata Poir.

OBJECTIVE

To study floristic diversity in Baraila lake Salim Ali Jubba Sahni Bird Sanctuary and documentation of the floristic wealth

BACKGROUND

This project was initiated in 2016. During previous year, 03 field tours were conducted to the Sanctuary during which 240 field numbers were collected along with 150 field photo of which 60 species were identified.

AREA AND LOCALITY

Baraila lake Salim Ali Jubba Sahni Bird Sanctuary, Bihar, c. 12.7 sq.km.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

This study reports *Fimbristylis griffithii* Boeckeler as new record for the state Bihar. The final report being processed and compiled.

PROJECT-6

Flora of Udaipur Wildlife Sanctuary, West Champaran, Bihar (New Project)

Executing Scientist (s): Dr. O.N. Maurya

Date of Initiation: April, 2017

Date to be completion: March, 2018

OBJECTIVE

To survey and document floristic diversity of Udaipur Wildlife Sanctuary, West Champaran, Bihar

BACKGROUND

This is a new project.

AREA AND LOCALITY

Udaipur Wildlife Sanctuary, West Champaran, Bihar, c. 8.74 sq. km.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

One field tour *w.e.f.* 03.11.2017 - 07.11.2017 was conducted to the study area during which 102 field numbers were collected of which 49 species were identified.



Passiflora suberosa L.

PROJECT-7

Taxonomic revision of *Impatiens* L. (Balsaminaceae) of Sikkim & Darjeeling Himalayas (New Project)

Executing Scientist (s): Dr. Rajib Gogoi & Mr. Anand Kumar

Date of Initiation: April, 2017

Date to be completion: March, 2020

OBJECTIVE

To revise the genus *Impatiens* (Balsaminaceae) in Sikkim & Darjeeling Himalayas

BACKGROUND

This is a new project

AREA AND LOCALITY

Sikkim & Darjeeling Himalayas

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, a comprehensive list of species of *Impatiens* was made on the basis of Literature and herbarium study at CAL. Two field exploration tours were conducted to the study area during which 72 field numbers were collected along with 1600 photographs depicting the habit of plants, close up of flowers, fruits, landscape vegetation, dissecting parts of flowers & fruits. Altogether 31 species were collected from different parts of Sikkim during this financial year of which a total of 10 species of *Impatiens* were identified. In addition, one Herbarium consultation tour *w.e.f.* 05.12.2017 - 18.12.2017 was undertaken to ASSAM Herbarium (BSI, ERC, Shillong) and determined 28 species. SEM imaging of seeds of 07 species of the genus *Impatiens* was done. Specimens of 23 species were mounted.

ACHIEVEMENTS/ OUTCOMES

This study reports four species (*Impatiens pseudolaevigata* Gogoi, B.B.T.Tham & Lidén, *Impatiens arunachalensis* Hareesh, A. Joe, M. Sabu & R. Gogoi, *Impatiens trigonopteris* Hook.f. ex Arisdason & Gogoi and *Impatiens dorjeekhandui* Chowlu, S. S. Dash & Gogoi) as new to science; three species (*Impatiens duclouxii* Hook. f., *Impatiens cyclosepala* Hook. f. ex W.W. Sm. and *Impatiens recticalcarata* S. Akiyama) as new addition for India; four species (*Impatiens kingii* Hook.f., *Impatiens gamblei* Hook.f., *Impatiens hobsonii* Hook.f. and *Impatiens sikkimensis* Govaerts & Chakrab.) collected after more than 50 years.

PROJECT-8

Flora of Bihar Vol. III & Flora of Jharkhand Vol. III (Cuscutaceae - Ceratophyllaceae)(33 families & c. 674 species)

Executing Scientist (s): Dr. Dr. V. Sampath Kumar

(Lamiaceae, c. 75 species), Dr. K. Karthigeyan (Acanthaceae, c. 94 species), Dr. (Ms.) Pushpa Kumari (Bignoniaceae, c. 29 species), Dr. O.N. Maurya (Cuscutaceae, Scrophulariaceae, Orobanchaceae, Lentibulariaceae, Gesneriaceae, Pedaliaceae, c. 98 species), Dr. S. Bandopadhyay (Turneraceae, Punicaceae, Trapaceae), Dr. (Mrs.) Mahua Pal (Verbenaceae, c. 45 species)

Date of Initiation: April, 2015

Date to be completion: March, 2018

OBJECTIVE

To document flora of Bihar and Jharkhand (Families Cuscutaceae - Ceratophyllaceae)

BACKGROUND

This project was initiated in 2015. During previous year, as part of this project, two Herbarium consultation tours were conducted to BHAG and Ranchi University Herbarium and maintained datasheet. Dr. Subir bandopadhyay and Dr. Avishek Bhattacharjee completed the allotted families and submitted accordingly.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

Dr. V. Sampath Kumar: Described about 40 species along with keys

Dr. K. Karthigeyan: Described about 70 species of the family Acanthaceae along with keys. This study reports one species as new to science and two species as new to India.

Dr. (Ms.) Pushpa Kumari: Studied herbarium specimens of the allotted family and prepared data sheets of the species

Dr. O.N. Maurya: Completed literature survey and completed description of 18 species of Scrophulariaceae.

Dr. S. Bandopadhyay: Completed and submitted the MSS. of the families Turneraceae, Punicaceae and Trapaceae and submitted.

Dr. (Mrs.) Mahua Pal: Completed description of 03 genera and 10 species of the family Verbenaceae.

CENTRAL REGIONAL CENTRE, ALLAHABAD

PROJECT-1

Floristic Diversity of Bhoj Ramsar Site, Madhya Pradesh

Executing Scientist(s): Dr. Arti Garg

Date of Initiation : April 2016

Date of Completion: March 2018

OBJECTIVE

To study floristic diversity of Bhoj Ramsar Site, Madhya Pradesh

BACKGROUND

This project was initiated in 2016. During previous year, one field tour was conducted in the study area and collected 257 field numbers along with 940 photographs. About 60 field numbers were identified to 60 species. In

addition, a herbarium consultation tour was also undertaken to SFRI, Jabalpur and Sagar University, Sagar to study the relevant specimens.

AREA AND LOCALITY

Bhoj Ramsar Site, Madhya Pradesh (23° 11' 00" to 23° 16' 43" N and 77° 14' 27" to 77° 25' 50" E).

SUMMARY/PROGRESS OF THE WORK DONE IN 2017-2018

Two field tours *w.e.f.* 24.7.2017 - 4.8.2017 and *w.e.f.* 7.01.2018 to 19. 01. 2018 were conducted to the study region during which 517 field numbers were collected and identified along with about 250 photographs of the different species. A complete list of 745 plant species was prepared. Final project report is under progress.

ACHIEVEMENTS / OUTCOMES



A view of Mixed Deciduous Forest

This study reports four species viz. *Lippia alba* (Mill.) N.E. Br., *Portulaca tuberosa* Roxb., *Solanum diphyllum* L., and *Trifolium tomentosum* L. as new record for the state.

PROJECT-2

Floristic diversity of Kishanpur Wildlife Sanctuary, Lakhimpur Kheri, UP

Executing Scientist(s) : Dr. G.P. Sinha and Shri Vineet Kr. Singh

Date of initiation : April, 2016

Date to be completion : March, 2019

OBJECTIVE

To estimate floristic wealth of Kishanpur Wildlife Sanctuary

BACKGROUND

This project was initiated in 2016. During previous year, two field exploration tours were conducted to various areas of the Sanctuary during which a total of 376 field numbers were collected and 250 field photographs taken. During this period, 88 specimens were identified.

AREA AND LOCALITY

Kishanpur Wildlife Sanctuary, Lakhimpur Kheri, UP, c. 227 sq.km.

SUMMARY/PROGRESS OF THE WORK DONE AND

ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During this period, one field tour w.e.f. 4.7.2017 to 10.7.2017 was conducted to the study site during which a total of 580 field numbers were collected of which 262 species were identified.

PROJECT-3

Cyto-taxonomical studies of selected taxa of Indian subtribe *Cassiinae* (New Project)

Executing Scientist(S) : Dr. A. K. Verma, Scientist-B, BSI, CRC-Allahabad

Date of Initiation : April, 2017

Date to be completion : March, 2019

OBJECTIVE

To study cytology of the subtribe *Cassiinae*

BACKGROUND

The taxonomy and nomenclature of *Cassia* L. species are quite complex and intriguing. Bentham (1871) divided the genus *Cassia* into three genera and nine sections. Recently Irwin and Barneby (1982) splitted the genus *Cassia* L. into three subgenera; *Cassia* L., *Senna* Mill and *Chamaecrista* Moench. Realizing diversity and complexity Irwin and Baneby proposed an improved classification proposing new delimitation based on persistent suit of characters. They have raised the genus



Landscape of Kishanpur Wildlife Sanctuary, U.P.

Cassia L. to the levels of subtribe (Cassiinae) and raised the subgenera *Senna* Mill. and *Chamaecrista* Moench. Indian subtribe Cassiinae deals with 62 taxa belonging to genera *Cassia* L. (8 species), *Chamaecrista* Moench (11 species) and *Senna* Mill (43 species). Critical review of literature indicate that despite of large size, taxonomic problem and scope of cytological investigations, subtribe Cassiinae cytologically seems to have not received adequate attention. Cytological work in the subtribe has so far been mainly limited to record chromosome number and observations on the mitosis. The number of chromosome, their gross morphology, meiotic behavior, banding karyotypic differences provide good material for delimitation of taxa up to the level of family and to determine evolutionary sequences. Considering mentioned facts, scope and need for cytological investigations in Indian subtribe Cassiinae, present project was taken.

AREA AND LOCALITY

Throughout India as per availability of the members of the subtribe *Cassiinae*

SUMMARY/PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During this period, more than 25 local field trips were conducted for collection of suitable plant material for cytological investigation and collected a total of 49 field numbers along with 150 field photographs. 09 species of subtribe *Cassiinae* viz. *Cassia fistula*, *C. roxburghii*, *Chamaecrista absus*, *Senna alata*, *S. obtusifolia*, *S. occidentalis*, *S. siamea*, *S. sulfurea* and *S. tora* were cytologically worked out. Cytological parameters based population study of *S. occidentalis* was also carried out in 3 localities of Allahabad.

PROJECT-4

Trees of Allahabad city and its Environs (New Project)

Executing Scientist(S): Dr. G.P. Sinha

Date of Initiation : April, 2017

Date to be completion: March, 2018

OBJECTIVE

To document tree flora of Allahabad City and its surrounding area

BACKGROUND

Allahabad is a city of tourists/pilgrimages and there is a great influx of devotees. The city covers a wide range of urban flora includes both the natural and introduced species that need to be documented in a pictorial form to create a better awareness and understanding.



Mallotus philippensis (Lam.) Muell.-Arg.



Adansonia digitata L.-Flower

AREA AND LOCALITY

Allahabad City, Uttar Pradesh

SUMMARY/PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During this period, taxonomic description of 182 tree species of Allahabad city was prepared along with habit and close up photographs of majority of species and vegetative key for the identification of species was also prepared.

PROJECT 5

Editing of Flora of Uttar Pradesh, Vol. II (New Project)

Executing Scientist(s) : Dr. G. P. Sinha

Date of initiation : April, 2017

Date to be completion : March, 2018

OBJECTIVE

To edit Flora of Uttar Pradesh, volume II

BACKGROUND

Individual scientific officials completed their allotted families of Flora of Uttar Pradesh, Vol. II. After publication of Flora of Uttar Pradesh, Vol. I, the editing work of volume II was taken up for publication.

AREA AND LOCALITY

The state Uttar Pradesh

SUMMARY/PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During this period, updation of nomenclature, consequential changes in their ranks, revision of key to genera and editing of families starting from Araliaceae to Ceratophyllaceae dealing with 1156 taxa under 519 genera and 59 families was completed including index to botanical names and vernacular names. Manuscript of the book entitle 'Flora of Uttar Pradesh, Vol. II (Araliaceae to Ceratophyllaceae)' was finalized for submission.

PROJECT-6

Identification of old unidentified specimens of BSA (New project)

Executing Scientist(s) : All the scientific officials of BSI – CRC, Allahabad

Date of initiation : April 2017

Date to be completion: March 2018

OBJECTIVE

To identify all the unidentified specimens deposited in BSA

BACKGROUND

The large number of unidentified specimens needed identification for incorporation at BSA herbarium as several earlier scientists could not work out their collections due to transfers, superannuation or some other reasons. As it is a time consuming work, hence the project was taken up.

AREA AND LOCALITY

Entire jurisdiction of Central Regional centre, Botanical Survey of India, Allahabad viz. Chhattisgarh, Madhya Pradesh and Uttar Pradesh.

SUMMARY/PROGRESS OF THE WORK DONE DURING 2017-2018

During this period, Dr. G. P. Sinha identified 97 specimens; Dr. A. Garg identified 40 specimens; Dr. A.N. Shukla identified 45 specimens; Dr. A. K. Verma identified 192 specimens; Dr. A.P. Tiwari identified 45 specimens; Sri V. K. Singh identified 246 specimens and Dr. Nitisha Srivastava identified 221 specimens.

ACHIEVEMENTS/ OUTCOMES

During this study, altogether 934 old herbarium specimens were identified.

PROJECT 7

Ex-situ conservation of endemic, threatened and economic plant species in the associated garden of CRC and documentation of phenological data on flowering and fruiting every month (New project)

Executing Scientist(s) : All the scientific officials of BSI, CRC, Allahabad

Date of initiation : April, 2017

Date to be completion: March, 2018

OBJECTIVE

To conserve endemic, threatened and economic plant species in the associated garden of CRC and documentation of phenological data.

BACKGROUND

This is a new project.

AREA AND LOCALITY

Endemic, threatened and economic plant species of entire jurisdiction of CRC, BSI.

SUMMARY/PROGRESS OF THE WORK DONE DURING 2017-2018

During this period, two days field tour *w.e.f.* 11.10.2017 to 12.10.2017 was undertaken in Chitrakoot area of Madhya Pradesh and Uttar Pradesh during which a total of 59 species comprising 16 species of Aquatic plants, two ferns, 43 species of terrestrial plants were collected.

ACHIEVEMENTS/ OUTCOMES

During this study, six saplings were planted which include *Adansonia digitata*, *Radermachera xylocarpa* and



Rauwolfia serpentina (L.) Benth. ex Kurz-Fruits

Pterocarpus marsupium introduced in the garden; In addition *Cycas circinalis*, *C. revoluta*, *Khaya senegalensis*, *Mussaenda* sp. etc were also planted during Banmahotsav.

PROJECT-8

Flora of Chhattisgarh (Monocot - 570 spp.)

Executing Scientist(s) : Dr. G. P. Sinha; Dr. A. Garg; Dr. N. K. Gautam; Dr. A. K. Verma; Dr. B. Joshi; Sri V.K. Singh; Dr. N. Srivastava

Date of initiation : April, 2016

Date to be completion: March, 2018

OBJECTIVE

To document Monocot Flora of Chhattisgarh

BACKGROUND

Towards completion of Volume II of the Flora of Chhattisgarh, following officials were allotted plant families mentioned against their name.

AREA AND LOCALITY

Chattishgarh

SUMMARY OF THE WORK DONE DURING 2017-18

Following officials completed the taxonomic descriptions of all species of allotted families:

Dr. G. P. Sinha, Scientist E: Orchidaceae – 69 species; Dr. A. Garg, Scientist D: Poaceae – 120 species; Dr. A. K. Verma, Scientist B: Potamogetonaceae, Eriocaulaceae and Cyperaceae – 77 species; Dr. B. Joshi, Botanical Asstt.: Dioscoraceae to Pontedariaceae and Commelinaceae – 57 species; Sri V. K. Singh, Bot. Asstt.: Hydrocharitaceae to Burmanniaceae and Xylariaceae – 52 species; Dr. N. Srivastava, Bot. Asstt.: Poaceae – 93 species.

ACHIEVEMENTS/OUTCOMES

During this study, taxonomic description of 468 species were completed.



Ipomoea pes-caprae (L.) R. Br.

CRYPTOGAMY UNIT, HQRS

PROJECT-1

Hot spring Algal flora of Rajgir and Munger, Bihar (New Project)

Executing Scientist(s): Dr. R.K. Gupta

Date of initiation : April, 2017

Date to be completion: March, 2020

OBJECTIVE

To study diversity of Algal flora in Hot spring of Rajgir and Munger, Bihar

BACKGROUND

Thermal springs are specialized habitats characterized by high temperature of water and Sulphur emission. The thermal aquatic environment provides special situations for studying the distribution of algae in natural temperature gradients. In India, about 386 thermal algal taxa were recorded which include 336 cyanobacteria, 35 diatoms, 12 green algae and 03 euglenoids. Due to their thermo-tolerance capacity, these algae plays important role in formulating effective conservation management and sustainable development of themal springs. The arena of scientific research on such habitats will help in demystifying the present day crisis of depletion of source of non – renewable energy in being a source of non – conventional energy.

AREA AND LOCALITY

Rajgir Hot Spring: (25.03° N & 85.42° E); Munger Hot Spring: (25.381° N & 86.465° E)

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

During this period, one field tour was conducted to the study area during which 51 specimens along with 55 photographs were collected of which 47 were identified. 27 specimens were incorporated in the herbarium. During this period, mss. of 'Algal Flora of Jharkhand' was also completed and submitted.

PROJECT-2

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

Executing Scientist(s): Dr. Kanad Das

Date of initiation : April, 2014

Date to be completion : March, 2019

OBJECTIVE

To study wild mushrooms of East and South Sikkim.

BACKGROUND

This project was initiated in 2014. During previous year, one macrofungal collection tour *w.e.f.* 13.08.2016-27.08.2016 was conducted to East district of Sikkim during which 68 field numbers belong to 60 species were collected along with 50 field photographs. 24 field numbers belonging to 22 species were identified, 18 species were documented along with preparation of microscopic illustrations for 10 species and SEM studies of 07 samples were completed.



Russula kewzingensis K. Das, D. Chakraborty & Buyck



Paxillus orientalis Gerardi, Vizzini, E. Horak & G. Wu

AREA AND LOCALITY

East and South districts of Sikkim, c. 1714 sq. Km

SUMMARY OF THE WORK DONE DURING 2017-18

One macrofungal survey tour *w.e.f.* 21.08.2017 to 27.08.2017 was undertaken to East and South districts of Sikkim during which 41 field nos. belonging to 34 species were collected. During this study, 32 field numbers belonging to 27 species were identified and 32 field numbers belonging to 27 species were identified. All the collected specimens were well preserved and under study, 12 specimens were incorporated in herbarium.

ACHIEVEMENTS/OUTCOMES

This study reports 20 species as new to science [*Russula kewzingensis* K. Das, D. Chakr. & Buyck, *Russula pseudocompacta* A. Ghosh, K. Das, R.P. Bhatt & Buyck, *Russula aureorubra* K. Das, A. Ghosh, A. Baghela & Buyck, *Gyroporus paramjitii* K. Das, D. Chakr. & Vizzini, *Thelephora sikkimensis* K. Das, Hembrom & Kuhar, *Craterellus parvogriseus* U. Singh, K. Das & Buyck etc.] and 02 species [*Paxillus orientalis* Gelardi, Vizzini, E. Horak & G. Wu and *Hygrophorus pudorinus* (Fr.) Fr., Anteckn. Sver. Ätl.] as new record for India. Notes on two edible Mushrooms were also recorded.

PROJECT-3

Revision of family Metzgeriaceae in India and databasing liverworts and Hornworts specimens of CAL

Executing Scientist (s) : Dr. Devendra Singh

Date of initiation : April, 2015

Date to be completion: March, 2018

OBJECTIVE

To study detail morphological characters of the members of the family Metzgeriaceae in India including SEM study.

BACKGROUND

This project was initiated in 2015. During previous year, one field tour was conducted to Dzoukou Valley, collected 166 specimens of Bryophytes including 26 specimens of Metzgeriaceae in particular along with 200 photographs of which 40 photographs were identified upto species level. A total of 16 species were documented, 282 specimens were incorporated.

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE DURING 2017-18

A total of 83 field numbers belonging to 16 species of the family Metzgeriaceae available in CAL herbarium or received on loan from various Indian and foreign herbaria were illustrated, micro photographed/SEM



Metzgeria leptoneura Spruce



Metzgeria pubescens Schrank Kuwah

study and described for the submission of the final project report. In addition 23 specimens were incorporated in herbarium.

ACHIEVEMENTS/OUTCOMES

This study reports one species [*Metzgeria mizoramensis* Sushil K. Singh & D.Singh] as new to science and eight species [*Cheilolejeunea birmensis* (Steph.) Mizut., *Cheilolejeunea intertexta* (Lindenb.) Steph., *Cololejeunea udarii* G. Asthana & S.C. Srivast., *Lejeunea anisophylla* Mont., *Lopholejeunea sikkimensis* Steph. var. *sikkimensis*, *Lophocolea heterophylla* (Schrad.) Dumort., *Metzgeria raoii* S.C. Srivast. & Sm. Srivast., *Plagiochasma cordatum* Lehm. & Lindenb. Srivast.] as new records for

Maharashtra. Besides during this period, prepared database of 467 liverworts and hornworts of general specimens deposited at CAL herbarium.

PROJECT-4

Liverworts and Hornworts Flora of Darjeeling District, West Bengal

Executing Scientist (s): Dr. Monalisa Dey

Date of initiation : April, 2016

Date to be completion: March, 2021

OBJECTIVE

To survey and document diversity of liverwort & hornwort flora of Darjeeling District, West Bengal

BACKGROUND

This project was initiated in 2016. During previous period, two field tours were conducted in the study area during which 316 field numbers were collected, 97 unidentified specimens belonging to 25 species from

Darjeeling District were identified, cameralucida drawing of six species was completed along with microphotography.

AREA AND LOCALITY

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

SUMMARY OF THE WORK DONE DURING 2017-18

118 unidentified specimens belonging to 25 species collected during previous year from Darjeeling District, West Bengal were identified. Microphotography and description of seven species were completed. Besides, microphotography of *Trocholejeunea meghalayensis* Ajit P.Singh & V.Nath [*A.P. Singh* 208657-B (Holotype: LWG)] obtained from National Botanical Research Institute, Lucknow, India (LWG) on loan studied in detail.

ACHIEVEMENTS/OUTCOMES

This study reports *Acrolejeunea meghalayensis*, a new synonym of *Acrolejeunea recurvata* (Lejeuneaceae: Marchantiophyta).



Plagiochila parvifolia Lindenb.

DECCAN REGIONAL CENTRE, HYDERABAD



Graphis andamanica Swarnal.



Coccocarpia palmicola (Spreng.) Arv. & D.J. Galloway

PROJECT-1

Inventory of Macrolichen diversity of Odisha State

Executing Scientist (s): Dr. Swarnalatha Ginnaram

Date of initiation : August, 2015

Date to be completion: March, 2018

OBJECTIVE

To study precise diversity of macrolichens of the state of Odisha

BACKGROUND

This project was initiated in 2015. During previous year, three field tours were undertaken in different regions of Odisha and 520 lichen specimens were collected of which 70 macrolichen specimens were studied and identified to 20 species under 09 genera. Besides, 39 micro-photographs were taken,

AREA AND LOCALITY

Odisha, c. 155707 sq.km.

SUMMARY OF THE WORK DONE DURING 2017-18

A total 90 macrolichen specimens were studied from earlier collections of which 76 specimens were identified

up to the species level (in to 30 species under nine genera) and 14 specimens were identified up to the genus level. Detailed descriptions of five species have been completed. In addition, one herbarium and library consultation tour *w.e.f.* 05.03.18-09.03.18 was undertaken to BSI, Central National Herbarium, Howrah.

ACHIEVEMENTS/OUTCOMES

This study reported six species [*Bulbothrix setschwanensis*; *Leptogium coralloideum*; *Leptogium cyanescens*; *Leptogium saturninum*; *Parmotrema crinitoides*; *Pyxine sorediata*] as new distributional records to the state of Odisha.

PROJECT-2

Flora of Manjeera Wildlife Sanctuary, Telangana (New project)

Executing Scientist (s): Dr. L. Rasingam

Date of initiation : April, 2017

Date to be completion: March, 2019

SUMMARY OF THE WORK DONE DURING 2017-18

As the incumbent official was involved in Non Detrimental Finding studies on Red Sanders (*Pterocarpus santalinus* L.f.) in India, the project was postponed.

PROJECT-3

Flora of Kinnerasani Wildlife Sanctuary, Telangana

Executing Scientist (s): Dr. J. swamy

Date of initiation : April, 2017

Date to be completion: March, 2020

SUMMARY OF THE WORK DONE DURING 2017-18

As the incumbent official was involved in Non Detrimental Finding studies on Red Sanders (*Pterocarpus santalinus* L.f.) in India, the project was postponed.

PROJECT-4

Grasses of Telangana State, India

Executing Scientist (s): Mr. S. Nagaraju

Date of initiation : April, 2017

Date to be completion: March, 2020

SUMMARY OF THE WORK DONE DURING 2017-18

As the incumbent official was involved in Non Detrimental Finding studies on Red Sanders (*Pterocarpus santalinus* L.f.) in India, the project was postponed.

EASTERN REGIONAL CENTRE, SHILLONG

PROJECT-1

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

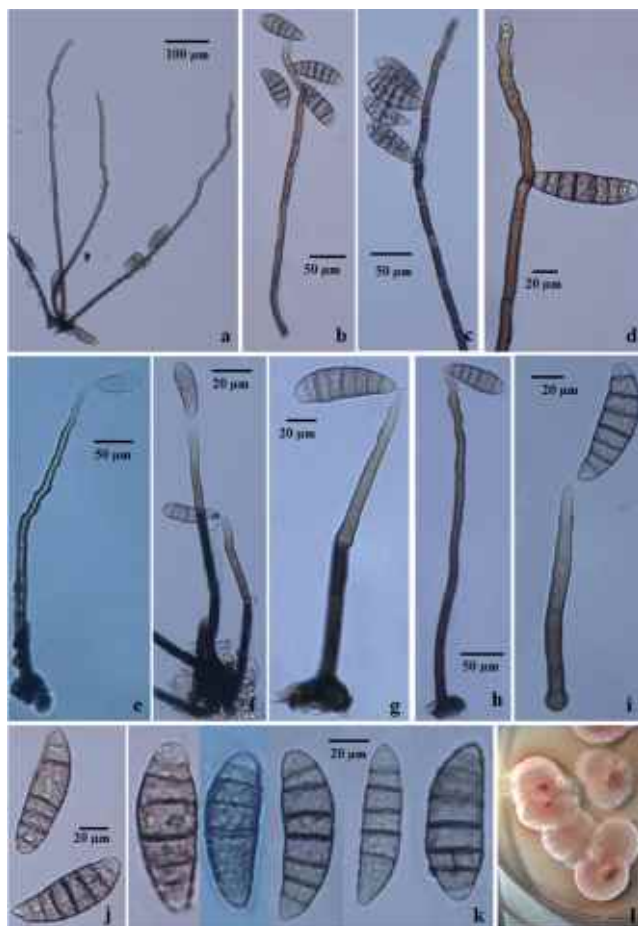
Executing Scientist(s): Dr. Ashish Venkatesh Prabhugaonkar

Date of Initiation : August, 2015

Date to be completion : March, 2018

OBJECTIVE

To document micro-fungal diversity of N.E. India with special emphasis on endemic and threatened plants of Meghalaya



Fusiconidium indicum Pratibha & Prabhugaonkar

BACKGROUND

This project was initiated in 2015. During previous years, as part of establishment of fungal laboratory, stereo-zoom microscope and a compound microscope with camera procured. 200 species were documented and microphotographed; 14 local tours were conducted in Khasi & Jaintia hills of Meghalaya. A total of 210 species were identified and documented so far. A fungal culture collection with 171 fungal species was being maintained at BSI, ERC, Shillong.

AREA AND LOCALITY

Meghalaya, N.E. India

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, eight fungal collection tours of 1-2 days were conducted to Garo, Khasi and Jaintia hills. A total of 55 fungal species belonging to 44 genera were isolated during this period of which 45 species were identified and 25 species were incorporated. DNA sequence data of three interesting fungal cultures namely *Dendrosporium lobatum*, *Semipseudocercospora peristrophes-acuminatae* and an unidentified fungal cultures from *Nepenthes khasiana* identified as *Acrodontium* sp. were obtained from RFDF, RGCG, Thiruvananthapuram; prepared manuscript with phylogenetic analysis to support morphological taxonomy on *Aureobasidium pullulans* var. *khasiana* associated with decaying leaves of *Wightia speciosissima* and *Acrodontium cratariforme*, a fungus associated with pitcher trap liquid. In addition to this, worked on first molecular phylogeny tree of interesting aquatic fungi *Setosynnema isthmosporum* and *Cryptophiale aristata*. Regarding this work, five fungal species (*Yuccamyces* sp., *Torula* sp., *Cryptophiale* sp. and 02 unidentified cultures) were grown in malt extract broth for DNA isolation and standardised protocol for DNA isolation for all the five species. DNA isolated from three fungal species was amplified in Polymerase chain reaction (PCR). The NS1-NS4 and LROR-LR7 (White & al. 1990) primer-pairs were used to amplify partial 18S rRNA gene and partial 28S rRNA gene, respectively. PCR product was purified using Nucleospin PCR clean up gel kit (Macherey-Nagel).

Purified PCR products were sent to Eurofins genomics Pvt Ltd. Bangalore and sequences obtained were being

analysed further. Deposited and received accession numbers for three fungal herbarium specimens (Type material) from Herbarium Cryptogamae Indiae Orientalis (HCIO), Division of Plant pathology, IARI, New Delhi. These are HCIO 52162 *Neosporidesmium khasiana*, HCIO 52163 *Aureobasidium pullulans* var. *khasiana*, HCIO 52164 *Neosporidesmium garoensis*. Submitted sequences of two gene regions of four fungi to NCBI-Genbank and obtained accession numbers for ITS and LSU as *Fusicoidium indicum* (MF588672, MF588673), *Acrodotium cratariforme* (MF613959, MF613646), *Argopericonia indirae* (KY977981 KY977982), *Pseudoxylomyces elegans* (KY977978 KY977983)

ACHIEVEMENTS/OUTCOMES

During this study, method for Fungal DNA isolation and PCR amplification of ITS, LSU and SSU gene regions were successfully standardised.

PROJECT-2

Flora of Amchang Wildlife Sanctuary, Kamrup, Assam

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

Date of Initiation : April, 2014

Date to be completion : October, 2017

OBJECTIVE

To study and document the floral diversity of Amchang Wildlife Sanctuary, Kamrup, Assam

BACKGROUND

This project was initiated in 2014. During previous year, 31 species were identified and documented.

AREA AND LOCALITY

Amchang Wildlife Sanctuary, Kamrup, Assam, c. 78.64 sq.km.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES DURING 2017-18

118 species collected from Amchang Wildlife Sanctuary of previous tour were identified alongwith documentation of 08 species. Final manuscript comprising of 444 species, 02 varieties and 02 subspecies belonging to 328 genera and 110 families from Pteridophytes, Gymnosperms, Dicotyledon and Monocotyledon were submitted.

PROJECT-3

Micropropagation of Rare, Endangered and Threatened Plant species of North East India

Executing Scientist (s) : Dr. A. A. Mao & Ms. L. Ibemhal Chanu

Date of Initiation : April, 2015

Date to be completion : October, 2017



Cymbidium tigrinum Parish ex Hook.f.



Rhododendron coxianum Davidian

OBJECTIVE

To develop protocol of micropropagation of five RET plants of North East India through tissue culture.

BACKGROUND

This project was initiated in 2015. During previous year, experimental work on micropropagation through tissue culture was in continuation of five RET species namely *Armadorum senapatianum*, *Cymbidium tigrinum*, *Paphiopedilum hirsutissimum*, *Ilex khasiana* & *Rhododendron coxianum*. Callus of *Rhododendron coxianum* was subcultured in different concentration of 2ip for further experiment; c. 7000 seedlings of *Cymbidium tigrinum* were grown in culture room, c. 2000 seedlings were subcultured & c. 100 plants were shifted in greenhouse; c. 250 plants of *Armadorum*

senapatianum were subcultured and experiment done for mass multiplication inside the culture room; experiment on seed germination of *Ilex khasiana* and *Paphiopedilum hirsutissimum* were in process.

AREA AND LOCALITY

N.E. Region, India

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, all related experiments and statistical analysis were completed and submitted.

ACHIEVEMENTS/OUTCOMES

Around 2500 seedlings of *Armadorum senapatianum*, 8000 seedlings of *Cymbidium tigrinum*, 150 seedlings of *Rhododendron coxianum* were grown in Experimental botanic garden of BSI, Shillong; meristem tip culture of *Ilex khasiana* was successful and *Paphiopedilum hirsutissimum* are in germination process.

PROJECT-4

Flora of west & south-west khasi hills district of Meghalaya with reference to the Sacred groves

Executing Scientist (s) : Dr. Chaya Deori & Shri S. R. Talukdar

Date of Initiation : April, 2016

Date to be completion : March, 2019

OBJECTIVE

To conduct intensive botanical exploration in entire west & south-west khasi hills district of Meghalaya covering sacred groves and preparation of a comprehensive floristic account.

BACKGROUND

This project was initiated in 2016. During previous year, a list of 97 species from two districts was prepared from relevant literatures. Two field tours were conducted in the study areas during which a total of 624 field numbers were collected along with 124 live plant species for introduction in garden. More than 1000 field photographs were taken and 111 species were identified so far.

AREA AND LOCALITY

West (c. 5247 sq.km.) & south-west khasi hills district (c. 1341 sq.km.) of Meghalaya

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, literatures pertaining to two districts were consulted and listed 30 species from literature and 200 from herbarium. Two field tours *w.e.f.* 04.04.17-11.04.17 and 07.08.17-18.04.17 were conducted to Nongstoin, Mawoing, Nongkhlaw and its surrounding



Utricularia striatula Sm.



Nongkhunum sacred grove in west khasi hills

areas, Kshekomoh, Lawshnong, Mawkadiang, Mawthawdon Nongkhlaw, Mairang, Klangrial Tyrsung, Photkhynraw, Kyndongngei, Nongkaniang, Photnondien, Lampi, Kynsi, Siangra, Songsak of West Khasi hill District and Mawkyrwat area, Mawthawniaw Rangthong, Rangthong West, Mawtheiem, Mawchawmah, Tdepyrnon, Nongkyniong, Twahdiengngon, Mawthanrew, Nonglang, Tannai, Ranikor, Edurilang, B.O.P. Chicken gate, Along basti and Rangthang and its surrounding areas, Ranikor, Jakrem of south west Khasi hill district during which a total of 551 field numbers were collected along with more than 1200 colour photographs and 89 live plants for introduction in garden. So far 300 plant specimens were identified and the remainings are under process.

ACHIEVEMENTS/OUTCOMES

This study reports a new addition to the orchid flora of India (*Liparis sootenzanensis*). During this study, 21 RET plant species belong to the family Orchidaceae, zingibers, 03 endemic plant species, 25 economically important

plant and 01 ecologically significant Poaceae member were collected and planted in the botanical garden of Botanical survey of India, Shillong as a means of *ex-situ* conservation and most of the species are surviving.

PROJECT-5

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

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

OBJECTIVE

To survey and collect the members of the genus *Riccia* from different regions of India, their identification, taxonomical characterization, SEM study of sporoderm pattern and documentation.

BACKGROUND

This project was initiated in 2014. During previous year, six field tours was conducted to different parts of NE India during which a total of 13 species of *Riccia* were collected along with 422 numbers of other liverworts and hornworts. 11 species of *Riccia* were documented alongwith SEM study of 10 species.

AREA AND LOCALITY

India

SUMMARY OF THE WORK DONE DURING 2017-18

53 samples of *Riccia* belonging to 13 species collected from different parts of Western Ghats and NE India were identified alongwith identification of 42 other bryophyte members. Taxonomic description of 09 *Riccia* species were completed along with checking of their nomenclature; sporoderm of 14 samples belonging to 09 species were studied under Scanning Electron Microscope. In addition to this, 01 Herbarium consultation tour *w.e.f.* 21.03.18 - 29.03.18 was conducted to NBRI Lucknow & Lucknow University Lucknow and studied the holotype of *Riccia attenuata*, *Riccia grollei* and other authentic specimens deposited there. During this period, more than 50 specimens were studied, alongwith documentation of 09 species, detailed nomenclature of 10 species was also checked.

ACHIEVEMENTS/OUTCOMES

This study reports seven species (*Riccia cavernosa*, *Riccia frostii*, *Riccia glauca*, *Riccia huebeneriana*, *Riccia melanospora*, *Riccia melanospora*, *Riccia perssonii*, *Riccia sorocarpa*) of *Riccia* as new to Jharkhand, 06 species (*Riccia cruciata*, *Riccia huebeneriana*, *Riccia sorocarpa*, *Riccia stricta*, *Riccia frostii*, *Riccia perssonii*) as new to Meghalaya.

PROJECT-6

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

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

OBJECTIVE

To survey four districts of eastern Nagaland and document the floristic wealth

BACKGROUND

This project was initiated in 2014. During previous year, two field tours were undertaken in the study site during which a total of 760 field numbers were collected of which 125 plant species were identified and documented.

AREA AND LOCALITY

Mon, Tuensang, Kiphire and Longleng districts, Eastern Nagaland

SUMMARY OF THE WORK DONE DURING 2017-18

During 2017-18, two field tours *w.e.f.* 29.08.2017 - 19.9.2017 and 20.11.2017 - 09.12.2017 were conducted to Kohima, (Dzulakie, Khonoma); Peren (Peren Forest Range, Pauna Mountain Range, Tesen Range, Poilo) and Wokha (Totsu, Pangti Village forest), Phek and Wokha districts of Nagaland during which a total of 599 field numbers were collected along with 800 photographs and GPS data. 292 live plants were collected for introduction in experimental botanic garden.

ACHIEVEMENTS/OUTCOMES

This study reports three species [*Gleadovia konyakianorum*, *Hedychium chinmeianum*, *Dendrobium tuensangense*] as new to science; 19 species as new records for the state, Nagaland [*Bulbophyllum*



Dendrobium tuensangense N. Odyuo & C. Deori

cariniflorum, *Bulbophyllum forestii*, *Bulbophyllum pectinatum*, *Calanthe hancockii*, *Dendrobium numaldeorii*, *Flickingeria abhaycharanii* etc.]; one species [*Liparis formosana*] as new record for India. one species (*Pyrenaria khasiana*) was rediscovered after more than a century.

PROJECT-7

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 Scientist (s) : Dr. M. Murugesan and Shri L. R. Meitei

Date of Initiation and Date to be completion : Ongoing

OBJECTIVE

To collect, conserve and multiply endemic, rare, threatened and economically important plants of North-East India at Experimental Botanic Garden, ERC, Barapani (Umiam); to record phenological data for the plants available in experimental garden.

