Chapter 3
Methodology

Kanyakumari is the southernmost district of Tamil Nadu. The district lies between 77° 15' and 77° 36' of the eastern longitudes and 8° 03' and 8° 35' of the northern Latitudes. The District is bound by Tirunelveli District on the North and the east. The South Eastern boundary is the Gulf of Mannar. On the South and the South West, the boundaries are the Indian Ocean and the Arabian Sea. On the West and North West it is bound by Kerala.

The major river in the district is Thamirabarani locally known as Kuzhithuraiar. This river has two major tributaries, Kodayar and Paraliyar, with the Pechiparai Dam and Perunchani Dam, respectively, built across them. There are many tributaries for the Kodayar River of which Chittar I and Chittar II, with their dams, are the major ones. The origin of Tambaraparani River is in the Western Ghats latitude 8.512440 N, Longitude 77.38495 E and the river confluences with Arabian Sea near Thengapattanam, Latitude 8.242156 N, Longitude 77.16720 E about 56 kilometres (35 mi) west of Kanyakumari town (Plate 1 and 2).

The District has a favorable agro-climatic condition, which is suitable for growing a number of crops. The proximity of equator, its topography and other climate factors favour the growth of various crops. The paddy varieties grown in the second crop season in Thovalai and Agasteeswaram taluks are grown during the first crop season in Kalkulam and Vilavancode taluks. This shows that there is distinct variation in the climatic conditions prevailing within the district. Unlike other district in Tamil Nadu, it has a rainfall both during the South West and the North East
monsoons. The South West monsoon period starts from the month of June and ends in September, while the North East monsoon period starts from October and ends in the middle of December. The forests in Kanyakumari District are about 75 million years old. Of the total district area of 1671.3 km², government forests occupy an area of 504.86 km² which comes to about 30.2 percent of the geographical area of the District. The forests of the district are administered through the Kanyakumari Forest Division, with headquarters at Nagercoil, the capital of Kanyakumari District.

There are 14 types of forests from luxuriant tropical wet evergreen to tropical thorn forests. This variety occurs in the district because of diverse locality factors. Rainfall varies from 103 cm to 310 cm elevation from sea level to 1829 m. The forest area is 30.2% of the total district geographical area which is next to Nilgiris district with 59% and Dharmapuri District with 38% in Tamilnadu State.

Climate

Tropical moderate bi-xeric bio-climate occurs along the lower elevations of the Kanyakumari forests (Figure 1). Here the temperature is more than 20°C throughout the year. But the rainfall varies from 500 to 1000 mm with five to six dry months annually. The dry season is interrupted by a very short rainy season which occurs in the month of May. This bio-climate is a variant of the tropical moderate bio-climate. Attenuated bio-climate prevails in elevations receiving 1000-2000 mm rainfall with three to four dry months. The wind velocity is low in October and January due to reversal of wind system. The air motion on the hills consists of an alternating movement between land breeze and sea breeze.
Plate 1. Map showing the study area
Plate 2. Thamiraparani river and its tributaries
The area is characterized by the presence of two main ridges and fourteen minor hillocks with undulating topography. The ridges show a general trend towards northeast-southwest direction. This area is discriminated by difference in elevation from mean sea level (277 - 369 m). The relief is varied from 60 m to 369 m. The southwest part of the ridges show moderate slope while a steep slope characterizes all other area. Numerous first order seasonal streams present in the area show the steepness and nature of the landform.

Geology and soil

The rock present in the hill group consists of well-bedded massive quartzofelspathic granite gneiss. This is the characteristic rock of Kanyakumari District and is generally found throughout the Western Ghats. It consists of variable
quantity of red or pinkish irregular, anhedral garnet crystals. The biggest rock on the main hill is made up of pyroxene quartzite, which resists denudation. The rock is dark colored, fine to medium grained with granoblastic texture. The rocks at the lower levels are of granetiferous gneiss, charged with titaniferous iron in minute grains. The garnets are embedded in the rock and it is impossible to break. The rocks also contain black mica. Limestone occurs in several places. The major type of soil present in the area is sandy-clay, red, laterite and sandy loam. Humus rich black soil is present in the clefts of rock due to the deposition of debris and organic matter. The soil is generally dry in nature with minimum water holding capacity.

