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Meghamalai landscape : a biodiversity hotspot

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Abstract: The Meghamalai, also known as High Wavy Mountains, is located in the Theni Forest Division of Tamil Nadu, Western Ghats. The landscape is endowed with an array of vegetation types varying from dry (thorn forests) in the eastern side to wet (evergreen) forests on the western side due to wide elevation gradient (220–2000 m above sea level) and varied rainfall pattern (wind ward and leeward zones). The composition and configuration of this landscape facilitates diverse species of vertebrates (18 species of fishes, 35 amphibians, 90 reptiles, 254 birds, 63 mammals). In the past, selected floral and faunal groups of Meghamalai have been sporadically surveyed by the British explorers. However, in-depth ecological studies on various biota have only been initiated in recent years by SACON and WILD, which highlighted the conservation importance of the area. It is hoped that the recently declared Meghamalai Wildlife Sanctuary encompassing a part of the landscape, and the proposal of the Srivilliputtur-Meghamalai Tiger Reserve, if realized, would help conserving the diverse biota of this landscape in the long run.

Keywords: Endemism, High Wavy Mountains, Meghamalai Wildlife Sanctuary, Theni Forest Division, Western Ghats.

The Western Ghats, a chain of mountain ranges (~1600km in length) that runs parallel to the west coast from the river Tapti (Gujarat) in the north to Kanyakumari (Tamil Nadu) in the south, is one of the 34 biodiversity hotspots of the world (Mittermeier et al. 2005). Meghamalai, is part of a larger landscape (ca. 800km^2), catchment area of Vaigai and Suruliar rivers. Periyar Tiger Reserve, Grizzled Squirrel Wildlife Sanctuary and Cumbam Valley surround Meghamalai. Meghamalai in local language (Tamil) denotes cloud covered mountains i.e. Megha = cloud, Malai = hill. Among the locals, it is known as Patchakumachi, (Patcha = green, Kumachi = jungle). Meghamalai is also known as High Wavy Mountains due to the general appearance (wavy) of these high hills from the Cumbam Valley/Town (Image 1). The term High Wavy

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Mountains was largely used by British Explorers.

The landscape has been identified as an important wildlife area by Rodgers & Panwar (1988). Meghamalai is largely under the control of the Theni Forest Division (Theni District), which was a part of erstwhile Travancore Presidency prior to the Indian Independence. In 2009, 269.11km^2 of the area was declared as Meghamalai Wildlife Sanctuary (Tamil Nadu Government Gazette 2009). Considering its conservation importance, (the landscape forms a buffer to the existing protected areas such as Grizzled Squirrel Wildlife Sanctuary and Periyar Tiger Reserve); the area, along with the Grizzled Squirrel Wildlife Sanctuary, has recently been proposed as a Tiger Reserve (Fig. 1). In the present paper, we provide a description of the Meghamalai area, especially with respect to conservation of biodiversity based on collation from published papers.

Image 1. The Meghamalai Mountain: A view from Cumbam mettu

History

The Theni forests have a long and remarkable history. The tract, in which the forests of this division lie, is the heart of the legendary and famous Pandya kingdom (ca. 1600 AD). Since the beginning of 1800, till the independence of India (1947), the area was managed and extensively exploited for revenue generation from forest produce by the British Empire. Notable actions that helped conservation and management of forests in the area are as follows:

- 1857: Report by Colonel Beddome indicating rapid denudation of forests in High Wavy Mountains

- 1861: Formation of Madurai Forest Division

- 1871: Establishment of Forest Ranges, viz., Madurai and Periakulam

- 1880: Committee formed with 21 Forest Blocks (738.15km^2)

