CHAPTER 4

PHYSIOGRAPHY, VEGETATION AND CLIMATE OF KERALA STATE

4.1. PHYSIOGRAPHY

Kerala is a small State located at the south-west region of peninsular India, bordered by Arabian Sea at the west, Karnataka State at the north and the State of Tamil Nadu at the southern and eastern parts (Sasidharan 2004). The geo-political boundaries of the State are located between 8° 18' and 12° 48' north latitudes and 74° 28' and 77° 38' east longitudes (Bhat 1994). Kerala encompasses an area of 38,863 km², which is about 1.18% of the total land area of India. The physiography of this State is extremely diverse because of the presence of a long stretch of mountain range called the Western Ghats in the eastern side and the Arabian Sea in the western side. Kerala has a composite topography comprising valleys, mountains and ridges.

The altitude ranges from sea level to 2695 m above sea level. On the basis of altitude, the State is divisible into three geographic regions: i) the highlands at 600–1800 m height constitute the mountain ranges of the Western Ghats. The Western Ghats has an average height of 900 m and it occupies about 48% of the land area of Kerala. There are a number of peaks above 1800 m high, of which the highest peak, Anamudi, has a height of 2694 m. The landscape of the highlands is composed of numerous valleys and gorges that support both natural forests and plantations of tea, coffee, cardamom and rubber; ii) the midlands at 300–600 m height,
situated in between the mountains and the coastal belt, represent around 40% of the total land area. The midlands have undulating hills and valleys. This region has large areas under cultivation of crops like cashew, tapioca, banana, coconut, arecanut and vegetables and iii) the lowlands at 1–300 m height, encompass lagoons, river deltas, backwaters and the coast of the Arabian Sea. Coconut and rice are the major cultivated crops in this region and it is also known for mangroves and other coastal vegetations (Sasidharan 2004).

4.2. VEGETATION

Kerala has a luxuriant forest cover of 11, 125.59 Km², which is about 28.88% of the total land area of the State (Chandrasekharan 1962; Sasidharan 2004). Owing to the varied geographical features, high rainfall and the geological conditions, Kerala has different ecosystems ranging from shola forests to mangrove forests. A remarkable feature of the State is the formation of tropical rainforests along the windward side of the Southern Western Ghats (Sasidharan 2004). Recently, the Western Ghats has been added to the UNESCO World Heritage Sites as it represents one of the eight "hottest hotspots" of biological diversity in the world (Myers et al. 2000). The Western Ghats supports more than 30% of the land plants and vertebrate species occurring in India (Das et al. 2006).

Champion and Seth (1968) documented twenty six types of forests in Kerala. Of these, the major types are the west coast tropical evergreen forest, west coast semi-evergreen forests, southern moist mixed deciduous forests, southern dry mixed deciduous forests, southern montane wet temperate forests, southern subtropical hill forests, southern montane wet
temperate grasslands, shola forests and littoral forest. In addition, patches of bamboo brakes, cane brakes, reed brakes, euphorbiaceous scrub jungles, laterite thorn forests and myristica swamp forests are also seen (Sasidharan 2004). The main tree species found in the evergreen forests of Kerala are *Artocarpus heterophyllus*, *A. hirsutus*, *Bombax ceiba*, *Cinnamomum zeylanicum*, *Dipterocarpus indicus*, *Elaeocarpus tuberculatus*, *Ficus nervosa*, *Flacourtia montana*, *Hopea parviflora*, *Hydnocarpus macrocarpus*, *Litsea bourdillonii*, *Mallotus tetracoccus*, *Mangifera indica*, *Mimusops elengi*, *Myristica beddomei*, *Persea macrantha*, *Pterospermum reticulatum*, *Syzygium gardneri*, *Terminalia bellirica*, *Terminalia travancorensis* and *Vateria indica*.

