

## CYATHEA BRUNONIANA (WALL EX HOOK) C.B. CLARKE ET BAKER: FIRST REPORT OF A THREATENED SPECIES OF TREE FERN FROM TRIPURA, INDIA

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### ABSTRACT

The generic name *Cyathea* came from the Greek word *Kyatheion* which means little cup. It refers to the sori found in the undersurface of the fronds. *Cyathea brunoniana* is a majestic plant which is fast disappearing from its natural habitat. The tree ferns mostly grow in warm humid environment in shady forest floor. *Cyathea brunoniana* is reported from some places of North East India including Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram and Sikkim from time to time but not from Tripura. The present communication records it as first report from the state of Tripura. It presents brief taxonomic description, distribution, causes of depletion, conservation strategies and cultivation technique of this tree fern.

**Keywords :** *Cyathea brunoniana*, New report, Kherengjuri, Tripura

### Introduction

The tree ferns are found growing mostly in tropical and subtropical areas because they prefer warm condition with consistent hours of sunlight, high humidity and adequate rainfall. These are lofty trees that make pleasing appearance in landscapes and gardens. Some may grow in temperate regions. The fronds of tree ferns are usually very large and bi or tri-pinnate. They exhibit circinate vernation.

There are about seven hundred species of tree ferns and they can be placed into two families: Cyatheaceae and Dicksoniaceae. However, there are also some other ferns known for their tree like habit and called tree ferns e.g. some plants belonging to Blechnaceae, Marattiaceae etc. Any fern that grows with a trunk elevating the leaves above ground level can be called a tree fern, but commonly in our country the term is used for the plants belonging to genus *Cyathea*. No

clear features characterize all of the Cyatheales. Some species in the Cyatheales have tree-like growth forms, but others have creeping stems. Some species have scales on the stems and leaves, while others have hairs. However, most plants in the Cyatheales are tree ferns and have trunk-like stems up to 20 meters tall. DNA sequence data indicates that the order is monophyletic.

The generic name *Cyathea* came from the Greek word *Kyatheion* which means little cup. It refers to the sori found in the undersurface of the fronds. The genus includes world's tallest tree ferns which generally grow faster than other tree ferns. Fossil evidences show that even two hundred million years ago they were growing there as well. While many ferns are able to achieve a widespread distribution, tree fern species tend to be very local. This makes their species vulnerable to the effects of local deforestation. It is really fascinating to know that in spite of their sufficient height

and greater chance of getting spore into the wind, the tree fern spores do not reach long distance.

Tree ferns are presently found in every continent except Antarctica. Holttum (1964) reported that in Malayasia alone there are 19 species of tree ferns while there are a total of 25 species of tree ferns in Asia excluding Malayasia. From Assam of British India, Beedome (1865-70, 1883) and Clarke (1880) reported some species of *Cyathea*. Holttum (1964) reported a total of 5 species of *Cyathea* viz. *Cyathea andersoni*, *C. brunoniana*, *C. gigantea*, *C. Khasyana* and *C. spinulosa* from the then Assam while from present political boundary of Assam Borthakur *et al* (2000) reported five species viz. *Cyathea andersoni*, *Cyathea gigantea*, *Cyathea henryi*, *C. Khasyana* and *C. spinulosa*.

Fern flora of Tripura has been explored by Deb (1961, 1981), Das (1992, 2007), Das and Sen (1991) and others. Das (2007) in his book Fern and fern allies of Tripura (North East India) through his extensive collection revealed that there are 76 species of ferns and fern allies belonging to 41 genera and 28 families. He has made new records of 36 species. He has also published a list of 26 species which was reported by earlier workers but could not be found by him despite repeated efforts. The only species of tree fern which could be traced in the literature is *Cyathea gigantea* (Wall ex Hook) Holtt belonging to Cyatheaceae. It is a tree fern with massive trunk, stipe and rachis dark purple, fronds bipinnate, veins 6-7 pairs on each pinnule, basal basioscopic vein always from the costae, sori globose, together forms v-shaped structure on each pinnule, exindusiate.

