ANNUAL REPORT
2022-23

भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

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MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE

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2022

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Botanical Survey of India

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From the DIRECTOR'S Desk

Dr. A.A. Mao

Director

It is a great honour for me to present the Annual Report of Botanical Survey of India for the year 2022-23. The report highlights the brief accounts of all-round achievements of the institute in the field of exploration, survey, research, technological development and outreach activities. During the period 2022-23, Botanical Survey of India excellently performed in multifunctional disciplines in basics as well as applied streams of plant sciences. As per the recommendation of the RAMC, BSI undertook 66 Annual Research Projects (ARPs) on various aspects of the floristic research of the country. Under these projects, BSI conducted 86 floral surveys (including local tours) in different phyto-geographical regions of the country and 5 Herbarium Consultation Tour (HCT) in various herbaria. 4977 plant specimens were collected and identified. During the year, BSI completed 24 projects such as Bryo-flora of Jharkhand, Algal Flora of Purbasthali Wetland, Bardhaman, West Bengal, Flora of Mount Abu Wildlife Sanctuary, Rajasthan, flora of Andaman & Nicobar Islands (Volume – 3 Monocotyledons), Plant diversity in Sacred Grooves of South Bengal, Flora of Eagle Nest Wild Life Sanctuary and its adjacent regions, West Kameng District, Arunachal Pradesh, Flora of Kunu National Park, Madhya Pradesh, Flora of Himachal Pradesh, (Vol-2), Ethnobotanical study of Tharu and Bhoxa tribe of Uttarakhand, India, Wild edible plants of Sikkim and Darjeeling Himalaya. Supplement to the Flora of Maharashtra, Red listing of Indian endemics as per IUCN criteria: Family Ranunculaceae etc. BSI documented 55,048 taxa of plants, belonging to 21, 984 taxa of angiosperms; 82 taxa of Gymnosperms; 1,314 taxa of Pteridophytes; 15,602 taxa of Fungi; 9,008 taxa of Algae; 2,800 taxa of Bryophytes and 2,989 taxa of Lichens towards the complete inventory of floral resources of the country. Towards fulfilling the Global strategy for plant conservation targets on *ex-situ* conservation, 165 rare, endemic, endangered, medicinal and economical plant species have been introduced and maintained in BSI botanical gardens spreading in different phytogeographical regions of India. Besides, BSI has also distributed more than 2 lakh seeds / seedlings among local people, village communities and various stakeholders, which plays an important role in carbon credit. Towards digitization, 22,500 herbarium sheets were scanned and 1,74,355 metadata were prepared.

During the year, the scientists of BSI published 42 taxa as new to science and 51 taxa as new additions to Indian flora and 4 taxa were rediscovered after centuries. The research aptitude of the scientific officials of the institute was reflected through the publication of 32 Books, and 205 research papers in peer reviewed journals. Besides, BSI published 03 periodicals [NELUMBO (vol. 64: Issues 1 & 2), Plant Discovery 2021, Vanaspati Vani 2020 & 2021]. The 15th volume of 'Plant Discoveries 2021' which was released on 5th June, 2022, presented details of 204 taxa as new to science and 125 taxa as new records for Indian Flora. This includes 135 Angiosperms, 4 Pteridophytes, 9 Bryophytes, 28 Lichens, 29 Algae, 98 Fungi and 12 Microbes to the floristic wealth of India. Now the current number of plants taxa from India has been updated to 55048 including 1269 microbes.

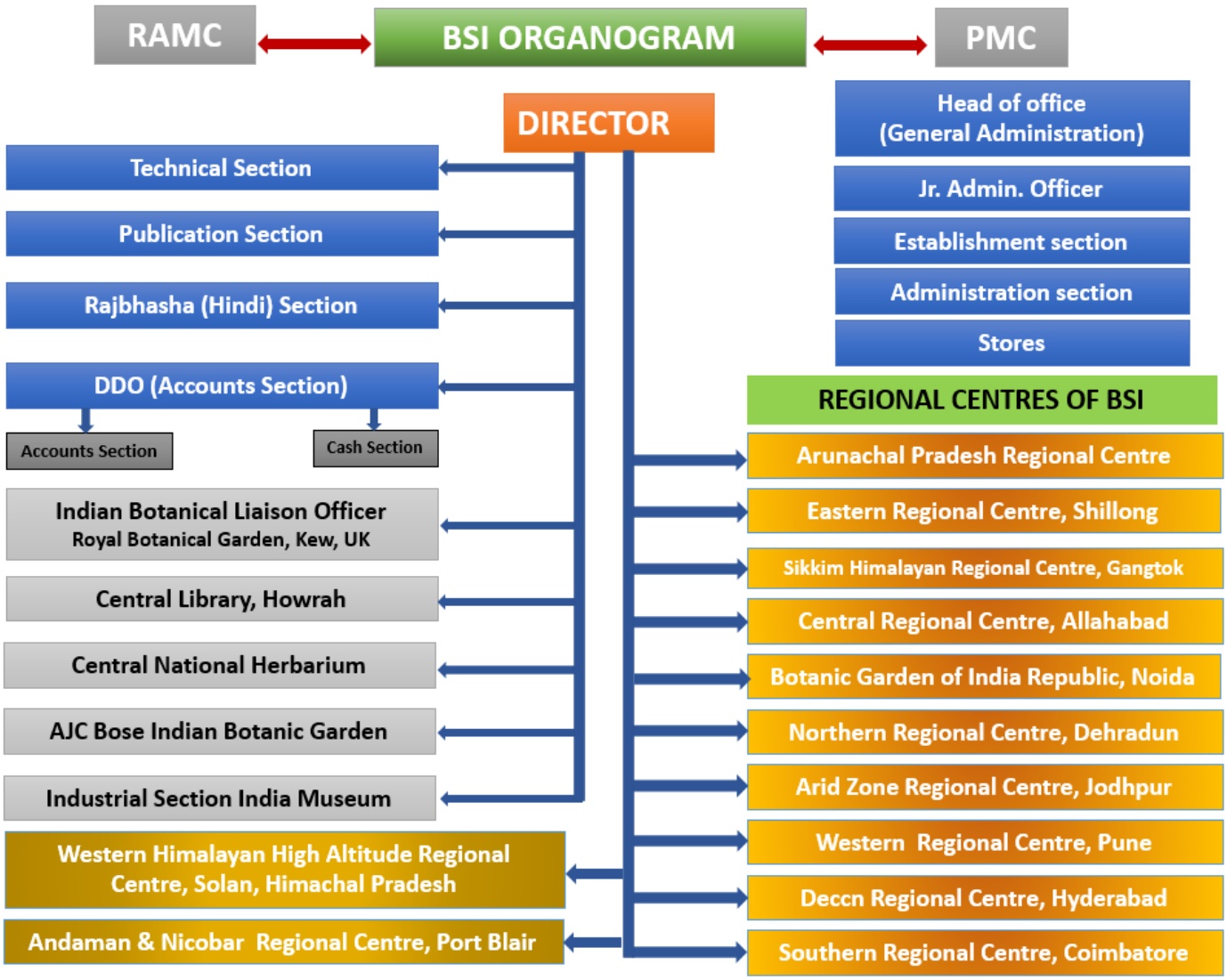
Botanical Survey of India, on its 134th Foundation Day, organized 2nd International Symposium on Plant Taxonomy, Ethnobotany and Botanic Gardens, (ISPTEBG) on 13th & 14th February, 2023 at Kolkata. The symposium was attended by more than 400 participants from all over India and 22 foreign delegates. The participants included students, research scholars and professors from around 93 colleges in India and about 70 delegates from Institutions/organisations of National repute. Besides, BSI hosted several important events namely 5th Nomenclatural Course w.e.f. 6th to 10th February, 2023 at BSI, NRC, Dehradun (coordinated by Dr. K.N. Gandhi); W*orkshop-cum Hands-on Training on Molecular Taxonomy of Plants* w.e.f. 11th to 15th July 2022 at BSI, CNH, Howrah; two days International conference on "Science, Humanism and making of Modern India: the role of E.K. Janaki Ammal" in hybrid mode on 9th & 10th January 2023 at BSI, ISIM, Kolkata, in Collaboration with University of Sussex, UK, which was attended by about 150 participants. In addition, a new section was introduced in the museum on "*Antarctic Research*

done by BSI Scientists" and displayed Antarctic information by BSI scientists. Besides, BSI also organised 2 DST sponsored Training programmes namely DST SERB (Vritika) and DST SERB (Karyashala) workshop at WRC Pune and CNH, Howrah. In addition, BSI actively celebrated various National and International Days such as National Science Day, Wetlands Day, International Day of Yoga, World Biodiversity Day, World Ozone Day, World Environment Day, Himalayan day, Vanmahotsab and promoted activities and awareness programmes under, Mission LiFE etc. The Rajbhasa division of this institute organized various workshops, meetings and Hindi Pakhwara for spreading and popularization of Hindi language. For smooth function of research works at par with other organisations, BSI signed an MoUs with the National Digital Library of India (NDLI), IIT Kharagpur) on 07.03.2023 and also in the process of signing 2 MoUs with (1). Atlanta Botanic Garden, USA and (2). Royal Botanic Garden Edinburgh (RBGE), U.K. and also an Agreement with the Indian National Trust for Art and Cultural Heritage (INTACH), New Delhi. For promoting taxonomic research under capacity Building programmes, BSI recruited 32 Junior Research Fellow (JRF) 2022 and also it is in the process of recruitment of 10 Research Associates (RA).

For outstanding contribution in the field of Plant taxonomy, Scientists of Botanical Survey of India were honored with National Awards and recognitions by different professional societies and organizations. Besides, towards public services, 1805 plant materials received from students, research scholars and general public were identified and 1225 images / photographs of herbarium specimens and related information were provided to various research scholars during this period. 1,50,928 visitors and student attended BSI herbarium and libraries for plant identification, herbarium and library consolations. Further, 35,39,099 visitors visited BSI websites (including BSI archives and Indian Virtual Herbarium).

I congratulate my scientific and administrative colleagues for their valuable cooperation and sincere efforts for enriching the work environment with team spirit, creativity and commitment. I am also thankful to all the staffs for fulfilling goals and targets of the Institution and maintaining the glory of Botanical Survey of India for carrying out taxonomic and floristic studies, survey, documentation and conservation of plant resources of the country.
Jai Hind

A.A. Mao
(Director)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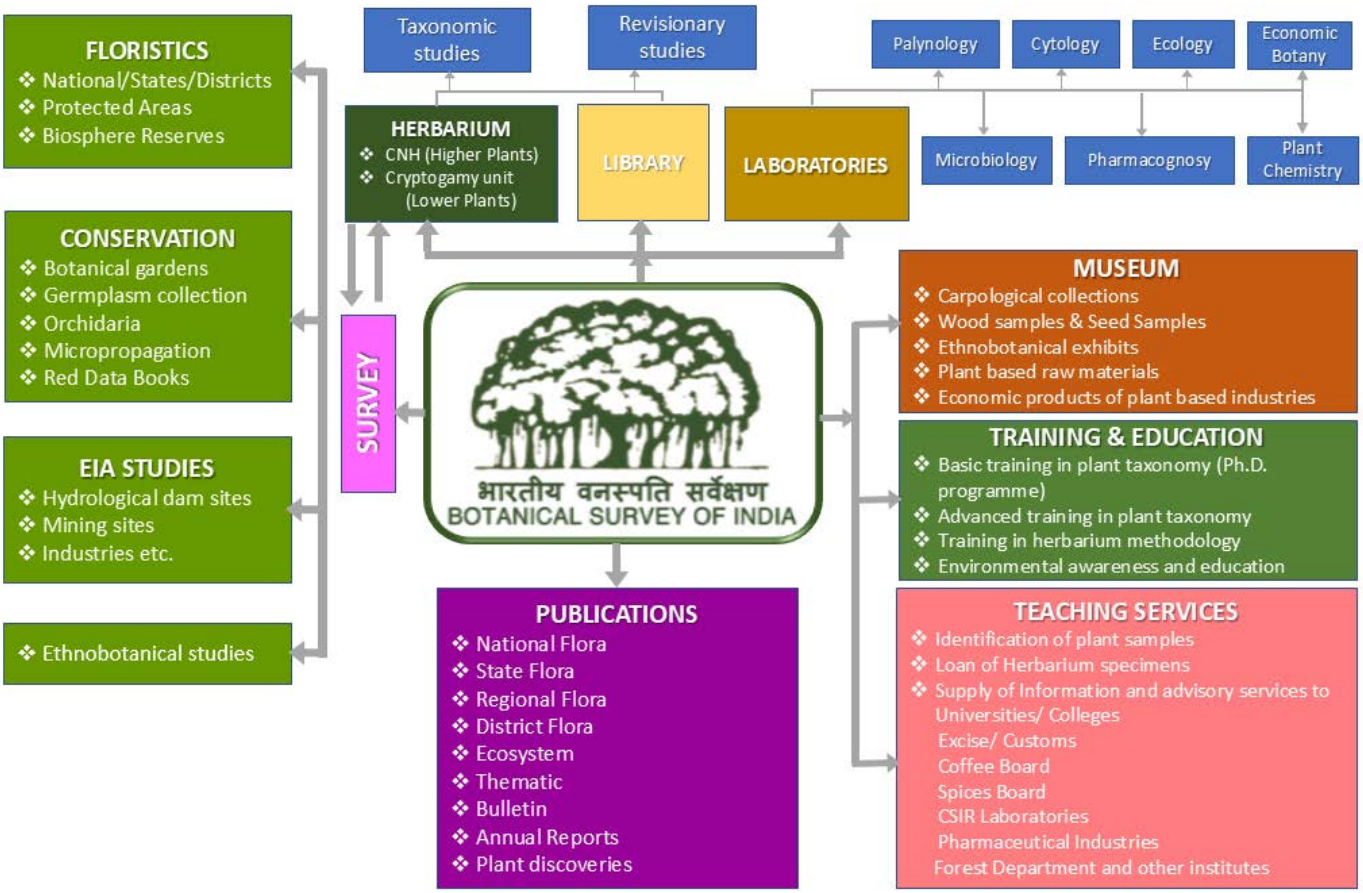
Deccn Regional Centre, Hyderabad
Southern Regional Centre, Coimbatore

SCHEMATIC DIAGRAM OF THE WORK FLOW IN BOTANICAL SURVEY OF INDIA



RESEARCH PROGRAMMES

Napoleonaea imperialis P.Beauv.

Acharya Jagadish Chandra Bose
Indian Botanic Garden, Howrah

AJC BOSE INDIAN BOTANIC GARDEN, BSI, HOWRAH

Project 1:
Development and maintenance of Aquatic Plant Section in AJCBIBG

Executing officials: Dr. Devendra Singh, Scientist-E,
Dr. S. P. Panda, Scientist- C,
Dr. R. Saravanan, Botanist,
Ms. Titir Saha, Botanical Assistant

Duration: Ongoing

Background: The aquatic plants being the primary provider of the aquatic ecosystem needs raised awareness and proper conservation which in turn would facilitate better management of the aquatic ecosystem. Owing to this urge, the aquatic section was developed at AJCB Indian Botanic Garden, Howrah. The main objective of this project was to enrich the aquatic section with different species and cultivars of aquatic plants at the same time serving as an ex-situ conservatory of aquatic plant germplasm.

Area and Locality: The aquatic section is built in an area of more than 12000 sq.ft in the AJC Bose Indian Botanic Garden, BSI, Howrah.

Achievements: During this period 37 wild cultivars of *Nelumbo*, 22 types of *Nymphaea* and 20 different species of aquatic ferns, hydrophytes, nymphoides etc. were introduced in this section. The aquatic section houses 5 major wild aquatic plants viz. *Nymphaea rubra* Roxb. ex Andrews, *N. alba* L., *Euryale ferox* Salisb., *Victoria amazonica* (Poepp.) J.C. Sowerby and *Nelumbo nucifera* Gaertn. In addition, this section also harbours more than 40 different cultivars including several varieties of the lotus and lilies. This includes one of the rarest cultivated lotuses called the Ultimate Thousand Petals discovered in 2009 by Daike Tian from Shanghai Institute of Biological Sciences, China, which has also been introduced here. The major attraction of this section is *Victoria amazonica* (Poepp.) J.C. Sower by which was first introduced in this garden in 1873 from Brazil, by George King. The mature leaf of this plant measures up to 2-2.5 m in diameter and said to hold 40 kg of human weight approximately. The mature seeds has been also harvested and processed for germination in next season. Another important plant is the Makhna or *Euryale ferox* Salisb., which is currently one of the most popular plant owing to the potential health benefits of its seeds.The mature seeds of Makhna has been also harvested and processed for germination in next season. Most of the plants here are established from tubers and while few are developed from seeds. Before introduction to the pond, the seedlings were developed in water nursery or shallow cistern. After reaching a certain stage of maturity it was introduced in the lakes. In the coming years there are plans to introduce more aquatic plant species in this section and maintain this section as a conservatory of aquatic plants germplasm for posterity.

Nymphaea pubescens Willd.

Nymphaea nouchali Burm.f. var. *zanzibariensis* (Casp.) Verdc.

Project 2:
Curatorial work of the Garden and Maintenance

Executing officials : All scientific staff of AJCBIBG up to the level of Preservation Asst. cum Garden Overseer

Duration: Ongoing

Background: The Acharya Jagadish Chandra Bose Indian Botanic Garden (AJCBIBG) is one of the oldest and biggest botanic gardens in South East Asia which was established in 1787. The garden is divided into 25 divisions and with 26 lakes. At present the garden serves as a living repository of 1377 plant species which adds up to a total of 14122 plants including trees, shrubs and climbers together with a large number of wild and cultivated herbs. This botanical garden had been serving in educational, scientific research, tour and travel fields since a very long time, so it is very important to maintain it on a regular basis to enrich the plant diversity. This project aims at proper maintenance of this heritage. This includes proper maintenance of all the 25 divisions and the 26 lakes in the garden premises. Emphasis is given towards the enrichment of plant species in all the sections, cater the plant diversity in each division and maintenance of the nurseries by multiplying the plants of AJCBIBG. The direction and signage of the garden are also updated and maintained to help the staff and visitors in locating different segments within the vast area.

Area and Locality: AJC Bose Indian Botanic Garden, Howrah.

Achievements:

All the 25 divisions were cleaned and maintained regularly in order to safeguard the spectacular of the garden. 24 lakes out of the 26 were cleaned and maintained regularly to conserve the aquatic plant diversity. The two new sections viz. Hibiscus and Aquatic Plant Section have been developed during this period. Work on restoration of the Bamboosetum after the devastating Amphan has been done. In addition to the existing *Bougainvillea* section, a large area near the Great Banyan Tree was converted into another new *Bougainvillea* section with more cultivars. The entire Cycad Section has been renovated by planting various cycad species either from the garden or collected from outside the country. The Rose population in the Rosarium of the garden were maintained properly to enhance its aesthetic value. The Front of Rosariumm, Great Banyan Tree and garden main gate area developed with various different types of winter annuals which became major attraction of the visitors during winter time. About 25 numbers of wild edible fruit were planted in a separate section. Further, Nursery no. 1 and 2 has been cleaned and civil structures has been renovated, three new shed net houses has been constructed in nursery no. 1 to keep the RET species which were either multiplied in the garden or collected during different field tours. The roads along the different avenues of garden were repaired and reconstructed through CPWD. The fencing of different sections and the outer boundary along with river Hooghly has been repaired. In order to highlight the modern-day farming techniques within a small space, the Seasonal Kitchen Garden plot was made. Cleaning of the canal from sluice gate to Banyan tree has been done. Garden maps and signages were installed on the vintage points of the garden for ease of navigation for the esteemed visitors. It is only through the untiring efforts of all the staff of the garden in restoring its picturesque view that approximately 1 lakh visitors including VIPS, research scholars, students from different schools, colleges, universities and institutions, general public visited the botanic garden during this period (2022-23).

A view of the garden

Hibiscus section of AJCBIBG

Project 3:
Introduction and ex-situ conservation of RET species in AJC Bose Indian Botanic Garden.

Executing officials: All scientific staff of AJCBIBG up to the level of Preservation Asst. cum Garden Overseer
Duration: Ongoing
Background: AJCBIBG is one of the best examples of wide collection of ex-situ conservation in India about past 230 years. In the last 2-3 years, AJCBIBG had faced several severe cyclones, which caused massive damage to its flora. To combat this damage, AJCBIBG has already started garden 'Restoration Programme' by collecting important plant seedlings from various locations of India through conducting field collection tours and planting those in the garden. Also, vegetative propagation by means of multiplication of garden plants is regularly done to compensate the loss of plants during the Amphan. The objective of this project was to collect, multiply and introduced RET and Endemic species from different phyto-geographical area of the country or/and multiply in AJC Bose Indian Botanic Garden.
Area and Locality: AJC Bose Indian Botanic Garden, Howrah

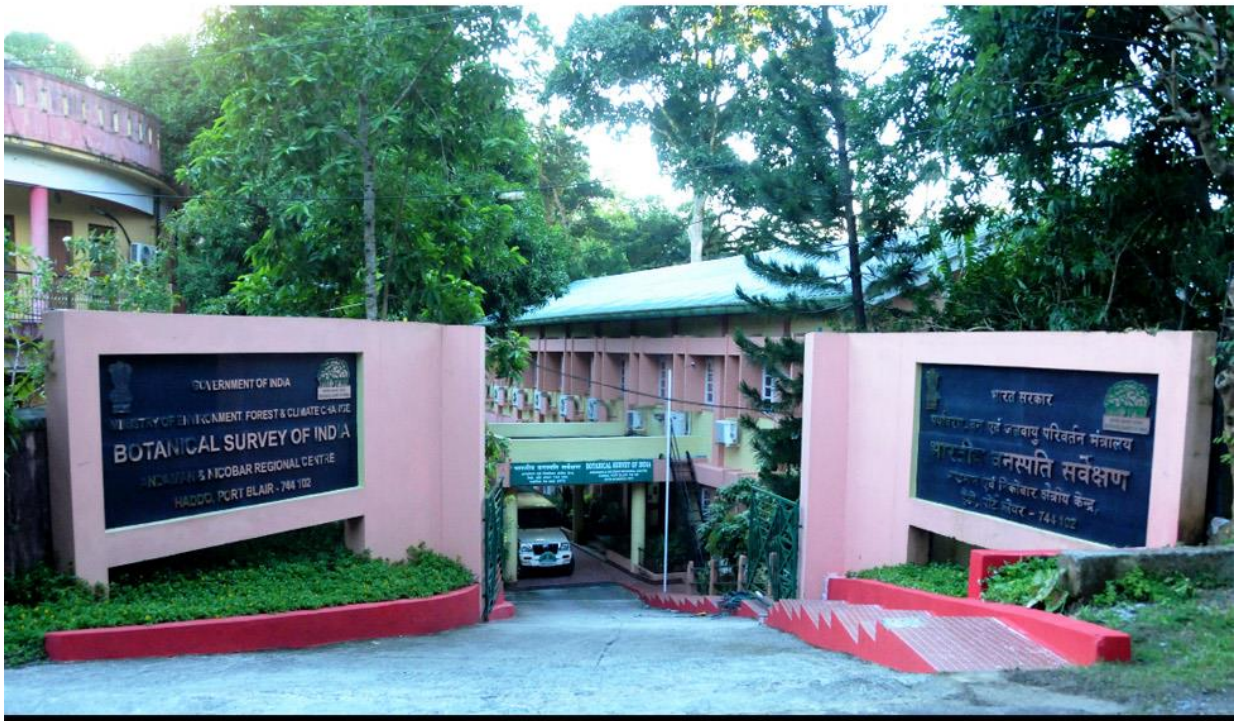
Achievements:
During the year 2022–2023, 7 field tours were conducted by the executing officials of AJCBIBG to different phyto-geographical area like Western Ghats (Kerala, Maharashtra, Tamil Nadu), Eastern Ghats (Telangana) Eastern Himalayas (Sikkim & Darjeeling), Western Himalayas (Uttarakhand). As a result, more than 1008 plant saplings, seeds, bulbs and tubers were collected including gymnosperms and Pteridophytes representing 178 species belonging to 62 families and 123 genera which are maintained in nursery of AJCBIBG. Some of the endemic and endangered plants like *Acer oblongum* Wall. ex DC., *Alstonia venenata* R.Br., *Bentinckia condapanna* Berry ex Roxb., *Buchanania barberi* Gamble, *Calamus baratangensis* Renuka & Vijayak., *Calamus rheedei* Griff., etc. were newly introduced to the garden. Besides collection from tours, some of the iconic and endangered plants like *Amherstia nobilis* Wall., *Brownea coccinea* Jacq., *Heritiera macrophylla* Wall. ex Kurz, *Swietenia mahogany* (L.) Jacq., *Bentinckia nicobarica* (Kurz) Becc., *Ficus krishnae* C. DC. of AJCBIBG were also multiplied through seed germination, cutting and air-layering. Further**,** a mass plantation drive of *Cocos nucifera* L. (Gowrigathram; Golden Coconuts of Kerala) was organized in collaboration with LIC, Kolkata on account of 66th year of LIC on 5th September 2022 in the surroundings of two lakes at division no. 4 and 5. Overall, more than 3500 plants were planted in different divisions and avenues of AJCBIBG through the mass plantation program in the year 2022–2023 during Biological diversity Day, World Environment Day, Van Mahotsav etc.

Ex-situ conservation at AJC Bose Indian Botanic Garden, Howrah

Project 4:
Bryoflora of Jharkhand.

Executing officials: Dr. Devendra Singh, Scientist- E
Duration: 2018 – 2023
Background: The main objectives of the study are to bring out the detailed Bryflora of Jharkhand by updating the nomenclature, characterization of macromorphological and micro-morphological characters under SEM and documentation of the same.
Area and Locality: AJC Bose Indian Botanic Garden, Howrah
Achievements: During this period 36 specimens belonging to 18 families, 22 genera and 36 species were identified. Out of which, 24 species belonging to 14 families and 20 genera were illustrated/ microphotographed and described viz. *Anthoceros punctatus* L., *Asterella wallichiana* (Lehm. & Lindenb.) Pande, K.P. Srivast. & Sultan Khan ex Grolle, *Bartramia roylei* (Hook. f.) Müll. Hal., *Bryum coronatum* Schwaegr, *Cyathodium aureonitens* (Griff.) Mitt., *Cyathodium denticulatum* Udar & S.C.Srivast., *Entodontopsis tavoyensis* (Hook.) W.R. Buck & Ireland, *Erpodium mangifereae* Müll. Hal., *Fissidens cranulatus* Mitt., *Frullania ericoides* (Nees) Mont. var. *ericoides*, *Heteroscyphus hyalinus* (Steph.) Abha Srivast. & S.C. Srivast., *Hydrogonium gracilentum* (Mitt.) P.C. Chen, *Lejeunea devendrae* (Sushil K. Singh) P.K.Verma & K.K.Rawat, *Lopholejeunea sikkimensis* Steph., Notothylas kashyapii D.K.Singh, *Octoblepharrum albidum* Hedwig., *Phaeoceros laevis* (L.) Prosk., *Riccia curtisii* (James ex Austin) Austin, *Riccia frostii* Austin, *Riccia huebeneriana* Lindenb., *Riccia sorocarpa* Bisch., *Solenostoma tetragonum* (Lindenb.) R.M.Schust. ex Váňa & D.G. Long, *Solmsiella biseriata* (Austin) Steere *Spruceanthus minutilobulus* (Udar & U.S.Awasthi) Sushil K. Singh**.** During the study**,** scientists from BSI reported 3 taxa *viz. Heteroscyphus hyalinus* (Steph.) Abha Srivast. & S.C. Srivast., *Solmsiella biseriata* (Austin) Steere, *Frullania ericoides* (Nees) Mont.Var. ericoides as New record for Central India. In addition, researchers from BSI also reported 3 taxa *viz. Cyathodium denticulatum* Udar & S.C.Srivast., *Riccia huebeneriana* Lindenb., *Solenostoma tetragonum* (Lindenb.) R.M.Schust. ex Váňa & D.G. Long as New records for the state of Jharkhand.

Andaman and Nicobar Regional Centre
Port Blair



Dissochaeta celebica Blume var. *celebica*

ANDAMAN AND NICOBAR REGIONAL CENTRE, PORT BLAIR

Project-1
Conservation Assessment, ENM studies including GIS mapping of Endemic trees of Andaman & Nicobar Islands (at least 50 trees species)

Executing officials : Dr. Chandan Singh Purohit, Sci-C
Dr. Lal Ji Singh,
Dr. Vivek C.P &
Shri Bishnu Charan Dey.

Duration: August, 2021- March, 2023

Background: Nature has provided the Andaman & Nicobar Islands with a unique and varied flora and fauna. The tropical hot and humid climate with abundant rains in the islands supports profuse vegetation. This study aimed at finalizing the list of endemic trees species with the help of literature consultation and herbarium followed by the survey, collection and identification of these endemic tree species in the area reported in literatures as well as from other localities. The project also worked on the assessment of these Endemic tree species according to IUCN red list guidelines and incorporated GIS mapping of the plants.

Area and Locality: Andaman and Nicobar Islands: *c.* 8249 sq. km.

Achievements:

During this period, three (03) field tours were conducted so far to South Andaman during 22.09.2022 to 28.09.2022 , to North Andaman during 16.11.2022 to 22.11.2022 and to Nicobar group of Islands during 08.01.2023 to 31.01.2023 and collected 2,311 seeds / seedlings / cuttings / bulbils / plantlets/rhizomes etc. of the 55 plant species during the field trip and introduced in the nursery of Botanical Garden. During the field survey, total 27 Endemic tree species i.e. *Bentinckia nicobarica* (Kurz) Becc., *Codiocarpus andamanicus* (Kurz) R.A.Howard, *Dillenia andamanica* C.E. Parkinson, *Garcinia andamanica* King, *Glochidion andamanicum* Kurz., *Glochidion calocarpum* Kurz., *Goniothalamus macranthus* (Kurz) Boerl., *Grewia calophylla* Kurz ex Mast., *Knema andamanica* (Warb.) W.J. de Wilde subsp. *Nicobarica, Knema andamanica* (Warb.) W.J. de Wilde, *Lagerstroemia hypoleuca* Kurz,, *Leea grandiflora* Kurz, *Mangifera andamanica* King, *Mangifera nicobarica* Kosterm., *Mecaranga nicobarica* N.P. Balakr. & Chakr., *Mesua manii* (King) Kosterm., *Miliusa andamanica* (King) Finet et Gagnep., *Mimusops andamanensis* King & Gamble, *Myristica andamanica* Hook.f., *Orophea katschallica* Kurz, *Phoenix andamanensis* S. Barrow, *Pinanga andamanensis* Becc., *Pinanga manii* Becc., *Planchonia andamanica* King, *Pterocarpus dalbergioides* Roxb. ex DC., *Rhopaloblaste angustata* (Kurz) Moore, *Semecarpus kurzii* Engl. Were located and recorded from study area. Further, species distribution maps of 53 endemic tree species prepared with the help of Arc-GIS software. Calculate AOO & EOO of 53 endemic tree species with the help of online software GeoCAT and finalized their IUCN Red List Assessment. Ecological Niche Modelling has been done with the help of Maxent 3.3.4 software and habitat suitability maps have been prepared for 53 Endemic tree species of Andaman & Nicobar Islands. This is a project of BSI-ANRC Port Blair. In addition to this following are the work done by Dr. C.P. Vivek, Scientist C during his tenure at BSI-ANRC (April – September, 2022). Conducted one exploration tour to Little Andaman *w.e.f.* 17.03.2022 to 23.03.2022 and recorded the GPS Coordinates of collection localities and prepared the voucher specimens of endemic trees like *Bombax insigne* Wall. (1 fruit with 20 seeds), *Dillenia andamanica* C.E. Parkinson (3 voucher specimens), *Garcinia andamanica* King (16 ripened fruits & 3 voucher specimens), *Grewia calophylla* Kurz ex Mast. (2 voucher specimens), etc. were also collected the seeds/seedlings of them and introduced in the garden for germination and multiplication.

Rhopaloblaste augustata (Kurz) Moore

Bentinckia nicobarica (Kurz) Becc.

Also, recorded the GPS Coordinates of collection localities and prepared the voucher specimens of the interesting plant species including [*Alstonia sp.* (25 ripened fruits & 3 voucher specimens), *Amomum andamanicum* V.P. Thomas & al. (10 rhizomes), *Aporusa sp.* (3 voucher specimens), *Barringtonia pendula* (Griff.) Kurz (3 voucher specimens), *Canthium* sp. (2 voucher specimens) etc. along with the seeds/seedlings if available and introduced in the garden for germination and multiplication.

Project - 2

Curatorial work of Botanical Garden: (Multiplication and Nursery development of Bamboos, Palms, Zingibers, Endemic trees species of Andaman & Nicobar Islands at Dhanikhari Experimental Garden Cum Arboretum

Executing officials: Shri Bishnu C. Dey, Bot. Asst.
Shri Basil Paul, Bot. Asst. &
Shri Gautam Anuj Ekka, Bot. Asst.

Duration : April, 2022 – March, 2024

Ceropegia andamanica Sreek., Veenakumari & Prashanth under ex-situ conservation at DEGCA

Pyrostria laljii M.C.Naik, Arriola & Bheem. under ex-situ conservation at DEGCA

Area and Locality: Andaman and Nicobar Islands: *c.* 8249 sq. km.
Background: The major focus of this project was to develop the nursery at the Dhanikhari Experimental Garden cum Arboretum and multiplication of Bamboos, Palms, Zingibers, Endemic trees species of Andaman & Nicobar Islands. This involved proper monitoring and maintenance of the garden including recording of phenological data of the tree species.

Achievements: Three (03) field exploration tours were conducted in areas of Middle Andaman, South Andaman and Great Nicobar Island between 2022 to 2023. During the tours, the team members of this project collected plantlets, seedlings fruits and seeds of 41 plant species belonging to Bamboos, Palms, Zingibers, and Endemic tree species of the Andaman and Nicobar Islands including IUCN Red Listed – Critically endangered and narrowly endemic plant species, *Ceropegia andamanica* Sreek., Veenakumari & Prashanth; narrowly endemic species *Plagiostachys nicobarica* M. Sabu *et al.*; Critically Endangered *Pyrostria laljii* M.C.Naik, Arriola & Bheem. *Rhopaloblaste angustata* (Kurz) Moore and raised nursery of them at Dhanikhari Botanical Garden. The growth behavioural pattern of endemic tree species (height & number of leaves initiation/leaf fall) in relation to temperature, rainfall and humidity were also studied.

Arunachal Pradesh Regional Centre, Itanagar

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

Project 1:
Pteridophytic Flora of India Vol 1.

Executing officials: Dr Vineet Kumar Rawat
Duration: 2021-2024

Background: Pteridophytes form an interesting and conspicuous part of our national flora with their distinctive ecological distributional pattern. The last three decades have witnessed a renewed interest on the study of systematics, distribution, ecology, phytogeography and taxonomy of Indian Pteridophytes, but still, it is not yet completely documented. There are 1107 species and 50 additional subspecies of Pteridophytes reported from India under 34 families and 130 Genera. Dryopteridaceae (204 species/ 17 Genera) is the largest family followed by Pteridaceae (172/20), Polypodiaceae (130/21), Woodsiaceae (130/10), Aspleniaceae (87/1), Thelypteridaceae (83/1), Selaginellaceae (55/1). The family Pteridaceae is represented by 172 species within 20 Genera from India, including 95 species of Pteris are reported from India. The present work will help to fill the gap. This project was initiated in 2021 with an objective to document all the species of Family Pteridaceae in India with proper key, taxonomical & Ecological Notes for the Pteridophytic Flora of India.

Different types of vegitation

Area and Locality: All states of India.

Achievements: During the entire period of study, 243 species within 23 genera along with keys and taxonomic Notes for pteridophytic flora of India (Vol. 1) have been described. From this study 2 new records for India, 3 taxa as new to North East India and 11 species are reported as new addition to the Pteridophytic flora of Arunachal Pradesh, 2 new to Manipur State and 2 new to Mizorum state. During this time a total of 5 papers were published along with 8 abstracts and 7 scientific papers were communicated in different journals. Microscopic studies were done of all species to know the morpho-taxonomic status and proper identification. Illustration of 105 species completed so far.

The details of described species under the genera are represented as follows- *Acrostichum* L. (2 spp.), *Actiniopteris* Link (1 sp.), *Adiantum* L. (26 spp.), *Aleuritopteris* Fee (19 spp.), *Anogramma* Link (2 spp.), *CeratopterisBrongn*. (4 spp.), *Cerosora* (Baker) *Domin* (1 sp.), *Coniogranune* Fee (7 spp.), *Cryptogramma* R.Br. (2 spp.), *Doryopteris* J.Sm. (2 spp.), *Mickelopteris* Fraser-Jenk. (1 sp.), *Notholaena* R.Br. (7 spp.), *Oeosporangium* Vis. (14 spp.), *Onychium* Kaulf. (8 spp.), *Pellaea* Link (4 spp.), *Pityrogramma* Link (2 spp.), *Pteris* L. (64 spp.), *Syngramma* J. Sm. (1 sp.), *Taenitis* Willd. ex Schkuhr (2 spp.); *Selaginella* P.Beauv. (1 Genus: 21 spp.); *Ophioglossum* (3 Genus: 20 species).

Project 2:
Phyto-taxonomic studies in selected High-Altitude Wetlands (HAWs) and its environs representing 5 districts of Arunachal Pradesh.

Executing officials: Dr. M. R. Debta, Scientist-D.
Duration: August 2020-March 2023
Area and Locality: Five districts of Arunachal Pradesh namely, Tawang, West Kameng, Upper Siang, Dibang Valley and Lohit.

Background: The study on High Altitude Wetland flora of Arunachal Pradesh is in itself a distinctive scientific proposition that entails the floristic diversity of the given wetlands along with the multiple roles they provide towards ecosystem services through aquafaunal diversity, natural landscape, serving as perennial source of water which feed the river downstream, ecotourism, etc. The fragile ecosystem, variable weather and biodiversity of HAWs are more vulnerable to the effects of changing global climate. However, scanty information is available for most of these wetlands due to their remoteness, inclement climatic condition and inaccessibility of the topographic terrain of the region. Keeping in view their uniqueness in the biosphere, the present study was proposed to assess and document the alpha diversity of selected HAWs from five districts of Arunachal Pradesh.The main objective of the study was to carry out intensive exploration in the selected High Altitude Wetland areas and document the phytodiveristy of such fragile ecosystem.


Penga Teng Tso lake


Kemo Unyan lake

Achievements: One Field tour to Kemo Unyan lake, Dibang Valley district and Titapuri lake of Upper Siang district was undertaken during 2022-23. A total of 245 Field numbers belonging to about 126 species were collected. A Herbarium Consultation Tour to CNH, Kolkata was conducted to study the specimens collected from the High Altitude Wetlands of Arunachal Pradesh. It was observed that earlier collectors had collected many specimens from Se La lake of Tawang district which is almost at equal altitude as of other wetlands. Accordingly, 25 specimens from Sela lake were recorded during the herbarium study. The present study resulted in a total of 321 taxa under 174 genera belonging to 71 plant families representing pteridophytes, gymnosperms and angiosperms. Identification of all collected taxa accomplished with the help of available literature and herbarium specimens housed at different herbaria. Documentation of all taxa was completed and the description along with key to the genera and species, brief citation, habitat and specimen examination were also done for all the taxa. The GIS grid map of wetlands in the district was prepared. Under this proiject, 01 new record was published and 01 new record for India has been communicated. Further, writing of 01 new species is in final stage which is to be communicated soon. Finalization of the manuscript is in progress, which will be submitted to the Directorate by 10th May 2023.

Project 3:
Curatorial work at Botanic Garden of BSI, APRC, Itanagar.

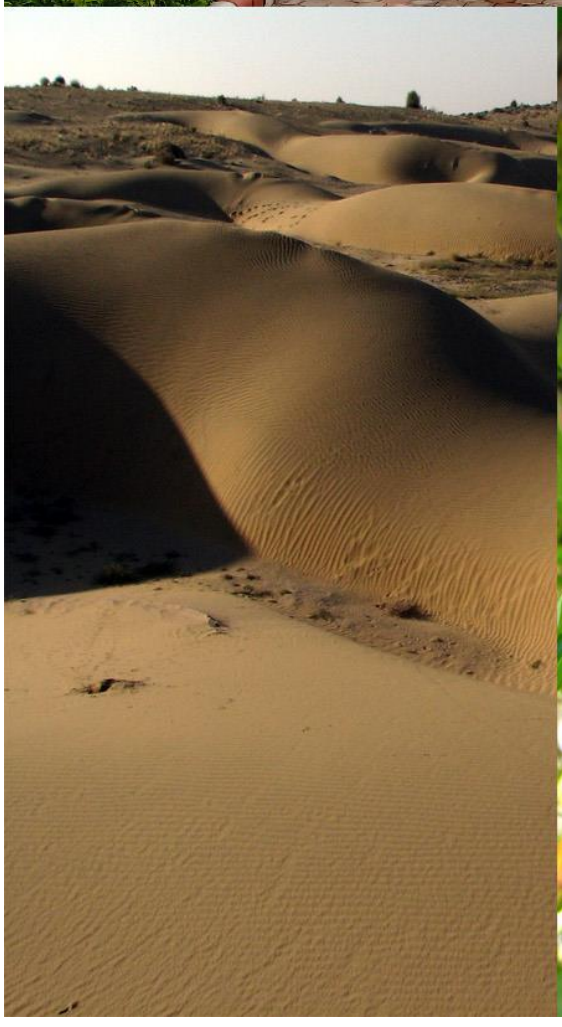
Executing officials: Dr. Ranjit Daimary, Botanist.
Duration: Ongoing
Area and Locality: Entire state of Arunachal Pradesh.
Background: Botanical Survey of India, Arunachal Pradesh Regional Centre, Itanagar is having one botanical garden for *ex-situ* conservation of RET, endemic and economically important plant species of the state of Arunachal Pradesh. The state is situated in the Indo-Burma biodiversity hotspot region and is important due to its richness in floristic diversity. The conservation of plant wealth of the state is necessary as many plant species have already become extinct due to natural and man made activities. The live plant species collected by the scientists, research scholars from different parts of the state of Arunachal Pradesh during their field tours are introduced in the garden. This project primarily aims to document all the live plant species available in the garden. Besides, phenological studies of the plants and regular maintenance of the garden is another objective of the project.