*Strychnos nuxvomica*, *Tabernamontana haeyneana*, *Tectona grandis*, *Terminalia bellirica*, *T. paniculata* and *Xylixylocarpa* are the major tree species found in tropical moist deciduous forests. Some tree species often observed in the shola forests of Kerala are *Cinnamomum sulphuratum*, *Elaeocarpus munronii*, *E. recurvatus*, *Euonymus indicus*, *Fagraea ceylanica*, *Mahonia leschenaultii*, *Michelia champaca*, *Pittosporum neelgherrense*, *Myrsine wightiana*, *Rhododendron arboreum* and *Syzygium densiflorum* (Sasidharan 2006).

Several protected forested zones in the form of national Parks, wildlife sanctuaries and biosphere reserves have been created in Kerala in order to conserve the enormous biodiversity of the State. Kerala has five national parks: Aanamudi Shola National Park, Eravikulam National Park, Silent Valley National Park, Mathikettan Shola National Park and Pampadum Shola National Park. Thirteen wildlife sanctuaries are there in Kerala to protect the wildlife: Aaralam Wildlife Sanctuary, Chimmini Wildlife Sanctuary, Chinnar Wildlife Sanctuary, Idukki Wildlife Sanctuary, Mangalvanam Bird
Sanctuary, Neyyar Wildlife Sanctuary, Parambikulam Wildlife Sanctuary, Peechi-Vaazhaani Wildlife Sanctuary, Peppara Wildlife Sanctuary, Periyar Wildlife Sanctuary for Tiger Reserve, Shendurney Wildlife Sanctuary, Thattekkaad Bird Sanctuary and Wayanad Wildlife Sanctuary. Additionally, there are two biosphere reserves maintained in the State, namely the Nilgiri Biosphere Reserve, which includes parts of Wayanad, Malappuram and Palakkad Districts and the Agasthyamalai Biosphere Reserve which encompasses parts of Thiruvananthapuram, Kollam and Pathanamthitta Districts.

Besides the aforementioned officially declared biodiversity conservation zones, Kerala has around two thousand small and large sacred groves encompassing roughly 500 hectares of land area (Khan et al. 2008). Sacred groves are small patches of forest traditionally conserved as religious or cultural heritage, which are usually associated with nature worship (Oviedo et al. 2005). They are often considered as repositories of rare or endemic wild plants and animals. Most of these sacred groves are found in districts like Thiruvananthapuram, Kollam, Pathanamthitta, Alappuzha, Thrissur, Kozhikode, Kannur and Kasaragod. A few groves also occur in high range areas of Wayandad and Idukki Districts (http://www.forest.kerala.gov.in). The sacred groves of Kerala are considered as supreme models of traditional conservation system which boasts a history of more than hundred years (Gadgil & Chandran 1992; Chandrashekara & Sankar 1998). The major tree species found in sacred groves of Kerala are Adenanthera pavonina, Antiaris toxicaria, Artocarpus hirsutus, Caryota urens, Celtis timorensis, Cinnamomum malabathrum, Ficus mysorensis, Ficus virens, Flocourtia montana, Garcinia gummi-gutta, Hopea
parviflora, H. ponga, Ixora brachiata, and Macaranga peltata (Chandrashekara & Sankar 1998).

4.3. CLIMATE

Kerala has a humid, tropical, maritime and monsoonal climate. The average annual temperature ranges from 25.4°C to 31°C (Sasidharan 2004). The maximum day temperature may rise up to 40°C in some places in summer and the minimum night temperature may dip to 0°C in some parts of the highlands in winter (Aravindakshan & Manimohan 2015). The tropical climate of Kerala is coupled with two monsoonal seasons, the south-west monsoon and the north-east monsoon. The south-west monsoon starts in early June and extends up to September and provides around 60% of the total annual rainfall. The north-east monsoon occurs between October and December and provides much less rain fall than south-west monsoon (Sasidharan 2004; Aravindakshan & Manimohan 2015).