

ENVIS CENTRE ON FLORAL DIVERSITY



ENVIS
NEWSLETTER



From Director's Desk

The Convention on Biological Diversity (CBD) makes it mandatory for the signatories to conserve biodiversity across the world. Conservation of biological diversity is a common concern for the present and future welfare of human beings and is an integral part of sustainable development. Therefore, it is essential to make a comprehensive documentation of floral and faunal diversity of our country and conserve the biodiversity existing at various levels. Since 1994, the ENVIS Centre of Botanical Survey of India has been focusing on issues especially related to floral diversity, conservation and environment and publishing articles in its official Newsletter.

This issue contains articles on biodiversity and conservation of rare species. Articles on *Codonopsis javanica* and *Fissistigma verrucosum* emphasize the habitat, occurrence, uses and rarity as well as the *ex situ* conservation of these species in botanic gardens. The article on *Eulophia andamanensis*, provides information on the distribution and phenology and *ex situ* conservation of this terrestrial orchid in the roof-top garden of Central Botanical Laboratory. The various properties, commercial value and status of *Aquilaria malaccensis* (Agarwood) have been discussed. In the article on *Hiptage benghalensis*, a species cultivated for its ornamental and medicinal values, a brief description, distribution, and invasiveness of the species in the world are provided. The article on world's highest Ramsar site – Tsomorari Lake, provides glimpses of unique biodiversity in and around this unique wetland site.

Hope, the articles published in this issue are informative and useful to readers. I appreciate the efforts of entire team of ENVIS Centre on Floral Diversity to bring out this issue.

(Panamjit Singh)
Director
Botanical Survey of India

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Codonopsis javanica (Campanulaceae) in Phawngpui (Blue Mountain) National Park, Mizoram

Phawngpui (Blue Mountain) National Park is located in the south eastern part of Mizoram in Chhimituipui district adjacent to Myanmar.

While exploring the Phawngpui (Blue Mountain) National Park, *Codonopsis javanica* (Blume) Hook.f. & Thomson [basionym: *Campanumoea javanica* Blume] was collected which is rare in the park. The species has a widespread distribution and occurs in SE Asia from West Bengal, Sikkim and north-eastern parts of India to Bangladesh, Myanmar and through China to Malesia and Japan.

It is a perennial twiner. The flowers are bisexual, solitary. The corolla is campanulate, greenish-white with purple veins and a short tube. Fruit is a berry, globose, with persistent and spreading calyx lobes at base. In Mizoram, the flowering and fruiting period is from October to November. The plants prefer sandy or moist loamy soils and grow in semi-shaded places on hill slopes.

The root is diuretic, expectorant, galactagogue and stomachic. It is used in the treatment of a wide range of conditions, including general debility, fatigue, anaemia, jaundice, dyspepsia, diarrhoea, nephritis, haemorrhoids, oedema and diseases of the lymphatic system (<http://www.pfaf.org/user/Plant.aspx?LatinName=Codonopsis+javanica>).

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Flower of *Codonopsis javanica*

Eulophia andamanensis (Orchidaceae) in the roof-top garden of Central Botanical Laboratory, Howrah

In India, 24 species of *Eulophia* are known to occur mainly in the Himalayan region (Misra, 2007) while *Eulophia andamanensis* Rehb.f. was reported in the wild from the Andaman Islands by Reichenbach (1872).

The terrestrial orchid *E. andamanensis*, popularly known as *Andaman-Eulophia*, was first described by Reichenbach (1872) based on plants introduced by S. Kurz in 1866 in the then Calcutta Botanic Garden, now renamed as AJC Bose Indian Botanic Garden, Howrah, from Andaman Islands which flowered for the first time in 1867 (Hooker, 1895: 34, t.52).

E. andamanensis was considered to be endemic to the Andaman and Nicobar Islands until peninsular SE Asiatic species *E. keithii* Ridl. was included under its synonymy (Seidenfaden & Wood, 1992). Consequently, its distribution range extended to Myanmar, Thailand, Laos, Cambodia, Vietnam, Malaysia, Indonesia (Sumatra) and the Philippines.