- 1882: Promulgation of Madras Forest Act

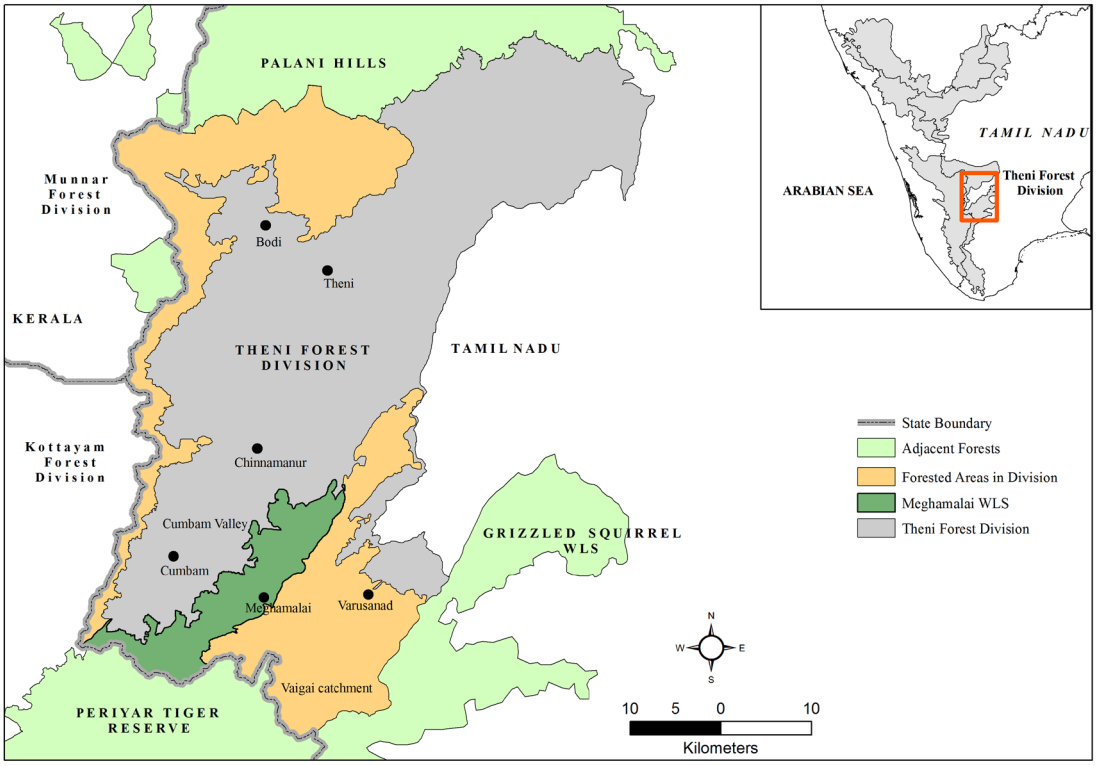

Figure 1. Location of Meghamalai and adjoining areas, Western Ghats

- 1882–1890: Demarcation of various Reserve Forests
- 1888: Formation of Forest Ranges, viz., Kanavaipatti, Sholavandan, Palamedu, Palani and Cumbam ranges
- 1951: Bifurcation of Madurai Forest Division as Madurai West and East
- 1956: Prohibition of shifting cultivation
- 1957: Madurai North and Madurai South divisions formed
- 1982: Formation of Theni Forest Division
- 2009: Declaration of Meghamalai Wildlife Sanctuary
-2013: Srivilliputtur-Meghamalai Tiger Reserve (proposal pending decision)

Terrain and Climate

The general area is rugged and mountainous with elevation ranging from 220–2000 m. Digital elevation model of landscape shows that the lower elevation (<800m) contributed to about 44% of the area followed by medium elevation (800–1400 m), which is about 38% (Bhupathy et al. 2012). Rock formation of the area is largely composed of charnockites, granite gneiss and pink granites which have been deformed by folds and faults (Palanivelu et al. 1988).