BACKGROUND

This is ongoing project. During previous year, 04 field tours were conducted to different parts of N.E. India during which a total of 531 live plant species were collected alongwith 1500 field photographs. Phenological data of 236 plant species were observed and a list was prepared.

AREA AND LOCALITY

Entire N.E. India

SUMMARY OF THE WORK DONE DURING 2017-18

Seven field tours and 12 one day tours were conducted to Reserved forests of Tripura, Peren and Mon Districts of

Nagaland, Manipur, Peren and Wokha Districts, Nagaland, Dullang Reserve forests, Nameri National Park, Karampani Wildlife Sanctuary of Assam, Peren and wokha Districts, Nagaland, Nongkhylllem wildlife Sanctuary, Mawlai and Mawiong, Shillong, Garo Hills, Ryngkangkhlha, Ri-Bhoi, Upper Shillong Area, East Khasi hills, Shyiap, Ri-Bhoi, Mawsynram, Lumsohpetbneng, East Khasi Hills, Meghalaya, during which a total of 864 live plants were collected. Around 1302 seedlings/saplings were raised from 38 species by stem cutting, root cutting and seed germination during the period.; tagged 475 name boards for trees and shrubs, orchids, zingers, medicinal plants and other economically important plants available in the garden.

ACHIEVEMENTS/OUTCOMES

During this study, 128 RET and 26 endemic plant species were collected from all the field tours and planted in the Experimental Botanic Garden, Barapani (Umiam) for *ex-situ* conservation and multiplication purpose. In addition, phenological data of flowering and fruiting of 203 plant species in the garden were observed and recorded, some of which are *Acampe rigida*, *Acampe ochracea*, *Acanthephippium striatum*, *Acmella paniculata*, *Aerides multiflora*, *Aerides rosea*, *Aeschynanthus parviflorus*, *Aesculus assamica*, *Ageratum conyzoides*, *Albizia lucidior*, *Aloe vera*, *Allamanda cathartica*, *Alpinea malaccensis*, *Arundina graminifolia* var. *gramnifolia*, *Ascocentrum ampullaceum*, *Baccaurea ramiflora*, *Bauhinia variegata*, *Bombax ceiba*, *Coelogyne micrantha*, *Coelogyne ovalis*, *Coelogyne rigida*, *Coffea Arabica*, *Dendrobium gibsonii*, *Eulophia pauciflora*, *Hedychium coccineum*, *Kaempferia galangal*, *Liparis luteola*, *Liparis odorata* etc.

PROJECT-8

Flora of Nagaland Vol. I & II

Executing Scientist (s) : Dr. A.A. Mao, N. Odyuo and D.K. Roy

Date of Initiation : April, 2016

Date to be completion : March, 2021

OBJECTIVE

To document vascular plant wealth of (excluding orchids and ferns) in Nagaland.

BACKGROUND

This project was initiated in 2016. During previous year, a checklist of 2287 taxa under 946 genera and 194 families were prepared by intensive literature survey and herbarium consultation. During this period, two field tours were conducted during which 412 field numbers were collected along with 112 live plant species.



Coelogyne ovalis Lindl.



A view of Laiching forest

AREA AND LOCALITY

Nagaland, c. 9222 sq.km.

SUMMARY OF THE WORK DONE DURING 2017-18

Two botanical exploration tours *w.e.f.* 11.04.2017 - 02.5.2017 and 29.08.2017 - 19.9.2017 were carried out to Peren (Gaili Mountain) and Mon (Nyoyang Mountain and Pessao Mountain) districts (11.04.2017 - 02.5.2017 for 22 days) and in Peren (Peren Forest Range, Pauna Mountain Range, Tesen Range, Poilo) and Wokha (Pangti Village forest) districts respectively during which a total of 750 field numbers were collected along with 390 live plant samples for introduction in Experimental botanic garden, BSI, ERC, Shillong. About 850 photographs of plants, vegetation and landscape were taken for documentation and incorporation in the Flora. Total 85 plant species taxonomically documented with proper author citation, description, phenology, ecology and distribution details.

ACHIEVEMENTS/OUTCOMES

This study reports four species [*Tupistra ashiohi*, *Rohdea extrorsandra*, *Peliosanthes arunachalensis*, *Tupistra leonidii* (Asparagaceae, subfamily Nolinoideae)] as new to NE India; one new species [*Tupistra leonidii*

(Asparagaceae, subfamily Nolinoideae)] from Meghalaya; two new species [*Hedychium chingmeianum* (Zingiberaceae), *Gleadovia konyakianorum* (Orobanchaceae)] from Nagaland; 19 new records of orchid to Nagaland and recollected 04 taxa [*Cleyera grandiflora* (more than 80 years), *Rhynchochum alternifolium* (more than 50 years), *Adinandra griffithii* (more than 80 years), *Aquilaria khasiana* (more than 74 years)] after a long gap.



Agapetes megacarpa W.W. Sm.

INDUSTRIAL SECTION INDIAN MUSEUM, KOLKATA

PROJECT-1

Collection of economic plant materials for enrichment and replacement of exhibits of the Botanical Gallery of ISIM.

Executing Scientist (s): Dr. A. K. Sahoo

Date of Initiation: April, 2016

Date to be completion: Ongoing

OBJECTIVE

To collect samples of plant materials and to replace with the old damaged exhibits in the Botanical Gallery.

BACKGROUND

This project was initiated in 2016. During previous year, one tour was undertaken to Koraput and Rayagada Districts of Odisha and 47 exhibiting materials mainly grains and millets were procured.

SUMMARY OF THE WORK DONE DURING 2017-18

Two field tours *w.e.f.* 29.08.17-08.09.2017 and 13.03.18-18.03.18 were conducted to Bargarh and Bolangir district of western Odisha and NBPGR, PUSA, Delhi. 35 plant materials of medicinal importance and 32 cereals, pulses, oilseeds, etc. were collected alongwith 31 photographs.

ACHIEVEMENTS/ OUTCOMES

During this study, eight varieties of uncommon plant materials of medicinal use (*viz. Drymaria, Embelia, Erycibe, Eulophia, Glycosmis, Pueraria, Remusatia, Tectaria, etc.*) were collected which possess Bio-perspectives.

PROJECT-2

Collection of economic plant material for enrichment and replacement of exhibits of the Botanical Gallery (New Project)

Executing Scientist (s): Smt. Geeta Chaudhury, Sri Bishnu

Charan Dey & Sri Surendra Kr. Sharma

Date of Initiation: March, 2017

Date to be completion: Ongoing

OBJECTIVE

To collect various economically important plant parts and replace with the older damaged ones in Botanical Gallery.

BACKGROUND OF THE PROJECT

Enrichment of Botanical Gallery by incorporating new plant materials.

AREA AND LOCALITY

Birbhum district, India

SUMMARY OF THE WORK DONE DURING 2017-18

One tour *w.e.f.* 08.03.18-14.03.18 was conducted to the Suri, Bolpur, Md. Bazaar & Rajnagar Range of Birbhum district during which 27 plants of ethno medicinal/ botanical materials were collected alongwith 20 field photographs. 22 previously collected materials were identified and processed for display in the Gallery.

ACHIEVEMENTS/ OUTCOMES

During this study, 21 ethnomedically important plants, two dye yielding plants and four edible plants were collected.

PROJECT -3

Interpretation of Roxburgh's icon for family Poaceae (New Project)

Executing Scientist (s): Dr. B. K. Sinha, Dr. M. Bhaumik, & Sudeshna Datta

Date of Initiation : April, 2017

Date to be completion: March, 2019

OBJECTIVE

To enumerate the nomenclatural status and taxonomic identity of Roxburgh's icon under family Poaceae (150 entries).

BACKGROUND

This is a new project. Roxburgh's drawing at CAL with reference to the Flora Indica manuscript is being updated for the family Poaceae.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

During 2017-18, out of 150 entries of the family Poaceae in Roxburgh's Icones, interpreted and nomenclature updated for 50 taxa. Description of 28 taxa was prepared.

PROJECT -4

Interpretation of Roxburgh's icon for family Ebenaceae (New Project)

Executing Scientist (s) : Dr. M. Bhaumik, D. L. Shirodkar & Sudeshna Datta

Date of Initiation : April, 2017

Date to be completion: March, 2018

OBJECTIVE

To enumerate the nomenclatural status and taxonomic identity of Roxburgh's icon under family Ebenaceae (12 entries)

BACKGROUND

This is a new project. Roxburgh's drawing at CAL with reference to the Flora Indica manuscript is being updated for the family Ebenaceae.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

During 2017-18, 12 entries of the family Ebenaceae were interpreted alongwith updated nomenclature and short description.

PROJECT-5

Listing and Identification of Dicot herbarium specimens at BSIS

Executing Scientist (s) : Smt. Geeta Chaudhury, Sri Bishnu Charan Dey & Sri S.K. Sharma

Date of Initiation : April, 2016

Date to be completion: March, 2019

OBJECTIVE

To prepare a digital catalogue of Dicot herbarium specimens at BSIS.

BACKGROUND

This project was initiated in 2016. During previous year,

1380 numbers of herbarium specimens were documented alongwith nomenclature update.

AREA AND LOCALITY

Different parts of India

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

During 2017-18, 3408 herbarium specimens were documented. These herbarium collections are now being preserved and digitized which will help future Botanists for further work on Economic Botany.

PROJECT-6

Nomenclature update of 9171 nos. digitized herbarium specimens at BSIS

Executing Scientist (s) : Dr. M. Bhaumik, Dr. A.K. Sahoo, Smt. Geeta Chaudhury, Smt. Sudeshna Datta, Sri Bishnu Charan Dey & Sri S.K. Sharma

Date of Initiation : April, 2016

Date to be completion : March 2018

OBJECTIVE

To update the metadata of digitized herbarium specimens with valid scientific names, synonyms and basynoms

BACKGROUND

This project was initiated in 2016. During previous year, 2396 metadata were updated.

SUMMARY OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES DURING 2017-18

During 2017-18, nomenclatures of 4171 herbarium specimens were updated along other relevant data.



ISIM, BSI, Building at Kolkata

NORTHERN REGIONAL CENTRE, DEHRADUN

PROJECT -1

Revision of Genus *Adiantum* L. (Adiantaceae) in India

Executing Scientist(s): Dr. Brijesh Kumar

Date of Initiation: April, 2016

Date to be completion: March, 2020

OBJECTIVE

To revise the genus *Adiantum* L. in India

BACKGROUND

This project is being initiated in 2016. During previous year, 35 taxa belong to the genus *Adiantum* were listed, 28 protologues and 10 type images were procured, 06 species were dissected & described, 05 species were illustrated, distribution data of 06 species was compiled and identification of 50 herbarium specimens housed at BSD was reconfirmed.

AREA AND LOCALITY

India

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

A checklist comprising of 38 taxa under the genus was updated, protologues of four species and type images of three species were procured, seven species were described, three species were illustrated, distribution pattern of five species were updated. Nomenclature of 20 species was also updated. Beside two herbarium consultation tours were undertaken to BSI, CRC, Allahabad (BSA) and Central National Herbarium,



Adiantum venustum D. don

Kolkata (CAL) and 472 herbarium specimens were examined, among these 396 were reconfirmed and 76 were determined, 70 herbarium sheets belong to *A. venustum* were digitized at CAL herbarium.

ACHIEVEMENTS/ OUTCOMES

This study reports one species (*Cheilanthes tenuifolia*) as a new record for the state Manipur. Conservation through religious practice for tree fern (*Cyathea spinulosa* Wall. ex Hook.) reported for the first time from Uttarakhand. Rare, Endangered and Economic important plants collected and details of conservation initiations taken for *Cyathea spinulosa*, only known Tree fern species in Western Himalaya and successfully conserved in BSI, NRC, Campus.

PROJECT-2

Flora of Sechu Tuan Nala Wildlife Sanctuary, Chamba District, Himachal Pradesh

Executing Scientist(s): Dr. Puneet Kumar

Date of Initiation: April, 2016

Date to be completion: March, 2020

OBJECTIVE

To survey and study floristic wealth of Sechu Tuan Nala Wildlife Sanctuary, Chamba district, Himachal Pradesh

BACKGROUND

This project was initiated in 2016. During previous year, one field tour *w.e.f.* 23.08.2016 - 05.09.2016 was conducted to the study area and collected 238 field numbers (c 700 plant specimens) of which 61 species were identified and 28 species were described. Besides, listing of species from earlier literature and BSD herbarium for Pangri Valley were done. During this period, 01 Herbarium Consultation tour to PUN, Punjabi University, Patiala, Punjab was conducted in which detailed information on 50 species (75 specimens) belonging to 48 families was collected. 04 RET and Endemic species were collected.

AREA AND LOCALITY

Sechu Tuan Nala Wildlife Sanctuary, Chamba District, Himachal Pradesh, c. 390 sq.km.



Picrorhiza kurroa Royle ex Benth.



Delphinium nordhagenii Wendelbo

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

During 2017-18, two field tours *w.e.f.* 11.07.2017-22.07.2017 and 04.10.2017-14.10.2017 were undertaken to Sechu Tuan Nala Wildlife Sanctuary, Chamba district, Himachal Pradesh.

A total of 440 field numbers were collected by covering an area of about 110 sq. km. Out of these, 76 species were identified and 72 species were described. Besides 09 RET and endemic plant species were also collected from the Sechu Tuan Nala Wildlife Sanctuary.

PROJECT-3

Flora of Binsar Wildlife Sanctuary, Kumaun, Uttarakhand (New Project)

Executing Scientist(s): Dr. Prashant K. Pusalkar

Date of Initiation : April, 2017

Date to be completion : March, 2018

OBJECTIVE

To prepare detailed descriptive floristic compilation, to serve as floristic database to formulate conservation policies and identification guide

BACKGROUND

This is a new project. In the state Uttarakhand, this is the only protected area for which consolidated floristic inventory was unavailable. Hence the project was proposed for detail floristic study of the protected area.

AREA AND LOCALITY

Almora-Bageshwar district, Kumaun, Uttarakhand, c. 47.07 Sq. Km.

SUMMARY/ PROGRESS AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

Data compilation was carried out for over 1200 specimens housed in BSD and DD herbarium collected from the sanctuary, over 700 specimens were identified and 380 species were described.

A detailed floristic inventory of the protected area comprising general introduction, detailed descriptions, keys, phenology and ecology data, status and abundance was prepared along with field photographs for easy identification.

PROJECT-4

Floristic Diversity of Sukhna Lake Wildlife Sanctuary, Chandigarh (UT) (New Project)

Executing Scientist(s): Dr. Kuldip S. Dogra & Dr. Kumar Ambrish

Date of Initiation: April, 2017

Date to be Completion: March, 2018

OBJECTIVE

To carry out extensive floristic exploration in the Wild Life Sanctuary, to prepare a database on the plant diversity of the Wild Life Sanctuary

BACKGROUND

This Sukhna Lake Wildlife Sanctuary, Chandigarh encompasses a wide variety of aquatic and terrestrial flora. The place is known for its nature trail and ecotourism. The lake witnesses a wide range of tourist almost all the seasons. The project aims to document floral wealth, information on economic importance of plants and on their phenology (flowering & fruiting). The endemic and threatened plants of the Sanctuary will also be identified during the floristic survey.

AREA AND LOCALITY

Sukhna Wildlife Sanctuary, Chandigarh (UT), c. 26 Sq. Km.



Justicia adhatoda L.



Butea monosperma Lam.

SUMMARY/PROGRESS OF THE WORK DONE IN 2017-18

Two plant collection tours were conducted to the study area and a total of 210 field numbers were collected. It is estimated that the sanctuary has around 235 plant species which includes trees, shrubs, herbs and climbers.

ACHIEVEMENTS/OUTCOMES

During this study, a terrestrial orchid species, *Habenaria plantaginea* was collected first time from this area of Chandigarh. Many other medicinally and economically important plant species were also collected from the area along with their photographs.

PROJECT-5

Trees of Dehradun city and its vicinity

Executing Scientist(s): Dr. Virendra K. Madhukar & Dr. S.K. Srivastava

Date of Initiation: April, 2016

Date to be Completion: March, 2019

OBJECTIVE

To document the tree diversity of Dehradun city and its vicinity along with high definition pictures of habit, flowering and fruiting and any peculiar characters.

BACKGROUND

This project was initiated in 2016. During previous year, listing of 300 tree species growing in and around Dehradun city was completed along with identification, updated nomenclature, brief description and phenology of 90 species.

AREA AND LOCALITY

Dehradun city and adjoining area

SUMMARY/PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/ OUTCOMES IN 2017-2018

Identification, updating of nomenclature, brief description, phenology and images of 93 species were completed.

PROJECT-6

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

Executing Scientist(s): Dr. Giriraj Singh Panwar

Date of Initiation: April, 2016

Date to be completion: March, 2018

OBJECTIVE

To standardize the protocol for threatened species *Catamixis baccharoides* (Asteraceae) and *Incarvillea emodi* (Bignoniaceae)

BACKGROUND

This project was initiated in 2016. During previous year, *Catamixis baccharoides* and *Incarvillea emodi* seeds were germinated *in-vitro* in basal MS medium. Shoot tip from the *in vitro* germinated seedlings of *Catamixis baccharoides* were used as explants for shoot induction and proliferation. The well developed shoots were transferred to root induction medium and well developed roots were obtained.

AREA AND LOCALITY

NA

SUMMARY/PROGRESS OF THE WORK DONE IN 2017-2018

During 2017-18, complete micropropagation protocol was standardized for the mass multiplication of *Catamixis baccharoides* and *Incarvillea emodi* and all the *in-vitro* regenerated plantlets were successfully transferred to the field.

ACHIEVEMENTS/OUTCOMES

During this study, *In vitro* micropropagation protocol has been standardized for the critically endangered and endemic species *Catamixis baccharoides* and plantlets were successfully transferred to their habitat in the wild.



In-vitro multiplication of *Incarvillea emodi* Chatterjee

PROJECT-7

ex-situ conservation of Endemic, Threatened and Economic Plant Species in the experimental gardens of NRC and documentation of phenological data on flowering & fruiting

Executing Scientist(s) : Dr. Kumar Ambrish, Dr. B.S. Kholia, Shri V.K. Madhukar, Shri P.K. Deroliya
Date of Initiation and Date to be completion: Ongoing

Objective: To collect Endemic, Threatened and Economic Plant Species from different regions of Uttarakhand and *ex-situ* conservation in office garden.

BACKGROUND

This is an ongoing project.

AREA AND LOCALITY

NA

SUMMARY/PROGRESS OF THE WORK DONE IN 2017-2018

During 2017-18, one *ex-situ* collection tour *w.e.f.* 22-10-2017 to 31-10-2017 was conducted to eastern Kumaun region, Uttarakhand for collection of orchids. 30 live specimens of Orchids were collected and introduced in the Orchidarium. Material for filling up of c. 250 orchid pots.

ACHIEVEMENTS/OUTCOMES

During this period, a total of 30 RET/ Endemic plant species were collected and maintained in Botanic Garden, Dehradun.

PROJECT-8

Flora of Himachal Pradesh, Vol. 1. [Estt. sp.: 584] (New project)

Executing Scientist(s): Dr. Kumar Ambrish, Dr. K.S. Dogra, Dr. Puneet Kumar, Dr. Manas Ranjan Debta, Sh. Sachin Sharma, Dr. Virendra K. madhukar, Sh. P.K. Deroliya
Date of Initiation: April, 2017
Date to be completion: March, 2020

OBJECTIVE

To document the flora of Himachal Pradesh

BACKGROUND

State Flora of Himachal Pradesh

AREA AND LOCALITY

Himachal Pradesh

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018

Dr. Kumar Ambrish: Described a total of 51 species belonging to the family Ranunculaceae. Conducted a herbarium consultation tour to Punjabi University Patiala (PUN) *w.e.f.* 03.11.17 – 05.11.17 by P.K. Deroliya and studied total c. 165 specimens of the family Ranunculaceae to Papavaraceae. Conducted a field tour to Himachal *w.e.f.* 14.12.2017 - 18.12.2017 for plant collection.

Dr. K.S. Dogra & Dr. Virendra K. Madhukar: Described, updated the nomenclature, phenology, distribution and ecology of 52 species of Brassicaceae to Caryophyllaceae

Dr. Puneet Kumar: Described 24 taxa belonging to 03 genera of 03 families (Fumariaceae, Capparaceae, Violaceae) with updated nomenclature. Studied c. 80 herbarium specimens housed at BSD.

Dr. Manas Ranjan Debta : Described 26 taxa belonging to the family Elatinaceae, Tamaricaceae, Hypericaceae, Malvaceae and Saurauiaceae; 15 unidentified herbarium sheets from BSD were identified.

Sh. Sachin Sharma & Sh. P.K. Deroliya: Described total 51 species belonging to the family Geraniaceae, Oxalidaceae, Balsaminaceae, Rutaceae and Simaroubaceae. No. of Herbaria consulted: 03 (BSD, DD, PUN).

PHARMACOGNOSY UNIT, HQRS, KOLKATA

PROJECT-1

Pharmacognostic studies on Indian Cycads

Executing Scientist(s): Dr. A.B.D. Selvam

Date of Initiation : April, 2016

Date to be completion: March, 2021

OBJECTIVE

To study Indian *Cycas* exhaustively on pharmacognostic aspects.

BACKGROUND

This project was initiated in 2016. During previous year, one field tour was undertaken to different regions of Andhra Pradesh during which nine field numbers were collected and of which 03 species of *Cycas* was identified. Pharmacognostic studies of three species of *Cycas* was

completed on four different parameters; 15 photoplates of habits, leaf anatomy, leaf surface features were prepared alongwith study of pollen morphology (LM & SEM study).

AREA AND LOCALITY

Western Ghats and Eastern Ghats

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018

Two field tours *w.e.f.* 18.06.17 - 25.06.17 and 02.01.18 - 15.01.18 were conducted to different parts of Kerala and Karnataka during which a total of 13 field numbers were collected. Pharmacognostic studies on 03 species of *Cycas*, *viz.* *Cycas swamyi*, *C. annaikalensis* and *C. rumphii* were completed.

PLANT CHEMISTRY UNIT, HQRS, KOLKATA

PROJECT-1

Chemical composition and Nutritive Value of Wild Edible Plants of North-East Region

Executing Scientist(s): Dr. Tapan Seal

Date of Initiation : April, 2008

Date to be completion : March, 2018

OBJECTIVE

To estimate chemical composition and nutritive value of edible plants of N.E. India

BACKGROUND

This project was initiated in 2008. During previous year, one field tour was conducted in different parts of N.E. India and 14 wild edible plants were collected. The proximate composition, mineral contents, antioxidant properties, DPPH radical scavenging activities and ABTS assay, total flavonol & flavonoid content of 18 plants were

carried out with four different solvent extracts. Quantitative estimation of rutin, quercetin, kaempferol, apigenin, myricetin, gallic acid, catechin, ferulic acid, coumarin, etc. were carried out using HPLC in four wild edible plants. Estimation of water soluble vitamin was carried out in 20 plant samples.

AREA AND LOCALITY

N.E. Region, India

SUMMARY/PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018

Estimation of proximate composition, mineral contents, antioxidant properties of 14 wild edible plants was carried out alongwith quantitative estimation of Phenolic acids and flavonoids using HPLC in 10 wild edible plants. Estimation of water soluble vitamin was carried out in 20 plant samples. *In-vitro* antidiabetic activity studies of 10 wild edible plants were carried out.

PUBLICATION SECTION, HQRS, KOLKATA

PROJECT-1

Interpretations of Roxburgh's Icons in respect to current nomenclature: Family Leguminosae

Executing Scientist(s) : Dr. Debasmita Dutta Pramanick & 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

This study was initiated in 2015. During previous year,

taxonomic interpretation and nomenclature of 120 taxa belonging to 15 genera were completed. Illustrations kept in CAL were examined along with study of protologues and other authentic literatures to ascertain taxonomic identity of the taxa.

SUMMARY/PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018

During 2017-18, taxonomic interpretation and nomenclature of 110 taxa belonging to 09 genera were completed. Illustrations kept in CAL were examined along with study of protologues and other authentic literatures to ascertain taxonomic identity of the taxa. The final report comprising of 198 accepted names, diagnostic features, local names, phenological data, ecology, distribution and uses and submitted on time.



Phanera ferruginea (Roxb.) Benth.



Phanera integrifolia (Roxb.) Benth.



Vigna dolichoidea (Roxb.) Baker

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 Scientist(s) : Dr. Dinesh Kumar Agrawala & Dr. David Lalsama Biate
Date of Initiation : April, 2013
Date to be completion: March, 2018

OBJECTIVE

To prepare comprehensive document of Orchid species as per IUCN criteria for implementing an effective conservation initiative

BACKGROUND

This project was initiated in 2013. During previous year, 03 field tours were conducted in Sikkim and West Bengal during which 39 field numbers were collected along with 30 photographs; out of 215 specimens, 134 taxa were identified. Population of 70 taxa was analysed and 34 taxa were characterised through digital and microscopic photoplates. Germplasm of 42 taxa of orchids and other medicinal plants were introduced in the campus garden for *ex-situ* conservation.

AREA AND LOCALITY

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

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

11 local tours were conducted at different parts of Sikkim and observed population of 150 orchid taxa. Collected 44 field numbers and introduced in the campus garden for further studies and *ex-situ* conservation, 48 photographs of 47 species were taken of which 41 taxa were identified, 08 taxa were illustrated, using digital macro-microscopic images of live specimens, Data Sheets of 600 species were prepared with updated nomenclature, synonymy and taxonomic citations, 1200 specimens were sorted out for inclusion in the excel sheets for mapping and 1258 species were listed with updated nomenclature and photographs of 800 species submitted for publication of

“Pictorial Guide to Indian Orchids”. During this period, 200 specimens were incorporated in the herbarium.

ACHIEVEMENTS/OUTCOMES

Most of the RET category collections were rescued from fallen tree logs in and around Gangtok, and introduced at BSI, SHRC campus and upon flowering, preserved one processed as voucher. Many of these species were not represented earlier at BSHC.

PROJECT-2

Flora of Sikkim: Family - Onagraceae

Executing Scientist(s) : Dr. David Lalsama Biate & Dr. Dinesh Kumar Agrawala
Date of Initiation : October, 2015
Date to be completion: March, 2017

OBJECTIVE

To study the family Onagraceae in the state of Sikkim

BACKGROUND

This project was initiated in 2015. During previous year, three local field tours were conducted to Kabi, Tamje, Karponang, Memaichu, Yakla and surrounding areas of Sikkim during which a total of 19 field numbers were collected, 17 taxa were identified from 58 specimens, documented 32 species belong to 04 genera, 06 taxa of Onagraceae were brought live to BSI, SHRC and introduced in the campus garden for *ex-situ* conservation.

AREA AND LOCALITY

State of Sikkim (East, West, North and South district)

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

During 2017-18, final Mss. of Flora of Sikkim- Family Onagraceae was prepared.

ACHIEVEMENTS/OUTCOMES

This study reported *Epilobium trichophyllum*, an endemic plant species to Sikkim, so far known only from its type collection.

SOUTHERN REGIONAL CENTRE, COIMBATORE

PROJECT -1

Assessment of Plant diversity in Cauvery North Wildlife Sanctuary, Tamil Nadu

Executing Scientist(s): Dr. R. Manikandan & Mrs. R. Mehaladevi

Date of Initiation: April, 2017

Date to be completion: March, 2021

OBJECTIVE

To Survey, identification, inventorisation of the floristic diversity of Cauvery North Wildlife Sanctuary to assess plant resources and their traditional utilization & conservation practices.



Ceropogia elegans Wall.



Indigofera mysorensis DC.

BACKGROUND

The Cauvery North Wildlife Sanctuary was recently established in the year of 2014, and covering an areas of 504.33 sq. km. It is situated in the Hosur and Dharmapuri Forest Divisions of the two districts namely Krishnagiri and Dharmapuri, in state of Tamil Nadu. The elevation varies from 200 m to 1390 m and the annual rainfall around 800 mm from the Hosur Plateau into the river. The topography affects the rainfall pattern over the sanctuary giving rise to diverse habitats ranging from different habitat types such as riverine, dry deciduous, xeric, and scrub to tropical wet evergreen forests. Though there are sporadic works on floristic account from the adjoining areas of the sanctuary, there was no details floristic account of the Sanctuary, so the present work is undertaken.

AREA AND LOCALITY

Cauvery North Wildlife Sanctuary, Krishnagiri and Dharmapuri Districts, Tamil Nadu, c. 504.33 sq. km.

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018

Two field tours *w.e.f.* 22.01.2018 - 31.01.2018 and 26.3.18-30.3.18 were conducted to study area during which 457 field numbers were collected alongwith 307 photographs which were identified to 376 species. During this period, 08 RET plants were collected for introduction in garden.

PROJECT -2

Cyperaceae of Tamil Nadu, India

Executing Scientist(s): Dr. C. Murugan, Dr. J. V. Sudhakar & Dr. S. Arumugam

Date of Initiation: April, 2015

Date to be completion: March, 2020

OBJECTIVE

To survey, study and document the family Cyperaceae of Tamil Nadu, India

BACKGROUND

This project was initiated in 2015. During previous year, four field tours including 01 local tour were conducted to Valparai, Attakatti area, Meghamalai Wild Life Sanctuary, Mukurthi National Park, Namakkal and Salem districts



Schoenoplectiella erecta (Poir.) Lye

during which a total of 152 field numbers were collected.

AREA AND LOCALITY

Tamil Nadu

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Three botanical exploration tours *w.e.f.* 17.04.17 - 26.04.17, 23.11.17 - 30.11.17 and 22.03.18 - 31.03.18 were undertaken and 241 field numbers of specimens were collected alongwith 500 field photograph.

ACHIEVEMENTS/OUTCOMES

During this study, some interesting *Fimbristylis* species were collected. Identified habitats of Cyperaceae in Kolli and Shevaroy hills of Eastern Ghats and in Kodaikanal of Western Ghats for future exploration.

PROJECT-3

Flora of Kanniyakumari Wildlife Sanctuary, Tamil Nad

Executing Scientist(s): Dr. H.Franklin Benjamin & Mr. R.G. Vadhyar

Date of Initiation: April, 2016

Date to be completion: March, 2021

OBJECTIVE

To prepare a detailed Floristic account of the Kanniyakumari Wildlife Sanctuary, Tamil Nadu

BACKGROUND

This project was initiated in 2016. During previous year, 02 field tours were conducted to study area during which a total of 362 field numbers were collected of which 95 field numbers were identified and label writing of 400

sheets were done. Nomenclature citation for 40 species was started. A checklist of RET species of the Sanctuary was prepared.

AREA AND LOCALITY

Kanniyakumari Wildlife Sanctuary, Tamil Nadu, c. 402.4 sq.km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Two field tours were undertaken to Kanniyakumari WLS and collected 384 field number of specimens alongwith 400 field photographs. During the current year, a total of 505 out of 746 field numbers were identified involving 366 species under 274 genera and 94 families.

ACHIEVEMENTS/OUTCOMES

During this study, many endemic species such as *Alstonia venenata*; *Andrographis elongata*, *Brachycorythis iantha*, *Didymocarpus tomentosa*, *Elatostema wightii*, *Gordonia obtusa*, *Hedyotis purpurascens*, *Impatiens dasysperma*, *Ochlandra travancorica*, *Smilax wightii*, *Syzygium myhendrae* were collected from the respective type localities.



Caralluma umbellata Haw.



Hypericum mysurense Wall. ex Wight & Arn.

PROJECT-4**Floristic studies in Kodaikanal Wildlife Sanctuary, Tamil Nadu, India**

Executing Scientist(s): Dr. K.A.A. Kabeer & Mr. A. Ravi Kiran

Date of Initiation: April, 2015

Date to be completion: March, 2020

OBJECTIVE

To prepare a detailed Flora of Kodaikanal Wildlife Sanctuary and to prepare the Vegetation type map.

BACKGROUND

This project was initiated in 2015. During previous year, two field tours were conducted to the study area during which a total of 231 field numbers were collected along with 810 photographs; a total of 466 field numbers (including previous year's collection) were identified. A good numbers of live plants were collected for introduction in garden. Beside 01 field tour was conducted to NRSC-ISRO, Hyderabad for satellite image study and for preparing vegetation map of the Sanctuary. A checklist of RET species found in KWLS was prepared.

AREA AND LOCALITY

Kodaikanal Wildlife Sanctuary, Tamil Nadu, c. 736 sq.km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Four field tours were conducted to Kodaikanal WLS during which 426 field numbers were collected and total of 1565 photographs of plants and habitat vegetation were also taken up. Vegetation type map of the Sanctuary was prepared with the help of NRSC – ISRO, Hyderabad by using Sentinel-2 satellite multi-seasonal images (10M Resolution). Many endemic and rare species pertaining to this sanctuary were collected for introduction in garden under *ex-situ* conservation.



Strobilanthes kunthiana T. Anderson ex Benth.



View of Kodaikanal WLS

ACHIEVEMENTS/OUTCOMES

During this study, four vulnerable, 03 endangered and 18 endemic plant species were collected for introduction in garden.

PROJECT-5

Floristic Assessment of Megamalai Wildlife Sanctuary, Tamil Nadu

Executing Scientist(s): Dr. C. Murugan & Mr. S. Arumugam

Date of Initiation: April, 2016

Date to be completion: March, 2020

OBJECTIVE

To undertake intensive floristic survey and collect detailed information on the distribution, ecology and economic utility of plants in the Sanctuary along with study of RET plants and their present status; to find the species richness area within the Wildlife Sanctuary.

BACKGROUND

This project was initiated in 2016. During previous year, three botanical exploration tours were undertaken



Hoya wightii Hook. f.



Ceropogia candelabrum var. (L.) Ansari

during which 755 field numbers were collected of which 365 field numbers were identified so far.

AREA AND LOCALITY

Megamalai Wildlife Sanctuary, Tamil Nadu, c. 269.11 sq.km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Four field tours *w.e.f.* 12.6.17 - 22.6.17; 19.7.17 - 27.7.17; 10.11.17 - 16.11.17 and 05.02.18 - 16.02.18 were conducted to the Sanctuary and 697 field number of specimens were collected and 5000 plant images taken. Of the total vouched specimens, 565 were identified upto species level. Some of the interesting plant species collected from the sanctuary are *Andrographis megamalayana* (Acanthaceae); *Cissampelopsis calcadensis* (Asteraceae), *Eria pseudoclavicaulis* (Orchidaceae), *Eugenia seithurensis* (Myrtaceae), *Hedyotis rajasekaranii*, *Hedyotis shettyi* (Rubiaceae) etc.

ACHIEVEMENTS/OUTCOMES

This study reports two species (*Syzygium lakshmananii* Murugan & Arumugam - Myrtaceae; *Tripogon jayachandranii* Arumugam & Murugan - Poaceae) as new to science; one species (*Syzygium neesianum* Arn. - Myrtaceae) as new record for the state Karnataka.

PROJECT-6

Collection, introduction and multiplication of 10 endemic tree species from Agasthyamalai Biosphere Reserve, Kerala and Kalakad Mundanthurai Tiger Reserve, Tamil Nadu (New project)

Executing Scientist (s): Dr. M.Y. Kamble & Mr. Mr. B. S. Elango

Date of Initiation: April, 2017

Date to be completion: March, 2018

OBJECTIVE

To collect 10 endemic tree species from Agasthyamalai Biosphere Reserve, Kerala and Kalakad Mundanthurai Tiger Reserve and Tamil Nadu; their introduction and multiplication in Experimental Garden, BSI, SRC, Yercaud.

BACKGROUND

This is a new project.

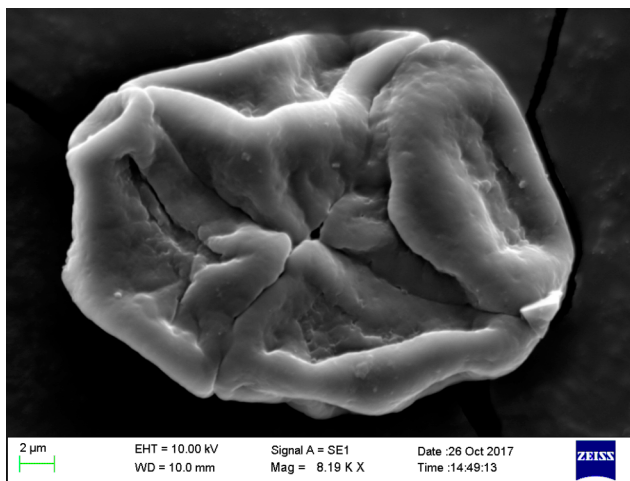
AREA AND LOCALITY

Agasthyamalai Biosphere Reserve, Kerala (3500 sq.km.) and Kalakad Mundanthurai Tiger Reserve, Tamil Nadu (251 sq.km.)

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018



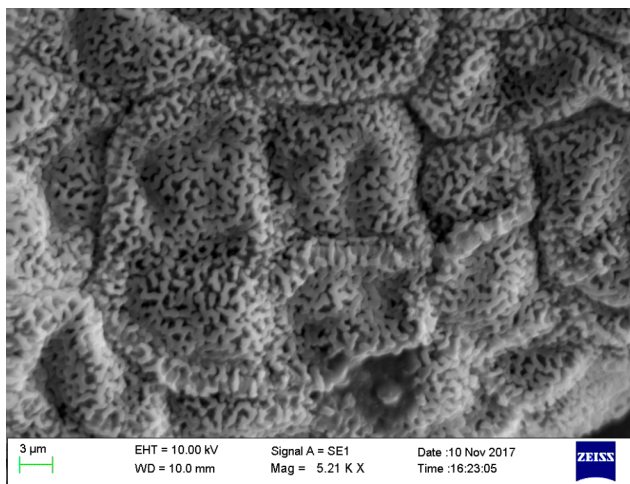
Bentinckia condapanna Berry ex Roxb. Seed germination



Structure of Pollen *Coelogyne ovalis* Lindl. under SEM



Syzygium laetum (Buch.-Ham.) Gandhi



Structure of Pollen *Habenaria heyneana* Lindl. under SEM

Two tours *w.e.f.* 11.12.17 – 16.12.17 and 26.02.18 – 04.03.18 were conducted to both the protected areas. Propagules of 16 endemic tree species were collected and introduced. *Actinodaphne bourdillonii*; *Aglaia elaeagnoidea* var. *courtallensis*; *Calophyllum apetalum*; *Eugenia mundagam*; *Eugenia singampattiana* and *Garcinia gummi-gutta* were introduced in the garden for conservation.

PROJECT-7

Study of Pollinia of South Indian Orchids using SEM: Phase II (New project)

Executing Scientist (s): Dr. S. Kaliamoorthy & Dr. T.V. Saravanan

Date of Initiation: April, 2017

Date to be completion: March, 2020

OBJECTIVE

To study the morphology and exine micromorphological characters of pollen of South Indian Orchids.