Achievements: The live plants collected from different parts of Arunachal Pradesh by scientists, research scholars are introduced in the garden and the plant species available in the garden are identified and documented. The phenology of different plant species of the garden have been studied and documented. 64 plant species available in botanical garden, BSI, APRC including plants like *Abroma augusta*, *Abutilon indicum*, *Albizia stipulata*, *Bauhinia purpurea*, *Cassia occidentalis*, *Curcuma longa*, *Dalbergia lanceolaria*, *Eupatorium odoratum*, *Globba racemosa*, *Plantago major*, *Sonchus oleraceus*, *Terminalia arjuna*, *Wrightia coccinea* etc were identified and documented. 21 plant saplings at botanic garden of BSI, APRC including *Acorus calamus, Bixa orellana*, *Curcuma aromatic, Saraca asoca*, *Tectona grandis*, *Tinospora cordifolia* etc were introduced.

Ficus hederacea Roxb.

Saraca asoca (Roxb.) Willd.

Arid Zone Regional Centre, Jodhpur



Tecomella undulata (Sm.) Seem.

ARID ZONE REGIONAL CENTRE, JODHPUR

Project 1:
Flora of Mount Abu Wildlife Sanctuary, Rajasthan (2021 – 2023)

Executing officials: Dr. Sanjay Mishra, Scientist-C & Dr. S. L. Meena, Scientist-E
Duration: November, 2021-March, 2023.
Background: The Mt. Abu Wildlife Sanctuary, Rajasthan (India) is situated between 24° 30' and 24° 43' N longitude and 72° 38' and 72° 53' E latitude in the southern part of the state in Sirohi district close to the south-western extremity of the Aravalli ranges. The sanctuary is spread in 326.09 sq km and comprises of the entire Mt. Abu hill which is known as Arbudanchal. It is the highest point not only within the state of Rajasthan, but also between the Himalayas in the north and the Nilgris and other hills in the far south of India. The highest peak of Mount Abu is Guru Shikhar at 1722 m (5,650 ft) above sea level. The vegetation of Mount Abu supports dry, semi-deciduous and evergreen species, which changes with the increase in altitude. The sanctuary exhibits great ethnic, cultural, floral, faunal diversity and is a very popular destination for eco-tourism. Several endemic, rare and endangered species are found in this sanctuary. The present study was proposed for complete floristic study of the protected area which will eventually provide insights into the composition of the forest and form a basis for monitoring changes in the floristic diversity of Mount Abu WLS.
Area and locality of the Allotted Project: 326.09 sq km, Mount Abu Wildlife Sanctuary, District Sirohi, Rajasthan

Achievements: Two botanical exploration tours to Mt. Abu Wildlife Sanctuary were conducted from 30.09.2022 to 08.10.2022 (Q3-first tour) and 15.12.2022 to 24.12.2022 (Q4-second tour) and a total of total 292 field numbers (comprising 584 specimens) were collected. Documentation of altitudinal range, latitude and longitude etc. of the explored area was done with GPS. 330 no. of species from the first tour were identified by comparing own description with the description available in literatures and authenticated or Type specimen available in Indian as well as in foreign herbaria. Taxonomic description of 358 no. of species were documented. Photographic documentation of the collected plants was done along with the landscape of the Sanctuary. More than 400 photographs of plants and landscape have been taken. Seeds/seedlings of 32 species were collected from the forest and introduced in Desert Botanic Garden for ex-situ conservation.

Project 2:
Curatorial work at Botanical Garden of AZRC, Jodhpur

Executing Scientists: Dr. S. L. Meena, Scientist-E, Dr. Sanjay Mishra, Scientist-C, Shri Ravi Prasad, Bot. Asstt. & Shri Amit Kumar, Sr. Preservation Asstt.
Duration: Ongoing
Background: The main objective of the project is the collection of RET and Economically important species germplasm and their introduction in the experimental garden for *ex-situ* Conservation and documentation of phenological data of plants growing in Desert Botanic Garden.The experimental Botanic Garden (Desert Botanical Garden) of AZRC was established during 1994 with an area of c. 8 acres for the maintenance of arid germplasm, collection, growing and multiplication of rare / endemic/ endangered / threatened/ medicinal/ economically important and other plant species of North-western arid regions of India, with special focus on Rajasthan and Gujarat state. At present, about 300 species of vascular plants of various categories are conserved in the garden.
Area and Locality: Rajasthan & Gujarat.

Achievements: One (01) field tour undertaken from March 15, 2023 to March 19, 2023 in which endemic and threatened species were collected (germplasms) from arid and semi-arid regions of Rajasthan. Maintenance of EET, Medicinal & Economically important plants, Grass section, Lawn maintenance, Weeding of garden plants etc. Cleanliness of garden and shifting of garden biomass was done. Seeds/cuttings/tubers were collected and sown for multiplication in the nursery. The phenological data of existing plant species of Desert Botanic Garden was recorded thorough out the year.

The following plants were collected and introduced in the Desert Botanical Garden of AZRC

Rare and Threatened plants: *Pulicaria rajputanae* Blatt. & Hallb.; *Withania coagulans* (Stocks) Dunal; *Farsetia heliophila* Bunge ex Coss.; *Tribulus rajasthanensis* Bhandari & V.S. Sharma; *Tephrosia falciformis* Ramaswami; *Commiphora wightii* (Arn.) Bhandari; *Convolvulus auricomus* var. *ferruginosus* Bhandari

Medicinal and Aromatic plants: *Calligonum polygonoides* L.; *Tecomella undulata* (Sm.) Seem.; *Cenchrus ciliaris* L.; *Cullen plicatum* (Delile) C.H.Stirt.

The seeds of the following plants were collected and introduced in the Desert Botanical Garden of AZRC

Adenium sp. (24 nos.); *Albizia lebbeck* (L.) Benth. (140 nos.); *Anogeissus pendula* Edgew.(50 nos.); *Anogeissus sericea* Brandis (80 nos.); *Anogeissus sericea* var. *nummularia* King ex Duthie (280 nos.); *Artocarpus heterophyllus* Lam. (10 nos.); *Barleria prionitis* var. *diacantha* Blatt. & Hallb. (20 nos.); *Bauhinia racemosa* Vahl (80 nos.); *Caralluma edulis* A.Chev. ex Hutch. & Dalziel (50 nos.); *Cassia fistula* L. (120 nos.); *Ceropegia bulbosa* Roxb. (20 nos.); *Citrullus colocynthis* (L.) Schrad. (10 nos.); *Colophospermum mopane* (J.Kirk ex Benth.) J.Leonard (80 nos.); *Dichrostachys cinerea* R.Vig. (60 nos.); *Dodonia viscosa* (L.) Jacq. (30 nos); *Fernandoa adenophylla* (Wall. ex G.Don) Steenis (01 nos.); *Gmelina arborea* Roxb. ex Sm. (75 nos.); *Holoptelea integrifolia* (Roxb.) Planch. (100 nos.); *Lasiurus scindicus* Henrard (50 nos.).; *Lawsonia inermis* L. (120 nos.); *Millettia pinnata* (L.) Panigrahi (100 nos.); *Moringa concanensis* Nimmo ex Dalzell & A.Gibson (130 nos.); *Moringa oleifera* Lam. (80 nos.); *Oryza sativa* L. (200gm); *Prosopis cineraria* (L.) Druce (35 nos.); *Sapindus laurifolius* Balb. ex DC (37 nos.); *Senna alata* (L.) Roxb. (150 nos.); *Senna alexandrina* Mill. (50 nos.); *Senna italica* Mill. (30 nos.); *Shorea robusta* Gaertn. (51 nos.); *Sterculia urens* Roxb. (15 nos.); *Tecoma stans* (L.) Juss. ex Kunth (100 nos.); *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn. (10 nos.); *Tylophora indica* (Burm.f.) Merr. (10 nos.).

The following plant species have been multiplied in the nursery of Desert Botanic Garden of Botanical Survey of India, Arid Zone Regional Centre, Jodhpur:

Multiplication by seeds: *Adenium* sp. (24 nos.); *Albizia lebbeck* (L.) Benth. (60 nos.); *Alcea rosea* L. (50 nos.); *Andrographis paniculata* (Burm.f.) Nees (05 nos.); *Anogeissus sericea* var. *nummularia* King ex Duthie (50 nos.); *Bauhinia racemosa* Vahl (30 nos.); *Caralluma edulis* A.Chev. ex Hutch. & Dalziel (30 nos.); *Cassia fistula* L. (120 nos.); *Ceiba pentandra* (L.) Gaertn. (13 nos.); *Colophospermum mopane* (J.Kirk ex Benth.) J.Leonard (120 nos.); *Datura metel* L. (10 nos.); *Dichrostachys cinerea* R.Vig. (30 nos.); *Holoptelea integrifolia* (Roxb.) Planch. (30 nos.); *Lawsonia inermis* L. (10 nos.); *Matricaria chamomilla* L. (numerous); *Millettia peguensis* Ali (50 nos.); *Millettia pinnata* (L.) Panigrahi (04 nos.); *Mimusops elengi* L. (03 nos.); *Moringa concanensis* Nimmo ex Dalzell & A. Gibson (30 nos.); *Moringa oleifera* Lam. (48 nos.); *Ocimum basilicum* L. (15 nos.); *Pedalium murex* L. (20 nos.); *Phyllanthus amarus* Schumach. & Thonn. (15 nos.); *Portulaca pilosa* L. (15 nos.); *Prosopis cineraria* (L.) Druce (35 nos.); *Sapindus laurifolius* Balb. ex DC (47 nos.); *Senna alata* (L.) Roxb. (96 nos.); *Solanum trilobatum* L. (05 nos.); *Tecoma stans* (L.) Juss. ex Kunth (60 nos.); *Terminalia arjuna* (Roxb. ex DC.) Wight &Arn. (10 nos.); *Tribulus terrestris* L. (10 nos.); *Withania somnifera* (L.) Dunal (20 nos.).

Multiplication by cuttings: *Euphorbia tirucalli* L. (20 nos.); *Basella alba* L. (06 nos.); *Euphorbia nivulia* Buch.-Ham.; *Euphorbia quadrangularis* Pax

Multiplication by Rhizome/Bulb/tuber: *Chlorophytum borivilianum* Santapau & R.R.Fern. (15 nos.).

Project 3:
Curatorial work at Herbarium and digitization of Herbarium specimens.

Executing Scientists: Dr. M.K. Singhadiya, Botanist,
Shri Ravi Prasad, Bot. Asstt.,
Dr. P.K. Deroliya, Bot. Asstt.,
Shri Ramesh Kumar, Bot. Asstt.
Shri Amit Kumar, Sr. Preservation Asstt.

Duration: Ongoing

Background of the Project: This project intends at the completion of digitization of herbarium of the BSI- AZRC Herbarium (BSJO) which at present holds about 51891 specimens.

Area and Locality: Desert Botanical Garden of AZRC, Jodhpur

Achievements: During this period, 16145 metadata entry of herbarium sheets in were done in excel format, 1130 specimens have been scanned and 1162 unidentified specimens have now been identified.

Botanical Garden of India Republic, Noida

BOTANIC GARDEN OF INDIAN REPUBLIC, NOIDA

Project 1:

Mass Germination and Multiplication of Horticulture and Ornamental plant /seasonal flowers in BGIR Noida

Executing officials: Dr Sandeep Chauhan and Dr C M Sabapathy
Duration: Ongoing
Background: The purpose of this project was to primarily establish a Germplasm centre of about 300 Medicinal plant at BGIR, Noida for displays and awareness.The project also aimed at QR/Bar coding of the endemic Plants in different plant Sections of BGIR Noida. Collection of plants from the different Regional Centres of BSI, Botanic Gardens, Forest Dept. Their introduction in BGIR Noida was done to eventually setting up of Seed bank, Tissue culture lab, plant conservatories and a Bio Composting /Vermicomposting unit. The overall Maintenance and development of the different horticulture landscape sections were also done.
Area and Locality: Regional Centres BSI, State Forest Dept Nurseries (H.P., Haryana, J &K, Utrakhand, Chatisgarh, MP, Rajastan , Gujrat , Delhi NCR, UP)

Achievements: Existing medicnal plant germplasm were increased from 131 to 153 and all medicinal plant spp. maintained in the Ayur vatika section, and tagged with accepted names.Additionally 2.5-acre area prepared for medicinal plant section where 21 new medicinal plants spp. which were collected in previous years were introduced and maintained *viz. Alternanthera pungens* Kunth (Khaki), *Bacopa monnieri* (L.) Wettst. (Brahmi), *Cyanthillium cinereum* (L.) H.Rob (Sahadevi), *Sida cordata* (Burm.f.) *Borss.Waalk*. (Bhuinii) and *Solanum nigrum* L. (Makoi or Bhatkoia), *Ipomoea indica*, *Ipomoea purpurea, Camellia japonica*, *Philodendron spp, Paphiopedilum insigne Allamanda cathartica, Tarlmounia elliptica, Mansoaalliacea* spp, *Conocarpus* sp., *Combretum indicum* ,*Jasminum sambac*, *Jasminum auriculatum* , *Jasminum* sp. Sukh Shanti Plant ,*Vanda tessalata*
(**Note :** Plant spp of *Acorus calamus, Cassia angustiafolia, Inula racemose, Swertia chirayita,Nardostachys grandiflora, Gernanium, lemmon grass, Rosemarry Lavender , valeriana jatamansi, Cinnamomum tamala, Stevia rebaaudiana Saussurea lappa, Aconitum hetrophylum, Picrorhiza kurroa , Podophylum* hexandrum Rheum emodi collected but reported 100% mortality.)
Physical verification of the 5711 plants have been completed in all the sections. In the periphery region of wood land where the Forest types is being established, all the plants have been digitised by DGPS and Total station. The data is being complied and plant labelling with number and Geo Tag number is under process. All around the year the entire focus was given on overall systematic maintenance and development of all the sections i.e new arboretum, 8 forest types zones, Economic Plant sections, Medicinal plant sections and Fruit section, Seed bank Nurseries and Net Houses conservatoires. A dedicated intercultural practice such as integrated disease management, irrigation, weeding-hoeing /cleaning/ Training and Pruning operation performed time to time. Some of the major problems are the occurrence of wood canker, powdery mildew which have now been successfully eradicated and controlled. The composting area has been expanded and strengthened with a proposal of Hi-Tech bio composting unit which is expected to come in operation in FY 2023-24. The garden has been made weed free by applying Foliar sprays of fungicide (Bavistin (0.5%), Mencozeb /Indofil M 45 and insecticide (Durmet).
52 winter seasonal ornamental flowering verities propagated and 24 summer seasonal ornamental flowers propagated through conventional methods vis a vis small section of for exotic vegetables prepared and seeds of respective vegetable varieties placed for germination and display .

Ornamental Plants propagation and Multiplication program:

1. Bouganvilla, *Havelia*, *Tecoma*, *Duranta*, *Inermis*, *Barleria* propagated in bulk and accordingly planted along the road side of BGIR.
2. Ornamental plant nursery expanded

1. During the calendar year efforts were made to collect desired and relevant plant material from various locations of India but in the calendar year no such big achievement were made due to financial constraints. The details of plant collections are as below :

Sr No	Number of plant species	Total no of plants	Centre collected
1	09	18	BSI Dehradun
2	Nil	Nil	BSI Shillong
3	11	121	BSI Jodhpur
4	5	10	BSI Pune
5	Nil	Nil	BSI Hyderabad
6	23	250	BSI Coimbatore, Kerala
7	11	123	BSI Arunachal Pradesh
8	21	560	Forest Dept Delhi
9	14	1222	Forest Dept Noida
10	10	1390	Local Nurseries Noida
11	21	780	Forest Dept Solan HP
12	31	2340	Forest Dept Haryana, Chandigarh
	133	6610	

2.**Xerophytic plant collection**

Crassula ovata (Crosbys compact), *Echeveria* spp., *Anacampseros, Senecio radicans* (Sting of bananas), *Sedeveria, Pachyveria, Sedum reflexum,* , Painted lady, Angel wing cactus, *Schlumbergera truncata* (White), *Portulaca riaafra* (White variegated),

2. **Multiplication of the cactus and succulents:**

i. *Notocactus* ----------25
ii. *Opuntia* ----------15
iii. *Zade* plant----------100

Seed bank lab expanded and work under final completion.

Seeds collected: (Above 500gm-1000gm)

Tectona grandis L.f
Terminalia belirica Wall.
Jatropha curcas L.
Sapindus pinnatus Roxb. Ex Hiern
Sterculia foetida L.
Mitragayna parvifolia (Roxb.) Korth.
Tamarindus indica L.
Moringa oleifera Lam.
Guilandina bonduc L.
Terminalia alata B. Heyne ex Roth
Aegle marmelos (L.) Correa
Plantago ovata Forssk.
Psoralea corylifolia L.
Oroxylum indicum (L.) Kurz.

Holoptelea integrifolia (Roxb.) Planch.
Ricinus communis L.
Abrus precatorius L.
Withania Somnifera (L.) Dunal
Datura metel L.
Madhuca indica J.F. Gmel.
Schleichera oleosa (Lour.) Oken
Mimusops elengi L.
Dolichandrone falcata (Wall. Ex DC.) Seem.
Cassia fistula L.
Bauhinia variegata L.
Syzygium cumini (L.) Skeels.
Duranta vestits Cham.
Asparagus racemosus Willd.
Cassia glauca Lam.
Acacia catechu (L.f.) Willd.

Note: All the above mentioned seeds were stored in air tight container and also placed in respective quantity for seed germination. At present the total seeds of 196 endemic plants stored for further usage.

Seed germination studies carried for 27 endemic tree spp., and 11 medicinal plant spp.
Oroxylum indicum (L.) Kurz.
Putranjiva roxburghii Wall.
Holoptelea integrifolia (Roxb.) Planch.
Mimusops elengi L.
Sapindus pinnatus Roxb. Ex Hiern
Terminalia belirica Wall.
Terminalia arjuna (Roxb.ex DC.)Wight &Arn.
Gautarda sepiosa
Syzigium cumini (L.) Skeels.
Madhuca indica J.F. Gmel.
Azadirachta indica A. Juss.
Sterculia urens Roxb.
Phyllanthus emblica L.
Cascabela thevetia (L.) Lippold
Kalanchoe pinnata (Lam.) Pers.
Murraya koenigi (L.) Spreng.
Albizia lebbeck (L.) Benth.
Pithecellobium dulce (Roxb.) Benth.
Bauhinia variegata L.
Cassia fistula L.
Carica papaya L.
Abrus prectorius L.
Mimosa pudica L.
Chlorophytum borivilianum Santapau & R.R.Fern.
Plantago ovata Forssk.

Note: All the above spp., have been kept under seed bank nursery unit for germination and acclimatization. The estimation of germination percentage of all above spp are under process.
Composting of plant litter using fruit based effective microorganisms (FEM).
• 15000 Quintals Vermicompost prepared and from leaf litter and grass waste.
Note: Revised preliminary estimate has been floated by CCU to set up Hi-Tech vermicompost unit

Project 2:
Establishment and enrichment of existing Forest Types and Proposed phytodiversity at BGIR Noida (zone 5,6,7,8) by introduction of plant spp., based on respective forest types and phytodiversity region.

Executing officials: **Dr. Priyanka Ashokrao Ingle,** Scientist-C
Duration: Ongoing
Background: The major objectives of the project were to establishment of 21 Thematic Botanic Garden sections in BGIR Noida aiming to conduct Precision Phenological Studies and preparation of Database of endemic trees, medicinal, fruit and endemic plants planted in BGIR Noida.
This project included Mass scale germination and Multiplication of cactus and succulents in garden and also plant spp. collection from different parts of the BSI Regional Circles, Botanic Gardens, Forest Dept. to BGIR Noida to strengthen the BGIR Herbarium. Plant labelling in forest arboretum (Forest types 1 to 8) cactus and Succulent section were also done.

Achievements: During this period, a plant collection tour was conducted to different localities of Tamil Nadu and Kerala and plant spp. were collected for Ex-situ conservation. Altogether 990 saplings belong to 151 taxa have been collected from different localities of Tamil Nadu and Kerala and conserved in different sections of BGIR. 46 varieties of Roses (15 var. of Climbers, 17 var. of Floribundas and 14 var. of Miniature roses) were procured and their plantation in Rose Section and other respective places were coordinated. Nymphaea sp. were collected from Andhra Pradesh and Quercus sp. were collected from Dehradun, Uttarakhand and conserved in BGIR. 60 seasonal/perennial plants like Ipomoea indica, Camellia japonica, Philodendron, Paphiopedilum insigne, Allamanda cathartica, Tarlmounia elliptica etc were collected as a stock for re-strengthening of different sections of BGIR such. Further, 3000 name plates prepared with scientific name and family and tagged the respective species after identification in forest types 1-8. In cactus and succulent section, almost 75 name plates prepared with scientific name and family and tagged the respective species after identification and 98 species were identified in arboretum and tagged.

During this period the Xerophytic Section (cactus and succulent) was also developed showcasing of more than 75 species with photographic record of flowering of about 25 species bloomed during the period. A Bonsai Section has been developed, which displays 16 species of trees such as *Casurina*, *Ficus virens*, *Malphigia galbara*, *Bombax ceiba*. Bonsai was also prepared from Jade plant. A list of 22 sacred plants with their religious importance for development of sacred section was prepared.Coordination of the plantation of 1643 taxa belongs to 65 species in Arboretum area, 980 taxa belong to 92 species in Phyto-geographic region, was done in addition to the plantation of 513 saplings of 35 plant species in zone 6 & 7, 80 saplings of *Putranjiva roxburgii* along the roadside in helipad area and 70 saplings of 04 plant species in the parking area. The phenology of 75 taxa were studied and almost 700 photographs of different plants in different developmental stages i.e. budding, flowering, fruiting, seeds, habit and also Fauna of BGIR were taken. The database/list of herbs, shrubs, trees, climbers/lianas/creepers/twiners conserved in BGIR (except winter and summer flowering plants) which includes 316 taxa belongs to 228 genera and 75 families were also prepared and updated.

Central Botanical Laboratory, Howrah


Combretum roxburghii Spreng.

CENTRAL BOTANICAL LABORATORY, BSI, HOWRAH

Project: 1
Effect of different cooking method on the nutraceutical value of wild edible plants of North East Region in India

Executing officials: Dr Tapan Seal, Scientist E
Duration : April 2022 – March 2025
Area and locality: NA
Background: The project focussed mainly on the areas like the proximate composition which involved monitoring the effect of boiling and microwave cooking on proteins, carbohydrates and fat content in twenty wild edible plants. Studies were also conducted to monitor the effect of boiling and microwave cooking on percent concentration of various minerals like Na, K, Ca, Cr, Mg, Cu, Zn, Mn and Fe, in twenty wild edible plants were studied. Further, the effect of boiling and microwave cooking on the antioxidant properties (TPC, TFC, RP, DPPH and ABTS) and antinutritional properties (Oxalate, tannin, saponin, phytate and cyanogenic glycoside) was also monitored in twenty wild edible plants were studied.

Achievements: The highest amount of fat (15.16±0.05%) was estimated in the seeds of *P. ocymoides* whereas least was found in *P. lineata* (0.58±0.01%). Cooking treatments significantly decreased the fat contents. There were significant decreases (3.95-67.90%) in the fat content in the microwaved edible plants. There was also depletion of fat content in the boiled samples (1.52-40.70%) but less than the microwaved treatment edible plants. The protein content in the raw wild edibles ranged from 5.45 to 28.06 %. The present investigation exhibited the significant increase (1.26-10.45 %, $P< 0.05$) in protein content of the wild edible plants after microwave treatment but there was an insignificant decrease (2.20-11.55%, $P > 0.05$) in the boiled sample. The carbohydrate content in the raw plants ranged from 5.70 to 8.84%. There was a significant increase ($P < 0.05$) in carbohydrate content with all the cooking methods. The microwaved edibles had a higher yield in carbohydrates (6.33-16.66%) followed by boiling (1.24-8.52%). The boiling treatments of the edible plants caused the range of losses of minerals *viz.*Na (1.12-4.89), K (4.41-33.55), Ca (3.07-33.88), Cu (0.0005-0.044), Mg (0.27-3.75), Zn (0.03-0.72), Fe (0.015-7.27) and Mn (0.02-1.23 mg/100gm) whereas, the decreases of minerals in the microwaved plants were comparatively insignificant ($P < 0.05$).Microwave cooking was found to increase the total phenolic content in *Z. acanthopodium* (9.26%), *V. foetidum* (8.69%), *H. cordata* (4.56%), *S. arvensis* (10.38%) and *O. linearis* (4.09%). Boiling treatment decreased the total phenolic content in the range 9.37-25.97% in all studied plants except in case of *V. foetidum*. Only *Z. acanthopodium* plant had the most important loss (25.97%). DPPH radical scavenging antioxidant activity of all vegetables under investigation significantly ($p < 0.05$) increased during microwave cooking procedures of *V. foetidum* (11.89%), *Z. acanthopodium* (20.47%), *H. cordata* (8.02%), *O. linearis* (24.20%) and *S. arvensis* (18.43%), compared to the values for the fresh ones. Boiled cooking decreased the DPPH radical scavenging activity of *Z. acanthopodium* (22.78%), *H. cordata* (10.65%), *O. linearis* (29.77%) and *S. arvensis* (13.75%) whereas radical scavenging activity increased in case of *V. foetidum* by 6.50% as compared to its raw form. The boiling treatment caused the reduction of 0.12-3.37% oxalate content in the edible plants and significant decreases (0.37-5.09%, $P< 0.05$) were achieved when the raw plants were microwave cooked. The highest loss (5.09%) of oxalate was observed in microwaved *V.foetidum* followed by *C. colebrookianum* (3.54%). The boiling treatments showed the decrease in phytate content (0.05 to 0.18%) whereas more significant loss (0.15 to 0.25%, $P < 0.05$) was observed in the microwave plants. The highest concentration of tannin was detected in the leaves of *O. linearis* (1.94±0.03%) and lowest amount was observed in *C. colebrookianum* (0.04±0.007%). Cooking treatment caused the highest reduction of tannin content

(1.57%) in microwaved *O. linearis* whereas least depletion was found in boiled *C. colebrookianum* (0.02%).

Project 2:
Diversity of Soil Cyanoprokaryotes and Algae in AJC Bose Indian Botanic Garden, Howrah.

Executing officials: Dr Pratibha Gupta, Scientist-E
Duration : July, 2022 - March, 2025
Area and locality of the allotted project: Soil cyanoprokaryotes and algal samples from all 25 Divisions of the AJC Bose Indian Botanic Garden area year wise. In first phase studies were initiated and samples collected from 01 to 09 division of AJCBIBG.
Background : Acharya Jagadish Chandra Bose Indian Botanic Garden, Howrah is situated on the west bank of river Ganga (Hooghly) and spread in 273 acres. The garden is divided into 25 divisions. Soil cyanoprokaryotes and algal samples has to be collected from all 25 Divisions of the AJC Bose Indian Botanic Garden area and year wise. So, the attempt has been made to study Soil cyanoprokaryotes and algae for that the samples were collected from 01 to 09 divisions of AJCBIBG in first phase.

Achievements: During this project, 09 field visit survey were done during which 2147 field Photographs and 105 Videos were taken. GPS readings were recorded from the sample collected areas of different divisions. Total 91 numbers of soil samples were collected for Microscopic studies. Maximum soil samples were collected during the month of September, 2022 followed by July, August, October, 2022, January, 2023, December, November, 2022, March and February, 2023. Division wise maximum samples were collected from Division no. 06 followed by Division nos. 01, 09, 07, 02, 03. 04, 05 and 08. All the samples were brought into the Laboratory and preserved in Formalin and properly maintained for identification. Soil Samples were analysed under Leica DM 2500 sophisticated Research Microscope using Leica Qvin 3.2 Image Analysis Software and Leica Application Suit V4 Software with annotation for Identification and 734 Photomicrographs were taken. Altogether 106 species of different classes like Cyanophyceae/Cyanobacteria/Cyanoprokaryota, Chlorophyceae, Bacillariophyceae and Ulvophyceae have been identified. Some of the species were repeatedly observed in the samples. Out of 106 species, **05 species** namely *Borzia periklei* Anagn., *Cyanothece major* (Schroter) Komarek, *Komvophoron anabaenoides* (C.C.Jao & Y.Y.Li) Anagn., *Pseudanabaena biceps* Bocher and *Synechocystis fuscopigmentosa* Kovácik are new record from India. Species observed in the samples like *Cladophora glomerata* (Linnaeus) Kütz. and *Microspora floccosa* (Vauch.) Thuret contains antimicrobial activity and can be a source of valuable bioactive materials for health products. It is very interesting to note that *Oscillatoria sancta* Kütz. ex Gomont found in the samples contains antibiotic activity against number of Bacterial and Fungal species and also having antioxidant activity which is already reported. *Phormidium molle* Gomont found in the samples has been reported to play an important role in increasing soil fertility. *Phormidium molle* Gomont is resistant to heavy metals and thus used for the removal of soil contaminated by heavy metals. Apart from this antitumor activity and anticancer properties of *Phormidium molle* Gomont is also reported. The study further revealed that representatives of the genus *Phormidium* is a promising source of biologically active substances.

Central National Herbarium, Howrah

CENTRAL NATIONAL HERBARIUM, HOWRAH

Project-1
Algal Flora of Purbasthali Wetland, East Bardhaman, West Bengal

Executing Scientist (s) : Dr. R.K. Gupta, Scientist-E & HoO, CNH
Date of initiation : April**,** 2020 – March, 2023
Area and Locality: 180.3 km2, Purbasthali Wetland, East Bardhaman, West Bengal
Background: The study focussed on recording the limnological data from the wetlands and performing photomicrography of the samples. The project also aimed to study the algal samples under SEM and prepare the taxonomic descriptions.

Achievements: Conducted one field tour to Purbasthali Wetland w.e.f. 31.05.2022 to 06.06.2022 and collected 47 samples along with field data. Certain limnological parameters were also recorded. Identified and prepared description of 57 species of Algae.

Project-2
Molecular phylogeny, morphology and taxonomy of Boletoid mushrooms in Uttarakhand

Executing official: Dr Kanad Das, Scientist-E
Duration: 2022-2025
Area and Locality: Uttarakhand
Background: The study intends to provide the macromorphological characterization, micromorphological characterization and also conduct the one to multigene molecular phylogeny of the Boletoid mushrooms samples collected from Uttarakhand

Achievements: A macrofungal survey tour was undertaken to Pauri and Rudraprayag districts of Uttarakhand w.e.f. 10^{th} to 24^{th} August, 2022. The forested areas of Kynkaleshwar, Nagdev, Hanuman mandir surroundings, Phedkhal, Chaubatta, Teka, Gangoti, Adwani, Khirsoo, Baniakund, Chopta, Dugalbitta, Mandal, Ukhimath were explored and 35 specimens belonging to 13 genera and 19 species were collected. The macro-morphological characterization of all the 35 collected specimens were undertaken in base camp. Micromorphological characterization of the 19 specimens were undertaken in the laboratory from the dried samples. All the specimens are well preserved. Multigene phylogenetic analyses were don under which DNA was isolated, amplified and sequenced (ITS, LSU, RPB2 & TEF1) from 11 specimens. Molecular phylogenetic estimations were prepared for 5 species.
Identification: With the help of morpho-taxonomy and molecular phylogeny 10 species belonging to 9 genera were identified from 19 collections.

Project-3
Editing of the Flora of Andaman & Nicobar Islands, Volume – 3 (Monocotyledons)

Executing official: Dr. K. Karthigeyan, Scientist-E
Duration: November, 2022 – November, 2023
Area and Locality: NA
Background: The project was started in 2022 with the intention of collecting data regarding new additions from online sources and library.

Achievements: Collection of recent literature pertaining to the monocot flora of Andaman & Nicobar Islands were done and editing of the manuscript is under progress.

Project-4
Plant diversity in Sacred Grooves of South Bengal

Executing official: Dr Kumar Avinash Bharati, Scientist-D
Duration: 2021-2023
Area and Locality :
Background: The study aimed at the identification of collected specimens from the sacred groves of South Bengal and preparation of the manuscript.

Achievements: During this period, 3 field tours (9th to 15th match 2022, 10th to 16th March 2022 and 28th December to 31 December 2022) were conducted in south districts of West Bengal. Out of the 14 districts, 9 districts have been selected on the basis of presence of scared grooves and 95 sacred groves have been covered by documenting GPS coordinates and photographs. Most of the sacred groves are very small in size. A total of 174 field numbers have been collected from adjacent to the scared grooves because collection is prohibited inside the scared grooves. Many common plants were identified in the field and photographs have been taken. A total of 180 species have been identified and the description of 102 species have been prepared. The final report is under preparation, it will be submitted to the office within couple of months.

Project-5
Digitization of the representative specimens of the species appeared in Flora of India vols. 1-5, 12, 13 & 23

Executing official: Dr Kumar Avinash Bharati, Scientist-D and Dr Anand Kumar, Botanist
Duration: 2022-2023
Area and Locality:
Background: The aim of the project was to digitize all the representative specimens of species under Flora of India vols. 1-5, 12, 13 & 23.

Achievements: The specimens belonging to plant species appeared in Flora of India vols. 1-5, 12, 13 & 23 were sorted out from general herbarium collections. A total of 1–3 good quality specimens preferably one in flowering and other in fruiting were selected for each species/ infra-specific taxon. The selected specimens were taken to Digital herbarium for digitization. The specimens were curated and barcodes were assigned for each specimen and pasted on the herbarium sheets. Each specimens was scanned in TIFF (600 dpi) with the help of scanner EPSON 11000XL. The scanned TIFF images were converted to two format JPEG (600 dpi) and JPEG (300 dpi) with the help of Adobe Photoshop. Metadata were prepared for all selected specimens. The metadata includes Barcode, Family, Genus, Species, Author, Infraspecific rank, Infraspecific taxon, Author, Other name, Country, State, Locality, Date of Collection, Collector, Collection number, Accession number. The names of the species were updated using IPNI and localities were updated using Google. A total of 5114 specimens belonging to 2600 taxa were digitized. Under Government's initiative of "Digital India", Botanical Survey of India has digitized 5114 specimens in the present project. This also includes the 91 digitized specimens from other regional centres of BSI. These digitized specimens and associated metadata has been uploaded on the Indian Virtual Herbarium portal (https://ivh.bsi.gov.in/). The Flora of India, Vol. 1 includes 18 families from Ranunculaceae to Barclayaceae. A total of 608 specimens belonging to 318 taxa were digitized for volume 1. The Flora of India, Vol. 2 includes 13 families from Papaveraceae to Caryophyllaceae. A total of 755 specimens belonging to 407 taxa were digitized for volume 2. The Flora of India, Vol. 3 includes 19 families from Portulacaceae to Ixonanthaceae. A total of 745 specimens belonging to 369 taxa

were digitized for volume 3. The Flora of India, Vol. 4 includes 15 families from Malpighiaceae to Dichapetalaceae. A total of 656 specimens belonging to 344 taxa were digitized for volume 4. The Flora of India, Vol. 5 includes 20 families from Olacaceae to Connaraceae. A total of 745 specimens belonging to 366 taxa were digitized for volume 5. The Flora of India, Vol. 12 includes tribes Anthemideae to Heliantheae of family Asteraceae. A total of 420 specimens belonging to 220 taxa were digitized for volume 12. The Flora of India, Vol. 13 includes tribes Inuleae to Vernonieae of family Asteraceae. A total of 417 specimens belonging to 204 taxa were digitized for volume 13. The Flora of India, Vol. 23 includes seven families from Loranthaceae to Daphniphyllaceae. A total of 768 specimens belonging to 372 taxa were digitized for volume 23. The final report was submitted on 6th April, 2023.

Project -6
Bio-Prospecting and Economic Potential of Selected Marine Macro Algae of India

Executing official: Dr. M. Palanisamy, Scientist-E
Duration: 14.11.2022-31.03.2024
Area and Locality : Selected Marine Macro Algae collected from Gulf of Mannar Marine Biosphere Reserve area, Tamil Nadu.
Background: The main objectives of this study were the Collection and processing of marine macro algae samples for screening. It included preparation of profile on Phytochemical & Biochemical screening of selected marine macro algae samples. The study also involved DNA sequencing using standard molecular markers, Phytochemical & Biochemical Assay on selected marine macro algae and identification of bioactive compounds, Antimicrobial screening and Cytotoxicity.

Achievements: Sixteen marine macro algal samples were collected from Gulf of Mannar region during the month of January 2023 and the collected samples were processed and identified. All the samples were shade dried in room temperature and properly packed in air tight container for further usage. Ten samples were used for phytochemical analysis and the phytochemical results were quite interesting. Ten complex marine macro algae samples were taken for genomic DNA isolation using DNeasy Plant Pro Kit (QIAGEN). Hundred gram of fresh and cleaned samples were used for isolation. DNA quality and quantity were checked using NanoDrop Lite UV spectrophotometer and by running the genomic DNA on 0.8% agarose gel. The genomic DNA quantity ranged from 20-100 ng/µl. Marker selection and synthesis Alshehri *et al*., (2019) recommended *rbcl* marker for seaweed identification with species level resolution. Synthesized the primers for *rbcl* marker at Barcode Biosciences. The lyophlised primers were diluted to working concentration and the primer sequence size were 20 – 26 bp. PCR amplification of *rbcl* region was carried out. The PCR products purified using the QIAquick PCR purification kit (QIAGEN) and sent for Sanger sequencing at Eurofins Genomics India Pvt. Ltd., Bengaluru, India. The Sequence alignment, contig preparation and NCBI blast were done to conform the authenticity for the two green algal samples. In the remaining samples, the DNA sequence and NCBI GenBank submission of sequence, bioactive compounds and cytotoxicity study will be completed in the coming year (2023-2024).

Central Regional Centre, Allahabad

CENTRAL REGIONAL CENTRE, ALLAHABAD

Project-1
Flora of Madhya Pradesh Vol. I including Pictorial Checklist (Revised edition)

Executing officials:

Dr. Arti Garg Scientist-E (Team Leader)	07 Families (35 Species)
Dr. O.N. Maurya, Sci-D:	18 Families (135 Species)
Dr. Arti Garg & Mr. B. Lakshmanudu, Sr. Pres., Asstt.:	10 Families 66 Species
Dr. A.K. Verma, Sci-C:	12 Families (129 Species)
Dr. Nitisha Srivastava, Botanist:	15 Families (127 Species)
Dr. N. Stalin, Botanist:	08 Families (11 Species)
Dr. N. Stalin, Botanist & Dr. Arti Garg, Sci-E:	03 Families (266 Species)
Dr. Saurabh Sachan, Bot.Asst.:	11 Families 84 Species

Duration: December, 2022 – March, 2024
Area and Locality :

Achievements:

Official	Achievements
Dr. Arti Garg Scientist-E (Team Leader)	Completed Literature Survey
Dr. O.N. Maurya, Sci-D:	Completed Literature Survey
Dr. Arti Garg & Mr. B. Lakshmanudu, Sr. Pres., Asstt.:	Check list of 9 families, 66 Species (Papveraceae, Cornaceae, Rubiaceae, Zygophyllceae, Simaroubceae, Olacaceae, Opiliaceae, Sabiaceae, Moringceae Description of Papveraceae is under process
Dr. A.K. Verma, Sci-C:	Prepared checklist of taxa for allotted families. Taxonomic description of 20 taxa of family Asteraceae completed
Dr. Nitisha Srivastava, Botanist:	Review of Literature. Preparation of checklist of species for families Ranunculaceae, Dilleniaceae and Annonaceae completed. Preparation of data for specimen examined for familes Ranunculaceae, Dilleniaceae and Annonaceae completed. Consultation of specimens examined is under process. Completed taxonomic description of 10 species. Prepared checklist for families Menispermaceae, Berberidaceae and Nympheceae. Completed nomenclature updation for families Menispermaceae and Berberidaceae.
Dr. N. Stalin, Botanist:	• A checklist containing 268 species was prepared for the families Fabaceae, Caesalpiniaceae, Mimosaceae. Nomenclature of botanical names was updated based on POWO. Botanical descriptions are being prepared and compiled (under progress).

