

# LAST ONES STANDING

Eleven threatened trees of the Western Ghats rainforests



A. P. Madhavan, Kshama Bhat, and Srinivasan Kasinathan



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**nature  
conservation  
foundation**

**Last Ones Standing** by A. P. Madhavan, Kshama Bhat, and  
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**ISBN:** 978-81-954663-0-6

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### **Recommended citation**

Madhavan, A. P., Bhat, K. and Kasinathan, S. 2022. Last ones standing: eleven threatened trees of the Western Ghats rainforests. Nature Conservation Foundation, Mysuru.

**This book has been printed on recycled paper.**

**Funding support:** Fondation Franklinita





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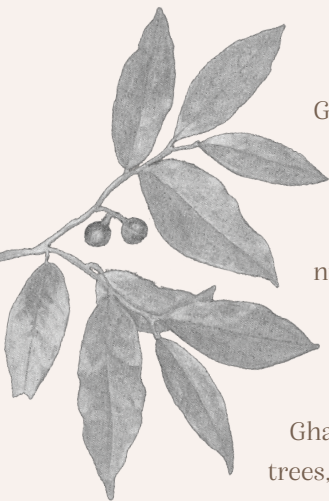


# Introduction

Trees and forests are vital for planetary health and human well being and yet large numbers of tree species and forest tracts are now threatened. Around the world, 58,497 species of trees have been documented, of which 30% are considered threatened with extinction, and 142 species have become extinct (BGCI 2021). A litany of factors including agriculture, logging, livestock, industrialisation and urbanisation, invasive species, and climate change threaten trees. India has about 2,600 species of trees, of which 18% or 469 species are considered threatened (BGCI 2021) as defined in the *IUCN Red List of Threatened Species* ([iucnredlist.org](http://iucnredlist.org)).



One of the most important regions for conservation of trees and forests within India is the Western




Ghats mountain ranges and biodiversity hotspot. Nearly 900 species of trees are known from this region, including a large number of endemic species found nowhere else in the world. The tropical wet evergreen forests (rainforests) of the Western Ghats are home to many of these trees, with a greater concentration of endemics in the southern ranges as in the Anamalai Hills (Pascal 1988, Ramesh and Pascal 1997). Patterns of distribution and abundance and present conservation status of many of these species are still poorly known.


Over the last two years, we undertook systematic field surveys to study 11 threatened tree species in the tropical rainforests of Anamalai Hills. This booklet, which integrates our observations with known facts and attractive illustrations, aims to increase knowledge and awareness of these rare and remarkable trees. We hope this leads to better conservation of these trees on the ground (*in situ*) and into the future.

## Key to seasonality

Flowering phenology of each species is indicated with a flower icon and month range:

 January – March

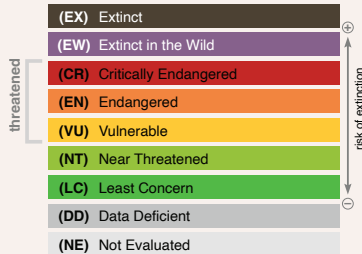
Fruiting phenology is indicated with a fruit icon and month range:

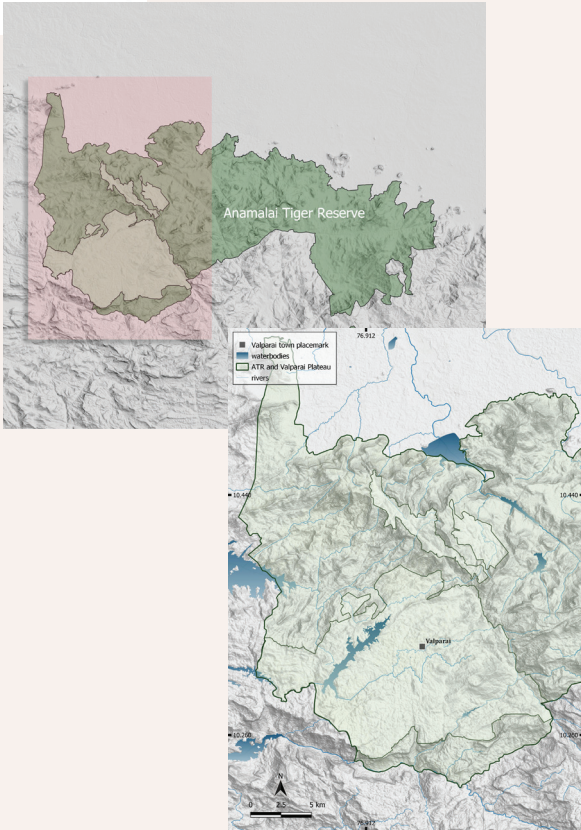
 March – June

## Key to IUCN Red List threat categories

The *IUCN Red List of Threatened Species* presents a graded list of conservation status categories from Least Concern (LC) to Extinct (EX). The categories considered threatened species are:

CR – Critically Endangered (in red), EN – Endangered (in orange), and VU – Vulnerable (in yellow).





### **Key to the species occurrence maps**

The Anamalai hill ranges are a part of the larger escarpment and plateau complex along the southern ranges of the Western Ghats, south of the Palghat gap. The study area is situated within the Anamalai Tiger Reserve (958 km<sup>2</sup>) and the rainforest fragments within the tea and coffee plantation-dominated Valparai Plateau (220 km<sup>2</sup>).

### **Map legend**

The maps represent the incidence and spatial distribution of individual geo-located trees (red stars) found along 63 forest trails surveyed across the landscape. The Anamalai Tiger Reserve is outlined by a dark green border, while the plantation-forest mosaics on the Valparai Plateau are demarcated by light green borders. Some trails were surveyed along rivers and within valleys indicated by the blue lines. Hydroelectric reservoirs and dams are represented by the graded blue polygons.

# *Dipterocarpus bourdillonii*



**Family:** Dipterocarpaceae

**Local names:** Kadar–Aeralan;


Tamil–Karanjili; Malayalam–


Chiratta-anjili, Kalpayin,

Karanjili; Kannada–Dhuma

**Description:** Emergent,  
evergreen tree (up to 52 m tall)

**Distribution:** 150–750 m asl

 January–March

 March–June





*Dipterocarpus bourdillonii* is a towering, emergent evergreen tree that can grow 52 metres tall. The bole is cylindrical and straight rising into a dome-shaped crown that branches out high over the forest canopy. The bark is grey, flaky and scaled in mature trees. Frequently found along rivers, these trees may have trunks buttressed at the base. The leaves are large and ovate with parallel secondary and tertiary veins. Young twigs are covered with dense, fine, reddish-brown hair.