It produces pale green erect scapes with 10 – 25 flowers which last for a month or so. The large pseudobulbs are best suited to dry climate and hence successfully propagating in an earthen pot kept in the roof-top garden of Central Botanical Laboratory in AJC Bose Indian Botanic Garden, Howrah for more than ten years with minimum care. It flowers here during March to May.

A devastating Tsunami struck off Andaman and Nicobar Islands on 26th December, 2004 causing severe damage to its biodiversity. In India, since *E. andamanensis* is restricted to Andaman and Nicobar Islands, its occurrence in the roof-top garden of the Central Botanical Laboratory plays a significant role towards its *ex-situ* conservation and to explore the horticultural prospects of this species for large scale commercial cultivation.

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Seidenfaden, G. & J.J. Wood. 1992. *The Orchids of Peninsular Malaysia and Singapore*. Olsen & Olsen, Fredensborg.

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Fig. 1: *Eulophia andamanensis*: A. Habit; B–C. Flowers; D. Perigone with sepals, petals, labellum and column with ovary; E. Labellum; F. Column with portion of ovary; G. Close-up of apical part of column; H. Anther; I. Pollinarium (ventral view); J. Pollinarium (dorsal view)

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Biodiversity of the world's highest Ramsar site – Tsomorari lake, Ladakh, Jammu and Kashmir

The high altitude lakes of the Himalayas located in alpine region represent a relatively common ecosystem in mountain ranges. However, they remain less intensely studied than lowland lakes, mainly because of their remoteness and the short summer open-water period. Nevertheless, high altitude lakes are sensitive reference systems of global climatic changes and other human impacts (Schmidt & Psenner, 1992). The wetlands not only support a wide variety of flora and fauna, but are also sources of various rivers originating from the region. Many human communities living here are dependent on livestock for their livelihood. Wetlands perform many essential ecosystem services such as carbon storage, flood control, maintenance of biodiversity, fish production and aquifer recharge that have increasingly important global consequences. Like biodiversity hotspots and frontier forests, the world's highest wetland Tsomorari was declared as a Wetland of International Importance under the

Ramsar Convention in 2002. The lake now has the distinction of being the highest Ramsar site in the world surpassing Salar de Tara in Chile. Tsomorari lake (32°07'N to 32°50'N and 78°03'E to 78°20'E) in eastern Ladakh is spread over an area of c 120 sq km of the Rupshu Desert in the northernmost Indian state of Jammu and Kashmir. This high altitude brackish water lake is situated at c 4,650 m and remains frozen in winter from December to March (Chandan *et al.*, 2008). The Pare Chu river, which originates c 40 km upstream, flows along the southern side. The area is characterized by an arid, cold desert climate. The migratory birds start arriving in this wetland for breeding in the month of April and after completing their breeding cycle leave this wetland during October – November. The lake is the only breeding ground outside China for one of the most endangered cranes, the Black-necked Crane (*Grus nigricollis*). Besides, several other species of birds also use this wetland

as their breeding grounds too, such as Bar-headed Goose (*Anser indicus*), Brown-headed Gull (*Larus brunicephalus*) and Great-crested Grebe (*Pediceps cristatus*) (Mishra & Humbert-Droz, 1998).

The vegetation in and around Tsomorari Lake can be broadly grouped into scrub formations, desert steppe and marsh meadows. The major communities including *Caragana* spp., *Artemisia* spp., *Oxytropis* spp. and *Carex* spp. have sparse communities of moss or cushion-like growth forms, such as *Thylacospermum caespitosum*, *Arenaria bryophylla*, *Androsace sarmentosa* and a variety of lichens. Stream banks and marsh meadows around the Lake exhibit characteristic sedge dominated vegetation represented by species of *Carex*, *Kobresia*, *Scirpus*, *Triglochin*, *Puccinella*, *Ranunculus* and *Polygonum*. The shallow parts of the Lake support dense growth of aquatic plants such as *Potamogeton pectinatus*, *P. perfoliatus*, *Zannichellia palustris* and *Ranunculus* spp. Some of the interesting species collected near Tsomorari during the plant survey in July–August, 2011 are *Astragalus confertus*, *Dracocephalum heterophyllum*, *Pedicularis pectinata*, *Chenopodium glaucum*, *Delphinium brunonianum*, *Potentilla anserina*, *Polygonum delicatulum*, *Poa lahulensis* and *Draba alpina*.