The species *Cyathea brunoniana* was first described by Wallich in his catalogue as *Alsophila brunoniana* Wall. on the basis of

collection made by him from Sylhet district of Bangladesh. Later, the species was validly published by Hooker (1844). Clarke (1880) and Beedome (1883) reported the plant as *Hemitelia brunoniana* C. B. Clarke and *Amphicosmia brunoniana* Bedd. Respectively from Sikkim, Bhutan, Nepal and Meghalaya. Clarke & Baker (1888) synonymized the above name under *Cyathea brunoniana* (Wall. Ex Hook.) Clarke & Baker. *Cyathea brunoniana* has been reported from Arunachal Pradesh by Dixit (1998) as *Sphaeropteris brunoniana* (Wall. ex Hook.) Tryon, from Manipur & Meghalaya by Kachroo *et al.* (1989), from Mizoram by Kumar *et al.* (2012), from Nagaland by Jamir & Rao (1988) and from Sikkim by Kholia 2010. Chandra *et al* (2008) considered *Cyathea brunoniana* as a species at risk. According to him *Cyathea brunoniana* (Wall. ex Hook.) C.B. Clarke & Baker (syn.: *Sphaeropteris brunoniana* (Wall. ex Hook.) R. Tryon) is found in E. Nepal; N.E. India (West Bengal, Darjeeling; Sikkim; Arunachal Pradesh; Manipur; Nagaland; Meghalaya). Reported from the W. Himalaya and S. India in error.

#### Materials and Methods :

Tripura is situated in the north eastern part of India between 22-32 and 24-32 N and 91-10 and 92-21 E. It is surrounded by Bangladesh in the West, South and North and by Assam in the North East and East respectively. It has an area of 10490 Sq Km. The climate is generally hot and humid. Physiographically the state shows small hillocks and plain land. It was a princely state before India became independent but became a part of Indian Union in 1949. It received a status of State in 1972.

In recent years extensive survey was conducted by the present authors to collect fern flora of Tripura. The collected plants were identified using standard literature and matching in the herbarium. The study includes

brief taxonomic treatment, causes of depletion of tree ferns, conservation strategy and cultivation techniques.

## Results and Discussion :

### Brief taxonomic treatment :

*Cyathea brunoniana* (Wall. ex Hook.) Clarke & Baker. in J. Linn. Soc. Bot. 24: 409. 1888. Holtt. in Kew Bull.19: 486.1965; Dixit, Cens. Indian Pterid.: 93.1984. *Alsophila brunoniana* Wall. ex Hook., Sp. Fil. 1: 52. 1844; Bedd., Fern. Brit. India t. 86.1865. *Sphaeropteris brunoniana* (Wall. ex Hook.) Tryon, Cotrib. Gray Herb. no. 200: 21. 1970; Dixit, Indian Fern J. 15: 40. 1998. *Alsophila costularis* Baker, Kew Bull. Misc. Inf. 1906: 8. 1906.:

Tree fern with massive stout erect trunk. Lamina bipinnate, undersurface whitish, Stipe and rachis yellow. Fronds 2-3 x 1.5-1.7 m, crowned, bipinnate to tripinnatifid, glaucous beneath; pinnae more than 60-80 x 25-30 cm long; pinnules 8.0-15 x 2.0-2.8 cm, lowest 1 or 2 segments almost free, rest deeply lobed, costules 1-1.5 x 0.4-0.6 cm, veins 10-11 pairs, once forked, acroscopic branch often again forked; lower surface greenishglaucous, margins entire, slightly inflexed., basioscopic basal veins from the costule . Sori globose, exindusiate, indusia spherical, found near costules, brown in colour; fertile segments narrower than the sterile ones, falcate, paraphyses many, narrow scales seen around sorus, a few scales with marginal hairs present.

