7. SUMMARY
Summary

A quantitative inventory of lianas was made in a large-scale 30 ha plot of tropical evergreen forest at Varagalaiaiar, Anamalais, Western Ghats, India. The prime objective of this study include assessment of the extent of diversity and density of lianas $>1.5$m height and $\geq 1$cm dbh and investigating their relationship with trees. The study was carried out in two phases. The first phase of fieldwork was carried out between September 1997 to May 1998 to make a quantitative inventory of lianas. The second phase of work was carried out in February-March 1999, during when all trees $\geq 30$cm gbh were examined for the presence of liana stems $\geq 1$cm dbh, to describe the distribution pattern of lianas on trees and to investigate tree-liana interactions.

The major results.

Liana inventory

A total of 11,200 lianas ($\geq 1$cm dbh) that belonged to 75 species in 67 genera and 37 families was enumerated in the 30 ha plot. Liana species richness of the thirty individual 1-ha subplots ranged from 26 to 48 species, while the density ranged from 185 to 500 individuals. The diversity measures such as the Shannon, the inverse Simpson's, the Pielou evenness index (E1) and Hill evenness index (E2) respectively were 3.36, and 17.92, 0.78 and 5.33 for the 30 ha plot. The Shannon and the inverse Simpson’s indices for the thirty 1-ha subplots ranged from 2.4 to 3.3 and 5.8 to 20.1, respectively. Liana basal area in the 30 ha plot was 13.56 m$^2$, with mean basal area of 0.45 m$^2$ ha$^{-1}$. The basal area of individual hectares ranged from 0.11 m$^2$ to 0.84 m$^2$.

The first five most abundant species, which also interestingly represented the five different climbing modes of lianas include *Olax scandens* (scrambler, contributed
13.5% of density), *Piper nigrum* (root climber, 12.8%), *Chilocarpus atrovirens* (twiner, 6.4%), *Artabotrys zeylanicus* (hook climber, 5.3%) and *Calamus gamblei* (grapnel-like climber, 4.4%).

The species-area curve of lianas for diameter thresholds of ≥1cm dbh and ≥6cm dbh stabilized at the 28th ha, while for ≥3cm dbh and ≥10cm dbh it stabilized at the 26th ha. Species-area curves of the thirty individual 1-ha subplots revealed that in 11 hectares, the curve levelled off at 1-ha scale, while in the remaining 19 hectares species number continued to increase with area.

The double logarithmic model of liana frequency distribution class for the thirty 1-ha subplots indicated a smooth decline with increasing diameter class. Species-rank abundance of 20 abundant species for the four size-classes (≥1cm dbh, ≥3cm, ≥6cm and ≥10cm) exhibited a logseries model.

The importance value index revealed that *Chilocarpus atrovirens* (Apocynaceae) scored the highest IVI. The first 25 species scored 87% of IVI, while the remaining 13% of IVI were shared by 50 species. Apocynaceae scored the top rank, based on family importance value. The family-area curve for lianas stabilized at the 21st hectare. The spatial patterns of 27 dominant liana species showed both uniform and clumped dispersions at the 1-ha scale.

Six climbing modes of lianas were recognized, of which twiners formed 41.32% of density, followed by the scramblers (29.14%); root climbers (14.04%); hook climbers (8.39%); grapnel-like climber (4.45%) and tendril climbers (2.67%).

The ordination of (PCA) analyses formed three distinct groups of subplots based on the subplot composition and a similar ordination for 20 abundant species yielded three distinct clusters based on their microhabitat preference. Spatial
autocorrelation revealed that the average similarity in liana species richness decreased with increasing distance from the focal hectares. Similarly, the climbing modes also changed from more number of twiners in the forest interior to the scramblers towards the edge.

*Tree-liana interactions*

A total of 13,445 trees \(\geq 30\text{cm gbh}\) were enumerated in the 30 ha plot, of which 28% of trees were infested with lianas. The frequency distribution of lianas on trees indicated a tendency towards random distribution.

Liana infestation on various host diameter thresholds revealed that maximum liana infestation occurred in the lower girth class. Liana infestation on 16 tree families and 20 species revealed that tree susceptibility to lianas was better pronounced at species rather than at family level.

The association between 20 abundant tree species and lianas revealed that some tree species such as *Poeciloneuron indicum*, *Dipterocarpus indicus*, *Myristica dactyloides* and *Vitex altissima* had higher liana infestation than the expected. Whereas the lower story species such as *Orophea erythrocarpa*, *Drypetes longifolia* and *Cleidion spiciflorum* had lower liana infestation than the expected.

Aggregation of lianas examined for 16 dominant tree families revealed that Clusiaceae, Dipterocarpaceae, Euphorbiaceae and Meliaceae showed significant departure from randomness. Among these four families, species with \(\geq 100\) individuals revealed that within a family there was no significant variation in liana aggregation; but when compared with species of different families, species of Dipterocarpaceae had higher degree of liana aggregation.
In Varagalaiair, there was a positive correlation between the branch-free bole height and the proportion of trees with lianas and among the three bark types, trees with slightly-rough bark had lower proportion of trees with lianas than those with smooth and rough bark.