Cycas beddomei : A Jewel of Seshachalam Hills

Boyina Ravi Prasad Rao

Cycas beddomei Dyer is a global endemic of Seshachalam hills (formerly called as Tirupati-Kadapa hills) belongs to family Cycadaceae, is the only Cycad species of India listed critically endangered by IUCN (IUCN, 2007) and the only Indian Cycad part of Appendix-I of CITES (Inskipp & Gillett, 2005). The species is of immense significance in the context of its medicinal importance and usuage and consequent resource exploitation led to decline in numbers. Scientific reports pertaining to the distribution of the species are based in many cases on non-detriment findings and secondary data published elsewhere. Our research team made keen efforts to study its distribution pattern and conservation *in situ*. The study was carried out in Seshachalam hill ranges, located in the Southern Eastern Ghats of Andhra Pradesh lying between Latitude 13°37' to 15°58'N and Longitude 79°15' to 79°30'E. These ranges have typical gorges and gaps due to faulting and stream erosion resulting into discontinuous ranges. The study area encompasses Sri Venkateswara Wildlife sanctuary and National Park. The altitude of the study area varies from 200 to 1150m above MSL and most of the hill peaks are above 900m above MSL. *Cycas beddomei*, locally called as Peritha or Madanakamakshi appear like a small phoenix tree with distinct trunk reaching up to 1.5m.

Habit

The plants are dioecious; the male and female plants can be distinguished, the former in clumps and the latter with isolated growth. Leaves pale green grown up to 1m long; leaflets narrow, linear, 12-18cm long, 2-3.5mm wide, with revolute margins. Male cones oblong-ovoid, to 35 x 16cm, with a short peduncle. Megasporophylls grow to 4 x 2cm. Ovules usually 2-4, occasionally 6 to 8 inserted above the middle of the stalk, to 4 cm across. All the individuals of the species were enumerated along an altitudinal gradient ranging from 400 to 1100m. Seven transects of 1000 m x 5m were laid at an interval of 100m altitude each. Interestingly the species has not been found at an altitude interval of 400-500m. The species was found distributed between 500m to 1100m above MSL with a slope range between 15° and 78° across. We inventoried a total of 900 individuals in 6 transects and found the species with a mean density of 150 84.27. Distributional ranges of *C.beddomei* were segregated along the widened altitudinal ranges. Plant density was recorded maximum at mid-altitudes and such, the peak density was at 900-1000m MSL; however below and above this altitudinal range the individual numbers show declining trend. In all grids, female trees component is higher (60-80%) than the male trees. Of the total recorded 900 individuals, majority of them i.e., 543 (60.53%) comprises 0-25 cm height class, followed by 174 individuals (19.37%) under 26-50 cm height, 149 individuals (16.49%) with 50-100cm height and the rest (3.37%) higher than 100cm height category.

The habitat of *Cycas beddomei* was found mostly of quartzite rock and sandy black soils. Plants grow in silt soils at lower elevation and clayey-loam in higher elevation (above 600m MSL). The pH of the soil was slightly acidic to near neutral (6.67) but at higher elevation (>800m MSL) it is acidic (6.08-6.1). The species usually grow in well-drained soils, but also found in nutrient poor soils. It is observed that specialized coralloid roots of plant containing symbiotic blue green algae, *Nostoc* and *Anabaena* which are able to fix

Box -1

Threat Status Justification: *Cycas beddomei* was originally listed as Vulnerable in the Indian Red Data Book (Nayar and Sastry 1987) and later re-evaluated as Endangered by Rao *et al.* (2003). Jadhav *et al.* (2001) classified the species as Critically Endangered based on secondary data and this assessment was the basis for the 2003 assessment (Hill 2003). However recent population studies (Suresh and Rao 2009; Rao *et al.* 2009) have provided detailed information on the distribution and population size of *C. beddomei*. These data show that the extent of occurrence (388 km²) and area of occupancy (20 km²) are small, but they are greater than originally thought and would mean that *C. beddomei* qualifies as Endangered (not Critically Endangered) under criterion B. Population size was originally estimated as <1,000 mature individuals, which means that it may also have qualified as Endangered under criterion C.

However, the latest data provides an estimate of between 20,000 and 30,000 individuals, so the risk associated with small population size is minimal.

The population is declining, partly due to local use and partly due to the frequency of fires. It was not possible to estimate the extent of decline as the historical data appears to have underestimated the actual extent and size of the population.

This species is threatened by frequent grassfires that effectively block reproduction. The male cones are used in Ayurvedic medicine, although the impact on populations is not known. The stems are also harvested for the extraction of the pith, which is used as treatment in the case of debility. The stem is used as a substitute for an Ayurvedic drug *Vidari*, which is originally *Ipomoea mauritiana*. Land clearing may also have a negative effect on populations.

