VII. SUMMARY
Summary

A 30 ha permanent plot was established to make a quantitative ecological inventory of trees in a tropical evergreen forest at Varagalaiai, Anamalais, Western Ghats, India. The diversity, density, dispersion patterns of trees ≥30 cm gbh and short-term population changes in tree communities were investigated within the 30 ha plot. The initial inventory of trees was carried out during 1997-98 and two recensuses were conducted during 1999 and 2000.

The major findings are:

A total of 153 species of trees representing 123 genera in 50 families was recognized from a total of 13,415 individuals within the 30 ha plot. Two species Drypetes subsessilis (Euphorbiaceae) and Prismatomeris tetrandra subsp. malayana (Rubiaceae) formed additional records to the tree flora of peninsular India (Ayyappan and Parthasarathy, 2001) and to the Indian subcontinent respectively.

The mean species richness, family richness, tree density and basal area per hectare were 66 species, 28 families, 447 trees and 36.47 m² respectively. The species richness and tree density consistently decreased with increasing girth threshold of trees.

The rectangular sample plots of various sizes drawn from the 30 ha plot harbored greater species richness on an average in most of the cases, than the comparable square plot samples of the same area, but the differences were always small in magnitude. Species richness of the thirty individual 1 ha subplots ranged from 52 species to 79 species ha⁻¹. This variation probably could be due to the normal stochastically random variation, and some extent to the density-dependent process.
The diversity indices such as the Shannon, the Simpson and the evenness index values respectively were 3.94, 0.034 and 0.782 for trees ≥30 cm gbh, within the 30 ha plot. While increasing the girth threshold of trees, the Shannon diversity index value decreased, the Simpson index value increased, while the evenness index value was nearly the same for all the girth thresholds. All the three diversity indices-individual curves were initially steep and later they tend to approach an asymptote.

The species-area curve for the 30 ha area attained an asymptote at the 27th hectare for trees ≥30 cm gbh; at the 28th hectare for trees ≥120 cm gbh and ≥240 cm gbh; and for trees ≥60 cm gbh the curve did not attain an asymptote. The species-area curve stabilized at the 24th hectare after the removal of those species represented by <3 individuals; the curve stabilized at the 8th hectare after the removal of species represented by density was <30 individuals. Species accumulation curves of thirty individual 1 ha subplots did not stabilize, although the Chao2 estimator curve stabilized in a total of 15 subplots.

A total of 50 families was recognized within the 30 ha plot and their representation varied between 21 - 36 families ha⁻¹. The family-area curve for the four different girth thresholds of trees (≥30 cm gbh, ≥60 cm gbh, ≥120 cm gbh and ≥240 cm gbh) revealed that the curves attained an asymptote.

Euphorbiaceae ranked the first in terms of species richness (with 19 species) and tree density (with 3786 trees). Based on the basal area contribution, Dipterocarpaceae ranked first, with 196.91 m² in the 30 ha plot. Euphorbiaceae, Dipterocarpaceae and Meliaceae were the top-ranked families based on family importance value index.
A total of 13,415 individuals of trees was enumerated within the 30 ha plot and their distribution in the individual hectares ranged from 273 to 674 trees ha\(^{-1}\). Within the 30 ha plot, 34 species were deciduous and they accounted for 11.5% of the stand density. A total of 583 trees was multi-stemmed.

Species were categorized into predominant (1.3% of species within the 30 ha plot), dominant (9.8%), common species (37.3%), rare species (34%) and very rare species (17.6%). The floristic structure of the study site, based on the importance value index of species depicted a reversed J structure. *Drypetes longifolia* scored the highest IVI. The importance value index of species in each subplot revealed that the cumulative IVI of the top-ranked 8 species contributed about 40%; 16 species contributed ≥50% and 50 species formed ≥90% of the total IVI.

Sorensen similarity index of different pairs of the 1 ha subplots varied between 0.7 to 0.9 for species and 0.8 to 0.9 for families, indicating a greater homogeneity of the forest stand. The principal component analysis, based on the 20 top-most species of the individual 1 ha subplots, yielded 3 distinct clusters.

Spearman coefficient of rank correlation analysis displayed variation in species richness between the subplots, which could be explained by the dominance of a few species. Correlation coefficient value for tree density and species richness decreased with increasing area from positive integer to negative.

The population structure of trees, based on their girth class frequency distribution, revealed that the number of trees decreased with increasing girth class for the whole 30 ha forest stand and also for the individual hectares.
An analysis of population structure of 45 selected species revealed four different types. At the 1 ha scale, uniform pattern of species distribution was prevalent than clumped dispersion. At the larger scales of 4 ha, 9 ha, 16 ha, 25 ha and 30 ha, clumped distribution was common, while the random pattern was rare.

Recensus of the permanent plot revealed that a total of 250 trees died and 336 trees recruited in the two-year interval. The number of trees recruited, and dead varied across the 1 ha subplots and also between the two successive years. The per cent mortality of trees differed between the tree size classes during each recensus.

The condition of dead trees was divided into four categories: standing dead, trunk snapped off, uprooted and by the activity of animals and human. Trunk snap off accounted for 45% tree death in the 30 ha plot. One species *Ficus beddomei* disappeared from the plot and there was no new addition of species. A total of 96 species showed changes in their population and 89 species displayed changes in their frequency of occurrence in the 2-year interval due to tree mortality and recruitment.