



Botanical Survey of India

Editorial

The world is a beautiful place to live in with all the different kinds of plants and animals in myriad hues and sizes. They all are as much a part of the Environment as we, the human beings are. Each one of us forms a component of what is known as Environment. Thus, in order to evade our extinction, each one of us have to make a conscious effort in safeguarding our surroundings. By doing so we will not be doing a favour to some body else but, we shall be safeguarding our own future.

The development of Environment Information Systems or ENVIS is one such contribution in this direction on the part of the Ministry of Environment and Forests. There are many ENVIS centres scattered all over India including the one in the Botanical Survey of India at Calcutta.

Botanical Survey of India has been entrusted with the responsibility to setup and develop a database on Plant Ecology under the ENVIS programme. Under this project, the hard-ware components procured includes a PC AT 486 DX System with a Dot Matrix Printer. A software for storage and retrieval of data is also being developed by our scientists in collaboration with the Engineers of reputed consultancies. At a later stage it is proposed to have a network-linkage amongst all the ENVIS centres in the country and with its central database in the MOEF.

This is the first ENVIS Newsletter brought out by our organisation. In the present issue information on Mangrove Ecosystems of West Bengal, importance of Wetland Plants Resources, the pitcher plant of India and a rare fern, has been given.

I wish all success to this project and congratulate each and every person who have assisted in bringing out this publication. I sincerely hope that the same enthusiasm will be prevalent in the forthcoming issues. I am thankful to the Ministry of Environment and Forests, New Delhi for their constant help and guidance in initiating this programme in the Botanical Survey of India.

(P. K. Hajra)

Place: Calcutta

Director

Date: Sept., 1994 Botanical Survey of India

ENVIS

(Environment Information Systems)

NEWSLETTER



Bicentenary Gate inauguration address by Hon'ble Minister Sri Kamal Nath at I. B. G.

Message

Diverse environmental parameters and complex ecological systems are the basic components for biodiversity. An accurate database on these components and interacting environmental factors will be a primary necessity for rational development of various environmental and ecological planning and management programmes. Further, disseminating this information to a wide range of users through a network of distributed database concept will be essential to promote the total conservation efforts in the country. Since plant life is intimately bound with developing a healthy environment, ecological information disseminated through database system would be of immense help in the whole process of conservation and sustainable development. I am happy that the Envis Centre on Plant Ecology located in Botanical Survey of India, Industrial Section, Indian Museum, Calcutta has brought forward its first Newsletter in meeting the task of disseminating information on plant ecology to the grassroot level which will be very much helpful to the Local People, Planners, Administrators, Scientists and Environmentalists.

(R. Rajamani)

Secretary to the Govt. of India

July — 1994

Wetland Plant Resources for Conservation

L.K. Banerjee and P. Venu

Wetlands by definition include areas transitional between aquatic and terrestrial ecosystems where the water table is usually at or near the surface or the areas covered by shallow waters. They include marshes, swamps, floodplains, bogs, peatlands, shallow ponds and littoral zones of the larger water bodies. India by virtue of its topographic, climatic and geographical diversity supports varied wetland habitats. Based on the stratigraphic and tectonic history, wetlands can be grouped under four major categories. They are (1) Wetlands of Himalayan Mountains, (2) Wetlands of Gangetic Plains, (3) Wetlands of Peninsular Uplands, (4) Coastal Wetlands and (5) Wetlands of Oceanic Islands. A national inventory of wetlands entitled All India Wetland Survey, was initiated by the Govt. of India in late 1960s. A large number of sites have been listed and the data has been updated over the years. A wetland working group was constituted by the DOEN in the early 1980s and it prepared a directory of Indian Wetlands in the year 1990. A total of 2167 natural wetlands covering an area of 14,50,861 ha and 65,253 man made wetlands covering 25,89,266 ha were recorded. The Ministry of Env. & For. has identified 16 wetlands

Harike (Punjab), Renuka (Himchalpradesh) Kabartal (Bihar) Pichola (Rajasthan), Loktak (Manipur), Ujni (Maharashtra), Bhoj (Madhyapradesh), Chilka (Orissa), Koleru (Andhrapradesh) and Astamudi (Kerala).



Cyperus pangorei Rottb. an aquatic sedge for mat industry.

