Indian Cycas under severe threat

Cycads are an ancient group of plants which have survived three mass extinctions. They are dioecious, perennial, palm-like trees or shrubs with woody trunk above the ground or subterranean. They are a relict group of seed plants that evolved in the late Carboniferous era 334 million years ago and are amongst the most threatened plant families in the world in the 1997 IUCN Red List of Threatened Plants. Nearly 64% of cycads are threatened, which is the highest value of risk of extinction given to any group of organism 335.

Taxonomy of cycads had its origin in India. Van Rheege gave the first description of a cycad, 'Todda panna', the Malayalam name of Cycas circinalis. Linnaeus336 used the illustrations of Van Rheege for naming the genus Cycas. In India, cycads are represented by only one genus, Cycas. Out of the 12 species (Table 1) of Indian Cycas reported so far, 5 species, viz. Cycas angamadamica, Cycas annaikalenkis, Cycas indica, Cycas nayaraghrensis and Cycas swamyi have been described in the last 10 years.9-13 They grow naturally in open forests or under canopy in the Western Ghats, Eastern Ghats, North East India, and Andaman and Nicobar Islands.

Indian cycads are extensively used as food, traditional medicine, cultural and religious rituals wherever they grow naturally. In South India, Cycas fronds are used to decorate temples and churches14. In remote areas of the Western and Eastern Ghats, seeds of Cycas are extensively used as food as an alternative for starch15,16. Male cones are used as pest repellent in Kerala and Odisha. In NE India, the young circinate leaves are commonly used as green vegetables and for making special dips and chutneys. Decoction of mature leaves is used to cure cystolithiasis and stomach-ache17. In urban areas, cycads are extensively grown in gardens as ornamental plant and the leaves are used in flower arrangement.

All the habitats of Indian Cycas species are threatened and have suffered severe reduction and degradation. These ever-increasing pressures are mainly due to clearing of forest, increase in human population, urbanization and unsustainable harvesting of seeds and male cones. Populations located at the vicinity of human settlements are more prone to anthropogenic activities, especially clearing of forest for agriculture. Illegal mining in forest areas and unsustainable harvesting of seeds are some of the main causes for reduction of cycad populations in the Eastern Ghats. All species of Indian Cycas are threatened (Table 1). Little
Table 1. Indian Cycas species and their conservation status (according to IUCN Red List)

<table>
<thead>
<tr>
<th>Species</th>
<th>Distribution</th>
<th>Conservation status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycas andamanica Prasad, Ramana, Sanjappa &amp; Rao</td>
<td>Andaman and Nicobar Islands</td>
<td>Critically endangered</td>
</tr>
<tr>
<td>Cycas annaikalensis Singh &amp; Radha</td>
<td>Kerala</td>
<td>Critically endangered</td>
</tr>
<tr>
<td>Cycas beddomei Dyer</td>
<td>Andhra Pradesh</td>
<td>Endangered</td>
</tr>
<tr>
<td>Cycas circinalis L.</td>
<td>Kerala, Tamil Nadu</td>
<td>Endangered</td>
</tr>
<tr>
<td>Cycas indica Linstrom &amp; Hill</td>
<td>Karnataka</td>
<td>Data deficient</td>
</tr>
<tr>
<td>Cycas nathorstii Schust.</td>
<td>Tamil Nadu</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>Cycas nayagarhensis Singh, Radha &amp; Khuraijam</td>
<td>Odisha</td>
<td>Critically endangered</td>
</tr>
<tr>
<td>Cycas orixensis (Haines) Singh &amp; Khuraijam</td>
<td>Odisha</td>
<td>Endangered</td>
</tr>
<tr>
<td>Cycas pectinata Buch.-Ham.</td>
<td>Assam, Bihar, Manipur, Meghalaya, Sikkim, West Bengal</td>
<td>Vulnerable</td>
</tr>
<tr>
<td>Cycas sphaerica Roxb.</td>
<td>Andhra Pradesh</td>
<td>Data deficient</td>
</tr>
<tr>
<td>Cycas swamyi Singh &amp; Radha</td>
<td>Karnataka</td>
<td>Data deficient</td>
</tr>
<tr>
<td>Cycas zeylanica (Schust.) Lindstrom &amp; Hill</td>
<td>Andaman and Nicobar Islands</td>
<td>Vulnerable</td>
</tr>
</tbody>
</table>

Attention has been paid towards preservation and conservation of the endemic cycads\(^{18}\). Till now, habitat of only one species, i.e. *Cycas beddomei* is protected using stringent laws (Figure 1). However, the remaining 11 species are prone to habitat destruction and illegal trade. Enactment of appropriate laws and cooperation of forest-dwellers will play an important role in successful *in situ* conservation of Indian Cycas. A successful long-term conservation of cycads can be achieved through combination of *in situ* and *ex situ* conservation. *Ex situ* conservation is a boon for cycads in restoring their natural populations, and protection from other biotic and abiotic factors, including natural calamities, climate change and habitat destruction. In India, only few botanic gardens carry out *ex situ* conservation of cycads. CSIR-NBRI Botanic Garden in Lucknow, Lalbagh Botanical Garden in Bengaluru and Acharya Jagadish Chandra Bose Indian Botanic Garden in Kolkata house some magnificent living specimens of cycads.

Cycad Conservation Centre at CSIR-NBRI Botanic Garden is the only Centre in India for *ex situ* conservation for this endangered and threatened group of plants. The centre houses 56 species of cycads (Figure 2). Out of the 12 species of *Cycas* found in India, 9 are conserved in this Centre, viz. *C. annaikalensis, Cycas circinalis, Cycas beddomei, Cycas nayagarhensis, Cycas orixensis, Cycas pectinata, Cycas sphaerica, Cycas swamyi* and *Cycas zeylanica*. The major activities of the Conservation Centre are collection, conservation, multiplication and study of reproductive biology. Propagation technique of Indian *Cycas* has also been developed at the Centre\(^{19}\). Here, the species are multiplied through vegetative...
propagation and seeds for raising sufficient number of seedlings for ex situ conservation and reintroduction in future.

Considering the present threat to Indian Cycas species and their habitats, ex situ conservation in various botanic gardens is important. Propagation of the species at different botanic gardens and reintroduction could reduce the pressure of over-collection from the natural habitats. All the natural cycad localities should be designated as Cycad Conservation Sites by the respective Forest Departments of the states in order to protect habitats and reduce over-exploitation. Botanic gardens in India especially the lead gardens identified by the Ministry of Environment, Forest and Climate Change, Government of India should collaborate and frame a strategy for joint efforts to conserve these threatened species, besides making them available for sustainable horticultural use.


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