The pink, magenta and green flowers are axillary racemes and produce copious nectar. The flowers change from green to magenta as they mature. In early summer, fallen flowers carpet the base of the trees. The calyx is winged along the five distinctly ribbed segments and is persistent. Two sepals of the calyx elongate to form the two distinct wings of the fruit. These wings pirouette the seed through the air when dispersed by wind.

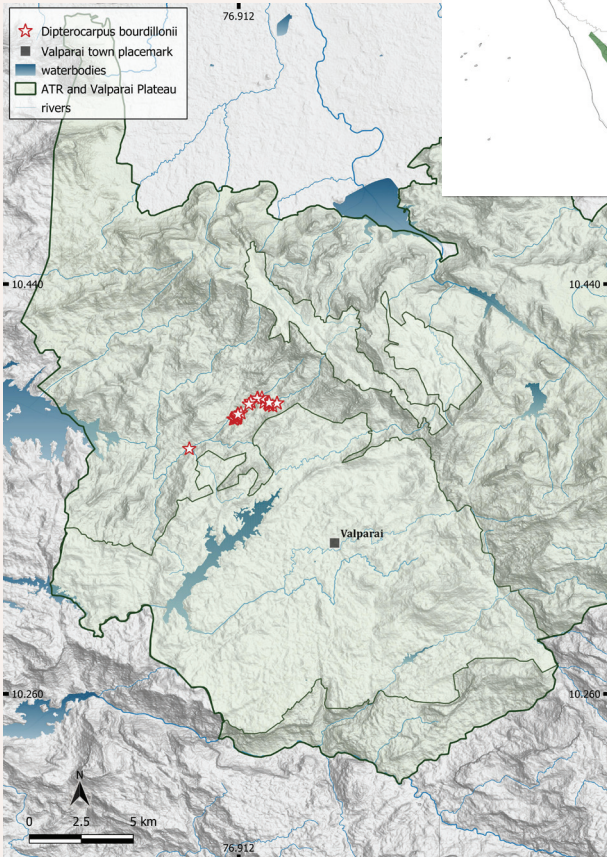




A quintessential species in mature lower elevation rainforests in Karnataka, Tamil Nadu and Kerala states between 150 and 750 m, primarily found along rivers. The global population was estimated at 250 adult individuals in 23 locations.



A good population of the species was discovered in the Anamalai Tiger Reserve along the Parayankadavu river. Only a few young plants were recorded indicating that regeneration is poor.



# *Phyllanthus anamalayanus*



**Family:** Phyllanthaceae

**Common name:** Anamalai  
Gooseberry, Anamalai Berry

**Synonym:** *Pseudoglochidion  
anamalayanum* Gamble

**Description:** Small shrub-like tree  
(upto 6 m tall)

**Distribution:** 600–1400 m asl

 January–December

 January–December





*Phyllanthus anamalayanus* is a small evergreen tree that can grow up to a height of 6 m. It is a shrub-like understory tree with a slender trunk. The tree is often multi-stemmed and has a spreading network of branchlets. These branchlets have 12 to 15 leaves characteristically arranged in rows on either side.

Flowers and fruits appear along the central branchlet emerging from axillary nodes at the leaf base and hang like small bells. The flowers are unisexual and the male and female flowers are distinct in form and placement. Male flowers have long, delicate and slender pedicels, with tear-drop shaped protective sepals. Female flowers have shorter pedicels and exposed stigmas. The fruit matures from green to brown and usually splits into 3–7 segments.

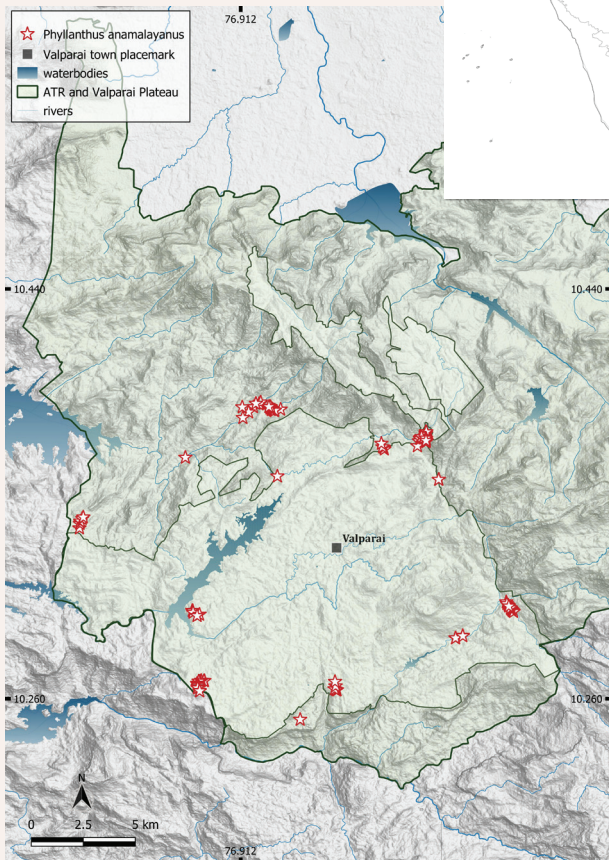




*Phyllanthus anamalayanus* is endemic to the Anamalai Hills and grows in clustered populations usually along streams and rivers. The small tree occurs between 600 and 1400 metres above sea level.



Earlier believed to occur in a single location, it has now been recorded in multiple locations in and around the Valparai Plateau.



# *Cryptocarya anamalayana*



🌸 April–July

🍎 July–October

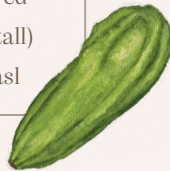
**Family:** Lauraceae

**Common name:** Mountain Laurel

**Local names:** Kadar–Chevukodi;  
Tamil–Kaatu Karuva

**Description:** Medium-statured  
sub-canopy tree (up to 16 m tall)

**Distribution:** 800–1400 m asl







*Cryptocarya anamalayana* is a medium-sized tree (up to about 16 m tall) endemic to the southern Western Ghats. The canopy spreads laterally, branching out low from the trunk. The smooth bark is greyish brown. The undersides of leaves and young twigs are coated with golden reddish-brown hairs. The simple, alternate leaves are elliptic-oblong to ovate with a rounded base and are velvety to the touch. Young leaves flush a deep maroon crimson.