Plant diversity in these aquatic habitats is remarkable both in microphytes and macrophytes exhibiting unique adaptations to these specific habitats. Besides, Wetlands have unique ecological functions such as in recharging groundwater, control of floods, providing ideal habitat for different plant and animal species. Wetland destruction and degradation have become major causes for the progressive loss of rich biological diversity associated with these habitats. Over exploitation, hunting, poaching and conversion of these habitats for building construction and other purposes have become major threats. A number of plant and animal species dependent on these wetlands are currently threatened. Plants like *Aldrovanda vesiculosa*, species of *Utricularia*, *Halophila stipulacea*, *Hygrophila pinnatifida*, *Nymphaea tetragona* and *Aeschynomene aspera* are at various stages of extinction in India.



Schumannianthus dichotomus very useful raw material for preparation of "Sital Pati".

for research and survey which include Dal and Wular Lakes (Jammu and Kashmir), Kanjli and

Some of the well-known aquatic species of the families Cyperaceae, Typhaceae and Marantaceae are the basic sustainable plant

resource for significant development of the rural economy in many parts of the tropical countries. Though in many cases, their utilization remains restricted at regional level but they can make an important contribution to the exports after updating the rural technology and promoting awareness. Recent field investigations in the districts of Midnapur, Coochbihar and Howrah in West Bengal reveal the intricate link of the



Typha angustifolia L. raw material for mat, roof thatching, basket and rope making.

livelihood of the rural population with the wetland species namely *Typha angustifolia*, *Cyperus pangorei* and *Schumannianthus dichotmus*. The shoot biomass of these species are used in mat industry, in thatching of roofs, basket and rope making. They also contribute in preventing soil

erosion, mitigating water pollution and in improving water quality. Several aquatic plants are grown in aquaria to replenish oxygen in the water and as fish food, besides beautification.

Realising the importance, the Director, Botanical Survey of India has initiated some research programmes on wetlands. A new project has been initiated at the Industrial Section to create a comprehensive database with information regarding the distribution of such aquatic plant resources, their diverse economic, commercial and medicinal importance and the interacting ecological and environmental factors for their regeneration. The scientists of Industrial Section, Botanical Survey of India have already undertaken five field tours to different districts of West Bengal to collect information in these aspects on these three species. Besides, a programme on the lakes of Indian Botanic Garden was taken up in collaboration with the scientists of Zoological Survey of India to understand the biodiversity of these water

bodies. A programme on Chilka lake was also taken up independently for the same purpose. The objective of these studies is to develop a comprehensive Computer Database Management System on different wetland plant resources of the country for its ready retrieval.

The pitcher plant - *Nepenthes khasiana* Hook. f.

U. Chatterjee and M.K. Manna

The Indian Pitcher Plant *Nepenthes khasiana* Hook. f. belongs to the order Theales and the family Nepenthaceae. The genus has +80 species and is distributed in S.E. Asia, India, Indo-China, Sychelles, Madagascar and Australia (Simpson, 94). In India this species is confined to Jorain, Bhagmara, Nongstoin, Muktapur in Khasi, Jaintia & Garo Hills of Meghalaya. The plant is first described by J.D. Hooker (in DC. Prodr. 17:102, 1873) based on his own collection from Khasia (Hook. f. & Thomson) and those of Wallich (Wall. Cat. no. 2244 in part) and Griffith from Jaintia Hills. The common local names in different languages are "Tiew-rakot" (Khasi) a demon flower, "Ksete-phare" (Jaintia) a device for trapping insects, "Memang-Koksi" (Garo)

a basket of the devil and "Kalas Udvid" in Bengali. This species grows in open rocky slopes amidst grass and humid forest edges. Its habitat ranges from 1200 m to 1500 m with temperature varying from 21° C - 30° C.

The plant is easily distinguished by its dioecious character, the pendant showy pitchers ("Pitfall traps" type) and the monadelphous staminate flowers. The pitcher develops by an invagination of the upper surface of the tip of the leaf. The end of the tendril develops into a pitcher, complete with a lid projecting over the mouth in a mature leaf. Numerous nectar glands are studded on the inner surface and at the entrance to the pitcher. The insects which are attracted by its colour

and odour, slip down into the digestive fluid at the bottom, where their bodies are slowly digested. The plant gets its vital nitrates and other nutrients from trapped insects rather than earth. It does best in poor soil where conventional and potentially hardier plants are not able to compete with it. Contrary to the common belief, the lid does not close down to trapping insects. But due to the peculiar system of the slippery glands the trapped insect cannot come out. Its flowering and fruiting time is from June to October.