**Study Site**

Thamiraparani River was taken up for the study of floristic diversity. Fortnightly pedestrian surveys were conducted from 2011-2014. Estimated 800 – 850 man hours were spent in the study area. Collection trips were organized during all season covering the entire study area of Thamiraparani River. Trails and trail-less portions of the study area were walked along the two sides of the river.

There was an extensive collection of plants was made in the study area. The structural formation and vegetation association at each and every area were also recorded. As a precaution were similar species were difficult to identify in the field, vouchers were collected as replicates. Sometimes more vouchers were collected than the number of species on the study area. The plant species were collected in different reproductive stages like flowers and fruiting stages, to prepare Herbarium specimens. In the case of herbs and grasses the whole plant with roots and below ground parts were collected. All field vouchers were taken to the laboratory for identification as
some species could only be determined using microscopic features. In-depth field data were collected during the field collection. The investigator collect information such as family and binomial name, date of the collection, the locality, the habit, the habitat, short description, conservation status of the field voucher plant and those characteristics which cannot be observed from the pressed specimens were recorded. Apart from the voucher specimens, visual and photographic identification were also done. Photographs were taken by using Olympus SP-800UZ Digital Camera. The preservation of the vouchers brought from the study area the wet method (Fosberg & Sachet, 1965) using 70% Methylated Alcohol and 5% formaldehyde was employed. Large specimens were trimmed in such a way as to fit them in the Herbarium. The collected specimens were pressed after spreading out the leaves and flowers neatly. The pressed specimen was mounted on white mounting cards of dimension 29 X 43 cm. The specimens were mounted that they resembled ‘Portrait’. The labels were kept in the right corner of the mounting cards, details such as the family name, binomial name, and collector’s name, date of collection and locality of collection of the specimen. Native species were checked for their RET status in the IUCN red lists (IUCN, 2011) and Nayar (1997). Voucher specimens of large trees, cultivated plants and some common plants were not collected due to difficult riparian terrain. So that some of the species entries have without specimens. Processed herbariums were deposited in the herbarium of Nesonomy Memorial Christian College, Marthandum. Photo documentation of the plants in the field condition was also done.
Identification

The plants which can be identified in the field were recorded and all other specimens were critically observed; flowers of unidentified plants were preserved and dissected. They were checked with descriptions available in flora of the Presidency of Madras (Gamble & Fischer, 1915 – 1936), The Flora of Palni Hills, South India (Matthew, 1999), Flora of Tamilnadu and Carnatic (Matthew, 1981,1982) and Flora of Tirunelveli Hills (Manickam et al., 2008). Identification was further conformed after matching the specimens with authentic or type sheets in Centre for Biodiversity and Biotechnology (CBB), St. Xavier's College, Palayamkottai, Tropical Botanical Garden and Research Institute (TBGRI), Palode, Kerala, Calicut University Herbarium Calicut, Kerala. A rare unidentified specimens were identified with the help of taxonomists at TBGRI and Botanical Survey of India (BSI), Coimbatore. In the enumeration of each species is provided with the correct name and basionym if any. Effort has been made to indicate the correct name or its basionym wherever possible. This followed by a short description and the flowering fruits phenology of the plant species.

Plan and Presentation of Data

The present investigation mainly followed Bentham and Hooker system of classification with necessary modifications. The families are numbered in the same order. All the plant species are arranged alphabetically under each family. The keys are provided for families, genera, species and subspecies. Each genus includes its correct name and author citation. The short description, flowering and fruiting phenology, economic uses of the species also given. Selected colour photographs of
species are provided to show habitats, association and their occurrence in various vegetation.

Limitations of the study

The restriction that thesis should not exceed the page limitations imposed by the Manonmanium Sundaranar University has prevented the candidate from making detailed description and citations for all species.