The Western Ghats recently received the prestigious World Heritage Tag from the United Nations Educational Scientific and Cultural Organisation (UNESCO). Rich in biodiversity, the Western Ghats include non-equatorial tropical evergreen forests that start at Dang along the border of Gujarat and Maharashtra and run through the states of Maharashtra, Goa, Karnataka, Tamil Nadu and Kerala ending at Kanyakumari.

This region is older than the Himalayas and is recognised as one of the world’s ten “hottest hot spots” of biodiversity sites. The Western Ghats are not true mountains but faults of Deccan Plateau formed about 200 million years ago by the break-up of the super continent Gondwanaland. The biodiversity that was present during the continental break up can still be traced in the lineages of extant species thriving in the region.

The Western Ghats comprise nine geological landscapes with 11 distinct types of evergreen vegetation spanning myriad ecosystems. It is home to 5,000 flowering plants, 139 mammals, 508 birds and 179 amphibian species. The region boasts of nearly 325 globally threatened species of flora, fauna, birds, amphibians and reptiles. It has a genetic biodiversity tracing back to 500 million years. These treasure chests were rightly mentioned by Norman Meyer as one of the “Earth’s biologically richest and most endangered terrestrial eco-systems”.

Fresh water swamps in the southern Western Ghats, also known as Myristica swamps, are living museums harbouring the only remaining habitat for the primitive plant family Myristicaceae. But the swamps are increasingly under threat of extinction from developmental pressures.
Its unique ecosystem diversity influences the Indian monsoon weather pattern. The Ghats was inscribed on the prestigious list by a 21-nation World Heritage Committee panel at its 36th session at St Petersburg in Russia on 1 July 2012.

**Myristica Swamps**

In the lower elevations, the southern Western Ghats harbour a remarkable relic habitat termed as Myristica swamps, which can be considered as living museums. These fresh water swamps are the only remaining habitat for the primitive plant family Myristicaceae.

Myristica swamps have been recorded from Goa, Uttara Kannara of Karnataka and Southern Kerala in India. Apart from southern Western Ghats, these swamps are reported from New Guinea, Venezuela and the Amazon basin only.

These swamps show a characteristic transitional condition between terrestrial land and deep water bodies. Myristica swamps are fresh water swamps characterized by sluggish flowing streams. During the rainy season these fresh water swamps get flooded due to poor drainage and low slope. These wetlands play a critical role in storing the water and maintaining ground water level. Many swamps dry up during the months of December to March. The water table recedes below 50 cm during summer.

**World Heritage List**

The World Heritage List includes 962 properties forming part of the cultural and natural heritage which the World Heritage Committee considers as having outstanding universal value. These include 745 cultural, 188 natural and 29 mixed properties in 157 States Parties. As of September 2012, 190 States Parties have ratified the World Heritage Convention.

The World Heritage emblem represents the interdependence of the world’s natural and cultural diversity. It is used to identify properties protected by the World Heritage Convention and inscribed on the official World Heritage List, and represents the universal values for which the Convention stands. While the central square symbolizes the results of human skill and inspiration, the circle celebrates the gifts of nature. The emblem is round, like the world, a symbol of global protection for the heritage of all humankind.

From India, 29 properties have been inscribed on the World Heritage List. To be included on the World Heritage List, sites must be of outstanding universal value and meet at least one out of ten selection criteria. These criteria are explained in the Operational Guidelines for the Implementation of the World Heritage Convention which, besides the text of the Convention, is the main working tool on World Heritage.

**Selection criteria:**

1. To represent a masterpiece of human creative genius;
2. To exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;
3. To bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared;
4. To be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;
5. To be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change;
6. To be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria);
7. To contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance;
8. To be outstanding examples representing major stages of earth’s history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features;
9. To be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals;
10. To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The protection, management, authenticity and integrity of properties are also important considerations. Since 1992, significant interactions between people and the natural environment have been recognized as cultural landscapes.

(Adapted from World Heritage Website)
The soils of these swamps vary in texture from sandy soils to sandy loams to silt loams and rarely clay loams depending on location factors including geology and physiography of the land; gradational variations within the swamps being not uncommon. The swamps also play a role in nutrient cycling and microbial relationship that enhance the plant-animal interaction.

The variety of microhabitats present in the Myristica swamps provide a favourable condition for the survival and breeding of various annelids, arthropods, molluscs, fishes, amphibians, reptiles, birds and mammals. Many of these animals are endemic and some are on the red list.

Myristica swamps show high specificity in distribution. The altitude, water bodies and slope of the swamp play pivotal roles in the formation of Myristica swamps and the survival of Myristica species. The first report about Myristica swamps in the Western Ghats region was provided by Krishnamoorthy in 1960 from the Kulathupuzha region in Kerala.