	• Prepared a checklist and botanical descriptions for the 10 species listed under the families Magnoliaceae, Bixaceae, Cochlospermaceae, Pittosporaceae, Elatinaceae, Hypericaceae, Theaceae, Dipterocarpaceae • Photographs preparation is under progress
Dr. Saurabh Sachan, Bot. Asst.:	• Undergone a comprehensive review of the literature pertaining to Flora of Madhya Pradesh works. • Prepared a complete checklist of genera/species concerned with my allotted families. • Undergone a comprehensive review of the literature pertaining to Flora of Madhya Pradesh and completed the Generic and species description of allotted families viz. Droseraceae and Rosaceae.

Project-2
Flora of Haiderpur wetland – a Ramsar site, Bijnor & Muzaffarnagar, Uttar Pradesh.

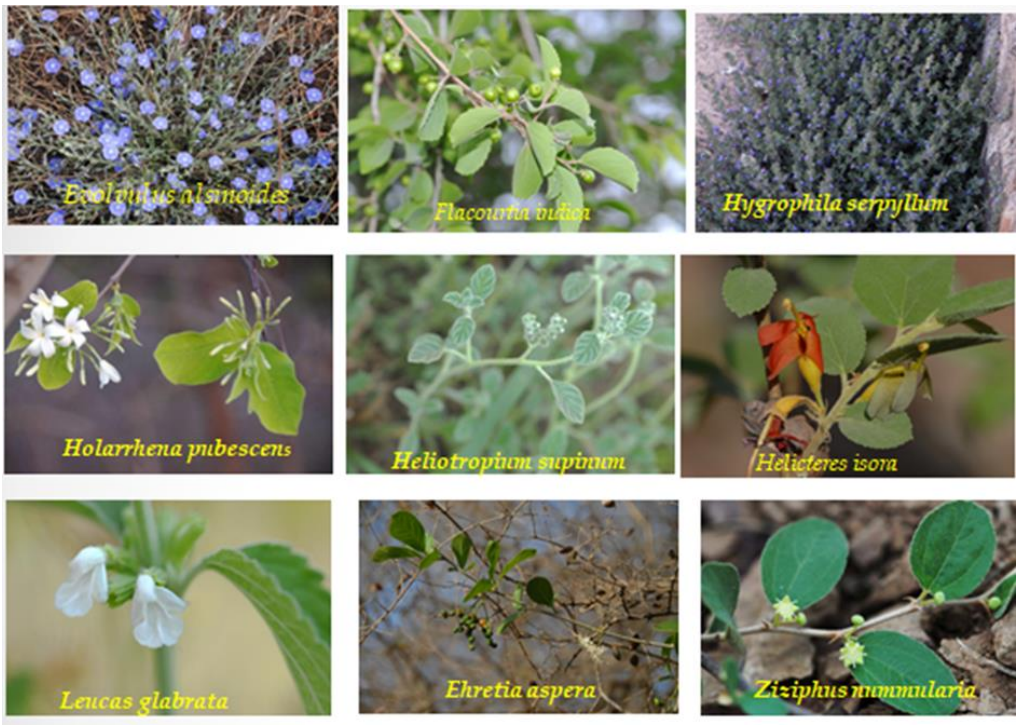
Executing Officials : Dr. O. N. Maurya, Sci-D and Dr. Saurabh Sachan, Botanical Assistant
Duration : 2022-2024
Area and Locality: Haiderpur wetland – a Ramsar site, Bijnor & Muzaffarnagar, Uttar Pradesh
Background: This study aims to provide a comprehensive report on the floral component of the Haiderpur wetland – a Ramsar site, Bijnor and Muzaffarnagar areas of Uttar Pradesh.
Achievements: The team underwent two field tours conducted from 20.11.2022 to 29.11.2022 and 13.03.2023 to 20.03.2023 respectively after collection of concerned literature and they have collected *c.*220 field numbers in triplicate samples. In addition, *c.* 316 plant photographs including GPS co-ordinates were taken. Tentatively 75 specimens have been identified from the collection. After tour supervision of processing (proper drying, periodic poisioning, mounting, stitching,) is in progress.

Project-3
Flora of Kuno National Park, M.P.

Executing Officials: Dr. AK Verma, Scientist –C
Duration : October, 2021 – March, 2023
Area and Locality: Palpur East, Palpur West, Dhorat, and Occhapura ranges of the Kuno National Park.
Background: Kuno National Park comes under the Kuno Wildlife Division of Sheopur district of Madhya Pradesh and situated between latitude 25^0 30' 50.03" N to 26^0 05 ' 23.19" N and longitude 76^0 58' 37.45" E to 77^0 20' 07.98" E. This national park started out as sanctuary of about 348 km^2 in 1981 and later, in December 2018 the state government changed the status of the Wildlife Sanctuary to National Park and enlarged the protected area by about 400 km^2, so now it covers around 748 km^2. This project work was undertaken considering the fact that till date comprehensive floristic account of Kuno National Park is not available.

Achievement: During this period two field tours were conducted and all ranges of aforesaid national park were covered and information on vegetation type, forest type, dominate vegetation

type etc. are collected. A total 280 field number were collected which had 750 specimens. Total 515 photographs were taken. 145 field numbers belonging to 106 species were identified.



Project-4

Curatorial work and maintenance of the RET and economically important species in the experimental garden of BSI, CRC, Allahabad.

Executing Scientist(s): Dr. Sheo Kumar, Sci-F,
Dr. Arti Garg, Sci-E, Dr. A. K. Verma, Sci-C,
Dr. Brijesh Kumar, Botanist,
Dr. N. Stalin, Botanist and
Dr. Saurabh Sachan, Bot. Asstt.

Duration : Ongoing

Background: Trees are invaluable resources of tropical biodiversity which helps in maintaining a balanced ecosystem and to mitigate climate change. However, accurate identification of tree species are challenging due to factors like tree height, non-availability of reproductive characters, overlapping key characters, and less expertise in the field of plant taxonomy. Rapid identification of trees species is pre-requisite to understand the ecological relationships and to execute conservation and management practices. The work is focused on establishing Quick Response (QR) code based identification method for tree species housed in the Experimental garden of Botanical Survey of India, Central Regional Centre, Prayagraj. The peroject aims to prepare a revised list of tree species by exploring the c. 2.50 hectares area of CRC campus through field survey and developing the meta-data for each tree species will be including botanical name, family name, common name, vernacular name, key morphological features and economic uses. A digital QR code will be created for all the tree species to achieve user-friendly identification. Finally, tag of QR code will be placed for tree species to aid easy identification. This work utilizes the digital technology to complement conventional plant taxonomy. The major outcome of the work is that even non-experts can identify tress species easily at any given time that attracts public to learn about importance of trees. This project will lead a way to disseminate the taxonomic knowledge of tree species to students, research scholars, scientists, and to all plant enthusiastic using existing technology.

Achievements: *Mangifera Indica*, *Mimusops elengi* and *Ficus carica* have been brought and conserved for introduction in garden. The data sheet with coordinates for 10 trees of CRC, experimental garden has been prepared. Rose plants have been trimmed for formation of new branches to get larger flower and compact floral bunches. All six sections of water bodies have been cleaned. An area of 5100 sq. ft. is properly cleaned and developed into new section for fruit yielding plants of U.P., M.P. and Chhattisgarh. Another area of 1200 sq. ft. is also cleaned for roses and other wild plants. 12 species including *Psilotum nudum* (L.) P.Beauv., *Nelumbo nucifera* Gaertn., *Nymphaea alba* L., *Ludwigia sedioides* (Humb. & Bonpl.) H.Hara, *Vallisneria spiralis* L., *Myriophyllum aquaticum* (Vell.) Verdc. Etc have been introduced into the garden from Acharya Jagadish Chandra Bose Indian Botanic Garden, BSI, MOEF&CC, Govt. of India, Howrah on 15.12.2022. Each and every Section of Botanic Garden of CRC has been maintained by the support staff for de-weeding, mulching, manuring and irrigation of conserved and horticultural species in/at respective place and areas. Documentation of trees and shrubs of CRC experimental garden is under progress. Six plant species: *Aspidistra elatior* Blume, *Gazania ringens* (L.) Gaertn., *Rhapis excela* (Thunb.) Henry etc. have also been introduced in garden. QR code for Tree species were prepared.

Development of a new Rosary in garden and renovation of an aquatic pond of CRC experimental garden for creating awareness and conservation purposes were done. Scanning of 100 herbarium sheets has been done as a part of Digitization work.

Deccan Regional Centre, Hyderabad

Kaempferia rotunda L.

Caralluma adscendens var. *attenuata* (Wight) Grav.and Mayur.

DECCAN REGIONAL CENTRE, HYDERABAD

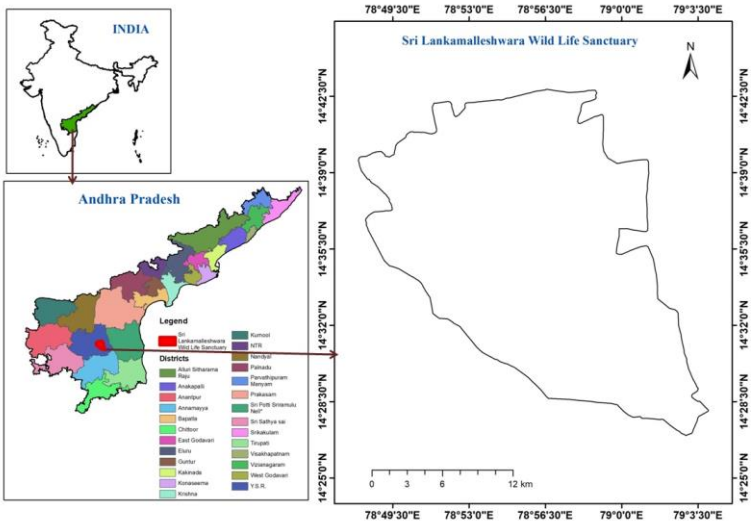
Project – 1
Curatorial work at Herbarium and Museum of DRC, Hyderabad

Executing officials: Dr. P. Harikrishna and Dr. G. Swarnalatha
Duration: April 2022-March 2023
Background: This project involved two areas of work, one was the Digitization and development of Database of Herbarium specimen and the other was the Development of Museum of DRC, Hyderabad. The BSI DRC Herbarium is holds nearly 23000 specimens and about 22167 specimens were scanned till date, out of which 3155 scanned specimens were converted from TIFF to JPG during 2022–2023. The scanned images of about 2594 specimens were copied and saved in 118 DVDs as back up. The main objective of the study was digitization and development of Database of Herbarium specimens. For the development of the BSI-DRC Museum, one wooden display cabinet and five customized display boards were procured. LED lights were installed in one display unit. Fluid preservatives of museum specimens were changed wherever required. Thematic rearrangement of Museum specimens was completed in one display unit. New labels were prepared wherever necessary. 16 new specimens were added to the museum and the damaged specimens discarded.
Area and Locality: Herbarium and Museum of BSI-DRC, Hyderabad

Achievements: Under the herbarium digitization work 4288 specimens were incorporated, 835 specimens were mounted and 65 remounted. New species covers were prepared for 264 specimen and new genus covers were prepared for 336 specimen with currently accepted names, synonyms (if any). 5089 herbarium sheets reincorporated from Malvaceae to Poaceae families at BSID. In addition to this segregation and arrangement of 4280 herbarium sheets as per field number and also segregation of more than 2000 duplicates specimens was completed. Further, one hundred fifty six (156) Herbarium specimens of unidentified specimens have been identified from previous projects. For the development of the museum three (03) customized display boards were procured for mounting of specimens on them. The fluid preservatives of museum specimens were changed wherever required. Thematic rearrangement of Museum specimens in display units are under progress. Procurement of new glassware for museum specimens and mounting materials are under progress. New labels were prepared wherever necessary. Added 12 new specimens to the museum and discarded damaged specimens.

Project – 2
Flora of Sri Lankamalleswara Wildlife Sanctuary (464.42 sq.km) (Kadapa & SPSR District, Nellore

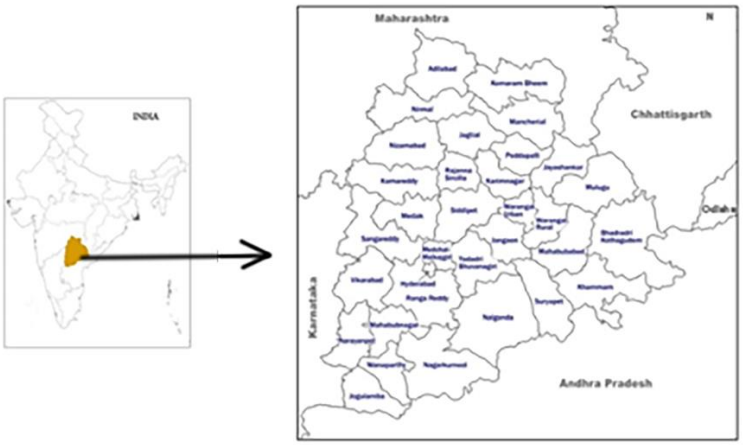
Executing Official: Dr. Mudadla Sankara Rao and Dr. Harikrishna
Duration: November 2022-March 2025
Background : The information on plant diversity of wildlife protected areas is of immense importance to design the conservation strategies to strengthen the conservation modules by involving the local people in these protected areas. Considering this fact, this project focusses on the Survey, Collection and Identification of Flora of Sri Lankamalleswara Wildlife Sanctuary (464.42 sq.km) (Kadapa & SPSR District, Nellore)of Andhra Pradesh.
Area and Locality: Sri Lankamalleswara Wild Life Sanctuary (464.42 Sq. Kms).



Achievements: The relevant literature and information pertaining to the study area has been collected.

Project – 3
Lichens of Telangana State

Executing Official: Dr. G. Swarnalatha
Duration: April 2022-March 2027
Background: As far as Lichens of Telangana state is concerned there is no noteworthy contribution. Limited work has been done and only few species i.e. 23 species under 11 genera have been reported by Manoharachary (1979); Venugopal Rao & Manoharachary (1980); Sujatha (2014); Sujatha et al. (2016); Manoharachary & Nagaraju (2017). Of which, 16 species under eight genera are macrolichens. However, a vast part of the state remains unexplored with respect to the lichens and moreover, neither the precise diversity inventory of lichens of the state is available. Therefore, detailed survey and study of lichens from the state is needed. Thus, this project has been proposed for detailed survey and study of lichens and to provide a thorough and comprehensive account of lichens of the state.
Area and locality: Telangana, state (1,12,077 sq. km.)



Achievements: The relevant literature and information were collected. One herbarium consultation tour was conducted to Dept. of Botany, Osmania University, Hyderabad (OULH) to borrow lichen specimens on loan. The loan specimens are yet to be received for detailed study. Persuasion for permission from PCCF, Telangana Forest Department to conduct field tours in Telangana forests is under process.

Eastern Regional Centre, Shillong

Impatiens benthamii Steenis

EASTERN REGIONAL CENTRE, SHILLONG

Project: 1
Micropropagation of EET plants of Northeast India

Executing officials: Dr. Deepu Vijayan, Scientist-D
Duration: September, 2020 - Ongoing
Background: This project was initiated with a goal to standardize the protocol, mass multiplication of EET plants of Northeast India namely *Eriodes barbata* (Lindl.) Rolfe, *Pholidota katakiana* Phukan and *Micropera rostrata* (Roxb.) N.P. Balakr and also the maintenance of *in vitro* raised plants of *Armodorum senapatianum* and *Cymbidum tigrinum* in plant tissue culture lab, garden and polyhouse.
Area and Locality: North East India

Achievments: Under this project, the different stages of *in vitro* cultures maintained in tissue culture laboratory were documented. Maintenance of *in vitro* raised plants of *Armodorum senapatianum* and *Cymbidum tigrinum* in the plant tissue culture lab, garden and polyhouse were done. Subculturing of *Cymbidium tigrinum* and *Cymbidium whiteae* were done in MS Medium. Maintenance, documentation and pollination were carried out for *Micropera rostrata* and *Renanthera imschootiana*. Subculturing of *Eriodes barbata* in MS Medium supplemented with 0.2% activated charcoal were conducted. Subculturing of *Ceologyne corymbosa* in MS Medium. Surface sterilization of *Renanthera imschootiana* seed pods and inoculation in MS media. Subculturing of *Cymbidium tigrinum* in MS Medium. *In vitro* raised plants of *Cymbidium tigrinum* (50 Nos.) were transferred for hardening. Surface sterilization of *Renanthera imschootiana* seed pods and inoculation in MS media. Maintenance, documentation and pollination were carried out for *Armodorum senapatianum* and *Vanda coerulea.* Maintenance, documentation and pollination were carried out in *Pholidata katakiana.* Surface sterilization of seed pods and inoculation of seeds of *Renanthera imschootiana* and *Penkemia nagalandensis* in MS Medium with 0.2% Activated charcoal and MS Medium supplemented with 0.5 mg/L GA_3 were done. Subculturing of *Ceologyne corymbosa* in MS Medium was done. Surface sterilization and inoculation of *Renanthera imschootiana* seed pods in MS medium. Subculturing of *Cymbidium whiteae* in MS Medium with 10% banana.

Project: 2
Flora of Manipur Vol. II

Executing Scientist(s): Shri B.B.T. Tham, Botanist; Shri L.R. Meitei, Botanist & Shri Harminder Singh, Botanical Assistant
Date of Initiation: April 2021-March 2023
Area and Locality: Manipur
Background: This project started in 2021 and the team has been collecting and documenting the plant specimens of the target families from the different areas of Manipur.

Achievements: A Field Tour to Manipur covering Imphal West, Kangpokpi, Tengnoupal, Chandel and Senapati districts of the state was undertaken w.e.f. 31.03.2023 to 14.04.2023. During the field tour herbarium specimens were collected for the target families. Live plants are also collected for ex-situ conservation purpose. Herbarium Consultation was done in ASSAM herbarium of the Regional Centre. Also, herbarium consultation works were done in Manipur University, Dhana Manjuri University and Institute of Bioresources & Sustainable Development (IBSD), Imphal. Listing and documentation of 220 plant species through herbarium and literature consultation work

was completed with reference to the Library Study of relevant Flora, Journals etc. concerned with the Floristic wealth of Manipur.

Project-3
Curatorial works and maintenance of the Experimental Botanic Garden, BSI, ERC, Barapani & ex situ conservation and multiplication of rare, endangered, threatened, endemic and economically important plants of North East India.

Executing Official(s): Shri B.B.T. Tham, Botanist &Shri L.R. Meitei, Botanical Assistant
Duration: Ongoing
Area and Locality : Meghalaya including the Kyrdemkulai Forest, Raid Nongbri Community Reserve Forest and Umiam & Umsaw areas of Ribhoi District, Meghalaya.
Background: The maintenance of a botanic garden requires proper curatorial management that not only focusses on conservation and display, but also encourages scientific research work involving seed germination, multiplication and recording the phenological data. It also involves distribution of healthy seedlings for more propagation of the plants. With this vision in mind, this project was started in order to upkeep the Experimental Botanic Garden, BSI, ERC, Barapani.

Achievements: During the field tour to Kyrdemkulai Forest, Ri bhoi District, Meghalaya on 13.01.2023, 24 plants belonging to 13 species were collected which included *Smilax sp*, *Impatiens* sp. (2 Nos.), *Dianella* sp. , *Dendrobium sp* etc. During the field tour to Raid Nongbri Community Reserve Forest, Umsaw Nongbri, Ribhoi District, Meghalaya on 18.01.2023, 13 live plants belonging to 6 species, 10 cuttings of 1 species and 10 seeds of 1 species were collected. The collection included plants like *Tupistra* sp*., Peliosanthes* sp*., Rhapidophora* sp*., Justicia* sp. etc. Also, during the field tour to Umiam and Umsaw areas, Ri-Bhoi, Meghalaya on 12.03.2023, 15 plant species including *Blechnum orientale*, *Brainia insignis*, *Zingiber* sp. etc were collected.The phenological data of some flowering plant species in the EBG, Umiam were observed and recorded Supervision of works carried out in the Experimental Botanic Garden for its general maintenance. Collected seeds of some plant species in the EBG, Umiam for germination. Transplanted plant seedlings raised in Nursery germination beds into plant sapling bags for distribution to different offices, organizations and individuals for plantation purpose. Distributed a total of 3942 saplings/seedlings to different offices, organizations and individuals for plantation.

Project: 4
Understanding the phylogenetic relationships between the genus *Tupistra* and *Rohdea* complexity in Indian phyto-geographical context based on the analysis of DNA Sequences.

Executing officials: Dr. David Lalsama Biate, Scientist 'C'
Duration: April, 2022 – March, 2024
Area and Locality: Assam, Meghalaya, Nagaland and Arunachal Pradesh
Background: In floral morphology, *Rohdea extrorsandra* shows closer relationship with *Rohdea* whereas in vegetative morphology it shows close relationship with *Tupistra*. But in pollination ecology the species is much more advanced than both the *Rohdea* and *Tupistra* in evolutionary point of view. Similarly, *Rohdea extrorsandra* is unusual in having subturbinate-urceolate perianths that are internally many ribbed and distally strongly inflexed, extrorse anther sacs borne on a well-developed connective, and small pistils with a short constricted style which auses the pistil to become sufficiently small for securing pollination in the narrow space inside the perianth. The small orifice in the frontal center of the perianth may allow only small pollen-vectors to enter the interior. After entering the interior through the orifice, it is likely that the vectors move around over the ribbed perianth wall and are touched and smeared with pollen by the extrorse anthers facing the

wall (Odyuo et al 2017; Averyanov et al. 2019). Therefore, based on the above discussions it is understood that the phylogenetic relationship between *Rohdea* and *Tupistra* is ambiguous. The present proposed study aims to understand the phylogenetic relationships between the genus *Tupistra* and *Rohdea* complexity in Indian phyto-geographical context based on analysis of DNA sequences.

Achievements: During this period, two local field tours were undertaken to Sumer, Kyrdem Kulai, Zero Point, Raid Nongbri and surrounding areas of Ri Bhoi District, Meghalaya. *Tupistra tupistroides* (Kunth) Dandy and *Peliosanthes* sp., and a total of 21 live specimens of RET plants including nine orchid taxa were collected for *ex situ* conservation at EBG, Barapani and Shillong. Three field tours were also undertaken to Dima Hasao District, Assam, Mokokchung District, Nagaland and West Kameng and Tawang Districts, Arunachal Pradesh for a period of 19 days. During the field tour 5 different species of *Tupistra* and *Rohdea eucomoides* were collected. A total of 108 live specimens of RET plants including 40 orchid taxa were collected for *ex situ* conservation at EBG, Barapani and Shillong. The collections in the field were accompanied by field photography of different plants, landscapes, forest types, vegetation etc.

As a part of the Molecular Biology screening, the Standardization of genomic DNA and Standardization of Polymerase Chain Reaction were done. The Standardization of genomic DNA involved genomic DNA extraction from leaves of *Tupistra* and *Rohdea* species using CTAB method (Murray and Thomson, 1980) with minor modifications. The quality of the extracted DNA was checked in 0.8% agarose in 1X TBE buffer. Standardization of Polymerase Chain Reaction involved PCR amplifications of the extracted genomic DNA targeting of the ITS region using primer pairs ITS2 and ITS4 as forward and reverse primers as follow-

ITS-S2F- 5' ATGCGATACTTGGTGTGAAT 3'

ITS4: 5' TCCTCCGCTTATTGATATGC 3'

Amplification of ITS region were performed in 20µl reaction volume containing 50 ng DNA sample, 5X PCR buffer, 2µM of $MgCl_2$, 200uM dNTPs, 2µM of both the forward and reverse primer and 0.6U of Taq polymerase. The PCR amplification was performed using Thermal cycler using the cycle: initial denaturation at 94ºC for 4mins followed by 35 cycles of denaturation for 40secs, annealing temperature at the range of 55-60ºC for 40secs and extension at 72ºC for 1min followed by final extension at 72ºC for 8mins. All the amplified PCR products obtained from ITS markers were resolved by electrophoresis on 1.5% agarose gel in 1X TBE buffer. PCR amplified fragments were visualized under UV light and photographed using Gel Documentation system.
The amplified PCR products were purified and send for Sanger DNA sequencing.

Project- 5
Curatorial works at herbarium of ERC, Shillong (Assam)

Executing Officials: Mrs. Nandita Sarma, Bot. Asst., Miss. Kankana Chakraborty, Bot. Asst., Mr. Vijay, Bot. Asst., Mr. Harminder Singh, Bot. Asst., Miss. Debala Tudu, Bot. Asst., Mr. Harekrushna Swain, Sr. Preservation Asst., Mr. Y. Mahesh, Sr. Preservation Asst.
Duration: July, 2021- Ongoing
Background: This project aims at the Regular maintenance of herbarium, Preparation of database and incorporation of metadata of all herbarium specimens and Digitization of herbarium specimens of ASSAM.
Area and Locality: ASSAM herbarium, ERC

Achievements: During entire tenure of the project, Total metadata enlisted: **122,129 (**approx 82%). Total number of Angiosperm Metadata enlisted- **111,195**{Dicot- **85968** (96%) and Monocot-**25,227**(98.55%)}, Total Number of Pteridophytes Metadata Enlisted-**10,358** (100%)}. Total

Number of Gymnosperm Metadata Enlisted- **576** (100%)}. .Total Metadata with Barcode- **35,585**, Total Metadata without Barcode- **85968.** Total Number of Barcode pasted-**43,306**. Total Number of Scanned Type Specimens- **779**. Total number specimens scanned: **5026**. Cleaning and changing of Genus cover and the species of Herabarium sheets were done whenever needed.

Project- 6
Backlog clearance of unidentified Herbarium sheets at ASSAM

Executing officials: Mrs. Nandita Sarma, Bot. Asst., Miss. Kankana Chakraborty, Bot. Asst., Mr. Vijay, Bot. Asst., Mr. Harminder Singh, Bot. Asst., Miss.DebalaTudu, Bot. Asst., Mr. Harekrushna Swain, Sr. Preservation Asst., Mr. Y. Mahesh, Sr. Preservation Asst. under the supervision of Dr. Chaya Deori, Sc-E.
Duration: June, 2022 **-** Ongoing
Background: This project focusses on areas like segregation of herbarium sheets, collecting the field related information whose field books are not available, data entry of herbarium sheets, identification of plants, fumigation & incorporation of identified sheets.
Area and Locality: ASSAM herbarium, ERC

Achievements: During entire tenure of the project, **1,297** herbarium sheets were segregated. **1,297** plants were identified and **1,297** data entry of herbarium sheets were done.

Project-7
DNA barcoding and Phylogenetic analysis of the endemic genus *Hypericum* of North-East India and Chemical composition, antioxidant activities of the essential oil produced.

Executing officials: Dr. Deepu Vijayan, Scientist-D and Mr. Harekrushna Swain, Senior Preservation Assistant
Duration: October, 2022 - 2024
Background: This project involves collection tour in different areas of Meghalaya and processing of the collected plant specimens towards Herbarium preparation related work; The sequential extraction of plant parts (medicinal plants) by using appropriate solvents for phytochemical profiling were done followed by the development of chemical profiles using GCMS/LCMS system.

Achievements: Nineteen (19) plant specimens of the genus *Hypericum* were collected from different areas of Meghalaya Extraction of Essential oil from the *Hypericm hookerianum* Wight & Arn., *Hypericum gracillipes* Stapf ex C.E.C. Fisch. and *Hypericum japonicum* Thunb by hydrodistillation using a Clevenger-type apparatus for 6h. The extracted essential oil was dehydrated over anhydrous Na_2SO_4 and was stored at 4ºC in an air tight dark brown glass vial until further analysis. Further, GC–MS analysis was performed for the above mentioned species, which resulted in the identification of 30-35 components, accounting for 95% of the total oil. The essential oil is primarily composed of monoterpene hydrocarbons, oxygenated monoterpenes, sesquiterpene hydrocarbons and oxygenated sesquiterpenes.

Further**,** 2, 2-diphenyl-1-picrylhydrazyl free radical scavenging ability (DPPH Assay), 2-azinobis-3-ethylbenzothiazoline-6- sulfonic acid scavenging ability (ABTS Assay) and reducing power capacity of the plant extracts of the same *Hypericum* were also carried out. The results indicated that essential oil is a rich source of sesquiterpene and monoterpene hydrocarbons with α-pinene and β-caryophyllene as the predominant constituents. Essential oil showed a moderate antioxidant capacity. This may be because it is composed of entirely terpene hydrocarbons which are not active antioxidants.

Industrial Section Indian Museum, Kolkata

Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore

INDUSTRIAL SECTION INDIAN MUSEUM, KOLKATA

Project – 1
Barcoding, Database and Digitization of BSIS Herbarium.

Executing officials: Dr. Rajeev Kumar Singh, Sushreya Pal, Shrabasti Das.
Duration : April 2022-March 2023.
Background: This project aimed to digitize the Economic Herbaria specimens of algae present in the Industrial Sections, Indian Museum (BSIS). The BSIS herbarium has separate sections for dicot and monocot specimens, as well as a vast collection of algal specimens, specifically collected by DR. K.S. Srinivasan. The objective was to contribute to the preservation and accessibility of valuable information of each specimen, by making the specimens available online for researchers interested in the study of taxonomy, distribution, and collection history.
Area and locality: not applicable.
Achievements: The team of this project used the Epson Expression 12000XL scanner to scan a total of 4,212 specimens. Two settings were used for scanning: 24-bit color, 300 dpi resolution, and JPEG format, and 48-bit color, 600 dpi resolution, and TIFF format. So, a total of 8424 digitized images were generated. A standard scale and colour codes were added to each herbarium sheet during scanning to facilitate future identification. We prepared an associated metadata in an Excel sheet to record the important details such as barcodes, scientific names, families, place of collection, date of collection, collector and field numbers. This information was used to create a database that will be made available online along with the digitized specimens. The herbarium is a valuable resource for researchers, but accessing and studying the specimens in person can be challenging due to the physical size of the collection and the time required to navigate it. By digitizing the specimens and making them available online, this project provides an accessible alternative for researchers to study the specimens and their associated data. Barcoding, digitization and metadata creation of 4212 algal herbarium specimens has also been completed.

Project-2
Trees in the Premises of Indian Museum-A Pictorial Guide

Executing Officials: Dr. Debasmita Dutta Pramanick, Sc.-C, Dr. Kangkan Pagag, Botanist & Dr. Sudeshna Dutta, Botanist
Duration: April, 2022-March, 2023
Background: In India, urban green verges, considered as part of ecological, aesthetic, and cultural tradition, include diverse ranges of plant species which are of economically important and having socio-cultural significance. Besides enriching the aesthetic framework of urban construction, the floristic wealth also contributes towards conservation and sustainable land management. With continuous expansion of construction, industries, transport, tourism etc., the natural urban vegetation facing terrific strain all over the India resulting wipe out of hundreds of wild as well as ornamental plant species in metropolitan areas and impart several direct and indirect effects on mental and physical health of population. The ignorance and lack of complete knowledge about urban vegetation and their buffering role to mitigate environmental issues in overdensed cities are one of the major reasons of fast species disappearance in most of the big cities of India. To overcome this alarming situation and recover pollution free healthy urban life, mass engagement and awareness is required. The premises of Indian Museum, comprises of several tree species of seed plants which are of cultural as well as economic significance. As no previous reports on floristic study in the premises of Indian Museum has been conducted so far, a documentation of the tree species in the premises of Indian Museum may be helpful to aware several hundreds of general public come to visit the Museum each and every day. Tree spotting and their identification in this area has been proposed for better understanding and environmental awareness of visitors.

Area & locality: The premises of Indian Museum, Calcutta, c. 12.11 acre

Achievements: The present study on spotting and identifying the tree species in and around premises of Indian Museum, Kolkata was started in 2021 for one year tenure.During this period, approx. 60times local visit were conducted throughout the year to identify the tree species, spot their location, record flowering and fruiting time and for capturing good field photographs.The key methods followed during present work are as following: identified & listed tree species of seed plants (Angiosperm and Gymnosperm) in and around the premises of Indian Museum; documented the listed plants comprising scientific name, family, common name, vernacular name, origin, distribution, ecology, population and common uses; recorded the phonological data along with good quality field photo; prepared a location map of the tree species in the premises of Indian Museum; prepared QR code for each species and inserted in ACP board. A total no. of 70 ACP boards were installed in the campus. A total of 44 tree species have been identified and labelled along with QR Code. ACP boards have been installed for 70 no. of tree species in the campus. Final report has been submitted

Project-3
Documentation of exhibits and materials of Botanical Gallery in Industrial Section, Indian Museum.

Name of the Executing officer: Dr (Ms.) S. Datta, Botanist, Dr (Ms.) K. Pagag, Botanist &
Dr M. Bhaumik, Scientist E & HOO.
Duration: April 2020- March 2022. (Extended One-year upto march 2023)
Background: The Economic Botany Gallery with an excellent effort and scheme of Sir George Watt was opened to public in the large hall of 2nd floor on May 29th, 1901 and samples were arranged scientifically in 8 Bays under separate categories, viz., i) Gum, Resin, India Rubber, Lac, Kino ii) Oils, Oilseeds, Oilcakes, Soaps & Waxes iii) Dyes and Tans etc. iv) Fibres, Silk, Cotton, Jute, Wool v) Medicinal produces and indigenous drugs vi) Narcotics, Opium, Indian hemp, Tobacco vii) Food substances, sugar, starch, cereals, etc. viii) Indian Timbers. In the centre of the gallery, finished and commercial articles were displayed. The Botanical Gallery now is repository of diverse collection of economical and useful plant materials, obtained from various phyto-geographical regions of India and at present it holds about 10,000 botanical exhibits. During this project we reassess and catalogue of exhibits and materials of Botanical Gallery in Industrial Section Indian Museum.
Area and locality: not applicable.

Achievements: The xylarium (wood sample) database has detailed records, plant name, place of collection and collector name. There are about 193 wooden samples of various shapes and sizes displayed along the staircase along with display at the gallery is based on usage pattern and classified as timber for construction, furniture works, agricultural equipment etc. There are several collections of wooden samples like *Castanopsis indica, Acacia nilotica, Alnus nitida, Bridelia retusa* and others that were collected from different parts of India during 1877-78. *Chukrasia tabularis, Lophopetalum littorale, Fernandoa adenophylla*are few samples collected from Burma, along with *Tectona hamiltoniana* which is endemic to Burma.
The Dye staffs are about 1142 in numbers as recorded during this documentation. Some common botanical samples displayed here were *Mallotus philippensis* (Lam.) Müll. Arg., *Mangifera indica* L., *Marsdenia tinctoria* R. Br., *Melia azedarach* L., *Mesua ferrea* L., *Hydnocarpus wightianus* Blume and many others.
The botanical gallery holds 1114 exhibits of oil and oil seeds of different genres, like common edible oils and seeds (mustard, soybean, sunflower, sesame), medicinal oils (castor, linseed,

myrobalan, karanj), industrial oil (turpentine, vateria, linseed), and oil used in cosmetics (rose, sandalwood, safflower).

The Economic Botany Gallery of Botanical Survey of India houses a total of 545 specimens of Gums, Resins and lac. It is one of the largest repositories of gum resin collection in India. The earliest collection dates back to 1891 which are gum samples of *Acacia leucophloea* and *A. farnesia*c ollected by different office holders. *Guttapercha* samples exhibited at Calcutta Exhibition (1882) is also housed here. It is noteworthy to mention that the Calcutta International Exhibition has been a foundation stone towards the development of the Botanical Gallery at Indian Museum. There are several foreign collections from places like Burma, Pakistan and Baluchistan. There are few collections in this category from plants that are not found in India, though the time frame of collection indicates that it was unified under British rule. So, all together 7460 samples documented, preserve and conserved wherever required.

HIGH ALTITUDE WESTERN HIMALAYAN REGIONAL CENTRE, SOLAN

Project:1
Flora of Himachal Pradesh Vol. 2 (Family Cucurbitaceae and Caprifoliaceae)

Executing Scientist(s): Dr. Kumar Ambrish, Scientist-E and Dr. Kuldip S. Dogra, Scientist-D
Duration: April 2022- March, 2023
Background: This project was done jointly with BSI-NRC, Dehradun that aimed at the documentation of the allotted taxa under the families Cucurbitaceae and Caprifoliaceae [c.62 taxa]

Achievements: The Floristic account of family Cucurbitaceae includes 19 genera with 35 taxa (34 species and 1 subspecies) and Caprifoliaceae includes 06 genera with 27 taxa (26 species and 1 subspecies) in Himachal Pradesh.

Northern Regional Centre, Dehradun

NORTHERN REGIONAL CENTRE, DEHRADUN

Project -1
In vitro mass multiplication and propagation and rehabilitation in natural habitat of useful and threatened species of the North-West Himalaya

Executing officials: Dr. Giriraj Singh Panwar, Scientist-E
Dr. Bhavana Joshi, Botanist
Duration: April, 2021- March 2023
Area and Location: North-West Himalaya
Background: Seeds and explants were collected from the wild in order to carry out *invitro* germination of the seeds. The project aimed at the optimization of sterilizing agents for different explants and screening of tissue culture medium for different explants of selected species. This project also includes screening of plant growth regulators for direct and indirect organogenesis in different explants of the selected species and the proliferation of cultures in the optimal medium and PGRs concentrations and hardening of the in vitro regenerated plantlets.

Achievements: Bud break and multiple shoot induction was induced in the pseudobulbs of *Malaxis acuminata* D. Don inoculated in MS medium supplemented with BAP (1.0 mg/l) (Fig. 1). Saplings of *Mezotropis pellita* (Prain) Sanjappa were reintroduced in the Jhari Pani area of Mussoorie forest Division, Uttarakhand to extend the distribution range of species (Fig. 2). Saplings of *Zanthoxylum armatum* DC. were introduced in the wild locality near Kimadi village, Mussoorie forest Division, Uttarakhand under the habitat rehabilitation and species recovery programme (Fig. 3). During experimental work it was also reported that the most of the species growing in our garden are heavily infested by the endophytic fungus and posing serious challenges in conducting the in vitro experiments. Covering all the species in the limited time frame is technically not feasible; thus, change the project in ongoing mode like the tissue culture project of other centres. Kindly extend the Duration and also change it in ongoing mode for the completion of the project Background of the Project:

Project-2
Ethnobotanical study of Tharu and Bhoxa tribe of Uttarakhand, India

Executing official: Dr. Harish Singh, Scientist-'E'
Duration: April, 2020-March, 2023
Area Surveyed: 19 villages of Pauri and Haridwar districts of Uttarakhand.
Background: The focal point of this project was to process the herbarium specimens, their identification, documentation and compilation of data in correlation with their ethnobotanical literature.

Achievements: During 2022-23, collected a total of 161 field numbers (in duplicate) of plant specimens with 192 ethnobotanical information. A total of 05 exhibits collected for ethnobotanical museum. Identified and documented of 191 plant specimens. During 2021-22, surveyed (approx 260 sq. km) areas of Udham Singh Nagar district among Bhoxa tribe and collected 200 field numbers with 270 ethnobotanical uses. During 2020-21, surveyed (1545 sq. km) areas of Dehradun district among Bhoxa tribe and Udham Singh Nagar district among Tharu tribe and collected 276 field numbers with 366 ethnobotanical uses. Draft report prepared and under submission.

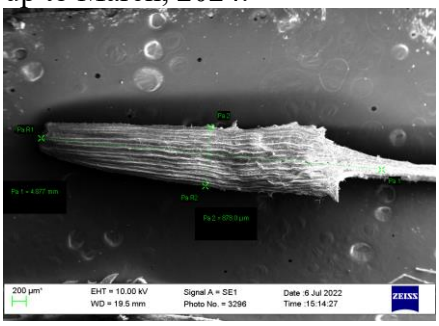
Field photographs during collection tour

Project-3
Taxonomic revision of genus *Taraxacum* F.H. Wigg. in India

Executing officials:: Dr. Sameer Patil (Botanist)
Dr. S.K. Singh (Scientist E
Duration: April 2020 - March 2023
Area Surveyed: 5000 sq. km
Background: This project aimed at preparing a revisionary report on the of genus Taraxacum F.H. Wigg. in India by documentation of the specimens of genus *Taraxacum* F.H. Wigg. collected and SEM and microscopic study of achenes collected.

Achievements: Conducted two field tours and 01 HCT tour to CAL. Identified 268 specimens of *Taraxacum* belonging to 80 spp. collected from field tour; documented/described 104 species of *Taraxacum* based on field specimen, herbarium collections and achene study. Herbarium processing of 518 herbariums of *Taraxacum* collected from field tours. SEM study of 174 nos. of achene samples of *Taraxacum* collected from field tour as well as procured through duplicate herbarium specimens housed at BSD, DD, CAL, ASSAM, PUN, PAN, IHBT & Jammu University. Prepared Ecological Niche Modelling maps of *Taraxacum* species for Western Himalayas; conducted computational analysis of achenes of 58 spp. of *Taraxacum*. Due to Covid-19 pandemic and financial problems the project is requested to be extended up to March, 2024.

Taraxacum parvulum DC.



Taraxacum nigrum achene SEM

Project-4
Assessment of Plant diversity in Rajaji National Park, Uttarakhand.

Executing officials: Dr. Puneet Kumar, Scientist-D,
Dr. S.K. Singh, Scientist-E
Dr. P.K. Deroliya, Bot. Asstt.
Poulami Ghosh, Bot. Asst.
Duration: April, 2021-March, 2024

Area Surveyed: Chilla, Beribara, Kansrao, Ramgarh, Ranipur, Ghori, Motichur, Chillawali and Dholkhand Ranges.

Background: This project aimed at the processing, identification and documentation of collected from the Rajaji National Park, Uttarakhand.