Fifty years of global climate data show variations in annual mean temperature across elevations, i.e., 24.1^{0}C (in 500m) and 18^{0}C (in 1700m). Monthly mean minimum and maximum temperatures recorded in 500m were 21.8^{0}C and 30.6^{0}C respectively, whereas it was 16.1^{0}C and 24.0^{0}C for 1700m (Bhupathy et al. 2009). Cumulative annual rainfall of lower and higher elevations of the area is 1500 and 2161 mm respectively. Both in higher and lower elevations, the lowest rainfall was recorded during January and the maximum during July (Bhupathy et al. 2009).

Rivers and Dams

Major rivers in the area are the Vaigai and the Suruliar. The Vaigai originates from Varusanad Hills while Suruliar originates from High Wavy Mountains and both join Periyar at different locations. The Public Works Department, Tamil Nadu has constructed five dams—High Wavys, Manalar, Venniyar, Eravangalar and Shanmuganathi—for electricity generation and for irrigation in and around Cumbam.

Tribes

Paliyar and Muthuvar are the two tribal communities spread across various parts of Theni District (Jeyaprakash et al. 2011).

Bhupathy et al. (2009) and Sukhla (2013) have reported the forest types from Meghamalai and its environs (Images 2–4). Besides these, teak plantations and cash crops (cardamom, and coffee (Image 5)) raised during the mid 19th Century are still being maintained, though a few of them have been abandoned. *Ailanthus excelsa, Ceiba pentandra, Tamarindus indica, Eucalyptus grandis, Schleichera oleosa* were the plantations under practice in Theni Forest Division.

The eastern fringe of the area (Varusanad) is covered with tropical thorn forests. As per the working plan of the Tamil Nadu Forest Department (2005), the following forest types were identified (i) southern tropical west coast semi-evergreen forests, (ii) southern tropical moist mixed deciduous forests, (iii) southern tropical secondary moist mixed deciduous forest, (iv) southern tropical dry mixed deciduous forests (v) southern tropical carnatic umbrella thorn forests (vi) southern dry deciduous scrub forests.

Biodiversity

Flora: The flora and fauna of Meghamalai landscape attracted several researchers during the 19th and early 20th centuries. The natural resources of this area were exploited by the British since 1801. The first status report on this forest was prepared by Colonel Beddome in 1857, which indicated rapid denudation due to a large number of commercial activities. Perhaps, this resulted in various

Image 2. Scrub forests

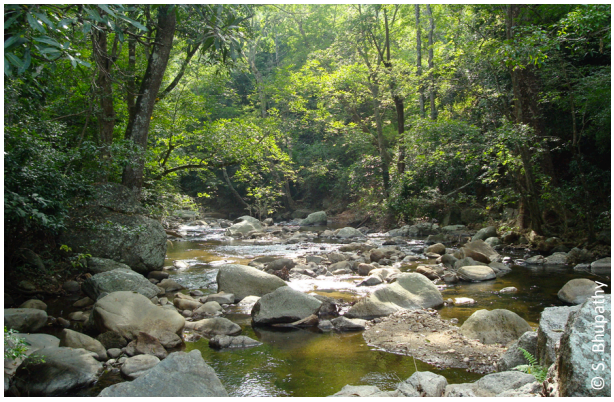

Image 3. Riparian forests

Image 4. Evergreen forests

Image 5. Plantations (Tea)

conservation and management initiatives in the region as well as in the erstwhile Madras Presidency.

The area was under dense montane rain forests during early 1900 (Blatter & Hallberg 1918). The Botanical Survey of India surveyed the area under District Flora Scheme 1984–1991. Seven new species have been reported by Ravikumar (1999). *Syzygium zeylanicum* var. *megamalayanum* is endemic to the landscape. Sasidharan et al. (1997) provided a brief description on the orchids of this area.

Fauna: Eighteen species of fishes belonging to 11 genera and four families have been reported from the area (Table 1). Among them, 10 (55.5%) are endemic to Western Ghats. *Puntius ophicephalus*, a rare barb has restricted distribution in the rivers originating/ flowing through this landscape (Silas 1951; Arunachalam et al. 2004).

