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## **Conservation and Management Plans for *Angiopteris evecta* (Forst.) Hoffm. (Marattiaceae: Pteridophyta): An Endangered Species**

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### **Abstract**

*Angiopteris evecta*, due to its rarity, is potentially a species of high value for fern enthusiasts. This is a threatened species which is included in the endangered categories in the 'Red Data Book' of International Union for Conservation of Nature and Natural Resources. Since this species is also known to be of importance for its ethnomedicinal uses, this is a matter of great concern. If we do not think about its conservation and protection, this species could very well disappear from the face of this earth. For these reasons, the present paper deals with the habitat, cultural value and medicinal uses of *Angiopteris evecta*. It also presents a plan for its recovery, conservation and management.

**Key Words:** *Angiopteris evecta*, habitat, uses, exploitation, proper management.

### **Introduction**

Ferns, at one time, were regarded primarily as ornamental plants. More recently, however, people have come to realize the wide- spectrum utility of ferns. A lot of work is being done on both the harmful and useful aspects of ferns. Although a large variety of ferns are available on the earth, there are some ferns that are slowly and gradually becoming extinct. Day by day the number of ferns is dwindling and this is a matter of great concern. If this problem is not addressed pretty soon, some ferns will surely become extinct forever. One such fern is called *Angiopteris evecta* which, as the 'Red Data Book' of International Union for Conservation of Nature and Natural Resources has termed it, is as an endangered species. The fronds of this fern are so big that they are generally described as *giant ferns*. If we do not think about its conservation and protection, then in some years it will disappear from the earth. What matters most is that this fern *Angiopteris evecta* is of tremendous medicinal value. Thus, the present paper deals with the habitat, cultural and medicinal uses of *Angiopteris evecta*, as well as a

plan for its recovery, conservation and management.

## Material and Methods

Plant material of *Angiopteris evecta* was obtained from the forests at Pachmarhi, Madhya Pradesh and kushmi in Gorakhpur district, Uttar Pradesh, India. The ethnobotanical data, gathered from tribal medicine men of India and also from other sources, is described here. Throughout this study, the author focused on the causes adversely affecting the survival of this species and its conservation and management.

## Observations

*Angiopteris evecta* (Forst.) Hoffm. in Comm. Soc. Reg. Gott. 12: 29, t. 5, 1796; Bedd., Ferns Brit. India 460, t. 285, 1883; Holttum, Fl. Malaya 2: 44. 1954. *Polypodium evectum* Forst. Prodr. 81. 1786. *Angiopteris crassipes* Wall. ex Presl. Suppl. Tent. Pterid. 23. 1845.

**Family** – Marattiaceae

**Common name** – English name: Giant fern, Yapese name: m'ong, Pohnpeian name: Peiwed (Poaiwed), Paiued, Chuukese name: ammarre (chuuk lagoon), Madagascarian name: Madagascar tree fern, Mule's foot, oriental vessel fern.

**Distribution:** *Angiopteris* is widely distributed throughout the Indian region up to 7,000 feet elevation. It has been reported from Malaya, Malaysia, Japan, Tropical Australia, New Caledonia, Madagascar, Fiji and some other places. Although this genus has about 100 species, it is represented in India by the single species *Angiopteris evecta*. It is a large sized fern which is usually found growing in deep ravines, flourishing well near water inside the dark gorges between 700-1500 m altitudes. In India it is distributed in Pachmarhi and Bailadilla hills of Central India, Eastern Himalayas like Darjeeling, Sikkim and South India viz., Kodaikanal and Palni hills. In Australia it occurs in the Northern Territory and along the east coast from the Queensland wet tropics to North Eastern New South Wales.

### Growth habit and external morphology

*Angiopteris evecta* is an ancient species reputedly having the largest fronds of any fern on earth. The plants are usually found growing in moist shady places along the water streams. The height of the plant is usually 6-1.8 m, consisting globose, upright rhizome and numerous adventitious roots arising from its basal part. Rhizome is robust and may attain a diameter of up to 60 cm. The overall appearance of the plant is like a small tree. The petioles are spirally arranged and form a crown at the apex of the rhizome. Each petiole bears a pair of fleshy stipules at its base, which enclose the next younger petiole. Pinnae are usually sessile or shortly stalked. A conspicuous swelling called pulvinus is present at the base of pinna. The venation pattern of lamina is open dichotomous and a prominent mid vein is differentiated in the pinnae. The free ends of the veins are often swollen. The base of petiole shows dense large brown scales. Sori of two close rows of sporangia attached along a vein at its apex, sporangia

dehiscing along slits on the side facing the vein.

## Uses

**Cultural uses:** There are many uses of this plant in the culture of Yap Island. This plant seems to be very important to the Yapese. This typical plant is used for leis (leis are a Hawaiian word for a garland). The Yapese, particularly young girls use this plant for making leis. They add the leaf with other types of flower. These leis are given to special people or used at the Yapese dance. Most people like to have leis just for decoration and its smell really helps the brain to calm down when tired. Some people use it to say goodbye to relatives and friends when leaving the Yap Island. Some hotels use these garlands to welcome Yap island visitors. Some people use these plants, especially the trunk, for medicine. It is also used in parties in Yap as a gift (1).

**Medicinal uses:** This plant is very important because it is one of the common ingredients of secret medicines in the families in Yap Island. This plant is believed to reduce bodily pain, and cool down the body temperature. The leaf can be gathered together and laid down on a mat. Any person who has backache can sleep on it at night. And at the same time it helps alleviate the pain (2).

