

# BIODIVERSITY OF MYRISTICA SWAMP FORESTS OF SOUTH WESTERN GHATS

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## Abstract

Myristica swamps are one of the unique ecosystems of the Western Ghats and these marshy places are dominated by the tree species of the family Myristicaceae and many other rare plant and animal species. The present study was conducted in *Myristica* swamp forest patches of Kulathupuzha

and Anchal Forest Ranges and Shendurney Wildlife Sanctuary (8.75 °–9.0 °N and 76.75°–77.25°E). The dominant trees are *Myristica fatua* var. *magnifica* *M.dactyloides*, *M. malabarica*, *Gymnacranthera farguhariana*, *Gymnacranthera canarica*, *Syzygium travancoricum*, *Hydnocarpus pentandra*, *Lagerstroemia hirsuta*, *Lophopetalum wightianum*, *Mastixia arborea* ssp. *Meziana*, *Knema attenuata*, *Glochidion zeylanicum*, *Calophyllum apetalum*, *Persea macrantha*, *Pandanus thwaitesii*, etc. The majority of the endemic species of trees belongs to the family Rubiaceae followed by Araceae, Fabaceae, Lauraceae, Dipterocarpaceae and Euphorbiaceae. The Myristica swampy members are also important in conservational status, 49 species belongs to various threat categories of IUCN, out of which, 12 species are endangered 5 species are critically endangered and 8 are vulnerable 19 are under least concern, 3 species are near threatened and 2 species are data deficient. These ecosystems are rich in faunal biodiversity hosting 23 percent of butterfly species, 11 percent of spiders, 8.4 percent of fish, 26.6 of percent birds, over 50 percent of amphibians, over 20 percent of reptiles and 6.6 percent of mammals. Despite the swamps comprising a mere 0.004% of the total land area of Kerala, they boast 16.3 percent of species that are endemic to the Western Ghats— notably 42 percent of fishes and 44 percent of amphibians. These swamps are under tremendous biotic pressure and their conservation is a challenging task and subjected to heavy degradation in various ways.