The flowers rise up vertically as axillary panicles, coated densely with hairs. While maturing, these extend out and upwards to form fruit stalks. The oblong, narrow, ridged fruits form a spiralled cluster along stalks and each holds a single seed.

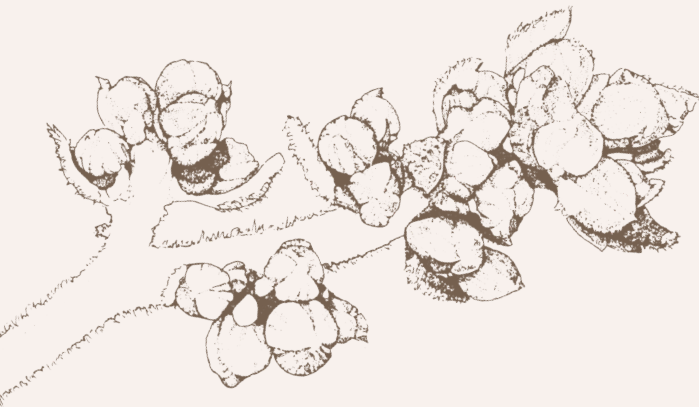


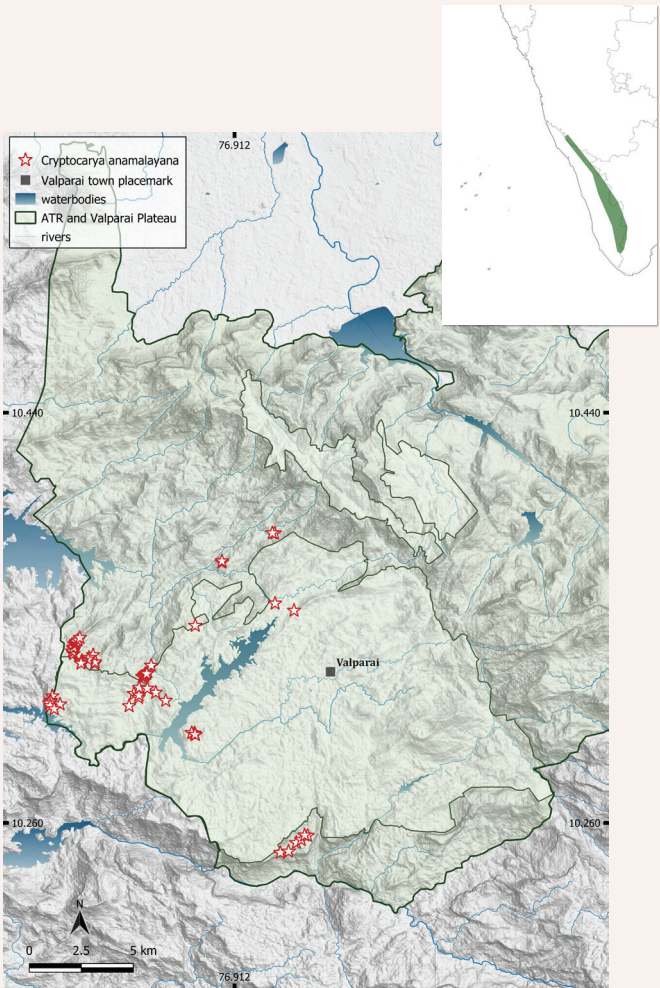


This understorey or sub-canopy tree is found within an altitudinal range of 800 and 1400 m. The species is primarily found in areas of distinctly high moisture availability and is sparsely distributed in small clustered pockets in the Anamalai Hills and few other areas in the southern Western Ghats.




The fruits are consumed and dispersed by hornbills and imperial pigeons.





# *Dysoxylum malabaricum*



 March–April

 May–September

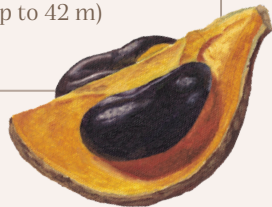
**Family:** Meliaceae

**Common name:** Pallid-leaved Common White Cedar

**Local name:** Kadar–Sembil; Tamil–Vellaiyagil, Purippa; Malayalam–Akil, Vellaiyagil, Kanu Mulla, Purippa; Kannada–Bili Agilu

**Description:** Large canopy tree (up to 42 m)

**Distribution:** 200–1200 m asl





*Dysoxylum malabaricum* is an endemic, large canopy tree, 25 to 40 m in height. A member of the mahogany family, this tree has a straight bole like a tall column that may be buttressed at the base. The distinct greyish-brown bark is profusely peppered with corky, prominent lenticels that exfoliate and break away as large scales in older trees. The spreading canopy is made up of large compound leaves, alternatively placed, arranged in spirals and clustered at the ends of branches. The 4–5 pairs of leaflets are elliptic and lanceolate, broad and long.

Small, clustered, green flowers form a fragrant inflorescence of slender racemes at axils below the terminal leaf shoots of branchlets. The fruits have a tough, gnarled, ridged and coiled surface which splits open into four segments. Each holds a large bean like seed with a thick black outer cover and a lipid-packed aril. Fruits form in clusters or pairs along branchlets.

