

NOTES ON *MAGNOLIA PUNDUANA* Hk. F. & Th. (MAGNOLIOPSIDA: MAGNOLIALES: MAGNOLIACEAE): AN ENDEMIC AND THREATENED TREE SPECIES OF NORTHEASTERN INDIA

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The family Magnoliaceae demonstrates many characters that are considered evolutionarily primitive such as their large cup shaped flowers and the lack of distinct petals or sepals, as a result of which it has attracted the attention of evolutionary biologists and biogeographers (Kundu & Kundu 1998). Due to their attractive flowers, these plants are widely appreciated as ornamental trees and shrubs (Cicuzza et al. 2007) and many of them are cultivated as ornamentals (Olson 2013). Apart from their aesthetic value, the members of this family are also known for their good timber and fragrant oil extracted from different parts used in cosmetics and perfumery. In India, the species comprises six genera with 36 taxa (comprising 32 species and 4 subspecies) (Hooker & Thomson 1855; Chowdhery & Daniel 1981;

Raju 1993; Raju et al. 1993) of which 11 are considered to be threatened (Kundu 2009). In India, a majority of the Magnoliaceae members are restricted to northeastern and southern India.

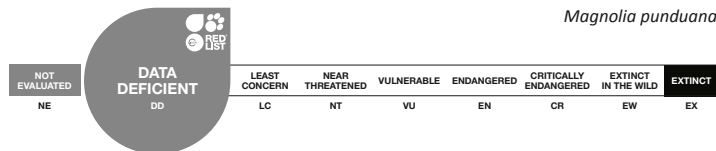
Northeastern India is a part of two biodiversity hotspots, i.e., the Himalaya and Indo-Burma (Mittermeier et al. 2004). Meghalaya, a small state in northeastern India falls under the Indo-Burma hotspot. The state is characterized by highly dissected and irregular topography with wide variations in altitude (50–1990 m). The average maximum and minimum temperature ranges from 14.5–24.3 °C and 5.8–17.8 °C respectively. The average rainfall varies from 2500–4000 mm per year in most parts of the state except Cherrapunji and Mawsynram which records the highest rainfall (12,000–13,000 mm) in the world (Haridasan & Rao 1985). The topography and the climatic factors coupled with the variation in soil properties are the major reasons for the state's rich biodiversity and endemism. It harbours about 3331 plant species of which 1236 are considered endemic to the state (Khan et al. 1997). Many of the endemic species of the state are threatened at the global level (Upadhaya et al. 2013; IUCN 2014).

Magnolia punduana Hk. f. & Th. (Synonym: *Michelia punduana*) is one of the endemic tree species of



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Meghalaya (Haridasan & Rao 1985; Nayar & Sastry 1990; Chaudhuri et al. 2003; IUCN 2014). It is a mid-sized tree attaining a height of 25m. It grows in sub-tropical broadleaved forests of the Khasi and Jaintia hills up to an elevation of 1500m. The tree is largely exploited for timber and the species was last collected in 1938 by G.K. Deka. Balakrishnan (1981) reported the species from the Jaintia Hills based on Kanjilal's collection of 1913. Haridasan & Rao (1985) reported only a few individuals of the species from the Jaintia Hills and stated that the species was facing the risk of extinction. It was listed as 'rare' by Walter & Gillett (1998) and Nayar & Sastry (1990) and is classified as Data Deficient by the IUCN Red List (Wheeler & Rivers 2015). Ramasubbu (2010) listed the tree under 'Wild Ornamental Plant Species Under Threat'.

In this paper, a detailed distribution of *M. punduana* with special reference to its phenology along with photographs is provided so as to enable easy identification of the species. Based on field observations, a few effective conservation strategies for the species have been suggested.

Observation: Based on available literature (Hooker

& Thomson 1855; Balakrishnan 1981; Haridasan & Rao 1985), herbarium specimens at Botanical Survey of India (Eastern Circle, Shillong) and Central National Herbarium (Kolkata), detailed floristic explorations were carried out from January 2013 to January 2015 in different parts of Meghalaya (Fig. 1) to locate the population of the species. Six populations of the species could be located in Cherrapunji ($25^{\circ}14.791'N$ & $91^{\circ}41.657'E$), Mawsynram ($25^{\circ}16.550'N$ & $91^{\circ}34.614'E$), Pynursla ($25^{\circ}17.610'N$ & $91^{\circ}53.053'E$), Lynshing ($25^{\circ}24.375'N$ & $91^{\circ}59.973'E$) in the Khasi Hills, and Jarain ($25^{\circ}18.018'N$ & $92^{\circ}08.704'E$) and Amlarem ($25^{\circ}15.634'N$ & $92^{\circ}05.588'E$) of the Jaintia Hills. It was observed that the species was restricted to moist sub-tropical broad-leaved forests of the Khasi and Jaintia hills in the southern part of the state (Fig. 1; Image 1). The species was found to occur in highly fragmented habitats and was represented by 1–5 adult ($\geq 5\text{cm dbh}$) individual(s) only. The site in Jarain with 25 adult individuals per ha recorded the highest population.