BACKGROUND

The pollen diversity in Orchids exhibit at three levels, *viz.*, variability a) in packaging of pollen in pollinia, 2) in pollen wall structure, and 3) in pollen surface sculpturing. Pollen characters particularly the exine micromorphology has been considered as the useful tool identification of orchids. In the present project exine micromorphological characters of 10 orchids of South Indian Orchids were taken into consideration.

AREA AND LOCALITY

South India

SUMMARY/ PROGRESS OF THE WORK DONE AND ACHIEVEMENTS/OUTCOMES IN 2017-2018

Pollinia of five species were collected from NOEG, Yercaud and studied using SEM respectively. Of the targeted 10 species of orchid (*Calanthe triplicata*, *Coelogyne fimbriata*, *C. flaccida*, *C. glandulosa*, *C. ovalis*, *Epidendrum macrocarpum*, *Habenaria heyneana* H.,

longicorniculata, *H. longicornu* and *Paphiopedilum spicerianum*) pollinia using SEM was completed. 20 SEM images of pollinia were taken using Scanning Electron Microscope.

PROJECT-8

Seaweed Flora of Goa coast (New project)

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

Date of Initiation: April, 2017

Date to be completion: March, 2019

OBJECTIVE

Systematic survey, collection and documentation of seaweeds of Goa coast; to collect information on the medicinally and economically important seaweeds.

BACKGROUND

Goa (14°53'-15°40'N latitude and 73°40'-74°20'E longitude), located in the southwest coast of India, is well known for its beautiful beaches and tourism. The state encompasses an area of 3,702 sq. km. Goa, with a coastal length of 101 km. Information on seaweeds of Goa coast is scanty. Previous reports reveal occurrence of 74 species of



Chondria armata (Kützinger) Okamura



Acrosiphonia orientalis (J. Agardh) P.C. Silva

seaweeds from this coast.

AREA AND LOCALITY

Coastal region of Goa

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Three field tours *w.e.f.* 06.10.17 - 15.10.17, 11.12.17 - 22.12.17 and 12.02.18 - 25.02.18 were conducted to the study area during which a total of 838 field numbers were collected and 1676 herbarium sheets were made, whereas 130 field numbers were preserved in wet form. Totally 615 field numbers of seaweeds were identified and taxonomic descriptions of 26 taxa of seaweeds were completed.

ACHIEVEMENTS/OUTCOMES

This study reports two species of marine macro algae [*Halopeltis australis* and *Dasya flagellifera* Boergesen] as new additions to seaweed flora of Kerala coast where as eight species of marine macro algae [*Enteromorpha linza*, *Acrosiphonia orientalis*, *Chaetomorpha aerea*, *Chaetomorpha crassa*, *Chaetomorpha spiralis*, *Cladophoropsis sundanensis*, *Bryopsis hypnoides* and *Codium dwarkense*] were reported as new additions to seaweed flora of Karnataka coast.

PROJECT-9

Study of Nutlets of tribe *Cyperae* and *Fimbristyledeae* from south India using SEM

Executing Scientist (s): Mrs. R. Mehala Devi & Mrs. M. Anantha Lakshmi

Date of Initiation: April, 2016

Date to be completion: March, 2019

OBJECTIVE

To collect the nutlets of the tribes *Cyperae* and *Fimbristyledeae* from field and duplicates of Herbarium specimens; to study the variations in the shape, size and ornamentations using SEM.

BACKGROUND

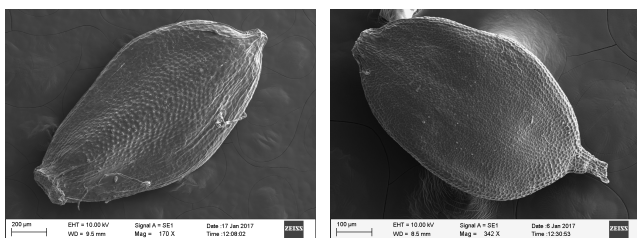
This project was initiated in 2016. During previous year, SEM studies of 69 species of *Cyperae* and *Fimbristyledeae* done; 103 SEM images were taken alongwith description of four species.

AREA AND LOCALITY

South India

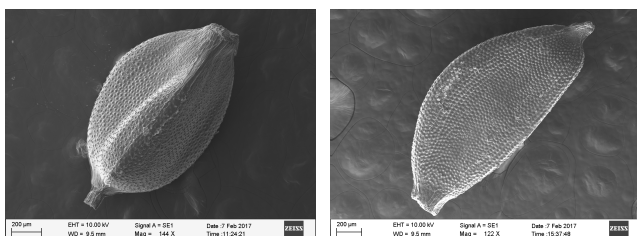
SUMMARY/ PROGRESS/ ACHIEVEMENTS/ OUTCOMES DURING 2017-2018

50 species of nutlets of tribe *Cyperae* were studied using SEM with special emphasis on ornamentation, shape and size. c. 300 SEM images were taken.



Kyllinga monocephala Rottb. nutlet

Cyperus exaltatus Retz. nutlet



Cyperus javanicus Houltt.

Mariscus bulbosus Clarke

Nutlet morphology under SEM

PROJECT -10

Ex-situ conservation of endemic, endangered and threatened plants of the region and documentation of phenology of species in garden (New Project)

Executing Scientist (s): Dr. S. Kaliamoorthy, Dr. M.Y. Kamble, Dr. T. Saravannan and Shri B.S. Elango

Date of Initiation: April, 2017

Date to be completion: Ongoing

OBJECTIVE

ex-situ conservation of endemic endangered and threatened plants of the region and to document flowering and fruiting data of the taxa.

BACKGROUND

During previous year, two field tours were conducted to Silent Valley National Park, Kerala during which a total of 54 species belong to 32 genera under the family Orchidaceae were collected along with GPS data. The collected species were introduced in the NOEG, Yearcaud for *ex-situ* conservation. Flowering data of 223 species (119 orchids, 104 angiosperm) and fruiting data of 40 species (36 orchids, 04 angiosperm) were recorded.

AREA AND LOCALITY

Mukurthi National Park, c. 78.46 sq.km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-

2018

Two field tours *w.e.f.* 03.01.18 to 11.01.18 and from 05.03.18 to 11.03.18 were conducted to Mukurthi National Park, Tamil Nadu during which totally 66 species belonging to 42 genera under 21 families were collected alongwith GPS data. Flowering of 112 species under 46 genera and fruiting of 20 species under 15 genera of the family Orchidaceae were noted and documented.

ACHIEVEMENTS/OUTCOMES

This study reports *Zeuxine grandis* and *Z. chowdheryi* as new to Eastern Ghats, Peninsular India. In addition, *Ceropegia omissa*, a rare, endangered and Economic important plant was collected after a long gap of 98 years from Tirunelveli District of Tamilnadu.



Shoot elongation of *Monosis shevaroyensis* Gamble H. Rob. Skvarla

WESTERN REGIONAL CENTRE, PUNE

PROJECT -1

Ferns of Karnataka

Executing Scientist (s): Dr. A. Benniamin

Date of Initiation: April, 2014

Date to be completion: March, 2018

OBJECTIVE

To explore, collect and document fern diversity of the state Karnataka; to identify endemic species, to list out threatened species, preparation of a database.

BACKGROUND

This project was initiated in 2014. During previous year, two field tours were undertaken to Someshwara WLS, Kudremukh National Park and Bhadra Tiger Reserve, Karnataka during which a total of 192 field numbers belonging to 75 species were collected; 18 live ferns belonging to 09 species were also collected to introduce in the botanical garden.

AREA AND LOCALITY

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

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Two field tours were undertaken to Mullangiri, Bababudhan hills, Bhadra Tiger reserve, Charnarighat, Pushpagiri Wildlife Sanctuary, Vanachal forest area, Mandalpatty forest area, Talacauvery forest, Makkambika Wildlife Sanctuary, Sharavathi Wildlife Sanctuary, Kadammakal forest, Marigundiforest area, Bhujimalai forest area, Girigade forest area and Pushpagiri Forest area of Karnataka and collected 221 field number (89 species) . 100 species from earlier collections were identified. Spore morphology of 53 species of Pteridophytes was studied. Submitted revised Project Report entitled "Taxonomic study of Polypodiaceae of North East India" to D/BSI, Kolkatta.

ACHIEVEMENTS/OUTCOMES

This study reports one species (*Dryopteris chrysocoma* (Christ) C. Chr.) as New record for Western Ghats; one species (*Thelypteris arbuscula* (Willd.) K. Iwats) as New Record for Karnataka; natural apospory from *Pteris biaurita* and *Pteris argyraea* were also observed.

PROJECT-2

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

Executing Scientist (s): Dr. Rashmi Dubey & Mr. Amit Diwakar Pandey

Date of Initiation: April, 2016

Date to be completion: March, 2020

OBJECTIVE

Taxonomic studies of micro-fungi in the phyllospheric region lakes of Sanjay Gandhi National Park, Maharashtra; molecular sequencing to establish new taxa; to study the ecological factors responsible for the micro-fungal richness; to isolate and preserve fungal germplasm in *ex-situ* condition for further uses and to prepare and document an inventory of fungi for ready reference.

BACKGROUND

This project was initiated in 2016. During previous year, two field tours were conducted in different parts of Sanjay Gandhi National Park and collected 114 field number of specimens from litter (66 pkts), branches and twigs (101 pkts), wooden logs (48 pkts), water (12 pkts), soil and infected mangrove samples (04 pkts) alongwith 617 photographs. A total of 69 dry specimens were examined and 300 slides were prepared alongwith microscopic measurement of 62 fungal specimens.

AREA AND LOCALITY

Sanjay Gandhi National Park, Maharashtra, c. 103.36 sq.km.



Leptoxyphium glochidion
H. Yang & K.D. Hyde

Stauronema sacchari Syd & Butler

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Two field tours *w.e.f.* 18.08.17-22.08.17 and 19-12-17 to 24-12-17 were undertaken in Goregaon, Malad, Khanivili, Jogeshwari, Vasai Creek and Tulsi Range of National Park during which 37 field numbers of Infected foliicolous specimens, more than 120 pkts of Litter samples, more than 100 pkts of Branches/ twigs Wooden Logs, 14 water samples, soil samples from Mangroove soil, Tulshi lake Soil, Forest area of Tulshi, Dahisar Soil, Yeur range, Yeur waterfall, Shingte Quarry, Ravalpada, Keshav Nagar, Maharashtra Quarry, K.N. Shaikh Quarry, Ramgad Plantation, Sambhaji Nagar, Damunagar, Akurli, Appapada, Powai Lake and four infected mangrove samples were collected. 46 samples including 66 Branches/ twigs Wooden Logs were processed in laboratory for further study.

ACHIEVEMENTS/OUTCOMES

This study reported two new fungal species (*Pseudoacrodictys lignicola*, anamorphic Ascomycota *Thirumalacharia thanensis*) and one new microfungus from Western Ghats of India (*Periconia chandoliensis*).

PROJECT-3

Floristic Diversity of Wan Wildlife Sanctuary

Executing Scientist (s): Dr. Priyanka Ingle

Date of Initiation: April, 2016

Date to be completion: March, 2020

OBJECTIVE

To survey and document the floristic diversity of Wan Wildlife Sanctuary; to collect ethno-botanical data from different tribal communities around the WLS.

BACKGROUND

This project was initiated in 2016. During previous year, two field tours were undertaken to the study area and collected 225 field numbers of specimens with GPS data.



Ceropogia bulbosa Roxb.

59 field numbers were identified and described. Ethno-botanical and ethno-veterinary data collected from 'Rathi' and 'Kokru' tribal communities were documented.

AREA AND LOCALITY

Wan WLS, Maharashtra, c. 211 sq.km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Two field tours *w.e.f.* 01.09.17-16.09.17 and 10.02.18-24.02.18 were undertaken to Wan Wildlife Sanctuary during which a total of 238 field numbers with their GPS coordinates were collected out of which 140 field numbers were identified and described. c. 700 photographs of plants, habitats, village and tribal communities, etc. were taken. Data of economically important plants, ethno-botanical and ethno-veterinary information were collected from 'Rathi' and 'Korku' communities and documented.

ACHIEVEMENTS/OUTCOMES

During this study, 17 live plants/bulbs/rhizomes/seeds of Angiosperms and six Pteridophytes were collected for *ex-situ* conservation in office garden of BSI, WRC, Pune. Dried fruits of two *Lagenaria* sp. & bark exude of *Boswellia serrata* was collected for display in Museum of BSI, WRC.

PROJECT -4

Biodiversity assessment of microalgae from thermal springs of Maharashtra, India

Executing Scientist (s): Dr. S. Bhakta

Date of Initiation: May, 2016

Date to be completion: March, 2019

OBJECTIVE

To assess diversity of microalgae from thermal springs of Maharashtra, India

BACKGROUND

This project was initiated in 2016. During previous year, one field tour was undertaken to different parts of Maharashtra during which a total of 105 algal samples were collected of which 40 species were identified and enumerated.

AREA AND LOCALITY

Maharashtra state

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

One field tour was conducted and collected 15 algal samples; temperature (39-70°C) and pH (6.8 to 7.2) of the thermal water were recorded in the field during the time of sampling. A total of 40 algal taxa belonging to 25

genera were enumerated and identified so far with processing of other samples is under progress.

ACHIEVEMENTS/OUTCOMES

This study recorded 21 abundant and dominant taxa of nonheterocystous cyanobacteria, over 05 heterocystous taxa and 13 taxa of Bacillariophyta. It is evident from the study that the simple thallus organization could thrive maximum temperature stress than the complex form.

PROJECT-5

Flora of Pushpagiri Wild Life Sanctuary, Karnataka

Executing Scientist (s): Mr. Sameer C. Patil (under guidance of Dr. P. Lakshminarasimhan)

Date of Initiation: May, 2016

Date to be completion: March, 2020

OBJECTIVE

To survey floristic diversity of Pushpagiri Wild Life Sanctuary, Karnataka

BACKGROUND

This project was initiated in 2016. During previous year, three field tours were conducted in the study area and collected 439 field numbers, of which c. 360 field numbers were identified. A total of 2400 photographs were taken. During this period, few rare terrestrial and epiphytic orchids were collected.

AREA AND LOCALITY

Pushpagiri Wild Life Sanctuary, Karnataka

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

Two field tours *w.e.f.* 14.06.17-22.06.17 and 07.06.18-22.06.18 were undertaken to different unexplored regions of Pushpagiri Wild Life Sanctuary during which a total of 80 field numbers of plants were collected alongwith 1213 photographs of which 750 photographs were identified till date; GPS locations were noted down for all the collections. A total of 205 plant specimens were processed till date. 848 quadrates were surveyed for five tours for three different seasons for two years for studying community ecology of high montane grasslands.

ACHIEVEMENTS/OUTCOMES

During this study, 14 endemic and critically endangered plants *viz.* *Rauvolfia densiflora*, *Christisonia bicolor*, *Arisaema barnesii*, *Conchidium microchilos*, *Clidemia hirta*, *Disperis neilgherrensis*, *Zingiber nesanum*, *Peliosanthes teta*, *Calanthe masuca*, *Scurrula buddleioides*, *Naravelia zeylanica*, *Balanophora fungosa* found in Central Western Ghats were introduced in BSI, WRC, Pune garden.



Nothapodytes nimmoniana (J.Graham) Mabb.



Balanophora fungosa J.R. Forst. & G. Forst.

PROJECT-6

Seed Morphology and Cytotaxonomy of some selected orchids of Northern Western Ghats of India (New project)

Executing Scientist (s): Mrs. A.M. Neelima

Date of Initiation: April, 2017

Date to be completion: March, 2020

OBJECTIVE

To study seed morphology and cytotaxonomy of some selected orchid species of Northern Western Ghats of India

BACKGROUND

This is a new project.

AREA AND LOCALITY

Northern Western Ghats, Maharashtra

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

One field tour *w.e.f.* 22.09.17 to 24.09.17 including one day tours were conducted to Amboli ghat, Mahabaleshwar, Kolhapur, Lonavala, Matheran, Mahabaleshwar, Koyna and Tahmini ghat during which 13 orchid species *viz.* *Habenaria longicorniculata*, *Habenaria sp.*, *Aerides sp.*, *Peristylus sp.*, *Oberonia*

falconeri, *Porpax reticulata*, *Dendrobium macrostachyum*, *Dendrobium aqueum*, *Dendrobium macrostachyum*, *Vanda sp.*, *Habenaria marginata* were collected alongwith GPS coordinates. About 37 species were preserved for microscopic studies.

ACHIEVEMENTS/OUTCOMES

SEM and microscopic studies were conducted on 13 orchid samples;

PROJECT -7

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

Executing Scientist (s): Dr. J. Jayanthi

Date of Initiation: April, 2013

Date to be completion: March, 2018

OBJECTIVE

To study comprehensive floristic account of Biligirirangaswamy Temple (BRT) Wildlife Sanctuary and to identify endemic and threatened plant species reported from the Sanctuary.

BACKGROUND

This project was initiated in 2013. During previous year, two field tours were conducted to the different habitats of the sanctuary during which a total of 330 field numbers were collected; A total of 504 field numbers collected in the earlier field tours were identified; a total of 1000 specimens were mounted after processing.

AREA AND LOCALITY

Biligirirangaswamy Temple (BRT) Wildlife Sanctuary, Karnataka



Habenaria sahyadrica Kumar et al

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

One herbarium consultation tour *w.e.f.* 18.01.18 – 20.01.18 was conducted to Herbarium of ATREE & FRLHT, Bangalore. All the specimens collected during earlier field tours were processed. Identified a total of 320 field numbers belonging to 280 species. Nomenclature standardised for 1200 species using authentic global e-databases. Citations for 1200 species were prepared; 900 herbarium specimens processed for mounting; mounting and stitching of 450 herbarium specimens were completed; field data incorporated in 1420 specimens. Brief descriptions were prepared for about 500 species.

ACHIEVEMENTS/OUTCOMES

The study reports *Habenaria sahyadrica* a new reports to Karnataka; reports 20 endemic and threatened species from the sanctuary. Some of these are *Adenostemma laevina*, *Barleria courtallica*, *Calamus gamblei*, *Cinnamomum sulphuratum*, *Decalepis hamiltonii*, *Dendrophthoe memecylifolia*, *Eriolaena quinquelocularis*, *Helicanthes elasticus*, *Ixora elongata*, *Kalanchoe bhidei*, *Ligustrum perrottetii*, *Memecylon talbotianum*, *Meyenia hawtayneana*, *Phyllanthus indofischeri*, *Scutellaria wightiana*, *Syzygium malabaricum*, *Taxillus recurvus*, *Tephrosia calophylla*, *Terminalia paniculata*, *Zingiber cernum* etc.

PROJECT-8

An assessment of Orchid diversity of Central Western Ghats: Goa

Executing Scientist (s): Dr. Jeewan Singh Jalal

Date of Initiation: April, 2015

Date to be completion: March, 2018

OBJECTIVE

To survey and study the orchid diversity of Goa; to identify and describe the orchid species collected from this area and to compile a comprehensive inventory, threat assessment of endemic Orchids alongwith their mapping.

BACKGROUND

This project was initiated in 2015. During previous year, two field tours were conducted in the study areas (Netravali WLS and Cotigaon WLS and their surrounding areas). 323 of samplings units 02 sq.km. each studied for orchid species. A total of 87 field numbers were collected along with 150 photographs of which 75 field numbers were identified. In addition, one herbarium consultation tour was undertaken in BLATT, Mumbai during which the genera *Peristylus*, *Smithsonia*, *Gastrochilus* and *Habenaria* were critically studied.

AREA AND LOCALITY

Western Ghats of Goa state, c. 3,702 sq.km.

SUMMARY/ PROGRESS OF THE WORK DONE IN 2017-2018

35 field numbers collected during previous field tours were identified. Descriptions were prepared for 65 species. A total of 250 herbarium specimens were sorted out, mounted and herbarium label details were filled up. Distribution maps were prepared in the ArcGIS for all the species based on GPS records. The 19 bioclimatic variables were obtained from World climate website. In order to be compatible with Maxent, these files were converted to 'ASCII' using ArcGIS 10.2. Maxent algorithm (version 3.3.3k) was used for modeling.

ACHIEVEMENTS/OUTCOMES

The study reveals documentation of 42 epiphytic orchids, 22 terrestrial orchids and 30 endemic orchids from Western Ghats. A total of 18 species viz., *Dendrobium aequum*, *D. herbaceum*, *D. microbulbon*, *D. nanum*, *D. peguanum*, *Eria exilis*, *Diplocentrum congestum*, *Geodorum densiflorum*, *Habenaria elwesii*, *Habenaria foliosa*, *H. rariflora*, *H. suaveolens*, *Nervilia crociformis*, *Oberonia mucronata*, *O. verticillata*, *Peristylus aristatus*, *P. stocksii* and *Vanda wightii* were reported as a new addition for Goa state. Four new habitats for Orchids were identified viz., Plateau, evergreen forest, semi-evergreen forest and moist-deciduous forest. Based on species niche modelling data, potential species richness in different protected areas were analysed. The analysis revealed that the Mhadei Wildlife Sanctuary is rich in orchid diversity among all the protected area of Goa followed by Bhagwan Mahavir Wildlife Sanctuary and Cotigaon Wildlife Sanctuary.

PROJECT-9

Pteridophytic Flora of Pushpagiri Wildlife Sanctuary, Karnataka with 10% Periphery.

Executing Scientist (s): Shri D. Jesubalan (under the Guidance of Dr.A.Benniamin)
Date of Initiation: April, 2016
Date to be completion: March, 2020

OBJECTIVE

To prepare a comprehensive floristic list of Pteridophytic flora in Pushpagiri Wildlife Sanctuary, Karnataka along with surrounding areas.

BACKGROUND

This project was initiated in 2016. During previous year, one field tour was conducted to the unexplored areas such as Vanachale, Mandalpatti and Beedalli forest areas during which 67 field numbers were collected and



Arachnoides aristata (G. Forst.) Tindale



Dryopteris cochleata (Buch.-Ham. ex D. Don) C. Chr.

tentatively identified; 09 species were separately collected with rhizomes for *ex-situ* conservation.

AREA AND LOCALITY

Pushpagiri Wildlife Sanctuary, Somwarpet taluka, Kodagu District, Karnataka, c. 102.92 sq. km.

SUMMARY/PROGRESS OF THE WORK DONE IN 2017-18

During 2017-18, 02 field tours *w.e.f.* 27.09.17-13.10.17 and 27.01.18-10.02.18 were undertaken and collected 134 field numbers of specimens with proper GPS data. Around 265 photographs were taken. Some of the common terrestrial and epiphytes species found in and around the Wild Life Sanctuary are *Andiantum concinnum*, *Andiantum lunulatum*, *Athyrium hohenackerianum*, *Dicranopteris linearis*, *Asplenium indicum*, *Odontosoria chinensis*, *Selaginella ciliaris* etc. Spore morphology of 20 species were studied under SEM.

ACHIEVEMENTS/OUTCOMES

During this study, 10 economically important species were collected from the study area.



**NEW
DISCOVERIES**

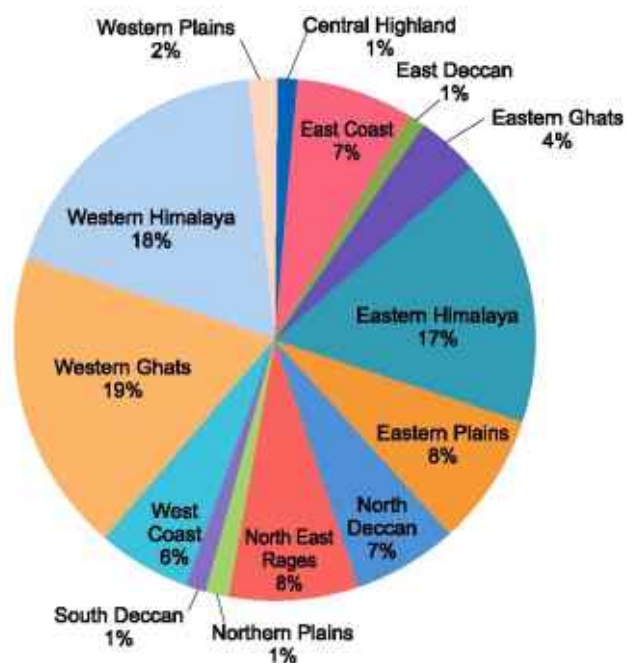
Impatiens zironiana

NEW DISCOVERIES

Current estimation reveals a total of 18532 species of Angiosperms, 81 species of Gymnosperms, 1293 species of Pteridophytes, 2754 species of Bryophytes, 2528 species of Lichens, 15223 species of fungi and 7396 species of algae which is approximately 11.5% of total recorded plant species of the world. The group wise current status of number of species in India is provided below:

Group	No. of species in India	Percent of Indian Flora
Virus/Bacteria	1196	2.42
Algae	7396	14.96
Fungi	15223	31.58
Lichens	2528	5.55
Bryophytes	2754	5.59
Pteridophytes	1293	2.61
Gymnosperms	81	0.16
Angiosperms	18532	37.13
Total	49003	100

During the year 2017, scientific officials of BSI published 01 new genus, 84 new species and 03 varieties as new to science and discovered 01 family, 01 genus, 24 species as new records for India.



Percentage of new discoveries made during 2017 from different phyto geographical regions

NEW TO SCIENCE

SEED PLANTS

NEW SPECIES

Brachystelma mahendragiriense K. Prasad, Chorghe & Venu, *Rheedea* 27(2):135. 2017 (APOCYNACEAE) : This new species has discovered and described based on collections made from Mahendragiri hills, Gajapati district of Odisha, at 1393m altitude.

Brachystelma seshachalamense K. Prasad & Prasanna, *Bangladesh J. Plant Taxon.* 23(1): 53. 2016 (APOCYNACEAE) : This new species has discovered and described based on collections made from Seshachalam hills, Sanipaya forest range Kadapa district of Andhra Pradesh, at 570m altitude.

Chlorophytum diwanjii Mujaffar, Tiwari & Chandore, *Phytotaxa* 291 (2): 159.2017 (ASPARAGACEAE) : This new species has discovered and described based on collections made from forest streams of Dhama Khandwa district of Madhya Pradesh at 333m altitude.

Cycas dharmrajii L. J. Singh, *Nordic Journal of Botany* 35(1): 69–76, 2017. (CYCADACEAE) : This new species has been discovered and described based on the collection made from littoral forest near the sea Table Excelsiar Island, Andaman and Nicobar Islands.

Dendrobium tuensangense N.Odyuo & C.Deori., *Phytotaxa* 311(2): 185.2017 (ORCHIDACEAE) : This new species has discovered and described based on collections made from Chingmei village, Bakhong forest reserve, Tuensang district of Nagaland at 2000m altitude.



Brachystelma mahendragiriense K. Prasad & Prasanna



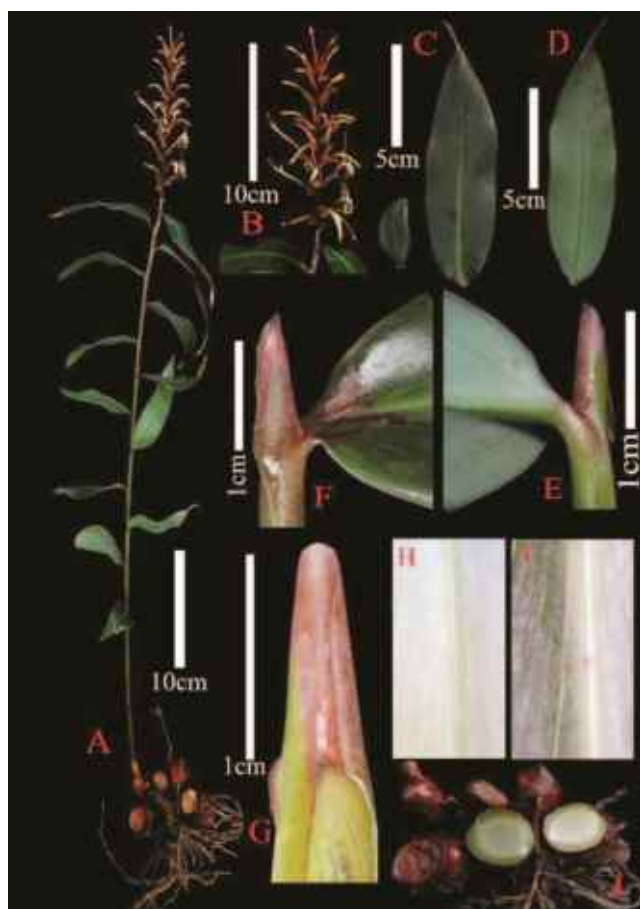
Chlorophytum diwanjii Mujaffar, Tiwari & Chandore

Drypetes kalamii G. Krishna, Karthig., Arisdason & Chakrab., *Phytotaxa* 319(3):271.2017 (EUPHORBIACEAE) : This new species has discovered and described based on collections made from Nalraja Ghar, Chilapatha, Jalpaiguri district of West Bengal.

Fimbristylis pandeyana Mujaffar, Wad. Khan & A.P. Tiwari, *Phytotaxa* 314 (2): 297.2017 (CYPERACEAE) : This new species has discovered and described based on collections made from wetland of Bhamori Pond of Rukhard village, Seoni district of Madhya Pradesh, at 1725ft., altitude.

Gleadovia konyakianorum N.Odyuo, D.K.Roy & Aver., *Phytotaxa* 326(4): 274.2017 (OROBANCHACEAE) : This new species has discovered and described based on collections made from Pessao village, Tobu town subdivision, Mon district of Nagaland at 1600m altitude.

Glochidion talakonense M. Sankara Rao, J. Swamy, S. Nagaraju, S.B. Padal, M. Tarakeswara Naidu, K. Chandramohan & T.Thulasiah, *Bangladesh J. Plant Taxon.* 23(1): 59.2016 (PHYLLANTHACEAE) : This new species has discovered and described based on collections made from Talakona hill, Chittoor district of Andhra Pradesh at 852m altitude.



Hedychium chingmeianum N. Odyuo & D. K. Roy



Impatiens nagorum Gogoi, Moaakum & S.Dey

Hedychium chingmeianum N. Odyuo & D. K. Roy, *Telopea* 20:194.2017 (ZINGIBERACEAE) : This new species has discovered and described based on collections made from Chingmei village, Barhong forest reserve, Tsuengsang district of Nagaland at 1598m altitude.

Impatiens dorjeekhandui Chowlu, S. S. Dash & Gogoi, *Nelumbo* 59(2):141.2017 (BALSAMINACEAE) : This new species has discovered and described based on collections made from Zemithang, Gorsam, Tawang district of Arunachal Pradesh, India at 1719m altitude.

Impatiens nagorum Gogoi, Moaakum & S.Dey, *Phytotaxa* 308 (2): 275. 2017. (BALSAMINACEAE) : This new species has discovered and described based on collections made from Fakim Wildlife Sanctuary, Kiphire district of Nagaland at 2336m altitude.



Impatiens rugosipetala Gogoi & Borah



Impatiens tatoensis Gogoi & W.Adamowski

Impatiens pseudolaevigata Gogoi, B.B.T.Tham & Lidén, *Phytotaxa* 313 (2): 227. 2017. (BALSAMINACEAE) : This new species has discovered and described based on collections made from Nichifu, West Kameng district of Arunachal Pradesh at 1800m altitude.

Impatiens rugosipetala Gogoi & Borah, *Nordic J. Bot.* 35:365.2017 (BALSAMINACEAE) : This new species has discovered and described based on collections made from Mayodia, Lower Dibang valley, district of Arunachal Pradesh at 2600m altitude.

Impatiens tatoensis Gogoi & W.Adamowski, *Telopea* 20: 23.2017. (BALSAMINACEAE) : This new species has discovered and described based on collections made in between from Tato and Menchukha, West Siang district of Arunachal Pradesh.

Impatiens walongensis Hareesh, M.Sabu & Borah, *Phytotaxa* 317(3):226.2017. (BALSAMINACEAE) : This

new species has discovered and described based on collections made from Walong, Near Nangala bridge, Anjaw district of Arunachal Pradesh, India.

Impatiens zironiana Gogoi, Hareesh & W.Adamowski, *Webbia: J. Pl. Tax. Geog.* 72(1):83.2017 (BALSAMINACEAE) : This new species has discovered and described based on collections made from Pine Groove, Ziro, Lower Subansiri district of Arunachal Pradesh, India at 1560m altitude.

Memecylon sivagirianum S. Prabhu and C. Murugan. *Indian J. Forest.* 40(1).69.2017 (MELASTOMOTACEAE) : This new species has discovered and described based on collections made from Nagariar estate, Kamarajar district of Tamil Nadu, India.

Monolophus arunachalensis Bhaumik, S. Dey & Langhu, *Kew Bulletin* 72:6.2017 (ZINGIBERACEAE) : This new species has discovered and described based on collections made from Roying to Tirbin, West Siang district of Arunachal Pradesh, India at 630m altitude.

Monolophus suksathanii S. Dey, Langhu & Bhaumik, *Kew Bulletin* 72:7.2017 (ZINGIBERACEAE) : This new species has discovered and described based on collections made from Shiroy Hills, Ukhrul district of Manipur, India at 2317m altitude.

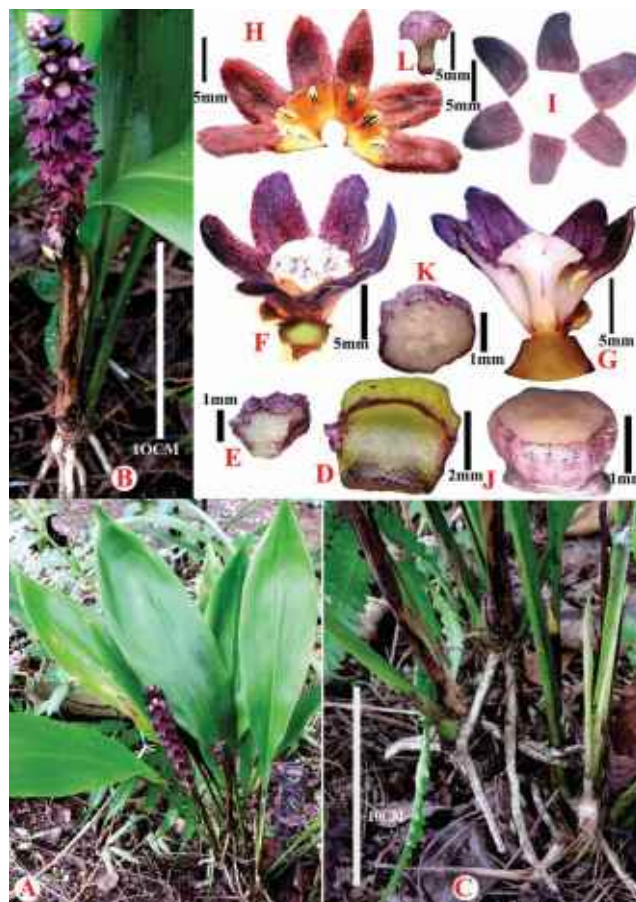
Oberonia bopanna Chowlu & Kumar, *Phytotaxa* 316 (3): 285.2017 (ORCHIDACEAE) : This new species has discovered and described based on collections made from Tengapani, Namsai district, Arunachal Pradesh India.

Oberonia jhae Chowlu & Rab, *Bangladesh J. Plant Taxon.* 24(1): 49.2017 (ORCHIDACEAE) : This new species has discovered and described based on collections made from Kheel, Papum Pare district, Arunachal Pradesh, India at 642m altitude.

Rohdea extrorsandra N.Odyuo, D.K.Roy & Aver., *Phytotaxa* 309 (3): 283.2017 (ASPARAGACEAE) : This new species has discovered and described based on collections made from Dampa Tiger Reserve, Tuichar stream banks in Dampa Hill, Mizoram, India at 50m altitude.

Strobocalyx mastersii B. Bhattacharjee, Lakshmin., S.K. Mukherjee & Av. Bhattacharjee, *Phytotaxa* 299 (2): 280.2017 (ASTERACEAE) : This new species has discovered and described based on collections made from Getukai, Assam, India.

Syzygium bournei Murugan and Arum., *Indian J. Forest.* 40(3).281.2017 (MYRTACEAE) : This new species has discovered and described based on collections made from Gandhi Wildlife Sanctuary, on way to Thanakamalai from Konalar, Coimbatore district of Tamil Nadu, India at 2000m altitude.



Tupistra ashiohi D. K. Roy, N. Odyuo & Aver.

Syzygium lakshmananii Murugan & Arum. *Indian J. Forest.* 40(2):189.2017 (MYRTACEAE) : This new species has discovered and described based on collections made from Hospital valley Madurai (Theni) district of Tamil Nadu, India at 1550m altitude.

Tripogon jayachandranii Arum. & Murugan, *Indian J. Forest.* 40(2).159.2017 (POACEAE) : This new species has discovered and described based on collections made from Meghamalai Wildlife Sanctuary, Theni district of Tamil Nadu, India at 1450m altitude.

Tripogon paramjitianus Murugesan, Arum., *Indian J. Forest.* 40(3).285.2017 (POACEAE) : This new species has discovered and described based on collections made from Velliangiri hills, Coimbatore district of Tamil Nadu, India.

Tupistra ashiohi D. K. Roy, N. Odyuo & Aver., *Phytotaxa* 305(1):52.2017 (ASPARAGACEAE) : This new species has discovered and described based on collections made from Garden of Botanical Survey of India, Eastern Regional Centre, Shillong, Meghalaya India.

Tupistra khasiana D.K.Roy, A.A.Mao & Aver., *Taiwania* 62(3): 257.2017(ASPARAGACEAE) : This new species has discovered and described based on collections made

from Garden of Botanical Survey of India, Eastern Regional Centre, Shillong, Meghalaya India.

NEW VARIETIES

Chloranthus nervosus var. **khasiana** Prabhugaonkar, Murugesan & Mao, *Pleione* 11(1):150.2017 (CHLORANTHACEAE) : This new variety has discovered and described based on collections made from East Khasi hills, Soon Valley, East Khasi Hills district of Meghalaya, India at 950m altitude.

Dimeria connivens Hack. var. **roxburghiana** K.C. Mohan & Prasanna, *Bangladesh J. Plant Taxon.* 24(2): 237.2017 (POACEAE) : This new variety has discovered and described based on collections made from Satkosia Tiger Reserve, Nayagarh district of Odisha, India at 201m altitude.

Pyrenaria khasiana R.N. Paul var. **lakhimpurensis** N. Odyuo & D.K. Roy, *Taiwania* 62(1): 29. 2017 (THEACEAE) : This new variety has discovered and described based on collections made from Dullung Reserve Forest, (Behind Beat office towards North), North Lakhimpur district of Assam, India at 600m altitude.



