



भारतीय बनस्पति सर्वेक्षण  
BOTANICAL SURVEY OF INDIA

December 2000 No. 7


# Envis

(Environmental Information System)

## EDITORIAL

ENVIS Centre, Botanical Survey of India Ministry of Environment & Forests is engaged in collecting comprehensive information on floral diversity from different parts of the country. These information are technologically managed by storage, retrieval, processing, communication, diffusion and sharing of information through hardware and software. Mosaic of technology on floral diversity, their different products and techniques in the collection, processing and transmission through electronic media in the service of the nation is no doubt a very hard and responsible task. But all these information will be much useful for overall development of floral diversity database of the country. This ENVIS Centre has already stored some important data on the floral diversity of Chilka Lake, Coastal Plant Communities, Mangroves, Some wetlands, Medicinal Plants of Western Ghats and developing a software named 'COBOMAN' (Comprehensive Botanic Manual of Rare and Endangered Plants in India). I have great pleasure in releasing 7th Volume of ENVIS Newsletter which deals with Overview of Indian Mangroves—Conservation strategies and Management; Common Foxglove from Sikkim; Fox-nut (Makhana) facing extinction; Overview of vascular plant diversity of wetlands in India—Conservation and Sustainable Development; Cultivation of *Trachycarpus takil* O. Beccari—a rare palm; *Gloriosa superba* L.—a medicinal plant needing conservation and some minor forest products of Buxa Tiger Reserve.

I am confident that above research activities conducted on floral diversity will immensely help in improving the information for preparing floral diversity database and sustainable use of plant resources for social, economic and cultural development.

  
(Dr. N.P. Singh)  
Director

Place : Kolkata  
Date : 24.12.2000 Botanical Survey of India

## NEWS LETTER



Ms. Sushma Choudhary, IAS, Additional Secretary, Ministry of Environment and Forests is planting an interesting Palm, *Veitchia merrillii* Becc. from Philippines at the Indian Botanic Garden, Shibpur, Howrah.

## Common Foxglove – A promising medicinal plant from Sikkim

Sikkim is the "Botanists' Paradise" due to its great floristic diversity. Because of variable climatic condition of the state, a reciprocal relationship has been established here in between vegetation and topography. This state is not only getting importance for its scenic beauty but is equally important for its richness in aromatic and medicinal herbs.

The Common Foxglove (*Digitalis purpurea* Linn. of Scrophulariaceae) called Litpishpi in Hindi and Dadameto in Bhutia, is one of the most important medicinal herb in Indian Pharmacopoeia. Its native place is Europe and Asia, commonly distributed in Mediterranean and Canary Islands. This plant was introduced in India for its great medicinal value and at present cultivated popularly in India.

In Sikkim this plant was available so far in cultivated condition. Interestingly it has been found recently in wild condition in a single locality (Lachung) in Sikkim at an elevation of 2720-2900m.

### Biology :

It is a biennial herb, 2-6 ft. tall, remain vegetative in the first year and bearing a rosette of radical leaves. In the second year a single rachis comes out with almost sessile leaves from the centre and terminates in a one sided raceme. Flowers about 5.2 cm long, tubular-campanulate, purple, white or yellow; seeds many, light brown.

Fl. & Fr. : March-July.

### Chemistry :

The main source of its active principle is the seeds and the leaves. Presence of



several glycosides like Digitoxin ( $C_{41}H_{64}O_{13}$ ), Gitoxin ( $C_{41}H_{64}O_{14}$ ), Gitalin ( $C_{35}H_{56}O_{12}$ ) etc., and the weak acids like fumeric acids, gallic acid etc., have so far been recorded from the leaves. The fatty matter is about 1.22%. However the major active principle Digitalin is chiefly located in the seeds with molecular formula  $C_{36}H_{56}O_{14}$  and its melting point is  $210^{\circ}$ - $217^{\circ}$ C. Besides this the seed contains about 31.4% fatty oil.

#### Uses :

It has great potentiality in terms of its pharmaceutical properties as follows:

- i. Glycosides compound Digitalin has effect on the cardio-vascular system. It slows the heart rate and reduces cardiac oedema with diuresis.
- ii. As myocardial stimulant in congested heart failure.
- iii. Causes rapid auricular fibrillation.
- iv. Increases coagulation of blood to antagonise the anticoagulant action of heparin in the body.
- v. It is a diuretic, useful in dropsy and renal obstructions.



*Digitalis purpurea* L. (Purple variety) growing wild at Lachung

- vi. Has a local effect on irritation, as an ointment made from *Digitalis*.
- vii. Used for cleansing wounds with glycosides.

One noteworthy aspect is that in north Sikkim the people of Lachung are totally unaware about its great pharmacological aspects. They are simply destroying its habitat adversely.

#### Toxic effect :

The toxic effects of Common Foxglove included headache, fatigueness, drowsiness, etc. Vision is often blurred. Sinus arrhythmia may occur early as a minor toxic effect. All these symptoms occur due to glycosides present in the leaves.

#### Cultivation potentials :

Common foxglove is a calcifuge species growing well on light and sandy soils containing traces of manganese (Mn). It has great potentiality for the large scale cultivation in Sikkim. This plant can be grown in places like Lachung, Lachen, Chungthang, Dzongu, Gangtok, Ribdi, Yuksum and Tumin at an elevation 1500 - 2800 m of Sikkim during March and April. It is already successfully grown in experimental garden (Alt. 1759 m) of Botanical Survey of India, Sikkim Himalayan Circle, Gangtok. It is at present grown by many plant lovers in Sikkim for its showy flowers.

#### Importance in Sikkim :

Apparently people in Sikkim are not aware of the importance of this plant for its valuable commercial drug products. In Lachung local people destroy its population as a practice of weed clearing. In other parts of Sikkim viz. South, East, West districts people are growing this plant in their garden as an ornamental plant due to its nice flowers of various shades.

#### Conclusion :

Due to its great potentiality for large scale cultivation in Sikkim the various state agencies like Forest Department, Department of Science and Technology

and other NGOs' may initiate its cultivation. It will be the most promising and productive medicinal herb for Sikkim in commerce as well as in trade. Horticulturists may grow this plant with the help of local people for their economic upliftment as it has also good marketing value in India and abroad too.

#### Acknowledgement :

Authors are thankful to the Director, Botanical Survey of India, Calcutta and Dy. Director, Botanical Survey of India, Gangtok for facilities. Authors are also thankful to Dr. L.K. Banerjee, Joint Director and Project Co-ordinator of ENVIS for going through the manuscript with fruitful suggestions.

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Shastri, B.N. (ed.) 1952. *The Wealth of India, Raw Materials*. Vol. 3. C.S.I.R., New Delhi.

D. Maity, S.K. Jana, M.S. Mondal\*  
Botanical Survey of India  
Sikkim Himalayan Circle  
Gangtok-737103

\* BSI, Indian Botanic Garden, Howrah - 711 103.



*Digitalis purpurea* L. (White variety) at Sikkim



## Fox-nut (Makhana) facing extinction : need for germplasm conservation



*Euryale ferox* Salisb. growing wild in the King Lake of Indian Botanic Garden

*Euryale ferox* Salisb. an aquatic plant commonly known as Fox-nut or Gorgon fruit and Makhana in Hindi is distributed throughout south-east Asia and is common in freshwater habitats of Assam, Bihar, Jammu & Kashmir, Meghalaya, Manipur, Orissa, Rajasthan, Tripura, Uttar Pradesh and West Bengal. It is extensively cultivated in North Bihar and found wild in the lakes of Indian Botanic garden and Kashmir. (V. Jha et. al, 1998). The plant has been long cultivated in China for its seeds (Anon, 1952).

*Euryale ferox* Salisb. (Family: Nymphaeaceae) is a monotypic stem less prickly, aquatic herb. Rootstock short and thick, leaves floating, elliptic and large in size (30-120 cm diameter) green and corrugated above and conspicuously purple or red beneath with strong spiny ribs, flowers violet, blue or red, the fruits are prickly, round (5-7 cm) containing as many as 55 seeds embedded in pulp of green purple consistency, seeds are sub-orbicular (1-1.3 cm diameter) with smooth surface undulated all around, and when fresh the seeds display deep dark brown colouration.

Lawrence(1895) in his classic book on the Vale of Kashmir records the abundant growth of *Euryale ferox* in Dal and Manasbal lake waters. Detailed taxonomy, distribution and uses of the seeds of *E. ferox* have been recently published (R.L Mitra, 1995). According

to Blatter (1927) *E. ferox* was found in Dal lake as a densely prickly aquatic plant bearing a spongy berry fruit containing 8-20 seeds, Subramanyam (1962) in his monograph on aquatic angiosperms of India made a casual mention of the presence of *E. ferox* in Kashmir lakes. Kaul (1984) and Zutshi (1987) reported the virtual disappearance of the weed from Kashmir waters. Kak (1985) observed the occurrence of a few plants of *E. ferox* in Dal (including Nagin Basin) and Manasbal lakes. Polunin and Stainton (1986) report the distribution of *E. ferox* in Kashmir. The reports of Kundangar and Sarwar (UEED,1997) that the plant is extinct and exists only on herbarium sheets is untenable in view of very recent publication of Khan (2000) who mentions that the plant though declining rapidly in population, still occurs sparsely as a floating leaf type in the lake Manasbal, Kashmir in close association with a dominant macrophyte *Nelumbo nucifera* Gaertn. The present author during a recent (summer-autumn of 1998) Dal lake monitoring programme noticed a number of detached rootstocks and fruits of *E. ferox* floating on the surface waters in the Hazratbal basin of the lake, where excavation of bottom sediments as a part of desiltation programme has been in operation.