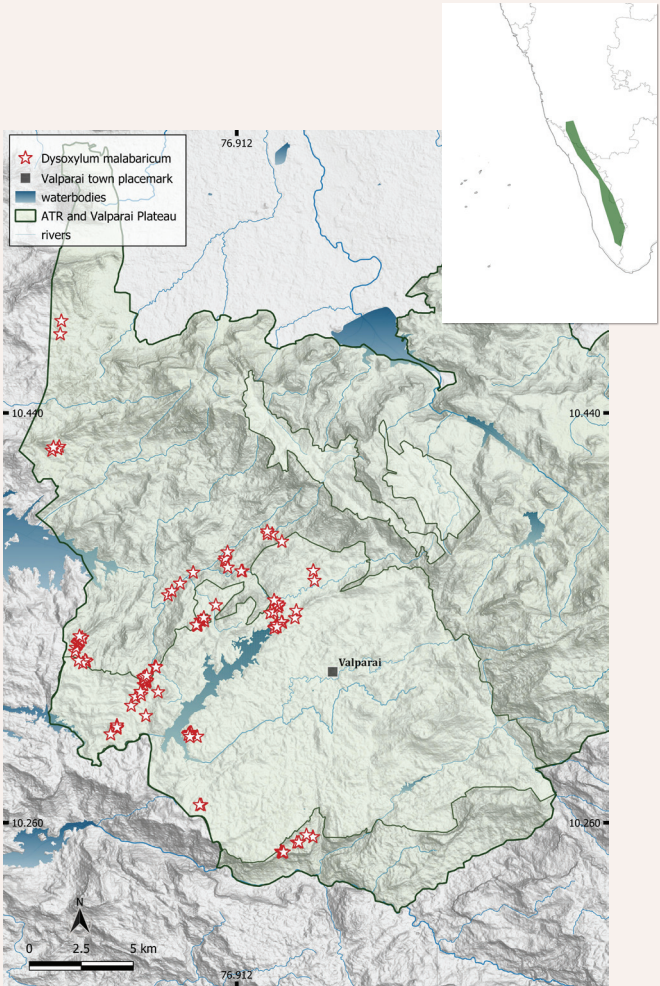




The tree occurs in low- and mid-elevation rainforests from 200 to 1200 m. The tree is infrequent but found spread in pockets of old growth forests and rainforest remnants.




The seeds of this species are dispersed by lion-tailed macaques and hornbills, and maybe eaten by porcupines.



# *Orophea thomsonii*



 March–April

 May–September



**Family:** Annonaceae

**Common name:** Thomson's Turret Flower

**Local name:** Kadar–Karunthovara

**Description:** Shrub-like tree (upto 10 m tall)

**Distribution:** 250–1250 m asl





*Orophea thomsonii* is an understated shrub-like tree that can grow up to 10 m in height. The tree forms a network of slender branches with distinct waxy leaves that make up a loosely-defined crown. The leaves are ovate with a rounded acuminate tip. These trees tend to grow in clusters in the forest.

The flowers and fruits are in clusters of 1–4 along nodes. They have a distinct arched chamber-like architecture formed by the fusing of three petal tips. The flowers are small and cream coloured with nectaries visible on the underside of the fused petals. The fruits are perfectly spherical berries and ripen from pink to a deep purple. Each fruit holds a single wrinkled seed.

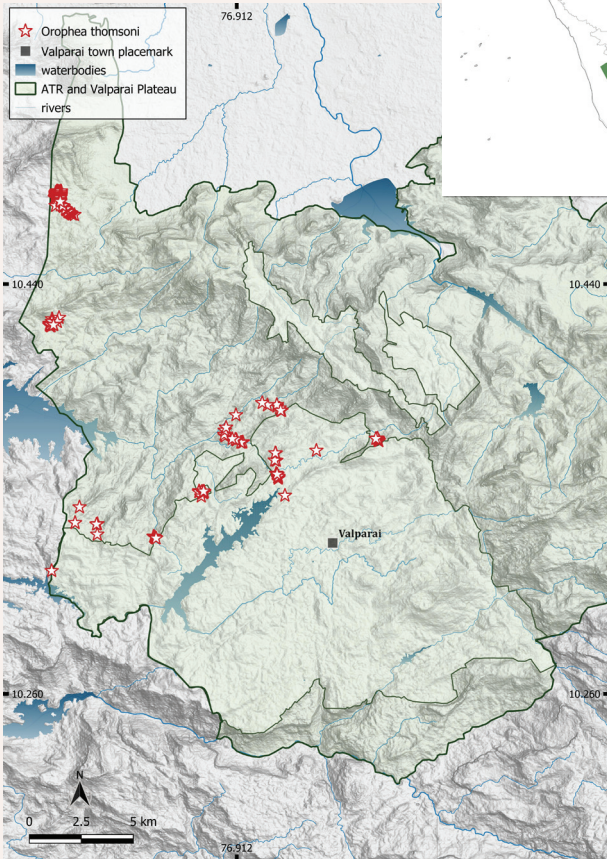




These evergreen trees, endemic to the Western Ghats, are found in altitudes from 250 to 1250 m. The species forms one of the core components of the understory in both evergreen rainforests and transitional moist-deciduous forests.



This is an animal-dispersed species with a fleshy berry. The seedlings have been found to have a low germination rate. However, some regeneration is seen in old growth rainforests.



# *Palaquium ravii*




**Family:** Sapotaceae

**Local name:** Kadar–Chora Pali;  
Malayalam–Choppala, Pachendi, Pali

**Description:** Rare canopy tree (up to 37 m)

**Distribution:** 670–1000 m asl



 April–June

 May–September



*Palaquium ravii* is an evergreen, rare, canopy tree around 20 to 30 m tall. It has a straight, smooth, greyish-red bole, branching out at a significant height to form a columnar rising canopy. The alternately placed leaves cluster in spiralled fans towards the tips of the branchlets. The leaf blade is oblanceolate. There are distinct scars of fallen leaves along the branchlets.

The creamy white flowers and the fruits are arranged along leaf axils. The slender flowers can be clustered or solitary in older individuals with peduncles less than a centimetre long and with a pointed and sheathed tip. The fruits are spherical or ovoid with a prominent persistent calyx. The surface of the fruit is grainy and rough and holds a single, hard, shiny seed.





This rare endemic tree is found in sparse clusters between an altitude of 600 and 1000 m. The tree occurs infrequently in moist and old growth forests.



Although very few in number and distribution, the tree germinates well in the nursery and survival is high in restoration sites.



# *Diospyros paniculata*

**Family:** Ebenaceae

**Common name:** Hill Ebony

**Local name:** Kadar–Karivella,  
Illekatta; Tamil–Karunthuvarai,  
Kari; Malayalam–Ilakatta,  
Illekatta, Kari, Karivella

**Description:** Large sub-canopy  
tree (up to 20 m tall)

**Distribution:** 580–1200 m asl



 February–July

 August–October





*Diospyros paniculata* is an evergreen tree that grows up to 20 m in height. The tree has a blackish bark, red when blazed, and a straight, fluted trunk rising to a rounded canopy. Young stems and pedicels are covered in dense sooty, pale hair. The leaves are oblong or spear-like with blunted tips, distinct horizontal veins that curve towards the apex, and a fine reticulated network of nerves.