Fissurina shivamoggensis Pushpi Singh & Kr. P. Singh



Graphis andamanica Swarnal



Leiorreuma nicobarensis Pushpi Singh, Jagadeesh and Kr. P. Singh

PTERIDOPHYTES

NEW SPECIES

Arthromeris crassirhizoma Fraser-Jenk., Odyuo & D.K. Roy, *Check list of Nagaland* 31.2017 (POLYPODIACEAE) : This new fern species has discovered and described based on collections made from Todu village, Nyoyang Mt. in Nagaland, India.

Diplazium nagalandicum Fraser-Jenk., Odyuo & D.K. Roy, *Check list of Nagaland* 24.2017 (WOODSIACEAE) : This new fern has discovered and described based on collections made from Wokha forest, Nagaland, India.

BRYOPHYTES

NEW SPECIES

Riccardia lachungensis D.Singh & D.K. Singh, *Taiwania* 62(1): 36. 2017. (ANEURACEAE) : This new species has been discovered and described based on collection made from Lachung towards Katau, North District, Sikkim, Eastern Himalaya, at 3118m altitude.

Riccardia udarii D. Sing & D.K. Singh, *Taiwania* 62(1): 39. 2017. (ANEURACEAE) : This new species has been discovered and described based on collection made from Shimkharkha, South District, Sikkim, Eastern Himalaya, at 1421m altitude.

LICHENS

NEW SPECIES

Fissurina shivamoggensis Pushpi Singh & Kr. P. Singh, *NeBIO* 8(1): 21. 2017. (GRAPHIDACEAE) : This new species has been discovered and described based on the collections made from Chithrate forest, Sagar-Shivamogga district, Karnataka.

Graphis andamanica Swarnal., *Phytotaxa* 313(1): 144. 2017. (GRAPHIDACEAE) : This new species has been discovered and described based on the collections made

from Wright Myo, South Andaman, Andaman Islands, at 30m altitude.

Leiorreuma nicobarense Pushpi Singh, Jagadeesh & Kr. P. Singh, Bangladesh J. Plant Taxon. 24 (1): 10. 2017. (GRAPHIDACEAE) : This new species has been discovered and described based on the collections made from Sastri Nagar, North South road, Great Nicobar Island, at 15 m altitude.

Melaspilea nitidochapsae Pushpi Singh, Y. Joshi & Kr. P. Singh, Acta Botanica Hungarica 59 (3-4): 440. 2017 (MELASPILEACEAE) : This new species has been discovered and described based on the collections made from Dhani-Khari Dam forest area, Motor Vhanji, South Andaman Island, at 24 m, altitude.

ALGAE

NEW SPECIES

Scytonema (Myochrotes) adiharii Sudipta K. Das, Phytos 47 (2): 2. 2017. (SCYTONEMATACEAE) : The new cyanobacterial species is described from a moist rock in a stream at Samdung, East Sikkim.

FUNGI

NEW GENUS

Mycorrhaphoides Hembrom, K. Das & Hallenb., Nordic J. Bot. 35:87.2017 (MERULIACEAE)

This new fungal genus has been discovered and described based on the collection made from AJCB Indian Botanical Garden, Howrah.

NEW SPECIES

Amanita cornelii Mehmood, K. Das, Iqbal Hosen, Tulloss, & R.P. Bhatt, Fungal Diversity 183:152. 2017 (AMANITACEAE) : This new fungal species has been discovered and described based on the collection made from temperate mixed forest dominated by *Abies* and *Quercus* at Baniyakund, Rudraprayag district, Uttarakhand, India.

Amanita emodotrygon Mehmood, Tulloss, K. Das, Iqbal Hosen & R.P. Bhatt, Fungal Diversity 183: 157. 2017 (AMANITACEAE) : This new fungal species has been discovered and described based on the collection made from temperate coniferous forest of Western Himalaya, Rudraprayag, Uttarakhand, India.

Amanita rajendrae Mehmood, K. Das & Uniyal, Cryptog. Mycol. 38(3):2.2017 (AMANITACEAE) : This new fungal species has been discovered and described based on the collections made from Shahar Phatak forest, Mukteshwar town, Nainital district, Uttarakhand, at 2247m altitude.



Craterellus shoreae Hembrom, K. Das, A. Parihar & Buyck

Austroboletus appendiculatus Semwal, D. Chakr., K. Das, Indoliya, D. Chakrabarty, S. Adhikari & Karunarathna, Fungal Diversity 83:189.2017 (BOLETACEAE) : This new species has been discovered and described based on collection made from Tapovan, Dehradun district, Uttarakhand at 650m altitude.

Boletus indoedulis D. Chakr., K. Das, A. Baghela, S. Adhikari & Halling, Nova Hedwigia 105(1-2): 200. 2017 (BOLETACEAE) : This new fungal species has been discovered and described based on collections from two localities Punthang (at 2077 m altitude) and forested area between Phadamchen and Zuluk (at 2351 m altitude), East district of Sikkim and found to be associated with *Lithocarpus* trees.

Cratellus parvogriseus U.Singh, K. Das & Buyck, Crypt. Mycol. 38(3):7.2017 (HYDNACEAE) : This new fungal species has been discovered and described based on the collections made from soil adjacent to the root outlets of *Quercus leucotrichophora*, Adwani-Teka forest, Pauri Garhwal district, Uttarakhand, at 1843m altitude.

Craterellus shoreae Hembrom, K. Das, A. Parihar & Buyck, Phytotaxa 306(3):204.2017 (CANTHARELLACEAE) : This new fungal species has been discovered and described based on the collection made from *Shorea robusta* dominated tropical deciduous scrub forest of Rajmahal hills, Jharkhand, India.

Cyanoboletus hymenoglutinosus D. Chakr., K. Das, A. Baghela, S.K. Singh & Dentinger, Fungal Diversity 78:165.2016 (BOLETACEAE) : This new fungal species has been discovered and described based on the collection made from temperate mixed forests dominated by species of *Cryptomeria*, *Pinus*, *Castanopsis* and bamboos forest of East district, Upper Phadamchen, Sikkim, India.



Gliophorus flavoviridis U. Singh, K. Das & R.P. Bhatt



Gyroporus paramjitii K. Das, D. Chakr. & Vizzini

Gliophorus flavoviridis U. Singh, K. Das & R.P. Bhatt, *Phytotaxa* 327(2):3.2017 (HYGROPHORACEAE) : This new fungal species has been discovered and described based on collection made from Pabdhar forest, Rudraprayag district, Uttarakhand, at the altitude of 2353m.

Gyroporus paramjitii K. Das, D. Chakr. & Vizzini, *Nordic J. Bot.* 35: 671. 2017 (GYROPORACEAE) : This new fungal species, the first Asian representative of the genus *Gyroporus*, has been discovered and described based on collection made from Churten, East district of Sikkim, at 1557m altitude.

Hortiboletus indorubellus D. Chakr., K. Das, A. Baghela, S.K. Singh & Dentinger, *Mycologia* 108(4): 759. 2016 (BOLETACEAE) : This new fungal species has been discovered and described based on collection made from Churten, East district of Sikkim, found to grow under *Betula alnoides*, at 1454m altitude.

Lactarius atrii Van de Putte & K.Das, *Fungal Biology* 30: 8. 2016 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from mixed coniferous forests of Lachung, Dombang Valley, North district, Sikkim, at 2940m altitude.

Lactarius dirkii Uniyal, K. Das, A. Baghela & R.P. Bhatt, *Fungal Diversity* 81: 252. 2016 (RUSSULACEAE) : This



Lactarius flavigalactus Verbeken & K. Das

new fungal species has been discovered and described based on the collections made from Baniyakun, Rudraprayag district, Uttarakhand, India.

Lactarius ferruginascens K. Das & Verbeken, *Cryptog. Mycol.*, 38 (4): 456. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from Kyangnosla Alpine Sanctuary, East district of Sikkim, at 3352m altitude.

Lactarius flavigalactus Verbeken & K. Das, *Fungal Biology* 30: 14.2016 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from mixed coniferous forests, 2km south-west of Dombang valley, North district, Sikkim, at 2840m altitude.

Lactarius indoquosus K. Das, Verbeken & A. Baghela, *Cryptog. Mycol.* 38 (4): 460. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from Maenam Wild Life Sanctuary, South district of Sikkim, at 2096m altitude.

Lactarius kumaonensis Uniyal, K. Das, R. P. Bhatt & U. Singh, *Nordic J. Bot.*, 35: 726. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from Dhakuri-Loharkhet trekking route, Bageshwar district, Kumaon Himalayas, Uttarakhand at 1400 m altitude.

Lactarius mukteswaricus K. Das, J.R. Sharma & Montoya, *Fungal Diversity* 16: 23. 2004 (RUSSULACEAE) : This new fungal species has been discovered and described based on the collection made from Mukteswar, Nainital, Uttarakhand, India.

Lactarius rajmahalensis Hembrom, K. Das & A. Parihar, *Cryptog. Mycol.* 38(1): 116. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described



Lactarius kumaonensis Uniyal, K. Das, R. P. Bhatt & U. Singh

based on collection made from tropical dry deciduous forests, dominated by *Shorea robusta*, Rajmahal hills, Jharkhand.

Lactarius sanjappae K. Das, J.R. Sharma & Montoya, Fungal Diversity 16: 23. 2004 (RUSSULACEAE) : This new ectomycorrhizal fungal species has been discovered and described based on the collection made from Mukteswar, Nainital, Uttarakhand, India.

Lactarius sikkimensis Verbeken & K.Das, Fungal Biology 30: 19. 2016 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from Dombang Valley, Sikkim at 2840m altitude.

Lactarius verbekenae K. Das, J.R. Sharma & Montoya, Fungal Diversity 16: 29. 2004 (RUSSULACEAE) : This new ectomycorrhizal fungal species has been discovered and described based on the collection made from Mukteswar, Nainital, Uttarakhand, India.

Lactifluus maenamensis K. Das, D. Chakr. & Buyck, Cryptog. Mycol. 38(3): 364. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from South district of Sikkim, Maenam Wild Life Sancturay, growing under *Lithocarpus* tree at 1843m altitude.

Leccinellum indoaurantiacum D. Chakr., K. Das, Baghela, S.K. Singh & Dentinger, Fungal Diversity 78: 160. 2016 (BOLETACEAE) : This new fungal species has been discovered and described based on the collection made from Memainchu and Kyangnosla areas, in East district, Sikkim, India.

Mycorrhaphoides stalpersii Hembrom, Nilsson, A. Parihar, K. Das, A. Baghela & S.K. Singh, Nordic J. Bot. 35: 87. 2017 (MERULIACEAE) : This new species has been discovered and described based on collection made from base of living tree trunk of *Tamarindus indica*, near bicentenary gate of AJC Bose Indian Botanical Garden, Howrah, West Bengal, at 13m altitude.

Russula aureorubra K. Das, A. Ghosh, A. Baghela & Buyck, Cryptog. Mycol. 38(3):30.2017 (RUSSULACEAE) : This new crust fungal species has been discovered and described based on collection made from Maenam Wild Life Sanctuary, South district of Sikkim, at 1843m altitude.



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



Russula aureorubra K. Das, A. Ghosh, A. Baghela & Buyck



Russula compactoides K. Das, A. Ghosh & Buyck

Russula compactoides K. Das, A. Ghosh & Buyck, *Cryptog. Mycol.* 38(4): 538.2017 (RUSSULACEAE) : This new crust fungal species has been discovered and described based on collection made from coniferous subalpine mixed Himalayan forests, East district of Sikkim, at 3352m altitude.

Russula indoalba A. Ghosh, Buyck, A. Baghela, K. Das & R.P. Bhatt, *Fungal Diversity* 81: 250. 2016 (RUSSULACEAE) : This new ectomycorrhizal fungal species has been discovered and described based on the collections made from Rudraprayag district, Baniyakund, Uttarakhand India.

Russula kewzingensis K. Das, D. Chakr. & Buyck, *Cryptog. Mycol.* 38(4): 527. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from Kewzing forest, South district of Sikkim, at 1888m altitude.

Russula obscuricolor K. Das, A. Ghosh & Buyck, *Cryptog. Mycol.* 38(3): 36. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from temperate broadleaf forest, Maenam Wild Life Sanctuary, South district of Sikkim, at 2136m altitude.

Russula pauriensis A. Ghosh, K. Das & Buyck, *Cryptog. Mycol.* 38(3): 42. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from temperate broadleaf forests, Pauri district of Uttarakhand, at 1911m altitude.

Russula petersenii A. Ghosh & K. Das, *Phytotaxa* 323 (3). 245. 2017 (RUSSULACEAE) : This new wild mushroom species has been discovered and described based on collection made from Dhakuri, Bageshwar district, Uttarakhand, at 2586 m altitude.

Russula pseudoamoenicolor A. Ghosh, Buyck, K. Das, A. Baghela & R.P. Bhatt, *Fungal Diversity* 81: 251. 2016 (RUSSULACEAE) : This new ectomycorrhizal fungal species has been discovered and described based on the collections made from Pauri Garhwal, along the road side of khirsu, Uttarakhand India.

Russula rajendrae A. Ghosh & K. Das, *Phytotaxa* 323 (3). 240.2017 (RUSSULACEAE) : This new mushroom species has been discovered and described based on collection made from temperate forests, under *Quercus* tree, Uttarakhand, at 2555 m altitude.

Russula pseudocompacta A. Ghosh, K. Das, R.P. Bhatt & Buyck, *Cryptog. Mycol.* 38(4):534.2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from temperate Himalayan forests, under the trees of Fagaceae, of two states Uttarakhand and Sikkim, at 1800-2300 m altitude.

Russula sarnarii A. Ghosh, K. Das & R.P. Bhatt, *Curr. Res. Environ. App. Mycol.* 7(2). 66. 2017 (RUSSULACEAE) : This new fungal species has been discovered and described based on collection made from Hariyali Devi Forest, Rudraprayag district, Uttarakhand, at 1561m altitude.

Strobilomyces longistipitatus D. Chakr., K. Das & S. Adhikari, *Fungal Diversity* 183: 207. 2017 (BOLETACEAE) : This new ectomycorrhizal fungal species has been discovered and described based on the collection made from subalpine mixed forest in East district of Sikkim, India.

Xerocomus doodhcha K. Das, D. Chakr., A. Baghela, S.K.Singh & Dentinger, *Mycologia* 108 (4): 756. 2016 (BOLETACEAE) : This new fungal species has been discovered and described based on the collections made from Bansoi, North district, Sikkim, at 2323m altitude. The h

Xerocomus longistipitatus K. Das, A. Parihar, D.Chakr. & A. Baghela, *Mycosphere* 8(1): 46. 2017 (BOLETACEAE) : This new fungal species has been discovered and described based on the collections made from Rabangla, East district, Sikkim, at 1985m altitude.

Xerocomus reticulostipitatus Hembrom, D. Chakr., A. Parihar & K. Das, *Cryptog. Mycol.* 38(3): 45. 2017 (BOLETACEAE) : This new fungal species has been discovered and described based on collection made from Dhakuri, Bageshwar district, Uttarakhand, at 2750m altitude.

NEW DISTRIBUTIONAL RECORDS

SEED PLANTS

FAMILY RECORD

Akaniaceae Stapf : This family, earlier known from South and East China, Taiwan and N. Vietnam, has been reported for the first time from India based on the collection made from Namdapa National Park, Changlang district, Arunachal Pradesh, at 500 m altitude.

GENERIC RECORDS

Bretschneidera Hemsley : This genus, earlier known from South and East China, Taiwan and N. Vietnam, has been reported for the first time from India based on the collection made from Namdapa National Park, Changlang district, Arunachal Pradesh, at 500 m altitude.

SPECIES RECORDS

Bretschneidera sinensis Hemsley (AKANIACEAE) : This species, earlier known from South and East China, Taiwan and N. Vietnam, has been reported for the first time from India based on the collection made from Namdapa National Park, Changlang district, Arunachal Pradesh, at 500 m altitude.

Carex capillaris L. (CYPERACEAE) : This species, earlier known from China, Japan, Korea, Russia, Europe and North America, has been reported for the first time from India based on the collection made from Suru, Kashmir, at 305m altitude.

Cleome hirta (Klotzsch) Oliv. (CLEOMACEAE) : This species, earlier known from tropical Africa, has been reported for the first time from India based on the collection made from Faratikui, Vadodara district, Gujarat, at 91m altitude.

Coelogyne calcicola Kerr (ORCHIDACEAE) : This species, earlier known from China, Laos, Myanmar, Thailand and Vietnam, has been reported for the first time from India based on the collection made from forest areas of Noklak, Tuensang district, Nagaland, at 1600m altitude.

Cymbidium nanulum Y.S. Wu & S.C. Chen (ORCHIDACEAE) : This species, earlier known from Liuku, Western Yunnan, has been reported for the first time from India based on the collection made from Hengbung, Senapati district, Manipur, at 1220m altitude.

Dioscorea polystachya Turcz. (DIOSCOREACEAE) : This species, earlier known from America, China, Japan, Korea and Taiwan, has been reported for the first time from India based on the collection made from Municipal Garden (Company Bag), Mussoorie, Uttarakhand.

Liparis Formosana Rchb.f. (ORCHIDACEAE) : This species, earlier known from China, Japan and Taiwan, has been reported for the first time from India based on the collection made from Old Pangha, Tuensang District, Nagaland, at 1076m altitude.

BRYOPHYTES

Cheilolejeunea vittata (Steph. ex G. Hoffm.) R.M. Schust. & Kachroo (LEJEUNEACEAE) : This species, earlier known from Australia, Indonesia, Malaysia, Papua New Guinea, Sri Lanka, Thailand and Philippines, has been reported for the first time from India based on the collection made from Pung-Pung river, Chandel District, Manipur, at 220m altitude.

Radula campanigera Mont. (RADULACEAE) : This species, earlier known from Fiji, Indonesia, Japan, Kusaie, New Zealand, Malaysia, Taiwan, Thailand, Tahiti, has been reported for the first time from India based on the collection made from the way to Talar camp from Tato, West Siang District, Arunachal Pradesh, at 2200m altitude.

VARIETAL RECORDS

Cololejeunea microscopica var. **microscopica** (Taylor) Schiffn. (LEJEUNEACEAE) : This species, earlier known from Africa and Europe, has been reported for the first time from India based on the collection made from 5 km after Chawmanu towards Manu, Longtarai Valley, Dhalai district, Tripura, at 49 m altitude.

LICHEN

Alyxoria culmigena (Lib.) Ertz. (ROCELLACEAE) : This species, earlier known from Galapagos Islands, Great Britain, Ireland, Africa, France, Malaysia, Papua New Guinea, South Korea, Tasmania and Thailand, has been reported for the first time from India based on the collection made from Mus Village, Car Nicobar Island, Andaman and Nicobar Islands, at 5m altitude.

Arthonia speciose (Mull. Arg.) Grube (ARTHONIACEAE) : This species, earlier known from East Africa, Galapagos Islands, Mexico and U.S.A., has been reported for the first time from India based on the collection made from Campbell Bay, Great Nicobar Islands, at 5m altitude.

Arthopyrenia malaccitula (Nyl.) Zahlbr. (ARTHOPYRENIACEAE) : This species, earlier known from Japan, Malaysia and U.S.A., has been reported for the

first time from India based on the collection made from Campbell Bay, Great Nicobar Islands, at 5m altitude.

Bactrospora leptoloma (Mull. Arg.) Egea & Torrente (ROCELLACEAE) : This species, earlier known from Carribbean Islands and Ghana, has been reported for the first time from India based on the collection made from Mus, Car Nicobar Islands, at 5m altitude.

Dictyomeridium campylotheliodes (Aptroot & Sipman) Aptroot, M. P. Nelson & Lucking (TRYPETHELIACEAE) : This species, earlier known from Indonesia, Papua New Guinea and Taiwan, has been reported for the first time from India based on the collection made from Lakshman Beach forest, Campbell Bay, Great Nicobar Island, at 5m altitude; Jhola village, Katchal Island, at 10m altitude and Tee Top, Car Nicobar Islands, at 5m altitude.

Stirtonia rhizophorae Kalb & Mongkolsuk (ARTHONIACEAE) : This species, earlier known from Thailand, has been reported for the first time from India based on the collection made from mangrove forest, Shyankund, Bakultala, Middle Andaman, at 5m altitude.

FUNGI

Aureoboletus nephrosporus G. Wu & Zhu L. Yang (BOLETACEAE) : This fungal species, earlier known from China has been reported for the first time from India based on the collection made near trees of *Quercus* sp. At Maenum Wild life Sanctuary at 2315m altitude of Sikkim.

Bovista nigrescens Pers. (AGARICACEAE) : This fungal species, earlier known from Europe has been reported for the first time from India based on the collection made from a subalpine grassland at Shiv-Mandir, North district, at 3828m altitude of Sikkim.

Gymnopilus purpureosquamulosus Høil. (HYMENOGASTRACEAE) : This fungal species, earlier known from parts of Africa and Europe has been reported for the first time from India based on the collection made from dead and decomposed log at Howrah, Katlia, of West Bengal, India.

Hygrophorus pudorinus (Fr.) Fr. (HYGROPHORACEAE) : This fungal species, earlier known from North East America, Europe has been reported for the first time from India based on the collection made from Memainchu, East district, Sikkim at 3601m altitude.

Lactarius olivaceoumbrinus Hesler & Smith (RUSSULACEAE) : This fungal species, earlier known from Canada has been reported for the first time from India based on the collection made from subalpine coniferous forests at Rudraprayag district, Chopta, at the altitude of 2943m and Tungnath trek at the altitude of 3236m, Uttarakhand.

Lycoperdon rupicola Jeppson, E. Larss. & M.P. Martín (AGARICACEAE) : This fungal species, earlier known from Europe and Asia has been reported for the first time from India based on the collection made from subalpine mixed forest near Memainchu Lake in East district, Sikkim.

Pulveroboletus auriflammeus (Berk. & M.A. Curtis) Singer (BOLETACEAE) : This fungal species, earlier known from North America has been reported for the first time from India based on the collection made from temperate broadleaf forest of Champawat, near Hingli Mata Mandir and Mundneshwar, Uttarakhand, India.

Retiboletus kauffmanii (Lohwag) N.K. Zeng & Zhu L. Yang (BOLETACEAE) : This fungal species, earlier known from China has been reported for the first time from India based on the collection made from temperate broad leaf forest Maenam Top, in East district, at the altitude of 2315m of Sikkim, India.

Strobilomyces mirandus Corner (BOLETACEAE) : This fungal species, earlier known from Malaysia, Japan and China has been reported for the first time from India based on the collection made from South district, Rabangla and Kewzing, Sikkim; and Rudraprayag, Kund at 1160m altitude of Uttarakhand, India.



Snow covered Sela lake, Arunachal Pradesh

A photograph of a pond filled with large, green, circular lily pads. The lily pads have a distinct red or pinkish-red border. A single pink flower is visible among the lily pads. The pond is surrounded by dense, lush green trees and foliage, creating a natural, shaded environment. The water is dark and reflects the surrounding greenery.

ex-situ CONSERVATION

Victoria cruziana A.D. Orb.

ex-situ CONSERVATION

Botanical Survey of India, the leading taxonomic research organization under the Ministry of Environment, Forest and Climate Change, Government of India, 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 establishment, all these gardens are doing tremendous 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.	Andaman & Nicobar Regional Centre, BSI, Experimental Garden, Dhanikhari	Port Blair	Medicinal Plants
3.	Arid Zone Regional Centre, Jodhpur: Experimental Garden, Jodhpur	Jodhpur	Arid plants
4.	Arunachal Pradesh Regional Centre, Itanagar: Experimental Garden, Sankie View	Itanagar	Indigenous species of Arunachal Pradesh
5.	Botanic Garden of Indian Republic, Experimental Garden, Noida	Noida	Arboreta, Woodland and Botanic Garden Education
6.	Central Regional Centre, Experimental Garden, Allahabad	Allahabad	Wild Rose and its cultivars
7.	Eastern Regional Centre, Shillong: Experimental Garden, Barapani	Shillong	Zingiberaceae, Orchids
8.	National Orchidarium and Experimental Garden, Yercaud	Coimbatore	Orchid
9.	National Gymnosperm collection cum Botanic Garden, Pauri, Garhwal	Dehradun	Gymnosperms
10.	Sikkim Himalaya Regional Centre, Experimental Garden, Gangtok	Gangtok	Orchids, Gymnosperms
11.	Western Regional Centre, Pune, Experimental Garden, Mundhwa	Pune	Pteridophytes, Gymnosperms

A. *ex-situ* CONSERVATION OF RARE/ THREATENED/ ENDEMIC PLANTS

A.J.C. Bose Indian Botanic Garden, Howrah

During the report period, under *ex-situ* conservation, nurturing and proper monitoring, up keeping and transplanting of the previously introduced Rare/Endangered/Threatened & Endemic (RET & E) plants were done due to the reason that said plants of the earlier tour collections get accumulated in the nursery and their division wise plantation was very much essential rather than making fresh collections through further field tours prior to the plantation and establishment of previous lots. Accordingly arrangement was made and target fulfilled for plantation of about 150 valuable plants including RET & E plants in the respective divisions on Environmental Day, Van Mahotsava Week Celebration etc. During the visit of dignitaries, VIPs from MoEF & CC, New Delhi, other occasions like Independence Day, Republic Day and as usual course of compensatory plantation and their subsequent upkeep and monitoring of 40 endemic plant species and 17 rare cactus species were collected from Regional Plant Resource Centre (RPRC), Bhubaneswar and introduced for *ex-situ* conservation in the glass house of AJCBIBG, Howrah.

Andaman & Nicobar Regional Centre, BSI, Dhanikhari Experimental Garden-cum-Arboretum, Port Blair

During this period, a total of 134 seedlings and seeds of 49 RET species (seedlings: 47 species; seeds: 02 species); 71 medicinally/economically important plant species (seedlings: 62 species; seeds: 09 species) and 14 ornamental plant species (seedlings: 14 species) were collected from various forest areas of Andaman & Nicobar Islands and introduced in the Dhanikhari Experimental Garden cum Arboretum (DEGCA, Dhanikhari, Nayashahar), some of which are *Amomum acculeatum*, *Amorphophallus blumei*, *Artocarpus chaplasha*, *Asplenium nidus* var. *nidus*, *Atalantia monophylla*, *Azadirachta indica*, *Bentinckia nicobarica*, *Calophyllum inophyllum*, *Carissa spinarum*, *Cleome gynandra*, *Curcuma roscoeana*, *Cycas pschannae*, *Datura metal*, *Dendrobium incurvum*, *Dillenia andamanica*, *Diospyros marmorata*, *Diospyros undulata*, *Eria andamanica*, *Eulophia andamanensis*, *Eulophia spectabilis*, *Ganophyllum falcatum*, *Garcinia cowa*, *Globba pauciflora*, *Korthalsia laciniosa*, *Lagerstroemia hypoleuca*, *Luisia balakrishnanii*, *Makino oberonia*, *Mangifera andamanica*, *Melocanna baccifera*, *Mimusops elengi*, *Musa paramjitiana*, *Myristica andamanica*, *Nervelia punctata*, *Pajanelia longifolia*, *Pandanus lerum* var. *andamanensium*, *Planchonia andamanica*, *Pteris biaurita*, *Pterocarpus dalbergioides*, *Ricinus communis*,

Solanum sisymbriifolium, *Solanum violaceum*, *Solanum virginianum*, *Syzygium samsrnsense*, *Tacca leontopetaloides*. In addition, Phenology of 73 tree species of Dhanikhari Experimental Garden cum Arboretum (DEGCA) has been documented for the first time.

Arid Zone Regional Centre, Jodhpur: Experimental Garden, Jodhpur

During 2017-18, the following plants were collected and introduced in Desert Botanic Garden, Jodhpur, BSI. **RET plants:** 27 species. 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. **Medicinal and Aromatic plants:** 37 species; **Plants of Botanical interests:** 14 species; **Ethno-religious plants:** *Desmostachya bipinnata*. **Economically important plants:** Pomology sections: 05 species and Timber yielding plants: 09 species and Seed collection: 14 species were collected. Multiplication of RET plants: 09 species and saplings prepared for plantation and exchange purposes: In exchange programme c. 2500 saplings of 35 species of Arid and Semi-arid region of India were supplied to Botanic Garden of Indian Republic, Noida for plantation purposes (most of the species were raised in the nursery of Desert Botanic Garden of Botanical Survey of India, Arid Zone Regional Centre, Jodhpur).

Arunachal Pradesh Regional Centre, Itanagar: Experimental Garden, Sankie View

During 2017-18 103 live plants of *Zingiberaceae*, Bamboos and *Musa* species were collected from EBG (Umiam), BSI, ERC, Shillong for plantation in the garden as part of *ex-situ* conservation project and were introduced 50 plant specimens in the garden namely majority of Orchid species.

Botanic Garden of Indian Republic, Experimental Garden, Noida

During 2017-18, A RET plant species block was prepared for conservation of about 80 RET species of BGIR Noida. A total of 15 threatened and endemic plant species (04 Endemic species and 11 RET species) were collected from the lead & small Botanic Gardens and placed in conservatories for acclimatization, some of which are *Hildegardia populifolia* (Critically Endangered, IUCN 2.3), *Madhuca neriifolia* (Endangered, IUCN 2.3), *Pterocarpus santalinus* (Near Threatened, IUCN 3.1), *Hardwickia binata* (Endemic), *Saraca asoca* (Vulnerable), *Commiphora wightii* (Critically Endangered, IUCN 3.1), *Dalbergia latifolia* (Vulnerable, IUCN 2.3), *Swietenia mahagony* (IUCN 2.3) etc. In addition, 25 tree species of

about 2650 plants and 32 species of about 2800 plants were collected from BSI-ARC, Jodhpur, Rajasthan and BSI, NRC, Dehradun respectively, about 12000 plants of 60 species of trees, shrubs, herbs as well ornamental plants were collected from local Forest Nurseries of NCR, Meerut, Saharanpur, and other parts of U.P. for introduction in BGIR.

Central Regional Centre, Experimental Garden, Allahabad

During 2017-18, 59 species comprising 16 species of Aquatic plants including 02 fern species and 43 species of terrestrial plants including 01 each of fern and an Orchid were collected including 6 seedlings (*Adansonia digitata*, *Radermachera xylocarpa* and *Pterocarpus marsupium*, *Alectra parasitica* subsp. *chitrakutensis*, *Zingiber zerumbet*, *Citrus* sp., *Hedychium coronarium*, *Syzygium jambos*, *Saraca asoca*, *Annona muricata*, *Withania somnifera* etc.) from Chitrakoot area of Madhya Pradesh and Uttar Pradesh and planted in the experimental garden. Among the collected plants 10 RET species and 22 Economic and Medicinal plant categories.

Experimental Garden, Barapani, Eastern Regional Centre, Shillong

The garden serves as a repository of rare, endangered, threatened and economic plant resources of North-east India and also creates awareness of the importance of its conservation. A total of 503 plant species (*Ceratostylis himalaica*, *Coelogyne griffithii*, *Cyathea khasyana*, *Cymbidium devonianum*, *Dendrobium pendulum*, *D. chrysanthum*, *D. ochreatum*, *Esmeralda clarkei*, *Holboellia latifolia*, *Hoya filicinus*, .), *Iris wattii*, *Liparis cordifolia*, *Mucuna macrocarpa*) were collected and planted during April 2017 to March 2018 including 67 RET plants (*Nepenthes khasiana*, *Citrus indica*, *Aquillaria malaccensis*, *Aesculus assamica*, *Brainea insignis*, *Magnolia hodgsonii*, *Cycas pectinata*, *Ilex khasiana*, *Musa velutina*, *Cyathea gigantea*, *Angiopteris helferiana*, *Platyserium wallichii*, etc.) were introduced in the garden. About 756 species of vascular plants, 13 Gymnosperms, 59 Pteridophytes and 53 Bryophytes of North-east India were conserved here. Many of them are rare, endemic and economically important plant species of this region.

National Orchidarium and Experimental Garden, Yercaud

During 2017–2018, 517 plants belonging to 95 species under 60 genera and 27 families were recorded. Among these, 30 species were Epiphyte and 5 species were terrestrial. The collected plant species were introduced in the National Orchidarium and Experimental Garden,

Southern Regional Centre, Yercaud for *ex-situ* conservation.

National Gymnosperm collection cum Botanic Garden, Pauri

During 2017–18, a total of 30 RET/ Endemic plant species were collected and maintained in Botanic Garden, Dehradun. A total of 30 economically important species were collected and maintained in Office garden.

Sikkim Himalaya Regional Centre, Experimental Garden, Gangtok

During 2017–18, 68 (*Agrostophyllum callosum*, *Anthodonium gracile*, *Bulbophyllum leopardinum*, *Calanthe alismaefolia*, *Coelogyne corymbosa*, *Cymbidium devonianum*, *Dendrobium hookerianum*, *Eria coronaria*, *Goodyera foliosa*, *Pleione praecox*, *Phaius tankervilleae*, *Vandopsis undulata* etc.) taxa were introduced in the campus garden for further studies and *ex-situ* conservation and Red listing of Orchids of Eastern Himalaya as per IUCN Criteria.

Western Regional Centre, Experimental Garden, Mundhwa, Pune

During 2017–18, 23 angiosperms (*Rauvolfia densiflora*, *Christisonia bicolor*, *Arisaema barnesii*, *Scurrula buddleoides*, *Naravelia zeylanica*, *Balanophora fungosa*, *Ceropegia bulbosa*, *Habenaria longicorniculata*, *Dendrobium barbatulum* etc.) and 10 Ferns species (*Adiantum latifolium*, *Andiantum lunulatum*, *Athyrium hohenackerianum*, *Tectaria coadunata*, *Thelypteris dentata*, *Lepisorus nudus*, *Drynaria quercifolia* and *Microsorium punctatum* etc.) were collected and introduced in office garden for *ex-situ* conservation.

B. in-vitro/MICROPROPAGATION OF RET PLANTS:

Experimental Garden, Barapani, Eastern Regional Centre, Shillong

During 2017–18, c. 2500 seedlings of *Armadorum senapatianum*; c. 8000 seedlings of *Cymbidium tigrinum*; c. 150 seedlings of *Rhododendron coxianum* were grown in garden; germination process of *Paphiopedilum hirsutissimum* is under process and meristem tip culture of *Ilex khasiana* was successful.

Northern Regional Centre, Dehradun

During 2017–18, complete Micropagation protocol was standardized for the mass multiplication of *Catamixis baccharoides* and *Incarvillea emodi* and all the *in-vitro* regenerated plantlets were successfully transferred to the field.



RESEARCH PUBLICATIONS

Hippolytia dolichophylla

RESEARCH PUBLICATIONS

PAPERS PUBLISHED

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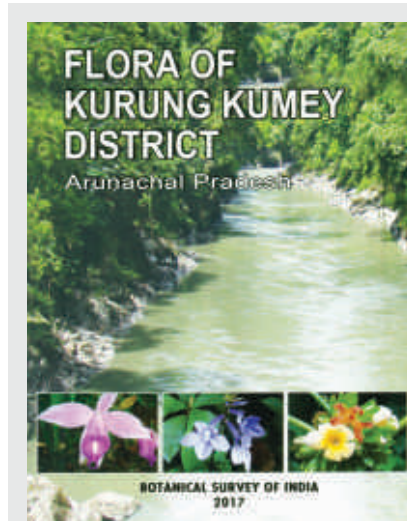
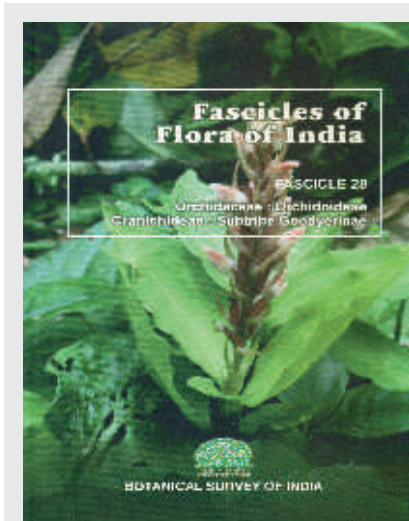
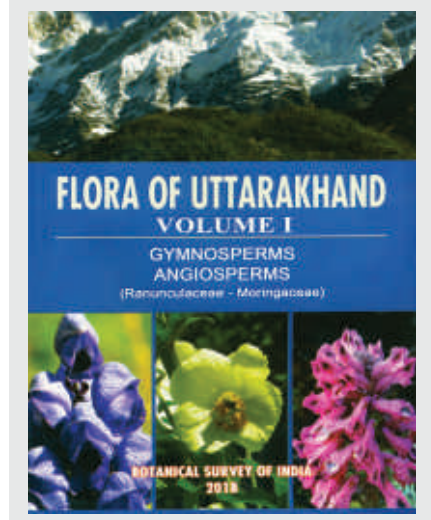
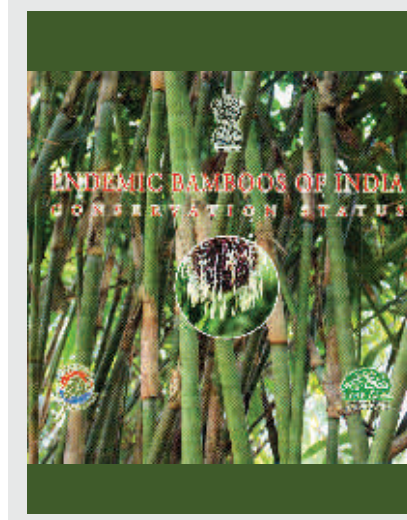
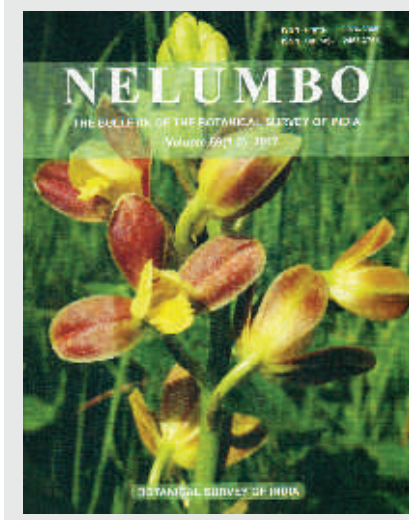
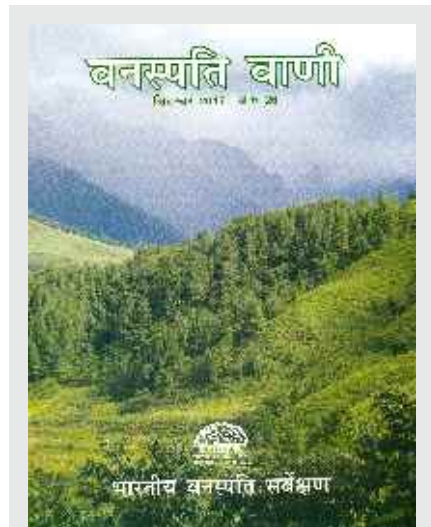
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BOOKS PUBLISHED BY BOTANICAL SURVEY OF INDIA DURING 2017-18



TRAININGS/ WORKSHOPS ORGANISED



ROBERTO KYDIO
MILITRIE
SRII HAJUK PUNRATHI
PORLAT
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Kyd's Monument

TRAININGS/WORKSHOPS ORGANISED BY BSI

During 2017-18, Botanical Survey of India organized the following training programmes, workshops, seminars, symposiums and conferences:

- An exhibition on 'Science Express Climate Action Special Train (SECAS)' at Barrackpore Railway station on 1st-2nd May, 2017.
- Workshop cum Hands-on training on 'DNA Barcoding-Molecular Analysis & Bioinformatics Approaches' organized by BSI, Eastern Regional Centre, on 21st-25th August, 2017, held at BSI, ERC, Shillong;
- Training on 'Basics of Plant Identification and Nomenclature' organized by BSI, Eastern Regional Centre, on 30th October-03rd November, 2017, held at BSI, ERC, Shillong;
- An exhibition on 'Botanical Heritage of India' co-organized BSI-ISIM (in association with CWEH, University of Sussex, UK) on 26th October-09th November, 2017 and 10th-12th November, 2017, held at India International Centre, and at University of Delhi, New Delhi respectively;
- Workshop on 'Lichen Identification and Nomenclature' organized by CRC, Allahabad, on 10th-11th November, 2017, held at CRC, Allahabad;
- National Conference on 'Status of Invasive Alien species of India' jointly organized by Zoological Survey of India & Botanical Survey of India on 14th-15th December, 2017, held at 'The Park', Kolkata;
- Hands-on training workshop on 'Cytological Techniques', organised by BSI, Western Regional Center, on 22nd-26th January, 2018, held at BSI, WRC, Pune;
- 128th Foundation Day programme and thematic seminar on 'Progress and prospects in Plant Taxonomy' organized by BSI-ISIM, on 13th-14th February, 2018 wherein Dr Sandra Knapp, Natural History Museum, London along with her colleague, Dr. Raneem Om Prakash) delivered the key-note address on "Past, Present and Future of Floristics-in relevance on Flora of modern world" and participated in various discussions on 'Present status of Botanical Nomenclature';
- National Seminar on 'Himalayan Plant Diversity: Taxonomy, conservation and Sustainable utilization', organized by BSI, Eastern Regional Centre in collaboration with North Eastern Hill University and East Himalayan Society for Spermatophyte Taxonomy on 8th-9th March, 2018, held at BSI, ERC, Shillong;
- Workshop on 'Herbarium Techniques and Plant Nomenclatures' organized by P.G. Department of Botany, Bethune College in collaboration with BSI, Central National Herbarium on 4th-5th July, 2017, held at Bethune College, Kolkata;
- Hands-on training programme on 'Herbarium Techniques and Plants Identification' organized by BSI, Deccan Regional Center, on 30th January, 2018, held at Khairatabad Degree college, Hyderabad;
- Hands on training on 'Plant Taxonomy and Herbarium Methodology' organized by BSI, Deccan Regional Center, for Telangana University and affiliated colleges students and faculty of Telangana state on 15th March, 2018;
- Botanical Art Workshop' organized by BSI, Eastern Regional Center, on 12th -24th March, 2018, held at BSI, ERC, Shillong;
- National Workshop on 'Herbarium Techniques and Plant Nomenclature', co-organized by Botanical Survey of India in collaboration with PG Department of Botany, R.K. Mission Vivekananda Centenary College, Rahara and ENVIS Resource Partner, BSI, AJCBIBG, Howrah, on 22rd -23rd February, 2018, held at PG Department of Botany, R.K. Mission Vivekananda Centenary College, Rahara;
- Botanical Heritage Walk' organized by BSI, Western Regional center in collaboration with Biospheres & Department of Botany, Modern College, Ganesh khind, on 07th January, 2018, held at BSI, WRC, Pune;
- Capacity building workshop on 'Long-term monitoring of Himalayan Biodiversity for Stakeholders of Himalayan region' organized jointly by Botanical Survey of India & Zoological Survey of India, on 23rd-24th March, 2018, held at ZSI-HARC, Solan, Himachal Pradesh;

- Besides, Botanical Survey of India observed and celebrated various festivals throughout the year such as International Day for Biodiversity (22nd May, 2017); World Environment Day (5th June, 2017); International Yoga Day (21st June, 2017); Environment Awareness programmes during 'Van Mahotsav' on 07th July, 2017; Independence Day (15th August, 2017); Himalayan Day (09th September, 2017); International day for preservation of Ozone layer (16th September, 2017); Gandhi Jayanti (2nd October, 2017); Republic Day (26th January, 2018); Earth Day (22nd April, 2018) etc.