**Keywords:** Myristica swamp, Biodiversity, Conservation, Floral composition.

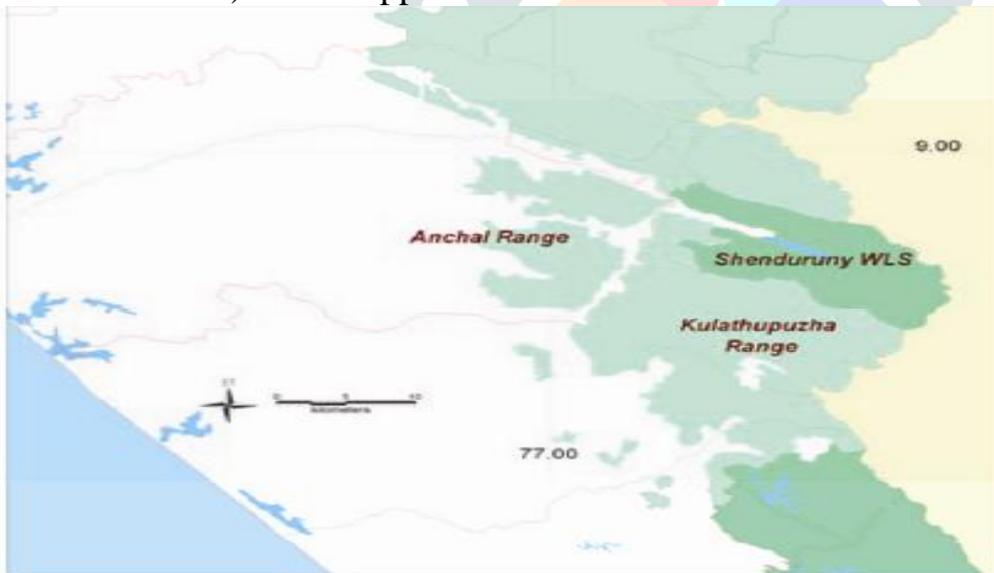
## Introduction

Myristica swamps are one of the unique ecosystems of the Western Ghats and these are dominated by the tree species of the family Myristicaceae and many other rare plant and animal species. Myristica swamps are found in the valleys between hill ranges of the Western Ghats. Fresh water littoral evergreen forests that once formed an extensive network along the streams of Western Ghats, now reduced to highly fragmented pockets. Myristica Swamps exhibits rich biodiversity and have many rare, threatened and endemic plant species, rare frogs, butterflies and many other biota. In Myristica swamps, plant species (especially Myristicaceae members) have special physiological adaptations for their habitat. They will develop special type of roots for their anaerobic respiration called as “aerial roots”, with many pneumatophores. Since,

*Myristica* swamp soil shows deficiency of oxygen, these swamps are dominated by the plant species like *Gymnocranthera canarica*, *Myristica fatua*, *Mastixia arborea*, *Lopopetalum whitianum* and many other important medicinal and NTFP species like *Garcinia gummigutta*, *Calamus* sp and *Cinnamomum* sp, *Dipterocarpus indicus*, *Ochlandra rheedii* and *Caryota urens*, *Arenga whitii* and *Pinanga dicksonii*. Some species such as *Gymnocranthera canarica* and *Myristica fatua* are of threatened categories. *Myristica* Swamps perform numerous valuable ecological functions such as recycle the nutrients, purify the water, recharge ground water, augment and maintain stream flow, provides habitat for wide variety of flora and fauna. Also, they provide food, fodder, fuel, fiber and large numbers of medicinal plants. They regulate water and carbon cycle. They will check the flooding by providing natural barriers against erosion and prevents water pollution. Unfortunately, these rare ecosystem is highly threatened due to various reasons like a rapid population increase accompanied by unplanned developmental works, pollution of surface water due to residential, agricultural, commercial and industrial wastes, plantations of commercial crops, mini hydro projects, shifting cultivation. There is urgent need to locate and conserve this threatened ecosystem. Otherwise these ecosystems will lose many important plant and animal species and we will face crucial water problem and finally we will lose whole the ecosystem. These ecosystems can be conserved by declaring as an in-situ conservation spot.

### Study sites

The study was conducted in the *Myristica* swamp forest patches of Kulathupuzha and Anchal Forest Ranges and Shendurney Wildlife Sanctuary 8.75°–9.0°N and 76.75°–77.25°E (Figure 1). Sixty *Myristica* swamp patches with a cumulative area of 149.75 hectare (ha) (0.01348% of Kerala forest) were mapped.