Plants in Myristica Swamps

Tree species belonging to the primitive angiosperm family Myristicaceae dominate in these swamps. A total of 65 tree species, 40 species of shrubs and 32 species of herbs were recorded from the Myristica swamps. More than 60% of the trees belong to Myristicaceae family. Gymnacranthera canarica and Myristica fatua var magnifica had the highest frequency of occurrence (37.94% and 33.53% respectively). Myristica fatua var magnifica individuals are increasingly distributed in flooding swamps and are less frequent in swamps without flooding conditions. Gymnacranthera canarica has more or less equal survival capability both in swampy or less swampy condition because of a wide tolerance range.

Other dominant members of these swamps are Lophopetalum wightianum, Vateria indica, Holigarna beddomei, Xanthocarpus pentandra, Xanthophyllum ornitianum, Elaeocarpus tuberculatus, Knema attenuata, Semecarpus auriculata, Tabernaemontana heyneana, Kingiodendron pinnatum, Dipterocarpus boudilloni, Utsea travancorica, Syzygium travancoricum, Anaphyllum wightii, Clemantis boudilloni and Vanilla aphylla. Ground vegetation consists mainly of Pandanus, Calamus, Ochlandra and members of Araceae, Acanthaceae, Zingiberaceae species such as Lagenandra ovata, Barleria courtallica, Alpinia malaccensis, Zingiber zerumbet, Schumannianthus virgatus etc.

Western Ghats are home to 5,000 flowering plants, 139 mammals, 508 birds and 179 amphibian species.
Since plants do not prefer flooded or water-logged conditions, plants growing in swamps require special kinds of adaptations, such as:

1. Roots: Aerial adventitious roots called stilt roots that spring out from the main trunk provide additional support to the swamp trees in the soft soil. Such roots might become woody and flattened with age, becoming ‘flying buttresses’ as in Myristica spp. and Virola surinamensis.

2. Rhizomes: Rhizomes are thick stems buried in the soils. Pinanga dicksonii, a delicate, shade-loving palm endemic to the Western Ghats, and often found in the vicinity of the Myristica swamps, propagates mainly through rhizomes. These rhizomes exhibit a much greater range of flood tolerance than roots.

3. Physiological adaptations: Roots of swamp species are known to cope up with oxygen deficiency of soil through anaerobic respiration. The lenticels seen on the surface of the aerial roots of the swamp plants diffuse out products of anaerobic metabolism, such as ethyl alcohol, acetaldehyde, ethylene etc., the accumulation of which could be toxic to the tissues.

4. Seed germination: Flooded conditions are a challenge to the germination of seeds. Seeds of many swamp plants, however, can remain viable in water for long periods. They do not germinate under water, and their regeneration is usually limited to the drought period when the soil surface is exposed.

Current Status in Kerala

Myristica swamps in the Western Ghats are a critically endangered ecosystem. These vanishing ecosystems are now largely confined to 53 patches in the Kulathupuzha and Anchal forest ranges and the Shendurney wildlife sanctuary in Kerala (between 77.27° and 77.58°E and 8.74°N and 9.03°N below 200m MSL). The swamps have a cumulative area of just 1.4975 hectares, which is 0.0039% of Kerala’s land area.

Many of these swamps were converted into paddy fields and plantations in the past and many are in a highly disturbed condition. These swamps play a critical role in water storage and maintaining ground water level. When they are drained, filled or otherwise disturbed, their water holding capacity is lost, resulting in floods and erosion during the rainy season and dry streambeds the rest of the year. Hence, the conservation of these swamps, which are the living museums of ancient life, is imperative to safeguard the ecological fabric of the Western Ghats.

However, recently due to the forest fragmentation, these valuable patches of unique vegetation are on the road to extinction. There has been a great pressure on these freshwater swamps because of increasing human interference.

The Western Ghats comprise nine geological landscapes with 11 distinct types of evergreen vegetation spanning myriad ecosystems.

Even though the Kerala forest department is promoting the conservation of these fragments in the Thenmala region of Shendurney wildlife sanctuary as part of its eco-tourism project, many patches of these swamps do not get enough attention. For example, the fragments of Myristica swamps on way to Sabarimala pilgrim centre face pressure from tourists and pilgrims. Few tracts of these unique ecosystems under the control of private parties also face pressures of developmental activities. Even the fragment conserved in the Thenmala region faces threat of erosion in the immediate future as the main hig way connecting Kerala and Tamil Nadu passes near this.

There are no concerted efforts from the government either to conserve these living museums or to create awareness among the masses regarding the ecological and economic significance of these swamps. Because of its unique feature these swamps have attracted researchers from many institutions like IISER Trivandrum, Agarkhar Research Institute Pune, KFRI, etc. in the past 40s.

The heritage of earth’s life is imprinted in the unique members of this ecosystem. One hopes that UNESCO’s heritage tag to the Western Ghats will surely get international attention and help to conserve this evolutionary relic for the sake of human kind.

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