GREEN SKILL DEVELOPMENT PROGRAMME (GSDP)

Green Skill Development Programme (GSDP), a National Mission of MOEF&CC, was initiated to develop green skill among unemployed youth especially groups of X/XII passed/dropout students so as to have technical knowledges and commitment to sustainable development which will help in attaining National Biodiversity Targets (NBTs), Sustainable Development Goals (SDGs) and National Determined Contributions (NDCs). In 2017, as part of this pilot programme, Botanical Survey of India was entrusted for preparing training modules of 420 hrs and imparting two training



GSDP Activities



GSDP Activities

courses on 'Floristic diversity' namely a) Foundation course on 'Biodiversity Conservationist' and b) Advanced course on 'Parataxonomist' in 09 regional centers including Andaman & Nicobar Regional Center (ANRC), Arid Zone Regional Center (AZRC), Arunachal Pradesh Regional Center (APRC), Central National Herbarium (CNH), Central Regional Center (CRC), Northern Regional Center (NRC), Sikkim Himalayan Regional Center (SHRC), Southern Regional Center (SRC) and Western Regional center (WRC). After initiation of the selection procedure of the candidates, the training programme was inaugurated on 29th May, 2017. The syllabus structure of Foundation and Advance course comprise of 11 different modules namely Biodiversity, Introduction to floral diversity of India, Economic botany, Medicinal plants and traditional knowledge, People's Biodiversity Register, Wetland ecosystem etc. The other topics such as Environmental issues, Biodiversity Acts, Wetland Laws, Nature trails, Nature guide and Ecotourism were taught by resource persons from different institutions. During this three months Fundamental course, both theory and practical classes were taken along with field trips to nearby forests and Wetland areas. After completion of theory and practical classes including field visits, theory and practical exams were conducted. On successful

completion of the training, certificates were distributed to the trainees. The students who qualified as 'Biodiversity Conservationist' were given the option to opt the advance course on 'Parataxonomist'. Likewise Foundation course, training modules of Advanced course, comprise Plant diversity, Collection and identification of different plant groups, Processing and preservation of specimens, Herbarium techniques, *in-situ* and *ex-situ* conservation, GRIDSS & GIS etc., is also of 420 hrs. During this course, BSI officials, research scholars and resource persons from other institutes imparted theory and practical classes. After successful completion of this training course, certificates were distributed to the trainees.

During 2017-18, BSI trained a total of 84 and 85 trainees in 'Foundation' and 'Advanced Course' respectively. After successful completion of both the courses, one student from NRC, Dehra Dun was appointed as Project Assistant under funded project in Department of Genomics, Forest Research Institute Dehra Dun; one trainee from the same Center initiated self-employment as Nature Guide, mushroom cultivator and environmentalist; one trainee from SRC, BSI, Coimbatore was selected in a project in SACON after completion of the same course.

one student from SRC, BSI was appointed as Field Assistant (GoMBRT) at BSI, SRC, Coimbatore, two students from of the same centre got opportunity as Field Assistant at IFGTB, Coimbatore; two students from SHRC, Gangtok were recruited as Field Assistant in NMHS Funded project at Sikkim University and another one of the same centre worked as outsourced for Garden maintenance at SHRC, BSI, Gangtok; one student from CNH, Howrah joined as Junior Project fellow on NDF Project in BSI, two students from same centre were engaged in Herbarium maintenance at CNH, Howrah, and two another started working at AJCB Indian Botanic Garden, Howrah as outsource basis; one student from ANRC, Port Blair was outsourced for Herbarium maintenance at ANRC, Port Blair; one student from WRC, Pune presently working as Junior Project Fellow in Naroji Godrej Centre for Plant Research, Shirwal, Maharashtra, one student of the same centre working as Junior Project Fellow in Tripura University and another got a job in Tissue Culture Lab of KF Bioplants, Pune. After this Pilot Green Skill Development Programme, a list of successful candidates were sent to the forest departments of West Bengal, Jharkhand and Chhattisgarh for further scope of absorption in various ongoing projects.

TRAINING AND DIGITIZATION OF NATURAL HISTORY MUSEUM (NHM) PLANT SPECIMENS FROM INDIA

As a part of inking of MoU between Botanical Survey of India (BSI) and Natural History Museum (NHM), three

scientific personnels of Botanical Survey of India viz. Dr. Basant Kumar Singh, Dr. Gopal Krishna & Dr. Dilip Roy visited the Natural History Museum (NHM), London on a four months official deputation training to digitize and repatriate the images of Indian plant specimens housed at NHM from 18.11.2017 to 15.03.2018. The team digitized more than 25,000 specimens belonging to more than 1000 species under five Angiosperm families (Asteraceae, Poaceae, Leguminosae, Gesneriaceae and Myrtaceae) and made a new benchmark in digitization programme duly acknowledged by NHM. The team also stub recorded certain data associated with the herbarium specimens. The digitized images are repatriated to India that can be used as reference material in Flora India project and publication of revisionary works of the concerned families. This data will provide baseline knowledge to be used by Indian Scientists to understand life on land, of which plants are the basic framework, and will also be key for providing the evidence for responsible conservation and environmental protection. The nomenclatural issues like typification can also be resolved by the interpretation of data associated with the specimens. Further study of the specimens will help the researchers to interpret the changes in plant distribution pattern and impact of climate change on phenology.

This training and digitization programme has opened an arena for further scientific collaboration and exchange programme between BSI & NHM. Harvesting the beneficial part of this collaboration can repatriate all the Indian specimens housed at NHM, back to India and can also give boost and exposure to the BSI scientific team in the field of modern curation protocols and digitization techniques.



Process of listing of available specimens in NHM Herbarium by the BSI Team



**SEMINAR/SYMPOSIUM/
CONFERENCE ATTENDED
BY BSI OFFICIALS**

Primula denticulata

SEMINARS/SYMPOSIUMS/CONFERENCES ATTENDED BY BSI OFFICIALS

Dr. A. A. Mao, Scientist-F

Organised workshop cum Hands-on training on 'DNA Barcoding-Molecular Analysis & Bioinformatics Approaches' from 21st-25th August, 2017, held at BSI, ERC, Shillong.

Organised 'Botanical Art Workshop' from 12th-24th March 2018, held at BSI, ERC, Shillong.

Organised a training programme on 'Basics of Plant Identification and Nomenclature' from 30th October-3rd November, 2017, held at BSI, ERC, Shillong.

Organised a National seminar (in collaboration with North Eastern Hill University and East Himalayan Society for Spermatophyte Taxonomy) on 'Himalayan Plant Diversity: Taxonomy, conservation and Sustainable utilization', on 8th & 9th March, 2018, held at BSI, ERC, Shillong.

Attended 7th training programme on 'Science, Technology and emerging trends in Governance' from 12th-16th February, 2018, sponsored by Department of Science & Technology, New Delhi and organised by Indian Institute of Public Administration, New Delhi.

Attended and delivered a lecture on 'Important Medicinal Plants of North East India' as on 'World Homoeopathy Day' on 10th April, 2017, organised by North Eastern Institute of Ayurveda & Homoeopathy (NEIAH), Shillong.

Delivered 08 lectures (01 lecture in Pune University, 01 lecture in D.Y. Patel University, 02 at University of Science & Technology and 04 in Mizoram University) for the UGC Refreshers Course for Assistant Professors.

Organised a training programme on 'Basics of Plant Identification and Nomenclature' from 30th October-3rd November, 2017, held at BSI, ERC, Shillong.

Attended Research Advisory Group meeting of Rain Forest Research Institute, Jorhat on 9th & 10th October, 2017; meeting of the State level Steering Committee for approving the Management Action Plan of Manas Biosphere Reserve and Dibru-Saikhua Reserve for 2017-18 to 2021-2022; attended inter-departmental wildlife crime meeting, organised by Forest Department, Government of Nagaland, on 6th December, 2017 at Dimapur.

Attended inaugural programme of North East Regional Brainstorming workshop on 'Bioresources Development and sustainable utilization' organised by BRCD, Shillong, on 4th December, 2017, at NEC Auditorium, Shillong.

Dr. B.K. Sinha, Scientist-F

Foreign Tour: Attended the 'IUCN Red List Assessor Training and Ebony Assessment' Workshop from 24th-28th April, 2017, at Royal Botanic Gardens, Peradeniya, Sri Lanka.

Dr. P.V. Prasanna, Scientist-F

Attended National Conference on 'Status of Invasive Alien Species in India' Organized by Zoological Survey of India and Botanical Survey of India on 14th & 15th December, 2017, Park Street, Kolkata.

Delivered a talk on 'Phytography, The art of describing plants' on 18th July, 2017, at Central National Herbarium.

Delivered a lecture about 'Research Activities of CNH' to the officials from MOEF&CC on 3rd April, 2017, at CNH, Howrah.

Attended 27th State level steering committee meeting of Sunderban Biosphere Reserve management on 19th July, 2017, held at Forest department, West Bengal.

Dr. G.P. Sinha, Scientist-E

Delivered an invited lecture entitled 'Flora of India with special reference to Uttar Pradesh' on 22nd September, 2017.

Attended a National Seminar on 'Paryawaran Evam Samaveshi Vikas: Chunautiyan evam Samadhan' on 4th & 5th August, 2017, held at MNNIT Allahabad.

Attended a two days Regional Consultation Workshop on 'Mainstreaming of Biodiversity: National Biodiversity Action Plan, National Biodiversity Targets and India's sixth National Report to CBD' on 22nd & 23rd August, 2017, organised by MoEF&CC, New Delhi through BCIL under a UNDP project at NBRI, Lucknow.

Attended a workshop on 'Molecular Systematics' and 'National Conference of Indian Lichenological Society'

respectively on 26th January, 2018 and 27th & 28th January, 2018 at NBRI, Lucknow, presented a paper entitled 'Status of Lichen diversity in Sikkim' and also chaired a session of the conference.

Organised a workshop on 'Lichen identification and Nomenclature' on 10th & 11th November, 2017, at CRC, BSI, Allahabad.

Attended (along with Dr. A.N. Shukla, Dr. A.K. Verma, Dr. Pooja Gupta and Sri Vineet Kumar Singh) a National Conference on 'Ecological Imbalance: A Threat to Fauna, Flora, Economy and Human Survival' on 22nd & 23rd September, 2017 at Vigyan Parishad Auditorium organized by DDU Government PG College, Saidabad, Allahabad, National Environmental Science Academy (NESA), New Delhi, Society of Life Sciences, Satna, M.P. and Environment & Social Development Association (ESDA), New Delhi.

Dr. M.U. Sharief, Scientist-E

Delivered a talk on 'Floral & Cultural Diversity: A BSI Perspective' at International Conference on 'Facets of Basic Science & Application' at Bijoy Krishna Girls' College, Howrah. He also delivered a talk on 'Biodiversity' to the Trainees of Green Skill Development Programme.

Delivered a talk on 'Andaman & Nicobar Island: A hotspot of Biodiversity & Paradise of sustainable tourism' on the occasion of Biodiversity Day at CNH.; delivered a talk on 'Andaman & Nicobar Island: A hotspot of Biodiversity' to the trainees of Forest Survey of India, Dehradun and also delivered a talk on the 'Importance of Wetland vegetation' on the occasion of World Wetlands Day at Howrah.

Dr. P. Lakshminarasimhan, Scientist-E

Delivered a talk on 'Herbarium Techniques' on 8th July at Department of Botany, Shivaji University, Kolhapur in a National Workshop on 'Plant Taxonomy: Basics and Synthesis of Data' *w.e.f.* 3rd-8th July, 2017, organised under "Center for Education, Learning and Research Training in Environment, Forest & Climate Change, Govt. of India, New Delhi"; was also Chief Guest of the Valedictory function.

Participated in the 'Nexus International Workshop 2017' on "Climate Change Adaptions for Sustainable Development: A Vedic Perspective" on 27th & 28th August, 2017 jointly organized by Govardhan Ecovillage, Shree Halari Visa Oswal College of Commerce at Palghar District (sponsored by NEERI).

Attended the Regional Consultation Workshop on 'Mainstreaming Biodiversity at Ahmedabad on 7th & 8th

September, 2017, organised by MoEFCC, NBA & UNDP and was part of group from Maharashtra.

Delivered the inaugural address "Flora of India - Present status" as Chief Guest in the 'National workshop on Floristics, Monographs and Revisionary studies in the age of Molecular Systematics' on 5th February, 2018 in the Botany Department, Shivaji University, Kolhapur organised under "Centre for Education, Learning and Research Training in Angiosperm Taxonomy".

Attended one day workshop on the occasion of International Day of Forests (21st March) and World Water Day (22nd March) 2018 as a Guest of Honour organized by Maharashtra Forest Dept., Biospheres & Dept. of Botany, SPPU, Pune on Wednesday, 21st March, 2018 in Department of Botany, Savitribai Phule Pune University, Pune.

Attended an International Conference on 'Environmental Science, Ecology, Biodiversity and Climate Change' [22nd and 23rd July 2017] and delivered a Key note Address on 'An introduction to the Convention on Biological Diversity for people working with botanical collections', organised by Department of Botany and Microbiology, Waghire College of Arts, Commerce and Science, in association with Indo Global Chamber of Commerce, Industries and Agriculture at Waghire College, Saswad, Pune.

Delivered a talk on 'Biodiversity with reference to human and environment interaction' as Key Note Speaker during the Environment Conclave on 29th July, 2017 at Symbiosis Centre for Management Studies, Pune.

Attended the National Conference on 'Emerging Trends in Mycology' on 5th January, 2018 organised by G.M. Momim Women's College, Bhiwandi (in their college) & Mycological Society of India under the aegis of University of Mumbai as Chief Guest and delivered the inaugural address 'Diversity of Algae, Fungi, Lichens and Non-Flowering and Flowering plants of India: An Overview'; besides gave a short talk on 'BSI, WRC, Pune and also the work done on Fungi by BSI Scientists'.

Foreign Tour: Attended the 'IUCN Red List Assessor Training and Ebony Assessment' Workshop from 24th-28th April, 2017, at Royal Botanic Gardens, Peradeniya, Sri Lanka.

Dr. Pratibha Gupta, Scientist-E

Attended Two weeks Faculty Development Programme "Climate Smart Governance" sponsored by Department of Science and Technology, Government of India conducted by Indian Institute of Public Administration (IIPA), New Delhi and delivered a presentation.

Delivered Invited Lecture on the topic "Antarctica Abhiyan" at Jhapordah Duke Institution (JDI), Domjur, Howrah on the occasion of 'Domjur Science Fair – 2018' organised by Domjur Integrated Society for HIV/AIDS (Disha Domjur), Dakshin Jhapordah, Domjur, Howrah, W.B.

Dr. A.B.D. Selvam, Scientist-D

Delivered a special lecture on the topic 'Conservation of biodiversity with special reference to Indian Medicinal Plants' in the 'National Seminar on Biodiversity of Medicinal Plants: Emerging trends and Challenges' on 4th January, 2018, held at Queen Mary's college, Chennai.

Dr. A. Benniamin, Scientist-D

Attended National Symposium on 'Evaluation and Conservation of Plant Germplasm' organised by Punjabi University, Patiala from 15th-17th September, 2017, held at Punjabi University, Patiala.

Attended National Symposium on 'Pteridological Studies in India: Perspective and Modern approaches in Relation to Environment & Climate Change' and presented a paper on 'Pteridophytic Diversity of Someshwara Wildlife Sanctuary, Karnataka, Western Ghats' on 22nd & 23rd February, 2018, held at Itanagar, Arunachal Pradesh.

Dr. A.K. Sahoo, Scientist-D

Attend two days National seminar on 'Status of Invasive Alien species in India' on 14th & 15th December, 2017 organized by BSI & ZSI, MOEFCC, held at The Park, Kolkata.

Participated in the 128th Foundation day celebration of Botanical Survey of India and Seminar on "Progress and Prospects in Plant Taxonomy" on 13th & 14th, 2018, held at ABC Hall, Indian Museum premises.

Foreign Tour: Participated (as MoEF & CC nominee) as one of the four Indian delegates in the International Conference on 'Popularization of Science' from 4th-6th October, 2017, organised by the 'Institute of Learning Education' Oregon State University in collaboration with U.S. National Science Foundation and co-host with National Science Centre, Petrosains, Malaysia, held at Kualampur, Malaysia.

Dr. (Mrs.) Chaya Deori, Scientist-D

Attended a training programme on 'Science and Technology for rural societies (for Scientists & Technologists)' from 19th-23rd March, 2018, sponsored by Department of Science & Technology, New Delhi and organised by Indian Institute of Public Administration, New Delhi.

Dr. D. Singh, Scientist-D

Attended a workshop cum Hands on Training on 'DNA barcoding - Molecular analysis & Bioinformatics approaches' from 21st – 25th August, 2017 organized by Botanical Survey of India, Eastern Regional Centre, Shillong.

Attended a 'National seminar on Polar Sciences' and presented a lecture on 'Diversity of Bryophytes of Larsemann Hills, East Antarctica' from 16th to 17th May, 2017, organized by National Centre for Antarctic and Ocean Research, Ministry of Earth Science, Headland Sada, Vasco-da-Gama, Goa.

Dr. D.K. Agrawala, Scientist-D

Attended First REMC monthly seminar at Forest Department, Deorali for lecture on 'Status of Red Panda in Sikkim Himalaya and Abundance and status of Snow Leopard in Sikkim Himalaya delivered' by WWF-1.

Attended Training programme of GIS at CNH, Howrah.

Delivered a lecture on 'Indian Orchids-Diversity and Species Concept' and received the best presentation award during the event.

Attended State level workshop on Biodiversity organized by Sikkim Biodiversity Board and provided biodiversity related data to the ministry in a 26 page questionnaire.

Attended one day conference on 'The Organic Movement: way forward' organized by Chief Minister's Office.

Attended one day Science Colloquium on 'Ayurveda for all and role of scientific community in nation building'.

Attended a training programme as resource person and delivered a lecture on 'Himalayan Orchids as indicator of climate change'; one day capacity building training programme on 'Biodiversity Conservation and climate change' organized by GBPNIHESD.

Attended workshop on GST and TDS organized by Government of Sikkim at Chintan Bhawan, Gangtok.

Attended Stakeholder's workshop on developing disaster resilience action plan through GIS and prioritizing action for natural disaster risk reduction in urban agglomeration of Shillong and Gangtok, organized by GBPNIHESD, Sikkim Unit Gangtok.

Attended National Conference on 'Floriculture for Rural and Urban Prosperity in the scenario of Climate Change', organized by ICAR-NRC (Orchids), Pakyong. Attended International Conference on 'State of the Cryosphere in

the Himalaya: with a focus on Sikkim and Eastern Himalaya' Organized by DST, Government of Sikkim.

Attended a four days workshop and Hands on training on 'Biodiversity conservation, Vegetation sampling, Climate Change and Species distribution modelling' and delivered a lecture on 'Plant specimen collection, Systematic studies and Herbarium cataloguing'.

Foreign Tour: Attended the 'IUCN Red List Assessor Training and Ebony Assessment' Workshop from 24th-28th April, 2017, at Royal Botanic Gardens, Peradeniya, Sri Lanka.

Dr. Harish Singh, Scientist-D

Attended the International Seminar on 'Forests, Sacred groves and Environmental Heritage in India' and presented a research paper on 'Traditional conservation of some plants in rural and tribal areas of India' on 30th March, 2017, held at Indian museum.

Attended a workshop on 'Agro biodiversity and Strategic plan for Integrated Landscape management for organic and sustainable agriculture' and delivered a presentation on 'Role of wild plants/forests in Agro biodiversity management in tribal and rural areas' on 5th September, 17, held at IBRAD, Kolkata.

Attended Seminar on 'Progress and prospects of Taxonomy' and 128th Foundation Day on 13th & 14th February, 2018, held at Ashutosh Birth Centenary Hall, ISIM, Kolkata.

Dr. J. Jayanthi, Scientist-D

Delivered a talk on 'Biodiversity (Floral diversity) Conservation & Sustainable Utilization' during the event "Environment Conclave" on 29th July, 2017, organized by Symbiosis Centre for Management Studies, Pune.

Attended the Regional Conference on 'Environment 2017' on 7th & 8th October, 2017 organized by National Green Tribunal, Pune, held at Dhanvantri Auditorium, AFMC, Pune.

Dr. Jagadeesh Ram, T.A.M., Scientist-D

Attended the 'Training Programme for DDOs' on 18th August, 2018 at Ganganagar Auditorium of Indra Paryavaran Bhavan, MoEF & CC, New Delhi.

Attended the Workshop cum Hands on training on 'DNA Barcoding - Molecular Analysis & Bioinformatics Approaches' from 21st - 25th August, 2017, held at BSI, ERC, Shillong.

Attended the 'Workshop on Lichen Identification and Nomenclature' as Resource Person on 10th & 11th November, 2017, held at BSI, CRC, Allahabad.

Dr. Jeewan Singh Jalal, Scientist-D

Attended National Conference (16-18 March, 2018) on 'Current Trends in Conservation, Sustainable Development and Biological and Social Benefits of Medicinally and Floriculturally Significance of Orchids' from 16th-18th March, 2018, held at Wayanad, Kerala and presented a paper on title 'Status of Orchids in different Protected Areas of Goa'.

Dr. K.A. Sujana, Scientist-D

Attended an International Seminar on 'Forests, Sacred groves and Environmental Heritage in India' and presented a research paper on 'Bio-cultural perspectives of sacred groves and serpentine worship' on 30th March, 17, held at Indian museum, Kolkata.

Attended 27th Conference of the Indian Association for Angiosperm Taxonomy & International Symposium on 'Plant Systematics: Priorities and Challenges' from 10th-12th November, 2017 and presented an oral paper on 'Conservation of wild nutmegs: A group of most primitive and highly threatened trees in Western Ghats', held at Department of Botany, University of Delhi.

Attended training on 'NTRP, Bhabishya, Revision of Pension and Compilation of Accounts & Settlement of Audit paras' on 18th August, 2017, held at MOEF & CC, New Delhi.

Attended National Conference on 'Status of Invasive Alien Species in India' on 14th and 15th December 2017, held at The Park, Kolkata.

Attended Seminar on 'Progress and prospects of Taxonomy' and 128th Foundation Day on 13th & 14th February, 2018 at Ashutosh Birth Centenary Hall, ISIM, Kolkata.

Dr. K. Karthigeyan, Scientist-D

Delivered a lecture on 'Island Flora: Diversity and Endemism in the flora of Andaman & Nicobar Islands - an Overview' on 7th March, 2018, in the workshop, "Taxonomy of Vascular Plants: Principles & Practices", held at University of Calcutta.

Dr. Kanad Das, Scientist-D

Delivered an invited lecture on 'Genus *Russula* Pers. (Russulales): Development in Systematics with Morphology and Phylogeny' in a National Seminar on

'Recent Advancement in Cryptogamic Botany' & '16th Probir Chatterjee Memorial Lecture' on 2nd February, 2018, in Department of Botany, University of Calcutta.

Delivered an invited lecture on 'Wild Mushrooms: Exploring the Relevancy of Morphological Diversity in the Era of Molecular Phylogeny' in a National Seminar on "Urban Biodiversity: Documentation and Conservation" on 7th March, 2018, being held at Bethune College, Kolkata.

Delivered an invited talk entitled 'Diversity of wild mushrooms in India' in West Bengal Biodiversity Board sponsored State Level Seminar on 'Forest resource and sustainable management in West Bengal' on 31st July, 2017, held at Lalgarh Govt. College, Lalgarh, West Bengal.

Delivered an invited talk entitled 'Diversity and systematics of wild Indian mushrooms' in 4th one day seminar on 'Plant Science' on 15th September, 2017, held at Hooghly Mahasin College, Chinsurah, West Bengal.

Dr. Kumar Ambrish, Scientist-D

Participated in Regional Consultation Workshop on 'Mainstreaming Biodiversity' on 14th & -15th September, 2017 organized by MOEF & CC & Punjab State Biodiversity Board at Chandigarh as one of the experts.

Attended a Consultative workshop on 'India's Sixth National Report to CBD and progress achieved on Biodiversity Targets-6' on 19th February, 2018, organized by WII, Dehradun and UNDP, New Delhi and delivered a PPT on 'Status and Trends of Floral Diversity in India' at WII, Dehradun.

Attended a Workshop on 'Biosafety for GM crops' on 16 March, 2018 and chaired a technical session in Y.S. Parmar University of Horticulture, Nauni, Solan, Himachal Pradesh.

Dr. L. Rasingam, Scientist-D

Attended 'ARC-GIS training program' from 10th -12th May, 2017, held at CNH, Howrah.

Attended the Workshop and Hands on training on 'DNA barcoding, Molecular analysis and Bioinformatics approaches' from 20th - 26th August, 2017, held at ERC, Shillong.

Attended two days Regional Consultation Workshop on 'Mainstreaming Biodiversity National Biodiversity Action Plan (NBAP), National Biodiversity Targets (NBT) and India's Sixth National Report on CBD' conducted by the MoEF & CC, on 21st - 22nd September, 2017, held at the Plaza Hotel, Hyderabad.

Attended State level workshop on the 'Preparation of 6th National Report to CBD' on 19th December, 2017, held at Hotel DV Manor, Vijayawada, organised by the Andhra Pradesh State Biodiversity Board.

Delivered a guest lecture on 'Recent advances in Plant Taxonomy' at one day state level seminar on 'Recent Advances in Plant Sciences' on 25th January, 2018, held at Department of Botany, Virudhunagar Hindu Nadars' Senthikumara Nadar College, Virudhunagar.

Delivered a keynote address on 'Recent trends in Plant Taxonomy' at State level workshop on 'Herbarium- Its role and significance in Plant Taxonomy' on 21st February, 2018, held at Government Degree College, Siddipet, Telangana.

Dr. Lal Ji Singh, Scientist-D

Attended thesis seminar on 'Taxonomy and Ecology of Opisthobranchs in Andaman and Nicobar Islands' 16.08.2017, held at Zoological Survey of India, ANRC, Port Blair.

Dr. M. Bhaumik, Scientist-D

Participated 'International Biodiversity Day' on 22nd May 2017 and delivered a lecture on 'Rhododendron diversity in different landscapes to promote tourism in Arunachal Pradesh' held at CHN.

Participated in the 128th Foundation of Botanical Survey of India and Seminar on "Progress and Prospects in Plant Taxonomy" on 13th-14th February, 2018, held at ABC Hall, Indian Museum, Kolkata premises.

Delivered a lecture on 'Forests of North East India and identification of common plants' to Forest Survey of India trainee on 22nd August, 2017, at CNH committee room. Also participated valedictory session on 25th August, 2017.

Attended 'Agro Biodiversity Workshop' and delivered a lecture on 'Wild relatives of crop plants' on 5th September, 2017, organized by Indian Institute of Bio-Social Research & Development (IBRAD) Kestopur, Kolkata .

Dr. M. Palanisamy, Scientist-D

Delivered invited lecture on 'Biodiversity & Its conservation values in India', on 5th January, 2018, in a National seminar organized by PG & Research Department of Botany, Queen Mary's College, Chennai.

Delivered an invited guest lecture on 'Perspectives of Indian Seaweed Diversity' on 7th February, 2018, at Dr. N.G.P College of Arts & Science.

Delivered an invited special guest lecture on 'Bio resources of Antarctica' on 16th March, 2018, sponsored by UGC, at Jamal Mohammad College, Trichy.

Attended an International seminar on 'Coastal and Marine Biodiversity and Conservation (ISCMBC-2018)' and presented a paper titled 'Diversity, distribution and taxonomy of marine macro algae of Karnataka coast, India' on 15th -16th March, 2018, organized by CAS in Marine Biology, Faculty of Marine Sciences, Parangipettai.

Dr. M. Y. Kamble, Scientist-D

Participated 21st Punjab Science Congress with theme "Scientific Advances for Inclusive Development and Environmental Protection" and presented a Poster entitled 'Ethno-Medicinal Plants Used in Liver Disorders by Native Tribes of Andaman and Nicobar Islands, India: A Review' on 7th-9th February, 2018, organized by Punjab Agriculture University, Ludhiana.

Attended XXVII Annual Conference of Indian Association for Angiosperm Taxonomy & International Symposium on "Plant Systematics: Priorities and Challenges" and presented a paper entitled, 'Diversity of Grasses in Shevaroy Hills of Eastern Ghats, India' on 10th to 12th November, 2017, organized by Department of Botany, University of Delhi, Delhi.

Attended National conference on "Multidisciplinary Approaches in Life Science: Research and Application for Sustainable Development (NCMALS 2018)" and presented a research paper entitled, 'Potential Ethno-medicinal plants of Bay of Bengal found in certain wildlife sanctuaries of Andaman group of Islands, India' on 5th-6th January, 2018, organized by Yashwantrao Chavan Institute of Science, Satara.

Dr. Prashant K. Pusalkar, Scientist-D

Attended Experts and Managers Meet cum workshop on 'Preparation of Zonal Master Plan (ZMP) for Eco-Sensitive Zone (ESZ) around Protected Areas' from 28th-30th August, 2017, held at Wildlife Institute of India Dehradun.

Attended one-week DST-sponsored training course 'Advances in Wildlife Conservation' for Government officers from 12th-16th March, 2018 at WII by the Wildlife Institute of India, Dehradun.

Attended interactive workshop for researchers and research institutes on 'Access and Benefit Sharing (ABS) - Mechanism and Conservation of Traditional Knowledge Systems through Patents and IPR Regimes' on 30th

January, 2018, organized by Uttarakhand State Council of Science & Technology (UCOST) in collaboration with Indo-German co-operation (GIZ) and Uttarakhand State Biodiversity Board, Uttarakhand at UCOST headquarter, Dehradun.

Dr. Pushpa Kumari, Scientist-D

Attended National Conference on 'Status of Invasive Alien Species in India' on 14th & 15th December, 2017 organized by Zoological Survey of India and Botanical Survey of India, Park Street, Kolkata.

Attended XIXth International Botanical Congress held from 23rd-29th July, 2017, at Shenzhen, China and delivered oral presentation on 'Ecology, endemism and generic circumscription in woody Bamboos in India' and poster presentation on 'Conservation and reintroduction of *Bentinckia nicobarica* (Kurz.) Becc. In Nicobar Islands- A case study'.

Dr. R.K. Gupta, Scientist-D

Attended a workshop cum Hands on Training on "DNA barcoding - Molecular analysis & Bioinformatics approaches" from 21st - 25th August, 2017, organized by Botanical Survey of India, Eastern Regional Centre, Shillong.

Attended an International seminar on 'Forests, Sacred Groves and the Environmental Heritage of India' on 30th March, 2017 at the Ashutosh Birth Centenary Hall of the Indian Museum.

Delivered a lecture on 'Biomonitoring River and water bodies with particular reference to algae' in Zoological Survey of India, Kolkata for the trainees of pollution control board, Telangana.

Dr. Rajib Gogai, Scientist-D

Attended three days Training programme on 'Arc-GIS' from 10th to 12th May, 2017 at CNH, Howrah.

Attended 'Conservation and Management of Wetland (Eastern States)' organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, on 23 June, 2017, held at ZSI HQ, Kolkata.

Delivered a talk on 'Biodiversity and Sustainable Tourism-a case study from Northeast India, a global biodiversity hotspot' on 22nd May, 2017, held at Central National Herbarium, BSI for the occasion of International Biodiversity Day.

Attended a workshop on 'Diversity of Angiospermic

plants' and delivered a talk on '*Impatiens* L. (Balsaminaceae: Wild Balsams) of Eastern Himalaya' on 5th March, 2018 organised by Department of Botany, Calcutta University.

Attended a National Seminar and delivered an invited lecture on 'An overview of Phytodiversity of North-east India—a plant hunter's experience' on 7th March, 2018 organised by Department of Botany, Bethune College, held at Bethune College, Kolkata.

Dr. Rashmi Dubey, Scientist-D

Attended 'XXXX All Indian Botanical Conference of Indian Botanical Society & National symposium on Evaluation and Conservation of plant Germplasm' and presented a paper on 'Taxonomic Studies of Floristic Microfungi from North Western Ghats' from 15th-17th September, 2017 at Punjabi University, Patiala, Punjab.

Attended National Conference on "Emerging trends in Mycobiototechnology" on 5th January, 2018, organized by G.M. Mowin Womens College, University of Mumbai.

Dr. S. Kaliamoorthy, Scientist-D

Attended Kerala Science Congress cum exhibition *w.e.f.* 25th – 30th January, 2018, organized by the KSCSTC, CWROM, Government Brennen College, Thalassery. An exhibition stall was made with orchid photographs and BSI publications.

Delivered an invited lecture on 'Plant Biodiversity and Conservation - with a special note on orchids' on 9th February, 2018, at the Department of Biotechnology, Selvam College of Arts & Science, Namakkal.

Dr. S.L. Meena, Scientist-D

Attended a National conference on 'Status of Invasive Alien Species in India' and presented a poster on 'Survey of Invasive Alien Plant Species of Rajasthan' on 14th & 15th December, 2017, organized by ZSI & BSI at Kolkata, held at The Park, Kolkata.

Dr. S.S. Dash, Scientist-D

Organized "Capacity building workshop on Long-term Monitoring of Himalayan Biodiversity for stakeholders of Himalayan Region" organized at Gangtok, Sikkim from 29th – 30th March, 2017.

Delivered a plenary lecture "Plant Taxonomic Research Priorities, Challenges and Opportunities" in National seminar on "Trends in Cotemporary Research in Plant Science" held in Dept. of Botany & Forestry, Vidyasagar University, Medinipur on 29-30 March 2018.

Delivered a Invited lecture "Phytogeography and affinity of Eastern Himalayan Flora" in National seminar on "Himalayan Plant Diversity: Taxonomy, Conservation and Sustainable Utilization" held in Botanical Survey of India, Eastern Regional Centre, Shillong on 8-9 March 2018.

Attended the Annual Conference of Indian Association for Angiosperm Taxonomy & International Symposium On Plant Systematics: Priorities And Challenges and delivered a talk "Phonological aspects of Plants in Indian Himalayan Region: A case study using herbarium records to identify climate change indicator" held at Dept. of Botany, Delhi University, Delhi on 10-12 Nov. 2017.

Delivered an Invited lecture "Phytogeography and affinity of Indian Flora" in Pre-Ph.D workshops at Dept. of Botany, University of Calcutta, Kolkata on 7th Nov. 2018.

Delivered a talk on the progress on the project "Floral assessment of through long term monitoring plots in Indian Himalayan landscape" organized at Almorah, Uttarkhand at GPNIHED on 12-13 Sept. 2017.