The most common method of propagation of this species is by root suckers and stem cuttings. Though it can be grown from seed, but this is a time consuming process and depends on seed availability and viability. This can be speeded up to some extent by the treatment of growth hormones. Advances in tissue culture methods have also added a "new age" to the plant growers.

This plant is widely used by the local inhabitants. The pitcher containing insects is ground into a paste and mixed with water and is given to cholera patients. The liquid inside the un-opened pitcher is also used as a remedy for urinary troubles, eye diseases, diabetes and for gynaecological diseases. The pitcher with its fluids is made into paste and applied on affected portions in leprosy. The plant is also used for ornamental purposes and is of great interest to plant morphologists.

This plant is endangered and occurs in small and isolated pockets in Meghalaya. This is due to

illegal trade, deforestations and practice of shifting cultivation. Excessive exploitation by students and other visitors are also responsible for its depletion.

Strict regulation of trade of this taxon has already been enforced and the plant has been included in the CITES list in Appendix -1. On recommendation of the authorities of Botanical Survey of India, the habitat of this particular species has been declared as "Protected Area" by the State Government. The Botanical Survey of



Nepenthes khasiana Hook. f.

India has also undertaken a programme for its regeneration by way of cuttings, tissue culture methods etc. in their experimental gardens at Shillong and Barapani. Since Botanical Survey of India has completed detailed taxonomic studies on threatened insectivorous plants in India, a comprehensive Computer Database Management System on the taxonomy, ecology, economic uses and distribution of the insectivorous plants will be of immense help.

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Ophioderma pendula : A Rare Fern Needing Conservation

R.D. Dixit, B. Ghosh and R. K. Ghosh

The genus *Ophioderma* (Bl.) Endlich belongs to the family Ophioglossaceae is represented by three species in the world, of which only one species *O. pendula* (L.) Presl. was recorded in India only from Great Nicobar (cf. Thothathri *et al.* 1969).

Present field observation indicates the species to be very rare in occurrence with scattered and thin populations, due to fast depletion of rain forests of Great Nicobar Island.

This fern is epiphytic on palms and other trees

in dense rain forest with short-creeping rhizomes and 2-3 m long ribbon like tropophylls drooping downwards. Fertile spikes are 20-30 cm long.



Ophioderma pendula (L.) Presl.

It requires an urgent need for *in situ* conservation to save this unique species of fern occurring only in the oceanic island. Recently, part of the Great Nicobar Island has been declared as Biosphere Reserve and the species will be conserved in the area for its survival. Botanical Survey of India has already introduced the species in the Andaman Circle in its Garden for *in situ* conservation.

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Mangrove ecosystem of West Bengal

L. K. Banerjee and A. R. K. Sastry

Mangroves are defined as plant species taxonomically unrelated with dark green shining leaves and negatively geotropic roots growing in the tropical and sub-tropical sheltered coastline along the intertidal regions of estuaries, creeks, canals and shallow lagoons. They exhibit maximum modification in the morphology, physiology and bio-chemistry with adaptive characters like pneumatophores, stilt roots and vivipary for withstanding partly submerged saline conditions of the habitat.

As per the estimate of FAO/UNEP, 7.1 million hectares of the land is covered under mangrove formation in the world. In the areawise ranking Indonesia ranks first followed by Australia, Malaysia, Bangladesh and India.

In India, mangroves occur along the east coast, west coast and Andaman and Nicobar Islands. The Gangetic delta complex in the southern part of West Bengal is situated in a sheltered part of Bay of Bengal. This area known as Sunderbans is massively dissected by innumerable meandering creeks, canals and distributaries forming several tidal fringes, islands and tidal flats. This attractive fragile ecosystem comprises one of the largest mangrove habitats in the country. It covers an area of 4200 sq. km. while the total area of the entire country stands at 6740 sq. km. This dynamic mangrove ecosystem is one of the most unique and wonderful with regard to its biological diversity and during high tide, 70% of the land remains submerged with varying degrees of salinity, continuous deposition of silt. Here biotic diversity is enormous and attractive. Vegetation represents a seral type depending on the variation of salinity, tidal flow and soil morphology. Plant species are remarkably adapted to withstand the high salinity of the water, greater velocity of the tidal flow and less aeration of the soil.

