4. METHODS
Methodology

The liana inventory was undertaken in a total of eight 1 ha plots, distributed one in each of the four coastal and inland sites. In the four coastal sites OR, AK, KK and PP inventory was made during August to September 2001 and investigation on tree-liana interaction during April to May 2002. In the same way a 1 ha plot was established in each of the four inland study sites viz. AP, KR, SP and MM and liana inventory and tree-liana interaction studies were carried out during January - February 2003 and June - July 2003.

Field methods liana diversity and distribution

The 1 ha plot of each site was subdivided into one hundred 10m × 10m quadrats and all rooted lianas, free standing as well as climbing individuals within the plot having girth greater than or equal to 3.1 cm (measured at 1.3 m from the rooting point of the stem) were enumerated. Later, girth measurements (gbh) were converted to diameter at breast height (dbh) values assuming a circular cross section stem (i.e. dbh = gbh/π). Four climbing modes of lianas based on field observations were recognized: the stem twiners that coil around supports, tendril climbers with modified leaves, leaflets or stipules which coil around supports, species with hook-like structure and species of scrambling types with stipular spines. Voucher specimens were collected, identified and lodged in the herbarium of School of Ecology, Pondicherry University.

Data analysis

Diversity indices such as Fisher’s α, Simpson, Shannon, Hill diversity numbers N1 and N2 and evenness indices (as in Magurran 1988) were computed to determine liana species richness and dominance at individual sites as well as for the whole liana community. Species-area curves were raised with respect to species accumulation by
sequential arrangement of 0.1 ha subplots. To determine the structural importance of liana species and families, phytosociological analysis in terms of importance value index (IVI, Curtis and McIntosh 1950) was calculated as the sum of relative density, relative dominance and relative frequency. The coefficient of dispersion (C.D., Variance/mean) of the number of liana stems in a 10m x 10m quadrat was used to assess the spatial distribution pattern of liana community and a ‘t’ test was performed to assess the significant deviation from C.D -1 (Krebs 1989) Spatial distribution patterns of liana species, with ≥20 individuals and present in at least two sites were determined using standardized Morisita’s index of dispersion, _I_ (Krebs 1989) that ranges from -1 to -1. An _I_ of zero indicates a random pattern, above zero indicates a clumped pattern and below zero uniform pattern, with 95% confidence limits at -0.5 and -0.5. Cluster analysis was done to obtain a dendrogram of related groups among the four sites.

Field methods Tree-liana interactions

The 1 ha plot established in each of the eight study sites distributed four each in the coastal and inland areas was subdivided into hundred 10m x 10m subplots and every tree >10 cm gbh was screened for the presence absence of lianas. Based on the manner lianas ascend on trees, such as directly through tree trunk or lower tree branches as primary hosts or by means of horizontal spread through side canopy as secondary host, was noted in the field to determine the liana load on trees. The number of individual lianas on a particular tree along with tree morphological traits such as branch-free bole height and bark texture categorized into smooth and rough were also noted in the field.
Data analysis

The data of four sites in each study area were combined to analyze tree-liana interactions. To determine whether a particular tree species had a higher or lower proportion of trees supporting lianas, the mean proportion of trees carrying at least one liana for the whole forest was calculated and contrasted it with the observed proportion of specific tree species (>20 individuals) with lianas by binomial goodness of fit test (Zar 1984). A similar binomial goodness of fit test was carried out to know which families had higher or lower proportion of trees with lianas than the forest mean liana infestation rate. To evaluate whether tree species having >20 individuals in the two gbh classes (10-30 cm and >30 cm) had significantly higher or lower proportion of trees with lianas than the forest mean in both the gbh classes or not, a binomial goodness of fit test was performed. Further, Mann-Whitney's test was performed to evaluate which size class of trees (10-30 cm and >30 cm) was more accessible for lianas to climb onto forest canopy, and for this, the proportion of trees acting as primary hosts and comprising >20 individuals in any size class was considered.

The observed frequency distribution of trees with different number of lianas was compared with expected trees for each category, calculated from Poisson distribution series, by Chi-square goodness of fit test to evaluate whether the frequency distribution of trees either random or clumped (Ludwig and Reynolds 1988). Mann-Whitney test was used to detect any significant difference in mean liana load between trees categorized into 10-30 cm gbh and >30 cm gbh classes. Similarly, Mann-Whitney test was employed to verify the differences in supporting lianas between tree species of smooth and rough bark categories. Spearman rank correlation was made to examine the relation between mean tree gbh values of each tree species and their corresponding liana infestation rates as well