Achievements: During the period of this report, eight field tours were conducted covering nine ranges (Chilla, Beribara, Kansrao, Ramgarh, Ranipur, Ghori, Motichur, Chillawali and Dholkhand Range) of the National Park. A total of 626 field numbers, comprising about 1878 plant specimens, were collected during the collection tours. Out of these, 470 field numbers have been identified, belonging to 87 families under 284 genera and 363 species. In addition, 109 species have been described over this time period. Of these identified plant species, 30 were new distributional records to the National Park. During 2021-2022, three tours were conducted and 328 field numbers, comprising about 984 plant specimens, were collected during the collection tours. Out of these, 162 field numbers were identified, belonging to 68 families under 127 genera and 142 species.

Potentilla indica (Andrews) Th. Wolf

Opuntia cochenillifera (L.) Mill.

Project-5
Backlog clearance of unidentified Herbarium sheets at BSD.

Executing officials : Dr. S.K.Singh, Scientist E,
Subhasmit Bhattacharyya, Bot. Asstt.,
Poulami Ghosh, Bot. Asstt., Latika Sagarwal, Bot. Asstt.,
Priti Gangwar, Pres. Asstt.
Monal Kumar Singh, Pres. Asstt.-cum Garden overseer

Duration: April 2022-March 2023.

Area Surveyed: NA.

Background: The main motive of this project was Identification, fumigation & incorporation of the previously unidentified sheets into the BSD Herbarium, Dehradun.

Achievements: Identified and fumigated 1593 herbarium sheets. Following the instruction of D/BSI, all above mentioned Technical staff were engaged in preparation of metadata along with barcode of 48,904.

Project-6
Curatorial works and maintenance of the garden of NRC, Dehradun. Ongoing

Executing Scientist (s): Dr. S.K. Singh, Scientist E,
Dr. Ramesh Kumar, Scientist-E,
Dr. Puneet Kumar, Scientist-D
Dr. P.K. Deroliya Bot. Asst.

Background: This project aims at regular maintenance and conservation of the of endemic threatened and economic plant species in the garden of NRC and regularly documenting their phonological data.
Area and locality: Botanic Garden of NRC

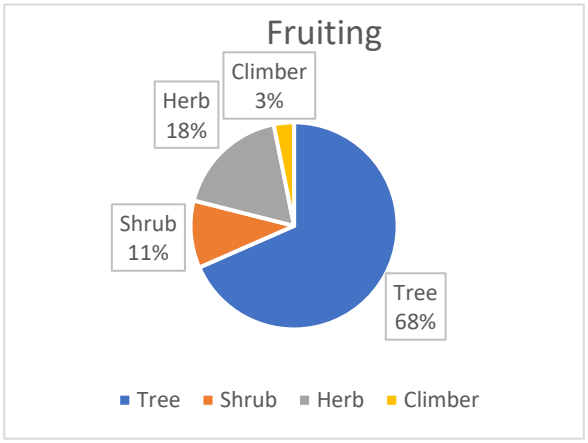
Achievements: During the period of report 26 species including *Opuntia microdasys var. albespina, Trihocerus pachanoi, Opuntia salmiana, Mammilaria carnea, Echinocerus pentalophus, Mammilaris vetula ssp. Opuntia ficus-indica, Cissus quadrangularis, Acacia senegal, Salvadora persica, Prosopis cineraria, Sarcostema* sp., *Euphorbia trinculii* etc. of Cacti have been introduced in newly developed Cactus House. Seeds of 08 species like *Stereospermum suaveolens* (Roxb.) DC. *Wrightia arborea* (Dennst.) Mabb; *Acacia farnesiana* (L.) Willd etc have been collected from nearby areas of Dehradun. Seed sowing has been done for 21 species like *Abrus pulchellus; Passiflora edulis; Corylus jacquemontii*, *Creareava magna etc.* . 14 species received from AJCB, IBG which included *Agave cantala, Aloe vera, Kalenchu pinnataum, Bryophyllum sp., Caralluma fimbricata* etc. Besides, live plants of *Opuntia cochenillifcra* (L.) Mill., *Lemna* sp., *Euphorbia royleana* Boiss, *Ardisia* sp., *Bigonia picta*, *Chlorophytum tuberosum*, *Curculiago orchoides*, *Globba racemosa*, *Habenaria intermedia*, *Habenaria* sp., *Leucas aspera*, *Zingiber* sp. and vegetative propagation of *Tinospora sinensis; Rauvolfia serpentiana; Ephorbia royleana; Comiphora caudate* have also been done in the garden. In Bougainvillea section, 100 Cuttings of 07 different varieties have been planted.

14 species of saplings of plants like *Acer oblongum, Eremostychus superba, Quercus leucotrichophora, Terminalia elliptica*to etc were supplied to AJC Bose, IBG; 08 species of saplings of plants like *Asparagus racemosus, Jatropha curcus, Chlorophytum tuberosum, Piper sp* etc. were distributed to ZSI, Dehradun and 07 plant species like *Jatropha curcus, Cinnamomum verum, Quercus leucotrichophora, Saraca asoca* etc were supplied to AZRC.

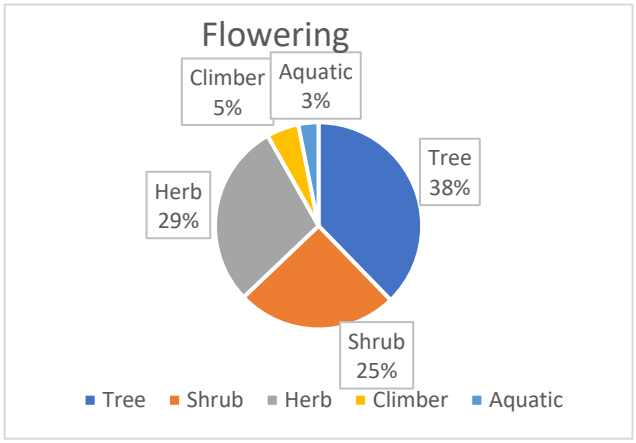
Three plantation programmes have been organized and plant material were supplied by BSI, NRC, Dehradun; 1) at Dr. B. R. Ambedkar Library, Aamwala, Tapovan Enclave, Dehradun on 13.07.2022 and planted 100 saplings of 15 plant species Plant material were supplied by BSI, NRC, Dehradun; 2) at Selaqui Forest Area and planted 300 saplings of 15 tree species with collaboration ZSI, NRC, Dehradun; 3) at Botany Department, Meerut College Meerut and pplanted 10 saplings of 5 tree species in Botany Department, Meerut College Meerut and 70 saplings of 26 plant species in botanic garden of Botany Department, Choudhary Charan Singh University, on the occasion of '*Harela'* Festival.

Phenological data for species conserved in the Botanic Garden was noted down with flowering in 159 species including Herb (46 spp., Fig. 1), Shrub (40 spp.), Tree (60 spp.), climber

(8 spp.), aquatic (5 spp.) and fruiting in 95 species including Herb (17 spp., Fig. 2), Shrub (10 spp.), Tree (65 spp.), climber (3 sp.) during this period.



Flowering data



Fruiting data

Project-7
Development of Medicinal plant Garden

Executing Official: Dr. Harish Singh, Scientist- 'E'
Duration: 2010- 2023
Area Surveyed: Collected live medicinal plants from Udham Singh Nagar, Pauri and Haridwar district
Background: The project was designed to collect medicinal plants from different areas and their plantation in the garden. The progress and agricultural operation were to be recorded.

Achievements: During 2022-23, planted saplings of plants like *Aloe vera* (L.) Burm.f., *Bryophyllum pinnatum* (Lam.) Oken, *Jatropha curcas* L. and *Euphorbia tirucalli* L., 2 saplings of. *Phyllanthus emblica* L., 2 saplings of *Senna* sp. and 5 saplings of *Toona ciliata* M. Roem, *Terminalia chebula* Retz., *Terminalia bellirica* (Gaertn.) Roxb., *Carissa carandas* L., *Mallotus philippensis* (Lam.) Muell.-Arg., *Acorus calamus* L., Dudh kheer and stem cuttings of *Clerodendrum inerme* (L.) Gaertn., which were collected from from Udham Singh Nagar district, Pauri and Hardwar districts. Also collected dried seeds of *Cassia occidentalis* and *Withania sominifera* for sowing. Communicated with medicinal plant grower of Rurapur. Observed the progress of planted medicinal plants in new garden in regular intervals. During 2021-22, prepared planning/ design of medicinal plant nursery beds and made 110 nursery beds along with path in 75 x 180 feet area. Prepared a list of 63 easily available medicinal plant species and planted 53 plant species of medicinal plants. Also planted around 100 saplings of medicinal plants along with staffs on 'Himalayan Day programme' on 09-09-21. Collected 08 live plants and seeds of 04 plants from Udham Singh Nagar district and planted. Contacted Centre for Aromatic Plants (CAP) Sailakui, Dehradun for arrangement of saplings of aromatic plants. Observed and recorded their progress in regular intervals.

Project -8
Grasses of Western Himalayas

Executing Official : Dr. Manish Kandwal, Scientist- 'E'
Duration: October, 2021- March, 2024
Area Surveyed: Jammu and Kashmir and Ladakh, Himachal Pradesh and Uttarakhand
Background: This project was initiated with the goal of Processing, identification and documentation of the collected specimens from the exploration tours to different areas like Jammu and Kashmir and Ladakh, Himachal Pradesh and Uttarakhand .

Achievements:
During the period of report two field tour have been undertaken and about 699 plant specimens collected. In addition to these 129 species have been identified and 32 species have also been described. One herbarium tour to CAL has also been conducted and examined 175 specimens.

Project -9
Flora of Himachal Pradesh Vol. 2. [Estt spp.:787 species] (Jointly with BSI, HAWHRC, Solan)
Executing Officials: Dr. S.K. Singh, Sci- E, Dr. Ramesh Kumar, Sci-E,
Dr. Giriraj Singh, Sci- E, Dr. Puneet Kumar, Sci-D,
Dr. Sameer Patil, Botanist, Dr. Bhavana Joshi, Botanist
Dr. P.K. Deroliya, Botanical Assistant, Poulami Ghosh, Botanical Assistant
Mr. Subhasmit Bhattacharyya, Botanical Assistant
Ms. Latika Sagarwal, Botanical Assistant
Mrs. Priti Gangwar, Botanical Assistant
Duration: April, 2022-March, 2023
Area and locality: Himachal Pradesh.
Background: This project was done jointly with BSI-HAWHRC, Solan and it aimed at the documentation of the allotted taxa under the families Fabaceae [c.299 taxa], Rosaceae [c. 133 taxa], Saxifragaceae-Myrtaceae [c. 116 taxa], Lecythidaceae-Caricaceae & Begoniaceae-Molluginaceae [c. 74 taxa] and Apiaceae- Alangiaceae [c. 103 taxa] allotted to different BSI officials.

Achievements:
A total of 800 taxa belonging to thirty-four families have been documented in this volume-2. Dr. S.K. Singh & al. documented 312 taxa belonging to Fabaceae. Dr. Puneet Kumar documented 131 taxa belonging to Rosaceae. Dr. Ramesh Kumar documented 86 taxa belonging to 13 families (Saxifragaceae-Myrtaceae). Dr. Sameer Patil, documented 79 taxa belonging to 13 families (Lecythidaceae-Caricaceae & Begoniaceae-Molluginaceae). Dr. Ambrish Kumar & Dr. K.S. Dogra documented 62 taxa belonging to Cucurbitaceae and Caprifoliaceae. Dr. Giriraj Singh Panwar and Dr. Bhavana Joshi documented 94 taxa (incl. 91 species, 3 varieties] belonging to four families (Apiaceae, Araliaceae, Cornaceae & Alangiaceae).

Sikkim Himalaya Regional Centre, Gangtok

SIKKIM HIMALAYAN REGIONAL CENTRE, GANGTOK

Project 1

Curatorial works and maintenance of Germplasm of *Rhododendron* L. (Ericaceae) and *Impatiens* Riv ex L. (Balsaminaceae) in EBG, BSI-SHRC.

Executing Scientist (s): Rajib Gogoi, Scientist E
J.H. Franklin Benjamin, Scientist D
Duration: Ongoing
Background: Collection and maintenance of *Rhododendron* L. (Ericaceae) and *Impatiens* Riv ex L. (Balsaminaceae) in Experimental Botanic Gardens, Gangtok were the major objectives of this project.
Area and locality: Experimental Botanic Garden, BSI-SHRC

Achievements: 14 taxa were collected from various regions of Sikkim and Darjeeling Himalayas. Out of these, 6 taxa of Rhododendrons and 3 taxa of Impatiens were collected during the period 2022-23. These taxa were planted for conservation in the experimental garden of BSI SHRC. 17 species of *Impatiens* Riv ex L. (Balsaminaceae) including *I. arguta* Hook.f. & Thomson, *I. exilis* Hook.f., *I. bakthangensis* Chhetri, Sherpa & Gogoi and *I. uncipetala* C.B.Clarke ex Hook.f. etc. and 17 species of *Rhododendron* L. (Ericceae) including *R. arboreum* Sm., *R. dalhousieae* Hook.f., *R. grande* Wight etc. are grown in the garden.

Project 2
Wild edible plants of Sikkim and Darjeeling Himalaya.

Executing Scientist (s): Dr. Rajib Gogoi, Scientist E
Dr. J.H. Franklin Benjamin, Scientist D (Team member)
Duration: July 2021-July 2023
Background: Wild Edible Plants (WEP) play major role in meeting the nutritional requirement (vitamins, carbohydrates, proteins, fibers and minerals) of the tribal and forest dependent and rural population. They provide in particular vitamins A and C, zinc, iron, calcium, iodine, thiamine, riboflavin, niacin, and folacin. They are the main source to select alternative source of food plant/medicine etc. WEP play important role in food security and nutritional balance especially for women, children, and the poor, who heavily rely on them. This project proposed to list down WEPs of Sikkim Himalayas (all districts in Sikkim and 2 district in W.B.- Darjeeling & Kalimpong)
Area and locality: -NA-

Achievement: Three field tours were conducted to South Sikkim, Kalimpong, Darjeeling, East Sikkim and North Sikkim. Surveyed 56 villages, 11 markets, 3 protected areas and recorded 46 wild edible plants. Literature survey was done for WEPs of Sikkim and Darjeeling Himalayas. The WEPs belonged to 24 angiosperm and 1 pteridophytic (Woodsiaceae) families. The genus *Diplazium* with 2 species, viz., *D.esculentum* (Retz.) Sw. and *D. maximum* (D.Don) C.Chr. were the only pteridophytic genus recorded during this year. In the **24 angiospermic families** recorded, Cucurbitaceae, Rutaceae and Rosaceae were dominant with 4 species each as WEPs, while Moraceae and Urticaceae were with 3 species each. On the further analysis based on the edible parts of WEPs, it was observed that **fruits** were the most common edible part of WEPs with 17 species; **shoots** with 8 species; **fruits processed** by pickling, juicing, with 6 species; **other edible** parts, especially infructescence were next with 5 species, **tender shoots and leaves** with 4 species; **inflorescence** as vegetable 2 species; **fruits** as vegetable with 2 species; **seeds** with 2 species and

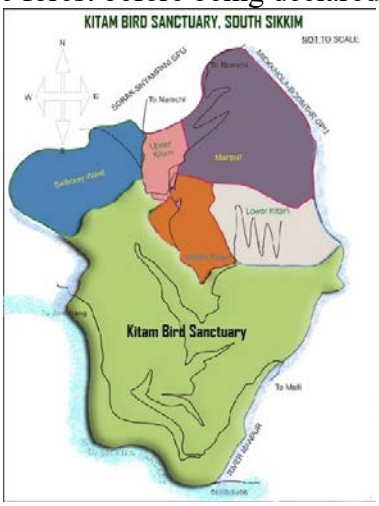
underground parts with 3 species. The consolidation and collation of data is being done and the final project report will be submitted by 30th June 2023.

Project 3
Flora of Kitam Bird Sanctuary, South district, Sikkim

Executing officials: **Dr. Rajib Gogoi, Dr. Monalisa Dey & Dr. Basant Kumar Singh**
Duration: April 2022-March 2024

Background: Sikkim is part of the 'Eastern Himalayan Agrobiodiversity Region', one of 22 agrobiodiversity hotspots in India and also part of the 'Himalaya' biodiversity hotspot. 82.31 percent of the total geographic area of the State is under the forest cover with 46.93 percent of the total area of the state brought under the Protected Area Network. Gogoi & al. (2021) reported 5068 taxa (including 152 cultivated taxa) under 1491 genera from Sikkim. Kitam Bird Sanctuary (88°20' E and 27°06' N to 88°22' E and 27°07' N) with about 6 km2 of area is the only low-elevation (320–875 m) protected area in Sikkim and serves as the refuge for various species of flora and fauna. The low-elevated parts of Himalayan region are under immense anthropogenic pressure due to less representation in the Protected Area Network. Since most of the lowland areas are human-dominated, Kitam Bird Sanctuary plays a major role in conservation of biodiversity of this part of the region. Though faunal surveys, especially with respect to birds and butterflies have been done by different groups of zoologists, the flora of the sanctuary has not been documented yet. Hence, the present work will not only fill the gap with respect to floral documentation of the sanctuary, it will also fulfil the demand of the State Forest Department for better management of this Protected Area and also by serving one of the mandates of Botanical Survey of India (BSI). In these contexts, the present work is being carried out.

Area and locality: Kitam Bird Sanctuary, South Sikkim located along the southern boundary of Sikkim state between $88^0$27"$27^0$06" and $88^0$22"$27^0$07" and 320 to 875 amsl within the tropical ecoregion. The total area is 6 sq. km. and total perimeter is 10 km. The sanctuary is located within the south district and bounded by great Rangit river in the south (which is also the boundary of Sikkim state to West Bengal state), Namchi-Manpur SPWD road in north, Goam Khola in the West and Manpur Khola in the East. The sanctuary was established in 2005 for protection of wildlife and its environment. The area was reserve forest before being declared a sanctuary.



Achievements: During this period, the team has sucessfully completed two field tours to Kitam Bird Sanctuary as planned in Qtr. II and Qtr. IV in the first year to assess the floral diversity during Monsoon and Spring seasons and around 650 specimens under 332 field numbers were collected. Identification of 234 field numbers into 217 species under 64 families were completed. Herbarium preparation and label writing of around 298 specimens completed. Field photographs of plants were grouped as per their families.

Southern Regional Centre, Coimbatore

SOUTHERN REGIONAL CENTRE, COIMBATORE

Project 1:
Flora of Tamil Nadu (1-7 vols.)
Flora of Tamil Nadu vol. 1

Executing Officials: Dr. W. Arisdason; Scientist 'E'
Dr. M. Anantha Lakshmi, Botanical Assistant
Duration: 2021–2024
Area under study: Tamil Nadu
Background: Under this project taxa belonging to Families: Ranunculaceae – Connaraceae were studied, identified and documented.

Achievements : The complete taxonomic account, which includes bibliographic citations, description, local names, distribution, flowering and fruiting period, and uses or remarks, if any, of the following **15** flowering plant families (altogether representing **121** species, **05** varieties, including **02** cultivated species belonging to **49** genera) has been completed: (1) **Annonaceae** [18 gen., 59 spp., 02 vars.]; (2) **Dipterocarpaceae** [05 gen., 14 spp.]; (3) **Ancistrocladaceae** [01 gen., 01 sp.]; (4) **Menispermaceae** [10 gen., 15 spp.]; (5) **Portulacaceae** [01 gen., 05 spp.]; (6) **Talinaceae** [01 gen., 02 spp.]; (7) **Hypericaceae** [01 gen., 07 spp.]; (8) **Bixaceae** [02 gen., 02 spp.]; (9) **Xanthophyllaceae** [01 gen., 03 spp.]; (10) **Stachyuraceae** [01 gen., 01 sp.]; (11) **Erythroxylaceae** [01 gen., 04 spp.]; (12) **Limnanthaceae** [01 gen., 01 sp.]; (13) **Linaceae** [03 gen., 04 spp.]; (14) **Dichopetalaceae** [01 gen., 01 sp.], and (15) **Staphyleaceae** [02 gen., 02 spp.].

Themetadata of voucher specimens holdings of Ancistrocladaceae (12), Annonaceae (908), Averrhoaceae (33), Berberidaceae (123), Bixaceae (764), Capparaceae (08), Cistaceae (08), Brassicaceae (378), Dilleniaceae, Illiciaceae, Magnoliaceae, Ranunculaceae and Schisandraceae (1277), Elatinaceae (115), Flacourtiaceae (16), Fumariaceae (49), Hypericaceae (275),Lardizabalaceae (02), Menispermaceae (810), Nymphaeaceae (240), Papaveraceae (118), Pittosporaceae (295), Polygalaceae (02), Resedaceae (08), Samydaceae (01), Tamaricaceae (45), Tremandraceae (03), Violaceae (489), Xanthophyllaceae (259) and Meliaceae (1742) has been prepared as per the prescribed format for a total number of **7980** herbarium sheets that are deposited in Madras Herbarium (MH).

Flora of Tamil Nadu Vol. 2
Executing Officials: Dr.Sujana K. A., Scientist E
Dr.Rakesh G. Vadhyar, Botanical Assistant
Duration: 2021-2024
Background: Under this project taxa belonging to Families: Fabaceae, Caesalpiniaceae, Mimosaceae, Rosaceae, Chrysobalanaceae, Vahliaceae, Parnassiaceae, Hydrangeaceae, Crassulaceae, Droseraceae, Haloragaceae, Rhizophoraceae, Combretaceae, Myrtaceae, Lecythidaceae, Melastomataceae, Lythraceae, Sonneratiaceae, Punicaceae, Onagraceae, Trapaceae, Turneraceae, Passifloraceae, Caricaceae, Cucurbitaceae, Datiscaceae, Begoniaceae, Cactaceae, Aizoaceae, Molluginaceae, Apiaceae, Araliaceae, Alangiaceae, Cornaceae, and Caprifoliaceae were studied, identified and documented.
Achievements: The Manuscript has been prepared for 385 taxa - Cucurbitaceae (34), Begoniaceae (9) Onagraceae (16), Apiaceae (19), Melastomataceae (52 taxa), Lythraceae (8), Combretaceae (10 taxa), Rosaceae (22 taxa), Myrtaceae (50 taxa), Fabaceae (165 taxa)**.** The lectotype for two names *Bupleurum distichophyllum*Wight &Arn. and *Bupleurum ramosissimum*Wight &Arn. (Apiaceae) are designated.

Flora of Tamil Nadu Vol. 3 (Rubiaceae – Gentiancaeae) 26 family 275 genera & 871 Spp.

Executing Officials: Dr. C. Murugan, Scientist - E,
Dr. M. Murugesan, Scientist -C
Dr. S. Arumugam, Botanist

Duration: 2021–2024

Background: Under this project taxa belonging to Families: Rubiaceae – Gentiancaeae, 26 family 275 genera & 871 Spp. were studied, identified and documented.

Area surveyed: Tamil Nadu

Achievements: Five **New Discoveries** (5 species) were reported from this project viz. *Eugenia pachakumachiana* Arum. & Murugan (MYRTACEAE), *Ardisia anamalaiana*V.Ravich., M.Murug. &P.S.S.Richard (PRIMULACEAE), *Symplocos sisparensis* B. Karthik, Murug., Anusuba, Premkumar & R. Tharani (SYMPLOCACEAE), *Arundinella mukurthiana* Murug. &Anusuba (POACEAE) and *Impatiens neo-orchioides*V.Ravich., Murug., B.Karthik&Premk. (BALSAMINACEAE).

Flora of Tamil Nadu Vol. 4 Families Menyanthaceae to Plantaginaceae (19 families with about 240 genera and 880 spp.)

Executing Officials: Dr. V. Sampath Kumar, Scientist 'E',
Ms. Lydia M Thomas, Bot. Asst.
Ms. Rini Vijayan, Sr. Presv. Asst.

Duration: 2021–2024

Area surveyed: Tamil Nadu

Background: A checklist is being prepared for the different families by referring various floras. Citations are made for the species and infraspecific taxa for the families Gesneriaceae (30 taxa), Lentibulariaceae (19 taxa), Orobanchaceae (8 taxa), Solanaceae (104 taxa) and Verbenaceae (50 taxa). The family Gesneriaceae has been completed in all aspects including key to the genera and species. While the descriptions and artificial keys are being prepared for the other families.

Achievements: Herbarium database has been made for the families from General herbarium: Avicenniaceae (151 nos.), Bignoniacear (698 nos.), Melastomataceae (1753 nos.), Pedaliaceae (422 nos.). Apart from this, from students' herbarbarium for the families from Boraginaceae to Plantaginaceae total 973 barcodes were fed in to the database. Presently, the databasing of Acanthaceae (6300 nos. completed so far) and Lamiaceae (600 nos. completed so far) of general herbarium is in progress.

Flora of Tamil Nadu Vol. 5 Family : Nyctaginaceae To Ceratophyllaceae

Executing Officials: Dr. R. Manikandan, Sci. 'E',
Ms. Mehala Devi R., Bot. Asst.
Shri Soumitra Bera, Preserv. Asst.-cum-Gard. Overs.

Duration: 2021–2024

Area surveyed: Tamil Nadu

Background: Under this project taxa belonging to Families: Nyctaginaceae to Ceratophyllaceae were studied, identified and documented.

Achievements: The team has scrutinized all the species and genera under the allotted 33 families based on available literatures like books, journals, revisions and monographs etc. and also the herbarium specimens available in MH, Coimbatore. The complete check list for 850 taxa under allotted families from Nyctaginaceae to Ceratophyllaceae for Flora of Tamil Nadu Vol. 5 has been prepared. Two species viz., *Helichrysum wightii* C.B. Clarke ex Hook.f. (ASTERACEAE) and *Vernonia malabarica* Hook.f. (ASTERACEAE) have been rediscovered from the Nilgiri Biosphere Reserve, based on various field tours during this period.

Flora of Tamil Nadu Vol. 6 Families Hydrocharitaceae to Ruppiaceae (33 families with about 170 genera and 552 spp.)

Executing Officials: Dr. M.U. Sharief, Scientist 'F' &HoO,
Dr. S.S. Hameed Scientist 'E',
Dr. W. Arisdason Scientist 'E', Dr. V. Ravichanadran, Sr. Pres. Asst.

Duration: 2021–2024

Area surveyed: Tamil Nadu

Background: A checklist is prepared for the different families by referring various floras. Citations, Descriptions, Phenology, Distribution, key to the genera and species have been made for the species and infraspecific taxa for the families Hydrocharitaceae (20 taxa), Burmanniacae (4 taxa), Cannaceae (1 taxa), Hypoxidaceae (3 taxa) Marantaceae (3 taxa) Stemonaceae (1 taxa) Xyridaceae (2 taxa) Asparagaceae (27 taxa) and Flagellariaceae (1 taxa). While the descriptions and artificial keys are being prepared for the other families.

Achievements: Herbarium database has been made for the families from General herbarium: Orchidaceae (4555 nos.), Arecaceae (108 nos.), Pandanaceae (63 nos.), Typhaceae (98 nos.), Sparganiaceae (3 nos.), Araceae (386 nos) and Lemnaceae (49). Apart from this, the other families of this volume are being databased.

Flora of Tamil Nadu Vol 7. Cyperaceae&Poaceae (2 Fam.) [152 genera & 652 spp.]

Executing officials: Dr. C. Murugan, Sci-E (HQ, BSI);
Dr. A. A. Kabeer, Sci-E (CBL, BSI)
Dr. S. Arumugam, Bot. Asst. (SRC, BSI)

Duration: 2021 - 2024

Area and locality: Tamil Nadu state

Background: The project was initiated in 2021 with an outlook to publish the Flora of Tamil Nadu, Volume 07 (Cyperaceae and Poaceae) has been assigned to Dr. C. Murugan, Sci-E (HQ, BSI); Dr. A. A. Kabeer, Sci-E (CBL, BSI) &Dr. S. Arumugam, Bot. Asst. (SRC, BSI) to make a complete updated descriptive documentation of these families. Herbarium specimens deposited at MH and CAL were studied. The existing past and present literatures were reviewed to restore the taxonomic complex within species/generic group. The team standardized and updated nomenclature of each taxa using worldwide online database. The objective of the project was completion of Flora of Tamil Nadu, Volume 7 comprising the detailed descriptive of all taxa belonging to two families (Cyperaceae&Poaceae)

Achievements: Dr. A. A. Kabeer, Sci. E, CBL, has taken up the Family Poaceae and prepared a comprehensive checklist of the family for the Tamil Nadu state based on earlier literature and herbarium consultation in the period of 2021-2022. The checklist enumerates about 480 species, 04 subspecies and 08 varieties of grasses so far. The checklist provides the protologue citation of correct name of every taxon, basionym, synonyms, if any, along with relevant bibliographic references, diversity of every genus and the family, vernacular name (Tamil), state-wise and district-wise distribution of every taxon.

In the year 2022-2023, the nomenclature updating work with standardized bibliographic citations have been taken up and a total of 192 taxa of Poaceae for Tamil Nadu state were revised and incorporated. Updating of nomenclature in remaining taxa are in progress. Regular scrutiny of literatures pertaining to the family Poaceae in India has been done to check and update the recent additions to the family.

Project 2
Revision of the Lichen family Pyrenulaceae in India

Executing officials: Dr. Jagadeesh Ram, T.A.M., Scientist 'E'
Duration: 2017 – 2023
Area surveyed: India
Background: The project aimed that the specimens brought on loan from BSI, CRC, Allahabad (257 collection numbers) will be studied morphologically, anatomically and chemically for identification/verification and preparation of description and illustration.

Achievements: A total of 227 specimens have been studied and identified into 2 species of Anthracothecium, 2 species of Lithothelium and 22 species of Pyrenula. 19 Type specimens from Agharkar Research Institute, Pune (AMH) have been brought on loan and studied in detail. 5 Type specimens from National Botanical Research Institute Lucknow (LWG) have been brought on loan and studied in detail. 10 Type specimens from Finnish Museum of Natural History, University of Helsinki, Finland (H-NYL) have been received on loan for further study on 31.03.2023. 8 Type specimens requested on loan from Natural History Museum, London (BM) for further study. Illustrations of all the examined Type specimens have been prepared. The key to the species of genera: Anthracothecium, Lithothelium and Pyrgillus have been prepared. From this study nine (09) species viz. *Lithothelium nanosporum* (C. Knight) Aptroot, *Nigrovothelium inspersotropicum* Aptroot & Diederich, *Pseudopyrenula media* Aptroot & Diederich, *Pyrenula ciliata* Aptroot, *Pyrenula cocoes* Müll. Arg., *Pyrenula fulva* (Kremp.) Müll. Arg., *Pyrenula septicollaris* (Eschw.) R.C. Harris, *Pyrenula sexlocularis* (Nyl.) Müll. Arg. and *Pyrenula subglabrata* (Nyl.) Müll. Arg. have been published as new records for India. In addition to this ten (10) species have been published as new records for Andaman and Nicobar Islands.Two taxa viz. *Bunodophoron awasthii* G.P. Sinha & Jagad. Ram (Sphaerophoraceae) and *Lasioloma krishnasinghii* Jagad. Ram and G.P. Sinha have been published as new to science.

Project-3
Kalakad Mundanthurai Tiger Reserve (KMTR), Tamil Nadu, India

Executing officials: Dr. S. Kaliamoorthy, Sci-E
Area surveyed: Kalakad Mundanthurai Tiger Reserve (KMTR), Tamil Nadu
Achievements: During the plant exploration tour from 17.08.2022 to 19.08.2022 at Kalakkad Mundanthurai Tiger Reserve, Tirunelveli, Tamil Nadu, India; totally 19 species belonging to 15 genera under 9 families were collected and recorded GPS data **(Table 1)**. The most dominant genera are *Crepidium* (2 species) followed by *Anoectochilus,*

Calanthe, Cymbidium, Sirhookera, Tainia and *Trichoglottis* (1 species each) were recorded. The collected plant species were introduced into National Orchidarium and Experimental Garden, Southern Regional Centre, Yercaud for Ex-situ conservation. During the plant exploration tour from 17.08.2022 to 19.08.2022 at Kalakkad Mundanthurai Tiger Reserve, Tirunelveli, Tamil Nadu, India; totally 20 species belonging to 18 genera under 14 families were surveyed and recorded GPS data. During the plant exploration tour from 20.08.2022 to 22.08.2022 at Kanyakumari Wildlife Sanctuary, Kanyakumari, Tamil Nadu, India; totally 22 species belonging to 15 genera under 4 families were collected and recorded GPS data. The family Orchidaceae recorded as 12 genera belonging to 18 species. Among these, 16 species is Epiphyte and 2 species are terrestrial. The most dominant genera are *Dendrobium* (5 species) followed by *Bulbophyllum* (3 species); *Acampe*, *Crepidium, Eria, Gastrochilus, Habenaria, Luisia, Oberonia, Polystachya, Schoenorchis* and *Vanda* (1 species each) were recorded.

Other plant species are recorded as 3 genera belonging to 4 species under 3 families. Among these, Herbs are representing highest in number (3 species) followed by Trees (1 species). The dominant families are Balsaminaceae (2 species each); Araceae and Musaceae (1 species each) were also recorded.

The collected plant species were introduced into National Orchidarium and Experimental Garden, Southern Regional Centre, Yercaud for Ex-situ conservation.

During the plant exploration tour from 20.08.2022 to 22.08.2022 at Kanyakumari Wildlife Sanctuary, Kanyakumari, Tamil Nadu, India; totally 17 species belonging to 16 genera under 14 families were surveyed and recorded GPS data. Among these, Herbs are representing highest in number (11 species) followed by Shrubs (5 species) and Trees (1 species). The dominant families are Commelinaceae (3 species) followed by Apocynaceae (2 species); Asteraceae, Fabaceae, Oxalidaceae, Araceae, Gentianaceae, Rubiaceae, Malvaceae, Vitaceae, Melastomataceae, Linderniaceae, Lentibulariaceae and Zingiberaceae (1 species each) were also recorded.

Western Regional Centre, Pune

WESTERN REGIONAL CENTRE, PUNE

Project 1
Bambusicolous fungi of Goa

Executing officials : Dr. Rashmi Dubey, Scientist 'E'
Duration : April, 2020 - March, 2024
Area Survey : Goa, located along the Arabian Sea has an area of 3,702 sq km and is bordered by Maharashtra in the North & East and Karnataka in the South

Background : Bamboos are fast-growing, versatile plant species with multiple end-uses. About 2.5 billion people globally depend on bamboos for their survival and livelihood. Bamboo has tremendous potential for economic and environmental development. Bamboos are estimated to comprise more than 1670 species in 125 genera belonging to three tribes: Arundinarieae (temperate woody bamboos), Bambuseae (tropical woody bamboos), and Olyreae (herbaceous bamboos) (INBAR 2017; Soreng et al. 2015, 2017). India is the second richest country in bamboo genetic resources after China which is threatened by various biotic and abiotic factors, including pests and diseases factors. About 195 species of bamboos belonging to 35 genera are found affected by various diseases and disorders. More than 1,100 fungal species have been described and recorded on bamboos, from the world (Hyde et al. 2002; Arjun et al. 2016). But India's knowledge of bamboo fungi is still at the cataloguing stage. Therefore, the project work was undertaken for a comprehensive understanding of complex of Bambusicolous Fungi with the objectives to conduct the Morpho-molecular characterisation of Bambusicolous fungal species associated with different parts of Bamboo. For implementation of this work, standard methodology was adopted as: Survey and collection of samples, laboratory processing for morpho and molecular studies (DNA extraction, PCR amplification, DNA sequencing) and Phylogenetic analyses

Achievements: As per the Annual action Plan (2022-23) one field tour was conducted to protected areas of Goa from 21.12.2022-27.12.2022. Over 300 samples including dead and live culms, fallen leaves, fresh leaves, leaf sheath, were collected. More than 350 photographs of fungi infecting bamboo parts along with the vegetation of the surveyed area were undertaken.

Project 2

Supplement to the Flora of Maharashtra State
Executing official: Dr. M.Y. Kamble, Scientist E
Duration: April 2021- March 2023
Area surveyed : Not Applicable
Background: Flora of Maharashtra State has been published by BSI in 03 volumes in the years 1996, 2000 & 2001. Since then, a number of taxa have been added to the flora of state as new discoveries and new records in the last two decades by scientists and researchers of Botanical Survey of India and those from other research institutions and academicians. Therefore, it is felt by Botanical Survey of India to compile all those publications and put into one as a Supplement to the Flora of Maharashtra State.

Achievements: Documentation of species as supplemented to the existing Flora of Maharashtra is in progress. Two Herbarium consultation tours conducted to SUK Herbarium, Department of Botany Shivaji University, Kolhapur w.e.f. 12th to 14th December, 2022 and BAMU Herbarium, Department of Botany, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad *w.e.f.* 25th to 28th December, 2022. Studied herbarium specimens have been deposited in both Herbaria

including Type specimens of new taxa described from Maharashtra and specimens of additions to flora of Maharashtra. A list of additions as new taxa to science described from the state or newly recorded taxa to state Flora has been prepared. So far 250 taxa have been listed as additions to the State Flora. Literature for more than 220 taxa has been collected. Descriptions for about ca 200 taxa have been completed along with citation, distribution, phenology of flowering & fruiting, ecological note, etc. Documentation of updated data for Threatened plants of Maharashtra is in progress. Finalization of the manuscript is in progress.

Project 3
Phyto Data-Base of Konkan (Maharashtra)

Executing officials: Dr. Prashant K. Pusalkar, Scientist E
Duration: 2020 – 2024
Background : This project aimed at preparing a comprehensive database on the phytodiversity of Konkan, Maharashtra including Conservation dependent flora and habitats.

Achievements: Phyto-Data-Base: Completed documentation for 1308 species under 78 flowering plant families, based on field surveys (flora and vegetation types), herbarium specimen study and literature. The researcher has undertaken one floristic survey tour to North and Central Konkan regions and surveyed habitats covering coastal plateaus (Konkan Sadas), hilly regions, sea beaches, mangrove belts, riverine and estuarine zones, wetlands and marine forts and collected 127 specimens. Identified 172 specimens from previous collections from South Konkan.

Project 4
Pteridophyte Flora of India

Executing officials: Dr. A. Benniamin, Scientist 'E'
Dr. Jesubalan, Bot.Asst.
Duration: August 2020 - March 2024
Background: Pteridophytes form a conspicuous element of vegetation as intermediate between the lower cryptogams and higher vascular plants with long geological history on the planet. There are about 12,000 species recorded globally. India has a rich and varied Pteridophytic flora due to the varied nature of topography, variable climatic conditions and its geographical positions. However, there are about 1107 species belonging to 35 families and 130 genera in India (Fraser Jenkins et al., 2016). The vascular flora of our country in general has about 15,000 species and as a constituent of Indian flora of vascular plants, the ferns and fern-allies form only five percent part as far as the number of species is concerned. But, due to their abundance in individuals as well as their conspicuousness in epiphytic vegetation and in the terrestrial vegetation along forest margins, roadsides and forest floors, the contribution of ferns and fern-allies to the vegetation pattern in India rank only next to the flowering plants. The project Pteridophytic flora of India was allotted in August 2020. During the period, 2022-2023 studied the Herbarium specimens housed at BSI. Critical review of existing past and present literature to restore the taxonomic complex among species. Standardizing and updating of nomenclature using standard worldwide online database. Altogether 233 species have been described, distribution of map though QGIS were prepared, Illustration for 65 species and 80 photo plates have been prepared for the Pteridophytic flora vol 1. The final report is going to be submitted on 25th April 2023.
Area and locality: INDIA

Achievements: Described 223 species under 18 families with detailed nomenclature have been prepared. Key has prepared for the family viz Selaginellaceae (55spp),Ophioglossaceae

(20spp),Marattiaceae (5spp),Osmundaceae (5spp.), Plagiogyriaceae (4spp) Glechniaceae (5spp) Lygodiaceae (9spp),Schizaeaceae, Marsileaceae, and Hymenophyllaceae (37spp) during this year. Moreover more than 170 RET Plants have been planted at Botanical Survey of india Western Regional Centre and experimental Garden, Mundhwa, Pune during world Environmental Day, Foundation and International Forest Day.

Dr. B. S. Kholia has prepared the detailed descriptive account of 93 species under 16 genera belonging to the families Lycopodiaceae, Selaginellaceae, Psilotaceae, Equisteacese, Isoetaceae, Dicksoniaceae, Cyatheaceae, Dennsteadiaceae have been prepared and final manuscript for Pteridophytic flora of India, Vol-I submitted.

During the year 2022-23, Dr. Brijesh Kumar prepared the description of 74 species were completed with updated nomenclature based on earlier published literature, online resources (POWO, IPNI, TROPICOS) and available herbarium specimens this work has been completed. Besides, one Herbarium and library consultation tour was conducted to Central National Herbarium, Howrah (CAL), during which studied 416 specimens were studied and clicked c. 600 photographs.

