Globally threatened mangrove species in India

Mangroves are uniquely adapted coastal plants of great ecological and economic significance, but their habitat continued to disappear globally at a rate of 0.66% per year during the 2000–2005 period[1]. This habitat loss has put at least 40% of the animal species that are restricted to mangrove habitat at an elevated risk of extinction under the International Union for Conservation of Nature (IUCN) categories and criteria[2]. However, none of the global mangrove plant species have been entered in the IUCN Red List. Very recently, assessments of mangrove species were made by 24 global mangrove workers including me, in two workshops, one in 2007 in Dominica and the other in 2008 in Philippines. The results published in *PLoS ONE* reveal that 11 of the 70 mangrove species in the world (16%) are at an elevated threat of extinction[3]; of which, only two species namely *Sonneratia griffithii* (critically endangered) and *Heritiera fomes* (endangered) exist in India. Globally, all other mangrove species in India are in the IUCN category of least concern and only one species, *Brownlowia tersa* is in the category of near threatened species. In spite of growing threats to mangroves, its forest cover increased by 58 km^2 between 2005 and 2007 in India[4].

H. fomes Buch.-Ham. (family Sterculiaceae; local names 'Sundari' in West Bengal and 'Bada Sundari' in Orissa) is abundantly present in Bhittarkanika of Orissa, but rarely in Sundarbans of West Bengal especially at the borders near Roymongal block towards Bangladesh. This species occurs in upstream, landward fringes of low saline areas. This species has well-developed buttresses, numerous peg-like pneumatophores or blind root suckers and can be distinguished by its shining silvery scales on lower surface of leaves, sub-globose fruits with longitudinal and transverse ridges. Flowering occurs during January–September and the fruiting during May–September. The species is disappearing due to absence of freshwater and low seed viability.

S. griffithii Kurz. (family Sonneratiaceae; local name 'Orua chakada' in Orissa) is found rarely at the muddy banks of estuarine mouths under tidal inundation in Sundarbans, Orissa and Andaman Islands. This species has numerous, short, corky pneumatophores and can be distinguished from other species of *Sonneratia* by its obovate leaves, large solitary white flowers with white stamens and larger globose fruits with a depression at the apex. Flowering occurs during February–May and the fruiting during June and July. The species is rare and locally extinct due to low seed viability.

B. tersa (L.) Kosterm. (family Tiliaceae; local name 'Lata Sundari' in West Bengal and 'Lati Sundari' in Orissa) is found on the soft mud of intertidal estuarine banks, commonly in West Bengal and Orissa; but rarely in Andaman Islands and Godavari estuary of Andhra Pradesh. The species can be recognized in the field by its greyish brown branches, lanceolate leaves with dull silvery undersurface, and pear-shaped woody fruits with two valved carpels. Flowering and fruiting occur during July–October. The species is experiencing severe loss at its range margins and is near-threatened.

Of special interest is *Rhizophora annamalayana* Kathir., which is endemic to the Pichavaram mangroves in south-east India[5] and it is included in the global list of mangrove species[1]. Its population is estimated at 170 individual trees, 9–12 m in height with broad, dark green leaves and well-developed stilt roots. It is a natural hybrid derived from two parental species of *R. mucronata* and *Rhizophora apiculata*. The species rarely produces seeds, making its propagation very difficult. However, such hybrids were not assessed as the IUCN Red List Guidelines generally exclude all plant hybrids for assessment[3].

Mangrove forests in India are endowed with 125 plant species, accounting for 56% of the world's mangrove species; of which 39 are true mangroves and 86 are mangrove associates. Species of mangrove associates comprise 30 trees, 24 shrubs, 18 herbs, 6 climbers, 4 grasses and 4 epiphytes[6].

It is necessary to collate comprehensive species-specific information for mangroves of India; in the absence of which, identification and implementation of conservation priorities is difficult. It is a matter of urgency to protect and propagate the two globally threatened species, *S. griffithii* and *H. fomes*, to increase the population size in their habitats. Research intervention is required to overcome the problem of low seed viability in these species, as well in the natural hybrids that occur in the families of Rhizophoraceae and Sonneratiaceae and also in the ecological varieties of *Avicennia marina* and *Ceriops tagal*. Further studies are required on the discontinuous distribution and occurrence of mangroves along coastal India.

1. FAO, Forestry Paper No. 153, Rome, 2007, p. 77.
2. Luther, D. and Greenburg, R., *Bioscience*, 2009, **59**, 602–612.
3. Polidoro, B. A. *et al.*, *PLoS ONE*, 2010, **5**(4), 1–10.
4. SFR, Forest Survey of India 2007, State of Forest Report, Dehradun, 2009, pp. 27–31.
5. Kathiresan, K., *Environ. Ecol.*, 1999, **17**, 500–501.
6. Kathiresan, K., Rajendran, N., Nabeel, M. A., Thiruneelakandan, G., Manivannan, S. and Kavitha, S., In *Conservation and Management of Mangroves in India* (*Zoological Survey of India*), 2009, pp. 105–127.

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