The flowers along the branchlets are unisexual and the calyx and base are covered in dense black to sooty hairs. Solitary, axillary female flowers have a much broader and larger calyx than male flowers. Young fruits are also covered in dense hairs but turn smooth as they grow and mature. Each fruit holds two individual crescent-like or sickle-shaped seeds.

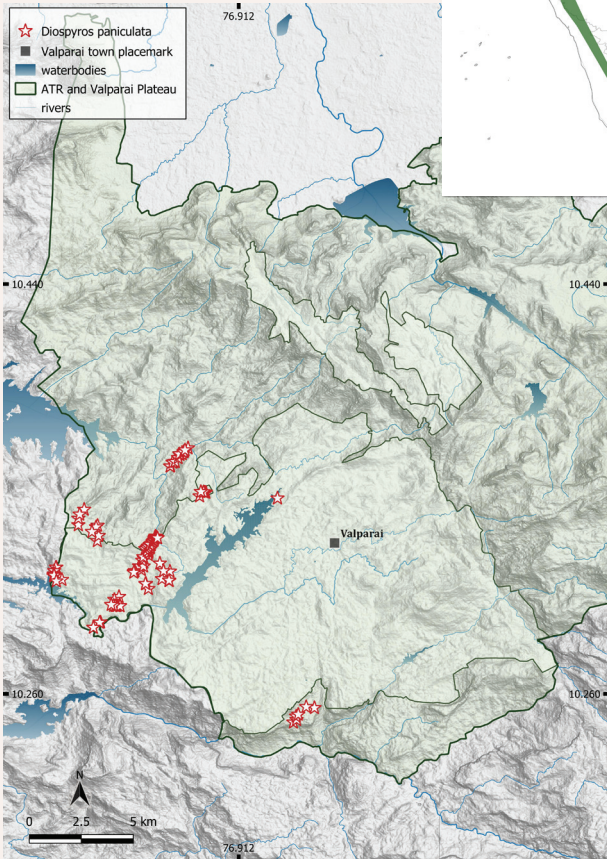




The tree, endemic to the Western Ghats, is found between 580 m and 1200 m in elevation. It occurs in sparse pockets in specific ranges and hills of the Western Ghats. It is found in both evergreen and transitional moist semi-evergreen forests.



The tree is part of the ebony family that includes many timber trees historically exploited in large numbers.



# *Drypetes wightii*




**Family:** Putranjivaceae

**Common name:** Papery Child's Amulet Tree

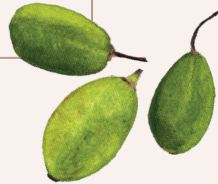
**Local name:** Kadar-Vellala, Sembil

**Description:** Medium-statured sub-canopy tree (up to 14 m tall)

**Distribution:** 590–1500 m asl

 January–May

 June–July





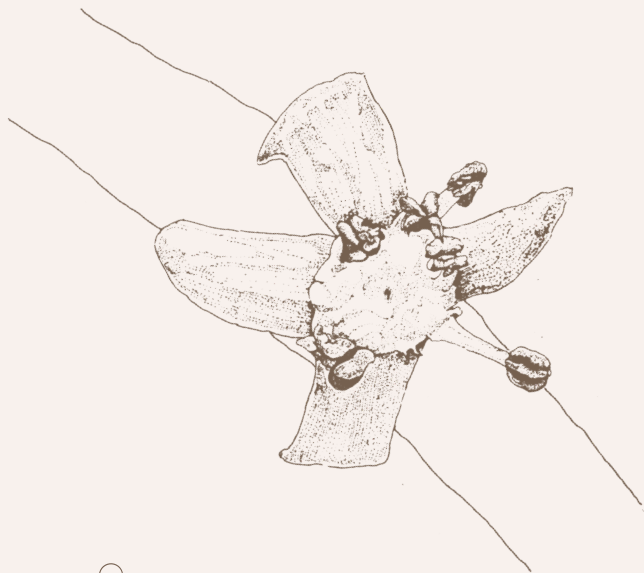
*Drypetes wightii* is a medium-statured tree between 7 and 14 m in height. The trees form an important part of low- and mid-elevation rainforests. The bole has a whitish smooth bark. Branches reach out horizontally from fairly low down the columnar trunk. The branchlets fan out and droop down from the ends of horizontal branches. The oval, narrow, and waxy leaves, tapering to a point, are alternatively placed on twigs.

The flowers and fruits are small and in axillary clusters. The inconspicuous flowers are unisexual with distinctive male and female flowers. The male flowers are star shaped and have anthers rising up from the base. The single-seeded fruits are oval and ripen from dark green to translucent yellow.

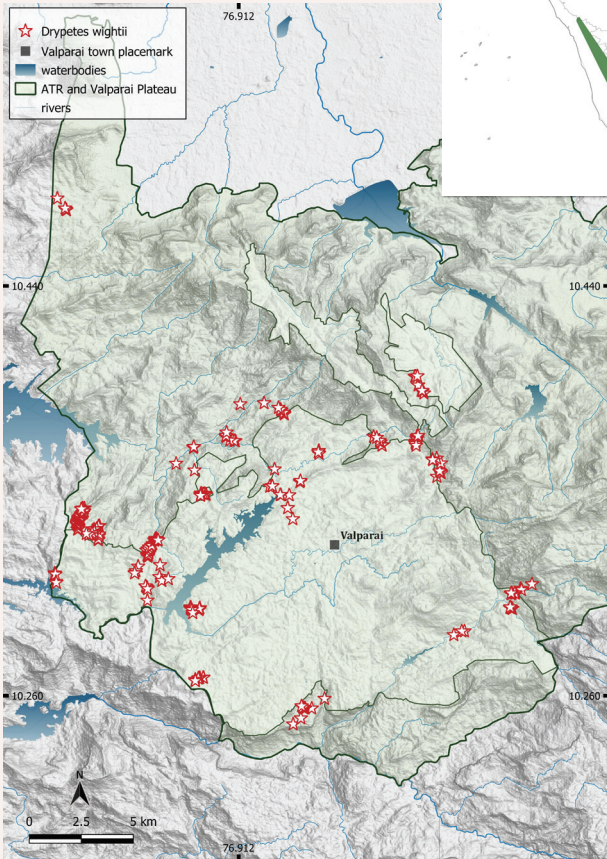




The evergreen tree is found between 590 and 1500 m altitude. The tree is densely populated in small pockets or tracts. These areas of relative abundance have clear geographic demarcations and are scattered.