Here both fish and crabs are found creeping up the trees while tigers roaming easily on muddy substrate infested with strong woody breathing roots. Tigers sustain both aquatic and terrestrial inputs in their foodchain with an unique habit of drinking salt water. The biomass productivity in this ecosystem matches well with the best reserves in India. The mangroves in Sunderbans represent a complex ecological system due to their vastness in extent and innumerable ramifications of the riverine system which are the ideal habitat for the growth of maximum number of mangrove species forming different associations and zonations. Such zonations of vegetation are not so prominent along the other mangrove areas in India. Diversity of flora and fauna and species density and variability is maximum in this

part and gradually tapers from the Sunderbans towards the west coast.

Mangrove ecosystems play an important role in fish production, coastal stabilization and in the maintenance of critical habitats for many common, threatened and endangered species. It forms a very unique habitat for the Royal Bengal tigers, monkeys, spotted

deers, wild boars, nesting and hatching ground for millions of migratory birds and the curious Olive Ridley turtles. Millions of people use the mangrove products such as fish, crabs, honey, fuel wood, timber, thatching material, gum, resin etc. for subsistence and survival.

However, information based with regard to different aspects of mangroves in general and of the Sunderbans in particular needs further strengthening. Hence it is envisaged to develop a Database Management System on this subject with particular emphasis on the taxonomy, nomenclature, distribution and ecological characteristics of mangrove species in India, in which the scientists of the Botanical Survey of India have made pioneering and important contributions.



Mangrove Forests of Sunderbans.

Recent Prime Activities

1. Botanical Survey of India participated in the India International Trade Fair which was held at Pragati Maidan, New Delhi from 14th to 23rd November "1993". The theme of the trade fair was "Environment & Development", B. S. I. was assigned to put an exhibition under the sub theme "Endangered species and their conservation". Photographs and live plants were displayed which were appreciated by many distinguished scientists, bureaucrats and laymen.
2. Director, Botanical Survey of India gave a talk on Rare and Endangered Orchids of India in an ecodevelopment camp organised by school of Fundamental Research at Purulia in December 1993.
3. Botanical Survey of India participated in the Indo-British workshop on "Wetlands and Biodiversity" in December 1993.
4. Botanical Survey of India was assigned to organise a meeting of the Empowered Committee on National Environmental Awareness Campaign by the Ministry of Environment and Forests. This was held in the Indian Botanic Garden in December 1993 and was chaired by Sri Rajamani, Secretary Ministry of Environment and Forests. Several NGO's, State Government Departments and representatives of prime academic institutions from the Eastern Zone participated. The proposals submitted by these organisations were scrutinised and financial assistance was given for creating environmental awareness among the people.
5. The Indo-British Workshop on Exclusive Economic Zone was held in Calcutta in January 1994. Director, Botanical Survey of India along with other scientists projected the important plant resources of the E. E. Z. in India and also recommended detailed studies on fungi along with this zone. Prof. A. K. Sharma of Calcutta University chaired the meeting.
6. Botanical Survey of India and School of Fundamental Research jointly organised a seminar on Plant Diversity at the Ashutosh Centenary Hall, Calcutta. This was attended by Sri Chandi Prasad Bhatt and other rural women who were directly associated with the Chipko Movement. Director, Botanical Survey of India gave a popular talk on Biodiversity in Hindi to make it comprehensive to the participants.
7. Ministry of Environment and Forests directed Botanical Survey of India to conduct site visits for Environmental Impact Assessment. The Deputy Director, Industrial Section B. S. I. visited the following areas in this context :
 - a. Teesta - Mahananda River Project
 - b. Gujarat Thermal Project of Lignite Mining area in Ahmedabad &
 - c. Gas Turbine Power Plant in Baroda.
8. A group discussion on formulation of appropriate methods of studying Bio-diversity was held in Spirit Building, Calcutta. The participants included Prof. Madhav Gadgil, Indian Institute of Science Bangalore, Director, Z. S. I. and Director, B. S. I. and other scientists from B. S. I. & Z. S. I.
9. The Museum Authorities, Calcutta organised a training course on collection and preservation of herbarium specimens. Director, Botanical Survey of India provided required know-how on this aspect through various demonstrations and talks.
10. A list of Plant species that are to be banned from export under the CITES convention was enumerated in a group discussion under the chairmanship of Director, Botanical Survey of India. Other participants included the Regional Deputy Directors of Wild Life (Ministry of Environment & Forests) and scientists of B. S. I.
11. The West Bengal Government organised a trade fair at Salt Lake in which Botanical Survey of India participated by putting up a stall. The main theme of inculcating a sense of environmental awareness in the common man was displayed with the help of posters, photographs and live plants. The stall was judged as one of the best stalls and B. S. I. secured a prize in this context.
12. Botanical Survey of India launched a joint project along with Zoological Survey of India to study the biodiversity of the lakes in the Indian Botanic garden.