Boulenger (1891a) described *Ixalus* (=*Philautus*) *travancoricus* based on a specimen deposited at the British Museum (now Natural History Museum, London) by Mr. H.S. Ferguson from Bodanaikanur (now Bodinayakanur). This species (currently known as *Raorchestes travancoricus*), which is endemic to Theni Forests, is listed as 'Extinct' as the same was not recorded for over 100 years (IUCN 2011, IUCN Red List of Threatened Species, Version 2011. 2). Bhupathy et al. (2012) reported 35 species of amphibians, including 23 (65.7%) endemics from the landscape (Table 1) (Srinivas & Bhupathy 2013). Meghamalai is one of the two known localities for the Malabar False Tree Frog *Rhacophorus pseudomalabaricus* (Srinivas et al. 2009).

Sporadic reptile collections were carried out in this landscape by the British explorers which resulted in descriptions of snake species such as *Silybura liura* Günther, 1875, now *Uropeltis liura* (fide, Smith 1943), *Silybura madurensis* Beddome, 1878, now *Uropeltis arcticeps madurensis* (fide, Whitaker & Captain 2008) and *Xylophis indicus* Beddome, 1878, now a putative synonym of *Xylophis stenorynchus* (fide, Günther 1875). Based on the collection of Harold S. Ferguson of the State Museum at Trivandrum (1880–1904), Boulenger (1891b) described *Lygosoma subcaeruleum* (Blue-bellied Tree Skink, now *Dasia subcaeruleum*). A second specimen was collected by Angus F. Hutton from High Wavy Mountains and the same was reported by Smith (1949a). This species was reportedly endemic to the area till recently (Harikrishnan et al. 2012). Angus F. Hutton collected snakes from the area during 1946–48. Most of these specimens are housed in the Museum of the Bombay Natural History Society and Natural History Museum, London (Hutton 1949a; Hutton & David 2009). Based on these collections, Smith (1949b) described Hutton's Pit Viper *Trimeresurus* (=*Tropidolameous*) *huttoni*. This species has not been recorded so far since its original description. In all, 90 taxa belonging to 53 genera and 16 families were reported from this landscape, including 30 (33.3%) endemic species (Bhupathy & Sathishkumar 2013).

Table 1. Richness of selected taxa in Meghamalai, Western Ghats; percent in parenthesis.

Taxon/ Group	Family	Species in Meghamalai	No. of species in the Western Ghats	No. of species in India	Endemic to the Western Ghats
Fish	4	18	318 (05.7%)	930 (1.9%)	10 (55.5%)
Amphibians	8	35	120 (29.2%)	314 (11.1%)	23 (65.7%)
Reptiles	16	90	197 (45.7%)	518 (17.4%)	30 (33.3%)
Birds	55	254	508 (50.0%)	1305 (19.5%)	14 (05.5%)
Mammals	24	63	137 (46.0%)	434 (14.5%)	09 (14.3%)

Nichols (1944a,b; 1945) surveyed the erstwhile Madura District including Meghamalai, for birds. Biddulph (1956) reported the occurrence of Red-faced Malkoha *Phoenicophaeus pyrrhocephalus* from this mountain range. Due to non-availability of specimens in the museum and lack of records from the region for over 60 years, distribution of this species within India is considered spurious, and currently this species is reportedly endemic to Sri Lanka (Erritzoe & Fuller 1997; Hoffmann 1996; Bhupathy et al. 2012). A most recent compilation showed that the area harbors 254 species belonging to 18 orders and 55 families of birds, and this includes 11% (18 of 159 species) of threatened bird species of India and 88% (14 of 16 species) of endemic birds of the Western Ghats (Babu & Bhupathy 2013). There were a few intensive studies on Grey Jungle Fowl *Gallus sonneratii* that addressed habitat use, nesting seasonality and threats on the species (Subramanian 2002; Ramesh 2007).