The fruits are mainly dispersed by bats, while also consumed by many fruit-eating birds.



# *Myristica beddomei*



 September–March

 April–August

**Family:** Myristicaceae

**Common name:** Jungle Nutmeg

**Local names:** Kadar–Pathripoo, Palkavi; Tamil–Kaatu Jathika, Katujathi; Malayalam–Panthapayin, Adakkapayin, Chithirapoovu, Kattujathi, Pasupathi, Pattapannu, Pathiripoovu; Kannada–Kadu Jajikai

**Description:** Large canopy tree (up to 40 m)

**Distribution:** 500–1400 m asl







*Myristica beddomei* is a canopy tree of low- and mid-elevation rainforests. A straight bole leads to distinctly horizontal branches arranged like spokes around the axis of the trunk. The tree has a columnar, sparse canopy with distinct large leaves. The leaves are oblong and lanceolate with a shiny upper surface and silver glaucous underside. The bark is flaky, brown, peppered with small lenticels and oozes deep red sap when injured.

The male and female trees are distinct with paired and grouped, small, goblet-shaped unisexual flowers. Fruiting occurs on female trees whose flowers are rounder and hold the orb-ed stalk-less ovaries, in contrast to the distinctly peduncled male flowers. The large, egg-shaped fruits split in two, exposing the bright yellow, delicately interlaced aril wrapped around the single large dark brownish seed.



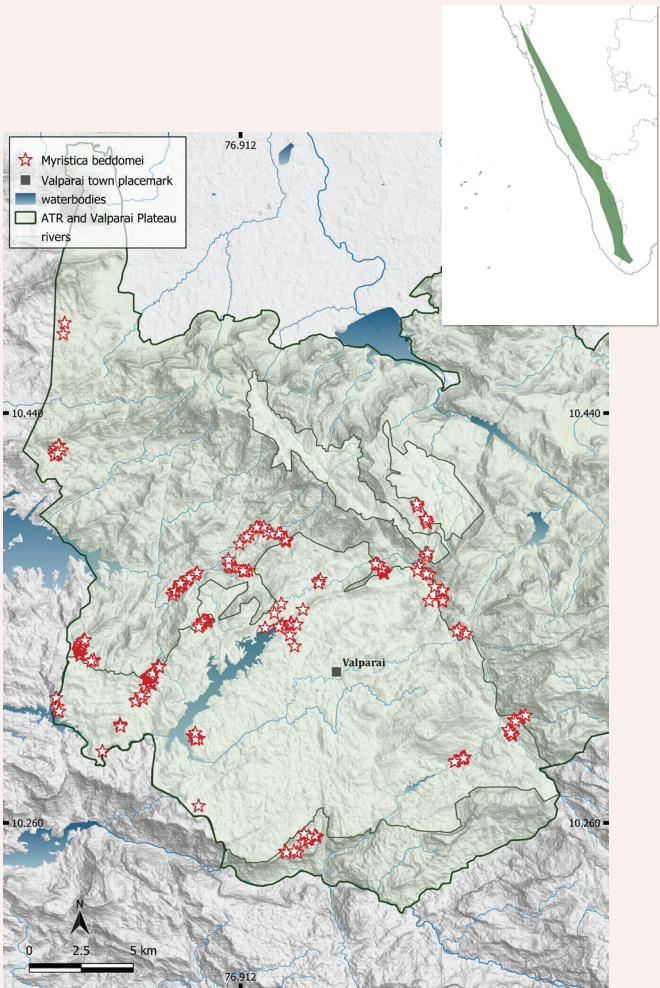


The endemic evergreen tree occurs in an altitudinal range from 500 to 1400 m. The tree is evenly and sparsely distributed through old growth evergreen rainforests but can also occur in transitional forest zones.



The species was wrongly identified in earlier floras and herbaria as *M. dactyloides*, a species endemic to Sri Lanka (Banik *et al.* 2017). The lipid-rich aril attracts large birds such as hornbills and imperial pigeons. The aril is also harvested by local people as mace (aromatic spice).





# *Syzygium densiflorum*

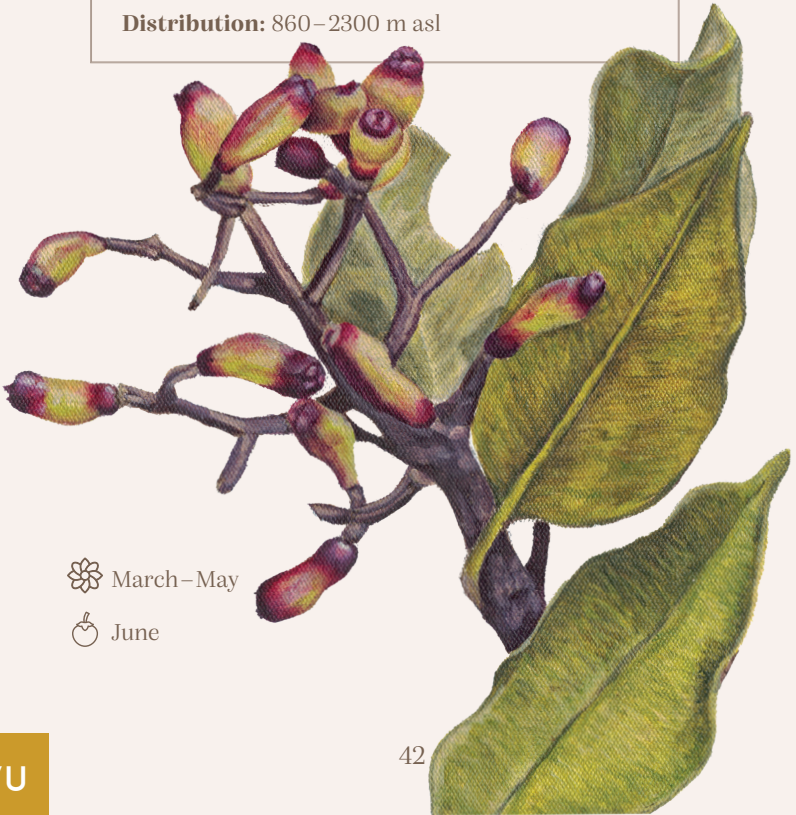
**Family:** Myrtaceae

**Common names:** Arnott's Mountain Black Plum

**Local name:** Kadar-Umanaral; Tamil-Nir-naval, Naaval, Nagay; Malayalam-Kattunjaval, Aatunjaval, Karinjaval, Ayuri, Karayambuvu, Njaval, Vellanjaval