13. A joint expedition to Sikkim was organised under the leadership of Botanical Survey of India. Its aim was to develop ecotourism along the route followed by Joseph Dalton Hooker during his floristic exploration in Sikkim in the middle of 19th Century. The participants included scientists from Botanical Survey of India, Zoological Survey of India, Anthropological Survey of India, Sikkim Forests & Tourism Departments, Sikkim Govt. The routes followed by W. W. Smith and C. H. Cave were also explored.
14. Convention on International Trade in Endangered Species of wild flora & fauna -

list compiled by B. S. I. scientists for inclusion in CITES appendices I & II were discussed by the Director, Botanical Survey of India in a Plant Committee Meeting at San Miguel de Allende, Leon, Mexico in May 1994. This will be finalised in the 9th Conference of parties to be held in U. S. A. in November 1994.

15. Hon'ble Minister, Environment & Forests, Sri Kamal Nath inaugurated the Bi-Centenary Gate of the Indian Botanic Garden on 15th July 1994. During his visits he planted saplings of "Ashoka" and "Neem" and released two books.

List of some recent publications

1. Bulletin of the Botanical Survey of India Vol. 33 : 1991.
2. Economic Plants of India Vol. 2 by M. P. Nayar, K. Ramamurthy & V. S. Agarwal, 1994.
3. A Manual of Cultivated Palms in India by S. K. Basu & R. K. Chakraverty, 1994.
4. Flora of Madhya Pradesh Vol. - 1, Edited by D. M. Verma. et al. 1994.
5. Flora of Thiruvananthapuram District, Kerala by M. Mohanan & A. N. Henry, 1994.
6. Flora of Yavatmal District, Maharashtra by S. Karthikeyan & Anand Kumar, 1993.
7. Paschimi Himalaya Ki Vanaspatiyan by Debendra Kr. Sinha et al. 1994.
8. Bicentenary Celebration of Indian Botanic Garden - A pictorial Glimpse by U. P. Samaddar & B. Roy, 1994.
9. Annual Report for the year 1989-90 unpriced.
10. Flora of Raigad District, Maharashtra State by M. J. Kothari & S. Moorthy, 1993.
11. Threatened Plants of India - A State - of - the - Art Report by S. K. Jain & A. R. K. Sastry , 1980.
12. Conservation of Tropical Plant Resources by S. K. Jain & K. L. Mehra, 1983.
13. An Assessment of Threatened Plants of India by S. K. Jain & R. R. Rao, 1983.
14. Endemic Plants of Indian Region Vol. 1. by M. Ahmedullah & M. P. Nayar, 1986.
15. Red Data Book of Indian Plants Edited by M. P. Nayar & A. R. K. Sastry,
 - Vol. 1. 1987.
 - Vol. 2. 1988.
 - Vol. 3. 1989.

The volumes deal with Red Data Sheets on threatened vascular plants and are profusely illustrated with line drawings.
16. Mangroves in India - Identification Manual by L. K. Banerjee, A. R. K. Sastry & M. P. Nayar , 1989.
17. Plant Resources of Jaldapara Rhino Sanctuary by L. K. Banerjee, 1993.
18. Flora of India :
 - Vol. 1 (Ranunculaceae - Barclayaceae. Edited by B. D. Sharma, N. P. Balakrishnan, R. R. Rao & P. K. Hajra, July 1993.
 - Vol. - 2 (Papaveraceae - Caryophyllaceae. Edited by B. D. Sharma, N. P. Balakrishnan with assistance from M. Sanjappa , July 1993.
 - Vol. 3 (Portulacaceae - Ixonanthaceae. Edited by B. D. Sharma, M. Sanjappa with assistance from N. P. Balakrishnan, July 1993.