A survey to assess the floristic composition of this landscape and



Tsomorari Lake – The breeding ground of Black-necked Crane



Patch of *Pedicularis* near Tsomoriri Lake

mapping of this important ecosystem is required. A detailed inventory of the bird community of the area is also required and study on their breeding behaviour will help in plant-animal interaction in this wetland ecosystem. The conservation of breeding habitats and feeding areas

of breeding populations such as Black-necked Crane, Bar-headed Geese, Great Crested Grebe, Ruddy Shell Ducks and other migratory water fowls may be prioritized.

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Aquilaria malaccensis (Thymelaeaceae) – ‘The Crown of all Sandalwoods’

The name White Sandalwood refers to *Santalum album* L. (Santalaceae) and Red Sandalwood to *Pterocarpus santalinus* L.f. (Leguminosae–Papilionoideae). Another name *Aggalichandhanam* (*chandhanam* means sandal) refers to *Aquilaria malaccensis* Lam. (synonym *Aquilaria agallocha* Roxb.) in the Siddha system of medicine.

In India, *A. malaccensis* occurs in the North East. It sometimes produces resin-impregnated heartwood in response to fungal infection. This is commonly known as Agarwood and has high demand mainly for medicine, incense and perfume. Agarwood is traded as wood, wood chips, powder and Agar oil extracted from it. The price of the Agarwood ranges from ₹ 250–10,000 per kg and Agar oil is

highly valued across the globe since ancient times. The price of genuine Agar oil ranges from ₹ 10–12 lakhs per kg (Shiva *et al.*, 2002).

The commercial value of *A. malaccensis* is much higher compared to the other two kinds of Sandalwood trees. So, it can be hailed as ‘The Crown of all Sandalwoods’ [<http://www.scribd.com/doc/34169282/The-Brownish-Assam-Sandal-The-Crown-of-all-the-Sandal-woods>].

All species of *Aquilaria* are included in the Appendix II of the Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES). This species is threatened primarily due to over-exploitation for its (Agar)wood and also included in Negative List of Exports of Government of India.

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Chips of Agarwood

Notes on *Fissistigma verrucosum* (Annonaceae) in Garo hills, Meghalaya

Recently on a plant collection tour to Garo hills, Meghalaya under the *ex-situ* conservation programme of Botanical Survey of India, the first author came across a large woody straggler bearing densely warted fruits. After critical examination, the plant was identified as *Fissistigma verrucosum* (Hook.f. & Thomson) Merr. [basionym: *Melodorum verrucosum* Hook.f. & Thomson]. Hooker & Thomson (1855: 119) while describing this species cited collection from Khasia mountain. Kanjilal *et al.* (1934) reported this species from a number of localities in Assam. Upadhaya (2002), Jamir & Pandey (2003) and Anonymous (2005) also reported this species from Meghalaya.

Mitra (1993) gave the distribution of this species as Assam, Mizoram and Meghalaya in India and adjacent countries like Bangladesh and Myanmar. However, in terms of herbarium specimens from the Indian region, this species is not well represented. Only a few collections of J.D. Hooker & T. Thomson, U.N. Kanjilal and R. Kumar exist.

In Garo hills, Meghalaya this species occurs in sub-tropical mixed forests between 1200–1500 m altitude along with *Terminalia myriocarpa*, *Schima wallichii*, *Castanopsis armata*, *Engelhardtia spicata* and *Elaeocarpus floribundus*. It fruits in March.

As this species is depleting in its natural habitat in Garo hills, adequate



Fruits of *Fissistigma verrucosum*

conservation measures must be taken to protect this species.

Efforts are being made for conservation by propagating through stem cuttings in the Experimental Botanic Garden at Barapani, Botanical Survey of India, Shillong as the seeds which were collected earlier were immature.