PUBLICATION SECTION,

BSI HEADQUARTERS, KOLKATA

Project-1
Red Listing of Indian endemics as per IUCN criteria: Family Ranunculaceae

Executing Officials: Dr. D.K. Agrawala, Sc.-E,
Dr. Debasmita Dutta Pramanick, Sc.-C., Dr.
J.S. Jalal, Sc. E & Dr. S.S. Dash, Sc. E
Duration : 2021-2023
Background: The main objectives of the project were evaluation of threat status of Indian endemics belonging to the family Ranunculaceae and spatial representation of the endemic species on the global atlas. The family Ranunculaceae is represented in India by 293 taxa under 31 genera of which 42 taxa are reported as endemic to the country. The family is well known for having highly explored medicinal plants like *Aconites*, *Thalictrum*, *Caltha* etc., but no comprehensive work has been done on the threat assessment in Indian context. Therefore, assessment of the endemic species under the family Ranunculaceae has been proposed for red list assessment as per IUCN guidelines.
Area and locality: India

Achievement: Collection and compilation of data for 42 endemic taxa of the family Ranunculaceae in India has been completed. Literature review has been completed for citation. Studied Type materials of the endemic taxa from different National herbaria (CAL, MH, BSD, DD, KFRI, ASSAM, ARUN). Data sheet of 42 taxa belonging to the genera *Aconitum* (08), *Anemone* (03), *Caltha* (01), *Clematis* (13), *Consolida* (01), *Delphinium* (04), *Isopyrum* (01), *Nigella* (01), *Oxygraphis* (01), *Paraquilegia* (01), *Ranunculun* (06) and *Thalictrum* (03) (Name of the taxon with author name, synonym, citation, taxonomic status, key diagnostic features, phenology, habitat, distribution and specimen examined) has been prepared as per IUCN guidelines. All the data have been compiled from literature and herbarium data. The distribution data of the 42 taxa have incorporated in excel sheet along with latitude-longitude data procured from Google earth. Mapping of the taxa and Red list assessment are in progress.

Project 2
Revision of the genus *Aristida* L. (Poaceae) in India

Executing Official: Dr. Nagaraju Siddabathula, Botanist
Duration : April 2022-March 2024
Background: The major objectives of this project are taxonomic revision of the genus *Aristida* (Poaceae) for India, to understand species diversity and solve the species complex within the genus, to resolve the problems related nomenclature, taxonomy, typification and distribution and to identify the status and distribution of endemic and threatened species in this genus. The project further aimed at recognizing the economic potential of the species in this genus and the conservation status assessment of endemic *Aristida* species.

The genus *Aristida* belongs to the family Poaceae tribe Aristideae (Clayton & Renvoize, 1986). It comprises about 300 species (POWO, 2023), spreads in Tropical & Subtropical to Mongolia and N. America, primarily it grows in subtropical climate. Presently, 10 species have been reported from India (Prasanna & al., 2020, Nagaraju & al., 2020), namely 1). *Aristida adscensionis*; 2). *A. cumingiana*; 3). *A. cyanantha*; 4). *A. funiculata*; 5). *A. hystricula*; 6). *A. hystrix*; 7). *A. mutabilis*; 8). *A. redacta*; 9). *A. setacea*; 10). *A. stocksii*. The genus is characterised by it has

terete lemma with convolute margins. The lemma apex has a spirally twisted trifid awn or sometimes without (Lazarides, 1994). The genus is classified into 5 sections: *Aristida*, *Arthratherum*, *Pseudarthratherum*, *Pseudochaetaria* and *Schizachne* based on the awn and the lemma column (Clayton & Renvoize, 1986). This genus has some taxonomical/nomenclature issues, a comprehensive study required to resolve those issues. Therefore, a taxonomic revision of the genus *Aristida* for India, project under taken.

Achievements: The literature pertaining to 10 species under the genus have been studied and consulted CNH at Howrah. A complete description of 5 species with photo plates have been prepared and specimens were deposited at DRC, Hyderabad (Which were my earlier collections from Telangana state). Rest of 5 species will be completed by the end of March 2024. In connection with that one field tour needs to be conducted during September-October 2023.

Research papers communicated: 02

TECHNICAL SECTION

BSI-HEADQUARTERS, KOLKATA

Project-1
Plants of Kolkata

Executing Scientist: Dr. S. S. Dash, Scientist -E
Dr. R. K. Chakraborty, Retd. Sci.
Dr. A. A. Mao, Director
Dr. U.L. Tiwari, Scientist-D
(with assistance of Ms. Sinchita Biswas, Bot. Asst.)

Duration: 2021-2024

Background: Kolkata, situated at the bank of the Hooghly River is a city of cultural heritage. The city has always occupied a very significant part in the History of India. It is the capital of the state of West Bengal. By virtue of its geographical location, it is blessed with the predominant alluvium of the Indo-Gangetic plain. The fertile alluvial soil promotes the growth of grasses, crop plants and many trees. The main objectives of the project is to prepare a handbook with comprehensive information on the different plants found in Kolkata and its outskirts. The handbook will have concise information on the plants with respect to their identifying characters, special distinguishing features (if any) along with their local names and pictures to aid students/ scholars in identification of plants in Kolkata. This project started in 2021 with the aim to document all the plants seen in the different localities of Kolkata. Special emphases were given to localities around places of historical importance in Kolkata. The plants found around these places were documented.

Area and Locality: Kolkata, West Bengal.

Syzygium aqueum (Burm.f.) Alston

Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore

Achievements: During the period of study, 311 plants were studied and identified from the different places of Kolkata through local visits. The plants were photographed and described mainly on the basis of leaves, flowers and fruits along with special visible characters for easy identification. The local names (Bengali) were also documented for 167 plant taxa. The data is being organized and under final round of modification and editing before bringing it out as a handbook.

Project-2
Wild useful/edible plants of Arunachal Pradesh.

Executing officials: Dr. U.L. Tiwari, Sci-D,
Dr. S. S. Dash, Scientist -E
Dr. K. Chowlu, Scientist-D
Duration: April, 2021-March, 2024.
Area and Locality: Entire Eastern Arunachal Pradesh.
Background: Arunachal Pradesh is the largest state in Northeast India. The state is represented with 26 major tribes and 110 sub tribes. Arunachal Pradesh has a rich and diverse cultural heritage. And the food habit of each tribe is so unique and different there. The method of preparations of item and the type of composition is so unique in each tribe. So to know the more about the edible plants of Arunachal Pradesh and also to know the way of preparation of the traditional food dishes including detailed food habits of the people living there, this study was carried out. The primary objective of this project is to identify and document all the wild/useful plants of Arunachal Pradesh which are used by the local people in various purpose. Further, the study aims to prepare a chronicle on the different food habits including all the plant species used by them and the traditional techniques of food preparation in Arunachal Pradesh.

Achievements: The state is represented by 26 major tribes and 110 sub tribes. The people in the state are diverse and rich in their culture and tradition. Many species are so uniquely prepared in their own way that gives it an exclusive taste. And mainly people prefer to take bitter species which are medicinally important. So, by interacting with the local people and recorded with proper photography and use pattern. It reveals that more than 100 species are having some medicinal properties. Till now nearly 208 species were listed as local edible plants of Arunachal Pradesh and all the preparation methods and local names by different tribes were collected. Represented by 34 genera and 21 families. The following tables represent the number of plant species which are traditionally used by the different tribes in Arunachal Pradesh. From the tour conduct in different

places of Arunachal Pradesh have recorded 108 species from eastern part and 134 species from Western and central part of Arunachal Pradesh. During the study it was found that different parts of plants have use value. Among all recorded taxa during tours used for, 34 % plant's fruits, 2 % pickle preparation, 60 % as leafy vegetable and 4 % for some or other purpose (Fig. 1). If data is segregated as per plant parts utilisation, it is represented as 38 % fruits, 4% tender shoots, 5% whole plants, 20 % stems, 25 % leaves and 8 % flowers (Fig. 2). Maximum number of wild plants were utilised by Nishi (46) followed by Khamptis (45) and least number were used by Noctes (20) tribal community (Fig 3).

During this project, a new species *Schoenorchis mishmensis* was reported, and the species *viz. Aeschynanthus monetaria* Dunn was rediscovered after 100 years. Further, two genera *Appendicula* (Orchidaceae) & *Boesenbergia* (Orchidaceae) and five species *viz. Thrixspermum patkaiensis, Boesenbergia kingie, Appendicula cornuta, Thrixspermum merguense, Nervilia punctata* were reported as new records for Arunachal Pradesh.

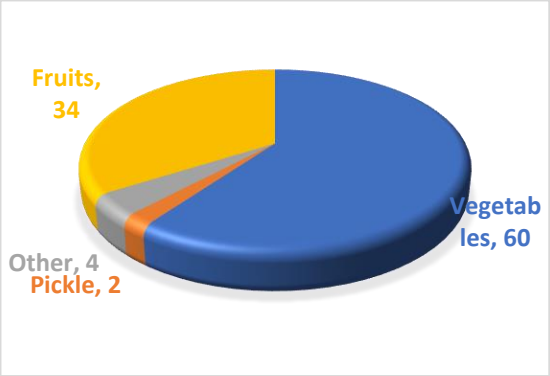


Fig. 1. Utilization pattern of Wild Edibles

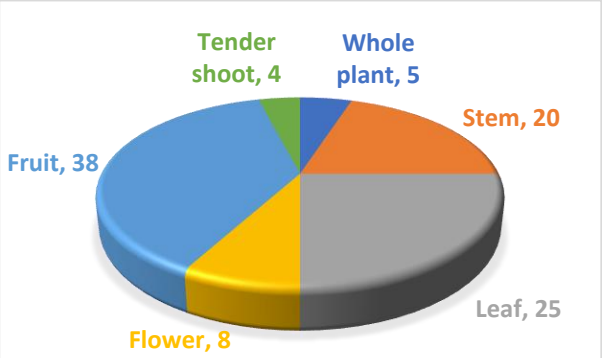


Fig 2. Plant part of Wild edibles used in Arunachal Pradesh

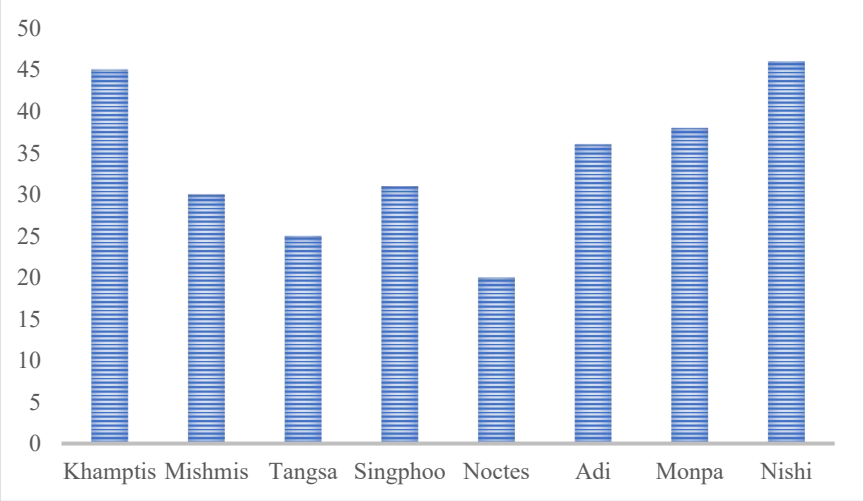


Fig. 3. Number of plant taxa used by different tribal communities

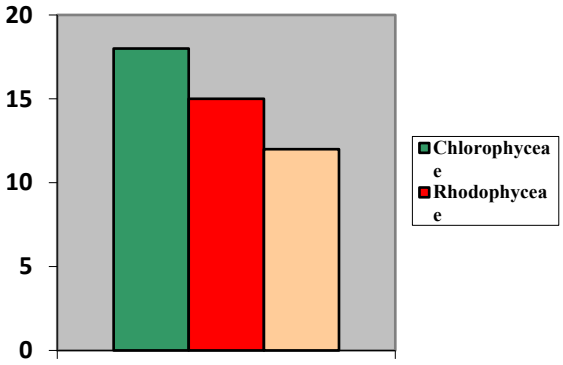
Schoenorchis mishmensis K. Gogoi, Mega & Chowlu; *Paphiopedilum spicerianum* (Rchb. f.) Pfitz.

Project 3
Documentation of economically important seaweeds of the Indian coast

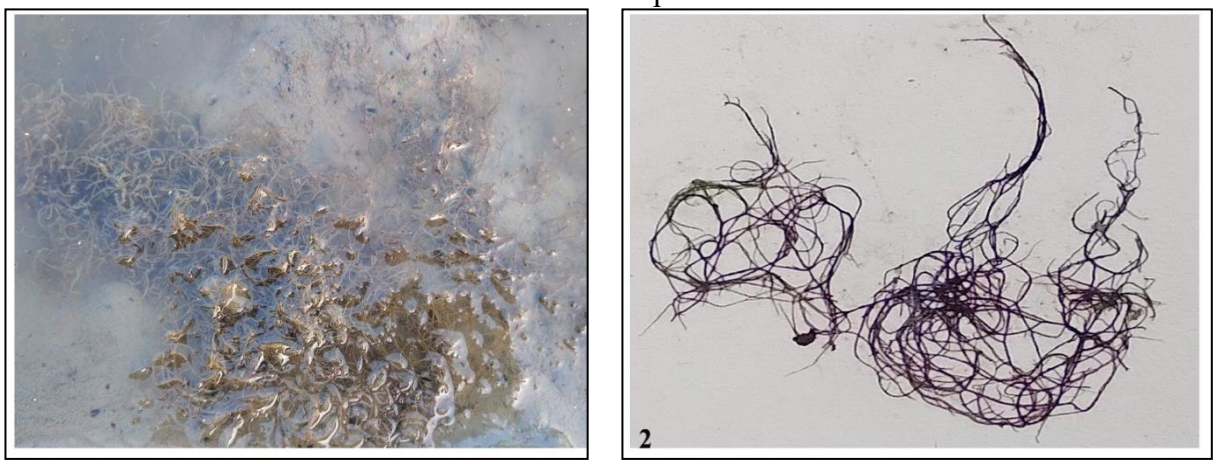
Executing Official: Dr. S.K. Yadav, Botanist
Duration of the project: April 2022-March 2025
Area and Locality: Indian coastline (c. 7500 km length)
Background: Seaweeds are one of the important marine natural resources, with great economic potential. It is directly linked with the SDG goals No. 14 *i.e. Life below water*. India is a maritime country with a coastline of c. 7500 km length, spreading into 9 states and 4 Union territories. The Indian coastline supports significant diversity of seaweeds. However, only sporadic and intermittent information is available on the economic aspects of these promising marine resources. Therefore, considering the above facts, the present works has been undertaken.

Achievement: Based on the thorough study of relevant literature and field observation, studied and documented a tentative list of 45 taxa of economically important seaweeds, comprising 18 taxa of Chlorophyceae, 15 taxa of Rhodophyceae and 12 taxa of Phaeophyceae. These seaweeds are used in various forms such as food, fodder, Manure, Seaweed Liquid Fertilizers (SLF) and also in various industries such as Pharmaceuticals, Biochemicals, Agar-Agar, Textile, Paper, Biodiesel etc. Seaweeds are the important natural source of phycocolloids, a jelly like substance, with high economic value. The three major phycocolloids are Agar-Agar, Alginates and Carrageenan, mainly extracted from the red seaweeds like species of *Gelidium, Gelidiella, Gracilaria* etc. Similarly, *Alginate*, (Algin or Alginic acid) is a polysaccharide and is mainly extracted from the brown seaweeds like species of *Sargassum, Turbinaria, Cystoceira, Dictyota, Padina, Hormophysa, Colpomenia, Spatoglossum, Stoechospermum* etc. The common edible seaweeds widely recorded along the Indian coast are species of *Ulva, Cladophora, Brypsis, Caulerpa, Sargassum, Hydroclathrus, Porphyra, Gracilaria, Gelidium, Grateloupia, Hypnea, Rhodymenia etc.* Among the documented seaweed taxa, 19 are edible, 12 as fodder and 24 with industrial values. *Gracilaria gracilis* (Stackh.) Steentoft, L.M.Irvine & Farnham – a highly economically important seaweed, used in agar-agar production, has been collected from the Canning in Sundarban Biosphere Reserves and reported as new addition to the West Bengal algal flora.

Map showing the Indian coastlines



Graph showing the no. of economically important seaweeds



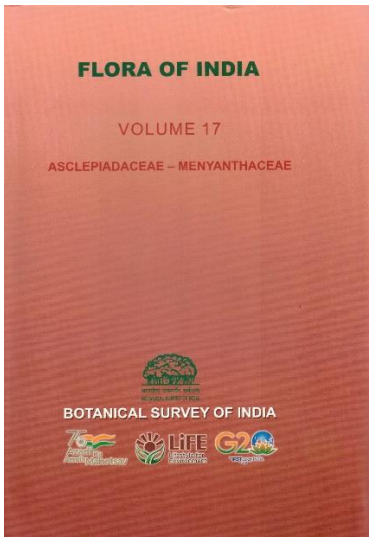
Gracilaria gracilis (Stackh.) Steentoft, L.M.Irvine & Farnham – an agarophyte, collected from the Sundarban Biosphere Reserves in West Bengal (1. Fresh specimen; 2. Dried specimen)

FLORA OF INDIA PROJECT

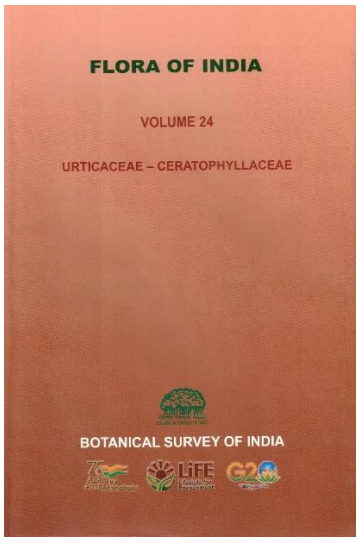
As approved by the RAMC during the last meeting, the editorial committee for completion of Flora of India volumes has been set up with following members.

1. Dr. A. A. Mao
2. Dr. S. S. Dash
3. Dr. J. Jayanthi
4. Dr. J.S. Jalal
5. Dr. D. K. Agrawala
6. Dr. U.L. Tiwari
7. Dr. A.N. Shukla
8. Dr. Gopal Krishna

The Editorial Committee has gone through the submitted manuscripts of Flora of India volumes and checked thoroughly the nomenclature, inclusion/exclusion of species, checked the synonymy, made the manuscript uniform, arranged the photographs and illustrations. Volumes 20 and 30 has been sent to press for publication. Volume 31 and 32 have been reassigned to Dr. K.A.A. Kabeer for updating. Volumes 8, 10, 14, 18, 19, 25, 26 and 28 are being worked for consistency check. Manuscripts of volumes 7, 11, 27, and 29 have not been received completely. Volume 09, 15, 17 and 24 has been published. Volume 06, 16, 21, 22 have been completed for checking and are ready for sending to the press.



Families: Asclepiadaceae-Menyanthaceae



Families:Urticaceae-Ceratophyllaceae

NEW DISCOVERIES

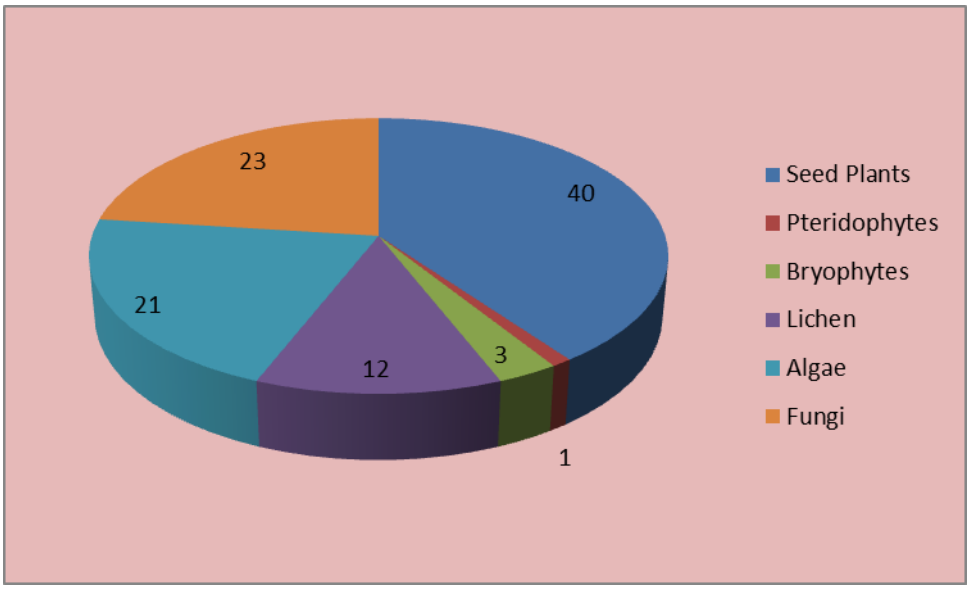
Cynometra sampathkumaraniana Sanjappa, Sringesw. & Dalavi

PLANT DISCOVERIES 2022-23

Current estimation of plant diversity in India stands at 55048 taxa including 21984 angiosperms, 82 gymnosperms, 1314 pteridophytes, 2800 bryophytes, 2989 lichens, 15602 fungi, 9008 algae and 1269 microbes (Plant Discoveries 2021). The Group wise current number of taxa known from India and their percentage contribution to the known Indian Plants has been presented in the following table.

Group	No. of taxa in India	Percentage of plant diversity in India
Virus/ Bacteria	1269	2.31
Algae	9008	16.36
Fungi	15602	28.34
Lichens	2989	5.43
Bryophytes	2800	5.09
Pteridophytes	1314	2.39
Gymnosperms	82	0.15
Angiosperms	21984	39.94
Total	55048	100

This year (from 1st April 2022-31st March 2023) scientists of Botanical Survey of India has discovered 92 taxa either as New Discovery or as Distributional Novelties from different phytogeographical regions of the country. This New Discoveries includes 20 new species, 2 new sub-species, 2 varieties of Seed Plants, 3 new species of Bryophytes, 2 new species of Lichen, one new species of Algae and 12 new Fungal species. This also includes 50 new distributional novelties from India.



Percentage of contribution of different Plant groups during 2022-23

NEW TO SCIENCE

SEED PLANTS

NEW SPECIES

Ardisia anamalaiana V.Ravich., M.Murug. & P.S.S.Richard, Nord. J. Bot. 2022: e03646 DOI: 10.1111/njb.03646 (Primulaceae)
This species has been discovered and described based on collection made from Anamalai Hills, the southern Western Ghats of India.

Arundinella mukurthiana Murug. & Anusuba, Gard. Bull. Singapore 74(1):132.2022 (Poaceae)
This species has been discovered and described based on collection made from Bangitappal, on way to Earthen (Bangi halla) Dam from Upper Bhavani, a part of Mukurthi National Park, Nilgiris District, Tamil Nadu at c. 2350 m altitude.

Aspidistra mokokchungensis D.K. Roy, N. Odyuo, R. Lytan, D.L. Biate, T. Punatemjen & A.A. Mao, Nelumbo 64(1):01.2022 (Asparagaceae)
This species has been discovered and described based on collection made from Mongchen Village, Mokokchung, Nagaland.

Cynometra sampathkumaraniana Sanjappa, Sringesw. & Dalavi, Nelumbo 64(2):2.2022 (Leguminosae)
This species has been discovered and described based on collection made from sacred grove, opposite bus station, Agumbe, Shivamogga District, Karnataka at 645 m altitude.

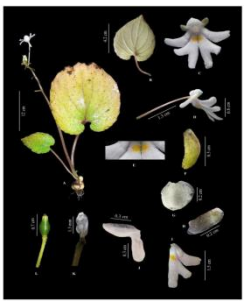
Eugenia pachakumachiana Arum. & Murugan, Edinb. J. Bot. 79(1938):2.2022 (Myrtaceae)
This species has been discovered and described based on collection made from Thenpalani Beat, Chinnamanur Range, Megamalai Wildlife Sanctuary, Theni District, Tamil Nadu at 990 m altitude.

Gastrochilus pseudocalceolaris S. Dey, L. Phom, Av. Bhattacharjee, Moaakum & K. Eshuo, Phytotaxa 574 (4):295.2022 (Orchidaceae)
This species has been discovered and described based on collection made from Yingyushang Mountain, Longleng District, Nagaland at 1854 m altitude.

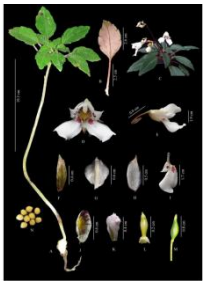
Gentiana ranae M. Shabir & M.D. Dwivedi, Rheedea, 32(1):4.2022 (Gentianaceae)
This new species has been discovered and described based on the collection made from Rohtang Pass, Himachal Pradesh at 4000 m altitude.

Glycosmis albicarpa Sujana & Vadhyar, Nord. J. Bot. e03501.2022 (Rutaceae)
This species has been discovered and described based on collection made from Kunnimuthicholai, Kanyakumari wildlife Sanctuary, Tamil Nadu at 633 m altitude.

Grewia lakshminarasimhani Arum., Murugan, Arisdason & R. Manik., JETB 45:1.2021 (Malvaceae)
This species has been discovered and described based on collection made from Megamalai, Megamalai Wildlife Sanctuary, Theni District, Tamil Nadu.



Impatiens keralensis Saravanan & Kaliamoorthy, Phytotaxa 552(1):107.2022 (Balsaminaceae)
This species has been discovered and described based on collection made from Kurichiarmala Reserve Forest, Wayanad District, Kerala at 1100-1320 m altitude.



Impatiens kurichiarmalayana Saravanan & Kaliamoorthy, Phytotaxa 552(1):110.2022 (Balsaminaceae)
This species has been discovered and described based on collection made from Kurichiarmala Reserve Forest, Wayanad District, Kerala at 1200-1320 m altitude.

Impatiens pasighatensis D. Borah, R.Kr. Singh & Taram, Ind. For. 148(2):233.2022 (Balsaminaceae)This new species has been discovered and described based on the collection made from Sirki, Pasighat, East Siang District, Arunachal Pradesh at 390 m altitude.

Isodon neorensis Ranjan, G. Krishna & Anant Kumar,Taiwania 67(2):261.2022 (Lamiaceae)
This new species has been discovered and described based on collection made from Lava to Kolbong, Neora Valley National Park, West Bengal, Darjeeling at 2025.4 m altitude.

Pancratium venkaiahii R. Prameela, J. Prak. Rao, S.B. Padal & M. Sankara Rao, JoTT 14(3): 20801.2022 (**Amaryllidaceae)**
This new species has been discovered and described based on the collection made from Ginjeru Village, Vizianagaram District, Andhra Pradesh at 75 m altitude.

Schoenorchis mishmensis K. Gogoi, Mega & Chowlu, Phytotaxa 575(1):98.2022 (Orchidaceae)
This species has been discovered and described based on collection made from Mishmi Hills, Lower Dibang Valley District, Arunachal Pradesh at 900 m altitude.

Staurogyne arunachalensis R. Kr. Singh, D. Borah & Yama, Ann. Bot. Fennici 59:48.2022 (Acanthaceae)
This new species has been discovered and described based on the collection made from Kimin, Papum Pare District, Arunachal Pradesh at 115 m altitude.

Striga todgarhica C.S. Purohit, JNBR 10(2):90.2021 (Orobanchaceae)
This species has been discovered and described based on collection made from Uperli Babhan, Jojawar Range, Todgarh-Raoli Wildlife Sanctuary, Rajasthan at 460 m altitude.

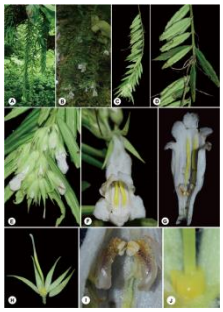
Symplocos sisparensis B. Karthik, Murug., Anusuba, Premkumar & R. Tharani, Phytotaxa 589 (1): 083–090 (Symplocaceae)
This new species has been discovered and described based on collection made from Mukurthi National Park in Nilgiris district of Tamil Nadu part of Nilgiri Biosphere Reserve (NBR).

Tainia epiphytica S. Sarkar, Agrawala, S. Chakraborty, D. Maity & Odyuo, Phytotaxa 578(2):181.2023 (Orchidaceae)
This new species has been discovered and described based on collection made on the way to Reiek Tlang, Aizwal, Mizoram at 1200 m altitude.

Zehneria neorensis Ranjan, Anant Kumar, G. Krishna & H. Schaef., Syst. Bot. 47(3):743. 2022 (Cucurbitaceae)
This new species has been discovered and described based on collection made from Lava to Kolakham, Neora Valley National Park, Kalimpong District, West Bengal at 1798 m altitude.

NEW SUB-SPECIES

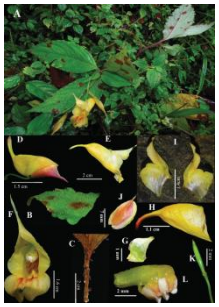
Gentiana capitata Buch.-Ham. ex D.Don subsp. **hemkundiana** M. Shabir & A.N.Shukla, Nelumbo 64(1):8.2022 (Gentianaceae)
This new subspecies has been discovered and described based on collection made from Hemkund, Garhwal Himalaya, Uttarakhand at 4250–4350 m altitude.



Lysionotus metuoensis W.T.Wang subsp. **arunachalensis** Chowlu & G.Krishna, J. Jap. Bot. 97(2):100.2022 (Gesneriaceae)
This new subspecies has been discovered and described based on collection made from Sukiyo, Pakke-Kessang district, Arunachal Pradesh at 1444 m altitude.

NEW VARIETY

Castanopsis armata Roxb. var. **raoi** Shankhamala Mitra, V. Ranjan & D. Maity (FAGACEAE)
The new variety discovered and described based on collection made from from the Gijang forest of Assam.

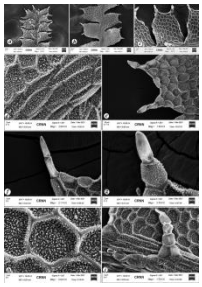


Impatiens jurpia Buch.-Ham. ex Hook.f. & Thomson var. **ravikumareana** Tiwari, U.L., Phytotaxa 530(3):280 (Balsaminaceae)
This new variety has been discovered and described based on collection made on the way to Sangchu sollung basti from Chiyang Tajo, East Kameng District, Arunachal Pradesh at 1524 m altitude.

BRYOPHYTES

NEW SPECIES

Cylindrocolea mizoramensis Sushil K. Singh, Ind J. For. 45(1):30.2022 (Cephaloziellaceae)
This new species has been discovered and described based on the collection made from Bukpui forest, Kolasib Mizoram at 860 m altitude.



Saccogyna darjeelingensis M. Dey & S. Majumdar, Curr. Sci. 123(2):145.2022 (Saccogynaceae)
This new species has been discovered and described based on the collection made from 2 km from Jogighat towards Ahaldara, Darjeeling District, West Bengal, Eastern Himalaya at 726 m altitude.

Telaranea mizoramensis Sushil K. Singh, Ind J. For. 45(1):30.2022 (Lepidoziaceae)
This new species has been discovered and described based on the collection made from Ngengpui WLS, Lawngtlai, Mizoram at 164 m altitude.

LICHEN & LICHENICOLOUS FUNGI

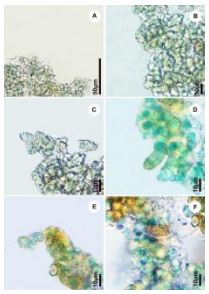
NEW SPECIES

Bunodophoron awasthii G.P.Sinha & Jagad. Ram, *Crypt. Biodivers. Assess.* 6 (1):11.2022 (Sphaerophoraceae)
This new species has been discovered and described based on collection made from fallen tree trunk from Neora riverine forest, Neora Valley National Park, Darjeeling District, West Bengal at 2223 m altitude.

Lasioloma krishnasinghii Jagad. Ram & G.P. Sinha, Taiwania 67(4):552.2022 (Pilocarpaceae)
This new species has been discovered and described based on collection made from Shompen Hut area evergreen forest, East West Road, Great Nicobar Island, Andaman and Nicobar Islands at 30 m altitude.

ALGAE

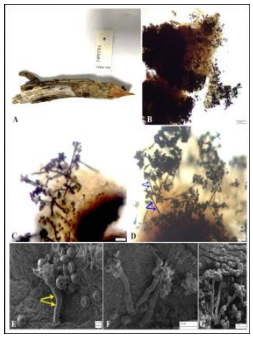
NEW SPECIES



Hyella taptapanica P. Basu, G.G. Satpati & R.K. Gupta, Species 23(72):362.2022 (Hyellaceae)
This species has been discovered and described based on collection made from Ganjam, Odisha.

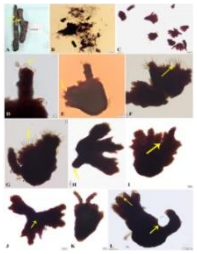
FUNGI

NEW SPECIES



Brevistachys indica Rashmi Dubey & Amit D. Pandey, J. Mycopathol. Res. 60(2):288.2022 (Stachybotriaceae)
This new species has been discovered and described based on the collection made from dead stem, Sarjamori, Yeoor Range (North), Sanjay Gandhi National Park, Palghar District, Maharashtra.

Cortinarius dombangensis K. Das, D. Chakr., A. Ghosh & Vizzini, Nord. J. Bot. e03579. 2022 (Cortinariaceae)
This new species of mushroom has been discovered and described based on the collection made from Dombang valley, North District of Sikkim under *Abies densa* in subalpine mixed forest.



Dictyosporium matherense Rashmi Dubey, Asian J. Forestry 6(1):2.2022 (Dictyosporiaceae)
This new species has been discovered and described based on the collection made from dry stem litter from Matheran, Maharashtra.

Lactarius indoviolaceus I. Bera & K. Das, Phytotaxa 576(2):206.2022 (Russulaceae)
This new species has been discovered and described based on the collection made from soil in association with *Castanopsis* sp. in Shergaon village, West Kameng District, Arunachal Pradesh.

Lactifluus tropicalis A. Ghosh, I. Bera, D. Chakr. & Hembrom, Phytotaxa 564(3):284.2022 (Russulaceae)
This new species has been discovered and described based on the collection made from tropical deciduous forests where it is quite popular as a delicacy amongst the local communities of Jhargram District of West Bengal and the Rajmahal hills of Jharkhand.

Phaeolus sharmae Hembrom, A. Parihar, K. Das & A. Ghosh, Cryptog. Mycol. 43(2):38. 2022 (Laetiporaceae)
This new species has been discovered and described based on the collection made from Yumthang valley, Shingba Rhododendron sanctuary, North District, Sikkim at at 3470 m altitude.

Russula boddingii Hembrom, D.Chakr., A. Ghosh & K. Das, Cryptogamie Mycol.20(3): 27-50.2023 (Russulaceae)
This new species has been discovered and described based on the collection made from tropical deciduous forests of Jharkhand and West Bengal and found to grow under Shorea robusta.

Russula indosenecis A. Ghosh, D. Chakr., K. Das & Buyck, Eur. J. Taxon. 847:108.2022 (Russulaceae)
This new species has been discovered and described based on the collection made in subalpine forest under *Abies densa*, on the way to Panga Teng Tso Lake, Tawang District, East Himalayan Region, Arunachal Pradesh.

Russula pseudoflavida A.Ghosh, Hembrom, I. Bera & Buyck, Cryptogamie Mycol.20(3): 27-50.2023(Russulaceae)
This new species has been discovered and described based on the collection made from tropical forests of Jharkhand and West Bengal and found to grow under Shorea robusta.

Russula pseudosenecis A. Ghosh, D. Chakr., K. Das & Buyck, Eur. J. Taxon. 847:112.2022 (Russulaceae)
This new species has been discovered and described based on the collection made in tropical forest under Shorea robusta from Joypur forest, Bankura District, West Bengal.

Russula shoreae D.Chakr., A.Ghosh, K. Das & Buyck, Cryptogamie Mycol.20(3): 27-50.2023 (Russulaceae)
This new species has been discovered and described based on the collection made from tropical forests of Jharkhand, West Bengal and Bihar and found to grow under Shorea robusta.

Vuilleminia tropica Hembrom, A. Ghosh, A. Parihar & K. Das, Cryptog. Mycol. 43(2):54.2022 (Xylariaceae)
This new species has been discovered and described based on the collection made from Rajmahal hills, Brindaban Panchayat, Joshkuti, Sahibganj District, Jharkhand at 63 m altitude.

NEW DISTRIBUTIONAL RECORDS

SEED PLANTS

Ainsliaea fulvipes Jeffrey et W.W. Sm. (Asteraceae)
This species earlier known to be endemic to China, has been reported for the first time from India based on the collection made from Zemithang (near Limpo), Tawang, Arunachal Pradesh at 3166 m altitude.

Aspidistra yingjiangensis L. J. Peng (Asparagaceae)
This species earlier known from China (Yunnan) has been reported for the first time from India based on the collection made from Fakim Forest Village, Pongro Subdivision, Kiphire District, Nagaland at 2000 m altitude.

Calanthe lamellosa Rolfe (Orchidaceae)
This species earlier known from China and Myanmar has been reported for the first time from India based on the collection made from Japfu Mountain Range, Kohima District, Nagaland at c. 2345 m altitude.

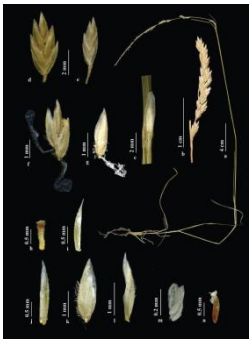
Eragrostis barrelieri Daveau (Poaceae)
This species earlier known from Mediterranean, Macronesia to Arabain Peninsula and also introduced to Australia, Europe and South & North America has been reported for the first time from India based on the collection made near Bondrat village, Bhainsa Mandal, Nirmal District, Telangana.

Goodyera alveolata Pradhan (Orchidaceae)

This species earlier known from Bhutan, has been reported for the first time from India based on the collection made from Sessa Orchid Sanctuary, West Kameng, Arunachal Pradesh.

Impatiens ecalcarata Collett & Hemsl. (Balsaminaceae)
This species earlier known from Myanmar and Laos has been reported for the first time from India based on the collection made from Loktak Lake, Bishnupur District, Manipur at 768 m altitude.

Pavetta thwaitesii Bremek. (Rubiaceae)
This species earlier known from Sri Lanka has been reported for the first time from India based on the collection made from Maramalai, Iruttucholai, Kanyakumari wildlife sanctuary, Kanyakumari District, Tamil Nadu at 588 m altitude.



Poa leptoclada Hochst. ex A. Rich. (Poaceae)
This species earlier known from Africa and Arabian Peninsula has been reported for the first time from India based on the collection made from Berijam, Berijam Range, Tamil Nadu at 2183 m altitude.

Pteroceras viridiflorum (Thwaites) Holttum (Orchidaceae)

This species earlier known from Sri Lanka, has been reported for the first time from India based on the collection made from Vellingiri hills, Tamil Nadu at 1581 m altitude.

Sterculia euosma W.W.Sm. (Malvaceae)

This species earlier known from Southeast Tibet to South China has been reported for the first time from India based on the collection made from Pakke-Kessang District, Seijosa, Arunachal Pradesh at 450 m altitude.

Tribulus ochroleucus (Maire) Ozenda & Quezel (Zygophyllaceae)

This species earlier known from Afghanistan, Algeria, Chad, Djibouti, Ethiopia, Iran, Libya, Mali, Mauritania, Niger, Northern Africa, Oman, Pakistan, Palestine, Sinai, Somalia, Sudan, and Yemen has been reported for the first time from India based on the collection made Near Harchand Kidani on SH-65, Jaisalmer District, Rajasthan at 236 m altitude.

Xanthosoma robustum Schott in Oesterr. (Araceae)

This species earlier known from Belize, Costa Rica, Guatemala, Honduras, Mexico, Nicaragua, and Hawaii has been reported for the first time from India based on the collection made from Padmavathi Nagar, Vizianagaram, Vizianagaram District, Andhra Pradesh, Eastern Ghats.

Sarcopyramis napalensis Wall.var. **bodinieri** (H. Lév.) H. Lév. (Melastomataceae)

This variety earlier known from China, India and Taiwan has been reported for the first time from India based on the collection made on the way from Chhang La to Tungri, West Kameng District, Arunachal Pradesh.

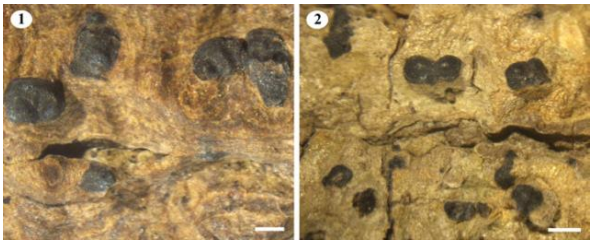
PTERIDOPHYTES

Diplazium mettenianum (Miq.) C.Chr. (Woodsiaceae)
This species earlier known from China, Japan, Taiwan, Thailand, Vietnam has been reported for the first time from India based on the collection made near Pi gate, Hapoli Primary Forest, Ziro Valley at 1580 m altitude and near medicinal plants nursery, on the way to orchid trail, Pange Valley, Tale Wildlife Sanctuary at 1590 m altitude Lower Subansiri District, Arunachal Pradesh.

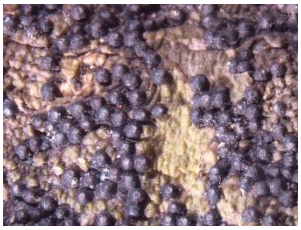
BRYOPHYTES

Saccogyna Dumort. (Saccogynaceae)
This genus earlier known from Macaronesia, Portugal, Faeroe Isles, Norway, Corsica, Italy, Lebanon, Europe and oceanic southern-temperate zone has been reported first time from India based on the collection made from 2 km from Jogighat towards Ahaldara, Darjeeling District, West Bengal, Eastern Himalaya at 726 m altitude. The genus is represented by *Saccogyna darjeelingensis* M. Dey & S. Majumdar.