### Causes of Depletion:

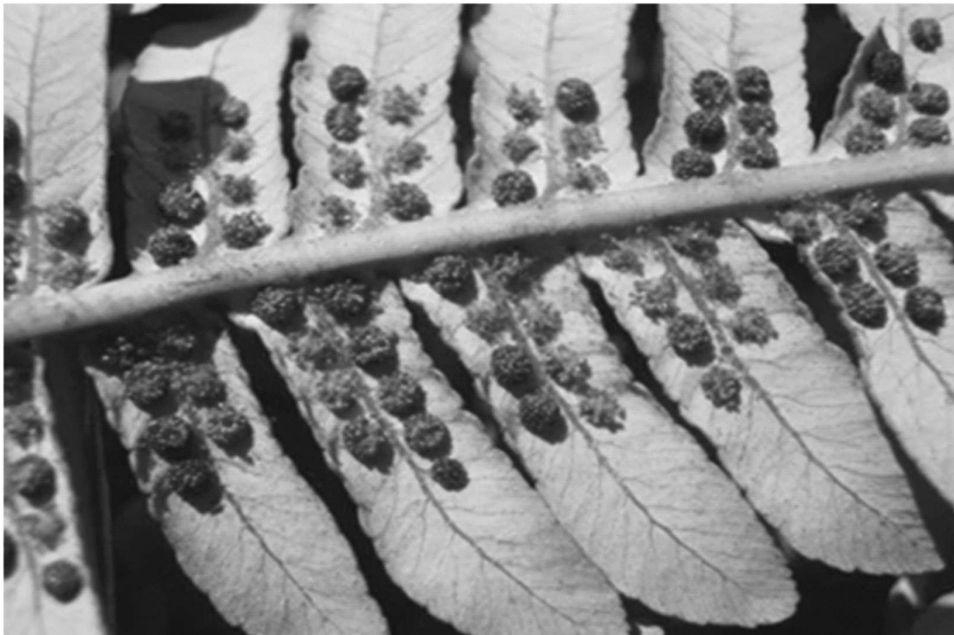
The present authors have witnessed that over last 10 to 15 years tree fern population has dwindled very rapidly in certain areas. Causes of decline of tree fern population in North Tripura district are different in different areas.

In most cases population have declined due to following reasons:

1. Expansion of tea plantations in last 100 – 150 years.
2. Rubber cultivation in recent years
3. Monoculture of Teak in last three decades of 20<sup>th</sup> century.
4. After partition of India, migration of population from East Pakistan and encroachment of land.
5. Urbanisation is one of the main causes.
6. Soil cutting and soil erosion.
7. Use of tree fern crown for medicinal purpose by the tribals.
8. Clearing of forest for shifting cultivation, pan jum, agriculture etc

### Conservation strategy:

1. *In situ* conservation should be done by declaring protected areas where the fern is still found.
2. As tree ferns are becoming threatened in their natural habitats, *ex situ* fern conservation takes on greater importance. The tree ferns may be grown and cultivated in home gardens.
3. A widespread practice of wild cutting of tree ferns for ethno botanical uses among local people has dramatically diminished native tree fern populations. There should be awareness campaign by NGOs and GOs to protect the remaining plants.
4. Tree fern has been used as a mounting material for orchids, especially once Osmunda fiber became more and more expensive and difficult to find. We have now reached the point where the demand for the product is endangering many of the slower growing species of this large fern.
5. The spores of tree ferns should be available in spore bank in the laboratory.



**Plate 1:** Under surface of the frond of *C. Brunoniana* showing sori.



**Plate 2:** Habit of the Plant.

6. Tissue culture technique should be used for mass cultivation.
7. The Social Forestry Department should promote this local species.

#### Cultivation:

Tree ferns require shade, ample moisture and good drainage. Pits are prepared adding rotted organic matter such as compost, cow manure or rotted leaf litter with coarse river sand. 1/3 of the trunk should be placed in the ground. It should be watered in the crown of the fern as well as round the base. For irrigation, a small circle of 4 mm drip hose or similar dripper in the crown connected to the main supply may be used. Tree ferns are rain forest plants which grows on soil supplemented with natural mulch of leaf litter

and regular rainfall. A deep watering round the base of the trunk once a week in summer is essential. Organic compost will supply the plant with most of its nutrients.

Generally tree ferns are not attacked by pests, only exception being scale insects. This usually shows as a lack of health and vigour of the fronds. Ants often accompany the presence of scale. Ants do not cause damage to ferns but they feed on the sugars sucked out of the scale insects.

Commercial cultivation of tree ferns from the forests is practiced in Tasmania, Victoria and New South Wales. In India cultivation of tree fern in home garden has not been very popular till date. However, in Sikkim some tree ferns being cultivated in home gardens as ornamentals.

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