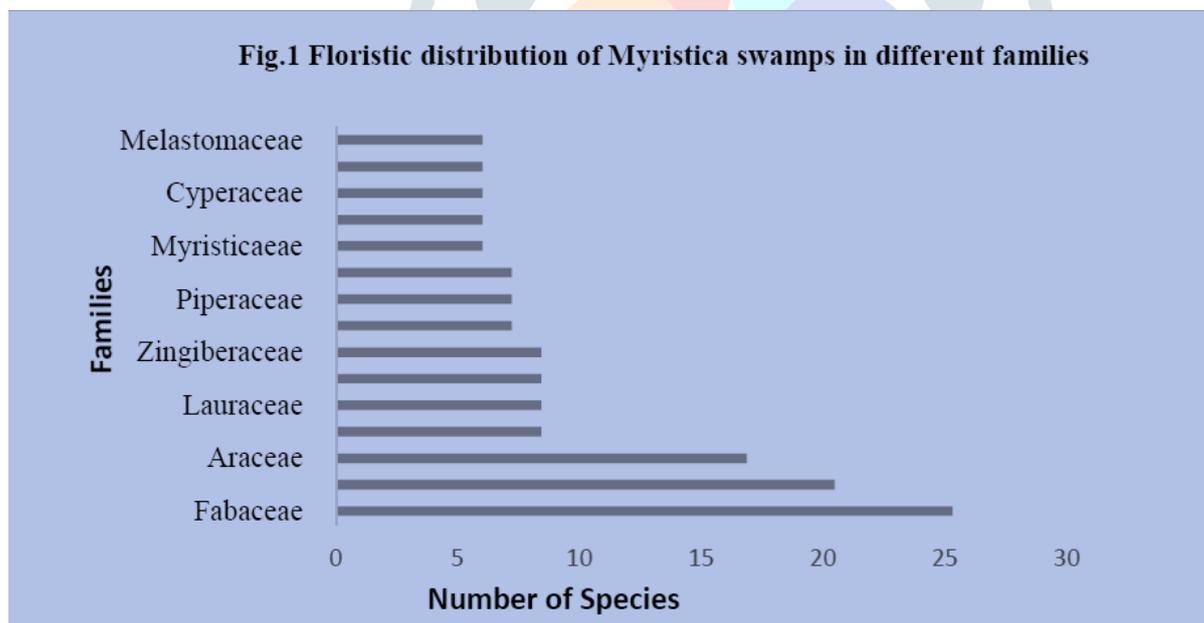


### Materials and Methods

The floristic diversity indices were assessed by laying quadrates of size 15 x 10m in randomized way and pooled to get the primary and secondary vegetation data. The data were analysed for Species richness (Mergalef, 1958), Important Value Index (Barbour et.al., 1974) Species evenness (Pielou, 1975) Floristic diversity indices (Shannon Weiner, 1963; Simpson, 1949), Species distribution (Whiteford, 1948; Curtis and McIntosh, 1958) and Biological spectrum (Raunkiaer, 1934). Species abundance data for amphibians and reptiles were collected. For amphibians and reptiles, transect sampling was carried out in early mornings and late evenings. The transect size was 100 m (length) 2 m (height) with sampling time of 2 h.

## Result and Discussion

Myristica swamps contains 246 species of angiosperms which belongs to 186 genera coming under 83 families. Dominant species are *Myristica fatua* var. *magnifica* and *Gymnacranthera canarica* of the family Myristicaceae. *Myristica fatua* is considered as flagship species because of their highly restricted distribution in swampy areas only. The non-Myristicaceae riparian members such as *Lophopetalum wightianum*, *Lagerstroemia speciosa*, *Hydnocarpus pentandra*, *Holigarna arnottiana*, *Syzygium travancoricum*, *Vateria indica* etc. are also well distributed. The dense vegetation of myristica swamps are four storied with continuous canopy. Top canopy constitutes above 20 m height trees and this layer is composed of species like *Gymnacranthera canarica*, *Lophopetalum wightianum*, *Lagerstroemia speciosa*, *Hopea parviflora* and *Neolamarckia cadamba*. Climbers also reach up this layer and formed a closed canopy, competing for light and space. Climbers such as *Chilocarpus denudatus*, *Kunstleriakeralensis*, *Gnetum ula* and *Entadarheedii*, are the major components of the upper canopy. Sub canopy is within the height ranges of 15-20 meter and consist of medium sized trees like *Myristica fatua*, *Myristica malabarica*, *Knema attenuata*, *Hydnocarpus pentandra* and *Xanthophyllum arnottianum*. The species richness of Myristica swamp is very low when compared to other forest types and low value for species richness is account by the prevailing edaphic conditions and ecological requirement of swampy species. The floristic diversity of Myristica swamp, shows low value when compared to other ecosystems of Western Ghats. Average Simpsons index value is 0.74, Shannon Weiner index is 2.71. The variety ratio of the these swamp is 0.137, and the value for equitability is 0.79 and that of Species richness is 1.29.



The dominant family is Fabaceae with highest number of species having 25.3% of species followed by Rubiaceae (20.48%), third dominant family is Araceae consisting of (16.86%) other dominant families as follow: Euphorbiaceae (8.45), Lauraceae (8.44), Oleaceae (8.43), Zingiberaceae (8.41).

