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INVESTIGATING SPATIAL CHARACTERISTICS OF TREE SPECIES IN SINHARAJA FOREST DYNAMIC PLOT USING BINOMIAL MIXTURE MODELS

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Individual tree species often exhibit heterogeneous behaviour in forest communities. Ecological and environmental factors such as topography, climate, soil nutrients and seed dispersal directly influence the occurrence and growth of the tree species. In general, all these factors are continually varying or unevenly distributed throughout the forest land. Investigating spatial characteristics of individual tree species in forest community would be advantageous for ecologists to acquire a better understanding on species richness and diversity of the forest. However, direct investigation of spatial characteristics often tends to make disturbances to the species population. To study the spatial characteristics, the two measures; "Degree of Spatial Heterogeneity" and "Mean Species Occurrence" of individual tree species are used in literature. The degree of spatial heterogeneity measures the uneven distribution of each species within an area. The mean species occurrence is the mean number of each species in a given area.

The objective of the present study was modelling spatial distributions of 239 individual tree species existing in 25 hectares Forest Dynamic Plot (FDP) in the Sinharaja World Heritage Site, using Beta-Binomial distributions as proposed in the literature. For the cases where the Beta-Binomial fails, a novel method is introduced based on Generalized Beta Binomial distribution. Further, the degree of spatial heterogeneity and mean species occurrence of 239 individual tree species are measured using the estimated parameters of the fitted models. By following the method given by Shiyomi *et.al.*(2000) to identify "high", "moderate" and "low" mean occurrences, it was noted that there were only 2.97% of the individual tree species with high mean occurrence, 77.23% of the individual tree species with low mean occurrence, and 19.80% of individual tree species having a moderate occurrence in Sinharaja FDP. Out of 239 individual tree species, 198 tree species were adequately modelled using the Beta-Binomial distribution. Of the rest, 15 tree species were recognized as rarely occurring species, and 18 species were best fitted with Gaussian Hypergeometric Generalized Beta-Binomial Distribution (GHGBB). Among the modelled tree species the percentage occurrence of AGROHO, MESUNA and PALATH is 8.42%, ABARBI, BOMBCE and EUONWA is 35.64%, and PRUNWA, SEMEWA and MEMERY is 55.94% which exhibit high spatial heterogeneity, moderate spatial heterogeneity, and low spatial heterogeneity respectively. It can be further noted that most of the species with low occurrence are spatially less heterogeneous, and there were only a very few number of species having a very high mean occurrence and are highly spatially heterogeneous.