Attended 5 days training workshop on "Knowledge management and Knowledge sharing" at IIPA, New Delhi *w.e.f.* 5-9th Feb. 2018.

Attended 2 days Conference on Invasive Alien species of India at Park Hotel, Kolkata *w.e.f.* 14-15 Dec. 2017 organized by BSI and ZSI.

Attended the Brain storming meeting of working groups Meeting of NMHS at IP Bhawan, MoEFCC, New Delhi on 12th 2. 2018.

Delivered a talk on "Monitoring of Floral Diversity in Indian Himalayan landscape" in the "Capacity building workshop on Long-term Monitoring of Himalayan Biodiversity for stakeholders of Himalayan Region" organized at Sholan, Himachal Pradesh, organized at ZSI, HARC, Solan on 24th – 25th March, 2018.

Dr. S.S. Hameed, Scientist-D

Attended "Multidisciplinary International Conference on Green Earth: A Panoramic View" and delivered a talk on "The role of Botanic Gardens in plant conservation: A special reference to AJC Bose Indian Botanic Garden, Howrah" held at B. N. Bandodkar College of Science, Thane, Mumbai in collaboration with Bombay Natural History Society and Birbal Sahni Institute of Palaeosciences, Lucknow and acted as a member of National Advisory Committee.

As the part of AHRC, School Project (in collaboration with Kew Garden, U.K, University of Sussex, U.K & BSI, MoEF & CC) delivered lectures to Kishore Bharati High School,

Dum Dum on 'General introduction about the Garden & Deforestation: A lurking menace' and 'General introduction about the Garden & Plant Wonders'.

Delivered Lectures on 'Botanic Garden and Biodiversity Conservation' to Lake Town school students as the part of BSI's collaborative school project programme.

Dr. V.P. Prasad, Scientist-D

Attended a regional workshop on "Conservation and Management of Wetland (Eastern States)" on 23rd June 2017, organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, at ZSI HQ, Kolkata.

Attended 'XXVII Annual Conference and the International Seminar of Indian Association for Angiosperm Taxonomy (IAAT)' from 10th - 12th November, 2017, held at Delhi University, New Delhi.

Dr. V. Sampath Kumar, Scientist-D

Attended a National Conference on 'Status of Invasive Alien Species in India' on 14th-15th December, 2017, organized by Zoological Survey of India and Botanical Survey of India, held at Park Street, Kolkata.

Attended a workshop on 'Herbarium Technique and Plant Nomenclature' on 17th April, 2017, held at Ramkrishna Mission Vivekananda Centenary College, Rahara, Kolkata and presented 02 lectures on 'History of Code of Botanical Nomenclature' and 'Categories and Hierarchy'.

Dr. Vinay Ranjan, Scientist-D

Attended a seminar on 'Agro-Biodiversity' on 5th & 6th September, 2017 at IBRAD, Kolkata.

Mr. Vinod Maina, Scientist-D

Attended consultation workshop on "Main streaming of conservation of Biological Diversity for preparation of 6th National report" on 7th & 8th September, 2017, at Ahmedabad, Gujarat during.

Attended National workshop on "Biodiversity and Conservation" on 9th February, 2018, organized by Dept. of Botany, M. S. University, Baroda and Gujarat Ecological commission, held at Navsari Agriculture University, Waghai. Participated in 'Botany Fest-2018', chaired the inaugural secession and judged the various competitions at National workshop on "Biodiversity and Conservation". Delivered two lectures on 'Plants used for making Musical instruments by Indigenous people of Rajasthan' and 'Diversity of *Zingiberaceae*'.

Dr. V.K. Rawat, Scientist-D

Attended a workshop on 'Agriculture Development for Farmers welfare' on 22nd December, 2017, organized by Department of Field Publicity, Ministry of Information and Broadcasting, Itanagar.

Attended National Symposium on "Pteridological Studies in India: Perspectives and Modern approaches in relation to Environment & Climate Change" on 22nd-23rd February, 2018, held at Botanical Survey of India, Itanagar, Arunachal Pradesh.

Dr. Deepu Vijayan, Scientist-C

Attended a training programme on NTRP/EIS/CDDO on 11th-12th January, 2018, at Institute of Government Accounts and Finance, RTC, Kolkata, at PAO, BSI/ZSI, Kolkata.

Dr. Giriraj Singh Panwar, Scientist-C

Attended a seminar on 'Research Needs: Forest and Climate Change in Himalayan Region' on 27th March, 2018, organized by Ecology, climate Change and Forest Influence Division, FRI, Dehradun.

Attended a workshop on 'Relevance of Access and benefit sharing for Scientific Research Institutes' on 21st March, 2018, organized by Uttarakhand Biodiversity Board, Dehradun and TERI.

Attended an International conference "XIX Commonwealth Forestry Conference-2017" on 3rd & 7th, April, 2017 and presented a poster entitled 'Micropropagation of *Lilium polyphyllum* D. Don ex Royle: a critically endangered astavarga plant', held at Forest Research Institute, Dehradun.

Dr. Ramesh Kumar, Scientist-C

Attended one day workshop on "Biodiversity and sustainable Tourism" at Forestry Training Institute, Jaipur on the occasion of International Biodiversity Day (22nd May 2017) organized by Rajasthan State Biodiversity Board.

Attended National workshop on "Biodiversity and Conservation" on 9th February, 2018 organized by Dept. of Botany, M. S. University, Baroda and Gujarat Ecological commission, held at Navsari Agriculture University, Waghai.

Dr A.K. Verma, Scientist-B

Participated in "Hands on Training Workshop on Cytological Techniques" on 12th-16th March, 2018, and delivered an invited lecture on 'Cytology and its scope in Plant Taxonomy' organised by BSI, WRC, Pune.

Dr. A.N. Shukla, Scientist-B

Delivered an invited lecture on the topic entitled “Flora of Ladakh: an annotated checklist of vascular plants”.

Attended a National Seminar on “Paryawaran Evam Samaveshi Vikas: Chunautiyan evam Samadhan” on 4th & 5th August, 2017, held at MNNIT Allahabad.

Attended a National Symposium on 'Pteridological studies in India: Perspective and Modern approaches in relation to environment & Climate Change' on 22nd & 23rd February 2018, held at Botanical Survey of India, APRC, Itanagar,.

Dr. Avishek Bhatattacharya, Scientist-B

Attended National Conference on 'Status of Invasive Alien Species in India' on 14th–15th December, 2017 organized by Zoological Survey of India and Botanical Survey of India, Park Street, Kolkata.

Attended the workshop on 'Herbarium Techniques and Plant Nomenclature' and delivered 02 lectures on 'Different Kinds of Names' and 'Flora, Revision, Monographs' on 18th April, 2017, held at Ramkrishna Mission Vivekananda Centenary College, Rahara, Kolkata.

Attended 2 days Exhibition in connection with the 'International Day for Biological Diversity 2017' on 22nd & 23rd May, 2017, at Kala Academy, Panjim, Goa, organised by MOEF & CC in association with NBA and State Biodiversity Authority.

Attended a workshop cum Hands on Training on "DNA barcoding - Molecular analysis & Bioinformatics approaches" from 21st - 25th August, 2017, organized by BSI, ERC, Shillong.

Attended as a member of Programme committee for the project monitoring meeting on 'Scheme for Young Scientists & Technologists (SYST)' of the SEED Division of DST on 18th and 19th August, 2017, held at CNH.

Acted as a member of the National Advisory Committee of the National Conference on 'Advances in Biodiversity, Biotechnology and Environment' from 22nd to 23rd December, 2017, held at SSGM College, Kopargaon, District Ahmednagar (Maharashtra).

Dr. C. S. Purohit, Scientist-B

Attended a training programme on 'Arc GIS software (installation and basics of software usage)' from 9th - 12th April, 2017, organised by CNH, BSI, Kolkata.

Dr. David Lalsama Biate, Scientist-B

Attended National Seminar on “Himalayan Plant Diversity: Taxonomy conservation and Sustainable Utilization” on 8th & 9th March, 2018, held at BSI, ERC.

Attended Training programme on “NTRP/EIS/CDDO” on 11th & 12th January, 2018, at Regional Training Centre, PAO Kolkata.

Attended Science Colloquium on “Ayurveda for all and role of scientific community in nation building” on 12th December, 2017, held at ICAR-NOFRI organized by Regional Ayurveda Research Institute, Tadong.

Attended one day DDOs training cum workshop on NTRP, EIS & PFMS on 18th August, 2017 at Indira Paryavaran Bhawan, New Delhi

Attended 'ARC-GIS Training' from 10th– 11th May, 2017 at CNH, Howrah.

Dr. Debasmita Dutta Pramanick, Scientist-B

Delivered a talk on 'Biodiversity conservation: Issues and Challenges' on 22nd May, 2017, at GHGS School, Andul, Howrah.

Attended hands -on -training on “DNA barcoding Molecular Analysis & Bioinformatics approaches” held on 21st-25th August, 2017 at BSI, ERC, Shillong.

Attended DST sponsored workshop cum training '17th Foundation Programme for Scientists and Technologists', held on 22nd January, 2018 – 16th March 2018, at IIPA, New Delhi.

Attended an International Workshop on 'Smart Republic 2018' sponsored by World Bank, held on 15th-16th February, 2018, held at Hotel Sangri La Eror's, New Delhi.

Attended two days' workshop on 'Consumer Protection Acts', held on 7th-8th March, 2018, at IIPA, New Delhi.

Attended in one day workshop on 'Resilient India' and participated in group discussions regarding 'Innovative methods towards development of science', held on 12th March, 2018, at Indian Habitat Centre, New Delhi.

Dr. K. Chowlu, Scientist-B

Attended a workshop on 'Agriculture Development for Farmers welfare' on 22nd December, 2017, organized by Department of Field Publicity, Ministry of Information and Broadcasting, Itanagar.

Attended National Symposium on “Pteridological Studies in India: Perspectives and Modern approaches in relation

to Environment & Climate Change” 22nd-23rd February, 2018, organised by Botanical Survey of India, Itanagar, Arunachal Pradesh..

Dr. K. Avinash Bharti, Scientist-B

Attended 2 days Exhibition in connection with 'International Day for Biological Diversity 2017' on 22nd-23rd May, 2017, at Kala Academy, Panjim, Goa, organised by MOEF & CC in association with NBA and State Biodiversity Authority.

Dr. Monalisha Dey, Scientist-B

Participated in the workshop cum Hands on Training on 'DNA barcoding Molecular analysis & Bioinformatics approaches' from 21st - 25th August, 2017, held at BSI, ERC, Shillong.

Participated in the “17th Foundation Training Programme For Scientists and Technologists” from 22nd January - 16th March, 2018, sponsored by Department of Science and Technology, Government of India, New Delhi, conducted by Indian Institute of Public Administration (IIPA), New Delhi.

Dr. M. Sankara Rao, Scientist-B

Attended “DNA Bar-coding” workshop on 4th - 5th January, 2018, held at ZSI, FBRC, Hyderabad.

Delivered a talk on “Conservation of medicinal plants in Sacred Groves” at International symposium on 'Biodiversity of Medicinal plants & Orchids, Emerging trends and challenges (BMPO)' on 9th February, 2018, held at Acharya Nagarjuna University, Guntur, Andhra Pradesh.

Attended Andhra Pradesh State Biodiversity Board meeting on 17th October, 2017, at Vijayawada, Andhra Pradesh. Also attended Telangana State Wildlife Board meeting at Secretariat on 19th December, 2017.

Attended Hands-on-training program on 'DNA Barcoding: Methods and applications' on 4th & 5th January, 2018 at Freshwater Biological Regional Centre, Zoological Survey of India, Hyderabad.

Dr. Priyanka Ingle, Scientist-B

Attended International Conference on 'Environmental Science, Ecology, Bio Diversity and Climate Change' on 22nd & 23rd July, 2017 and presented a paper on the topic 'Effect of mutagens on pollen sterility of Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub. at Waghire College, Saswad, Pune.

Attended National Seminar on 'Himalayan Plant Diversity: Taxonomy, Conservation and Sustainable Utilization' and presented a paper on the topic 'Characterizing the potential weed from Onion fields that resembles high morphological similarities with Onion by using molecular techniques' on 8th - 9th March, 2018, held at BSI, ERC, Shillong.

Dr. Puneet Kumar, Scientist-B

Attended XIX Commonwealth Forestry Conference from 3rd-7th, April, 2017 and presented a paper, at Forest Research Institute, (Indian Council of Forestry Research & Education), Dehradun.

Attended workshop cum Hands on Training on "DNA barcoding - Molecular analysis & Bioinformatics approaches" from 21st - 25 August, 2017, organized by Eastern Regional Centre, Botanical Survey of India.

Attended XXXX All India Botanical Conference and National Symposium on “Evaluation and Conservation of Plant Germplasm' from 15th-17th September, 2017, being organized by Department of Botany, Punjabi University, Patiala.

Attended one day Interactive workshop on 'ABS mechanism and conservation of traditional knowledge systems through Patents and IPR regime' on 30th January, 2018, held at UCOST, Vigyan Dham, Jhajhra, Dehradun.

Attended One day “Relevance of Access and Benefit Sharing for (Scientific) Research Institute “on 21st March, 2018, organized by Uttarakhand Biodiversity Board and The Energy and Resources Institute (TERI) at Dehradun.

Dr. Sanjay Mishra, Scientist-B

Participated in Training of Trainers (ToT) on common Yoga Protocol as framed by Ministry of AYUSH from 5th – 10th June, 2017, held at auditorium of Government Girls Senior Secondary School, Marina Park, Port Blair.

Attended training programme of GST on 3rd April, 2017, organized by Goods and Service Tax Department, Andaman and Nicobar Administration, held at Dr. B. R. Ambedkar Auditorium, Port Blair

Attended the workshop on 'NTRP, CDDO & EIS module under PMFS' on 11th & 12th January, 2018, held at INGAF, Kolkata.

Dr. S.P. Panda, Scientist-B

Delivered a talk on orchids as an invited speaker at Rama Devi Women's University, Bhubaneswar, Odisha.

Delivered a talk on 'Mangrove diversity' to the trainees of Green Skill Development Programme.

Dr. Subir Bandopadhyay, Scientist-B

Attended a Workshop on 'Taxonomy of Vascular Plants: Principles & Practices' (organized by CAS, Department of Botany, University of Calcutta) on 5th March, 2018 and delivered an invited lecture on 'Typification of plant names'.

Attended a workshop on 'Herbarium Technique and Plant Nomenclature' on 17th April, 2017 and delivered a lecture on 'Typification of Plant Names', held at Ramkrishna Mission Vivekananda Centenary College, Rahara, Kolkata and presented.

Dr. Umesh Kumar Lalchand Tiwari, Scientist-B

Attended National Symposium on "Pteridological Studies in India: Perspectives and Modern approaches in relation to Environment & Climate Change" on 22nd & 23rd February, 2018, held at Botanical Survey of India, Itanagar, Arunachal Pradesh.

Mr. B.B.T. Tham, Botanist

Attended a workshop on 'NTRP, CDDO & EIS module under PFMS for CDDOs' on 11th & 12th January, 2017, at INGAF institute, Kolkata.

Attended Workshop cum Hands on Training on "DNA bar coding - Molecular analysis & Bioinformatics approaches" from 21st – 25th August, 2017, organized by Eastern Regional Centre, Botanical Survey of India.

Attended a workshop on 'Agriculture Development for Farmers welfare' on 22nd December, 2017, organized by Department of Field Publicity, Ministry of Information and Broadcasting, Itanagar.

Attended National symposium on "Pteridological Studies in India: Perspectives and Modern approaches in relation to Environment & Climate Change" on 22nd & 23rd February, 2018, held at Botanical Survey of India, Itanagar, Arunachal Pradesh.

Attended a National seminar on 'Himalayan Plant Diversity: Taxonomy Conservation and Sustainable Utilization' and presented an oral presentation on a topic entitled 'Conservation of Wild *Musa* species and its significance' on 8th & 9th March, 2018, held at BSI, ERC Shillong.

Dr. C.M. Sabapathy, Botanist

Attended 3 days training on 'Arc-GIS' organised by ESRI India at CNH.

Attended one day ESRI India Regional Conference (East) at Hyatt Regency, Salt Lake City, Kolkata.

Mrs. Geeta Chaudhury, Botanist

Attended a Training Programme on "Role out of Employees' Information System (EIS) for online Salary/GPF application Rearrangement" Under PFMS portal -e-payment functionality of CDDOs on 17th & 18th May, 2017.

Attended a DDO's training/workshop on 18th August, 2017 at Gangaram Auditorium, Indira Paryavaran Bhawan, Jorbagh, New Delhi.

Dr. M.E. Hembrom, Botanist

Participated in 3 days ArcGIS training programme from 10th-12th May, 2017, held at CNH committee room.

Attended a thematic seminar on 'Biodiversity and Sustainable Tourism' in International Day for Biological Diversity on May 22, 2017, held at CNH, BSI, Howrah.

Attended a training programme in connection with 'e-tender in government office' at BSI, Hqrs., Kolkata.

Attended training on "Basic training programme of working in Hindi on computer" from 11th - 15th December, 2017 at Department of Official Language, Nizam Palace, Kolkata.

Dr. M.K. Singhadiya, Botanist

Attended DDO training programme on "NTRP/EIS/CDDO" sponsored by PAO, BSI/ZSI, Kolkata on 11th & 12th January, 2018, at Institute of Government Accounts & Finance, Regional Training Institute, Kolkata.

Shri P. P. Ghoshal, Botanist

Delivered lecture in workshop on 'Herbarium techniques' on 2nd August, 2017, at Nilambar Pitambar University, Daltonganj, Jharkhand.

Shri P. K. Baske, Botanist

Attended training on "NTRP, Bhabishya, Revision of Pension and Compilation of Accounts & Settlement of Audit paras" on 18th August, 2017, at MOEF &CC, New Delhi.

Dr. S. Borah, Botanist

Attended a National symposium on 'Current Trends in Research in Biotic Systems' on 29th & 30th June, 2017, at Department of Botany, North-Eastern Hill University, Shillong, India.

Attended a National seminar on 'Prospects and Challenges of Plant Science Research in India' on 25th & 26th November, 2017, at Department of Botany, Gauhati University, Guwahati.

Attended a workshop on 'Agriculture Development for Farmers welfare' on 22nd December, 2017, organized by Department of Field Publicity, Ministry of Information and Broadcasting, Itanagar.

Attended a National seminar on 'Himalayan Plant Diversity: Taxonomy Conservation and Sustainable Utilization' and presented an oral presentation on 'Conservation of Wild *Musa* species and its significance' on 8th & 9th March, 2018 in BSI, ERC Shillong.

Mr. Anand Kumar, Botanical Assistant

Attended a regional workshop on 'Conservation and Management of Wetland (Eastern States)' on 23rd June, 2017, organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, at ZSI HQ, Kolkata.

Mr. Arvind Parihar, Botanical Assistant

Attended a thematic seminar on 'Biodiversity and Sustainable Tourism' in International Day for Biological Diversity on 22nd May, 2017 in CNH, BSI, Howrah.

Attended five days' Workshop cum Hands on Training on "DNA barcoding Molecular analysis & Bioinformatics approaches" from 21st - 25th August, 2017 at BSI, ERC, Shillong.

Dr. B.K. Singh, Botanical Assistant

Attended 3-days training on Arc-GIS organised by ESRI India at CNH, Howrah.

Delivered a lecture as Invited Speaker on "Pollution Free Environment" in a seminar organised by Botanic Garden Chittaranjan Adarsha Mandir, Howrah.

Delivered a lecture on 'AJC Bose Indian Botanic Garden - A perfect blend of Conservation and Tourism' during the celebration of World Biodiversity Day, on 22nd May, 2017.

Attended one day ESRI India Regional Conference (East) at Hyatt Regency, Salt Lake City, Kolkata.

Delivered a lecture on 'ex-situ & in-situ conservation' for the 'Green Skill Development Programme trainees'.

Delivered lecture on 'Major Ecosystems' for the Green Skill Development Programme trainees; imparted 'in-field training on the local flora' to the trainees.

Attended two days workshop on 'Agro-biodiversity' organized by IBRAD, Keshtopur, Kolkata in collaboration with BSI and delivered lecture on 'Agro-biodiversity and Sunderbans'.

Attended 4 months Training and Digitization of Natural History Museum (NHM) plant specimens from India at NHM, London.

Dr. Brijesh Kumar, Botanical Assistant

Attended three days training course on 'Introduction to Arc GIS' from 10th-12th May, 2017 at CNH, Howrah.

Attended hands-on training on 'Cytological Techniques' from 12th-16th March, 2018 organized by Botanical Survey of India, WRC, Pune.

Participated and presented a paper in National Symposium on 'Pteridological Studies in India: Perspective and Modern approaches in relation to environment & Climate Change' on 22nd & 23rd February, 2017, organized by Botanical Survey of India and The Indian Fern Society, Chandigarh at Itanagar.

Dr. Dhole P.A., Botanical Assistant

Attended an International Seminar on 'Forests, Sacred groves and Environmental Heritage in India' on 30th March, 2017, at Indian museum, Kolkata.

Attended Seminar on 'Progress and prospects of Taxonomy' and 128th Foundation Day on 13th & 14th February, 2018, at Ashutosh Birth Centenary Hall, ISIM, Kolkata.

Attended a Training Course on 'Introduction to ArcGIS - 1' on 10th-12th May, 2017 at CNH, Howrah.

Attended a Training Course on 'Introduction to ArcGIS - 2: Essential Workflows' on 7th-8th September, 2017, at CNH, Howrah.

Dr. G. Swarnalatha, Botanical Assistant

Attended Hands-on-training program on 'DNA Barcoding: Methods and applications' on 4th & 5th January, 2018, held at Freshwater Biological Regional Centre, Zoological Survey of India, Hyderabad.

Attended and delivered an invited talk on 'Diversity and endemism in the Indian Lichens: A conservative prospective' on 27th & 28th January, 2018, at National conference on "Current developments and next generation lichenology" organized by Indian Lichenological Society (ILS), Lucknow.

Delivered a lecture as a resource person on the topic 'Introduction to the Lichenized Fungi' at one day State level workshop on 'Herbarium – Role and Significance in Plant Taxonomy' on 21st February, 2018, organized by Govt. Degree & PG College, Siddipet, Telangana.

Attended 'Botanical Art Workshop' from 12th - 24th March 2018, at Botanical Survey of India, Eastern Regional Centre, Shillong.

Dr. Gopal Krishna, Botanical Assistant

Attended a regional workshop on 'Conservation and Management of Wetland (Eastern States)' on 23rd June, 2017, organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, at ZSI HQ, Kolkata.

Attended workshop cum Hands on Training on 'DNA barcoding - Molecular analysis & Bioinformatics approaches' from 21st - 25th August, 2017, organized by Eastern Regional Centre, Botanical Survey of India.

Attended the workshop on 'Herbarium Technique and Plant Nomenclature' on 17th April, 2017 and delivered a lecture on 'Herbarium Techniques' and demonstrated a practical session, held at Ramkrishna Mission Vivekananda Centenary College, Rahara, Kolkata.

Dr. J. Swamy, Botanical Assistant

Delivered lectures on 'Identification of Flowering Plants', 'Herbarium Techniques' and 'Phytosociological Studies' and demonstrated Herbarium Techniques on 28th & 29th June, 2017 to students and staffs of Forest College and Research Institute, Mulugu, Siddipet District.

Delivered two lectures on 'Botanical Survey of India - An Overview & Its Role in Advancement of Taxonomic

Dr. Monika Mishra, Botanical Assistant

Attended an International Seminar on 'Forests, Sacred groves and Environmental Heritage in India' on 30th March, 2017, at Indian museum, Kolkata.

Attended a workshop cum hands on training on 'DNA barcoding-Molecular analysis and Bioinformatics approaches' from 21st - 25th August, 2017, at Eastern Regional Centre, BSI, Shillong, Meghalaya.

Attended a seminar on 'Progress and prospects of Taxonomy' and 128th Foundation Day on 13th & 14th February, 2018, at Ashutosh Birth Centenary Hall, ISIM, Kolkata.

Attended Hands-on Training Workshop on Cytological

Techniques from 12th - 16th March, 2018, at BSI, Western Regional Centre, Pune, Maharashtra.

Dr. Nitisha Srivastava, Botanical Assistant

Attended a National workshop on 'Recent technologies for food security and rural development' on 19th-25th February, 2018 and delivered a lecture on "Nanotechnology for Agricultural improvement" organized by SBSRD, Allahabad and K.A.P.G. College, Allahabad in collaboration with Zoological Survey of India, Kolkata and ESW Society, U.P. Chapter.

Attended an International symposium on 'Indiscriminate development: Current scenario & Socio-environmental challenges' (IDCSC 2018) on 18th & 19th March, 2018 and presented two research papers entitled 'Flora of Chandra Prabha Wildlife Sanctuary, Chandauli District, Uttar Pradesh' and 'Laser rays induced chromosomal aberrations in green manure crop *Sesbania cannabina* Poir.', organized by Blue Planet Society, Allahabad; BSI, CRC, Allahabad and Government P.G. College, Saidabad, Allahabad in collaboration at BSI, CRC, Allahabad.

Dr. P. Harikrishna, Botanical Assistant

Attended training programme on Arc GIS software (installation and basics of software usage) from 9th to 12th April, 2017, organised by CNH, BSI, Kolkata.

Mr. R. Saravanan, Botanical Assistant

Attended an International seminar on 'Forests, Sacred groves and Environmental Heritage in India' on 30th March, 2017, at Indian museum, Kolkata.

Attended Seminar on 'Progress and prospects of Taxonomy' and 128th Foundation Day on 13th & 14th February, 2018 at Ashutosh Birth Centenary Hall, ISIM, Kolkata.

Attended a Training Course on "Introduction to ArcGIS - 1" on 10th-12th May, 2017, at CNH, Howrah.

Mr. Rakesh G. Vadhayar, Botanical Assistant

Participated the 'National Science Expo' from 26th-30th January, 2018 conducted at Thalassery, Kannur, Kerala along with Dr. C. Kaliamoorthy, Scientist D, NOEG, Yercaud.

Mr. Ravi Prasad, Botanical Assistant

Participated in a Training programme on 'DNA Barcoding - Molecular analysis & Bioinformatics approaches', from 21st - 25th August, 2017, organized by Botanical Survey of India, Eastern Regional Centre at Shillong, Meghalaya.

Mr. S.C. Patil, Botanical Assistant

Attended 'XXVII Annual Conference of Indian Association for Angiosperm Taxonomy & International Symposium on Plant Systematics: Priorities and Challenges' on 10th-12th November, 2017 and presented a paper titled 'Ecological Niche Modelling of *Anoectochilus elatus* Lindl.: An endemic south Indian Jewel Orchid, using GIS', held at University of Delhi, Delhi.

Mr. S. Nagaraju, Botanical Assistant

Participated a 12 weeks training program on 'Geospatial Technologies and Applications' from 6th November 2017 - 25th January, 2018, held at National Remotes Sensing Centre-ISRO, Hyderabad.

Participated and delivered a lecture on General 'Grass Morphology' in one day State level workshop on 'Herbarium-its role and Significance in Plant Taxonomy' on 21st February, 2018, at Government Degree College, Siddipet, Telangana State.

Participated 2 weeks 'Botanical Art Workshop' from 12th -24th March, 2018, held at ERC, BSI, Shillong.

Mr. Saurabh Sachan, Botanical Assistant

Attended a regional workshop on 'Conservation and Management of Wetland (Eastern States)' on 23rd June, 2017, organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, at ZSI HQ, Kolkata.

Attended three days training programme on Arc GIS from 10th to 12th May 2017 at CNH.

Mr. Shyam Biswa, Botanical Assistant

Attended a regional workshop on 'Conservation and Management of Wetland (Eastern States)' on 23rd June, 2017, organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, at ZSI HQ, Kolkata.

Attended National conference on 'Status of Invasive Alien Species in India' on 14th-15th December, 2017 organized by Zoological Survey of India and Botanical Survey of India, held at The Park, Kolkata.

Attended three days training programme on Arc GIS from 10th to 12th May 2017 at CNH.

Imparted a training on 'Herbarium methodology for aquatic plants at AJCB Indian Botanical Garden'

addressing to batch of delegates from Pollution Control Board, Andhra Pradesh on 18th January, 2018.

Attended and participated in 128th Foundation day of Botanical Survey of India and seminar on "Progress and Prospect of Plant taxonomy" and presented a talk on 'Floristic Diversity of Koderma Wildlife Sanctuary, Jharkhand' on 14th February, 2018, at ISIM, Kolkata.

Dr. Sudhir Kumar Yadav, Botanical Assistant

Attended an International seminar on "Coastal and Marine Biodiversity and Conservation (ISCMBC-2018)" organized by CAS in Marine Biology, Faculty of Marine Sciences, Parangipettai on 15th -16th March, 2018 and presented a paper entitled 'Diversity, distribution and taxonomy of marine macro algae of Karnataka coast, India'.

Mr. Vijay Kumar Mastakar, Botanical Assistant

Attended three days training programme on Arc-GIS from 10th to 12th May 2017, at CNH, Howrah.

Attended a regional workshop on 'Conservation and Management of Wetland (Eastern States)' on 23rd June, 2017, organized under aegis of the National River Conservation Directorate of the Ministry of Environment, Forests & Climate Change, Govt. of India, at ZSI HQ, Kolkata.

Attended and participated in 128th Foundation Day of Botanical Survey of India and seminar on "Progress and Prospect of Plant taxonomy" and presented a talk on 'Flora of Palkot Wildlife Sanctuary, Jharkhand' on 14th February, 2018 at ISIM, Kolkata.

Mr. Vineet Kumar Singh, Botanical Assistant

Attended a National Seminar on "Paryawaran Evam Samaveshi Vikas: Chunautiyan evam Samadhan" on 4th & 5th August, 2017, held at MNNIT Allahabad.

Attended a two days National seminar on 'Diversity and Utilization of Tropical Plants' and also presented a paper entitled 'Economically valuable Non-Timber Forest Products of PAWS and Adjacent Tikri forest area, Gonda, Uttar Pradesh' organized by Department of Botany, Deendayal Upadhyay Gorakhpur University, Gorakhpur.

Attended a two days International symposium on 'Indiscriminate Development: Current Scenario & Socio-Environmental Challenges' on 18th-19th March, 2018 jointly organized by Blue Planet Society, Allahabad, Botanical Survey of India, CRC, Allahabad and Govt. P.G. College, Saidabad, Allahabad at BSI, CRC, Auditorium and presented a poster entitled 'Taxonomic Diversity of

Climbers with special reference to their economic potential in PAWS and Tikri forest area, Gonda, U.P.' and awarded the best Poster presentation award during the valedictory session.

Dr. Vivek C. P., Botanical Assistant

Attended the Central Government Employees Meeting on 29th August, 2017 at Andaman Harbour Works, Port Blair.

Mr. Amit Pandey, Preservative Assistant

Attended "5th National Workshop on Taxonomy, Biodiversity, *ex Situ* Conservation and Applications of Fungi", 22nd-31st May, 2017, held at MACS' Agharkar Research Institute, Pune, from.

Mr. B. Meena, Preservative Assistant

Mr. B.C. Dey, Preservative Assistance

Participated in the ongoing exhibition on "Botanical Heritage of India" organized by BSI being held at India International Centre, New Delhi from 26th October -7th November, 2017.

Mr. Gautam Anuj Ekka, Preservative Assistance

Attended the Workshop cum Hands on training on 'DNA Barcoding - Molecular Analysis & Bioinformatics Approaches' on 21st-25th August, 2017, at BSI, ERC, Shillong.

Attended training programme of GST at Dr. B. R. Ambedkar Auditorium on 10th November, 2017, organized by Goods and Service Tax Department, Andaman and Nicobar Administration.

Mr. S.K. Sharma, Preservative Assistance

Participated in the ongoing exhibition on "Botanical

Heritage of India" from 26th October- 7th November, 2017, organized by BSI being held at India International Centre, New Delhi.

Participated in the International Exhibition on 'Botanical Heritage of India' at India International Centre, New Delhi from 27th October - 7th November, 2017 and from 10th-12th November, 2017 at Botany Department, University of Delhi.

Participated in the 22nd 'Sunderban Krishi Mela-O-Loko Sanskriti Utsab-2017' from 20th-29th December, 2017.

Participated in organizing 128th Foundation Day Celebration on 13th & 14th February, 2018, held at ABC Hall, Indian Museum, Kolkata.

Mr. D.K. Saha, Artist

Participated in Botanical Art Workshop from 12th - 22nd March, 2018 held at BSI, ERC, Shillong.

Mr. Durgadas, A.T., Artist

Participated Botanical Art Workshop from 12th - 22nd March, 2018, held at BSI, Shillong.

Attended the Foundation course Inaugural ceremony of "The Green Skill Development Programme (GSDP)", on 29th May 2017, at Central National Herbarium.

Attended basic training in Hindi "Basic training programme of working in Hindi on computer" from 11th - 15th December, 2017, at Department of Official Language, Nizam Palace, Kolkata.

Mr. R. Suresh, Artist

Participated in Botanical Art workshop from 12th - 22nd March, 2018, held at BSI, ERC, Shillong.



ACTIVITIES OF RESEARCH FELLOWS

Henckelia pumila (D.Don) A.Dietr.

ACTIVITIES OF RESEARCH FELLOWS

Revision of the subtribe Cenchrinae (Poaceae) in India by Dr. Sangita Daschowdhury (Dey), AJC Bose PDF:

The subtribe Cenchrinae (Poaceae) comprises of 8 genera, 48 species and 2 varieties in India. During 2017-18, a checklist of species and intraspecific taxa was made for all the genera. Study of types (from specimens as well as scanned images) and other original materials was completed for the genera *Cenchrus* and *Holcolemma*. 03 Herbarium cum field tours were undertaken in Central Regional Centre Allahabad; Arid Zone Regional Centre Jodhpur and Eastern Regional Centre Shillong during which a total number of 16 taxa belonging to *Cenchrus*, *Paspalidium*, *Pennisetum* and *Setaria* were collected. During the period under study, a total number of 1167 herbarium specimens were studied in BSA, BSJO, CAL and ASSAM and among them identity of c. 320 specimens were corrected and the rest were validated. A database of 120 specimens belonging to above said genera available at CAL was entered in excel format. During this period, 01 research paper was published in peer reviewed journal.

Taxonomic Revision of Family Davalliaceae M.R. Schomb ex A.B. Frank in India by Dr. Pushpesh Joshi, AJC Bose PDF:

During 2017-18, 01 herbarium consultation tour (CAL) was conducted during which c. 180 specimens belonging to family Davalliaceae were studied. Beside this, a checklist of 21 taxa belonging to 05 genera was prepared. Type images and protologues of 05 species were procured. Detailed dissection and description of 05 species were completed. This study reports *Huperzia quasipolytrichoides* as an addition to the Pteridophytic flora of India and *Cheilanthes tenuifolia* as an addition to the Pteridophytic flora of Manipur. In addition, conservation of *Cyathea spinulosa* (tree fern), through religious practices, was reported for the first time in Uttarakhand. During this period, 02 papers were published in peer reviewed international journal (Phytotaxa, Bionature) and received 'Award of Merit in Pteridology' for the year 2018 by The Indian Fern Society, Chandigarh.

Revision of Indian Stereaceae Pilát by Dr. Deepa Mishra, AJC Bose PDF:

During 2017-18, 02 Herbarium consultation tour was

undertaken to Forest Research Institute, (DD), Dehradun and Herbarium Cryptogamae Indiae Orientalis (HCIO), ICAR-IARI, New Delhi during which 21 specimens of Stereaceae were studied/ described/ identified from unidentified gathering and about 56 specimens belonging to 21 species of Stereaceae were studied. Critically studied and identified 15 field numbers of the family Stereaceae collected from Western Himalaya to 08 species and documented 32 specimens from DD and BSD. During the period under report, 04 species namely *Xylobolus subpileatus*, and *Xylobolus frustulatus*, *Stereumgaus apatum*, *Stereum hirsutum* were studied in detail and completed in all respects including line drawings.

GIS Mapping of Floristic Components with Special Reference to Threat Assessment of EET Plants of Desert National Park by Dr. Kulloli Ravikiran Ningappa, AJC Bose PDF:

During 2017-18, 02 field tours were conducted to the study area during which 11 field numbers of 08 EET species were collected (*Tephrosia falciformis*, *Dipcadi erythraeum*, *Moringa concanensis* etc.). Population data of EET species were recorded by quadrat method (10 × 10 m size) and collected specimens for herbarium preparation; seeds were collected for *ex-situ* conservation. Besides this, at each site dominant and associated species were noted down. Passport data were recorded to assess habitat requirement of respective EET species. GPS locations were noted for preparation of distribution maps of 03 species, viz. *Dipcadi erythraeum*, *Anticharis glandulosa* var. *caerulea* and *Tephrosia falciformis*. Ecological Niche Modelling using MAXENT software for 04 species was carried out to estimate habitat suitability of concerned species. Herbarium consultation at BSI, AZRC, Jodhpur was completed to assess distribution of EET species in DNP area as well as in Rajasthan. Collected literature from authentic floras, relevant articles and online database.

Diversity and Phylogeny of Bambusicolous fungi from Northeast India by Dr. Pratibha A. Prabhugaonkar, AJC Bose PDF:

During 2017-18, 14 field tours were conducted to Barapani Experimental Botanical Garden, Umiam, Arwah, Cherrapunji, Umroi, near airport, Mawsinram,

Near Tyrshi fall, Saphai village, Jaintia hills,, Lady Hyderi Park, Shillong, Nongriat village, Cherrapunjee, Tura and Baghmara, Garo Hills, Nongpoh, Meghalaya, Kohima and Dimapur districts of Nagaland during which litter samples of 49 bamboo species were collected, some of which are *Bambusa balcooa*, *Bambusa jaintiana*, *Bambusa teres*, *Bambusa jaintiana*, *Bambusa vulgaris* var. *wamin*, *Dendrocalamus hookeri*, *Yushania microphylla*, *Chimonocalamus griffithianus*, *Melaconna clarckei*, *Phyllostachys nigra*, *Pseudostachyum polymorphum*, *Teinostachyum griffithii* *Gigantochloa rostrata*, *Yushania microphylla* etc. Total of 110 species of fungi belonging to 88 genera (9 ascomycetes and 101 anamorphic taxa) from 30 bamboo species were isolated and identified up to species and genus level. The most common species identified in this study was *Astrosphaeriella stellata* found associated with 10 bamboo species, followed by *Shrungabeeja vadirajensis* on 09 bamboo species, *Cordana vasiformes* and *Vamsapriya khunkonensis* on 06 bamboo species and *Trichobotrys effusus* on 05 bamboo species. Other common species are *Bactrodesmium longisporum*, *Periconia byssoides* and *Chalara* sp. occurring on 05 bamboo species. Most of the isolated fungi were recorded from dead bamboo culms (80 species), followed by sheaths (25) and leaves (5). All the isolated fungi were photo-documented and maintained in herbarium. 45 fungi were isolated in pure culture and maintained in malt extract agar slants. During the period under report, in connection with Molecular phylogeny of fungi, DNA isolation protocol was standardized along with PCR protocol for LSU and SSU gene regions. Isolated DNA from 04 fungal species and amplified in Polymerase chain reaction (PCR). The ITS1- ITS4, NS1-NS4 and LROR-LR7 primer-pairs were used to amplify partial ITS, 18S rRNA gene and partial 28S rRNA gene, respectively. PCR product was purified using Nucleospin PCR clean up gel kit (Macherey-Nagel). Phylogeny of *Gangliostilbe indica* was studied after analysis of sequencing results. This study reports 07 fungal species (*Arthrimum yunnanum*, *Blastophragma beilschmiediae*, *Fissuroma maculans*, *Hypoxylon pseudodefndleri*, *Synnemaseimatoides nipponica*, *Vamsapriya khunkonensis* and *Xenosporium larvae*) as new records to India. During this period 05 research articles were published in peer reviewed international journals (Webbia, Phytotaxa, Kavaka, Mycosphere etc.).