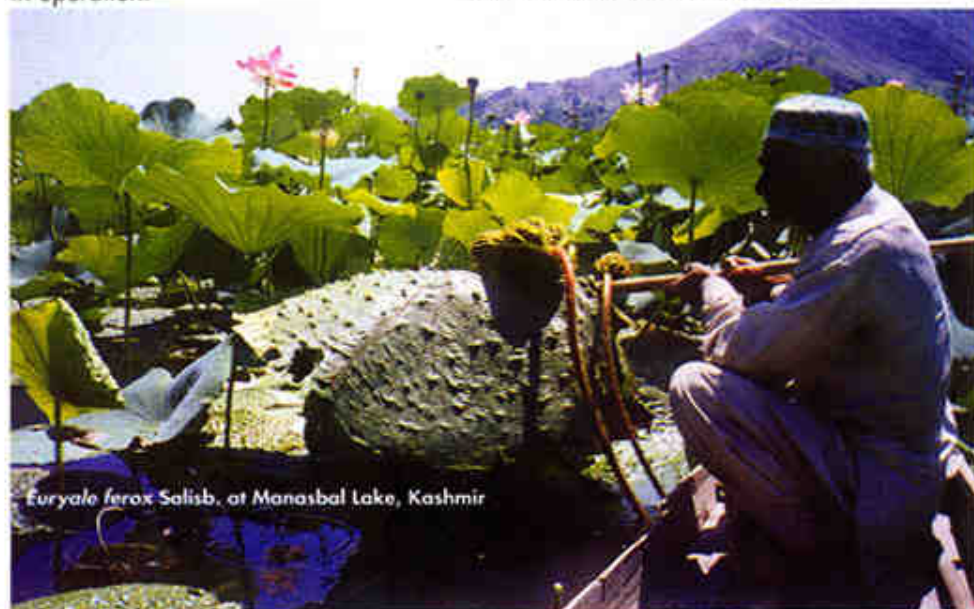
In Kashmir, *E. ferox* used to grow in abundance and the sale of its seeds (Local name-Jewar) was a very common practice even in fifties. The fruits were harvested from naturally growing aquatic plants and sold in market; the seeds, eaten raw or roasted. On roasting in hot sand the seed coat swells and bursts and can be easily peeled off. The seeds are sold in bazaar and used as farinaceous food. The seed flour is used as a substitute for arrowroots.

The chemical analysis (Anon,1952) of the edible part of the seed is given below:

Chemical constituent	Value
1. Moisture	12.8
2. Protein	9.7
3. Fat	0.1
4. Mineral matter	0.5
5. Carbohydrates	76.9
6. Calcium	0.02
7. Phosphorus	0.9 %
8. Iron	1.4 mg/100g
9. Carotene	in traces

The seeds valued as farinaceous food is recommended for invalids, and medicinally used as tonic, astringent and obstruct.

Harvesting Technology of the seeds by the rural people has been given in detail in the ENVIS, BSI News letter, 1998.



*Euryale ferox* Salisb. at Manasbal Lake, Kashmir



The rapid environmental deterioration of Kashmir valley Lakes due to accelerated eutrophication, indiscriminate fruit harvesting and exploitation for economic gains, its deliberate eradication by humans for its prickly morphological character, and interference in the growth of locally cherished *Nelumbo nucifera* (Lotus) constitute the main factors for the vulnerability and population decline of *E. ferox*.

In view of high economic importance of the plant, a strong plea is made for in-depth research to conserve the germplasm to avert its probable extinction. Recent media reports (Hindustan Times, 18.8.2000) show that the 'Makhana powder' is being surreptitiously exported from India to the United States, "possible on the way to being patented". It is a cause for concern to all scientific communities.

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#### M.A. KHAN

Division of Environmental Sciences.

SK. University of Agricultural Sciences and Technology

GPO Box 726, Srinagar, J&K 190001.

## A note on the cultivation of *Trachycarpus takil* O. Beccari - A rare Palm.

The *Trachycarpus takil* O. Beccari is a rare palm endemic to Kumaon Himalaya, particularly on Takil mountains in Pithoragarh district of

Uttaranchal State. The plant is 7 to 9 m tall, medium sized tree with leaves of about 1-1.5 m long and suitable for ornamental horticulture.

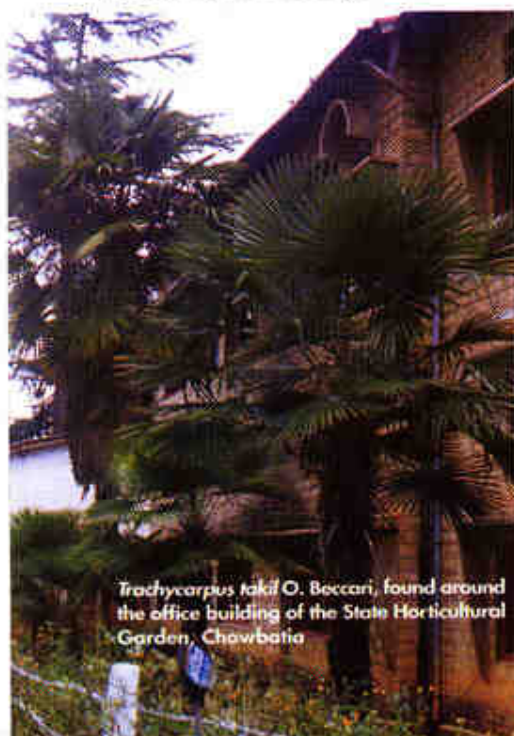
Singh *et.al.*, (1995) has quoted the Beccari (1931) and reported that the plant is under cultivation at the State Horticultural Garden at Chowbatia since 1877. To verify this the authors (AKB & S.B.) have visited the Chowbatia garden, near Ranikhet during their annual live plant collection tour during 15th September to 2nd October, 2000. With surprise, and pleasure the authors have noticed more than a dozen of well grown plants of *T. takil* Becc. in the State Horticultural garden at Chowbatia. Seeds setting also was observed in some of the plants growing near their office building. The horticulturists of the garden raised a few seedlings under proper care.

In addition to the above locality plants were also found growing in front of the office building of Conservator of Forests (West) in Tallital and near Nainadevi temple area of Mallital in Nainital town. For *ex-situ* conservation, a few seedlings have been collected from the Chowbatia garden and brought to the Indian Botanic Garden, Howrah. These seedlings have been found growing slowly in this garden and showing the sign of adaptability in this climatic condition of Calcutta and Howrah.

#### Reference :

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A.K. Banerjee, S. Basu and H.S. Pandey  
Indian Botanic Garden,  
Botanical Survey of India, Howrah-3.



*Trachycarpus takil* O. Beccari, found around the office building of the State Horticultural Garden, Chowbatia



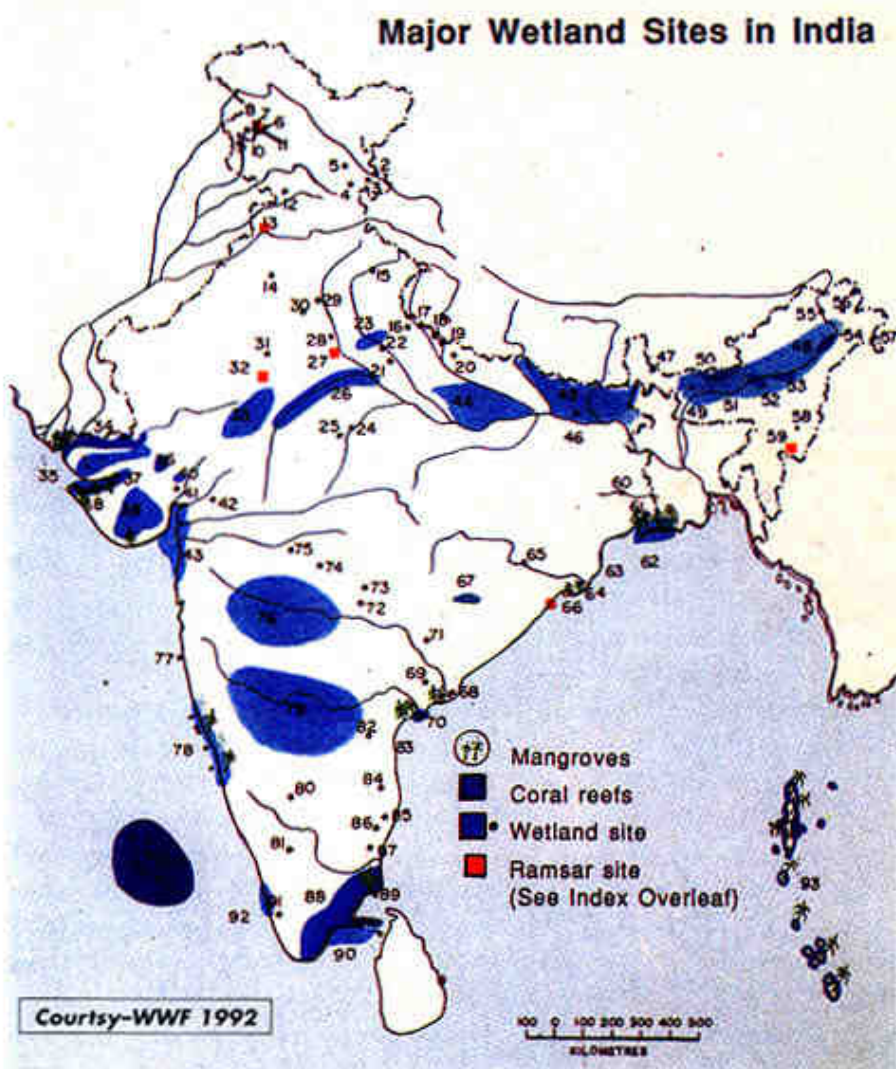
# An overview of vascular plant diversity of wetlands, its conservation and sustainable development in India