LICHENN & LICHENICOLOUS FUNGI

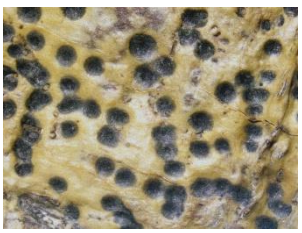


Lithothelium nanosporum (C. Knight) Aptroot (Pyrenulaceae)
The species earlier known from Australia, Japan and South Africa, has been reported for the first time from India based on collection made from Lamia Bay Beach forest, Diglipur, North Andaman, Andaman & Nicobar Islands at 10 m altitude.



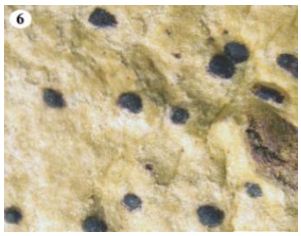
Nigrovothelium inspersotropicum Aptroot & Diederich (Trypetheliaceae)
The species earlier known from Guyana and Seychelles, has been reported for the first time from India based on collection made from Saddle Peak National Park, North Andaman, Andaman & Nicobar Islands at 512 m altitude.

Pseudopyrenula media Aptroot & Diederich (Trypetheliaceae)
The species earlier known from Seychelles, has been reported for the first time from India based on collection made from Pooltala, Middle Andaman, Andaman & Nicobar Islands at 30 m altitude



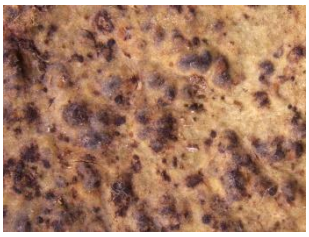
Pyrenula ciliata Aptroot (Pyrenulaceae)
The species earlier known from Papua New Guinea, has been reported for the first time from India based on collection made from Kinmai, Car Nicobar Island, Andaman & Nicobar Islands at 6 m altitude.

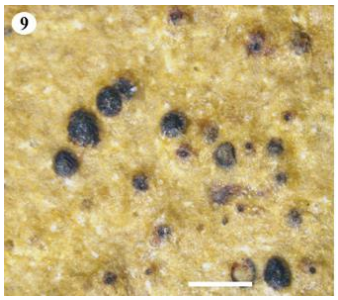
Pyrenula cocoes Müll. Arg. (Pyrenulaceae)
The species which is known to be pantropical, has been reported for the first time from India based on collection made from South Bay beach forest, Little Andaman, Andaman & Nicobar Islands.



Pyrenula fulva (Kremp.) Müll. Arg. (Pyrenulaceae)
The species earlier known from Seychelles, has been reported for the first time from India based on collection made from Paget Island, North Andaman, Andaman & Nicobar Islands.

Pyrenula septicollaris (Eschw.) R.C. Harris (Pyrenulaceae)
The species which is known to be pantropical, has been reported for the first time from India based on collection made from Lamba Baalu Beach Forest, Coffee Dera, North Andaman, Andaman & Nicobar Islands.





Pyrenula sexlocularis (Nyl.) Müll. Arg. (Pyrenulaceae)
The species which is known to be pantropical, has been reported for the first time from India based on collection made from Kalipur, North Andaman, Andaman & Nicobar Islands at 10 m altitude.

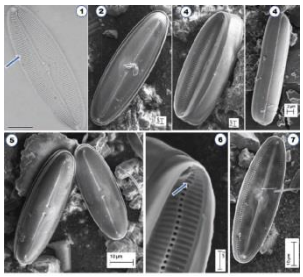
Pyrenula subglabrata (Nyl.) Müll. Arg. (Pyrenulaceae)
The species earlier known from Singapore and Sri Lanka, has been reported for the first time from India based on collection made from Makachua School Point Beach, Little Nicobar Island, Andaman & Nicobar Islands at 5 m altitude.

ALGAE

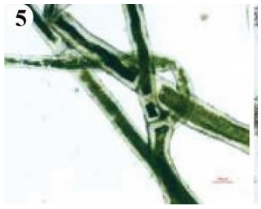
Achnanthidium minutissimum (Kützing) Czarnecki (Achnanthidiaceae)

This species has been reported for the first time from India based on the collection made from Mangrove habitats of Sundarbans Biosphere Reserve, West Bengal.

Anabaena catenula Kützing ex Bornet & Flahault (Nostocaceae)
This species has been reported for the first time from India based on the collection made from Mangrove habitats of Sundarbans Biosphere Reserve, West Bengal.



Caloneis oregonica (Ehrenberg) R.M. Patrick (Naviculaceae)
This species has been reported for the first time from India based on the collection made from Bhitarkanika National Park, Odisha.



Cladophora laetevirens (Dillwyn) Kützing (Cladophoraceae)
This species has been reported for the first time from India based on the collection made from Mangrove habitats of Sundarbans Biosphere Reserve, West Bengal.

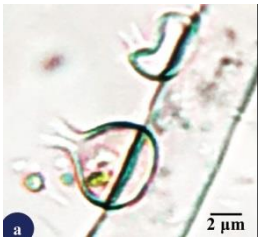
Diadesmis confervacea Kützing (Diadesmidaceae)
This species has been reported for the first time from India based on the collection made from Mangrove habitats of Sundarbans Biosphere Reserve, West Bengal.

Gracilaria dotyi Hoyle (Gracilariaceae)

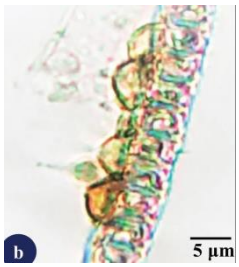
This species erstwhile known from Hawaiian Islands has been reported for the first time from India based on the collection made from Dokulupadu, Srikakulam District, Andhra Pradesh.

Klebsormidium nitens (Kützing) Lokhorst (Charophyceae)

This species erstwhile known from all continents ranging from temperate to tropical regions has been reported for the first time from India based on the collection made from the soil bed crust of river Gadilam, Cuddalore District, Tamil Nadu.

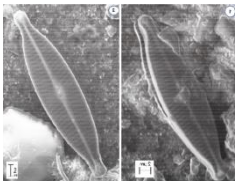


Lagynion macrotrachelum (A. Stokes) Pascher. (Chrysophyceae)
This species erstwhile known from Australia, Brazil, Britain, Japan, Korea, New Zealand, North America, Spain and South America has been reported for the first time from India based on the collection made from Keladi and Mattur, Shivamogga District, Karnataka.

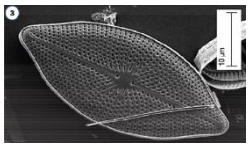


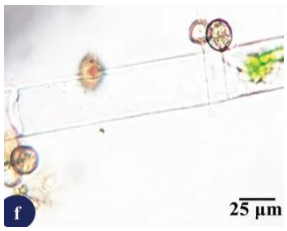
Lagynion reductum Prescott (Chrysophyceae)
This species erstwhile known from Korea, Netherlands and North America has been reported for the first time from India based on the collection made from Keladi and Mattur, Shivamogga District, Karnataka.

Navicula subrostellata Hustedt (Naviculaceae)
This species has been reported for the first time from India based on the collection made from Bhitarkanika National Park, Odisha.



Navicula torneensis Cleve (Naviculaceae)
This species has been reported for the first time from India based on the collection made from Bhitarkanika National Park, Odisha.





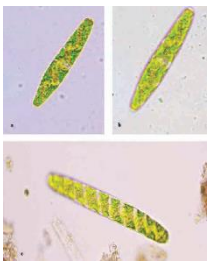
Peroniella hyalothecae Gobi (Xanthophyceae)

This species erstwhile known from Norway, North America, Romania, Russia, Spain and Taiwan has been reported for the first time from India based on the collection made from Mattur and Tammadikoppa, Shivamogga District, Karnataka.

Phormidium thwaitesii Umezaki & Watanabe (Oscillatoriaceae)

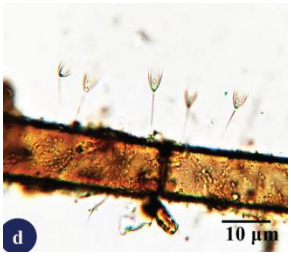
This species has been reported for the first time from India based on the collection made from Mangrove habitats of Sundarbans Biosphere Reserve, West Bengal.

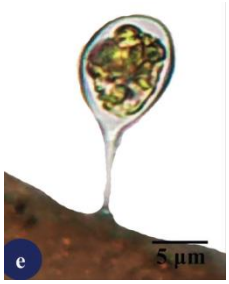
Spirotaenia erythrocephala Itzigs. in Braun (Mesotaeniaceae)
This species erstwhile known from Great Britain, Bulgaria, Czech Republic, Slovakia Germany, Netherlands, Romania has been reported for the first time from India based on the collection made from Sadivayal, Chinnar Bridge, Coimbatore District, Tamil Nadu.



Stokesiella epipyxis Pascher (Chrysophyceae)
This species erstwhile known from Australia, New Zealand and Russia has been reported for the first time from India based on the collection made from Mattur and Tammadikoppa, Shivamogga District, Karnataka.

Stokesiella lepteca (A. Stokes) Lemmer. (Chrysophyceae)
This species erstwhile known from Australia, Brazil, New Zealand, South Korea and Taiwan has been reported for the first time from India based on the collection made from Mattur and Tammadikoppa, Shivamogga District, Karnataka.



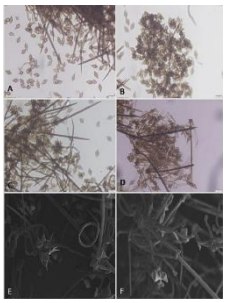


Stylodinium phaseolus (Pascher) Bourrelly (Dinophyceae)

This species erstwhile known from Malaysia has been reported for the first time from India based on the collection made from Mattur and Tammadikoppa, Shivamogga District, Karnataka.

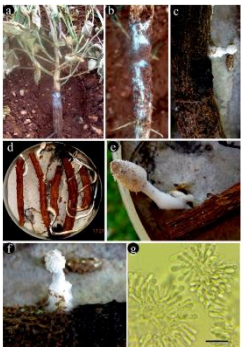
Trentepohlia abietina (Flotow ex Kützing) Hansgirg (Trentepohliaceae)
This species has been reported for the first time from India based on the collection made from Mangrove habitats of Sundarbans Biosphere Reserve, West Bengal.

FUNGI



Beltrania pseudorhombica Crous & Y. Zhang (Dematiaceae)
The fungal species has been reported for the first time from India based on collection made from Leaf litter, Vaitarna Reservoir, Dhargaon District, Nashik, Maharashtra

Boletus himalayensis Jabeen & Sarwar, Khalid (Boletaceae)
The fungal species earlier known from Pakistan, has been reported for the first time from India based on collection made from Kalatop and Khajjiar, Chamba District, Himachal Pradesh at 2380 m and 1930 m altitude.



Coprinopsis cinerea (Schaeff.) Redhead, Vilgalys & Moncalvo (Psathyrellaceae)
The fungal species has been reported for the first time from India based on collection made from infected leaves of *Vigna unguiculata* (L.) Walp., collected from Doddamaragowdanahally, Mysore, Karnataka.

Cortinarius longistipitatus Saba, S. Jabeen, Khalid & Dima (Cortinariaceae)
This mushroom was collected from Kalatop Wildlife Sanctuary, Chamba District, Himachal Pradesh. It was found growing solitary to scattered, on soil under *Cedrus deodara*

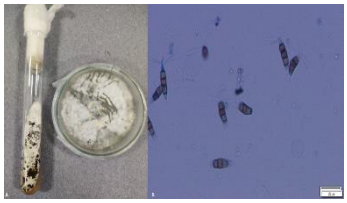
Lasiodiplodia mahajangana Begoude, Jol. Roux & Slippers (Botryosphaeriaceae)
The fungal species has been reported for the first time from India based on collection made from stem litter, collected from Sarjamori, North of Vasai Creek, Yeoor Range (North), SGNP, Palghar District, Maharashtra.

Neopestalotiopsis eucalypticola Maharachch., K.D. Hyde & Crous (Pestalotiopsidaceae)
The fungal species has been reported for the first time from India based on collection made from Palm fruit litter, collected from Nagla Block, North of Vasai Creek, Yeoor Range (North), Sanjay Gandhi National Park, Palghar District, Maharashtra.

Nigrospora zimmermanii Crous
The fungal species has been reported for the first time from India based on collection made from protected areas of Goa.

Periconia byssoides Pers. (Periconiaceae)
The fungal species has been reported for the first time from India based on collection made from foliar lesions of *Vigna unguiculata* (L.) Walp., collected from Doddamaragowdanahally Mysore, Karnataka.

Tylopilus glutinosus Iqbal Hosen (Boletaceae)
The fungal species earlier known from Bangladesh, has been reported for the first time from India based on collection made from soil in a forest dominated by *Shorea robusta*, Tuluha, Jhargram District, West Bengal at 80 m altitude.



EX-SITU CONSERVATION

Ex-situ Conservation

Botanical Survey of India, a premier organization under Ministry of Environment, Forest and Climate Change is custodian of 11 botanic gardens covering different geographical regions of India. Through these gardens BSI practices *ex-situ* conservation of different Endemic, Threatened and Economically important plants which require conservation. 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 EET plants. Since their inception, all these gardens are doing excellent works in the field of ex-situ conservation, biodiversity conservation, education and awareness.

Botanic Gardens under control of Botanical Survey of India are:

Sl. No.	Name of Garden	Regional Centre jurisdiction
1	AJC Bose Indian Botanic Garden, Howrah	Howrah
2	Andaman & Nicobar Regional Centre, BSI, Experimental Garden, Dhanikhari	Port Blair
3	Arid Zone Regional Centre, Jodhpur: Experimental Garden, Jodhpur	Jodhpur
4	Arunachal Pradesh Regional Centre, Itanagar: Experimental Garden, Sankie View	Itanagar
5	Botanic Garden of Indian Republic, Experimental Garden, Noida	Noida
6	Central Regional Centre, Experimental Garden, Allahabad	Allahabad
7	Eastern Regional Centre, Shillong: Experimental Garden, Barapani	Shillong
8	National Orchidarium and Experimental Garden, Yercaud	Coimbatore
9	National Gymnosperm collection cum Botanic Garden, Pauri	Dehradun
10	Sikkim Himalaya Regional Centre, Experimental Garden, Gangtok	Gangtok
11	Western Regional Centre, Pune, Experimental Garden, Mundhwa	Pune

AJC Bose Indian Botanic Garden, Howrah

During the year 2022-2023, 7 field tours were conducted to different phyto-geographical regions like Western Ghats (Kerala, Maharashtra, Tamil Nadu), Eastern Ghats (Telangana), Eastern Himalayas (Sikkim & Darjeeling) and Western Himalayas (Uttarakhand). As a result, more than 1008 plant saplings, seeds, bulbs and tubers were collected including gymnosperms and pteridophytes representing 178 species belonging to 62 families and 123 genera. These plants are maintained in nursery of AJCBIBG. Some of the endemic and endangered plants like *Acer oblongum* Wall. ex DC., *Alstonia venenata* R.Br., *Bentinckia condapanna* Berry ex Roxb., *Buchanania barberi* Gamble, *Calamus baratangensis* Renuka & Vijayak., *Calamus rheedei* Griff.,

Commiphora caudata (Wight & Arn.) Engl., *Garcinia indica* (Thouars) Choisy, *Ginkgo biloba* L., *Heritiera fomes* Banks, *Jasminum parkeri* Dunn, *Madhuca insignis* (Radlk.) H.J.Lam, *Mammea sanguinea* (Jum. & H.Perrier) Kosterm., *Ochlandra travancorica* (Bedd.) Gamble, *Phlomoides superba* (Royle ex Benth.) Kamelin & Makhm, *Pterocarpus marsupium* Roxb. subsp. *acuminatus* (Prain) Thoth., *Syzygium palodense* Shareef, E.S.S.Kumar & Shaju were newly introduced to AJCBIBG.

Besides tour collection some of the iconic and endangered plants like *Amherstia nobilis* Wall., *Brownea coccinea* Jacq., *Heritiera macrophylla* Wall. ex Kurz, *Swietenia mahogany* (L.) Jacq., *Bentinckia nicobarica* (Kurz) Becc., *Ficus krishnae* C. DC. of AJCBIBG were also multiplied through seed germination, cutting and air-layering.

A Mass plantation drive of *Cocos nucifera* L. (Gowrigathram; Golden Coconuts of Kerala) was organized in collaboration with LIC, Kolkata on account of 66th year of LIC on 05.09.2022.

Eventually, more than 3500 plants were planted in different divisions and avenues of AJCBIBG through the mass plantation program in the year 2022-2023 like Biological diversity Day, World Environment Day, Mav Mahotsav and various dignitries during their visit to AJCBIBG.

***Ex-situ* conservation 1. A view of plantation of Aquatic species; 2–5. Collection of plant saplings during different field tours; 6–9. Plants sapling brought in AJCBIBG nursery.**

Andaman and Nicobar Regional Centre, BSI, Dhanikhari Experimental Garden cum Arboretum, Port Blair.

As part of ex-situ conservation of EET plants of Andaman and Nicobar Islands, several species are being collected and introduced in the Dhanikhari Experimental Garden cum Arboretum. Some of the plant species are: *Boesenbergia siphonantha* (King ex Baker) M. Sabu & al., *Calamus andamanicus* Kurz, *Carissa andamanensis* L.J.Singh & Murugan, *Ceropegia andamanica* Sreek., Veenakumari & Prashanth, *Cissus adnata* Roxb., *Coelogyne quadratiloba* Gagnep., *Corypha utan* Lam., *Curcuma roscoeana* Wall. , *Eria andamanica* Hook.f., *Etlingera fenzlii* (Kurz.) Skornick & M. Sabu, *Garcinia andamanica* King, *Garcinia dhanikhariensis* S.K. Srivast., *Gigantochloa nigrociliata* (Buse) Kurz, *Goniothalamus macranthus* (Kurz) Boerl., *Grewia calophylla* Kurz ex Mast., *Knema andamanica* (Warb.) W.J. de Wilde., *Mesua manii* (King) Kosterm., *Mimusops andamanensis* King & Gamble, *Myristica andamanica* Hook.f., *Nervilia plicata* (Andrews) Schltr., *Otanthera nicobarensis* Teijsm. & Binn., *Peristylus parishii* Rchb.f., *Pinanga manii* Becc., *Pontederia vaginalis* Burm.f., *Schizostachyum andamanicum* M. Kumar & Remesh, *Semecarpus kurzii* Engl., *Sphaeropteris albosetacea* (Bedd.) R.M. Tryon, *Zingiber squarrosum* Roxb.

***Rhopaloblaste angustata* (Kurz) Moore**

Experimental Botanic Garden, Arid Zone Regional Centre, Jodhpur

One field tour was undertaken in which endemic and threatened species were collected (germplasms) from arid and semi-arid regions of Rajasthan. Rare and Threatened plants *viz*. *Pulicaria rajputanae* Blatt. & Hallb.; *Withania coagulans* (Stocks) Dunal; *Farsetia heliophila* Bunge ex Coss.; *Tribulus rajasthanensis* Bhandari & V.S. Sharma; *Tephrosia falciformis* Ramaswami; *Commiphora wightii* (Arn.) Bhandari; *Convolvulus auricomus* var. *ferruginosus* Bhandari, Medicinal and Aromatic plants *viz. Calligonum polygonoides* L.; *Tecomella undulata* (Sm.) Seem.; *Cenchrus ciliaris* L.; *Cullen plicatum* (Delile) C.H.Stirt. were collected.

Seeds of the following species were collected- *Adenium* sp.; *Albizia lebbeck* (L.) Benth.; *Anogeissus pendula* Edgew.; *Anogeissus sericea* Brandis; *Anogeissus sericea* var. *nummularia* King ex Duthie,; *Artocarpus heterophyllus* Lam. ; *Barleria prionitis* var. *diacantha* Blatt. & Hallb.; *Bauhinia racemosa* Vahl ; *Caralluma edulis* A.Chev. ex Hutch. & Dalziel; *Cassia fistula* L.; *Ceropegia bulbosa* Roxb.; *Citrullus colocynthis* (L.) Schrad.; *Colophospermum mopane* (J.Kirk ex Benth.) J.Leonard ; *Dichrostachys cinerea* R.Vig.; *Dodonia viscosa* (L.) Jacq.; *Fernandoa adenophylla* (Wall. ex G.Don) Steenis; *Gmelina arborea* Roxb. ex Sm.; *Holoptelea integrifolia* (Roxb.) Planch.; *Lasiurus scindicus* Henrard; *Lawsonia inermis* L.; *Millettia pinnata* (L.) Panigrahi; *Moringa concanensis* Nimmo ex Dalzell & A.Gibson ; *Moringa oleifera* Lam.; *Oryza sativa* L. (200gm); *Prosopis cineraria* (L.) Druce ; *Sapindus laurifolius* Balb. ex DC; *Senna alata* (L.) Roxb.; *Senna*

alexandrina Mill.; *Senna italica* Mill.; *Shorea robusta* Gaertn.; *Sterculia urens* Roxb.; *Tecoma stans* (L.) Juss. ex Kunth; *Terminalia arjuna* (Roxb. ex DC.) Wight & Arn.; *Tylophora indica* (Burm.f.) Merr.

Following plant species have been multiplied in the nursery of Desert Botanic Garden of Botanical Survey of India, Arid Zone Regional Centre, Jodhpur- *Adenium* sp.; *Albizia lebbeck* (L.) Benth.; *Alcea rosea* L.; *Andrographis paniculata* (Burm.f.) Nees; *Anogeissus sericea* var. *nummularia* King ex Duthie; *Bauhinia racemosa* Vahl; *Caralluma edulis* A.Chev. ex Hutch. & Dalziel; *Cassia fistula* L.; *Ceiba pentandra* (L.) Gaertn.; *Colophospermum mopane* (J.Kirk ex Benth.) J.Leonard; *Datura metel* L.; *Dichrostachys cinerea* R.Vig.; *Holoptelea integrifolia* (Roxb.) Planch.; *Lawsonia inermis* L.; *Matricaria chamomilla* L. (numerous); *Millettia peguensis* Ali; *Millettia pinnata* (L.) Panigrahi; *Mimusops elengi* L.; *Moringa concanensis* Nimmo ex Dalzell & A. Gibson; *Moringa oleifera* Lam.; *Ocimum basilicum* L.; *Pedalium murex* L.; *Phyllanthus amarus* Schumach. & Thonn.; *Portulaca pilosa* L.; *Prosopis cineraria* (L.) Druce; *Sapindus laurifolius* Balb. ex DC; *Senna alata* (L.) Roxb.; *Solanum trilobatum* L.; *Tecoma stans* (L.) Juss. ex Kunth; *Terminalia arjuna* (Roxb. ex DC.) Wight &Arn.; *Tribulus terrestris* L.; *Withania somnifera* (L.) Dunal.

Following plant species have been multiplied by cuttings: *Euphorbia tirucalli* L. (20 nos.); *Basella alba* L. (06 nos.); *Euphorbia nivulia* Buch.-Ham.; *Euphorbia quadrangularis* Pax,

Following plant species have been multiplied by Rhizome/Bulb/tuber: *Chlorophytum borivilianum* Santapau & R.R.Fern. (15 nos.). Phenological data of existing plant species of Desert Botanic Garden was recorded thorough out the year.

Experimental Botanic Garden, Arunachal Pradesh Regional Centre, Itanagar

Scientists had identified and documented 64 plant species available in botanical garden, BSI, APRC and introduced 21 plant saplings at botanic garden of BSI, APRC *Acorus calamus*, *Adenanthera pavonina*, *Aquilaria malaccensis*, *Asparagus racemosus*, *Bixa orellana*, *Curcuma aromatica*, *Curcuma amada*, *Curcuma caesia*, *Euphorbia neriifolia*, *Holarrhena antidysenterica*, *Justicia adhatoda*, *Litchi chinensis*, *Mangifera indica*, *Michelia champaca*, *Phoebe hainesiana*, *Punica granatum*, *Saraca asoca*, *Syzygium cumini*, *Tamarindus indica*, *Tectona grandis*, *Tinospora cordifolia*.

Experimental Botanic Garden, Botanic Garden of Indian Republic, Noida

A plant collection tour was conducted to different localities of Tamil Nadu and Kerala. Plant spp. were collected for ex situ conservation. Altogether 990 saplings belong to 151 taxa have been collected from different localities of Tamil Nadu and Kerala and conserved in different sections of BGIR.

Experimental Botanic Garden, Central Regional Centre, Allahabad

Aspidistra elatior Blume , *Gazania ringens* (L.) Gaertn., *Rhapis excela* (Thunb.) Henry, *Rosa alba* L., *Mangifera Indica, Mimusops elengi* and *Ficus carica* were introduced in the garden. Scientists had also introduced 12 species (*Psilotum nudum* (L.) P.Beauv., *Nelumbo nucifera* Gaertn., *Nymphaea alba* L., *Nymphaea mexicana* Zucc., *Nymphaea caerulea* (Savigny) Verdc., *Nymphaea rubra* Roxb. ex Andrews, *Salvinia molesta* D.Mitch., *Ludwigia sedioides* (Humb. & Bonpl.) H.Hara, *Vallisneria spiralis* L., *Myriophyllum aquaticum* (Vell.) Verdc., *Pistia stratiotes* L. and Roses) in garden from Acharya Jagadish Chandra Bose Indian Botanic Garden, BSI, MOEF&CC, Govt. of India, Howrah on 15.12.2022. Documentation of trees and shrubs of CRC experimental garden is under progress. Metadata for 180 tree species of CRC experimental garden, QR code is developed for 25 tree species and their work is under progress.

Barapani Experimental Botanic Garden, Eastern Regional Centre, Shillong, Meghalaya

Two local field tours were undertaken to Sumer, Kyrdem Kulai, Zero Point, Raid Nongbri and surrounding areas of Ri Bhoi District, Meghalaya. *Tupistra tupistroides* (Kunth) Dandy and *Peliosanthes* sp., and a total of 21 live specimens of RET plants including nine orchid taxa were collected for *ex situ* conservation at EBG, Barapani and Shillong. Three field tours were also undertaken to Dima Hasao District, Assam, Mokokchung District, Nagaland and West Kameng and Tawang Districts, Arunachal Pradesh for a period of 19 days. During the field tour 5 different species of *Tupistra* and *Rohdea eucomoides* were collected. A total of
108 live specimens of RET plants including 40 orchid taxa were collected for *ex situ* conservation at EBG, Barapani and Shillong.

Experimental Botanic Garden, and National Orchidarium, Yercaud, Southern Regional Centre, Coimbatore

During the plant exploration tour from 17.08.2022 to 19.08.2022 at Kalakkad Mundanthurai Tiger Reserve, Tirunelveli, Tamil Nadu, India; totally 19 species belonging to 15 genera under 9 families were collected.

During the plant exploration tour from 20.08.2022 to 22.08.2022 at Kanyakumari Wildlife Sanctuary, Kanyakumari, Tamil Nadu, India; totally 22 species belonging to 15 genera under 4 families were collected.

During the plant exploration tour from 19.12.2022 to 25.12.2022 at Kalakad, Tirunelveli, Tamil Nadu, India; totally 44 species belonging to 28 genera under 9 families were collected.

The collected plant species were introduced into National Orchidarium andExperimental Garden, Southern Regional Centre, Yercaud for Ex-situ conservation.

Experimental Botanic Garden, Sikkim Himalaya Regional Centre, Experimental Garden, Gangtok

Four local field tours were conducted to Kalimpong, Mungpoo, Kupup, Kyongnosala sanctuary Darjeeling, East Sikkim and following 14 species were collected for ex situ conservation in EBG.
Aeschynanthus micranthus C.B.Clarke [Gesneriaceae], *Begonia picta* Sm. [Begoniaceae], *Begonia* sp. [Begoniaceae], *Begonia xanthina* Hook. [Begoniaceae], *Hedychium* sp. [Zingiberaceae], *Impatiens pulchra* Hook.f. & Thomson [Balsaminaceae], *Impatiens sikkimensis* Govaerts & Chakrab. [Balsaminaceae], *Impatiens tripetala* Roxb. ex DC. [Balsaminaceae], *Rhododendron arboreum* Sm. [Ericaceae], *Rhododendron edgeworthii* Hook.f. [Ericaceae], *Rhododendron falconeri* Hook.f. [Ericaceae], *Rhododendron griffithianum* Wight [Ericaceae], *Rhododendron thomsonii* Hook.f. [Ericaceae], *Rhododendron vaccinioides* Hook.f. [Ericaceae].

Mundhwa Experimental Botanic Garden , Western Regional Centre, Pune

More than 170 RET Plants have been planted at Botanical Survey of India, Western Regional Centre and experimental Garden, Mundhwa, Pune during world Environmental Day, Foundation and International Forest Day.

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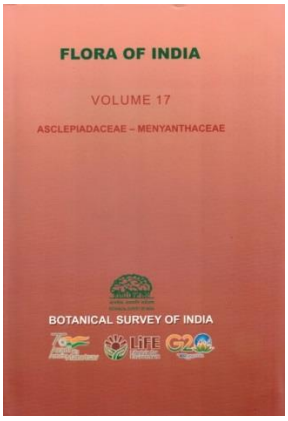
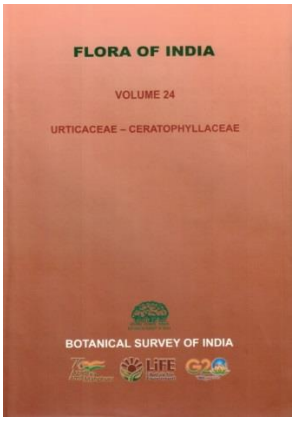
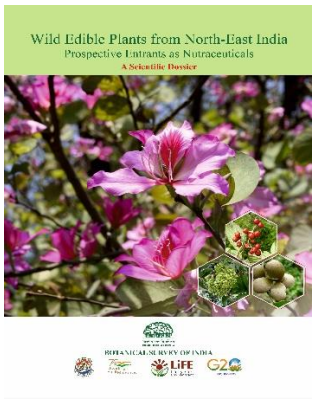
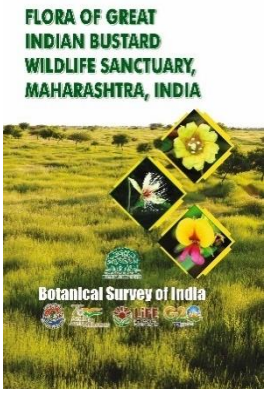
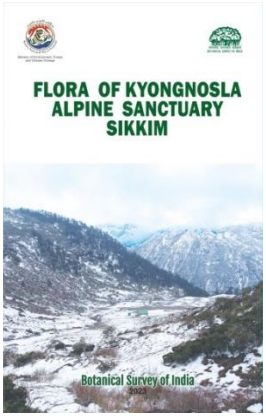
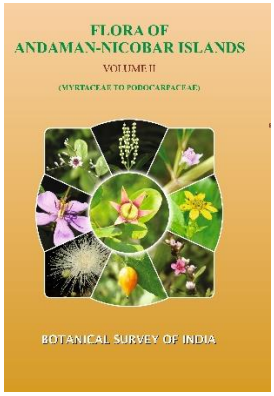


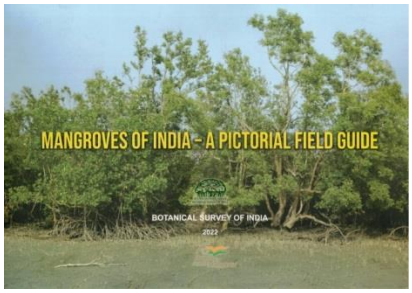


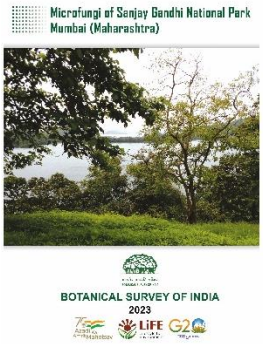






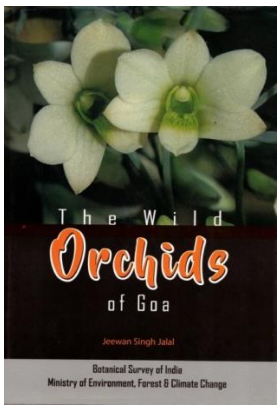


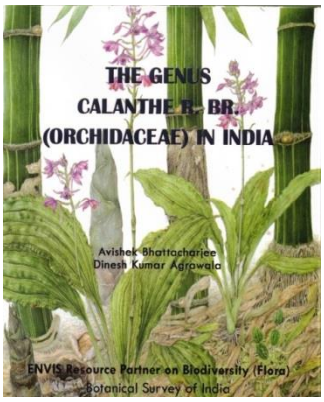


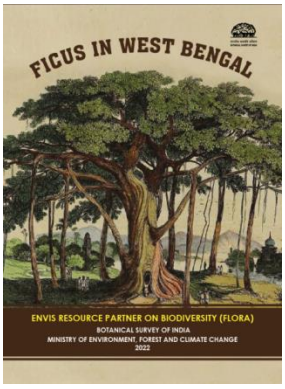


Publications under ENVIS-RP

1. Bibliography & Abstract of Rajasthan
2. The Wild Orchids of Goa
3. The genus *Calanthe* R.Br. (Orchidaceae) in India
4. Ficus of West Bengal
5. ENVIS Newsletter 2-volumes
6. Glimpses of E.K. Janaki Ammal Rosarium in AJC Bose Indian Botanic Garden
7. Brochure on AJCB Indian Botanic Garden

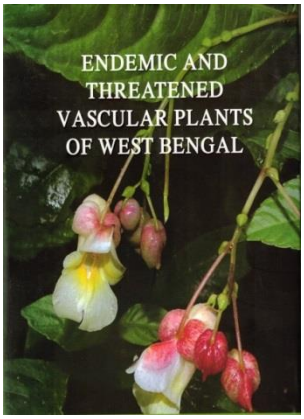


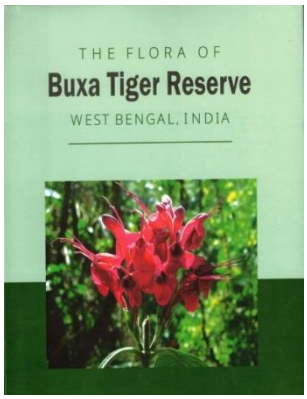




Collaborative publications:

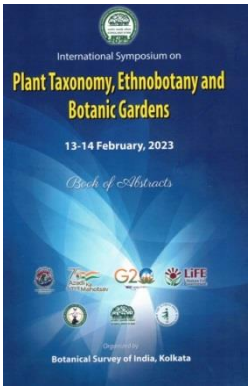
1. The Flora of Buxa Tiger Reserve, West Bengal
2. Endemic and Threatened Plants of West Bengal
3. Flora of Manipur-A Pictorial Guide





Miscellaneous publications:

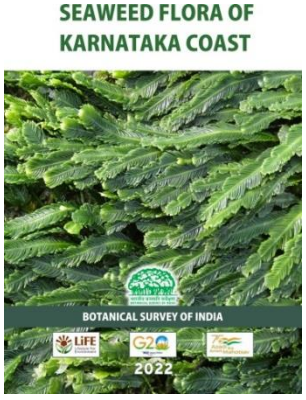
1. Guideline for Assistance to Botanic Garden Scheme
2. Abstract Book for 2nd International Symposium on Plant Taxonomy, Ethnobotany and Botanic Gardens.
3. Annual Report of BSI for 2021-2022.
4. Desk Calendar 2023 (Theme: Indian Virtual Herbarium)
5. BSI Price List 2022



E-book publication:

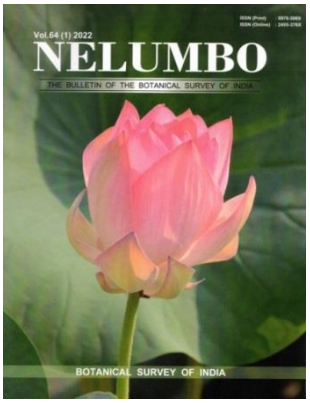
Initiative has been taken to publish the pending manuscripts pertaining to completed project reports which could not be published earlier. For quick publication, manuscripts which address a smaller portion of a larger prospective or manuscripts which require lot of updating/ upgradation are taken as E-book publication by adding the ISBN to the manuscript and publish in the BSI website. The earlier unpublished technical reports are also included under this category. During 2022-2023 following books were published under this category. Work on some more manuscripts is under process.

1. See weed Flora of Karnataka Coast, ISBN: 978-81-958726-2-6
2. Grasses of Telangana State, ISBN: 978-81-958726-9-0
3. See weed Flora of Goa Coast, ISBN: 978-81-958726-3-33



Nelumbo-The Bulletin of Botanical Survey of India:

The print version of Nelumbo was pending since last two years due to COVID-19 pandemic. Those volumes along with the current one were published during 2022-2023. This apart, the regular publication of online version of the journal was continued. The articles were received; reviewed; coordinated with the authors and reviewers; abstracts translated to Hindi; designed and composed in the Nelumbo format; proofread; coordinated with the online publisher; and published online. A total of 110 articles were dealt for the two parts in volume 64 for the year 2022. 85 articles were accepted and published.



Print version:

1. Nelumbo volume 62 (1-2). 2020
2. Nelumbo volume 63 (1). 2021
3. Nelumbo volume 63 (2). 2021
4. Nelumbo volume 64 (1). 2022

Online version:

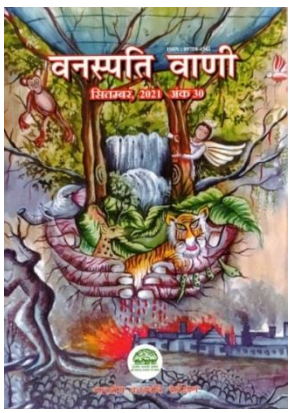
1. Nelumbo volume 64 (1). Date of publication 31.07.2022.
2. Nelumbo volume 64 (2). Date of publication 31.12.2022

Plant Discoveries:

Botanical Survey of India has been publishing regular volumes of 'Plant Discoveries' since 2007 every year by compiling the new species and new distributional records of plants from the country. This year also the publication unit has compiled the 15th volume 'Plant Discoveries 2021' which presents details of 315 taxa either as new to science or reported as distributional novelties from India. This includes 135 Angiosperms, 4 Pteridophytes, 9 Bryophytes, 28 Lichens, 29 Algae, 98 Fungi and 12 Microbes to the floristic wealth of India. Now the current number of plants taxa from India has been updated to 55048 including 1269 microbes.

Vanaspati Vani:

Botanical Survey of India also publish one annual periodical in Hindi which includes articles on floristic research and documentation, importance of plants, traditional knowledge associated with plants, botanical travelogue etc. Publication of Vanaspati Vani was pending since 2020 due to COVID-19 pandemic. During 2022-2023, the publication unit has completed the publication of Vanaspati Vani, volume 29. 2020 and Vanaspati Vani, volume 30. 2021. Compilation work of volume 31 for the year 2022 is in its final stage and will be published shortly.



HINDI ARTICLES PUBLISHED

देबस्मिता दत्ता प्रमाणिक 2021. पवित्र वन: जैव विविधता संरक्षण का एक प्राचीन तरीका. वनस्पति वाणी 30:1-5.

दामिनी शर्मा, दीपाक्षी बब्बर, कुसुम उपाध्याय, मंयक धर द्विवेदी, प्रियंका, संदीप कुमार चौहान 2021. रानीखेत में जैविक और सांस्कृतिक विविधता का अंतर्संबंध. वनस्पति वाणी 30:6-8.

नवनीत कुमार दाँगी 2021. झारखंड राज्य का पर्यावरण संरक्षण में योगदान. वनस्पति वाणी 30:9-11.

लाल जी सिंह, चन्दन सिंह पुरोहित, गौतम अनुज एक्का एवं एम. चिन्ना केशावुलु नायक 2021. अदरक) जिन्जर (की नई जाति. वनस्पति वाणी 30:12-13.

दीक्षा कुसुम उपाध्याय, दीपाक्षी बब्बर, दामिनी शर्मा, प्रियंका, शिवानी मिश्रा एवं संदीप कुमार चौहान 2021. मुक्तेश्वर की पादप विविधता और उनके उपयोग की एक झलक. वनस्पति वाणी 30:14-17.

लाल जी सिंह, चन्दन सिंह पुरोहित, गौतम अनुज एक्काए एवं फौज़िया सलीम 2021. अंडमान एवं निकोबार द्वीपसमूह में करौंदा की नई स्थानिक जाति. वनस्पति वाणी 30:18-19.

शिव कुमार 2021. भारतीय गणराज्य वनस्पति उद्यान के पादप प्लवक, बृहत शैवाल और जलमग्न मैक्रोफाइटस. वनस्पति वाणी 30:20-24.

ऐ. सी. हलदर, आर. सरवनन, पी. ऐ. ढोले एवं के अल्ताफ अहमद कबीर 2021. डेस्मोस्टेचिया बायपिन्नाटा) एल (.स्टैफ - बिहार राज्य में छप्पर बनाने के लिए उपयोगी घास. वनस्पति वाणी 30:25.

भैरव यादव 2021. औषधीय पौधे : - एक ऐतिहासिक अवलोकन. वनस्पति वाणी 30:26-28.