**Description:** Large canopy tree (up to 35 m height)

**Distribution:** 860-2300 m asl



March-May



June



*Syzygium densiflorum* is a large canopy tree, growing upto a height of 35 m, in mid- and high-elevation rainforests. The cylindrical blackish-grey, rough and shiny bole rises up in a broad powerful column. Above, the branches spread and end in leaf clusters. The opposite leaves are lanceolate and have closely-parallel secondary nerves.

The flowers and fruits form on the terminal tips of branchlets and diverge as clustered, arched cymes. The cream-coloured, bisexual flowers form dense clusters with long filamentous stamens. Fruits turn from green to purple-black when ripe. Each contains a single seed.

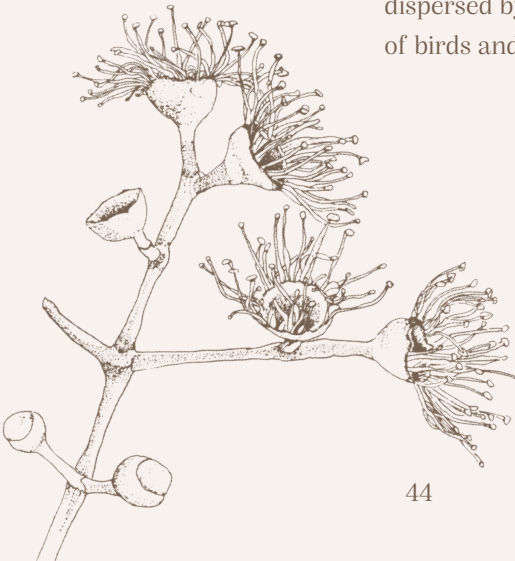


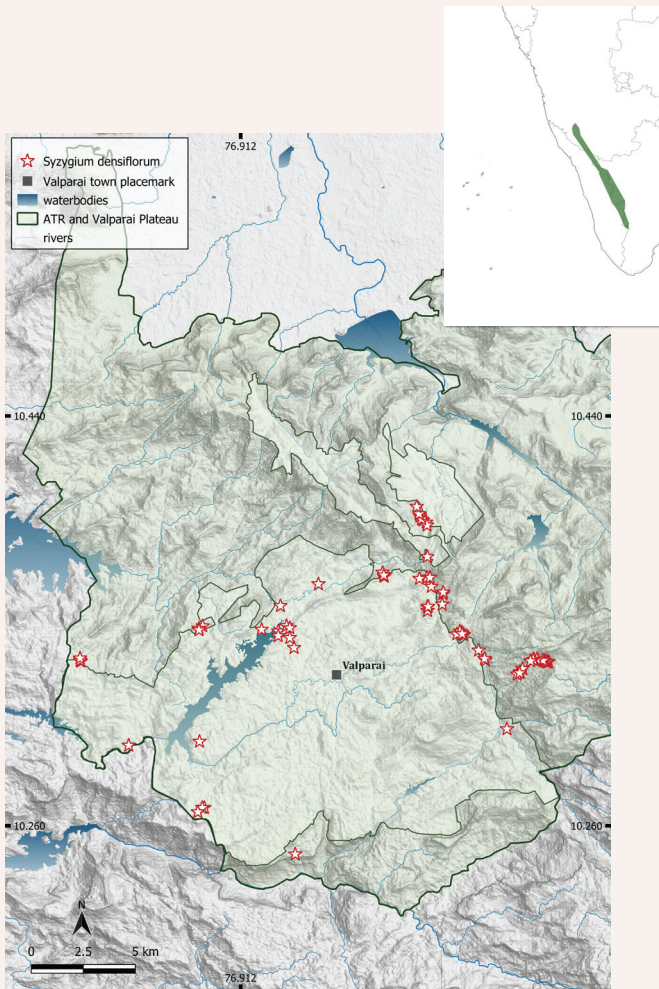


It is an endemic moist forest species that occurs within an altitudinal range of 860 to 2300 m.



The fruits of this species are eaten and seeds dispersed by many species of birds and mammals.







# *Vateria indica*



🌸 March–May

🍊 June–September

**Family:** Dipterocarpaceae

**Common names:** White Dammar, Piney Tallow, Indian Copal Tree

**Local names:** Tamil–Dhupa Maram, Vellai Kundurukkam, Vellai Kungiliyam, Painimaram; Malayalam–Payan, Kuntirikkappayin, Vellappayin, Telli; Kannada–Bili Daamaru, Bili Dhupa, Velthapaini; Marathi–Chandrusa

**Description:** Emergent tree (up to 45 m)

**Distribution:** Sea level to 1200 m





*Vateria indica* is an emergent tropical rainforest tree endemic to the Western Ghats. The tree has a cylindrical trunk and a smooth grey bark with patches of white and green. The bole leads to a dense, spreading, domed canopy, made up of thick, elliptic-oblong leaves. Young leaf flushes are deep pink in colour with bright green veins. The maturing leaves turn dark green and leathery and are positioned alternately in spirals on branchlets.

The five-petaled small flowers form clustered inflorescences called panicles. The fruits are borne as axillary, loosely-branched structures. The fruits (about 6.5 cm long) are egg shaped, with a persistent calyx and divided into three-valved capsules. The usually hold a single large seed that splits open as if blooming with large cotyledons when germinating.