## What is Wetland :

The term 'wetlands' represent low-lying areas of inland, coastal and marine habitats forming a transition between dry-land and fresh or marine water system. Proper definition of wetlands may differ from place to place but according to Ramsar Convention (1971) wetlands are, "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters". In general wetlands can be easily distinguished when the rate of accumulation of water in lowland areas is greater than the rate of evaporation and provide supersaturated soil with hydrophytic vegetation, and in case of the coastal wetlands the rate of receiving tide water in the low-lying areas is higher than the rate of receding tide water.

## Characteristics of Wetlands :

- Wetlands are rich heritage of biological diversity. Due to specialized environmental condition, aquatic plants are found either growing submerged, emerged or in floating habit.
- Biological diversities in these habitats show extremely modified in their morphology, physiology, and biochemistry for withstanding such changed environmental conditions. Development of spongy or woody pneumatophores, knee roots, stilt roots and vivipary, etc. in case of mangroves are of very unique features. Detoxification of soil toxin, anaerobic



metabolism by  $C_2$  pathway, rapid elongation of plant tissue, development of aerenchyma, scanty amount of xylem, absence of stomata etc. are characteristic features of the wetland bio-diversities.

c. Wetland ecosystem is most significant for large biological productivity, climatic and hydrological stability, improvement of water quality, recharge and discharge of ground water, flood water control etc. which are economically or commercially important for sustainable development and life support.

## Wetlands of India :

17.7% of India's total land mass is occupied by wetlands (including rice field). India's wetlands can be divided into 4 major Eco-geographic

regions, such as wetlands of Himalayan Mountains, wetlands of Gangetic plains, wetlands of Peninsular uplands and Coastal wetlands including wetlands of Oceanic islands.

Himalayan Mountain ranges in the North are accompanied with Palaeartic Lake of Ladakh and Valley of Kashmir. Vast saline expanses and brackish water lakes are in Orissa and in the western part. The North Eastern and Eastern





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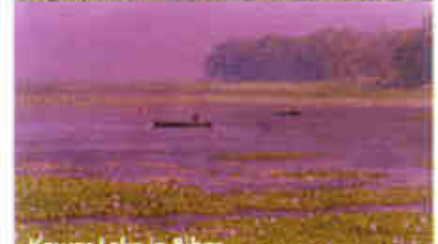
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East Kolkata Wetlands in Salt Lake, W. Bengal



Urban Wetlands in Rabindra Sarobar, Kolkata



Kowar Lake in Bihar

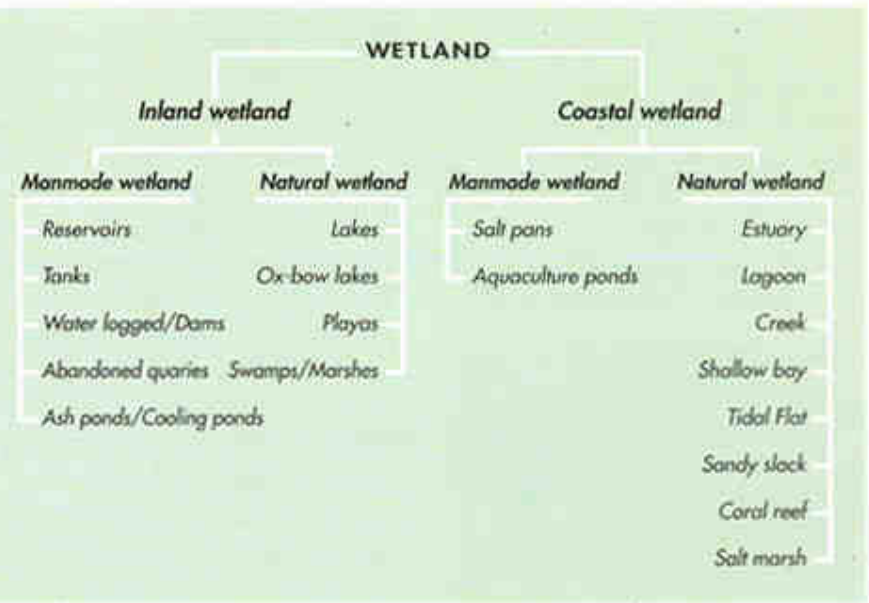


Bhoj Lake in Bhopal, M.P.



Lok-Tak Lake in Manipur

part of the country is covered with massive floodplains of the Ganga and Brahmaputra with many swamps, marshes, oxbow lakes, chauris, bills and jheels. In the South, the Deccan Plateau is associated with number of tanks and reservoirs. More than 7500 km long coastline of India has many important tidal swamps, estuaries, back waters and lagoons. The Oceanic groups of islands like Laksha-dweep, Andaman and Nicobar Islands are also associated with important marine wetlands. On the basis of origin, characteristics and physicochemical conditions, wetlands can be divided into the following types -





**Total areas of Wetland :**

Total areas of wetland in the world :	5291666.6 Sq. km.
(1989) (excluding rice field)	
Total areas of wetland in the Asia :	73426.0 Sq. km.
(1989) (excluding rice field)	
Total areas of wetland in India :	3924709.5 Sq. km.
(1990) (including rice field)	

**Extent of Wetlands in India :**

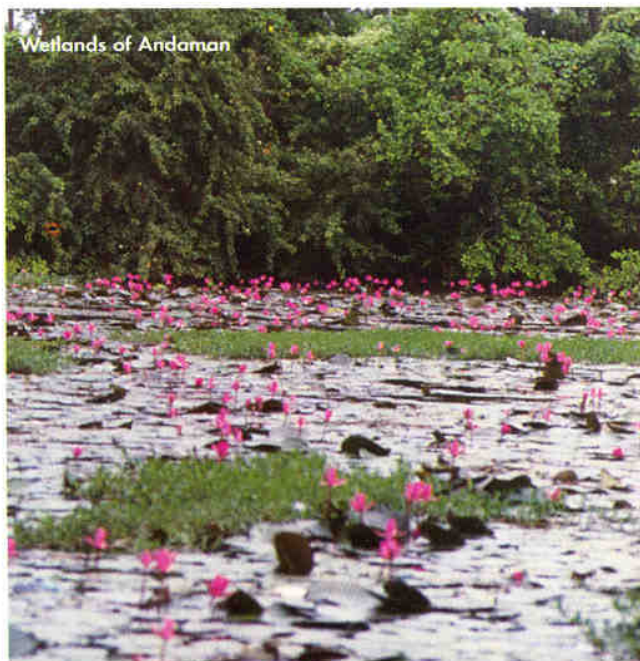
Indian Wetlands have not been comprehensively surveyed. There are, therefore, varying estimates of the total extent of wetland resources in the country. A directory of Asian Wetlands (IUCN, 1989) present the following estimates:

Figures in million sq. km

Area under paddy cultivation	0.409
Area suitable for fish culture	0.036
Area under capture fisheries (brackish and freshwater)	0.029
Mangroves	0.004
Estuaries	0.039
Backwaters	0.035
Man-made impoundment	0.030
Rivers, including main tributaries	(28,000 km)
Canals and irrigation channels	(113,000 km)
Total area of wetlands (excluding rivers)	0.582

**Wetlands in India under Ramsar Convention :**

The Ramsar Convention was held in 1971 at Ramsar (Iran) where 118 countries sat together and prepared a draft to conserve and protect wetlands in regard to waterfowl habitats and wise use of wetlands. There are 1014 water bodies throughout the world, which have been already declared as Ramsar sites.