Leaf: The leaves of *M. punduana* measures 6–13 x 2.5–5 cm. It is oblong, elliptic, obovate or oblanceolate, shortly and abruptly acuminate with a cuneate base. Leaves are coriaceous and glabrous on both the surfaces,

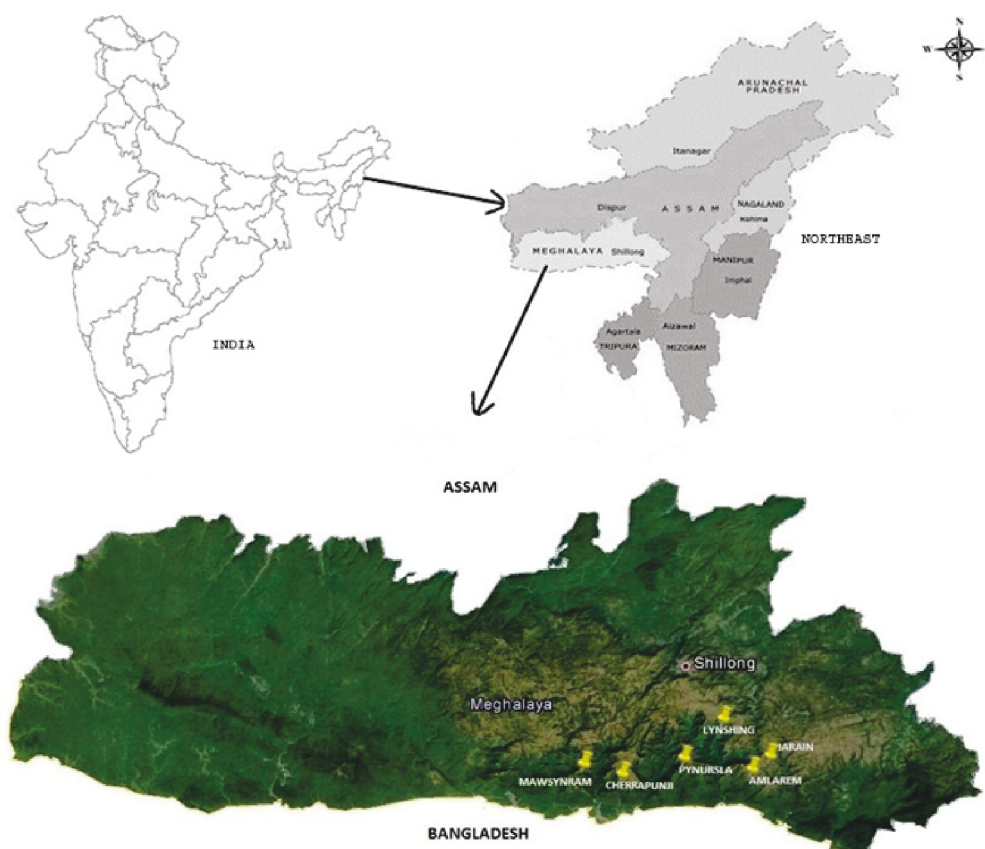


Figure 1. Recorded locations of *Magnolia punduana* in Meghalaya.

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Image 1. *Magnolia punduana*: a - Habitat; b - An adult tree; c - A twig showing leaves; d - A cut stump.

shining above and pale beneath with 8–12 nerves on either side. Reticulation is open and visible on both the surfaces. The petiole is 1.5–1.8 cm long (Image 1). The species undergoes a brief period of leaf fall during the month of April that extends up to May. The leaves are yellowish in colour during senescence. Flushing of new leaves occurs during the month of June and July.

Flowering: Flower bud initiation starts from September and each bud measures 2.0x1.25 cm. The species attains peak flowering during mid- October that extends till November. Flowers are axillary, fragrant, yellowish white in colour and are made up of three whorls of three tepals each. The tepals of the outer and the middle whorls are slightly larger measuring 2.7x1.4 cm compared to that of the inner whorl which measures 2.45x0.8 cm. The carpel measures 1.2cm which gives rise to ovules and is surrounded by numerous stamens which gives rise to pollens (Image 2).

Fruits: After the completion of flowering period in November, fruit initiation start that attains full maturation in the month of August. The fruit is an aggregate of 3–20 follicles that measures 3–12 cm. The follicles are reddish-green in colour with distinct lenticels that measures 7–8 mm in diameter which dry at maturity and split open at one side. Each follicle contains 1–2 reddish seeds with fleshy seed coat/aril. The seeds are 5–7 mm long, oval-ellipsoid or ellipsoid



Image 2. *Magnolia punduana*: a - a full blooming flower; b - twig with matured fruits; c - follicles exposing matured seeds; d - seeds without aril.

and black in colour (Image 2).

Endemic and endangered species often have small populations (Holsinger & Gottlieb 1989) which are restricted to specific habitats. Therefore, it is vital to have a detailed knowledge and understanding of species-habitat relation to assess their current status (Kalliovirta et al. 2006). In the present study, it was observed that the population of adult *M. punduana* was very limited and had a specific habitat preference. The species required high moisture and adequate sunlight for its growth and survivorship which was evident by the presence of more individuals in areas characterised by seasonal streams and tree fall gaps. However, it was observed that the species occurred in highly fragmented forest patches in all the surveyed sites. The major threat to the decline of the species was habitat degradation evident by the expanding villages located near the species habitats, construction of roads and coal mining. Further, the species being a good timber yielding tree, even young poles of the species measuring 15cm are exploited exacerbating its decline (Image 1). Further, no measures have been taken for the conservation of the taxa.

Therefore, it is suggested that apart from in-situ conservation, ex-situ conservation measures should also be implemented to understand the germination capacity of the species. Nayar & Sastry (1990) stated that efforts should be made to locate the species so that reintroduction programs could be implemented. As the

species attributes good timber value, plantation of the same through afforestation programmes will reduce the pressure of its exploitation in the wild. As the species is primitive, reintroduction of the species in botanical gardens will not only help in conserving the species but also attract and impart knowledge to bio-geographers and researchers in the field of evolutionary biology. None of the sites of occurrence of the species fall under any protected area networks. Therefore, extra efforts are required to provide protection to this species in order to reduce the immediate threat.

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