Survey, Documentation, Current Distribution, Diversity Status, Conservation Priorities and GIS Mapping Of Narrow Endemic Plants In Nilgiri Biosphere Reserve, The Western Ghats by Dr. V. Ravichandran, AJC Bose PDF:

During 2017-18, 01 field tour was conducted to Nilgiri Biosphere Reserve, Tamil Nadu during which 15 specimens were vouched, some of which are *Flacourtia*

montana, *Sonerila elegans*, *Rapanea wightiana*, *Actinodaphne lawsonii*, *Litsea stocksii*, *Isonandra perrottetiana*, *Helicia nilagirica* etc. Corrected and determinavit slip was attached against 02 misapplied specimens of *Sonerila*, viz. *Sonerila speciosa* (= *Sonerila brunonis*) and *Sonerila anaimudica* (= *Sonerila speciosa*).

Taxonomic revision of Sub-tribe Platantherinae (Orchidaceae, 04 genera and 20 species) from India by Dr. K. Prasad, AJC Bose PDF:

During 2017-18, a checklist of species and infraspecific taxa was made for all the genera and studied types (from specimens as well as scanned images) for the genera *Hemipiliopsis* and *Hemipilia*. 04 field-cum-herbarium consultation tours were undertaken in Eastern Regional Centre, Botanical Survey of India, Shillong, Northern Regional Centre, Botanical Survey of India, Forest Research Institute, Dehra Dun and Western Regional Centre, Pune, BLATTER Herbarium, Bombay and Kolhapur university, Kolhapur for herbarium consultation during which a total number of 02 taxa belonging to *Platanthera* were collected, 261 herbarium specimens were studied in CAL, ASSAM, BSI, BSD, DD, BLAT and KOU and among them identity of c. 80 were corrected and the rest were validated. A database of 20 specimens belonging to above said genera available at CAL was entered in excel format. During this period, 03 research papers were published in peer reviewed journals (Rheedea, Taxon, *Indian Journal of Forestry*).

Revision of the subtribe Cenchrinae Dumort. (Poaceae, 08 genera, 48 species and 02 varieties) in India by Dr. Debashish Behera, AJC Bose PDF:

During 2017-18, 01 field tour was conducted to the transitional area of Similipal Biosphere Reserve (Bangiripushi, Pudadiha, Sarat, Nato, Thakurmunda) during which 02 *Acampe* species (*Acampe praemorsa* and *Acampe carinata*) were observed in full bloom, collected live specimens along with photographs and fixed on the Mango tree of Botanical Garden, BSI, Howrah for future use. Other than that, *Dendrobium aphyllum*, *Cymbidium aloifolium*, *Aerides odorata*, *Aerides multiflora*, *Luisia trichorrhiza* and *Vanda tessellate* were also recorded from the study site. The phorophytes were also documented at that locality as *Terminalia alata*, *Shorea robusta*, *Syzygium cumini*, *Diospyros malabarica* and *Madhuca indica*. Among all these phorophytic plants, *Madhuca indica*, noted down as the major phorophytic plants. During this period, conservation through *in vitro* propagation of wild orchids was initiated with association of Regional Plant Resource Centre, Bhubaneswar, Odisha. During this period, 02 research papers were published in peer reviewed journal.

Taxonomic and phylogenetic reassessment and revision of the genus *Phaeographis* and allied genera in the family Graphidaceae (lichenized fungi: Ascomycota) of India by Dr. Pushpi Singh, N-PDF:

During 2017-18, 02 field tours *w.e.f.* 18.11.2017 - 29.04.2017 and 05.03. 2018 - 16.03.2018 were undertaken to Panchgani, Mahabaleshwar, Sinhgad, Maharashtra and Udham Singh Nagar, Champawat district in Uttarakhand and Pilibhit District in UP during which a total of 270 specimens were collected. About 150 species were identified during consultation of herbaria BSA and ASSAM and 80 specimens taken on loan from LWG were investigated morphologically, anatomically and chemically and checked/ corrected. This study reports 02 new species *viz.* *Leiorreuma nicobarense* Pushpi Singh, Jagadeesh and Kr. P. Singh and *Melaspilea nitidochapsae* Pushpi Singh, Y. Joshi & Kr. P. Singh from Andaman & Nicobar Islands, 06 new combinations were proposed in family Graphidaceae and 15 species as addition to the Andaman and Nicobar Islands, 06 research papers (3 international + 2 national) were published along with one hindi article. Attended Workshop on "Molecular Systematics of Lichens" on 25 January, 2018 and also participated and presented research findings in "National Conference on Current Development and Next generation Lichenology" organized by Indian Lichen Society at NBRI, Lucknow during 26-27th January, 2018. Besides the assigned projects, worked on the genera *Melaspilea* and *Buelliella* in India, *Pyrgillus* at world level and identification keys were published.

Taxonomic Revision Of The Family Myrsinaceae (under 'Flora of India Project') by Mrs. Rijupalika Roy, SPF & Dr. Arabinda Pramanik, Scientist-E:

During 2017-18, 01 field-cum-herbarium consultation tour was conducted to Dehradun and adjoining areas and BSD & DD. Type specimens of the genera *Sadiria* (*Sadiria erecta*, *S. griffithii*, *S. solanifolia*, *S. eugenifolia*, *S. boweri*) and *Maesa* (*Maesa andamanica*, *M. macrophylla*, *M. ramentacea*, *M. bengalensis*, *M. chisia*, *M. truncata*, *M. arunachalensis*) were collected from different Indian and foreign herbaria and solved the species complexes. Key to the genera and species were prepared for easy identification of the taxa. Field data were collected for distribution, etymology, flowering and fruiting period of 78 species and 05 varieties of the family Myrsinaceae. Illustrations of dissected parts of 54 taxa of the family were prepared along with habit sketches of 57 taxa. During this period, 02 research papers were published in peer reviewed international journals (Journal of Japanese Botany and Bangladesh Journal of Botany).

Ethnobotanical study of Lodha (A primitive tribal Group) of West Bengal and nutraceutical analysis of selected plant species by Mrs. Sagari Chaudhury, SPF & Dr. Harish Singh, Scientist-D:

During 2017-18, a field tour was conducted at Sagar Island, South 24 Pargana District, West Bengal and 42 numbers of plant species along with 55 ethnobotanical and 06 ethno zoological information were collected. Seven maps were prepared by using GIS-Arc software. All the collected plant materials were poisoned and herbarium sheets were prepared. Statistical analysis was done on 728 ethnobotanical data by using suitable quantitative indices, 07 plant species were taken for nutraceutical analysis to validate the tribal claim. Anti-oxidant analysis, Mineral analysis, Anti-diabetic property, Vitamin estimation and HPLC analysis were performed. During this period, 02 articles and 02 abstracts were published.

Taxonomic Studies on the genus *Rubus* L. (Esstt. taxa: 73 species and 16 varieties) in India by Ms. Chandani Gupta, SPF & Dr. S. S. Dash, Scientist-D:

During 2017-18, 01 field tour was undertaken to West Kameng & Tawang Districts of Arunachal Pradesh and 27 different species of *Rubus* were collected along with 500 photographs. Detailed description, illustration and nomenclatural notes of 58 species were completed towards the preparation of the final report. Besides SEM of pollen & seed of 05 species were also done. In this period, 04 scientific papers were published in peer reviewed journals (*Blumea*, *Nelumbo*).

Taxonomic revision of the subgenus *Carex* of genus *Carex* L. (Cyperaceae) in India by Shri Animesh Maji, SPF & Dr. V. P. Prasad, Scientist - D:

During 2017-18, 01 field-cum-herbarium consultation tour was conducted to BSD and DD, Dehradun during which a total number c. 100 specimens of 31 field numbers including other members of Cyperaceae were collected from different high altitude areas of Uttarakhand : Mussoorie, Subakholi, adjoining forest areas of Rishikesh, Parts of Chamoli District etc. Out of these 31 field numbers, 24 belongs to the genus *Carex* among which c. 22 field numbers were identified till date. Besides this, 03 field numbers belonging to the genera *Kobresia*, 01 *Pycnus*, 01 *Cyperus*, 01 *Fimbristylis* and *Eriophorum comosum* were also identified. About 500 herbarium specimens of *Carex* were documented including 02 type specimens and made description and illustration of 16 species by studying a total number of c. 195 specimens (CAL) and the selected specimens received on loan. Specimen data collected during the herbarium consultation tour were utilized to record the state-wise distribution and phenology. To record the

habit and habitat of different species of *Carex* a total number of c. 10 photographs were taken during the collection tour. During this period, 02 articles were published in peer reviewed journals (*Research Journal of Pharmaceutical, Biological and Chemical Sciences*, *Research Journal of Life Science*, *Bioinformatics*, *Pharmaceutical and Chemical Sciences*).

Taxonomic revision of the family Fagaceae in India by Mrs. Shankhamala Mitra, SPF & Dr. Vinay Ranjan, Scientist-D:

During 2017-18, field-cum-herbarium consultation tours were undertaken to CSIR-National Botanical Research Institute (LWG), CSIR-Central Drug Research Institute (Lucknow, Uttar Pradesh) and Forest Research Institute Herbarium (DD) (Dehradun, Uttarakhand) during which 04 species of *Quercus* (*Q. leucotrichophora*, *Q. acutissima*, *Q. floribunda* & *Q. semecarpifolia*) were collected. During this period, a total of 3949 specimens housed at different foreign herbaria were studied. 02 species of *Castanopsis* (*C. indica*, *C. tribuloides*), 05 species of *Lithocarpus* (*L. dealbatus*, *L. fenestratus*, *L. pachyphyllus*, *L. polystachyus* and *L. truncatus*), 03 species of *Quercus* (*Q. acutissima*, *Q. griffithii* and *Q. leucotrichophora*) were identified along with dissections and descriptions of 21 plant specimens. In addition, 02 papers were published in peer reviewed journals.

Taxonomic revision of *Pteris* L. (Pteridaceae) in India by Mrs. Piu Das, SPF & Dr. P.M. Padhye, Scientist-F:

During 2017-18, 126 herbarium specimens housed in CAL were consulted, procured type images from P (Muséum National d'Histoire Naturelle) and K (Royal Botanic Gardens), studied 28 specimens. 25 species were identified along with description of 28 taxa from live specimens collected from different parts of India as well as from herbarium specimens. In addition, 10 numbers of illustrations and 08 photo plates for various *Pteris* species were also prepared. This study reports 02 Rare, Endangered species & 03 economically important species of *Pteris*. During this period, received 'Best poster Award' from National Symposium on "Pteridological Studies in India: Perspective and Modern approaches in relation to Environment & Climate Change", held at Itanagar, Arunachal Pradesh.

Hepaticae and Anthocerotae of Anjaw District, Arunachal Pradesh by Dr. Shuvadeep Majumdar, SPF & Dr. D.K. Singh, Scientist-F:

During 2017-18, 20 species were worked out along with identification and description. This study reports 01 species (*Anastrophyllum lignicola*) as new to India; 01 species (*Radula tabularis*) as new record for State; collected 01 interesting species (*Plagiochila kurzii*);

made 01 new synonym (*Acrolejeunea meghalayensis* to *Acrolejeunea recurvata*). Presented a poster titled "Udaria – A New Liverwort Genus of Lophocoleaceae from Eastern Himalaya, India" at the XIX International Botanical Congress (IBC-2017), which was held at the Shenzhen Convention and Exhibition Center in Shenzhen, China, from July 23-29, 2017. During this period, 04 research papers were published in peer reviewed journals and 01 was accepted.

Studies on the families Agaricaceae, Boletaceae, Hygrophoraceae, Suillaceae and Cantharellaceae of East and South Districts of Sikkim by Mrs. Dyutiparna Chakraborty, SPF & Dr. Kanad Das, Scientist-D:

During 2017-18, final project report comprising micro-morphological characterization, microphotography, descriptions, illustrations and identifications was submitted.

Flora of Kawal Tiger Reserve & Two National Parks of Hyderabad (Telangana) by Ms. P.S. Annamma, SPF & Dr. P. Venu, Scientist-G:

During 2017-18, final project report comprising artificial keys, author citation, description, flowering & fruiting, distribution and exiccata of about 144 taxa collected from Kawal Tiger Reserve was submitted.

Flora of Satkosia Tiger Reserve, Odisha by Dr. K. Chandramohan, SPF & Dr. P.V. Prasanna, Scientist-E:

During 2017-18, 01 field tour was conducted to Mahanadi Wildlife Division, Satkosia Tiger Reserve, Odisha during which 19 species were collected, 55 species from earlier collections of Satkosia Tiger Reserve, Odisha were identified. Prepared and submitted the floristic elements of eco sensitive Zone viz., Sunabeda, Chandaka-Dampara, Kapilash, Balukhand-Konark, Kotagarh & Kuldhia Wildlife Sanctuaries of Odisha state. Poisoned 2500 specimens collected from the Satkosia Tiger Reserve, Odisha and 685 specimens were incorporated in the general herbarium. Attended a workshop on "Integrative Taxonomy" from 14-23 November, 2017 in Department of Environmental studies, University of Delhi, Delhi and Two days 'Hands on Training on DNA Barcoding: Methods and Applications' from 4th January to 5th January, 2018 in Freshwater Biology Regional Centre, Zoological Survey of India, Hyderabad.

Micropropagation and screening of secondary metabolites of six medicinal orchids in Meghalaya by Ms. Gargi Pradhan, SPF, Dr. A.A. Mao, Scientist-F and Dr. Deepu Vijayan, Scientist-C:

During 2017-18, *in-vitro* seed germination of *Aerides odorata* was carried out along with direct shoot regeneration from leaf in MS medium supplemented by

5% banana, 10% banana, 10% coconut water, 0.2% activated charcoal, 0.8% GA₃ and 6-Benzyladenine (BA) etc. The *in vitro* raised well rooted plantlets were carefully taken out from the culture flasks and were transferred to root trainer in green house for hardening. For *In vitro* regeneration through shoot multiplication of *Bulbophyllum odoratissimum*, healthy shoot segments (3-4 nodes), collected from newly grown branches of the experimental garden of BSI, ERC, Shillong, were multiplied in MS basal medium supplemented with different concentrations of BA and IBA. For *in vitro* regeneration of *Malaxis acuminata* through pseudobulb culture, healthy and young pseudobulb from seed germinated plants were used as source of explants for shoot initiation experiments. MS Basal medium supplemented with different concentrations of BA and 2iP was used for multiple shoot induction. For *In vitro* seed germination and shoot multiplication of *Cephalanceropsis gracilis*, MS Basal medium with different concentrations of banana, coconut oil, activated charcoal and 2iP was used. In case of *Aerides odorata*, seeds started swelling (colour turning to green) within 6 weeks and protocorm like bodies (PLB) had initiated within 7 weeks. From PLBs, leaf-like structure had come out within 10 weeks. Observation for shoot initiation was taken in the weekly interval. Small greenish clumps initially appeared at the base of leaf segment within 3rd week of inoculation, continued swelling, expanding and eventually developed into PLBs. MS medium supplemented with BA (4mg/L) and GA₃ (2mg/L) produced maximum shoot proliferation and elongation from leaf explants. 5-6 months old plantlets having 3-4 leaves shows higher survival rate as compared to the younger plantlets. Among different potting media, soil mixed with sand (1:2) and wood pieces gave the better growth rate. It was observed that 60% was found to be optimum as visual observation. In case of *Bulbophyllum odoratissimum*, shoots started sprouting and initiation of multiple shoots started within 2nd week in MS media supplemented with BA (10mg/L) and IBA (0.5mg/L). Highest percentage of multiple shoots was obtained in BA (10mg/L), IBA (0.5mg/L) as compared to BA (10mg/L) alone. MS medium alone was not effective for induction of multiple shoots. For *Malaxis acuminata*, among the growth regulators used for multiple shoot induction, BA showed maximum number of shoots and a higher percentage of multiple shoot formation as compared to 2iP. On an average 4 (four) no. of shoots were produced in the concentration range at 1mg/l BA and 100% multiple shoot formation was calculated for the same. For *Cephalanceropsis gracilis*, no seed germination was noticed in any of the additives. High rate of fungal contamination was observed in the direct shoot induction experiments.

A systematic study on the Tribe Ipomoeae (Convolvulaceae) in India by Ms. S. Shalini, SPF & Dr. P. Lakshminarasimhan, Scientist-E:

During 2017-18, 02 herbarium consultation cum plant exploration tours were conducted to various parts of India during which c. 108 herbarium specimens were studied; description of 70 species was completed along with 06 illustrations and 10 photoplates. Study of remarkable amount of morphological variations in leaf indumentum, seeds and pollen grains within species of each genus using SEM is in progress. Study of seed morphology of 26 species of *Argyreia*; 04 species of *Ipomoea*; 01 species of *Stictocardia*; pollen Morphology of 23 species of *Argyreia*; 05 species of *Ipomoea* and leaf Morphology of 04 species of *Argyreia* were completed. This study reports 01 species as new record to Tamil Nadu and Manipur each; lectotypification of 10 names of the genus *Argyreia* was done. During above period, 02 research papers were published in peer reviewed journals.

Microfungi of Biligiri Rangaswamy Temple wildlife Sanctuary, Karnataka by Mrs. Shreya Sengupta, SPF & Dr. (Mrs.) Reshmi Dubey, Scientist-D:

During 2017-18, c. 176 dry specimens and 831 slides were examined, isolation of the endophytic fungi and litter fungi were done by 3 – steps sterilization process, particle filtration method respectively in different culture media of which 55 specimens were identified some of which are: *Triadelphia heterospora* (on branch litter); *Trematosphaeria crassiseptata* (on stem litter); *Parapericonia* sp. (on stem litter); *Melanographium citri* (on branch litter); *Niesslia vidarbhia* (on stem litter); *Dendrostilbella prasinula* (on stem litter), *Diplocladiella scalaroides* (on branch litter); *Podosporiella humilis* (on stem litter); *Arthrimum arundinis* (on stem litter); *Sarcinomyces* sp.(on branch litter); *Monodictys castaneae* (on stem litter); *Ciliochorella* sp. (on stem litter), *Alternaria* sp., *Cladosporium* sp.(on stem litter); *Taeniolella* sp., *Torula herbarum* (on stem litter) etc. Scanning electron microscopic photographs were taken for 22 samples. Preservation of host follicolous plant specimens by herbarium technique, dried bark and leaf litter in specimen envelope with proper field label were done.

Flora of India by Ms. Reshma Lakra, JPF :

During 2017-18, phenological data were documented from 876 sheets belonging to 27 genera and 55 species (under NHMS project). Type specimens of sub-family Bambusoides under the supervision of Dr. PushpaKumari were documented. Besides in this period, delivered 03 lectures in National seminar and GSDP course. Lectures were attended from the Scientists of

Central National Herbarium, Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc.

Flora of India by Y Mahesh, JPF:

During 2017-18, the lab work was carried out on documenting with phenology of Himalayan plants under NMHS Project, the data from 5035 herbarium sheets were documented and submitted, a total of 776 herbarium sheets were incorporated in Hall No. 1. In General Herbarium, 192 herbarium sheets were digitized in Digital herbarium from which 1151 herbarium sheets were sorted out and sent to the respective halls. Assisted Dr. Sandra Knapp for incorporation, labelling and taking photos of approximately 850 Herbarium sheets of *Solanum* genus in Hall No. 4. Tagged 350 trees across various Divisions of AJC Bose Indian Botanic Garden. Lectures were attended from the Scientists of Central National Herbarium, Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc.

Flora of India by Shrikant Dadarao Ghodake, JPF:

During 2017-18, the lab work was carried out on documenting the phenology of Himalayan plants under NMHS Project. The data from 3944 herbarium sheets were documented and submitted to the Project I/C., a total of 802 herbarium sheets were incorporated in Hall No. 5, 2430 herbarium sheets were sorted out and sent to the respective halls. Following, a total of 3670 herbarium sheets were checked for labels containing data about the location, date of collection and collector's name, were documented and submitted. Lectures were attended from the Scientists of Central National Herbarium, Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc.

Taxonomic Studies on Lejeuneaceae Schizostipae (Marchantiophyta) in Northeast India including Sikkim by Shashi Kumar, SPF & Dr. S. K. Singh, Scientist-D:

During 2017-18, 07 one day tour were conducted in different forest areas of Meghalaya during which 132 bryophyte samples were collected, taxonomic description and camera-lucida illustration plates were prepared for 16 species some of which are *Cheilolejeunea krakammae*, *Cheilolejeunea laeviuscula*, *Drepanolejeunea erecta*, *Drepanolejeunea foliicola*, *Drepanolejeunea longii*, *Drepanolejeunea tibitana*, *Lejeunea apiculata*, *Lejeunea alata* etc. This study reports 01 variety (*Cololejeunea microscopica* var. *microscopica*) as new to India; 02 species (*Drepanolejeunea ternatensis*, *Lejeunea kodamae*) as new to N.E. India and 09 species

(*Cheilolejeunea kitagawae*, *Cheilolejeunea laeviuscula*, *Drepanolejeunea erecta*, *Drepanolejeunea pulla*, *Lejeunea discreta*, *Lejeunea parva*, *Lejeunea princeps*, *Lejeunea subacuta* and *Microlejeunea punctiformis*) as new to Nagaland. 05 research papers were published in peer reviewed National and International journals. In this period, participated in two 5-Days workshop venued at Botanical Survey of India, Eastern Regional Centre, Shillong.

Pteridophytic flora of Kudremukh National Park Central Western Ghats with 10% periphery by Shri Devendra Tripathi, SPF & Dr. A. Benniamin, Scientist-D:

During 2017-18, 02 field tours were undertaken to unexplored areas of Karkal, Kudremukh, Muniyal, Valikunja, Game road, Andar, S K Border, Gangamoola, Kerekatte, Srimane Falls, Bajegudi, Bajigoli, Samse, Kalasa, Belthangady, Charmadi, Mudigere, Kottigehra, Kudremukh National Park, Central Western Ghats during which 134 field numbers were collected of which 79 species were identified. During the floristic survey ecological observations were also noted and studied associated species, altitude, latitude and longitude and forests types for each and every species. Some of the collected species were: *Cyathea spinulosa*, *Angiopteris helferiana*, *osmunda hugeliana*, *Asplenium crinicaule*, *Botrychium daucifolium*, *Cheilanthes farinosa* etc of which the dominant species are dominant species are *Adiantum lunulatum*, *Lycopodiella cernua*, *Thelypteris dentata*, *Pteris biaurita*, *odontosoria chinensis*, *Lepisorus nudus* and *Tectaria coadunata*. Studied the spore morphology for 11 species of Pteridophytes namely *Cyathea gigantea*, *Tectaria coadunata*, *Araiostegia pulchra*, *Bolbitis subcrenata*, *Botrychium daucifolium* etc. During the field survey, ecological observation was also noted. During this year, one herbarium consultation tour was undertaken to Mahatma Gandhi Memorial College, Udipi and Studied 220 specimens including 170 species under 30 families. All the herbarium specimens were photographed for further study. During this study, 02 species namely *Trichoman plicatum*, *Sphaerostephanos arbuscula* were collected first time from the National Park; ethnomedicinal informations were collected from Girijana community, Gowdlu tribal and non tribal people. Published 02 abstracts and 02 research papers accepted for publication. Attended 02 workshops venued at Botanical Survey of India, Arunachal Pradesh Regional Centre, Itanagar and Botanical Survey of India, Western Region Centre, Pune.

Flora of India by Sulaiman M, JPF:

During 2017-18, lab work was carried out on documentation of the phenology of Himalayan plants under NMHS Project, data from 2774 herbarium sheets

were documented and submitted to the Project I/C, a total of 1,115 herbarium sheets were incorporated in Hall No. 1, 2, 4 & 5. 83 herbarium sheets of General herbarium were digitized in Digital herbarium from which 742 herbarium sheets were sorted out and sent to the respective halls. Assisted Dr. Sandra Knapp for incorporation, labelling and taking photos for approximately 650 herbarium sheets of genus *Solanum* in Hall No. 4. The illustrations were prepared for about 06 species of Orchidaceae and Convolvulaceae and presented to the concerned I/C. Lectures were attended from the Scientists of Central National Herbarium, Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc.

Flora of India by Basil Paul, JPF :

During 2017-18, lab work was carried out on documentation of the phenology of Himalayan plants under NMHS Project, data from 3041 herbarium sheets were documented and submitted to the Project I/C, a total of 958 herbarium sheets were incorporated in Hall No.1. In General Herbarium, 104 herbarium sheets were digitized in Digital herbarium from which 2120 herbarium sheets were sorted out and sent to the respective halls, labelling of members of 27 families were done in Hall No: 3. Assisted to Dr. Sandra Knapp for incorporation, labelling and taking photos for approximately 850 Herbarium sheets of the genus *Solanum* in Hall No. 4. Tagged 350 trees across various Divisions of AJC Bose Indian Botanic Garden. Lectures were attended from the Scientists of Central National Herbarium, Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc.

Flora of India by Ashutosh Kumar Upadhyay, JPF :

During 2017-18, the data from 5189 herbarium sheets for the documentation of phenology of Himalayan plants under NMHS Project were prepared and submitted to the Project I/C. A Total of 1800 herbarium sheets from CBL were checked for data, geographical location and collectors name for incorporation and a total of 1628 and 552 herbarium sheets were incorporated in Hall no. 1 and Hall no. 4 respectively. 280 herbarium sheets from General Herbarium and 66 herbarium sheets from Type section were digitized in Digital Herbarium section of CNH. Worked out and illustrated various parts of *Setaria barbata* and assisted in the Geo-tagging of 350 trees in AJCBIBG. Prepared and submitted a database of *Solanum* L. in West Bengal, India and assisted Dr. Sandra Knapp in locating, tagging and incorporating herbarium sheets belonging to genus *Solanum* L. Attended various lectures on Invasive alien species and Biodiversity Understanding

from invited Scientists and Professors from foreign Universities, BSI Scientists in different occasions.

Flora of India by Ruma Bhadra, JPF :

During 2017-18, a total of 2315 herbarium sheets were sorted according to positions and total of 816, 419 and 561 herbarium sheets were incorporated in Hall-1, Hall-2 and Hall-4 respectively. The data from 3723 herbarium sheets for the documentation of phenology of Himalayan plants under NMHS project were prepared and submitted to the Project I/C. The data from 397 herbarium sheets for the documentation of phenology of *Poa* was prepared, 486 herbarium sheets in Dicot Type Section were documented, digitized 128 herbarium sheets of RET plants in Digital Herbarium Section of CNH, 36 sheets were scanned and edited. Assisted in the Geo tagging of 345 trees in AJCBIBG. Worked in Student's Herbarium to arrange herbarium sheets according to APG-IV, worked out various parts of *Vernonia squarrosa*, *Poa polycolea* and *Eremopoa persica*, Illustrated various parts of *Rubus* sp. Attended ArcGIS training on 07.09.2017 and 08.09.2017 in CNH, BSI, Howrah and lectures from various Scientists on different topics. Participated in The 'Botanical Art Workshop' from 12.03.2018 to 24.03.2018.

Flora of India by Ishika Bera, JPF :

During 2017-18, a total number of 639 herbarium sheets of various families were incorporated in Hall 3 along with labelling of 21 families in the Herbarium Almirah in the same Hall. The data from 2692 herbarium sheets for the documentation of phenology of Himalayan plants under NMHS project was prepared and submitted to the Project I/C. 77 sheets were scanned and edited, documentation of 62 general herbarium and 01 Type specimen was digitized and documented in Digital Herbaria section of CNH. Attended ArcGIS training on 07.09.2017 and 08.09.2017 in CNH, BSI, Howrah and lectures from various Scientists, BSI, on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc. Assisted in the Geo tagging of 35 trees in AJCBIBG. Worked in Student's Herbarium to arrange according to APG 4. Data entry of 120 Herbarium sheets of Type section (Dicot) was done.

Flora of India by Kuntal Sen, JPF :

During 2017-18, a total number of 2287 herbarium sheets were incorporated in hall no. 4 and Hall no. 5, systematically arranged 38 families and 178 genera of student herbarium as per APG IV system of classification, a total number of 3213 herbarium sheets were documented and database of phenology of Himalayan plants were submitted. Consulted library and herbarium specimens of the family Orchidaceae and also completed

the illustration, dissection of a specimen *Vanda tessellata* and consulted Kew plant glossary for plant description. 15 type specimens including Holotypes, Paratypes and Isotypes were sent to type section Hall no 4, assisted Dr. Sandra Knapp in locating, tagging and incorporation of herbarium sheets belonging to the genus *Solanum* L.; assisted in GPS tagging of the trees (around 360) across various Divisions in AJCBIBG, Howrah. Participated in the Arc GIS training on 07.09.2017 and 08.09.2017 and lectures by BSI and outside scientists on various aspects of Taxonomy, biodiversity, conservation biology etc.

Flora of India by Monalisa Das, JPF :

During 2017-18, a total number of 1706 Herbarium sheets of 27 families (Acanthaceae, Amaranthaceae, Aristolochiaceae, Bignoniaceae, Boraginaceae, Chenopodiaceae, Chloranthaceae, Convolvulaceae, Euphorbiaceae, Fagaceae, Gentianaceae, Gesneriaceae, Juglandaceae, Lamiaceae, Lauraceae, Loranthaceae, Moraceae, Myristicaceae, Nyctaginaceae, Plantaginaceae, Polygonaceae, Scrophulariaceae, Solanaceae, Salicaceae, Thymelaeaceae, Urticaceae, Verbenaceae) were incorporated in Hall 4 of which 2752 Herbarium sheets were sorted out, 112 sheets of 20 families were separated and sent to different halls, completed documentation of 146 herbarium sheets of the family Annonaceae of Hall 4 Type section. Details study of a particular Species *Chlorophytum arundinaceum* was completed along with documentation of herbarium sheets from Himalaya, dissection of herbarium specimens, slide preparation, Illustrations, description and typification problem was solved. The Base line data from 3291 herbarium sheets of 86 genera of 09 families for the documentation of phenology of Himalayan plants under NMHS project was prepared and submitted to the Project I/C. Worked in Student's herbarium to arrange total 38 families according to APG IV system, assisted in Geo-Tagging and numbering of Phanerophytes in different Divisions of AJC Bose Indian Botanic Garden.

Flora of India by Rupamanya Ghosh, JPF:

During 2017-18, 530, 464 and 10 herbarium sheets were incorporated in Halls 1, 2 and 3 respectively, a total number of 1108 herbarium sheets were sorted in Halls 1 and 2, barcoded, scanned, edited and entered data of 201 herbarium sheets from general herbarium in Digital Herbarium, CNH, Howrah. Data entry of 3806 herbarium sheets were done under the NMHS project and submitted to the project in-charge. Worked and assisted in arranging herbarium sheets in Students herbarium according to the APG-IV system of classification. Data basing of herbarium sheets in the Type section (120 sheets done till date, Hall 4) is under process. Described and illustrated 02 Lamiaceae members *viz.* *Anisomeles*

indica and *Leucas aspera*. Assisted in Geo-tagging of 350 trees in the AJC Bose Indian Botanic Garden. Attended and participated in the Arc GIS training and workshop held in CNH on 07.9.17 and 08.9.17, lectures of BSI, other scientists and Professors on various aspects.

Flora of India by Shreya Chaudhuri, JPF:

During 2017-18, a total no. of 427 herbarium sheets were incorporated in different Halls along with sorting of 461 herbarium sheets, sent 42 sheets for stitching and remounting. Completed documentation of herbarium sheets of 62 RET species along with scanning and editing of 101 sheets, barcoding of 146 herbarium sheets, documentation of 373 Herbarium sheets of Type Section; completed Indexing of few members of Apiaceae and Rubiaceae. Documented 2243 sheets for the Database of Himalayan Plants for NMHS Project and submitted to Project in-Charge. Drawing & description was completed for the species *Orthosiphon glabratusi* (Lamiaceae). Worked in Student Herbarium to arrange the same according to APG IV and typed the name of 27 species under 10 Genera. Attended and participated in the Arc GIS training and workshop held in CNH on 07.9.17 and 08.9.17, lectures of BSI scientists, other emiratus scientists and Professors of different colleges, Universities etc on various aspects.

Flora of India by Shrabasti Das, JPF:

During 2017-18, 896 herbarium sheets of various families were incorporated in different halls, 408 herbarium sheets were sorted out. Data entry of 2657 herbarium sheets under the NMHS project was done and submitted to the In-charge. Worked in student Herbarium for arranging herbarium sheets according to APG IV classification system, data entry of 146 herbarium sheets was done in Type Section. Completed description, illustration and identification of *Cyperus exaltatus*. Attended lectures from various Scientists of Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc., lectures of BSI, other scientists and University Professors on various aspects.

Flora of India by Sreyoshee Sen sarma, JPF:

During 2017-18, a total of 828 herbarium sheets were incorporated in Hall 3 and completed Genus Indexing (Labelling) of 38 Angiosperm families of the same Hall. Under Database of Himalayan Plants of NMHS Project, a total of 5279 sheets were documented and arranged the whole Database (along with all JPFs) according to G.P. number and submitted to the Project In-charge. Worked in Student's herbarium to arrange the herbarium sheets according to APG IV, scanning of 83 sheets and documentation of 41 sheets belonging to 13 plant

families were done. Worked out and described a tree species (*Bauhinia purpurea*) and completed data entry of type section of the Family Rosaceae (66 species and 75 sheets). Assisted in Geo-Tagging of 96 trees of AJC Bose Indian Botanic Garden. Attended lectures from various scientists, Botanical Survey of India on varied aspects of Biodiversity and Taxonomy of Angiosperms, Cryptogams, Fungi etc., lectures of BSI, other scientists and Professors on various aspects.

Flora of India by Chhandam Chanda, JPF:

During 2017-18, a total number of 958 herbarium sheets were incorporated in Hall- 2 and Hall- 3, separated and sent 482 herbarium sheets to different Halls. In Digital Herbarium, scanned and documented 82 herbarium sheets of RET plants and barcoded 146 herbarium sheets. Documented total number of 2128 herbarium sheets of Himalayan plants and submitted to Project In-Charge. Documented total number of 55 herbarium sheets of type specimens from family Primulaceae. Dissected, drew and described a specimen of *Oplismenus compositus* (Poaceae). Helped in arranging 119 herbarium sheets according to APG IV system, in Student's Herbarium. Attended and participated a training programme on Arc GIS on 07.09.2018 and 08.09.2018 and on different lectures delivered by Scientists and Professors from different institutes and universities.

Flora of India by Murugan, P, JPF:

During 2017-18, the data from phenology of 3564 herbarium sheets of Himalayan Plants were documented under NMHS Project and submitted to the Project I/C. A total of 1400 herbarium sheets from CBL were checked for data, geographical location and collectors name for incorporation and a total 1144 and 1518 herbarium sheets were incorporated in Hall no. 1 & 5 respectively. Total 3214 herbarium sheets of General herbarium and 13 herbarium sheets of type specimens of different families were sorted out and sent to respective Hall. A total 395 herbarium sheets from General herbarium and 74 specimens from Type section were digitized in Digital Herbarium section of CNH. Attended various lectures on Invasive Alien Species & Biodiversity understanding from invited Scientists and Professors from foreign Universities and participated in the Arc GIS training on 07.09.2017 and 08.09.2017 at CNH.

Flora of India by Pritha Basu, JPF:

During 2017-18, 1258 herbarium sheets were incorporated in hall 5 and hall 4 along with sorting and distribution of herbarium sheets in hall 4. Data entry of 2612 herbarium sheets of Himalayan plants were done

and 139 sheets of 07 families of Dicot Type Section were documented. Indexing of 88 herbarium sheets was completed in hall 5. Collected phytoplanktons and algae from different lakes and monuments of botanical garden, prepared Slides, drawings, photos were taken and photo plates of collected algal specimens were prepared. Library consulted for identification of the collected specimens. Attended various lectures on Invasive Alien Species & Biodiversity understanding from invited Scientists and Professors from foreign Universities and participated in the Arc GIS training on 07.09.2017 and 08.09.2017 at CNH.

Flora of India by M. Uma Maheshwari, JPF:

During 2017-18, 3124 herbarium sheets were documented under Documentation of phenology of Himalayan plants under NMHS project and submitted to the project In-charge. A total of 1215 herbarium sheets were incorporated, 04 specimens were identified, 12 specimens were sorted out, 03 specimens were sent for remounting in Hall no. 5. A total of 24 and 47 genus and species cover were written respectively. Genus indexing was done for 983 genera of monocot families of 39 almirahs in Hall no. 5 under the guidance of In-charge of Hall No. 5. Illustrated and described parts of *Asystasia gangetica*. Participated in Arc-GIS training on 07.09.2017 and 08.09.2017 in CNH, BSI, Howrah, Botanical Art Workshop in Botanical survey of India, Eastern Regional Centre, Shillong from 12.03.2018-24.03.2018 and attended lectures in varied aspects of taxanomy of Angiosperms, Cryptogams, fungi etc. by Scientists of Botanical Survey of India, eminent outside scientists and Professors.

Flora of India by Tanay Shil, JPF:

During 2017-18, database of 3526 herbarium sheets of different families of Himalayan region & 130 type herbarium sheets of the family Leguminosae were completed. 509 herbarium sheets were separated and sent to different Halls, 14 herbarium sheets were separated for stitching/mounting, 508 herbarium sheets were barcoded, 91 herbarium sheets were scanned and edited and label data entry of 42 herbarium sheets were done in digital herbarium section. In student herbarium section, 154 herbarium sheets of 6 families were arranged according to APG IV system of classification. Assisted in Geo tagging of about 300 trees of the A.J.C.B. Indian Botanic Garden. Dissection, drawing, description and photoplate were made for the grass *Setaria barbata*. Attended lectures in varied aspects of taxanomy of Angiosperms, Cryptogams, fungi etc. by scientists of Botanical Survey of India, eminent outside scientists and Professors.