Wetlands of Andaman

**Ramsar site in India :**

Name of the Water bodies	Year
1. Chilka lake (Orissa)	1981
2. Keoladeo National Park (Rajasthan)	1981
3. Wular & Dal Lake(Kashmir)	1990
4. Harike Lake (Punjab)	1990
5. Loktak lake (Monipur)	1990
6. Sambar Lake (Rajasthan)	1990
7. East Calcutta wetland ( West Bengal)	2000
8. Tso Morari (Jammu & Kashmir)	2000
9. Lake Sanctuary (Arunachal Pradesh)	2000
10. Dipor Bill (Assam)	2000
11. Pong Dam ( Himachal Pradesh)	2000
12. Kavar lake (Bihar)	2000
13. Bhitarkanika Sanctuary (Orissa)	2000
14. Wetlands of Andaman & Nicobar islands	2000
15. Pulicat lake (Tamil Nadu)	2000
16. Point Calimere Sanctuary (Tamil Nadu)	2000

**Assessment of wetland vascular plant diversity in India :**

The importance of wetland plant diversity for sustainable life support system is an acceptable truth throughout the world. Mostly lack of scientific knowledge and appropriate technique for using the wetland bio-diversity are the main problems for conservation and management of wetlands. Today management programme to conserve, improve or rescue wetlands is a global problem. There must be some criteria in a priority basis to solve these problems. One of the most important criteria for management of the wetland is to assess the biological diversity by which we can estimate the values of a particular wetland. Assessment of floral and faunal diversity is objectively measurable parameter for determining the value of wetlands. Moreover taxonomic information regarding the plant diversity is very poorly known for proper assessment of the plant species occurring in different wetlands.

Detail taxonomic information of Indian aquatic plants has not received much attention. The correct identity of aquatic plants needs careful observation on both vegetative and floristic characters critically in field, laboratory and herbarium. Moreover aquatic plants possess phenotypic plasticity for their special ecological habitats. Besides the light, temperature and oxygen the chemical nature of the sediments also play a major role to the phenotypic variation. Therefore proper identity, systematic classifications and distribution of plant species will be a valuable criteria for assessment of wetland plant diversity.

Wetlands which cover only 6% of the earth surface contain 20% of world's biodiversity (Denny, 1997) including fresh



and marine water resources. Fresh water wetlands which cover 1.4% of the earth surface support near about 1500 aquatic vascular plant species. Recently Cook (1996) estimated 733 species, 211 genera and 66 families from the fresh water wetlands of Indian subcontinent mostly from the south of the Himalayan areas.

In the present work, assessment of floristic diversity of aquatic plants have been carried out mainly on vascular plants. The

assessment of algae, bryophytes and phytoplankton will be treated in separate volume.

**Preliminary assessment of wetland vascular flora in India :**

Family	Genera	Species	Endemic
110	392	865	132

**Preliminary assessment of number of vascular plant species in different states in India :**

State	No. of Sp.	State	No. of Sp.	State	No. of Sp.
Andaman & Nicobar Is.	134	Jammu & Kashmir	92	Orissa	242
Andhra Pradesh	180	Kerala	372	Punjab	145
Arunachal Pradesh	51	Karnataka	370	Rajasthan	241
Assam	264	Laksha dweep	25	Sikkim	141
Bihar	184	Meghalaya	142	Tamil Nadu	345
Delhi	100	Maharashtra	265	Tripura	52
Gujarat	145	Manipur	98	Uttar Pradesh	270
Goa	168	Madhya Pradesh	282	West Bengal	373
Himachal Pradesh	95	Mizoram	51		
Haryana	29	Nagaland	52		

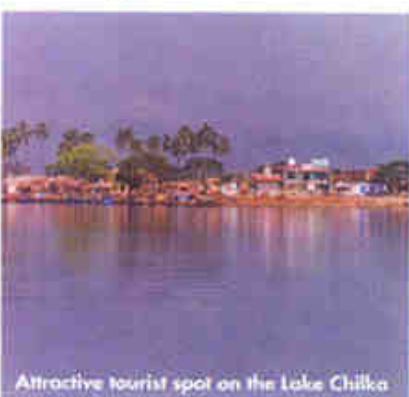
**Status of wetland plants in India :**

IUCN has recorded several categories of plants in the Red Data Book to indicate the degree of threat to individual species in their field habitats. In India no detailed specific fieldwork has been done so far for assessment of such status of aquatic plants. However on the basis of collected herbarium data and field investigation, the status of certain vascular plant species has been determined as follows:

Total No. of Plants	No. of Rare	No. of Endangered	No. of Vulnerable	No. of possibly Extinct
865	20	25	28	6

**Values of wetland :**

Values of wetland are very much well known as they serve as an integral part of human life and society as well as protection and maintenance of environment, starting from flood control, shore line stabilization, water purification, microclimatic stabilization, habitat for various biological diversities on which numerous people depend for their livelihood. There are so many other values, which are essentially required for balancing the ecosystem. Some of the important values perform by various types of wetlands are represented in the following chart:

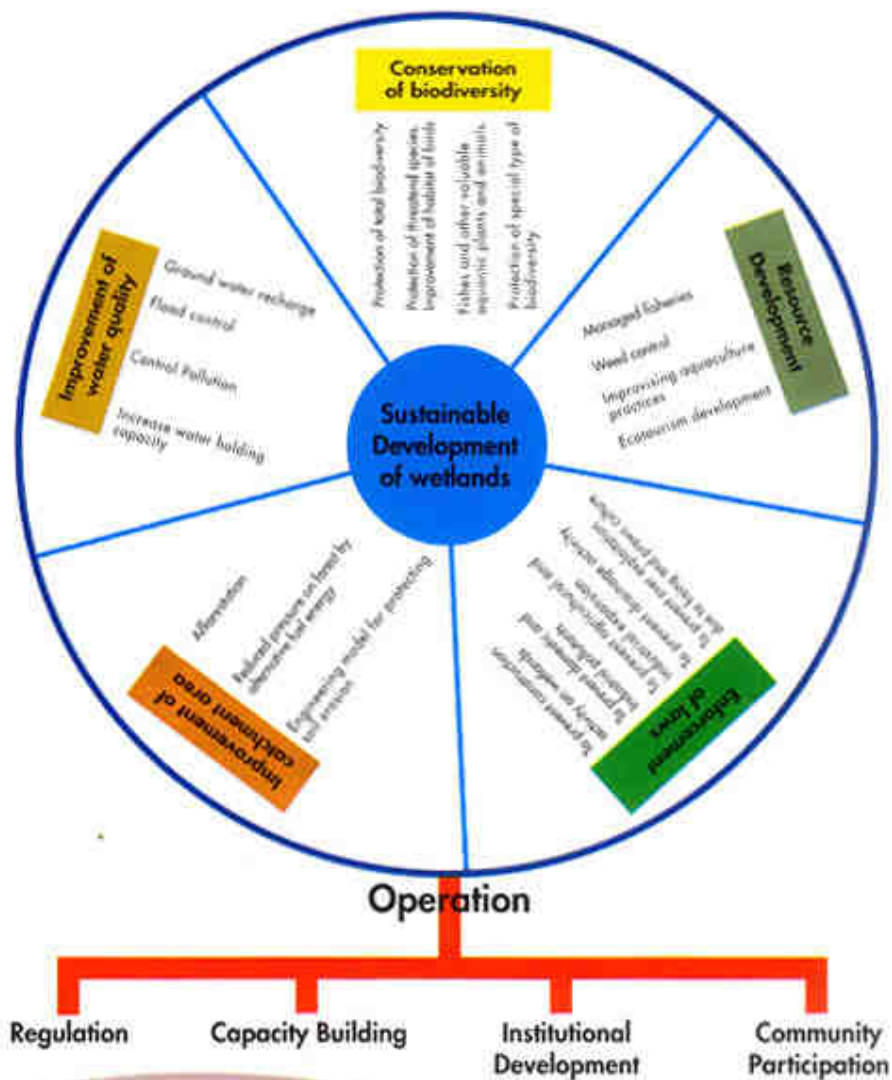


- Ground water recharge
- Ground water discharge
- Flood control
- Shoreline stabilization
- Toxicant retention
- Nutrient retention
- Biomass export
- Storm protection
- Microclimate stabilization
- Water transport
- Recreation/tourism
- Forest resources
- Wild life resources
- Human food
- Medicine
- Fisheries
- Forage resources
- Agricultural resources
- Water supply
- Biological diversity
- Uniqueness to cultural Diversity



## Conservation and sustainable development :

During the last few decades wetlands in India are facing tremendous pressure due to increase in population and natural calamities. As a result overall signs of degradation and shrinkage of wetlands are very apparent from high rate of sedimentation, decrease in ground water level, rapid change in water quality, decrease in fish production, huge growth of aquatic weeds and overall change of atmospheric quality. In general there are two fundamental problems for degradation of wetlands such as anthropogenic and natural problems. Large scale construction projects for rehabilitation and human settlement, expansion of Industries, hydel power and agriculture, large scale drainage activities, filling of wetland for road and commercialization, discharge of pesticides, herbicides, industrial pollutants and domestic sewage, conversion for aquaculture ponds and salt pans, large-scale fishing and other activities are related to anthropogenic problems and earthquake, storm, cyclone, Super cyclone, soil erosion, etc. are natural problems. For biodiversity conservation and sustainable development of wetlands following model has been proposed:



L.K. Banerjee & P.S. Kumar  
Botanical Survey of India, Howrah-3.