For more information: www.iucnredlist.org

atmospheric nitrogen allows the cycads to survive in nutrient poor environments. The species occur in a range of habitats from closed canopy to open forests and scrub.


Megasporophylls

Although the species in reference is present in considerable numbers locally, it is noticed that this species is experiencing severe threats. The seeds have no dormant period and are relatively short-lived and subject to damage by desiccation. Although rapid recovery of the individuals is noticed even after fire, frequent grass fires are preventing the cone-setting as well seed maturity. It is also found that, the past unsustainable collection of the plant material for illegal marketing owing to its medicinal importance led to fall of alarming proportions of individuals. However it is to be appreciated the efficient management of the local forestry sector leading to strong positive recovery of the populations.

Our team along with John Donaldson, authority on the world cycads, re-assessed in terms of the International Union for the Conservation of Nature Red List. New data available from field surveys indicates that *C. beddomei* to be classified as Endangered (EN B1 a, b (i–v) + B2 a, b (i–v)) and that it still meets the biological criteria for inclusion in **Convention on International Trade in Endangered Species** Appendix I under criterion B (Bi, iii, iv). The justification for including the *Cycas bedommei* as Endangered in IUCN listing is provided in the box 1 of page 11.

More reading:

1. Rao, R.P.B., M.V.S. Babu, B. Sadasivaih, S.K. Basha, & K.N. Ganeshaiah (2009). Current threat status of *Cycas beddomei* Dyer, an endemic species of the Tirupati-Kadapa Hills, Andhra Pradesh, India. *Encephalartos* 97: 21–25.
2. Rao, R.P.B., M.V.S. Babu & J. Donaldson (2010). A Reassessment of the conservation status of *Cycas beddomei* Dyer (Cycadaceae), an endemic of the Tirupati-Kadapa Hills, Andhra Pradesh, India, and comments on its CITES Status. *Encephalartos* 102: 19–24.
3. Rao, B.R.P. 2010. *Cycas beddomei*. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.2. <www.iucnredlist.org>. Downloaded on 21 March 2012.

For more information: Professor of Botany, Sri Krishnadevaraya University, Anantapur 515 003, Andhra Pradesh.

Thought to ponder!

Eco-Restoration of Endangered Medicinal Plant Species

K.V Krishnamurthy

Biological diversity at all three levels (generic, species and ecosystem) is getting lost at a very rapid rate due to several stochastic and deterministic causes. Hence, many countries have started to shift their focus of attention from studying nature ecosystems to damaged ecosystems. They have also started to take several in-situ and ex-situ conservation measures to save their biodiversity. One such measure is eco-restoration, a process under the Science of Restoration Ecology. The Society of Ecological Restoration (RER) formed in 1987 has defined eco-restoration as "a process of intentionally altering a site to establish or defined, indigenous, historical ecosystem" with goal of emulating the structure, function, diversity and dynamics of the concerned ecosystem. Many ecologists have also felt that conserving a threatened plant species as part of its ecosystem is better than its ex-situ conservation. The restoration of an endangered plant species to its original ecosystem is not very easy and hence poses several problems.

Five important sampling decisions for relocating the endangered species have to be followed stringently in order to capture a significant percentage of the species total diversity. The successful re-establishment of the concerned species depends on its Minimum Viable Population (MVP) size, which varies from taxon to taxon and has to be estimated through Population Vulnerability Analysis (PVA). Reintroduction of the endangered species should also involve the re-introduction of its associated pollinators/dispensers, soil microbes, plants and animals in order to rebuild the correct food chain/web. It also requires knowledge on the Autecology- Study of ecology of individual organisms of the concerned plant species, its genetic and demographic traits and an understanding of the causes on or circumstances leading to the species endangerment from the original ecosystem. However , it should be borne in mind that reintroduction of a species involves high risk, high cost and high expertise in different disciplines, and should be based on considerations of economic, social, political and other demands of humanity. Although more than 600 projects have been taken so far the world over, only few plant species have been successfully rehabilitated in their original habitats. But the taste of eco restoration is going to be very difficult in future particularly in tropics since ecosystem/species loss is happening at a very alarming rate.

For more information: Adjunct Professor, Institute of Ayurveda and Integrative Medicine, Bangalore & Professor and Head Department of Plant Science, Bharathidasan University, Tiruchirappalli - 620 024.
Phone No. +91-0431- 2407061
Fax No: +91-0431- 2407045/ 2407020
Email : kvkbdu@yahoo.co.in ;
kvkbdu@rediffmail.com