पंकज ढोले, मोनिका मिश्र, आर. सरवनन एवं हरीश सिंह 2021. बिहार की जन-जातियों द्वा रा देसी पटुआ) कॉर् कोरस ओलिटोरियस (से रेशे नि कालने की पारम्प रिक विधि एवं उपयोग. वनस्पति वाणी 30:29.

फौज़िया सलीम एवं लाल जी सिंह 2021. मोमोरडिका कोचीनचाइनेनसिस) लाँर (स्प्रेन्ज- एक महत्त्वपूर्ण औषधीय लता. वनस्पति वाणी 30:30.

भावना जोशी और गिरिराज सिंह पंवार 2021. बहुउपयोगी वरनोनिया एमिगडेलिना डेलिले) कड़वी पत्ती (का एक परिचय एवं संरक्षण. वनस्पति वाणी 30:31-34.

जीवन सिंह जलाल 2021. जिंगकिएंग जेरी :खासी जनजातियों की एक अद्भुत बायो-इंजीनि यरिंग. वनस्पति वाणी 30:35-40.

ललिता यादव एवं भैरव यादव 2021. महात्मा गांधी के पर्यावरण सम्बन्धी विचार. वनस्पति वाणी 30:41-42.

सौरभ सचान 2021. वनस्पति विज्ञान एवं अध्यात्म. वनस्पति वाणी 30:43-44.

दीप नारायण पाण्डेय, अच्युता नन्द शुक्ला एवं अर्जुन प्रसाद तिवारी 2021. मध्यप्रदेश का रहस्यमय नरो पहाड़ के उष्णकटिबंधीय शुष्क वनों का. वनस्पति वाणी 30:45-47.

नितिषा श्रीवास्तव एवं शिंजिनी मुखर्जी 2021. भारत में खाद्य अपमिश्रण. वनस्पति वाणी 30:48-51.

एस. के. यादव एवं के. मजूमदार 2021. वायुमंडलीय ऑक्सीजन के संतुलन में शैवाल की भूमिका. वनस्पति वाणी 30:52-53.

शिव कुमार 2021. विविध जलीय पौधों का भारतीय गणराज्य वनस्पति उद्यान में. वनस्पति वाणी 30:54-58.

नितिषा श्रीवास्तव 2021. आओ मिलकर पेड़ लगाये. वनस्पति वाणी 30:59.

विभूति प्रकाश 2021. वसुधा सुंदरी. वनस्पति वाणी 30:60.

Seminar/Symposium/Conference

ORGANISED BY BSI

BSI, CNH, Howrah organized mass awareness programme on BSI social media platforms on World Health Day 2022 on "Our Planet Our Health", to focus global attention on urgent actions needed to keep humans and the planet healthy on 07/04/ 2022.

National Webinar on "Traditional Knowledge and Ethnobotany" in collaboration with Society of Ethnobotanists to commemorate the 1st death anniversary of late Dr. S.K. Jain, Ex-director, also known as Father of Indian Ethnobotany on 20/04/2022.

BSI, DRC, Hyderabad conducted one day workshop in collaboration with Government Degree College, Begumpet, Hyderabad on "Basics and applied aspects of Plant Taxonomy on 29/04/2022.

BSI, SHRC, Gangtok organized "Capacity Building Training Programme in Plant identification" on 04/05/2022.

BSI, CNH, Howrah organized a webinar on "कार्यालयी दिनचर्या में योगाभ्यास की महत्ता" on 06/05/2022.

lecture on "Temperate rarities: Imperilled species of *Magnolia* in Vietnam" by Dr. Scott McMahan, Manager, International Plant Exploration Programme from Atlanta Botanic Garden, USA at BSI, CNH, Howrah on 06/05/2022.

BSI, NRC, Dehradun organized a one week "Taxonomical Training Programme for UG and PG students in collaboration with the Uttarakhand Science Education and Research Centre (USERC), Dehradun *w.e.f.* 23/05/2022-28/05/2022.

BSI, DRC, Hyderabad organized 2 days training programs for the students of St. Ann's College for Women, Hyderabad from 22/06/2022-23/06/2022.

BSI, WRC, Pune organized DST SERB (Vritika and Karyashala) Training on Plant Taxonomy and Conservation for college students from 01/07/2022-30/07/2022.

BSI, CNH, Howrah organized a workshop cum hands on training on Molecular Taxonomy of Plants (including Fungi) for the departmental officers/ scientific staffs of CNH and other units of BSI at Howrah/ Kolkata from 11/07/2022 to 15/07/2022.

BSI, WRC, Pune organized DST, SERB, (Karyashala) Workshop on "Herbarium Digitization on Plants" at BSI, WRC, Pune from 18/07/2022-25/07/2022.

Lecture/ Special Talk on "Emergency preparedness and response" by Dr Ranee Prakash, Natural History Museum, London UK at BSI, CNH, Howrah on 25/07/2022.

BSI, DRC, Hyderabad organized one-day workshop on "Herbarium Techniques" in collaboration with St. Francis Degree College for Women, Begumpet, Hyderabad, Telangana State on 17/08/2022.

BSI, ERC, Shillong conducted a Hands-on Training programme on "Advanced Biochemical Techniques and Applications" under the aegis of STUTI, sponsored by Department of Science and Technology, Govt. of India, at the Department of Biochemistry, North Eastern Hill University (NEHU), Shillong *w.e.f.* 01/09/2022- 08/09/2088.

A two days National Level workshop on "Identification & Nomenclature of Plants including Lower groups (Algae, Fungi, Bryophyte & Angiosperm)" was jointly organized by the Department of Botany, Dr. A.P.J. Abdul Kalam Government College and BSI, CNH, Howrah along with BSI-ENVIS Resource Partner on Biodiversity (Flora) from 06/09/2022-07/09/2022.

BSI, Hqrs, Kolkata and CNH, Howrah organized a Webinar on Record Management under the aegis of Swachchta Abhiyan 2.0 on 07/09/2022 for all its scientists and officials for participation in the cleaning and disposal drive. Shri S. Sridhar, Deputy Secretary (Rtd.) was
the lead speaker of the webinar.

Two days National Level workshop on "Identification and Nomenclature of Plants including Lower Groups" at A.P.J. Abdul Kalam Government College, Newtown, Kolkata organised by Department

of Botany in collaboration with BSI, CNH, Howrah & ENVIS Resource Partner on Biodiversity (Flora), Botanical Survey of India, Howrah on 07/09/2022.

BSI, APRC, Itanagar organized a webinar on "Capacity Building Training Programme on Plant Systematics & Phyto-Diversity" in collaboration with Arunachal Pradesh State Council for Science & Technology, DST, Arunachal Pradesh on 21/09/2022-23/09/2022.

BSI, Kolkata in collaboration with the Midnapore City College, Midnapore, organized a Two days National Workshop on Herbarium methodology and Plant nomenclature at Midnapore City College, Midnapore, West Bengal *w.e.f.* 26/09/2022-27/09/2022.

11th Research Advisory and Monitoring Committee (RAMC) meeting of BSI held at BSI, CNH, Howrah on 20/10/2022-21/10/2022.

The Mansarovar Global University (MGU), Bhopal in collaboration with the Indian Fern Society and the Botanical Survey of India hosted the XVII Annual Conference of the Indian Fern Society and also organized a national symposium on "Advances in Pteridology Research: Present Status and Future Strategies" from 25/11/2022 27/11/2022 at MGU, Bhopal.

BSI, NRC, Dehradun, in collaboration with Uttarakhand Science Education and Research Centre (USERC) organised a workshop on "Hands on Field Based Taxonomy" *w.e.f.* 28/11/2022-03/12/2022 to promote taxonomic research among the College students.

BSI, CNH, Howrah organized DST-SERB funded "SERB *Vritika* Research internship workshop" from 06/12/2022-03/01/2023 with an aim to provide a short-term training programme on Plant Taxonomy and Threat Assessment of plants to 5 selected interns.

Under the DST-SERB funded scheme, BSI organized a SERB High-End Workshop on "Plant Identification to Biodiversity Assessment (*Karyaslshala*)" at BSI, CNH, Howrah from 12/12/2022-18/12/2022. Under this workshop, 25 young researchers were selected from all over the country and a series of lecture and Hands on Trainings were organized by the Eminent Scientists and Professors to train and develop the skills of plant identification, biodiversity conservation, herbarium methodology etc.

BSI, ANRC, Port Blair organized a special lecture in association with C.P.R. Environmental Education Centre (CPREEC), Port Blair for teacher trainees of TGCE college students on "Plant Diversity of Andaman and Nicobar Islands-An overview" on 14/12/2022.

BSI, ANRC, Port Blair organized a special lecture in association with C.P.R. Environmental Education Centre (CPREEC), Port Blair for science teacher trainees of first year batch of TGCE college students on "Endemic Flora of Andaman and Nicobar Islands and its conservation" on 16/12/2022.

Two days International Conference and launch of month-long collaborative exhibition on "Science, Humanism and making of modern India: role of E.K. Janaki Ammal" on 09/01/2023 and 10/01/2023 organized by BSI, ISIM, Kolkata in collaboration with University of Sussex, UK.

BSI, NRC, Dehradun organized a "Botanical Nomenclature Course" at *w.e.f* 06/02/2023-10/02/2023.

Botanical Survey of India celebrated its 134 th Foundation Day during 13/02/2023-14/02/2023 at 'Bhasha Bhawan', National Library Campus, Kolkata. To commemorate this important day, a two days International Symposium on "Plant Taxonomy, Ethnobotany and Botanic Gardens" was organized.

BSI, CNH, Howrah organized a webinar on Mission LiFE on 01/03/2023. Dr. Viveca Mellagard, Royal Botanic Garden, Kew, UK and Mrs. Kanika Mukherjee, SURTA Kolkata jointly delivered a talk on "Reviving natural dye in West Bengal and the scope of natural dye research in West Bengal" and Dr. Adrien Rieux and Dr. Olivier Pruvost, from Cirad (French Agricultural Research Centre for International Development), France delivered a talk on "Improving our understanding of crop pathogen emergence and evolution using herbarium specimens".

In addition to this BSI together with all its regional centers and units imparted trainings on Herbarium techniques, nomenclature, biodiversity and others to various groups including researchers, students and others from time to time.

PARTICIPATED BY BSI OFFICIALS

National workshop on "Hands on Training in Cryptogames and Gymnosperms for the Postgraduate students" organized by Department of Botany, Shivaji University, Kolhapur on 24/03/2022.
31st Indian Association for Angiosperm Taxonomy Annual Conference & International Conference on "Documentation, Bioprospecting and Conservation of Biodiversity for Sustainable Development", Akole, Maharashtra on 04/04/2022-06/04/2022.

9th International Congress of Society of Ethonopharmacology, at JSS Academy of Higher Education & Research Mysure, Karnataka on 22/04/2022-24/04/2022.

Regional Research Conference of Telangana & Eastern India through virtual mode organised by the Institute of Forest Biodiversity (IFB, ICFRE), Hyderabad on 25/05/2022.

XII Biennial National KVK Conference-2022 chaired by Honourable Chief Minister of Himachal Pradesh organized at Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan from 01/06/2022 to 02/06/2022.

2-days' state-level workshop organised by Basirhat College on 3/6/2022.

Virtual National Conference on "Underutilized Horticultural Genetic Resources: Conservation and Utilization (NCUHGR-2022)" organised by ICAR-Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands, India from 03/06/2022-04/06/2022.

National Seminar on "Only One Earth - Local intervention on Climate Change" organized by the Microbiologists Society of India Unit on 06/06/2022.
Meeting of IBPES -Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services at Bonn, Germany from 03/07/2022-09/07/2022.

Seminar cum workshop on "Tribal people of Andaman and Nicobar and their role in Freedom struggle" organized by Anthropological Survey of India, ANRC, Ministry of Culture, Government of India, Port Blair on 05/07/2022.

UGC-sponsored online Refresher Course in Biological Science (Interdisciplinary), conducted by the UGC-Human Resource Development Centre, Bharathidasan University, Tiruchirappalli for University and College Teachers on 08/07/2022.

Online meeting under the Chairmanship of Senior Economic Advisor, MoEF&CC to discuss proposal on "Pilot Capacity Building Programme for Biodiversity Management Committee (BMCs) for effective implementation of Biological Diversity Act 2002" on 11/07/2022.

Two-Day National conference on "Coastal Zone Management – Policy to Action" at Mahatma Mandir, Gandhinagar, organized by Gujarat Ecology Commission & the Gujarat state ENVIS Hub along with Gujarat National Center for Sustainable Coastal Management [NCSCM] and Society for Integrated Coastal Zone Management [SICOM], MoEF&CC, GoI, New Delhi from 26/07/2022-27/07/2022.

Online International Conference SCAR, 2022 organized by Scientific Committee on Antarctica Research, Scott Polar Research Institute, University of Cambridge, Lensfield Road, Cambridge CBZIER, United Kingdom from 01/08/2022 to 10/08/2022.

One-day Seminar on "Biodiversity Management for Sustainable Services" organized by Department of Botany, Kongunadu Arts and Science College, Coimbatore on 02/08/2022.
Seminar on "Environment Concerns in Himalaya" on the occasion of Prof/ V.P.s Pangtey Memorial Day' lecture organized by Prof. Y/P.S. Pangtey Research Foundation on 23/08/2022.
Two days National Conference of Ministers of EF&CC of States/UTs at Kevadiya, Gujarat on 23/09/2022-24/09/2022.

Refresher Course for Deputy Rangers & Foresters of the Department of Environment & Forests, A & N Administration, organized by Forest training Institute, Wimberligunj, South Andaman on 24/08/2022

National Webinar on "Heritage Sites, National Parks, Tiger Reserves, WLS and Botanical Gardens, Zoological Parks, Museums of India – Identification, Conservation, Management" organized by Govt. Madhav Sadashivrao Golvalkar College, Rewa (Madhya Pradesh) from 27/08/2022 to 05/09/2022.
Special Lecture through VC entitled "A tribute to Prof. Birbal Sahni, F.R.S.: Recent Advances in Paleobotany" organized by University Department of Botany & Department of Botany, T.P.S. College, Patna on 31/08/2022.

Training and Capacity building programme on sharing of outcomes of ZSI, BSI and NBPGR projects at Maredumilli organised by Andhra Pradesh State Biodiversity Board on 02/09/2022.

National Webinar on Botanic Gardens, Biosphere Reserves & Protected Areas organized by M.S. Golvakar College, Rewa, Madhya Pradesh on 05/09/2022.
National workshop on Medicinal Plants and Hydroponics (NWMPH-2022) at SV University Tirupati on 08/09/2022.

14 days Refresher Course in Life Science organized by UGC-Human Resource Development Centre, Ranchi University, Ranchi on 17/09/2022.

H.Y. Mohan Ram Memorial Lecture 2022 (Hybrid mode) entitled "Building, Using & Exploring the Green Plant Tree of Life" delivered by Prof. Douglas E. Soltis, Distinguished Professor, Florida Museum of Natural History and Department of Biology, University of Florida organized by Department of Botany, University of Delhi on 26/09/2022.

Training to Build science leaders in India -Science leadership program – Capacity Building Programme at Prime Minister Office, New Delhi from 26/09/2022-30/09/2022 at ISRO, Bangalore.

National symposium on 'Panch Mahabhoot' at ICAR-CIARI, Port Blair in online mode from 12/10/2022 to 13/10/2022.

One day seminar in Central Ayurveda Research Institute, Kolkata, Department of AYUSH, Govt. of India on 20/10/2022.

Training programme for mapping of land and building area regarding "Updation of land & building records on portal of Govt. Land Information System (GLIS)" organized by MoEF&CC, New Delhi on 21/10/2022.

National Seminar on "Plant and Microbial Sciences: Achievements and Way Forward" organized by Department of Botany, University of Jammu on 04/11/2022.

Virtual meeting on "Management of Marine Ecosystem and Mangroves' at Krishna Conference Hall, IPB, MoEF&CC on 11/11/2022 under the chairmanship of Director General of Forest and Special Secretary.

An online Brain storming meeting for the drafting of Project proposals for biodiversity studies in the Great Nicobar Island on 11/11/ 2022.

19th meeting of the Conference of Parties (CoP) to the Convention on International Trade in Endangered Species of wild fauna and flora (CITES), held *w.e.f* from 14/11/2022-25/11/2022 at Panama City, Panama.

National Training Programme on Biodiversity Conservation for Women Scientists and Technologists at WII, Dehradun, Uttarakhand during 14/11/2022-18/11/2022.

Inaugural function of the workshop on "Bird Identification and Basic Ornithology" organized by ZSI, ANRC, Port Blair on 15/11/2022.

Workshop on "Implications of Human-Animal Interfaces in Public Health with reference to zoonoses" organized by National Institute of Animal Biotechnology, Hyderabad at ICMR- RMRC, Port Blair on 21/11/2022.

12th Training programme on "Science, Technology and Emerging Trends in Governance" at IIPA, New Delhi from 21/11/2022 to 25/11/2022.
Virtual training programme on "Training on GeM issues" organized by ISTM, New Delhi on 22/11/2022.
Online training programme on Government e-Marketplace (GeM) by Sri Shailesh Soni, Undersecretary, Institute of Secretariat Training and Management - ISTM, New Delhi on 22/11/2022.

1st National Conference on Plant Genetic Resources Management (NCPGM 2022), held at National Agricultural Science Complex, Pusa Campus, New Delhi, from 22/11/2022-24/11/2022

Seminar on the occasion of Agricultural Education Day-2022 at ICAR-Central Island Agricultural Research Institute on 25/11/20222.

Three Days workshop on "Coastal and marine biodiversity of Islands Ecosystem" organized by ZSI, ANRC, Port Blair on 08/12/2022.

Training Course on "Para-taxonomy includes Preparation of People's Biodiversity Register (PBR)" organized by ZSI, ANRC, Port Blair and sponsored by Department of Environment & Forests, A&N Islands on 13/12/2022.

Webinar jointly organized by ZSI & Dr. Hari Singh Gaur Central University, Sagar, Madhya Pradesh on 14/12/2022.
National seminar on 'Sustainable Healthy Diets-Health for all' at NIN, Hyderabad from 21/12/2022 to 23/12/2022.
Science Academies' Education Programme on "Diversity, Taxonomy and Utilization of Lower and Higher Plants" organized by PG and Research Department of Botany Vivekananda College of Arts & Sciences for Women (Autonomous) on 23/12/2022.

4th International Conference on Environment and Society (ICES 2022) organised by Jiwaji University Gwalior from 23/12/2022 to 24/12/2022.

Two-Days Workshop on "Essentials of Plant Taxonomy" at Fergusson College, Pune on 12/01/2023.

11th Training Programme on "Financial Management in Scientific Organizations" at Indian Institute of Public Administration, New Delhi from 16/01/2023-20/01/2023.
One Day Capacity Building Workshop on Implementation of Provisions of CITES' organised by MoEF&CC (WL), New Delhi and ZSI at ZSI, Kolkata on 20/01/2023.

ESRI India conference on Arc-Gis on 20/01/23 at Alipore, Kolkata, West Bengal.

Agri Vission-2023-International Conference on Agriculture and Rural Development, held at Centurion University of Technology & Management, Bhubaneswar, Odisha from 27/01/2023-29/01 2023.

National Workshop on "LiFE (Lifestyle for Environment)" of EIACP on 30/01/2023 in the MoEF&CC, New Delhi.

Webinar for APT Medal Award Lecture 2020-2022 conducted by Association for Plant Taxonomy on 31/01/2023.

2 days National level conference on "Scientific input, technological advancements and empowerment for sustainable development" organised by Kongunadu Arts & Science College, Coimbatore on 02/02/2023-03/02/2023.

"International Conference on Contemporary Approaches in Science and Humanities – Future Prospectives" by Nirmala College, Coimbatore on 02/02/2023.

National Conference at Kongunadu Arts and Science College, Coimbatore on 03/02/2023.

Training Programme on "Management and Utilization of Plant Genetic Resources" organized by ICAR-NBPGR, New Delhi on 04/02/2023

Thesis seminar on "Functional Ecology of Intertidal Macrobenthic Fauna and Benthic Ecological Status of South Andaman, Coast, India" at Pondichery University, Brookshabad Campus, Port Blair on 10/02/2023.

Regional Workshop on "Strengthening Medicinal Plants Sector in Andaman and Nicobar Islands" organized by NMPB-Regional cum Facilitation Centre – Southern Region, KSCSTE-KFRI in association with Andaman & Nicobar Islands Medicinal Plant Board & ICAR-CIARI on 16/02/2023.

Thesis seminar on "Taxonomy, biology, and identification of potential fishing zones of carangids around andaman and nicobar islands with special reference to Atule mate (Cuvier, 1833)" at Pondichery University, Brookshabad Campus, Port Blair on 17/02/2023.

National Level Seminar on Herbarium organized by Kandaswami Kandar's College, Velur, Tamil Nadu on 24/02/2023.

One day National Seminar 'Potential of plants for sustainable future'. Organized by the Department of Botany, Telangana Mahila Viswavidyalaym, Koti, Hyderabad on 28/02/2023.

International Conference "Advances in Plants, Microbes and Agricultural Sciences" held in the Department of Botany, University of North Bengal from 02/03/2023-04/03/2023.
One day Workshop at Kerala Forest Research Institute, Nilambur on 04/03/2023.
One-day National-level Seminar-cum-Workshop on "Plant Taxonomy: Historical Perspectives and Future Prospects" organized on 06/03/2023 at Women's Christian College, Chennai.

Two days National Conference on "Recent Trends in Biological Sciences (NCRTBS) organized by VTM NSS College, Dhanuvachapuram, Thiruvananthapuram on 09/03/2023 & 10/03/2023.
National Conference on *'Emerging Trends in Plant Science Research with Special Emphasis on Medicinal Plants' and One Day Workshop cum Buyers-Sellers Meet on Medicinal Plants'* on 14/03/2023-16/03/2023.

Online training on "PFMS CAN training for Capacity Building Commission and its stakeholders" on 17/3/2023.

1st Botanical Congress 2023 on 23/03/2023-25/03/2023 organized by Botanical Society of Bengal & Department of Botany, University of Calcutta.

BSI, APRC, Itanagar participated in the Research, Innovation, Initiative Gathering (#RIIG) on circular bio-economy at Itanagar on 25/03/2023.

ACTIVITIES BY RESEARCH FELLOWS

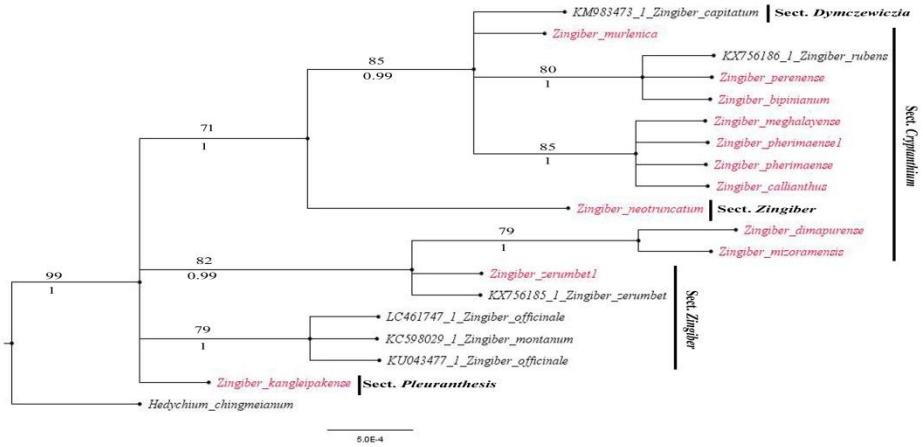
Taxonomic revision and phylogenetic study of Zingiberaceae with special reference to endemic and endangered species of North East India by Ms Suparna Debnath, under the supervision of Dr. Deepu Vijayan, Scientist- D

Duration of the Project: August 2018 - August 2023

Zingiberaceae is among the ten largest monocotyledonous families in India. These are distributed mainly in Southwest India (especially Western Ghats area) and Northeast India. This project was started with the intention of Field survey, collection of specimens, preparation of taxonomic illustration and herbarium, phylogenetic analysis. During the previous year several members of the family have been collected and studied, protocol for DNA extraction, PCR amplification also DNA sequencing of many species were completed.

During April 2022-March 2023, 5 field tours were conducted to different areas of East Karbi Anglong district-Assam, Umlaiteng and Umshiaw, Ri-Bhoi District, Barapani Experimental Garden-BSI during which different plants of the family Zingiberaceae were collected.

Morphological studies including dissection were done for *Zingiber murlenica, Zingiber montanum, Alpinia nigra* and *Zingiber rubens* and the and photographs of these specimen were taken. As a part of the molecular phylogeny study genomic DNA was isolated and agarose gel [0.8% (w/v)] electrophoresis in 1x TBE buffer, along with Lambda DNA were conducted to check quality and quantity of *Zingiber callianthus, Zingiber montanum, Zingiber mizoramensis, Zingiber zerumbet* and two species of *Rhododendron* from SRC, Coimbatore. PCR standardization using rbcL primer pair rbcL a-F & rbcL a-R was carried out for the genomic DNA of the four *Zingiber* species. Good quality DNA sequences of rbcL barcode of four *Zingiber* sp. was received from Heredity Lifesciences, Odisha. DNA sequence were used to construct phylogenetic tree using four phylogenetic tree construction methods: neighbor-joining (NJ) method, the maximum parsimony method (MP) method, the maximum likelihood (ML) method, and the Bayesian inference (BI) method.



Strict consensus tree obtained from the Bayesian analysis of rbcL dataset

Flora of Nagaland by Mr. Rikertre Lytan under the supervision of Dr. Nripemo Odyuo Scientist-E

Duration of the Project: November 2018 - November 2023

During this period, a total of 435 species were documented with proper citation and description along with key preparation for 396 taxa and identification 60 taxa were done. The completed herbarium sheets of 28 species of Nagaland specimen with accession number were incorporated to the herbarium. Dusting and Repoisoining were done for 110 sheets from family Moraceae collected from Nagaland. During this tenure 01 new species *Aspidistra mokokchungensis* D.K. Roy, N. Odyuo, R. Lytan, D.L. Biate, T. Punatemjen & A.A. Mao, and 01 new record to India *Aspidistra yingjiangensis* L.J. Peng were published. Overall, documentation of 885 taxa spread over 84 families, 388 genera, 869 species, 11 variety and 5 subspecies have been done under this project and the Finalization of Mss. of Flora of Nagaland Vol. I From Ranunculaceae to Asteraceae is under process.

Fig 1: *Aspidistra mokokchungensis* D.K. Roy, N. Odyuo, R. Lytan, D.L. Biate, T. Punatemjen & A.A. Mao

Fig 2: *Aspidistra yingjiangensis* L.J. Peng

Project title: Phytochemical screening, proximate composition, nutritional analysis and mineral element status of selected wild edible fruits of Northeast India by Ms. Larima Sten, under the supervision of Dr. Deepu Vijayan, Scientist-D

Duration of the Project: July, 2018 - July, 2023

This project dealt with both Qualitative and quantitative phytochemical analysis of the Proximate composition, Nutritional and Mineral analysis, Compilation of phytochemical/proximate composition/ nutritional and mineral analysis data of selected wild edible fruits. During April 2022-March 2023 field tour was conducted to Manipur, Mizoram and Laitliam Village, East Khasi Hills Distric. Total moisture content for species like *Ficus semiserrata*, *Citrus latipes, Gnetum gnemon*, *Phyllanthus acidus*, *Bruinsmia polysperma*, *Diospyros kaki*, *Citrus medica, Stixis suaveolens, Syzygium tetragonum* etc. were checked. Pulp recovery for plants like *Eleocarpus floribundus, Phyllanthus acidus, Citrus medica*, *Stixis suaveolens* (big fruit and small fruit), *Bruinsmia polysperma* etc was determined. Pulp to stone ratio were also calculated for *Eleocarpus floribundus*, *Diospyrus kaki, Stixis suaveolens* (big and small fruits). The plant samples like *Debregeasia longifolia*, *Garcinia pedunculata*, *Ficus semichordata*, *Citrus latipes*, *Cordia dichotoma, Syzygium*

tetragonum., Solanum torvum, Rhus chinensis, *Ficus semichordata*, *Diospyros kaki, Phyllanthus acidus*, *Citrus medica* tc. were processed by cleaning, washing, drying, grinding, taking photographs and making herbarium. 10 wild edible fruits samples were packaged and sent to National Botanical Research Institute (NBRI) Lucknow for Nutritional and Mineral analysis. Hot water extraction was prepared and qualitative phytochemical screening analysis were done for *Tetradium fraxinifolium* and *Prunus acuminata.* Solvent extraction was done for *Vaccinium griffithianum* (water), *Tetradium fraxinifolium* (methanol), *Aphananthe cuspidata* (methanol), *Bruismia polysperma* (methanol), *Ficus cyrptophylla* (methanolic extract) and *Stixis suaveolens* (methanolic extract) using Soxhlet apparatus. Percentage yield for *Sabium baccatum* (methanolic extract), *Ficus cyrptophylla* (methanol extract), *Tetradium fraxinifolium* (methanol cold extract), *Prunus acuminata* (methanol extract), *Tetradium fraxinifolium* (methanolic extract), *Aphananthe cuspidata* (methanolic extract), *Vaccinium griffithianum* (water extract), *Bruinsmia polysperma* (methanol) and *Stixis suaveolens* (methanolic extract) were determined. Total phenolic content for *Sabium baccatum*, *Prunus acuminata*, *Tetradium fraxinifolium*, *Ficus cyrptophylla, Vaccinium griffithianum* (water extract), *Bruismia polysperma* (methanolic extract) and *Stixis suaveolens* (methanolic extract) were analyzed. Total carotenoids were also analyzed for species like *Syzygium tetragonum* (fruits), *Hodgsonia heteroclita* (seed kernel), *Prunus acuminata* (fruits), *Vaccinium griffithianum* (fruits) and *Citrus latipes* (mature fruits). DPPH radical scavenging activity for ascorbic acid was determined for plants like *Sabium baccatum, Tetradium fraxinifolium and Prunus acuminata.* Internal maintenance of UHPLC by purging, washing and troubleshooting and UHPLC analysis for some wild edible fruits was perfomed.

The highest total phenolic content and flavonoid content was observed in the fruits of *Sabium baccatum* (35± 0.0149 mgGAE/g) and and *Sapium baccatum* (35±0.015 mg QE/g). *Syzygium tetragonum, Sapium baccatum* and *Tetradium fraxinifolium* act as a good source of antioxidant properties among the fruits studied and collected. It was also observed that *Aphananthe cuspidata* fruit was highest in amino acid content (1.47±0.00 mg/g), reducing (63±0.06 %) and non-reducing sugar (4.92±0.01%) and Mn (46.83±1.1µg g^{-1}). *Tetrastigma obovatum* were the lowest in amino acid content (0.17±0.03 mg/g) and Mn concentrations (4.73±0.18 µg g^{-1}). Fe was recorded as the most abundant mineral element in the fruits of *Debregeasia longifolia* followed by *Prunus acuminata*, *Aphananthe cuspidata* and *Syzygium tetragonum.* The least was observed in the fruits of *Sapium baccatum* and *Tetradium fraxinifolium*. The highest Mn concentration was also observed in *Aphananthe cuspidata* and *Sapium baccatum* was recorded as the highest in Zn concentrations.

Fig. 1. *Stixis sauveolens*

Fig. 2. *Bruinsmia polysperma*

Micropropagation of some selected endemic and threatened plants of Northeast India by Ms. Dawanri Marwein under the supervision of Dr. Deepu Vijayan, Scientist-D

Duration of the Project: July, 2018 - July, 2023

This project involved collection of mature seeds/fruits/seedlings of the selected plants for *in vitro* multiplication and conservation and *in vitro* and *ex vivo* seed germination and vegetative propagation. Rehabilitation of *in vitro* raised plants to its natural habitat were done with the help of Forest Department. During the period from April 2022 – March 2023, *in vitro* propagation protocol were standardized for *Rhododendron formosum* Wall., *Rhododendron inaequale* Hutch., *Adinandra griffithii* Dyer. and *Pyrenaria barringtoniifolia* Seem. Culture initiation and shoot multiplication of and *Rhododendron iteophyllum* Hutch. have been carried out. Regular subculturing and rooting of *Rhododendron wattii* Cowan., *Pyrenaria khasiana* R.N.Paul., *Cymbidium tigrinum* Parish ex Hook. and *Cymbidium whiteae* King & Pantl were done. *In vitro* seed germination studies were carried out in seven orchid species, like *Coelogyne corymbosa* Lindl., *Coelogyne viscosa* Rchb.f., *Eriodes barbata* Rolfe., *Micropera rostratum* (Roxb.) etc. The *in vitro* raised plants were transferred for hardening and regularly maintained by watering. Reintroduction of *in vitro* raised plants in BSI, ERC, Shillong office garden and BSI, Experimental Garden, Barapani were done. Manuscript entitled "*In vitro* propagation of *Adinandra griffithii* Dyer. - a critically endangered and endemic plant from Northeast, India" is under preparation. Data compilation, statistical analysis and interpretation were carried out for preparation of final technical report.

Under this project *in vitro* propagation protocol has been standardized for *Rhododendron formosum* Wall., *Rhododendron inaequale* Hutch., *Adinandra griffithii* Dyer. and *Pyrenaria barringtoniifolia* Seem. *In vitro* raised seedlings of *Rhododendron formosum* Wall. (600 Nos.), *Rhododendron inaequale* Hutch. (50 Nos), *Adinandra griffithii* Dyer. (400 Nos), *Rhododendron wattii* Cowan. (80 Nos.) and *Pyrenaria khasiana* R.N.Paul. (180 Nos.) are maintained and few are distributed to officials of Forest Department, Meghalaya and other stakeholders. Rehabilitation of *Rhododendron inaequale* Hutch. from Laitlyngkot, Meghalaya in collaboration with Forest Department due to habitat destruction.

Fig. 1. Cultures of *Rhododendron formosum* maintained in tissue culture laboratory

Fig. 2. *In vitro* raised plants of *Adinandra griffithii* in hardening

Taxonomic revision of Polygonaceae in Eastern Himalaya" under Flora of India Project by Ms. Monalisa Das under the supervision of Dr. Sudhansu Sekhar Dash, Scientist-E
Duration of the Project: June, 2017 to June, 2022

The main objectives of the study are taxonomic revision of the family Polygonaceae in Eastern Himalaya with reference to correct identity, updated nomenclature and to characterize the macromorphological and micromorphological characters under SEM to clarify any significance in the delimitation of the taxa at the generic as well as species level. Under this project, One SEM consultancy tour to SRC, BSI, Coimbatore was carried out during 2022–2023. The pollen morphological characteristics of 63 taxa belonging to Polygonaceae family have been investigated. Pollen acetolysis and Light Microscopic studies of those taxa have been done in detail. Detailed pollen and achene description with photo plate of 41 taxa has been prepared. Complete morphological and micromorphological characterization has been done for 41 taxa, illustrated and prepared Photo plates of live specimens. The distribution maps were prepared for a total of 41 species using individual GPS coordinate information gathered during field trips and from old herbarium sheets from various herbaria.

Floristic diversity of Papikonda National Park, Andhra Pradesh (under Flora of India Project) by Mr. Y. Mahesh (Presently working as Senior Preservation Assistant at ERC, Shillong) under the supervision of : Dr. L. Rasingam, Scientist –E
Duration of the Project: June, 2017 to June, 2022

The project is aimed to document the floral wealth of Papikonda National Park situated in East Godavari and West Godavari districts of Andhra Pradesh state spreading over ca.1012.87 sq. km. The National Park is one of the important protected areas of Andhra Pradesh state which has been flourishing with rich floral and faunal resources. The vegetation found in the state is largely dry deciduous type with a mixture of species belonging to the genera, *Tectona, Terminalia, Dalbergia, Pterocarpus* etc. The hills are the part of Eastern Ghats and are home to many endemic species of plants, birds and Animal life. The rich floral resources of the National Park have not received much attention in relation with floristic studies that is why this National Park has been taken for exploration under Flora of India Project. During the year 2022 to 2023, description, citation and distribution details have been prepared for 215 species along with the Keys for the Families, Genera and species. In addition to this, 22 Photo plates have been prepared.

Grass flora (Poaceae) of Andaman and Nicobar Islands by Reshma Lakra under the supervision of Dr. Pushpa Kumari, Scientist-E
Duration of the Project: July, 2017 to July, 2022

Under this project, the systematic key of 89 genera and 207 taxa of Poaceae of Andaman and Nicobar Islands have been prepared. Now, final compilation (taxonomic treatment) of 207 taxa is going on.

Taxonomic revision of the genus *Poa* L. (Poaceae) in India by Mrs. Ruma Bhadra (presently working as Senior Preservation Assistant, CNH, BSI) under the supervision of Dr. P.V. Prasanna (retired 31.05.2021) Former Scientist-G and Dr. K. Althaf Ahmed Kabeer, Scientist E
Duration of the Project: July, 2017–July, 2022.

The nomenclatural notes part of all taxa under the genus *Poa* L. from India, their citation and taxonomic account has been completed. The writing the project report for final submission is under process.

Taxnomic studies of *Ficus* L. of Northeast India under Flora of India by Ms. Sreyoshee Sensarma under the supervision of Dr. Chaya Deori, Scientist E, BSI-ERC, Shillong
Duration of the project: 2017-2022

The manuscript of the project report has been prepared. Description of 67 species has been made along with 20 Ink Illustration and 13 Photographic Illustration. During this period, two field tours conducted (1 local and 1 to Karbi-anglong). Along with this, finalizing of the Manuscript for the Family Moraceae in Flora of Nagaland, Vol. 2 is being done.

Taxonomy and Ecology of Pteridophytes of Lower Subhansiri District with special focus to Tale Wildlife Sanctuary of Arunachal Pradesh by Sri Ashish Kumar Soni, SRF under supervision of Dr. V.K. Rawat, Scientist-E.

Duration of the project: 2019-2023

During 2022-2023, plant survey, the ecological data, herbarium consultation in parent herbarium, collection tours and field photography were done to allotted research site in Lower Subansiri District as Tale wildlife sanctuary (Pange& Tale Beat of the WLS), Hapoli primary forest, primary forest of the Pistana, Yachuli and Yazali circle & surrounding areas. During which a total of 320 field numbers were collected along with 1555 photographs. The collected specimens were processed by standard method and identified with the help of authentic literature and herbarium sheets. Now, out of 197 species identified as epiphytic (43) and terrestrial (near around 146) including with a single one endemic species *Polystichum polyodon* to N.E. India, and also endangered, rare & threatened species for allotted research site. During this period, 02 taxa was collected after 20 years for Pteridophytic flora and as well as 110 previously collected sheet of Pteridophytes also identified; these all of Herbarium sheets are also incorporated in the herbarium and their description has been prepared. Beside this preparation of checklist of Pteridophytes of Lower Subansiri District and database of herbarium sheets for digitization are under process. Two herbarium consultation tour was conducted to APH, SFRI herbarium w.e.f. 09.01.2023 to 12.01.2023 and study about 300 herbarium specimen field numbers and arranged all the herbarium specimens followed by the classification of Fraser-Jenkins, et. al. 2010. In this period, approximately 200 herbarium specimens were identified and incorporated in ARUN, which was deposited by students of several institutes of India.During this period, one new record of fern for India, two new additions for Arunachal Pradesh and one for Manipur was published in several different journals; whereas, two new records for India, ten new records for Arunachal Pradesh, two new records for Northeastern India, one generic record and species for Eastern Himalaya and one new species record each for Manipur and Mizoram was communicated to the different journals.

FUNDED/ COLLABORATIVE PROJECTS

Investigation on Indian *Aster* L. (Asteraceae: Astereae) with emphasis on morpho-anatomical studies of cypsela by Dr. Avishek Bhattacharjee, Scientist-D, BSI-CNH, Howrah
Name of the funding agency: Science and Engineering Research Board (SERB)
Tenure of the project: 30.12.2021 to 29.12.2024

The research work for the project was started from 1.2.2023, i.e. after recruitment of a Project Assistant. A preliminary checklist (including their distributional data) of Indian *Aster* comprising of 26 species, 3 subspecies, 4 varieties and 1 forma (34 infrageneric taxa) was prepared based on consultation of herbarium-specimens and literature.

Two field tours in remote areas of Eastern and Western Himalayas like Lachen, Thangu, Lachung, Yumthang, Zuluk etc. of Sikkim and Chopta, Mandal, Valley of Flowers, Hemkunth etc. of Uttarakhand were conducted during the flowering periods of *Aster*. From the field 7 species/ taxa belonging to the genus *Aster* were collected. The collected species are *Aster ageratoides, A. albescens* var. *albescens, A. albescens* var. *niveus, A. diplostephoides, A. himalaicus, A. heliopsis, A. sikkimensis*. The specimens of *Aster* deposited at BSD (Dehradun, 170 specimens), BSHC (Gangtok, 95 specimens), CAL (Howrah, 390 specimens), DD (Dehradun, 405 specimens), WII (Dehradun, 13 specimens) were documented/studied for reference. Types and protologues of 14 names were obtained and studied in detail. The distribution, phenology, elevation and other field-notes were documented from the label-data of these specimens and morphological variations of different specimens were noted.