## Some minor forest products of Buxa Tiger Reserve – N. Bengal

Buxa Tiger Reserve is situated in Alipurduar Sub-division of Jalpaiguri district, West Bengal. It lies between 26°30' & 26°55'N latitude and 89°20' & 89°55'E longitude. The reserve stretches over 50 km from West to East and 35 km from North to South, having a total area of 760.87 sq km, out of which 385.02 sq. km area is demarcated as core zone and the rest 375.85 sq. km area is demarcated as buffer zone. The core zone consists of Buxa sanctuary and National Park. The reserve as constituted in the year 1983 and became the 15th Tiger Reserve of the country. The Reserve consists of 195 compartments.



The present information highlights sixteen minor forest products from Buxa Tiger Reserve. The following table will give an idea about some minor forest products and other related aspects of Buxa Tiger Reserve.

Sr. No.	Botanical name of the plant collected	Family	Local Common name	Trade name	Parts of the plant collected	Time of collection	Cost of the collected product at primary collectors level
1	<i>Aglaia spectabilis</i> (Miq.) Jain & Bennet	Meliaceae	Lali	Lali	Seed	February to March	Rs. 7/kg.
1a	<i>Aglaia spectabilis</i> (Miq.) Jain & Bennet	Meliaceae	Lali	Lali	Seed coat	February to March	Rs. 7/kg.
2	<i>Bauhinia scandens</i> L.	Leguminosae	Sanpelahara	Sanpelahara	Stem	February to March	Rs. 200/mt
3	<i>Canarium strictum</i> Roxb.	Burseraceae	Gokul Dhup	Gokul Dhup	Resin	September to January	Rs. 120/kg.
4	<i>Caryota urens</i> L.	Palmae	Rangbhan	Chagunar	Spadix	May to June	Rs. 1/stick
5	<i>Chukrasia tabularis</i> Jussieu	Meliaceae	Chikrasi	Chikrasi	Seed Coat	January to February	Rs. 50/1000 nos.
6	<i>Lophopetalum wightianum</i> Arnott.	Celastraceae	Narkeli	Budhnath	Seed Coat	June to August	Rs. 1300/1000 nos.
7	<i>Oroxylum indicum</i> (L.) Vent.	Bignoniaceae	Totola	Totola	Seed	February to March	Rs. 70/kg.
8	<i>Persea glaucescens</i> (Nees) Long	Lauraceae	Kawla	Kawla	Stem bark	Throughout the year	Rs. 8-10/kg.
9	<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Poaceae	Pundi	Pundi	Fruits	August to September	Rs. 70/1000 nos.
10	<i>Piper longum</i> L.	Piperaceae	Pipla	Piper	Fruits	September to October	Rs. 120/kg.
11	<i>Sapindus detergens</i> Wall.	Sapindaceae	Ritha	Ritha	Seed Coat	November to December	Rs. 60/kg.
12	<i>Schima wallichii</i> (DC.) Korthals	Theaceae	Chilaune	Chilaune	Seed Coat	January to February	Rs. 5/kg.
13	<i>Sterculia villosa</i> Roxb.	Sterculiaceae	Udal	Land Lotus	Seed Coat	April	Rs. 60/kg.
14	<i>Swietenia mahagoni</i> (L.) Jacq.	Meliaceae	Mahagoni	Motha	Kernel	February to March	Rs. 60/1000 nos.
14a	<i>Swietenia mahagoni</i> (L.) Jacq.	Meliaceae	Mahagoni	Motha	Kernel	February to March	Rs. 300/1000 nos.
15	<i>Thysanolaena maxima</i> Ktze.	Poaceae	Phuljharu	Phuljharu	Inflorescence	November to February	Rs. 80/1000 sticks.
16	<i>Wrightia arborea</i> (Dennst.) Mabb.	Apocynaceae	Khira	Snake head	Seed Coat	March	Rs. 60/kg.





A photograph of the Minor Forest Products of Buxa Tiger Reserve



Position of the Minor Forest Products in the given photograph corresponding to their serial numbers as shown in the table.

Buxa Tiger Reserve has a rich-biological diversity of flora and fauna. It represents most of the endemic species of northeast India. Apart from the most common and economically important species found within the moist tropical multi-tier forest of Buxa Tiger Reserve, there are many minor forest products available in the reserve. Unfortunately there is no definite extraction procedure adopted for its collection. Forest villagers go inside the

forest and collect the minor forest product for their livelihood according to their demand.

#### Acknowledgement :

The authors are indebted to the director, Botanical Survey of India and Field Director, Buxa Tiger Reserve for extending their helping hands during the field survey and data collection. Sincere thanks are also due to Mr. P. K.

Xalco, F.R., B.T.R. for his kind co-operation.

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L.K. Banerjee, R.N. Koyal, P.P. Ghoshal & S. Saha  
Botanical Survey of India, Howrah-3.

## *Gloriosa superba* L. (Kalihari) - An ornamental and medicinal plant needs urgent conservation strategies.

*Gloriosa* L. is a small genus of tropical Asia & Africa. It is usually known as glory lilly or climbing lillies. In India only one species of this genus is found to occur in different eco-regions. Pure communities of this plant is hardly seen. It is distributed throughout India, starting from the sea level up to the Himalayan ranges.

The authors, during the visit to the forest of Bundelkhand region, near Chitrakut in Uttar Pradesh in connection with ethnobotanical studies, came across *Gloriosa superba* L. (Locally known as Kalihari) growing in open forests, among thorny bushes and roadside thickets on

sandy-gravelly and rocky soil conditions. The leaf tips are modified into tendrils which appear very ornamental along with flame colour of the flowers. On enquiry to the tribals who are using the plant for medicinal purposes, the authors came across a number of persons belonging to Chammaha community who were engaged in search of the tubers of this plant and informed the authors that, the plant (Kalihari) is very useful for treatment of acute rheumatism & gout.

A brief description, mode of uses and *ex-situ* conservation in the garden would be of some informative value.

*Gloriosa superba* L., Slender, branched, climbing or scrambling herbs, with leafy tendrils and fleshy cylindric tubers. Leaves sessile, opposite or alternate or verticillate, ovate-lanceolate with a cordate base, narrowed into a coiled tendril at apex, glabrous, 10-15 x 2-5 cm. Flowers axillary, solitary, forming terminal corymbs. Pedicels 10-15 cm. long, with a deflexed tip. Tepals lanceolate, acuminate, with a crispy-undulate margins, erect and greenish at first, reflexed and purplish or scarlet finally. Anthers 1-1.5 cm long. Style 3-fid, 4 cm long. Capsule oblong.

Fl. & Fr. : Aug. - Oct.



Scrutiny of literature reveals that several medicinal and other uses are reported since 1956 but the present mode of uses is perhaps a new one.

Chopra <i>et al</i> 1956	Chopra <i>et al</i> 1969	Anon 1986	Jain 1991	Present observation, Dixit, 2001
Tuber—Purgative, antihelmintic; used in leprosy, skin diseases, piles, gonorrhoea.	Causes vomiting & purging. Used for promoting labour pain, as abortifacient, against gastro intestinal infection. Leaf juice kills lice. Tuber is used for deworming cattle.	Tonic, Stomachic & antihelmintic, intensely poisonous in large doses. Promotes labour pain, acts as abortifacient. Externally applied for neuralgia & skin diseases. Contains Toxic alkaloid colchicine used for treating gout & rheumatism. It can also induce polyploidy.	Tubers—Treatment of rheumatism, gout, leprosy, piles, peptic ulcer, skin diseases. Stem—Antidote to snake-bite; tied on arm of women for smooth delivery; has abortifacient & anti-helmintic properties, used against gonorrhoea & cholera.	Tuber—boiled in mustard oil and massaged to treat gout & rheumatism for at least one hour.

**Books, New Publication from BSI : 2000-2001**

**Flora of India—Introductory Volume Part—II** : Edited by N. P. Singh, D. K. Singh, P. K. Hajra and B. D. Sharma : Rs. 356.00 or \$76.00.

**Flora of India—Vol. 5 (Olacaceae to Connaraceae)** : Edited by N. P. Singh, J. N. Vohra, P. K. Hajra and D. K. Singh : Rs. 312.00 or \$ 64.00.

**Fascicle 24 (Asclepiadaceae & Periplocaceae)** : Rs. 532.00 or \$ 172.00

**Flora of Manipur** : Edited by N. P. Singh, A. S. Chawhan & M. S. Mondal : Rs. 568.00 or \$180.00.

**Flora of Maharashtra (Ranunculaceae to Rhizophoraceae) Vol. I** : Edited by N. P. Singh and S. Karthikeyan : Rs. 664.00 or \$140.00.