*Angiopteris evecta* yields aromatic oil and is used for perfuming coconut oil in South Sea Islands (3). The rhizomes of *Angiopteris evecta* are used for scabies in India (4). In the Southern highlands of Papua New Guinea, the fronds of this giant, fleshy, terrestrial fern were bound on to a fractured limb. Swollen caudex used as starvation food in highland and low land areas of Papua New Guinea. (5). In the treatment of headaches, *Angiopteris evecta* is used in both Yap and Meghalaya. (6, 7). *Angiopteris evecta* is used in Fiji for blisters and boils (8). It is used in the treatment of ptomaine poisoning and also in cancer in Yap Island (9).

The commonest causes endangering the survival of species are desertifications, inappropriate collection, tourism, small population, fire, growth of exotic plant species.

**A)** Desertification is the process leading to desert formation. This may result either due to a natural phenomenon linked to climatic change or due to abusive land use. Removal of giant fern brings about marked changes in the local climate of the area.

**B)** Inappropriate collection is the plant removal or destruction through botanical collections which threaten the giant fern. Due to the rarity of this species the giant fern is potentially a species of high value to fern enthusiasts. Inappropriate collection of plant material has the potential to kill the only known individual in the fern populations.

**C)** Tourism which increases the visitor's access would increase the chances of accidental damage to the giant fern.

**D)** The only known population of the giant fern comprises one plant that is not frequently reproducing resulting in a population that is highly susceptible to stochastic events.

**E)** The giant fern is likely to be extremely fire sensitive and easily killed by exposure to flames.

F) The giant fern site has a history of invasion by exotic species such as Lantana, Indian Corel tree and Camphor laurel. Exotic species such as these compete with, suppress growth and interrupt the recruitment of juvenile and adult plants.

## Results

**Conservation and management:** Due to selective and excessive exploitation of giant fern without proper management practices for their regeneration and due to destruction of certain natural ecosystems, there is an extinction of species. Once a species becomes extinct, that combination of gene pool is permanently lost and man no more can recover it for future use. Therefore conservation of giant fern is all the more important. Each disappearing species takes with it other dependent species of insects or higher animals etc. An endangered species is one in which the natural regeneration is not able to cope with the prevailing exploitation level. There are several economic reasons also for the conservation of genetic resources as some are found to be of much medicinal importance. On geological time scale the evolution of new taxa and extinction of the existing giant fern in somewhat balanced proportions have been taking place, but in recent year's human activities by way of destruction of biota and natural habitats have accelerated the process of extinction to an alarmingly faster rate. But for a proper ecosystem balance, the preservation of giant fern richness is necessary. For this the disruptive technologies have to be replaced by eco-developmental technologies. For the presentation of diversity of flora, there is an urgent necessity of creating a series of nature reserves, biosphere reserves, botanical garden etc. Due to the rarity of this species, the giant fern is potentially a species of high value for fern enthusiasts. In New South Wales, this plant is included as endangered under the NSW threatened species conservation Act 1995. The act 1988 was enacted in India to check indiscriminate dereservation and diversion of forest land for non-forest purposes. Management actions for the giant fern consist of many tasks which include the following:

- 1) We must develop an awareness of and sensitivity to the total environment and its allied problems as regards giant ferns.
- 2) We must gain a variety of experiences and acquire a basic understanding of the environment and its associated problems of giant ferns.
- 3) We should acquire a set of values and feelings of concern for the environment and the motivation for active participation in environmental improvement and protection of giant ferns.
- 4) We should also acquire skills for identifying and solving problems regarding giant ferns.
- 5) Also we should evaluate environmental measures and education programs of giant ferns in terms of ecological, economic, social, aesthetic, and educational factors.
- 6) An easy opportunity should also be made available to be actively involved at all levels in

working towards the resolution of giant fern problems.

7) The wire fence around the habitat of giant ferns be constructed to exclude live stock from the immediate area.

8) Educated persons should tell others about the multiplication of giant ferns through tissue culture technique.

9) Germplasm banks of giant fern should be established to preserve the diversity of flora

## Discussions and Conclusions

**Guiding principles:** A number of new objectives and guiding principles for developing giant fern education at all levels, in both formal and non-formal levels, should be formulated. These are as follows:

1. To be interdisciplinary in approach.
2. To emphasize active participation in prevention and solution to giant fern problems.
3. To examine fern issues from local, national, regional and international point of view.
4. To focus on current, potential environmental situations about giant fern.
5. To consider environmental aspects in plans for growth and development.
6. To emphasize the complexity of fern problems and need to develop critical thinking and problem-solving skills.
7. To promote the value and necessity of local, national and international cooperation in the prevention and solution to giant fern problems.
8. To help learners to discover the symptoms and the real causes of giant fern problems.
9. To utilize diverse learning about giant fern and different approaches to teaching and learning about giant fern.
10. An act should be implemented with a view to checking indiscriminate dereservation and diversion of giant fern land to non forest purposes.
11. Identifying the universally recognized areas which have threatened life support systems.
12. Enumerating the conservation objectives
13. No giant fern land or any portion thereof may be cleared of giant ferns which have grown naturally in that land or portion for the purposes of using it for reforestation without prior approval of government.
14. Certain trees, particularly conifers like *Pinus* and *Larix*, and dicots, like *Quercus*, develop fire resistant bark with insulating effect against heat. These trees help in escaping the damages against surface and ground fires. So these trees should be planted in and around giant fern zone.

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