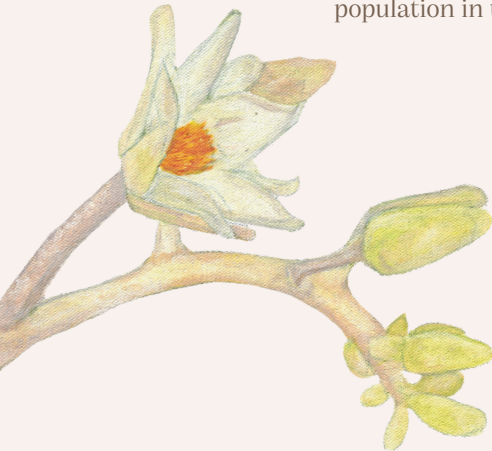


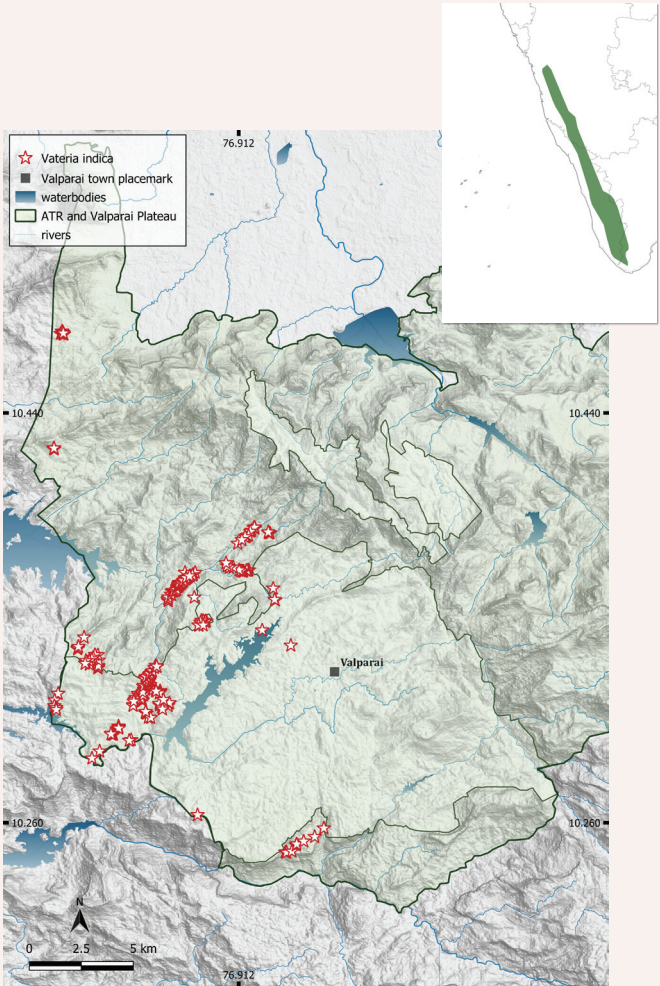


The tree is endemic to the Western Ghats and distributed mostly from the plains up to 800 m (maximum up to 1200 m). It is one of the key emergent trees of low- and mid-elevation wet evergreen forests.



When scarred, the trunk produces a white, aromatic resin that was widely harvested for use in varnishes and traded in large amounts impacting their population in the wild.





# Conserving Threatened Trees

Understanding the ecology of threatened trees—their patterns of abundance and spatial distribution, their connections to land, other species, and forest composition—provides a foundation for in situ conservation and ecosystem restoration efforts.

Threatened and endemic trees of the Western Ghats have specific areas of occurrence based on altitude, soil, terrain, climate, and biogeography, where there may be marked differences in species composition even between neighbouring valleys and transitions across the length and breadth of the mountain range. Much remains to be understood on how localised and refined their association is with precipitation, soil, topography and associations to other species.

The study of threatened tree species occurrence and distribution within the Anamalai Tiger Reserve and Valparai Plateau in the Anamalai Hills has provided

an ecological and geographic lens to understand the endangerment, ecology, and associations of threatened trees with landscape features and habitat fragmentation. Some species, such as *Vateria indica* and *Myristica beddomei*, that are geographically more widespread in the Western Ghats are also more widely distributed and relatively common locally, occurring in continuous forests and fragments. Others, with more restricted ranges, include both frequently occurring species (e.g., *Phyllanthus anamalanus*) and rare and highly localised ones (e.g., *Palaquium ravii* and *Dipterocarpus bourdillonii*). The sites where these species continue to occur, both in the protected reserve and in rainforest fragments, are vitally important for their conservation.

The protection of existing populations and pockets containing the last remaining clusters of critically endangered and threatened species is of paramount importance. Linear intrusions such as roads and powerlines can cause significant disturbances to interior forest tracts. Within the Anamalai Hills, as in other parts of the Western Ghats, remnant sites with threatened trees are often close to and highly susceptible to disturbances from 'developmental' activities. Three of the listed threatened species in

this book have globally significant populations along main highways or forest roads, which are under risk of disturbance and damage. Locating the exact clusters of these trees can ensure awareness and informed protection of these sites within protected areas and within the human-dominated plantation-forest mosaic, to safeguard these last remaining populations.

The information from threatened tree surveys also aid in choosing sites for ecological restoration, to enhance their survival prospects, establishment, and growth, rather than uninformed planting in unsuitable sites or habitats. Targeted and localised active interventions based on an in-depth understanding of the landscape can aid in their regeneration and to some degree mitigate their further decline and loss.

Much remains to be known about these threatened and endangered species. Ongoing studies of their phenology (seasonality of flowering and fruiting), growth, distribution, and regeneration, indicate that each tree species has individual stories on how and why they are endangered, or so few in number. Some species have small populations but show

high regeneration, while others have large stands but few young plants. Further understanding of these dynamics, patterns, and interactions will be valuable for the conservation of these trees and the conversation around safeguarding and ensuring an extended future for ecosystems and landscapes formed over millennia.

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# Acknowledgments

We thank the Tamil Nadu Forest Department for research permits. We are grateful to our colleagues on the research team for much help: Navendu Page, Akhil Murali, Robin Wilson, G. Moorthi, T. Sundarraaj, R. Rajesh, A. Sathish, M. Muthulakshmi, and P. Sumathi. We thank Fondation Franklinia for funding this project, and Rohini Nilekani Philanthropies, Rainmatter Foundation, and the AMM Murugappa Chettiar Research Centre for supporting our rainforest restoration work in the Anamalai Hills. A. P. Madhavan was partially supported as an Artist-in-Residence at Valparai by the donation from Sartaj Ghuman to NCF.









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