**Flora of the Mahanadi Delta, Orissa** : By L. K. Banerjee & T. A. Rao : Rs. 260.00 or \$48.00

**Reprinted edition of Red Data Book—Vol. I—III** : Vol. I : Rs. 208.00 or \$48.00; Vol. II : Rs. 56 or \$40; Vol. III : Rs. 152.00 or \$40.00.

**Orchids of Nagaland** : By T. M. Hynniewta : Rs. 312.00 or \$64.00.

**Genera of Indian Polypores** : J. R. Sharma : Rs. 248.00 or \$52.00.

[Drafts are to be drawn in favour of 'Accounts Officer, PAO (BSI & ZSI), Calcutta', and to be sent to the Publication Officer at Botanical Survey of India, P-8, Brabourne Road, Calcutta—700 001, India.]

**Introduction in the Garden :**

*Gloriosa superba* L. flowers in great profusion, during rainy season and can be easily introduced in the garden through tubers planted before rainy season in rocky-gravelly soil with good drainage. Keeping in view of its occurrence in selected habitat and beautiful ornamental flowers and over-exploitation for medicinal value, widely used scientifically in inducing polyploidy due to presence of Colchicine obtained from the tubers, its ex-situ conservation is highly desirable in view of its ornamental and highly medicinal importance.

**Acknowledgement :**

The authors are grateful to Dr. N.P. Singh, Director, BSI, Calcutta for encouragement and to Dr. L.K. Banerjee,

Jt. Director, CBL, Howrah for suggestions, to submit the article to ENVIS.

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**R.D. Dixit and Ramesh Kumar**  
*Botanical Survey of India, Central Circle, Allahabad.*



*Gloriosa superba* L.



## A Plea for Conservation



Scraped tree trunk of *Persea glaucescens* (Nees) Long. (Kawla)

### 1. *Persea glaucescens* (Nees) Long.- 'Kawla'

During a recent botanical exploration in the forest areas of Rydak plains and Jainti hills of Buxa Tiger Reserve of Jalpaiguri district, West Bengal, the authors came across a plant locally known as "Kawla". The plant was later identified as *Persea glaucescens* (Nees) Long., which is better known by its synonym *Machilus villosa* (Roxb.) Hook. f. and *Persea villosa* (Roxb.) Kostermans belonging to the family Lauraceae. The plant is moderate to large tree up to 20 m tall; branches spreading with rufo-tomentose shoot, wood yellowish brown, moderately hard, texture smooth. Leaves elliptic, acuminate, base cuneate, 10 - 20 x 3 - 6 cm, coriaceous, pale green above, reddish-brown beneath; nerves lateral, 6-8 pairs, rising upwards; petiolate. Panicles numerous, umbellate, usually longer than the leaves, densely tomentose, reddish-brown when dry; perianth hemispheric, densely tomentose, lobes ca 3 mm long. Berries globose, ca 0.8 mm in diameter, seated on reflexed calyx.

The plant is generally distributed in Southern Asia, Malaysia, Indonesia and Indo-China. In India it is known to occur in the sub-tropical forests of West Bengal, Sikkim and in upper Assam up to an elevation of 950 m.

The resinous substance present in the stem bark of "Kawla" is commercially used as fixative in incense stick industries. The wood of "Kawla" is durable and is not liable to warp. It is used as shingle and firewood.

According to the official report of forest department, the stem bark of "Kawla" is scrapped off from the living tree and then cut into small pieces of about 3"x3" sizes and dried under sunlight. The dried pieces are then bagged in small gunny bags and sold to the local traders at Alipurduar and Siliguri areas of Jalpaiguri district at the rate of Rs. 8-10 per kg. It is found that collection of "Kawla" bark as non-timber forest product from Buxa Tiger Reserve during



Grazed gunny bag containing dried stem bark of *Persea glaucescens* (Nees) Long (Kawla)

1997-1998 is about 10.07 metric tons valuing at primary collector's level of around Rs. 0.6 lakhs. The authors collected market samples of dried stem bark pieces from the Jainti forest division of Buxa Tiger Reserve.

Now-a-days this trade gets flourished in such a manner that many of the villagers of Buxa Tiger Reserve (especially villagers of Jainti forest division) are engaged in collecting dried "Kawla" stem bark for selling. In this course of action the villagers use to cut off and fell down the whole of "Kawla" tree in the forests to scrap off every inches of available stem bark, which may pose threats to the sustenance of this particular species in the forests of Buxa Tiger Reserve.

#### Acknowledgement :

The authors are indebted to the Director, Botanical Survey of India, and the Field Director, Buxa Tiger Reserve for extending their kind co-operation. Sincere thanks are also due to Mr. Swapan Saha, B.O., B.T.R. for his kind co-operation.

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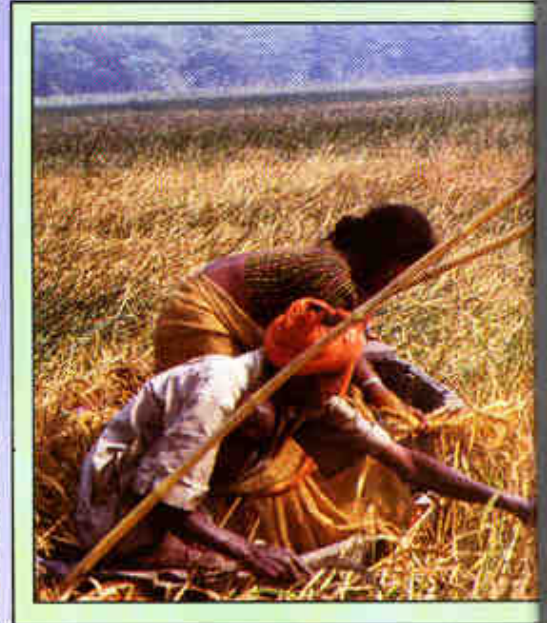
L.K. Banerjee, R.N. Koyal, P.P. Ghoshal & S. Saha  
Botanical Survey of India, Howrah-3.



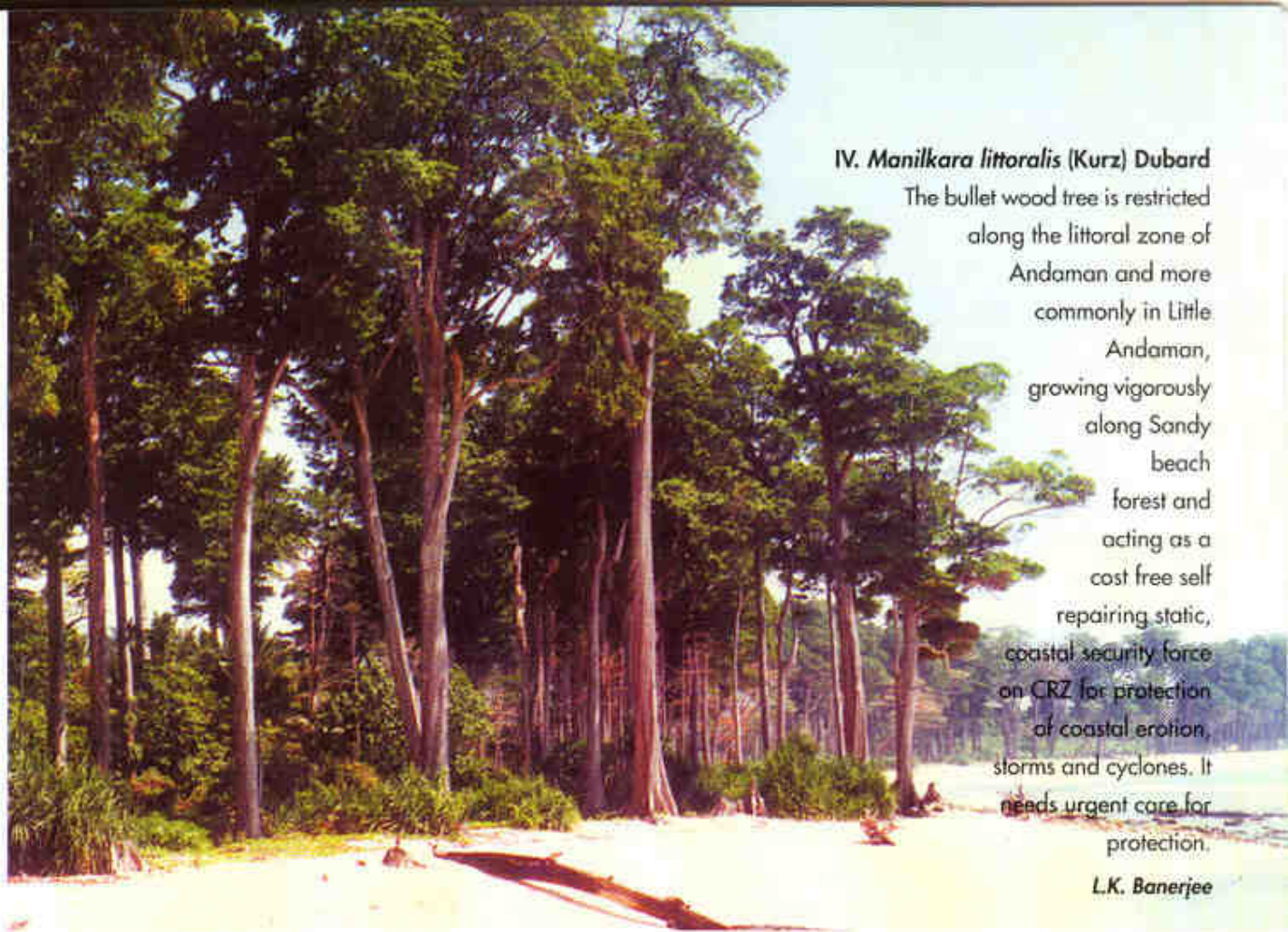


II. *Lumnitzera littorea* (Jack) Voigt. probably the tallest tree among the mangroves attaining 36 to 38 m tall and 2 to 2.5 m in diameter with beautiful crown, deep red flowers and knotted pneumatophores growing just behind the *Rhizophora* zone in S. Andaman. This gregarious tree has become rare due to extensive industrial utilization and is restricted only in some pockets of S. Andaman. It needs immediate care for protection.