**Fauna** - *Myristica* swamps in Kerala have a total of 362 invertebrates and 281 vertebrates.

**Invertebrate Diversity**

General group / Phylum	Class	Order	Family	Species
<b>Protozoa</b>	Not recorded			
<b>Cnidaria</b>	Not recorded			
<b>Platyhelminthes</b>	Turbellaria			2
	Cestoda			1
<b>Nemathelminthes</b>				1
<b>Annelida</b>	Oligochaeta			2
	Hirudinea			2
<b>Mollusca</b>	Gastropoda			10
<b>Arthropoda</b>	Crustacea	1		3
	Insecta	14	83	281
	Myriapoda	2		6
	Arachnida	5	19	54
<b>Minor Phyla</b>	Not recorded			
<b>Total</b>				362

**Vertebrate Diversity**

Class	Order	Family	Genus	Species
Pices	5	7	11	14
Amphibia	2	5	15	56
Reptilia	2	13	38	55
Aves	14	37	94	129
Mammalia	6	16	24	27
Total				281

**Endemism in *Myristica* Swamps of Kerala**

16.32% of the animals recorded from the *Myristica* swamp are endemic to Western Ghats.

- 16.67% (3/18) of Odonates
- 4.94% (4/81) of Butterflies
- 42.86% (6/14) of Fishes
- 44.64% (25/56) of Amphibians
- 29.09% (16/55) of Reptiles
- 3.86% (5/129) of Birds
- 11.11% (3/27) of Mammals

## Red listed Animals in the *Myristica* swamps

Group	Species	% En	% Vu	%DD	%LRnt	% Total Redlisted
Pisces	14	14.29	7.14	0	0	21.48
Amphibia	56	12.5	8.93	5.36	5.36	32.14
Reptilia	55	9.09	14.55	0	43.64	67.27
Aves	129	0	0	0	1.55	1.55
Mammalia	27	11.11	14.81	0	3.70	29.63
<b>Total</b>	<b>281</b>	<b>6.05</b>	<b>6.41</b>	<b>1.07</b>	<b>10.68</b>	<b>24.20</b>

The flora of Myristica Swamps shows high degree of endemism . The Myristica swamp supports characteristic amphibian evergreen vegetation with the specialist and generalist species; dominated with Myristicaceae family. The floristic diversity and species richness is lower than other forest types of Western Ghats, indicating the specific edaphic and ecological requirements of these species, habitat specialization which permits only adaptive species to survive in swampy area. Again the vegetation is with high percentage of endemism. The swamp inhabiting threatened specialist species like *Myristica fatua* var. *magnifica* and *Gymnacranthera canarica* population are declining . The fragility of ecosystem and unique flora and biota invite the immediate alternative of the conservation strategies required to protect the existing swamps.

Myristica swamp forests as highly fragmented and disturbed so further studies concentrating on the use of simple statistical tools as a diagnostic measure in predicting cryptic disturbances to an ecosystem are needed. The loss and desiccation of this ecosystem and the accompanied alteration in vegetation will eventually affect the composition and structure of animal populations in irreversible ways . A major threat to the Myristica swamps was their conversion into rice fields (Krishnamoorthi, 1960; Champion and Seth, 1968). *Asplenium grevillei*, a very rare and threatened species of fern that occurred in a swamp of Quilon district of Kerala had vanished as the swamp was drained and the trees removed (Nair and Nair, 1988). Many have been converted into rice fields, oil palm and teak plantations (Ramesh *et al.*, 1991). Biodiversity Authority, should come up with the appropriate conservation measures for protecting these ecosystem. Saving the swamps will pave the way for researchers to unravel the secret lives of the flora and fauna inhabiting these ecosystems—and in the process perhaps yield vital clues as to how life evolved in the Western Ghats in the face of a changing climate over thousands of millennia.

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