A close-up photograph of several bright yellow flowers of Dolichandra unguis-catis. The flowers are trumpet-shaped with five lobes and are clustered together. They are growing on a dark, textured tree trunk. The background is filled with green leaves and more yellow flowers, creating a vibrant and natural setting.

FUNDED/ COLLABORATIVE PROJECTS

Dolichandra unguis-catis (L.) L. G. Lohmann

FUNDED/COLLABORATIVE PROJECTS

1. Study of Algal Diversity on Larsemann Hills, Antarctica by Dr. Pratibha Gupta, Scientist-E:

The Larsemann Hills, an ice-free area of about 50 sq. km., located approximately halfway between Vestfold Hills and Amery Ice Shelf on South-eastern coast of Prydz Bay. Continuous human activity in Larsemann Hills is promoted by the coastal location, ice free landscape, the further scientific research and the potential for tourist visits may affect the algal diversity. The Antarctic climate/environment is highly susceptible to the impacts of human activities and has much less natural ability to recover from disturbances than the environment of other continents. Algae play fundamental role in the world's ecosystems and their kaleidoscopic diversity, systematic and phylogeny is indispensable and also play a very important role in monitoring the water quality and prospects of utilisation of algal genetic stock in multiple ways. Algal diversity and distribution in the Larsemann Hills are unknown, except a few aquatic species from freshwater lakes and marine habitats of Prydz Bay. The work on Algae in Larsemann Hills is still in very nascent stage. So the studies were initiated in 2014 to study the algal diversity of Larsemann Hills area for presentation of factual algal profile and diversity from diverse habitat of Larsemann Hills and its biological significance. The main objectives of the project is to collect baseline data/information, survey, collection of the algal samples from various sites for taxonomic studies to know the algal diversity from diverse habitats of Larsemann Hills, East Antarctica.

During 2017-18, systematic survey and collection of Algae was carried out from diverse habitat of Larsemann Hills, East Antarctica and its environs. During survey, samples were collected from diverse habitats of this area which includes 04 peninsulas and 07 islands (except Stornes peninsula due to ASPA) and algal diversity of Larsemann Hills studied. Samples were analysed under Leica DM 2500 sophisticated Research Microscope using Leica Qvin 3.2 Image Analysis Software and Leica Application Suit V4 with annotation for Identification. During Microscopic studies, Cyanoprokaryota (Cyanophyceae / Cyanobacteria), Bacillaeriophyceae, Mediophyceae, Chlorophyceae, Conjugatophyceae, Ulvophyceae, Euglenophyceae, Coscinodiscophyceae and Dinophyceae were observed from different water bodies

and terrestrial habitats of this area and 61 algal species were recorded. Algal biogeography in Antarctica offers many challenges and opportunities to study the nature and rates of adaptation of different groups of algae in the harsh climatic conditions and geographically isolated habitats on the continent and to investigate how much of the algal diversity evolved *in situ*. This is the first step of the study of the algal diversity from diverse habitats of Larsemann Hills, East Antarctica. 59 species reported for the first time as new records from Larsemann Hills, East Antarctica except *Nostoc commune* Vaucher ex Bornet & Flahault and *Pinnularia borealis* Ehrenb.

2. Study & Documentation of Biodiversity of Dalma Wildlife Sanctuary (DWLS) & Saranda Forest Division (SED) sponsored by Jharkhand Biodiversity Board, Ranchi, by Dr. P.V. Prasanna, Scientist-F & Dr. Vinay Ranjan, Scientist-D:

This is a new project. During 2017-18, 03 field tours were undertaken (09.03.2017 to 20.04.2017; 05.05.2017 to 13.06.2017; 19.06.2017 to 23.07.2017) in both the areas; quantitative study through permanent quadrates (20 in Dalma & 80 in Saranda) were done; collection and description of plants are in progress.

3. Non Detrimental Finding studies of *Dalbergia sissoo* DC. and *D. latifolia* Roxb. in India by Dr. Avishek Bhattacharjee, Scientist-B & Sri Anant Kumar, Bot. Asstt.:

Ensuring trade within sustainable limits is at the core of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). According to the Convention, Parties shall allow trade of species included in Appendix II only if the Scientific Authority of the State of export has advised that "such export will not be detrimental to the survival of that species" (Article IV). Further, a Scientific Authority in each Party shall monitor both the export permits granted by that State for specimens of species included in Appendix II and the actual exports of such specimens. Whenever a Scientific Authority determines that the export of specimens of any such species should be limited in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I, the Scientific Authority shall

advice the appropriate Management Authority of suitable measures to be taken to limit the grant of export permits for specimens of that species (Article IV). Collectively these requirements are referred to as 'non-detriment findings' (NDFs).

Dalbergia sissoo DC. and *Dalbergia latifolia* Roxb., members of the legume family are hardy, deciduous tree species with potential for cultivation and also with high demand for their timbers. To support sustainable timber trade and addressing illegal trade all *Dalbergia* spp. found across the world were brought under CITES trade controls at CITES CoP17. However, India has entered a reservation concerning the inclusion of all *Dalbergia* spp. in Appendix II. 'NDFs of *Dalbergia sissoo* DC. and *D. latifolia* Roxb. in India' was essential for taking the policy making decisions and thus the work was assigned to BSI to execute as per CITES guidelines.

During 2017-18, identity and availability of the specimens belonging to both these species deposited at different herbaria (CAL, BGIR, BSJO, BSIS, BSA, BSD, BSI, BLAT, ERC, MH) and in wild were examined along with collection of field data. Information was also collected from CBL based on ethnobotanical collections of the unit. Information on the wild/cultivated populations was gathered from the observation of the scientific staffs of AJCBIBG, AZRC, BGIR, BSHC, CRC, DRC, ERC, ISIM, NRC, WRC. Information from different publications were gathered. Prepared distribution maps with ArcGIS based on the above mentioned information. Sent letters to forest departments of all Indian States and Union Territories requesting to provide information on present living stocks of *Dalbergia latifolia* and *D. sissoo* in cultivation/ nurseries (like seedlings/grafted plants etc.) and in Wild, plantation initiative taken (if any), harvest practices adopted for these two species, followed threats and management protocols for these two species, illegal trade of these two species, availability of seized stock of *D. latifolia* and *D. sissoo* and any other pertinent information on these two species. However, reply was received only from the forest department of Manipur and Mizoram till date. Besides, with permission of HoO, CNH visited forest offices and plantation sites in Dibrugarh (Assam), Roing (Arunachal Pradesh), Tezu (Arunachal Pradesh) during the second field tour (from 28.02.18 to 14.03.18 in connection with Annual Action Plan) to collect information on *Dalbergia* spp.

4. Indicative Flora of Eco sensitive Zone of Dalma Wildlife Sanctuary, Jharkhand by Dr. Mahua Pal, Bott. Asstt.:

The Dalma Wildlife Sanctuary, Jamshedpur lies between Latitudes 22°46'30" and 22°57' N and Longitudes 86°3'15" and 86°26'30" E in the East Singhbhum and

Saraikela-Kharsawan districts of Jharkhand, was established in 1976 and covering an area of 193.22 sq.km. It is necessary to conserve and protect the area around the protected area of Dalma Wildlife Sanctuary as Eco-sensitive Zone from ecological and environmental point of view. Central Government notifies the area up to five kilometres from the boundary of the protected area of the Dalma Wildlife Sanctuary as the Eco-sensitive Zone.

During 2017-18, 01 tour was conducted to Dalma Wildlife Sanctuary for studying the indicative Flora of this Eco sensitive Zone during which a total of 398 species under 307 genera belonging to 91 angiosperms families were listed from the study area and field photo of 125 plant species were taken.

5. Studies of fossil and living plants with reference to the impact of climate change on flora of Gangetic Plains and Central India (in collaboration with BSIP, Lucknow) by Dr. G. P. Sinha, Scientist-E, Dr. Arti Garg, Scientist-D and Dr. A. N. Shukla, Scientist-B:

Pollen fossils obtained from Quaternary and pre-Quaternary sedimentary deposits are indices of the vegetational history, while the leaf surface, stomatal patterns reflect the impact of climate change and elevated CO₂ levels on plants as these are the structures which play key role in photosynthesis to absorb atmospheric CO₂. Comparative studies of fossil samples and present day vegetation constituents reveal alterations in the vegetation through geological time scale. The present project is therefore intended to throw light on the impact of climate change on flora of Gangetic plains and Central India.

During this period, 01 survey and plant collection tour *w.e.f.* 03.10.17 to 27.10.17 was conducted to Chitrakoot area during which fresh plant materials were collected for pollen study and studies on stomatal indices. Total 48 field numbers of plant specimens were collected and identified with c. 100 photographs of the habit of plants, flowers and landscape vegetation. The pollen of 21 species and leaf samples of old collections at BSA and present day specimens were processed and analysed under LM and FESEM and compared for the changes that might have occurred in terms of stomatal index in the time span of about 50 years. The study was taken up to see the adaptability of plant species with regard to CO₂ increase in the atmosphere in recent years. Results reveal a varied degree of increase in the stomatal index in modern leaf samples with respect to different species. The polliniferous material pertaining to the above 21 plant species were studied under Light Microscope and Scanning Electron Microscope in BSIP, Lucknow and chemical processing for the study of pollen morphology

was made for taxonomic characterization through Modern Analogue to facilitate proper identification of fossil specimens at species level. The precise identification of different pollen taxa recovered in Quaternary and pre-Quaternary sedimentary deposits would find utility to interpret the past vegetation diversity, climate and ecological conditions. A comparative picture of the fossil present in pollen samples was prepared for wetland species which reflected the existence of pollen samples of *Ludwegia adscendens* in fossils. Comparative stomatal indices prepared from leaf surfaces of herbarium specimens dating about 50 years back when compared with present day samples for studying the impact of elevated temperature and CO₂ concentration on plants revealed alteration in stomatal frequency depicting impact of elevated atmospheric CO₂ levels on plant tissues. Data is yet to be summarized. Pollen morphometry of important plant constituent of tropical dry and moist forests of northern and central India viz. *Cassia fistula*, *Mallotus philippensis*, *Madhuca longifolia* var. *latifolia* and *Shorea robusta* is in progress. Some endangered species like *Rauvolfia serpentina*, *R. tetraphylla* (Apocynaceae) and *Withania somnifera* (Solanaceae) from the Indo-Gangetic plains have also been undertaken for the preparation of pollen morphological repository. Pollen morphology of marshy taxa of *Ludwigia* species (Onagraceae) have also been taken up in order to understand the distinct morphometry among different species, *Ludwigia octovalvis*, *Ludwigia octovalvis* subsp. *sessiflora*, *Ludwigia adscendens*, *Ludwigia perennis*, *Ludwigia hyssopifolia* in India. About 13 plant species were taken up for analysing Stable Carbon Isotope in leaf samples. Interpretations and calibration of the result are in progress.

6. Non Detrimental Finding studies on Red Sanders (*Pterocarpus santalinus* L.f.) in India by Dr. L. Rasingam, Scientist-D, Dr. J. Swamy, Bot. Asstt., Sri. S. Nagaraju, Bot. Asstt., Dr. M. Sankara Rao, Scientist-B, Miss. Pooja, Miss. A. Swathi, Mr. K. Nethaji, Mr. P. Chandu and Mr. S. Gurappa, Miss. Sharfa Naaz, Mr. A. Narasimha, Mr. P. Bharath Simha Yadhav, Mr. Ranjith, Mr. Patan Nazeer Khan and Mr. D. Ramesh, JPFs:

Pterocarpus santalinus L.f., an endemic tree species belonging to the family Leguminosae-Faboideae, is mostly distributed in the southern districts of Andhra Pradesh viz. Chittoor, Kadapa, Nellore, Prakasam and Kurnool and also reported from the northern districts of Tamil Nadu. According to the AP State Forest Department, the total area of red sander forests is estimated to be 3.98 lakh hectares in 171 beats of eight forest divisions in Andhra Pradesh. The species is listed under the endangered category (B1+2de) in the IUCN Red List and Appendix II of CITES. This species has red

heart wood which is used for making musical instruments, artefacts and many other medicines. In the recent years, illegal felling and smuggling was increased many folds and the same has been illegally exported to many countries cause a threat to the species survival in natural habitat. The heartwood is highly priced in the international market, which is the main cause of illegal felling and smuggling.

During 2017-18, 06 plant exploration tours *w.e.f.* 08.08.17-15.08.17 and 04.09.17-18.09.17, 09.10.17-14.10.17, 01.11.17-12.11.17, 28.02.18-06.03.18 and 19.03.18-26.03.18 were undertaken to the study areas during which three 0.1 ha. sampling plots in each beat were established in three strata viz. plain, slope and plateau to study the population status of Red Sander species. All the tree species including *Pterocarpus santalinus* \geq 10 cm gbh were enumerated. For multi-stemmed trees the bole girth was measured separately. Further, information pertain to the height of the trees, disturbances, cut stumps were also recorded. To study of regeneration capacity of the Red Sander species, a 3 x 3 m small sampling plots were established in the east left corner of each 0.1 ha plots and enumerated all the seedlings, saplings and coppice. Population assessment of *Pterocarpus santalinus* in 06 forest divisions viz., Kadapa, Rajampeta, Nandhyal, Giddalur, Proddatur and Nellore have been completed. The collected data were entered in the excel sheet for analysis.

7. Preventing Extinction and improving conservation status of Threatened plants through application of Biotechnological tools (NHMS Project) by Dr. Giriraj Singh Panwar, Scientist-C and Amber Srivastava :

The major objectives of the project are to carry out intensive and extensive survey for locating the selected species viz. *Pittosporum eriocarpum*, *Ephedra gerardiana*, *Malaxis muscifera*, *Malaxis acuminata*, *Lilium polyphyllum* and *Skimmia laureola* in Western Himalaya and attempting for *ex-situ* and *in-situ* conservation of the concerned species, collecting GPS data and Ecological niche modelling of the selected species of the above mentioned objectives.

During the period, a total number of 36 tours were conducted in the different regions of Indian Western Himalaya to locate the species. Two new localities of *Pittosporum eriocarpum* were also discovered from Kumaon (UK) and Shimla (H.P.) region. Besides this the concerned species were mass propagated and introduced in ENM marked sites of habitat suitability. The growth and survival of the planted saplings were also monitored in suitable intervals. The propagated saplings of *Pittosporum eriocarpum* and *Ephedra gerardiana* were introduced in wild habitats selected through ENM.

Besides this the remaining localities were also surveyed to locate the targeted species and newer localities of *Pittosporum eriocarpum*. Apart from the targeted species of the project other threatened species were also collected, propagated and maintained under *ex-situ* conservation in the botanical garden. These species include *Tricholepis roylei*, *Jasminum parkeri*, *Eulophia dabia*, *Catamixis baccharoides*, *Incarvillea emodi*, *Seleginella adunca*, *Cyathea spinulosa*, *Magnolia kisopa* etc. In 2017-18, *Pittosporum eriocarpum* (500 plants), *Crepidium acuminatum* (300 plants), *Lilium polyphyllum* (150 plants), *Skimmia anquetilia* (150 plants), *Ephedra gerardiana* (100 plants) were successfully propagated.

8. Exploration and Evaluation of Cytomorphological diversity in the Grasses of Cold desert of Pangi Valley sponsored by DST-SERB, by Dr. Puneet Kumar, Scientist-B and Mr. Harminder Singh, JPF:

The major objectives of the project are exploration and evaluation of chromosomal diversity in the members of Poaceae. During previous year, 02 field tours were conducted during which 106 grass cytological samples were collected. 92 cytological samples were worked out of which 53 samples were meiotically photographed (including counts and meiotic abnormalities). During 2017-18, 02 field tours were conducted to the study area during which 46 field collections were made, of which all the samples collected were worked out. Only 11 samples showed presence of chromatin at dividing stages. An attempt was also made to study the mitosis of the wild grasses; the roots tips of grasses in the field were collected. Some grasses were brought as live specimens, but failed to survive in laboratory. Mature seeds were also collected for mitotic studies and were germinated in the laboratory. Karyo-morphological study was done in *Elymus semicostatus*. Pollen size and pollen fertility were calculated for 45 cytologically worked out samples. Some of the grass species for which chromosome counts was determined are *Elymus nutans* (n=14), *Elymus semicostatus* (n=14), *Chrysopogon gryllus* (n=10) and *Phleum alpinium* (n=21). Karyo-morphological study was done in *Elymus semicostatus*. Meiotic abnormalities such as Cytomixis, Laggards, Cytoplasmic bridges, Mis-oriented bivalents, Micro-nuclei, Stickiness, Disturbed Anaphase I, Late Disjunction were observed in as many as 10 species. Consequent to these meiotic abnormalities, pollen sterility of 10-15% was observed in these species.

9. Multidisciplinary Studies in Floristic Assessment, Ecological Analysis, Ecosystem Services, Conservation and Sustainable Management of selected National Parks of Western Himalayas by Mr. Rajni Kant, Mr. Kapil Kharkwal and Ms. Shalini Singh, JPFs Dr. P. Singh, Dir/BSI (PI), Dr. B.K. Sinha, Scientist-

F, Dr. Kumar Ambrish, Scientist-D & Dr. K. Chandrasekar, Scientist-D, G.B. Pant Institute of Himalayan Development (Co-PI):

The major objectives of the project are exploration and inventorization of floristic diversity assessment based on different criteria. During the period of 2017-2018, 02 field tours were conducted to Valley of Flowers National Park, Chamoli, Uttarakhand and another to Great Himalayan National Park, Kullu, Himachal Pradesh during which a total of 513 plants specimens were collected from both sites. During 2017-18, 02 field tours *w.e.f.* 08.11.2017 to 17.11.2017 and 11.09.2017 to 27.09.2017 were conducted to Valley of Flowers, National Park, Chamoli, Uttarakhand and Great Himalayan National Park, Kullu, Himachal Pradesh during which a total of 400 field numbers were collected. Identification & label writing of c. 500 plant specimens were completed, c. field 566 data were entered in excel format.

10. Study of Diversity of Marine Macro Algae of Andhra Pradesh by Dr. M. Palanisamy, Scientist 'D' and Shri. Aron Santhosh Kumar. Y, Project Fellow (AICOPTAX Project):

The major objectives of the project are survey and collection of seaweeds; taxonomic enumeration and diversity of seaweeds; study of the physico-chemical parameters of coastal water and study of the seaweed population density of various localities. As per the approved program 01 field tour *w.e.f.* 19.09.2017 – 30.09.2017 was undertaken to Andhra Pradesh coastal region for survey and collection of Marine macro algae during which 420 field numbers of seaweeds were vouched, 840 numbers of herbarium sheets were prepared and 80 numbers of field numbers of live specimens were preserved in wet form for lab studies. Approx. 340 field numbers of seaweeds were identified. GPS coordinates of all the collection locations were recorded with the help of GPS. A total of 275 photos were taken on coastal nature, habit and habitat of seaweeds.

During this study, dominant seaweed diversity was recorded at the northern part of the state, especially at Bheemlipatnam and followed by Chintapalle, Akkupalli, Yerramukkam, Mangamaripeta. Dominant growth of seaweeds *i.e.* *Enteromorpha compressa*, *E. flexuosa*, *Ulva fasciata*, *U. lactuca*, *U. rigida*, *Acrosiphonia orientalis*, *Chaetomorpha antennina* were recorded. The green algae species such as *Enteromorpha compressa*, *Chaetomorpha linoides* *Ulva* sp. were found throughout the coastal areas of Andhra Pradesh; *Enteromorpha intestinalis*, & *Chaetomorpha crassa* were only found in the estuaries and back water area of Andhra Pradesh.

11. ex- situ conservation and Propagation of Indigenous, Threatened and Endemic Plants through Improvement of Infrastructure Facilities in National Orchidarium & Experimental Garden (NOEG), Yercaud Funded by MoEF & CC (Lead Garden Project, Ref. No. F. No. 10/28/2014-CS (BG) dated 24/07/2015 sponsored by MOEF & CC, New Delhi), by Dr. S. Kaliamoorthy, Scientist - D:

The purpose of this project is to augment the facilities available at present at National Orchidarium & Experimental Garden (NOEG), Yercaud so as to improve the operation and functions of the garden. Improvements to this garden will reflect a desire to promote and educate the community about sustainable biodiversity. NOEG has an area of 18.6 hectares with an altitudinal range of 1380 to 1511m. Its main activity is concerned with conservation and preservation of plant species with particular emphasis on Orchids, Ferns, Rare and Endemic plants of Peninsular India. It has been entrusted with the mandate of conserving as many wild species of Indian orchids as possible so as to establish this group's germplasm centre.

The Garden has two entrances. The first one has a very old climber *Gnetum ula* Brongn., near it, thereby getting the name 'Gnetum Gate'. The second one takes the name of 'Mamaram Gate' being the tamil equivalent for 'Mango tree Gate'. The Garden has been engaged in systematic survey, collection, introduction and botanical studies of rare, endangered and threatened plants, plants of potential economic value and wild relatives of cultivated plants. The garden is regularly visited by School and College students, teachers, Scientists from various research institutions and local people. Now a days, due to a great influx of visitors, especially students from colleges and schools, a proposal is submitted herewith to strengthen and develop the facilities of the garden in such a way to make it an excellent Centre for plant conservation, education and extension.

During 2017-18, micropropagation of 07 plants (*Vernonia shevaroyensis*, *Crotalaria shevaroyensis*, *Canarium strictum*, *Coelogyne mossiae*, *Xenikophyton smeeanum*, *Coelogyne nervosa*, *Paphiopedium spicerianum*) were successfully done in various kinds of media. Regarding this, shoot tips, nodal segments and mature seeds were used as explants. In connection with vegetative propagation, 60 cuttings of *Vernonia shevaroyensis* were treated with 50 ppm IBA and planted in a pot for multiplication; 100 cuttings were prepared and treated with 0.2% Bavistin and all finally prepared cuttings were planted in a grow bags. Finally prepared cuttings were planted in a grow bags with each bags contain 10 cuttings. Around 49 cuttings were found to

show bud initiation and are under observation. 100 cuttings of *Canarium strictum* were prepared and treated with 0.2% Bavistin and IBA hormone in different concentrations (50ppm to 125ppm), finally prepared cuttings were planted in a grow bags with each bags contain 10 cuttings. Around 49 cuttings were found to show bud initiation and are under observation. For seed propagation, 29 out of 98 *Crotalaria shevaroyensis* seedlings were raised through seeds in botanical garden.

12. Strengthening Lead Botanical Garden, Barapani, ERC, Shillong, funded by MoEF & CC by Dr. A.A. Mao scientist-F, Dr. M. Murugesan, Scientist-B and Mr. L. R. Meiti, Botanical Assistant:

The main objective of this project is collection, introduction and multiplication of plant species in the Experimental Botanical Garden, Barapani and Shillong office Garden. In this regards, 07 field tours were conducted during this period of which a total of 503 plant species were collected and planted, 67 RET plants such as *Agrostemma khasiana*, *Anoectochillus brevibrabis*, *A. roxburghii*, *Anthogonium gracile*, *Bambusa affinis*, *B. alemtemshii*, *B. Bambos*, *B. nagalandiana*, *Brachycorythis galeandra*, *Bulbophyllum leopardinum*, *B. monoliforme*, *Calanthe clavata*, *Caulokaempferia secunda*, *Ceratostylis himalaica*, *Ceropegia macrantha*, *Coelogyne griffithii*, *C. viscosa*, *Crotalaria sessiliflora*, *Cyathea khasyana*, *Cymbidium devonianum*, *C. aloifolium*, *C. macrorhizon*, *Dendrobium pendulum*, *D. chrysanthum*, *D. devonianum*, *D. falconeri*, *D. ochreatum*, *Vanda alpine* etc. were collected and introduced in the garden. To develop Gene Pool, 09 species of *Citrus*, 07 species of *Musa*, 20 species of *Rhododendron*, 08 species of *Dioscorea*, 58 species of *Zingibers*, 05 species of *Piper*, 23 species of Bamboo, 37 medicinal plants, 59 fern species 26 wild edible plant species, 86 species of rare orchids of NE India. Approx. 503 plant species were introduced in Experimental Garden. Around 1302 seedlings/saplings were raised from 38 species by stem cutting, root cutting and seed germination for multiplication purposes. A total of 700 seedlings/cuttings/rhizomes were distributed during the months of April 2017 to March 2018.

13. Great Indian Himalayan Project "Biodiversity Assessment through long term monitoring plots in Indian Himalayas Landscape"- NMHS by Dr. Rashmi Dubey, Scientist-D:

As part of NMHS project, Dr. Dubey, as Co-PI and micro-fungi expert, isolated 11 soil samples on different media applying soil dilution method; identification of fungi is in process; 14 samples were isolated on PDA; 76 slides were prepared from the cultures obtained from soil samples collected under studies in above project; 19 strains of *Aspergillus* was reported till now.

14. Biodiversity assessment through long-term monitoring plots in Indian Himalayan landscape by Dr. Sudipta Kr. Das, Dr. Vikas Kumar, Dr. Dinesh Singh, RAs, DR. Samiran Pandey, Ms. Natasha Srivastava, Mr. Arnab Banerjee, Mr. Subhajit Lahiri, Mr. Deep Sekhar Dash, SPFs, Mr. Madhav Kr. Jha, Mr. Nikesh Kumar, Field Assistt. & Dr. P. Singh, Dir/BSI (PI), Dr. B.K. Sinha, Scientist-F & Dr. S.S. Dash, Scientist-D (Co-PI):

During 2017-18, research staffs of this project conducted altogether 10 field trips to all IHR states for sampling as well as establishment and monitoring of long-term monitoring plots. A total of 1916 plant specimens were collected from different sampling sites, which were preserved in Central National Herbarium (CAL), Howrah.

So far 1115 plants were identified and rests are under process. Sampling areas of 1 sq. km. (1 X 1 km) were identified in each landscape based on vegetation, habitat and threatened status of some selected taxa. Intensive plant sampling was carried out by selecting random plots of 20m X 20m size in each sampling area. Shrubs and herbs along with cryptogams were collected from 5m X 5m size and 1m X 1m size quadrats within the designated plots respectively. A total of 208 monitoring plots were established across the IHR for long term monitoring and base line data collection. 52 pre-existing plots were also monitored. A checklist of 10289 plant taxa of the Himalayan region belonging to 2256 genera and 238 families was prepared as a baseline data.



Scenic view of Chakma Village, located in outskirts of Namdapha National Park

ASSISTANCE TO BOTANIC GARDEN SCHEME

ABG GRANT- IN -AID, FUND DISBURSED IN FY 2017-18

Grant -in- Aid Available	Sl. No	Date of Sanction	Name of the Institution	Amount sanctioned in FY 2017-18	Balance Amount
2,30,00,000/-	1	10/17/2014-CS/BG dt.23/08/2017	Y. S. Parmar University, Solan	38,64,626	1,91,35,374
	2	10/28/2014-CS(BG) dt.12/12/2017	Botanical Survey of India, southern Regional Centre, Coimbatore	8,88,995	1,82,46,379
	3	10/02/2013-CS/BG dt.06/11/2017	G.B. Pant Institute of Himalayan Environment and Development, Almora	6,02,092	1,76,44,287
	4	10/04/2012-CS(BG) dt. 12/12/2017	Shivaji University, Kolhapur	27,60,767	1,48,83,520
	5	10/16/2016/CS/BG dt.12/12/2017	Yogi Vemana University, Kadapa	22,76,574	1,26,06,946
	6	10/13/2009-CS/BG dt. 22.12.2017	Foundation for Revitalisation of Local Health Traditions (FRLHT), Bangalore, Karnataka	4,00,000	1,22,06,946
	7	10/08/2012-CS/BG dt. 09.01.2018	University of Agriculture GKVK, Bnagalore	12,63,507	1,09,46,439
	8	10/21/2017-CS/BG dt. 23.01.2018	Osmania University, Hyderabad	25,50,000	83,93,439
	9	10/17/2017-CS/BG dt. 15.01.2018	Y. S. Parmar University, Solan	8,47,800	75,45,639
		Total fund disbursed			1,54,54,361

HERBARIUM INFORMATION (2017-18)

Sr. No	Herbarium Maintenance	ANRC	APRC	AZRC	CBL	CNH	CRC	CRYPTO GAMY	DRC	ISIM	NRC	SHRC	SRC	WRC	TOTAL
1.	No. of specimens mounted/ remounted/ labelled	624/ 0/ 604	4323/ 0/ 4323	3975/ 30/650	918	4221/ 5235/ 599	4112/ 936/ 3050	37	0	0/0/33	4502/ 0/ 2166	340/ 0/ 100	783/0/ 288	800	24635/ 6201/ 11,813
2.	No. of herbarium sheets stitched/re-stitched/ poisoned/fumigated/ dusted	4140/ 0/ 8231	4323/ 0/400/ 0/2750	3525	0/1000 /975	4239/ 0/ 3276/ 6164	4080/ 0/0/ 2367/ 8560	0	0/0/ 1539	0/0/19 3/3020	956/ 6166	1507/ 0/ 2761	648/0/ 0/752/ 506	1500/ 800	24,918/ 7966/ 17,375
3.	No. of herbarium sheets accessioned	420	170	3548	0	0	1885	0	0	0	380	1784	158	0	8345
4.	No. of specimens incorporated/re-incorporated	1330	170/0	3818	0	6571	2998	1348	3372	0	5360	2433	1097	0	28,497
5.	No. of specimens sent on loan	0	0	0	0	133	0	0	0	0	28	0	0	0	161
6.	No. of loaned/gifted specimens received/ returned/exchanged	0	0/27	69	0	265/ 764/2	23	162	0	0	0	0	32	0	551/ 791/2

7.	No. of specimens identified	89	0	825	445	1331	483	127	40	0	560	28	0	0	3,928
8.	No. of Genus/species covers changed	220	29/63	200/ 300	0	2066/ 4479	550/ 735	0/ 1125	654	54	0	127/ 420	160/ 260	0	4064/ 7,382
9.	No. of specimens segregated	0	715	375	0	0	0	0	0	0	0	0	123	0	1213
10.	Documentation of existing herbarium sheets at herbaria/entry in Excel sheet/Field data written	0	3478/ 8041	0	0/0/ 415	0	0	0	0/0/ 1800	0	0/0/ 2253	0	0	0/0/ 1500	3,478/ 8041/ 5,968

HERBARIUM DIGITIZATION (2017-18)

REGIONAL CENTERS	ANRC	APRC	CNH	CRYPTOGAMY	DRC	NRC	SHRC	TOTAL
Digitization	6374	4500	31,143	1570	4803	2253	4500	55,143

AWARDS & HONOURS

Dr. Lal Ji Singh : 'Award of Honour-2017' for exemplary contribution to research and development benefitting Andaman & Nicobar Islands by ASIAME (South Asia Thematic School).

Dr. Rashmi Dubey : 'Best Women Botanist Award'- for best paper presentation during XXXX All Indian Botanical Conference of Indian Botanical Society held in Patiala, Punjab in 2017.

'Best Scientist Award' by EET CRS Academic Achievement Awards during 5th Academic Achievement Awards-2017 held in Mumbai in 2017 for outstanding contribution to research and development.

Sri Vineet Kumar Singh : 'Gold medal for Best presentation' in a National Conference on 'Ecological Imbalance: A Threat to Fauna, Flora, Economy and Human Survival' in 2017 at Vigyan Parishad Auditorium organized by DDU Government PG College, Saidabad, Allahabad.

Received 'Best Poster presentation award' in a two days International Symposium on 'Indiscriminate Development: Current Scenario & Socio-Environmental Challenges' in 2018 jointly organized by Blue Planet Society, Allahabad, Botanical Survey of India, CRC, Allahabad and Govt. P.G. College, Saidabad, Allahabad at BSI, CRC, Auditorium.

Dr. Nitisha Srivastava : 'Best oral presentation award' in a two days International Symposium jointly organized by Blue Planet Society, Allahabad, Botanical Survey of India, CRC, Allahabad and Govt. P.G. College, Saidabad, Allahabad on 'Indiscriminate Development: Current Scenario & Socio- Environmental Challenges' in 2018 at BSI, CRC, Auditorium.

Dr. (Mrs.) Piu Das : 'Best poster Award' in a National Symposium on "Pteridological Studies in India: Perspective and Modern approaches in relation to Environment & Climate Change, in 2018.

Dr. Shuvadeep Majumdar : 2nd prize (poster session) in a National Seminar on "Himalayan Plant Diversity: Taxonomy, Conservation and Sustainable Utilization" organized by Botanical Survey of India, Eastern Regional Centre in collaboration with East Himalayan Society for Spermatophyte Taxonomy & North Eastern Hill University, Shillong, Meghalaya in 2018.

Dr. A. N. Shukla : 'Biodiversity Conservation Award-2018' by Blue Planet Society, Allahabad in an International Symposium on IDCSC 2018 in 2018.

Dr. Pushpesh Joshi : 'Award of Merit in Pteridology' for the year 2018 by The Indian Fern Society, Chandigarh.

Dr. D. K. Agrawala : 'Best poster presentation Award' during Foundation Day ceremony of ICAR, NRC (Orchids), Pakyong in 2017.



Dr. Rashmi Dubey receiving 'Best Women Botanist Award' at Indian Botanical Society, Patiala



Dr. Lal Ji Singh receiving award of honour by ASIAME



Dr. Vinit Ku. Singh receiving 'Young Scientist Award' by Blue Plant Society, Prayagraj (ABSS 2018)



Dr. Nitisha Srivastav receiving the 'Best oral presentation award' from Blue Planet Society, Prayagraj on 'Indiscriminate Development: Current Scenario & Socio- Environmental Challenges' in 2018



Dr. A.N. Shukla receiving Biodiversity Conservation Award-2018 (IDCSC 2018)



Dr. G.P. Sinha receiving 'Green India Promotion Award' by 'International Academy of Science and Research, Kolkata'

SERVICE RENDERED

A. PUBLIC SERVICE RENDERED:

- **Assistance to scientific community:** Dissemination of information, assistance to c. 3500 researchers and scientific officials in pursuing researches on plant taxonomy and allied disciplines.
- **Experts services:** 158 Queries on plant distribution, ecology, nomenclature, RET taxa etc. were attended and solved by BSI experts.
- **Identification & authentication:** c. 1,956 Specimens of angiosperms, pteridophytes, bryophytes, fungi, lichens and algae; 53 crude drugs including CITES and Negative Listed Plants were pharmacognostically authenticated.
- **Visitors attended:** c. 13,738 visitors including VIPs, dignatories, foreign delegates, scientists, academicians, researchers and students; c. six lakhs general visitors exclusively visited AJC Bose Indian Botanic Garden, Howrah.
- **Plantation programme & sapling distribution:** c. 2950 plant materials, saplings and seeds supplied to different Institutions.
- **Miscellaneous services:** Evaluation of M.Phil. & PhD thesis from different Universities, reviewing manuscripts from different peer reviewed journals such as *The Philippine Journal of Systematic Biology*, *Bangladesh J. Plant Taxonomy*, *Lichenologist*, *Fungal Diversity*, *Rheedea*, *Plant Science Today*, *Annals of Botany* etc., *Indian J. Forestry*, *Phytotaxa*, *Phytokeys* etc.

B. REVENUE EARNING:

- Total revenue earned: Rs. 5,498,121/-
- Identification charges of plant specimens/crude drug samples: Rs. 80,800/-
- Sale of BSI publication: Rs. 140025/-
- Miscellaneous (Entry fee in Botanic Gardens, Photography charges, guest house charges, photocopy charges etc.): Rs. 5,277,296/-

EVENTS & ACTIVITIES



Hon'ble Prime Minister Shri Narendra Modi releasing Botanical Survey of India publication "Plant Discoveries 2017" on World Environment Day, 5th June 2018 at Vigyan Bhawan, New Delhi



Visit of Hon'ble Minister MoEF&CC Dr. Harsh Vardhan's to Indian AJCB Indian Botanical Garden



Hon'ble Governor Meghalaya Shree Ganga Prasad releasing the Abstract Volume during National Symposium Himalayan Plant Diversity : Taxonomy, Conservation and Sustainable Utilization on 8th March 2018 at ERC, BSI, Shillong



Group of Participants on BSI 128th foundation day programme "Progress & Prospects in Taxonomy" at Ashutosh Centenary Hall, ISIM, Kolkata on 13-14 Feb, 2018



Mr. Sandeep Mukherjee, DoPT giving lectures to the participants of two weeks training of Botanical Assistant



Plantation of saplings by school students on Vanamahotsav 2018



Prof. C.R. Babu giving lectures to the participants of two weeks training of Botanical Assistant



Prof. S.R. Yadav giving lectures to the participants of two weeks training of Botanical Assistant



DM, Howrah addressing school students during World Environment Day



Dr. P. Lakshminarasimhan interacting with Hon'ble CM of Goa



Dr. P. Lakshminarasimhan at International Forest Day celebration at Pune University-March 2018



Environment Day celebration at BGIR



Hon'ble Minister Dr. Harsh Vardhan MoEF&CC visiting the Great Banyan Tree at AJCBIBG



Celebration of International Yoga Day



Visit of School & College students to AJCBIBG



BUDGET ESTIMATE 2017-18

BOTANICAL SURVEY OF INDIA

Government of India

DETAILED DEMANDS FOR GRANTS OF MINISTRY OF ENVIRONMENT, FORESTS & CLIMATE CHANGE FOR 2017-18

Grant No. 27

3435-Ecology and Environment (Major Head)

01-Survey (Botanical)(Sub-Major Head)

01.001-Direction and Administration (Minor Head)

04-Attached/Subordinate Offices (Sub Head)

04.01-Botanical Survey of India (Detailed Head)

Object Head

(Figure in Thousand)

FY 2017-18	Revised Allotment 2017-2018	Exp. Upto 28.02.2018	Exp. Upto 31.03.2018	Expenditure for 01.03.2018-31.03.2018	Balance as per actual exp.
1. Salaries	419200	417223	417147	-76	2053
2. Wages	100	37	68	31	32
3. Overtime Allowances	500	174	221	47	279
6. Medical Expenditure	7000	4186	4908	722	2092
11. Domestic Travel Expenses	11500	10114	11145	1031	355
12. Foreign Travel Expenses	1000	285	992	707	8
13. Office Expenses	91170	66196	90526	24330	644
16. Publication	2000	1317	1989	672	11
20. Other Administrative Expenses	400	189	200	11	200
21. Supplies and Materials	1000	524	947	423	53
27. Minor works	20000	19756	19756	0	244
28. Professional Services	5685	1474	5568	4094	117
30. Oth. Cont. Services	37000	34498	36524	2026	476
31. Grant-in-aid	45	0	45	45	0
34. Scholarship & Stipend	10500	9875	10482	607	18
Total-PLAN	607100	565848	600518	34670	6582



भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

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