L.K. Banerjee







#### IV. *Manilkara littoralis* (Kurz) Dubard

The bullet wood tree is restricted along the littoral zone of Andaman and more commonly in Little Andaman, growing vigorously along Sandy beach forest and acting as a cost free self repairing static, coastal security force on CRZ for protection of coastal erosion, storms and cyclones. It needs urgent care for protection.

L.K. Banerjee

#### III. *Oryza rufipogon* Griff.

The most common wild rice in India which can be distinguished from cultivated rice by deciduous nature of grain and presence of reddish awns. It is found growing indigenously without cultivation in the Kavar Lake, Bihar. Its stems attains 3 to 5 m long according to the rise of water level of the lake. Native Shani communities are harvesting the grain during the month of December for their regular food. This wild rice is very much medicinal and also valuable when water level will be uplifted due to green house drift and global temperature rise in the lowlying areas.

L.K. Banerjee

## An overview of Indian Mangroves, conservation strategies and management

### 1. What is Mangrove :

Group of Plants taxonomically isolated and successfully adapted in colonizing saline intertidal zone at the interface between the land and sea along the deltas, shallow lagoons, bays and back waters in tropical and subtropical sheltered coast lines.

### 2. Characteristic of Mangroves :

Mangrove forest is restricted only along the saline intertidal habitat of sheltered coastline. It is characterized by dark green foliage and negatively geotropic roots. It shows maximum modification in its morphology, physiology and biochemical processes expressing some superficial characters like pneumatophores, stilt roots and vivipary for withstanding partly submerged saline conditions.



Stilt roots of *Rhizophora apiculata*



Vivipary of *Bruguiera gymnorrhiza*



Knee roots of *Bruguiera gymnorrhiza*





### 3. Best growth & limitation of mangrove forests :

Best Mangrove formation is found where the tidal regime is normal (2-6 ft/1-3 m) with regular mixing of seawater and fresh water from the rivers, where temperature does not optimally go below 20°C, soil is mostly alluvial in nature with high salt, low oxygen, high hydrogen sulphide, high water contents and rainfall remains 2000-3000 mm per year. Mangrove forest can extend only up to the limit of saline intertidal flow.



### 4. Role of mangrove ecosystem for sustainable development :

- This ecosystem maintains very special type of biological diversity and highest biological productivity.
- Mangrove plants play a vital role in environmental protection and act as a cost-free self-repairing static border security force for saving inland vegetation and life from storm, cyclone and floods.
- This ecosystem provides atmospheric equilibrium; checks soil erosion, stabilizes coastline by adding new areas and building new islands.



d) Some of the potential resources of this ecosystem are very valuable for sustainable life support system, such as highest efficient fuel energy from the wood of *Avicennia*, source of good charcoal, tannins, ply-woods, adhesive, alcohol, honey, wax, rayon, oils, fodder, medicines, perfumes, boat and ship building materials, paper pulp and many wild life resources like fishes, crustaceans, shellfishes, reptiles, birds, amphibians, insects and mammals. It is very valuable for many migratory birds, edible crabs, fishes, tiger prawns, reptile's skin, oysters and Royal Bengal Tiger.



### 5. Areawise distribution of Mangroves forests in India :

Total areas in the world-	1,71,091 Sq. km
(source: Wacharakitty, 1983)	
Total areas in India - (non IRS)	6756 Sq. km
Total areas (IRS) India -	4844 Sq. km



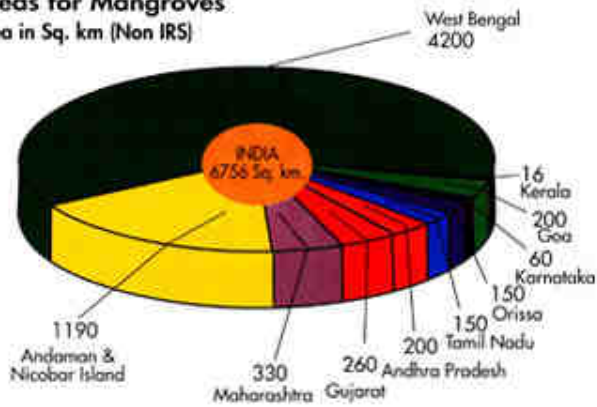


## 6. Distribution of mangrove areas in different states :

[The State-wise area covered by Mangrove forests (non IRS & IRS data) are shown in the following charts.]

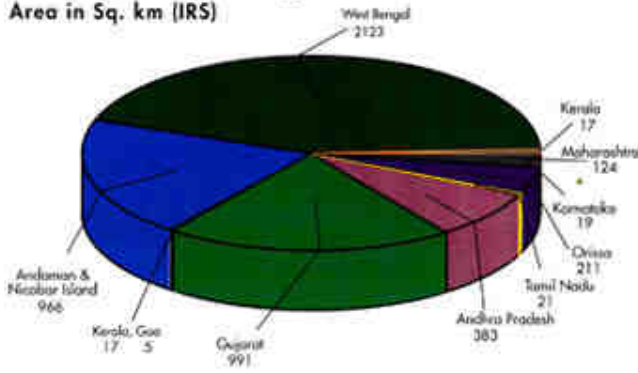
### Areas for Mangroves

Area in Sq. km (Non IRS)



### Areas covered by Mangroves

Area in Sq. km (IRS)



## 7. Assessment of species diversity :

Except one fern *Acrostichum*, all trees, shrubs, climbers and herbs in this group belong to the families of Angiosperm. Species diversity is dependent upon the availability of optimum ecological conditions in different areas. Depending upon the relative environmental factors, richness of the species decreases from the East coast mainly the Sundarbans and the Mahanadi delta towards the West Coast and finally form a monotypic strand in the Gulf of Kutchh in Gujarat.

### a. Diversity of families, genera & species of world mangroves (including orchids) :

	WORLD	NEW WORLD	OLD WORLD
FAMILIES	31	4	29
GENERA	47	5	42
SPECIES	99	13	82

### b. Diversity of families, genera & species in Indian mangroves (excluding orchids) :

	INDIA	E.COAST	W.COAST	AND & NICO
FAMILIES	29	28	20	22
GENERA	43	42	26	32
SPECIES	69	63	35	49

### c. No. of salt marshes & associated species in mangrove areas in India :

	FAMILIES	GENERA	SPECIES
SALT MARSHES	1	8	12
ORCHIDS	1	4	7
ASCLEPIADACEAE	1	1	2

### d. No. of mangrove species endemic, rare/endangered in India

	NO.OF SPECIES	PERCENTAGE
ENDEMIC	6	8.8
ENDNG / RARE	25	36.5

### e. No. of families, genera and species occur in different states of India.

	Family	Genera	Species
1. Sundarbans	26	40	59
2. Orissa	27	40	61
3. Andra Pradesh	19	26	33
4. Tamilnadu	13	16	20
5. Kerala	15	21	25
6. Karnataka	19	17	24
7. Goa	11	15	22
8. Maharashtra	13	17	25
9. Gujarat	9	10	12
10. Andaman & N. Islands	22	32	49



Backwater mangroves in Kerala



Mangroves of Andaman Islands



## 8. Values :

Mangroves are the maintainers of near shore marine habitats and simultaneously provides varieties of commercial and economic need to a variety of organism in different trophic

levels. Besides the commercial and economic values mangroves also play a major role in maintaining different types of environmental problems. The economic and commercial values as well as environmental values are shown in the following table :

### Economic and commercial values

Firewood and charcoal	Adhesive
Timber for house and ship building	Fish food and fish float
Fishes	Crocodile skin
Shrimps and prawns	Perfume
Crabs, shellfish and crustaceans	Soft wood industries
Birds	Oils
Tannin	Alcohol used as transport fuel
Mammals	Rayon
Ply wood	Fibre
Paper pulp	Amphibian
fodder	Condiments
Honey and wax	Sweet meat
Medicine	Cigarette wrappers