Meghamalai was included in the Mammal Survey of India (1911–1923) organized by the Bombay Natural History Society (BNHS). Stanley Hendry Prater carried out surveys in Meghamalai during 1917 and the results were reported by Wroughton (1917). Angus F. Hutton (1946–48) collected mammals from this landscape (Hutton 1949b). Thonglongya (1972) described a new species of bat, Sálim Ali's Fruit Bat *Latidens salimalii* from Hutton's collection. In recent years, a few researchers conducted surveys in the High Wavy Mountains in search of the globally threatened *Latidens salimalii*. Muni (1991) has described the experience of mist netting the bat in the High Wavy Mountains. After a lapse of a decade, Singaravelan & Marimuthu (2003a,b) mist netted Sálim Ali's Fruit Bat and described habitat characteristics and morphometric differences of the species with other closely related species. Including all records, 63 species of mammals belonging to 24 families were reported to occur in the landscape, which include 24 globally threatened and nine Western Ghats endemics (Babu et al. 2013).

Most of explorations and research on the biota of the Meghamalai were carried out during pre-independence era (Silas 1951; Boulenger 1891a; Smith 1943; Hutton 1949a; Nichols 1944a,b, 1945; Hutton 1949b). In recent years, the study of flora and fauna of this region is being carried out by several research institutions such as Sálim Ali Centre for Ornithology and Natural History (Bhupathy et al. 2012) and Wildlife Information Liaison Development Society, Coimbatore (Babu et al. 2013), and Madurai Kamaraj University, Madurai (Singaravelan & Marimuthu 2003a,b). Several local NGOs such as VANAM, Wildlife Association of Rajapalayam and Wildlife Association of Ramnad District are interested in conserving this landscape (Kumara et al. 2011).

Conservation Issues

Conservation problems of this area are similar to that of other landscapes of the Western Ghats. Major among them are:

1. Encroachment and developmental activities—About 5911ha of area has been encroached in 2896 encroachments. This includes 2060ha in Varusanad and 1721ha in Meghamalai Forest Ranges (Srinivas et al. 2013). Apart from these, leased forest land for tea and coffee estates in the upper elevations also take a major share of natural forests. The estate workers depend on natural forests for their fire wood requirement and for cattle grazing. New proposals on roads in this landscape should be carefully studied and mortality of fauna due to vehicular traffic needs to be assessed (Bhupathy et al. 2012)

2. Monoculture plantations such as Silk Cotton (*Ceiba pentandra*) have been extensively planted in the Varusanad Valley and the southern slopes of Koranganai. Preliminary surveys show that these plantations are devoid of vertebrates as the lower stratum is removed periodically. A detailed study on vertebrate assemblages in the plantation would help in managing biodiversity in these man-modified landscapes.

3. Five hydro-electric projects are currently in operation in this landscape. Apart from inundation of natural forests, these dams might hinder the movement of smaller vertebrates such as fishes and amphibians (tadpoles). Investigations on the current capacities of these hydro-electric projects and their utilization by wildlife are required.

4. Hunting was reported as an issue for the wildlife in the landscape (Kumara et al. 2011). In addition, on-going studies on large mammals by WILD would provide the baseline information about the hunting practices and preferred species by hunters in the area.

The present review shows that the Meghamalai landscape harbors rich diversity of several groups of vertebrates including endemics (Table 1). Ecology of many of these species is poorly known. Only a portion (269.11km^2) of the Meghamalai landscape has been declared as Meghamalai Wildlife Sanctuary (MWS), and efforts should be made to identify other important areas holding rich biodiversity and proposals should be made to include them in the existing protected area (MWS). Recognizing this landscape as a nationally important area such as a Tiger Reserve (Srivilliputtur-Meghamalai) and Important Bird Area would help conserving the biota of Western Ghats in a long run.

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