Morpho-taxonomic studies of 9 species of *Aster* including *Aster ageratoides, A. albescens* var. *albescens, A. flaccidus, A. himalaicus, A. heliopsis, A. sikkimensis* were done. Macro and micro-morphological (SEM) studies of cypsela of *Aster ageratoides, A. albescens* var. *albescens, A. albescens* var. *niveus, A. diplostephoides, A. flaccidus, A. himalaicus, A. indamellus, A. heliopsis, A. sikkimensis* were done. Significant differences were observed in the micro-morphological characters of different species of *Aster.*

It is quite difficult to identify several Indian species of *Aster* only with the help of macro-morphological characters due to the presence of high range of variation among them. Therefore, molecular study of all collected species was carried out to determine their identity and also to resolve their phylogenetic relationships. Further, genomic DNA extraction of 26 accessions (belonging to 7 species) has been done at the recently established (May, 2022) molecular biology laboratory of the Central National Herbarium (CNH) where the PI is the Scientist-in-charge. The PCR amplifications were carried out (total 78 reactions) using the ITS, *matK*, and *trnL-F* markers. The sequencing of the purified products was outsourced from Eurofins Genomics India Pvt. Ltd., Bengaluru, India and Barcode Biosciences, Bengaluru, India. Phylogenetic trees (with ITS, *matK*, *trnL-F* and combined markers) were constructed in order to understand the relationship between the species of Indian *Aster* based on sequences obtained from own collections and also from the sequences downloaded from NCBI GenBank. In connection to this project, two abstracts were published and two presentations were delivered in the 2nd International Symposium on Plant Taxonomy, Ethnobotany, and Botanic Gardens (13-14 February 2023) organised by BSI in Kolkata. One manuscript is under preparation which will be communicated very soon for publication.

Under Scientific Social Responsibility (SSR) policy of the project, One-Day Institutional visit programme was organized at CNH on 12.01.2023. Twenty-five students from four different

colleges of West Bengal, viz. Bethune College, Murlidhar Girls College, Ramakrishna Mission Vivekananda Centenary College, and Vedanta College, attended the programme. In addition to this, a two-month long Student Internship programme was completed under the project from 16.01.2023 to 15.03.2023. A postgraduate student (Ms Kasturi Chakraborty, M.Sc. Botany) worked as intern. During the internship the intern was trained on the various aspects of taxonomic revision with special reference to the tribe Conyzinae (Asteraceae) in India.

Study of Floral Diversity of the Medicinal Plant Conservation Area at Jhalda, Purulia, West Bengal by Dr K. Karthigeyan, Scientist E, CNH (Principal Investigator) and Dr Avishek Bhattacharjee, Scientist D, CNH (Co-Principal Investigator)*.
Name of the funding agency: West Bengal Forest Department.
Tenure of the project: January 2022 to March 2023

The study area Medicinal Plant Conservation Area (MPCA) is a hilly terrain in the Purulia district of West Bengal situated at the West Bengal-Jharkhand border with area of c. 188.27 Ha. Botanical explorations (three field tours) covering 3 seasons i.e. winter, summer and post monsoon were made in the MPCA Jhalda during 2022. A total of 256 field numbers comprising 598 specimens have been collected and identified. The MPCA is represented by 206 taxa spread over 182 genera belonging to 64 families that includes 3 families of Pteridophytes (4 genera and 4 species). The final report was prepared with citation of 206 taxa, vernacular names, description, photograph of each taxon, flowering and fruiting period, habitat, specimens examined, uses and submitted. The voucher specimens were prepared for deposition at CAL and also digitized as per the format of BSI.
*Dr P.P. Ghoshal, Botanist, CNH, BSI, Dr Shyam Biswa, Botanical Assistant, CNH, BSI and Ms. Kasturi Chakraborty, Project Assistant, CNH, BSI has also worked under this project as project members.

Molecular phylogeny, morphology and nutraceutical potentials (for edible members) of fleshy wild mushrooms in Kalatop-Khajjiar Wild Life Sanctuary of Himachal Pradesh by Dr. Dyutiparna Chakraborty, Scientist-C, BSI-ERC, Shillong (earlier NPDF-SERB)
Name of the funding agency: Science and Engineering Research Board
Tenure of the project: 07.01.2020-06.07.2022

The Kalatop-Khajjiar Wildlife Sanctuary is situated at the lap of Western Himalayas in Chamba district of Himachal Pradesh. Previously, this area was poorly explored in terms of macrofungal flora which is evident from the few sporadic reports from Khajjiar. During 2020 to 2022, four (4) macrofungal forays were conducted to the different parts of Kalatop and Khajjiar to unveil the fleshy macrofungal wealth of this sanctuary. Altogether 82 collections were made from this exploration tour. Detailed macromorphological characterization and microscopic studies of all those collections revealed 32 genera and 38 species of macrofungi. Apart from morpho-taxonomical studies, molecular phylogenetic analyses were also conducted with the help of nrITS, nrLSU and rpb2 genes for some interesting species and also for those species which were difficult to establish/identify with morphotaxonomy alone. Among the collected wild mushrooms, the ectomycorrhizal members were dominating and were mostly found to be associated with *Cedrus deodara* which appeared to be one of the most suitable symbiont for these mushrooms. Preliminary studies also revealed that members of Boletaceae (35%) were dominant amongst the ectomycorrhizal mushrooms followed by Rusullaceae (30%) in this sanctuary. Seven (7) wild edible species were also recorded from the study including highly priced Morels. Two new records for Indian mycoflora viz. *Cortinarius longistipitatus* Saba, Jabeen, Khalid & Dima and *Boletus himalayensis* Jabeen & Sarwar, Khalid were reported from this region during the project tenure.

Taxonomic assessment of the lichen biodiversity of Agasthiyamalai Biosphere Reserve, Southern Western Ghats by Dr. T.A.M. Jagadeesh Ram, Scientist-E, BSI-DRC, Hyderabad
Name of the funding agency: SERB-DST (Science and Engineering Research Board, Department of Science and Technology), New Delhi
Tenure of the project: 3 Years (2022 to 2025)

Under this project, JRF post was advertised in April 2022 for which the Interview was conducted on 24th May, 2022 and the Selected JRF Joined on 6th June 2022. The JRF has been trained for the methodologies on lichenological studies: sectioning of thallus, fruiting bodies (apothecia/perithecia), asexual structures (Pycnidia/ campylidia) and their characterization using Stereo- and compound microscopes. Over 700 numbers of Lichen Herbarium Packets have been prepared for keeping Lichen specimens. The Previous collections from the area by the Principal Investigator were sorted out using Stereomicroscope and assigned 141 Collection Numbers. Field data have been incorporated on the Herbarium packets and also on the Lichen Herbarium Register. 46 specimens have been characterized morphologically and anatomically for identification.Six specimens have been identified into 2 species. Due to delay in getting forest permission, Field Tour was not undertaken within March 2023. It will be undertaken in April-May 2023.

Herbarium derived DNA Barcode library of Gymnosperms and Phylogenomic of Selected Gymnosperms of NE India by Dr. David Lalsama Biate, Scientist-C, BSI-ERC, Shillong
Name of the funding agency: SERB-DST (Science and Engineering Research Board, Department of Science and Technology), New Delhi
Tenure of the project: 2021- 2024

During this project local field tours were conducted to different areas of Meghalaya where specimens including *Gnetum montanum* Markgr., *Gnetum* sp., *Cedrus deodara* (Roxb. ex D.Don) G.Don, *Cycas revoluta* Thunb., *Cedrus deodara* (Roxb. ex D.Don) G.Don. etc. were collected. Further, a field tour was conducted to Dima Hasao District, Assam during the period from where species like *Gnetum gnemone* L., *Pinus kesiya* Royle ex Gordon, *Araucaria heterophylla* (Salisb), *Juniperus* sp. etc. were collected. Species like *Juniperus chinensis* L., *Thuja* sp., *Juniperus communis* L., *Pinus kesiya* Royle ex Gordon, *Cryptomeria japonica* (Thunb. ex L.f.) D.Don etc. were collected during this period from a field tour to Mokokchung District, Nagaland. Another field tour was conducted to West Kameng and Tawang District, Arunachal Pradesh during this period and specimens like *Taxus* sp., *Abies* sp., *Pinus wallichiana* A.B.Jacks., *Pinus kesiya* Royle ex Gordon, *Juniperus* sp.. *Cycas pectinata* Buch.-Ham etc. were collected. Genomic DNA extractions were also carried out from Live Specimens. High quality genomic DNA were successfully extracted from 36 live specimens belonging to 30 species and three species from herbarium specimens of different age i.e, *Cryptomeria japonica* (Age 62 years), *Calocedrus formosana* (Age 57 years), *Cycas pectinata* (Age: 66, 57, 14 years) using both modified CTAB and DNeasy Plant Mini Kit (Qiagen) protocol (Fig.1).

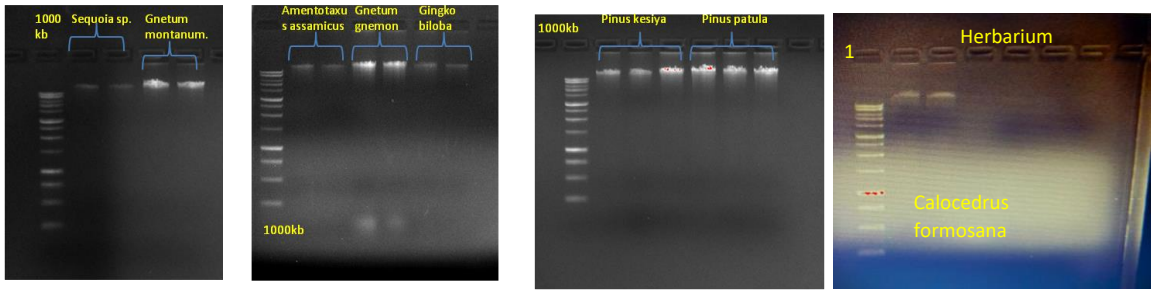


Fig. 1. Genomic DNA extracted from live and herbarium specimens of gymnosperms

Further, Polymerase Chain Reaction (PCR) amplification using primers ITS2 and ITS4 targeting the Internally Transcribed Spacers region was successful achieved in 30 live plants representing 24 different species of gymnosperms and 1 species from herbarium specimens (Fig. 2) i.e., *Cycas pectinata* (Age: 14 years).

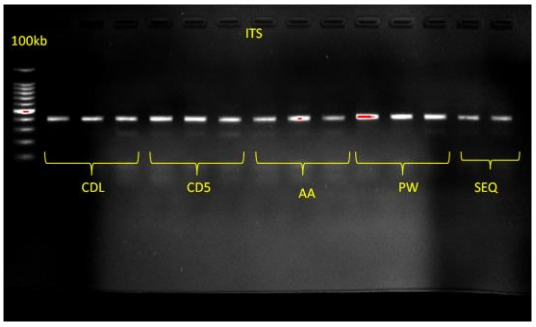


Fig.2. PCR amplification using ITS markers

The PCR amplification was successfully carried using the chloroplast genome derived primers matK Gym_F1A: matK Gym_R1A in 21 live plants representing 19 different species of gymnosperms and 1 herbarium specimen (Fig. 3) i.e Cycas pectinata (Age: 14 years). The PCR amplification was also successfully carried out using the chloroplast genome derived primers psbA trnH markers in 6 live plants representing 4 different species of gymnosperms (Fig. 4).

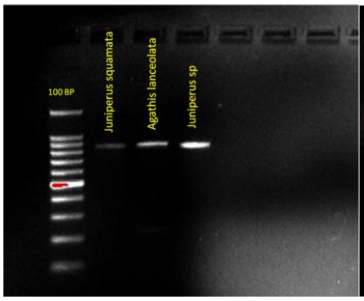
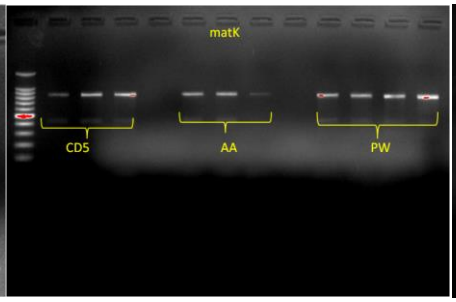


Fig.3. PCR amplification using matK markers



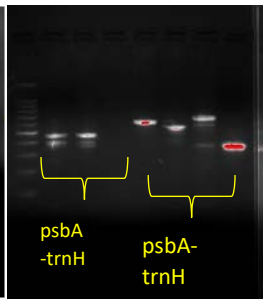


Fig.3. PCR amplification using psbA trnH markers

During this period, purified PCR amplified derived from ITS and matK markers were successfully sequenced for 31 live samples and 2 herbarium samples from 30 different species of gymnosperms.

Purified PCR amplified derived from ITS, matK and psbA markers of 26 different specimens of gymnosperms have been sent for sequencing during the period.

Molecular Phylogeny and Biogeography of genus Phyllanthus based on chloroplast and nuclear markers by Dr. Senthilkumar U. Assistant Professor, Department of Botany, Madras Christian College, Chennai and Mentor: Dr. V. Sampath Kumar, SRC, BSI, Coimbatore

Name of the funding agency: SERB-DST (Science and Engineering Research Board, Department of Science and Technology), New Delhi

Tenure of the project: 3 years

The project was sanctioned, however, the fund is yet to be received

Grant-in-Aid under the Assistance to Botanic Garden Scheme

Fund disbursed in the Financial Year 2022-23

Grant-in-Aid available (in Rupees)	Sl. No.	Date of Sanction	Name of Institution	Amount sanctioned in the FY 2022-23	Balance Amount
75,00,000	1.	No.10/17/2014-CS/BG dt. 31/03/2023	Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, H.P. entrusted to Dr. Bhupender Dutt	₹ 1, 82,645/-	NIL
	2.	No.10/17/2018-CS/BG dt. 31/03/2023	Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh entrusted to Dr. Puja Sharma	₹ 4, 19,129/-	NIL
	3.	No.10/09/2014-CS/BG dt. 24/03/2023	Udayagiri Mahavidyalaya, District Latur, Maharashtra	₹ 3,26,657.00	NIL
	4.	No.10/24/2018-CS/BG dt. 29/03/2023	Kerala Forest Research Institute, Nilambur, Kerala	₹ 3, 14,700/-	NIL
	5.	No.10/23/2018-CS/BG dt. 31/03/2023	Kumaun University, Nainital, Uttarakhand	₹ 4, 87,937/-	NIL
	6.	No.10/19/2018-CS/BG dt. 29/03/2023	Central University of Punjab, Bathinda, Punjab	₹ 8, 50,000/-	₹ 6, 50,000/-
			TOTAL	**₹ 25, 80,888/-**	**NIL**

Information on Herbarium Maintenance

	ANRC	APRC	AZRC	BGIR	CBL	CRC	DRC	ERC	NRC	SRC
Present status of Herbarium holdings	40,000	38833	52400	2757	12345	106264	23031	1,52000	1,20,076	2, 90,000

Herbarium maintenance	**Numbers**										
Name of the Regional Centre/ Unit	**ANRC**	**APRC**	**AZRC**	**BGIR**	**CBL**	**CNH**	**CRC**	**DRC**	**ERC**	**NRC**	**SRC**
No. of specimens mounted/remounted/labelled	20	2461/ 2341	927	210	254	NIL/2055/ 813	845	835/60/9 52	2286/0/2915	3,134	**1,414/ 2,723/ 569**
No. of Herbarium sheets stitched/re-stiched/ poisoned/ fumigated/ dusted	20	2332/ 6608	1180	2219	547	NIL/ NIL/ 4799/ NIL /9104	1530	0/0/1118/ 4000/0	1623/50/600/ 1821/0/8511	28,399	3841/1263/2 490/Nil/656 0
No. of Herbarium sheets accessioned	-	1450	501	nil	-	NIL	635	22400	1353	3,577	85
No. of Herbarium sheets incorporated/re-incorporated	-	1270	00	nil	-	4791	450	4288/ 1089	0/4625	183	212/260
No. of specimens sent on loan	-	0	00	nil	-	01	256 (Lichen)	-	0	--	NIL
No. of loaned/type specimens received/returned/exchanged	-	16/1	00	nil	-	NIL/41/ 01/NIL	-	-	0/8/0/0	--	299/163/23/ NIL
No. of specimens identified	44	513	1078	211	-	301	429	156	1500	1593	45 from General Herbarium
No. of Genus/species covers changed	-	15/35	137	25 and 30	614	593/888	115/220	336/264	450/830	400	393/530
No. of specimens segregated	-	0	00	nil	412	9324	300	4280	0	--	133
Documentation of existing herbarium sheets at herbaria/entry in Excel sheet/Field data written	-	7500	16145	1853	2738	NA/5659/ NIL	10500	22400	1,22129/ 1,22129/1500	2,557	49050

NO. OF HERBARIUM SHEETS DIGITIZED

Contents	NUMBERS										
Regional Centres/ Units	**ANRC**	**APRC**	**AZRC**	**BGIR**	**CBL**	**CNH**	**CRC**	**DRC**	**ERC**	**NRC**	**SRC**
Scanning	23,343 **General herbarium** (Out of which 17,143 Images along with metadata submitted to CNH) 420 **Type Specimens** (Images along with metadata submitted to CNH)	1750	1130	50	**2813 (Total-6975)**	14313	1281	22400	5408	2,044	**2,000**
Metadata preparation	27, 135	7500	16145	1853	2738 (Total-6900)	5659	400	23031	122129	2, 557	**49,050**
Remarks:	6,200 Images along with metadata will submit soon to CNH.										Total Metadata prepared so far **1,58,460**

AWARDS

- Dr. Kanad Das, Scientist-E received "Prof. K.S. Thind Medal" for 2020 on 6th February, 2023 from Association for Plant Taxonomy at Botanical Survey of India, Northern Regional Centre, Dehradun.
- Dr. Shyam Biswa, Botanical Assistant was awarded first prize in photography competition organized by the AJCBIBG on the occasion of World Environment Day on 15th July 2022 during Van Mahatsov celebration at IBG.
- ERC: The research work "Diversity, Distribution and Phytochemical Analysis of selected species of Hypericum in Meghalaya" presented by project executing official was awarded with "Young Scientist Award" at the International Conference on Agriculture & Rural Development (AGRIVISION-2023) from 27th-29th January, 2023 at NISER, Bhubaneswar and Centurian University of Technology & Management, Bhubaneswar, Odisha.

PUBLIC SERVICE RENDERED

TOTAL VISITOR: 1,50,928

Total Identification for visitors: 1732

Total revenue= 5,60,148

Events and Activities

CELEBRATIONS:

Eath Day: 22/04/2022

Zealous celebration of Earth Day was observed all over BSI and its different regional centres and units on 22/04/2021.

On this occasion BSI, AZRC, Jodhpur hosted visitors from G.D. Memorial College, Jodhpur and showcased the Herbarium, Museum and Botanic Garden of this office. Moreover, a lecture on "Primary and Secondary objectives of BSI and overview of Earth Day 2022 with focus on theme – Invest in our Planet" was delivered.

BSI, HAWHRC, Solan celebrated World Earth Day along with 15 Ph.D students of Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni. An essay competition on 'Save Earth to save many Lives' was also organized for the students.

International Day for Biological Diversity: 22/05/2022

The day was observed by BSI and all its regional centres and units. On this occasion various outreach activities such as plantation programmes, sapling distribution and lectures were organized at different centres of BSI.

Director, BSI and a team of senior scientists attended the event at Chennai. BSI arranged a stall on "Biodiversity, Nutritional security & Human Wellbeing" organised by the National Biodiversity Authority, Chennai. The Hon'ble Minister, EF&CC Shri Bhupendra Yadav also visited the stall.

BSI, CNH, Howrah organized two thematic lectures on "Diversity of Mangroves in India" and "Diversity of Marine Macro Algae in India", also organized an online drawing competition on botanical illustration for postgraduate and PhD. Scholars.

BSI, DRC, Hyderabad organized a painting competition for the school children in association with Zoological Survey of India, Hyderabad on this day.

BSI, HAWHRC, Solan celebrated the day along with local people of Kotla Panola Panchayat Kalaghat and delivered a brief lecture on the Biodiversity Status in India and conservation strategies.

BSI, SRC, Coimbatore organized a Multiple Choice-Question's (MCQ's) Competition for the School children of 7th to 9th standard of Nehru Vidyalaya School, R.S. Puram, Coimbatore.

BSI, WRC, Pune arranged a Stall in association with Maharashtra State Biodiversity Board and IISER Pune on this day.

World Environment Day: 05/06/2022

BSI and all its regional centres and units celebrated the World Environment Day with much enthusiasm. A series of programmes such as Sit & Draw competitions, lectures, awareness programmes were organized at various regional centres.

At BSI, AGCBIBG, Howrah 450 people participated in Environment awareness rally from curator office to Kyd monument. 188 students from different schools participated in the drawing competition also 38 persons participated in photography competition.

BSI, ANRC, Port Blair organized a virtual drawing competition for school students on this occasion.

At BSI, AZRC, Jodhpur, more than 26 students from various schools of Jodhpur visited the centre. Plantation programme and drawing competition were organized for the students. All staff of the regional centre virtually attended the "Life Global Call for Ideas" programme organized by MoEFCC on this day.

BSI, BGIR, Noida organized online lecture of Dr. A.L. Ramanathan, Prof. & Dean, School of Environmental Science, JNU, New Delhi on "Glacier and Water resource in India".

BSI, ERC, Shillong distributed around 4850 seedlings of plants belonging to endemic, indigenous and economically important species to forest department and various other organizations for plantation.

BSI, CRC, Allahabad made plantation of *Cassia fistula* (Amaltas) and *Delonix regia* (Gulmohar) saplings in cantonment area.

BSI, DRC, Hyderabad organized a lecture on GIS Applications in Floristic Studies to Degree College students from City College on 03/06/2022, also conducted an elocution competition for the college students on this occasion. The regional centre participated in the World Environment Day celebration organised by the Telangana State Biodiversity Board at Birla Planetarium, Hyderabad and displayed the BSI publications and other materials.

BSI, HAWHRC, Solan celebrated the day at Govt, Senior Secondary School Samror, Nauni and organized a quiz competition and awareness programme on Environmental issues for school children.

BSI, SRC, Coimbatore organized an Elocution Competition with active participation of students from three schools of Coimbatore.

BSI, WRC, Pune Participated in celebration of "World Environment Day" and organized mass plantation program at Mundhwa Botanical Garden, during this function more than 80 saplings of RET species were planted.

International Day of Yoga, 2022: 21/06/2022

BSI and its different regional centres and units celebrated the International Yoga Day and performed Yoga and created awareness.

Van Mahotsav: 01/07/2022-07/07/2022

The Van Mahotsava was observed in the first week of July 2022 by BSI and all its regional centres and units. On this occasion, a series of programmes, such as plantation drives, awareness programmes and competitions were organized at various regional centres of BSI. Around 1220 plants of 170 different species were planted in BSI, AJCBIBG, Howrah and 300 saplings at BSI, NRC, Dehradun.

Under outreach activities, the scientists of BSI also visited various school and colleges to encourage students for plantations and setting up medicinal gardens in school premises. All scientist and staff of BSI, AJCBIBG, Howrah attended the closing ceremony of Van Mahotsav on 15/07/2022 joined by the Chief Guest Shri Praveen Kumar Tripathi, IPS, Commissioner of Police, Howrah City Police and transplanted *Camellia japonica* L. near the Cafeteria. They also Participated in Tree Challenge organized by ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding, Coimbatore in connection with Van Mahotsav 2022.

BSI, ANRC, Port Blair Organized one-week tree plantation programme on this occasion and planted numbers of seedlings of rare, threatened and endemic plants and edible fruiting tree species, also organized the same at the Kendriya Vidyalaya premises, Port Blair and planted over 100 numbers of seedlings of rare, threatened and endemic plants and edible fruiting tree species (*Baccaurea ramiflora* Lour., *Bentinckia nicobarica* (Kurz) Becc., *Cycas zeylanica* (J.Schust.) A.Lindstr. & K.D. Hill, *Garcinia dhanikhariensis* S.K.Srivast. and *Mangifera indica* L.).

BSI, HAWHRC, Solan planted state tree *Cedrus deodara* tree sapling in campus as part of the week-long celebration.

BSI, SRC, Coimbatore organized the Tree Planting Programme with active participation of students and Teachers of Coimbatore Corporation School.

Azadi Ka Amrit Mahothsav:

The *76th Independence Day* was celebrated on 15/08/2022 at the BSI, AJCBIBG, Howrah and all its regional centres and units. The Director, BSI hoisted the National flag. Many awareness programmes, competitions and Tiranga rally were organized and 75 saplings were planted by officials Under Azadi Ka Amrit Mahotsav programme. *Har Ghar Tiranga* rally was organized by different regional centres of BSI and all the staff participated in those rallies to mark the 75 years of India's independence.

On this occasion, BSI, ANRC, Port Blair organized 'Bio-diversity Conservation Awareness Programme (plantation programme of Endemic Plants)' in Experimental Garden of BSI on 08/08/2022.

Different regional centers of BSI celebrated Yoga awareness Programme, Countdown to 8th International Day of Yoga on 06/05/2022 as part of Azadi ka Amrit Mahotsav. All the Officers and Staffs of different regional centers of BSI has participated and performed Yoga as part of Yoga@Workplace programme.

International Day of Preservation of Ozone Layer: 16/09/2022

All regional centres and units of BSI celebrated International Day of Preservation of Ozone Layer.

On this occasion, BSI, ANRC, Port Blair Organized drawing competition for school children.

BSI, CBL, Howrah arranged a speech on "Global Cooperation Protecting Life on Earth" and organised Quiz Competition between two local Schools *viz.* Maria's Day School and Thanamakhua Model High School.

BSI, DRC, Hyderabad organized a lecture on "Montreal Protocol@35: global cooperation protecting life on earth" and celebrated the day with six educational institutions from the Telangana State.

BSI, HAWHRC, Solan conducted an Inter-school sit and drawing competition and scientists delivered a short lecture on the importance of ozone layer and protection of life on earth to the school children.

BSI, SRC, Coimbatore invited 40 students from different school in Coimbatore and arranged essay competition on "OZONE".

World Wetlands Day-02/02/2023

All regional centres and units of BSI celebrated World Wetlands Day. Various competition were organized such as essay writing competition, painting competition, extempore competition for the local school children.

The staff of BSI, AJCBIBG, Howrah organised an awareness campaign on World Wetland Day. Oral presentation was given and an extempore competition on Wetland was organised.

BSI, ANRC, Port Blair celebrated the occasion at Vivekananda Kendra Nagar Palika Vidyalaya, Ranchi Tekri and post tsunami wetland of Sippighat.

A Slogan writing competition was organized by BSI, CNH, Howrah at Thanamakua Model High School, Howrah on this occasion to sensitize students about the importance of Wetlands.

BSI, WRC, Pune celebrated the day at Kendriya Vidyalaya, BEG, Pune.

Miscellaneous

- *World Bicycle Day* was celebrated by BSI, CBL, Howrah to create the awareness and promote personal health, fitness as well as the health of the Environment and Sustainable development, with this connection Cycle rally was conducted at BSI, AJCBIBG, Howrah premises on 03/05/2022.

- BSI, ISIM, Kolkata celebrated *World Museum Day* on 18/05/2022. On this occasion, a guided tour and documentary was screened in two phases

- BSI, ISIM, Kolkata celebrated *World Soil Day* on 05/12/2022, and *National Pollution Prevention Day* 12/12/2022 by organizing Gallery visit, popular talk, documentary film shows and extempore speech competition with college students.

- BSI and its regional centres and units observed *74th Republic Day* in grand manner. It this connection National flag was unfurled by Director, BSI at the AJCBIBG, BSI, Howrah premises in presence of senior scientists and staff of BSI.

- BSI and all its regional centers and units celebrated *World Wildlife Day* 2023 on 03/03/2023 with a slogan writing competition on the theme "Partnerships for Wildlife Conservation in online mode"

- BSI and all its regional centers and units observed *World Taxonomist Appreciation Day* on 19/03/2023 to express the gratitude to all taxonomists for their dedication towards revealing the secrets of numerous species on earth. on the occasion a special lecture was organized on "Taxonomy-ANI's Historical Expeditions" at BSI, ANRC, Port Blair on 22/03/2023.

ACTIVITIES

- **MISSION LiFE** (Lifestyle for Environment)
  As part of the Mission LiFE Programme, the staff of BSI, AJCBIBG, Howrah has sensitised more than1129 students, teachers and parents of various schools and colleges of West Bengal, a rally on Mission LiFE - an initiative for a sustainable and healthy lifestyle was organised by Botanical Survey of India on 10/12/2022.

  BSI, ANRC, Port Blair organized the campaign on Mission LiFE to motivate islanders to use of eco-friendly products and climate friendly behaviours in daily life on 12/01/2023 and 18/01/2023, also arranged a special lecture for officers and staff of forest at office of the Range Forest officer, Manglutan, Department of Environment and Forest, South Andaman Division as a part of Mission LiFE on 31/01/2023.The same had also organized a special campaign to create awareness on "Natural Resources in our Daily Life" to motivate use of eco-friendly products at different parts of A&N islands, scientists delivered a special invited lecture on "Lifestyle changes that youth may undertake in line with objectives of life" during Seminar on Mission LiFE organised by Nehru Yuva Kendra, Port Blair on 27/02/2023,

  All officers and staffs of BSI, AZRC, Jodhpur participated in the Mission LiFE rally on 10/12/2022.

  BSI, BGIR, Noida Implemented Mission life activities to spread awareness among visitors and School Children time to time.

  BSI, CBL, Howrah conducted awareness program related to Mission LiFE with students and teachers of three schools.

  Under the Mission LiFE campaign, a school visit programme at Thanamakua Model High School, Howrah was conducted by BSI, CNH, Howrah on 30/01/2023 and more than 100 students were sensitized during the visit.

  BSI, DRC, Hyderabad organized a no of lectures on Mission LiFE to students from different school, college and universities.

  BSI, HAWHRC, Solan organised "MISSION LiFE" Rally on 10/12/2022 and campaigned in Markets, Shops, Bus stand & offices to aware people to Save water, save energy and adopt Life style for environment etc.

Scientists of BSI, Hqrs., Kolkata conducted a Green Audit at Berhampur College, Murshidabad, W.B. and highlighted the need to nudge individuals' action and undertake simple acts in their daily lives to address climate change.

BSI, WRC, Pune organized Mission LiFE Environment awareness programme at St. Mira College for women, Pune on 24/01/2023.

- All the Officers and Staffs of Botanical Survey of India observed and took "*Swachh Bharat Harit Bharat Green Pledge*" on 11/04/2022. On this occasion different regional centers and units organized campaign or awareness programmes for students or general public to avoid the use of single use plastic.

  BSI, CBL, Howrah celebrated it with faculty members and students of Department of Botany, Netaji Mahavidyalaya, Aarambagh, Hooghly.

- The Indian Virtual Herbarium (IVH) portal has been inaugurated by the Hon'ble Union Minister, MoEF&CC Shri Bhupender Yadav from BSI, CNH, Howrah on 01/07/2022. The same has been narrated by Shri Narendra Modi, the Hon'ble Prime Minister, in his 91st session of 'Man ki Baat' programmes, also appreciated the IVH portal of BSI suggesting it will serve as an important national resource to the Botanical fraternity.

- BSI, ISIM, Kolkata organized *'World Coconut Day Exhibition'* on 02/09/2022, where UG & PG students of the Botany Department, R.K. Mission Vivekananda Centenary College, West Bengal participated. On this occasion, 75 coconut trees were planted in the BSI, AJCBIBG, Howrah.

- BSI, ISIM, Kolkata organized *World Bamboo Day* exhibition for visitors and explained Importance and usefulness of Bamboos in Human welfare on 18/09/2022.

- To commemorate the 153rd Birth Anniversary of Mahatma Gandhi, '*Swachh Bharat Abhiyan*' was observed by BSI, AZRC, Jodhpur on 02/10/2022. All officers and staff members participated in this Cleanliness programme.

- All regional centers and units of BSI Implemented *Swach Bharat Special Campaign 2.0*. Cleanliness drive was undertaken in the office under this campaign from 2/10/2022-31/10/2022

- All officers and staff of BSI celebrated *Rashtriya Ekta Divas* and took 'Unity Pledge' and 'Integrity Pledge' on 31/10/2022 to commemorate the birth anniversary of Sardar Ballav Bhai Patel and observed *Vigilance Awareness Week* from 31/10/2022 onwards.

  BSI, NRC, Dehradun Participated in 'Run for unity' programme organized by BSI, ZSI and other NGOs in Dehradun on 31/10/2022.

- BSI, BGIR, Noida organised a rally on 10/12/2022 for spreading awareness in public in respect to '*Save Life*' programme of Govt. of India.

- BSI, APRC, ltanagar, in collaboration with G.B. Plant National Research Institute of Himalayan Environment and Sustainable Development & ZSI, ltanagar organized *International Mountain Day* programme on 11/12/2022.

  BSI, HAWHRC, Solan organised & celebrated "International Mountain Day" (Theme- Women Move Mountains) in Village Pandah on 11/12/2022. BSI, NRC, Dehradun also celebrated the day.

EVENTS

- BSI, SRC, NOEG, Yercaud participated in the *45th Annual Flower Show* organized by the State Horticulture Department, Government of Tamil Nadu from 25/05/2022-31/05/2022 and demonstrated 100 potted plants, grouped under Orchids, Medicinal Plants, Peperomia, Begonia, Endemic, Endangered & Threatened plants, Cacti & Succulents and 4 Gymnosperm cones.

- BSI, Hqrs, Publication Section participated in the *25th National Exhibition* at Central Park Maidan, Salt Lake from 24/08/2022-27/08/2022 where the section had installed a stall presenting the popular books published by BSI for display.

- BSI, ERC, Shillong participated and displayed an exhibition on the activities of BSI in the *Science Fest 2022* on the theme of 'Science and Technology for a sustainable future', organized by the Synod College, Shillong, sponsored by DBT, Ministry of Science and Technology, Govt. of India on 21/10/2022.

- BSI, ISIM, Kolkata participated in the '*Damodar Mela*' from 07/12/2022-13/12/2022 at Amta Howrah, wherein the activities of BSI and importance of biodiversity, environment and plants were disseminated among the villagers.

- BSI, Hqrs, Publication Section participated in the *26th Sundarban Kristi Mela O Lokosanskrite Utsab 2022*, Kultali, South 24 Parganas from 20/12/2022-29/12/2022 where the section had installed a stall presenting the popular books published by BSI for display.

- BSI, WRC, Pune Conducted an official tour to Akluj, Solapur *w.e.f.* 22/12/2022 to 24/12/2022 to participate in "*Shinning Maharashtra 2022*" exhibitions where exhibits were showcased for environmental awareness work (posters, books, etc) of BSI for three days.

- BSI, WRC, Pune participated in *108th Indian Science Congress* from 03/01/2023-07/01/2023 at Nagpur and exhibited BSI stall during the India Pride Expo 2023.

- BSI, WRC, Pune attended and set up of the BSI pavilions in the first ECSWG Meeting in connection with G20 summit from 09/02/2023-11/02/2023 in Bangalore.

- BSI, BGIR, Noida Organized *Annual Winter Flower Show*, inaugurated by Hon'ble Mr. Bhupender Yadav Minister, MoEF&CC during 28/02/2023-05/03/2023.

- BSI, CNH, Howrah and BSI, CBL, Howrah jointly participated in *Acharya Prafulla Chandra Roy Smarak Vigyan Mela O Pradarshani* at Belgachis, Kolkata from 16/03/2023-18/03/2023.

- BSI, AZRC, Jodhpur participated and set up a stall at the '*Vriksha Utpadak Mela*' organized by Arid Forest Research Institute, Jodhpur on 17/03/2023 where the representatives exhibited the BSI publications, museum artifacts and provided information on the plant resources of the arid and semi-arid areas and promote the Mission LiFE campaign.

ACTIVITIES TO PROMOTE RAJBHASHA

Botanical Survey of India and it's all regional centres organize different Hindi seminar, Hindi Workshops (Quarterly Hindi Workshop), Hindi Pakhwara, Quarterly Hindi Rajbhasha Meeting etc to promote Rajbhasha throughout the year the heads of offices organize necessary meetings and made preparations to attend Parliamentary Committee Inspection (Hindi). BSI and all its regional centres and units observed Hindi Pakhwada (On *Hindi Saptaha* from 14/09/2022-28/09/2022). On this occasion, many events like essay competition, speech competition, noting and drafting, recitation, quiz competition etc. were organized and officials were encouraged to use Hindi in official communications. Zealous celebration of Hindi Diwas was observed all over BSI on 14/09/2022.

BSI, ANRC, Port Blair organized two Hindi Workshops.

BSI, AZRC, Jodhpur organized four Hindi Workshops *viz*. i. On Hindi Diwas Dr. D.D. Ojha, Former Scientist, Ground Water Department, Govt of Rajasthan, delivered lecture on "*Swatantra Bharat Ki 75 Vaigyanik Uplabdhiya Evam Vigyan mein Hindi Ki Bhawi Bhumika*". ii. On 26/09/2022 Shri Navin Kumar Yadav, Deputy Director (Rajbhasha), CAZRI, Jodhpur delivered lecture on the topic '*Tippan Aalekhan'*. iii. on 31/03/2023, Shri Navin Kumar Yadav, Deputy Director (Rajbhasha), CAZRI, Jodhpur delivered lecture on the topic *raajabhaasha kaaryaanvayan mein samasyaen evan samaadhaan* iv. On 31/03/2023 Prachaary Shri Nandakishor Yadav, Govt. Sr. Sec. School delivered lecture on the topic *Prayojanmoolak Hindee- Ek Parichay*. All the employees attended the address of Honorable Home Minister during webcast of "Second All India Official Language Conference" organized on the occasion of Hindi Diwas on 14/09/2022 in Surat.

BSI, CBL, Howrah organized one day Hindi Workshops on "*Rajbhasha Niti evam Hindi Tankan ke Vividh Tools*" on 23/02/2023.

BSI, CRC, Allahabad organized Hindi Workshop on "*Hindi Saralta Ke Naye Aayam*" on 06/ 09/2022.

Outreach activities at AJCBIBG 1. World Environment Day, 2022; 2. Azadi Ka Amrit Mahothsav; 3, 5–9. MISSION LiFE; 4. International Day of Yoga, 2022.

Celebration of Van Mahotsav at BGIR in collaboration with NMNH

Rally organised by BGIR, Noida for creating awareness under Mission LiFE Programme.

Yoga Day celebration at NRC, Dehradun

Ozone Day celebration at BSI, NRC, Dehradun

BUDGET ESTIMATE 2022-2023

GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE
BOTANICAL SURVEY OF INDIA
CGO COMPLEX, SALT LAKE , KOLKATA- 700064

ALLOCATION OF REVISED BUDGET TO REGIONAL CENTRES & OTHER OFFICES OF BOTANICL SURVEY OF INDIA FOR THE YEAR 2022-2023

08 TH APPROPRIATION FOR 2022-2023 DATED 09.03.2023 (Rs. In thousand)

Sub Major Head 01 (Survey-Botanical) Minor Head 01.001 (Direction & Administration)

Demand No. 028 Detailed Head 04.01 (Botanical Survey of India)

(Rupees in thousand)

DDO	SAL	WAG	OTA	REWARD	MED	DTE	FTE	OE	RRT	PUB	OAE	SMT	ADVT	MW	PS	OCS	GIA	SCH	TOTAL
HQRS	106800	0	0	1500	2355	3770	1000	12560	11600	2500	75	400	15	38000	0	7675	15000	4500	207450
BG, Howrah	107500	0	0	0	1200	500	0	14700	0	0	0	0	0	0	0	24500	0	0	148400
CNH, Howrah	47000	0	0	0	300	600	0	11400	0	0	0	0	0	0	0	4250	0	0	63550
CBL, Howrah	16800	0	0	0	50	112	0	2300	0	0	0	0	0	0	0	225	0	0	19487
ISIM, Kolkata	21500	0	0	0	120	150	0	2400	0	0	0	0	0	0	0	1550	0	0	25720
DRC, Hyderabad	0	0	0	0	0	300	0	2300	0	0	0	0	0	0	0	1675	0	0	4075
BGIR, Noida	0	0	0	0	0	300	0	8800	0	0	0	0	0	0	0	15800	0	0	24900
FRC, Shillong	35000	0	0	0	200	400	0	4700	0	0	0	0	0	0	0	3550	0	0	43850
WRC, Pune	40000	0	0	0	800	600	0	3650	0	0	0	0	0	0	0	4200	0	0	49250
NRC, Dehradun	34700	0	0	0	1700	800	0	3450	0	0	0	0	0	0	0	4250	0	0	44900
SRC, Coimbatore	46000	0	0	0	350	750	0	3500	0	0	0	0	0	0	0	3950	0	0	54550
CRC, Allahabad	24700	0	0	0	385	400	0	2800	0	0	0	0	0	0	0	2500	0	0	30785
AZRC, Jodhpur	16200	0	0	0	250	350	0	2150	0	0	0	0	0	0	0	2750	0	0	21700
ANRC, Port Blair	17000	0	0	0	250	700	0	2200	0	0	0	0	0	0	0	3950	0	0	24900
APRC, Itanagar	12300	0	0	0	20	450	0	1500	0	0	0	0	0	0	0	2135	0	0	16405
SHRC, Gangtok	14000	0	0	0	20	318	0	1700	0	0	0	0	0	0	0	2540	0	0	18578
	540000	0	0	1500	8000	10500	1000	79910	11600	2500	75	400	15	38000	0	85500	15000	4500	798500

07/03/23

(C. MURUGAN)
SCIENTIST-E & HEAD OF OFFICE