### Environmental Values

Protection from wind, storm, cyclone and act as a cost free self repairing static security guard

Shore line stabilization

Decrease coastal erosion

Protect inland flora and fauna from the effect of sea level rise

Essential habitat for spawning and nursery bed of marine fishes

Sewage and Industrial pollutant resistant

Essential habitat for Royal Bengal Tiger

Essential habitat for scarlet-eye bees and other endangered migratory birds

Essential habitat for estuarine crocodiles, dugongs, dolphin

Essential habitat for Olive Ridley Turtles

Essential habitat for sea otters

Eco-Tourism

Education and scientific studies



## TRAINING & WORKSHOP

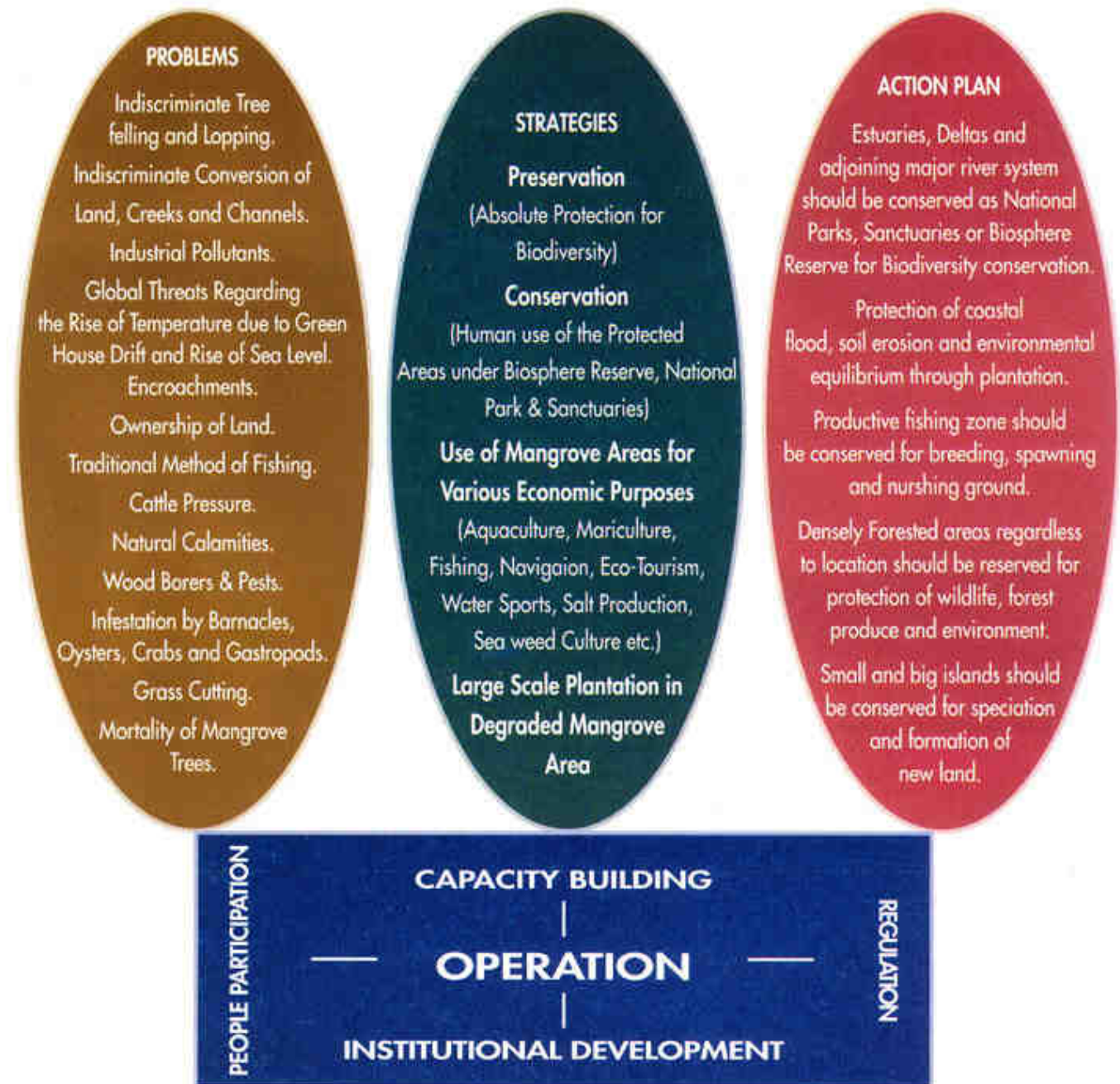
The Project Co-ordinator attended (1) ENVIS-users Interface Meet in Gangtok from 17-18 June 2000 (2) National workshop on Statistical Assessment of Plant diversity organised by Ministry of Statistics and Programme Implementation at Tiruvananthapuram from Feb 7-9, 2001 and (3) the training programme on Mangrove taxonomy at NIO, Goa from 17-19 April 2001.

Mr. T. Chakraborty attended the training course on Modern Information Technology—Web site design and development organised by ENVIS & NISSAT at Bangalore from 26-28 Feb 2001.



## 9. Conservation & management of Indian Mangroves :

Problems, conservation strategies & management action plan of Mangrove forests are shown in the following chart.



## SCIENTIFIC AND TECHNICAL ACTIVITIES IN BRIEF

Four fieldtours have been undertaken during 2000-2001 for data collection on wetland plant diversity and ethnic use of medicinal plants of Eastern and Western Ghat regions.

Plant diversity of fresh water lakes in India and medicinal plant resources of Westernghats have been processed and stored for future development.

This year, the centre has given special emphasis on the coastal plant diversity of

India and the computerised data along with different photographs is under process for publication in two volumes. From the month of August 2001 the centre's activities will be available in its website [www.envisbsi.org](http://www.envisbsi.org)

Queries/information received and replied during this year are 160 national queries and 17 international queries.

International queries received from different countries are as follows :

Australia	:	3
Austria	:	2
Bangladesh	:	3
Brazil	:	1
Bhutan	:	3
Nepol	:	1
Poland	:	2
USA	:	2



## UNDP—GEF/CCF Small Grants Programme.

### Background :

Small Grants Programme, co-founded by Global Environmental Facility (GEF) and the Country Co-operation Framework—India (CCF— I) Environment Programme seeks to support activities which demonstrate community based approaches that could reduce threat to the global environment.

The Programme is rooted in the belief that global environment problems have local solutions and that with small amounts of funding local communities can undertake activities, which shall make a significant difference to their lives and in their environment.

Small Grants Programme is administered by the UNDP and Ministry of Environment and Forests (MoEF), Government of India. It is being implemented by Centre for Environment Education (CEE) as the National Host Institute (NHI). CEE is a national institute of excellence for

Environment Education supported by the MoEF and affiliated to the Nehru Foundation for Development, Ahmedabad.

### Activities supported by SGP :

Small Grants Programme provides grants to organisation for activities that address local problems related to :

1. Land Management
2. Water Management
3. Biodiversity conservation.

In addition, good proposals in the areas of climate change and international waters are also considered.

SGP mainly supports activities that :

1. promote innovative local response in the themes specified.
2. build local capacity to implement sustainable development strategies.
3. demonstrate high replicability and scaling up potential.
4. create public awareness on environmental issues.
5. address livelihood and gender concerns.

### Who can submit proposals ?

The following types of organisations can submit proposals.

1. Non Governmental Organisations (NGOs).
2. Community Based Organisations (CBOs).
3. People's Organization.
4. Universities.
5. Schools.
6. Local Co-operative societies.

Agencies which work at the community level to address local aspects of the global environmental issues can submit proposals.

### Time frame and Funding :

SGP provides a maximum funding of 15 lakhs over a time frame of two years.

Agencies interested in developing projects under the SGP may contact CEE at the following address :

**Centre for Environment Education  
Nehru Foundation for Development  
Thaltej Tekra  
Ahmedabad 380 054  
email : [ceeindia@vsnl.com](mailto:ceeindia@vsnl.com)**

### AWARD

Dr. S. K. Jain (Left), Ex-Director, BSI who has been internationally awarded as a distinguished Economic Botanist for the year 1999 from the Society of Economic Botany is giving Prof. B. A. Raji Award to Dr. N. P. Singh (Right) the Director BSI, in the National Seminar organised by APT, Dehradun-2001.



Bhuj city in Gujarat just before the earthquake. ENVIS Centre BSI is deeply shocked for the massive devastation of life and property due to earthquake. We condole for the same and hope renovation as early as possible.



### Contact Address :

Dr. L.K. Banerjee, Jt. Director & Project Co-ordinator : ENVIS, Botanical Survey of India,  
Industrial Section, Indian Museum, 1 Sudder Street, Kolkata-700 016.  
Phone : 033-217 0643 Fax : 033-668 3232 E-mail : [envis@cal2.vsnl.net.in](mailto:envis@cal2.vsnl.net.in)