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Hiptage benghalensis (Malpighiaceae) – The Helicopter plant

Hiptage benghalensis (L.) Kurz is a native of India, Southeast Asia and the Philippines.

It is cultivated as an ornamental throughout the warmer temperate, sub-tropical and tropical regions of the world. In India, it has several vernacular names viz., *Madhavi*, *Madhavilata*, *Madhumalati* and *Madhulata*. It is also known as *Helicopter* plant because of its fruits whose three wings act like helicopter blades to fly a considerable distance for effective dispersal.

This species occurs in the natural forests and along water courses as one of the elements of riparian vegetation and often prefers moist and shady habitats. It is also found growing in suburban gardens, along hedges and in wastelands. It can be trimmed to give a bushy appearance or trained as a vine on trellis. The plant is widely cultivated in the tropics for its pretty, fragrant flowers. The fragrance is very strong and



Habit of *Hiptage benghalensis*

pleasant, resembles fruity perfume. It is also occasionally cultivated for medicinal purposes and used in Ayurvedic medicine. The leaves and bark are hot, acrid, bitter, insecticidal, vulnerary and useful in the treatment of biliousness, cough, burning sensation, thirst and inflammation. These are also used to treat skin diseases and leprosy. Due to its therapeutic value, it is grown in the *Charaka Udyan* (Medicinal Plant Garden) of AJCB Indian Botanic Garden, BSI, Howrah.

H. benghalensis is a highly variable species and may range in habit from a large woody vine to a shrub. Tender shoots are greyish-green, often lenticellate. Leaves are simple, opposite, lanceolate to ovate-lanceolate, 6–20 cm long and usually acuminate at apex, rarely acute. Petals are fimbriate at margins, varying in colour between pink and white; the inner one or more petals partly yellow. Fruit a samara with three spreading, papery 2–5 cm long oblanceolate to elliptic wings. Flowering occurs throughout the year, and usually profuse in early spring.

H. benghalensis has become weedy on several islands in the Pacific and Indian Ocean as well as



Flowers of *Hiptage benghalensis*

in Florida in the USA. It is a problematic species in Hawaii and has been reported to be particularly invasive on La Reunion and Mauritius in the Mascarene Islands. It can smother the native vegetation and even choke large trees in natural forests and has also been observed to form impenetrable thickets. Because of its invasiveness it has been included in the Global Invasive Species Database list of 100 of the World's Worst Invasive Species.

Websites referred:

http://en.wikipedia.org/wiki/Hiptage_benghalensis#cite_ref-6

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Dr. (Ms.) N. Chatterjee, IAS, Additional Secretary, Ministry of Environment & Forests, New Delhi chairing the first meeting of the Programme Management Committee (PMC) on 18.5.2012 at Central National Herbarium, Botanical Survey of India, Howrah

Dr. D.K. Singh, Additional Director, Botanical Survey of India delivering a lecture in the 'Capacity Building Training Course in Plant Taxonomy' organised by ENVIS Centre on Floral Diversity, Botanical Survey of India from 21-22 April, 2012.



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Activities of the Centre: The Botanical Survey of India having involved in exploration activity has been collecting diverse data pertaining to floral diversity and the ENVIS Centre of BSI proposes to disseminate this information by building databases on the distribution of endemic and threatened plants, documentation of traditional / ethnobotanical knowledge, carnivorous plants and mangroves of India. It is also engaged in publication of state wise bibliography including abstracts of papers pertaining to plants of India and also selected publications that have relevance both in documentation and conservation.

List of publications brought out so far:

- Books:**
1. Mangroves, Associates and Salt Marshes of the Godavari and Krishna Delta, Andhra Pradesh-India
 2. Diversity of Coastal Plant Communities in India (Priced publication) ₹ 804.00*
 3. Red List of Threatened Vascular Plant Species in India
 4. A Pictorial Guide of some-of the Indian Plants included in CITES and Negative List of Exports
 5. Bibliography and abstract of papers on flora of West Bengal
 6. Bibliography and abstract of papers on flora of North East India - I
 7. Bibliography and abstracts of papers on flora of West Bengal - II
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