PHYTOSOCIOLOGY OF A MONTANE FOREST IN SRI LANKA

a thesis submitted by

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ABSTRACT

The phytosociological study of the woody vegetation over 15 cm gbh and undergrowth at lower elevations (1740 m - 2040 m) and that on the peak (2100 m) in the Hakgala SNR revealed the following:

The density of individuals in the woody vegetation at the lower elevations was found to be 5973 individuals per 1.875 ha. However, with increase in altitude a decrease in density was observed. The girth class distribution of stems showed that, 62% of its individuals sampled were below 29 cm gbh. Three vertical strata, at 9 m, 9-12 m and 12 m - above, in height were recognisable in this vegetation, but towards the upper limit of this elevational range the canopy was very discontinuous or absent. The leaf size variation studied showed that over 70% of the species in this forest are microphyllous and with increase in altitude the number of individuals bearing larger leaves reduced. The vegetation sampled also showed low branching, particularly in the sites situated close to the village.

The floristic composition of the woody vegetation at lower elevations ranged from site to site between 14 - 32 families, 22 - 53 genera and 33 - 65 species. A total of 38 families, 66 genera and 96 species were identified in the entire area of 1.875 ha sampled in this woody component of the vegetation. The floristic diversity was found to be less at the upper limit of the elevational range.

The species-area curve of the woody vegetation at lower elevations showed a step wise increase, indicating a localised distribution of species. The minimal area for this vegetation was found to be around 1.25 ha.

The leading dominant species in the woody vegetation at the lower elevations, based on the Importance Value Indices, were *Syzygium revolutum, Psychotria bisulcata, Allophylus varians* and *Michelia nilagirica*, while the most dominant families were Myrtaceae, Rubiaceae, Lauraceae and Symplocaceae. Both family and species dominance changed from site to site and with altitude. Based on the floristic composition in the woody vegetation at the lower elevations, it was possible to recognise four minor communities, *viz.*, i. *Psychotria bisulcata - Allophylus varians - Michelia nilagirica* Community, ii. *Actephilla neilgherrensis - Pittosporum tetraspermum - Abarema subcoriacea* Community, iii. *Syzygium revolutum - Psychotria* sp. 1 - *Neolitsea fuscata* Community and iv. *Ilex walkeri - Symplocos suborbicularis - Syzygium rotundifolium* Community.

The population sizes of the species studied showed that 32% of the species were represented by less than 10 individuals. Only 15 of the 96 species identified were represented by more than 100 individuals in the area sampled. About 44% of the species encountered in this study are endemic to Sri Lanka. While they were represented in all the girth classes, a larger proportion of them were observed in the higher girth classes.

The physico-chemical properties of the soils examined showed a pH range of 4.78 - 5.24 and extractable NPK values of 17.17 ppm, 73.29 ppm, 3.09 ppm respectively. Soils in the lower limit of this elevational range had higher NPK levels.

In the undergrowth component of the vegetation at lower elevations there were 93 species, 81 genera and 51 families including 12 monocots and 4 pteridophytes. Among these species 48 were saplings of both canopy and subcanopy species, while the remainder were taxa confined to the ground layer.

In this component of the vegetation the dominant family was Rubiaceae. Among the species *Indocalamus debilis* dominated the shady areas while *Strobilanthes* species dominated more open areas, especially at the upper limit of the elevational range studied.

One of the findings of this study was the presence of 4 exotic species namely, *Aristea ecklonii* Baker, *Cestrum aurantiacum* Lindl., *Solanum hispidum* Pers. and *Eupatorium riparium* Regel, in the undergrowth of the Hakgala SNR. These species have escaped from Hakgala Botanic Garden in the late nineteenth century and have now become invasive plants. Of the native species in the undergrowth 31 are endemic to the island and 21 of them are herbaceous.

In the peak vegetation the density of individuals sampled was 528 individuals per 84 sq.m. The highest girth measurements

recorded was below 50 cm. Most of the stems fell into the girth class 1 - 5 cm. All species were microphyllous and those with larger leaf sizes were absent. In the small area of 84 m^2 sampled 21 families, 33 genera and 42 species were recorded. Of these, *Allaeophania decipiens* Thw., *Osbeckia minor* Triana, *Syzygium sclerophyllum* Thw. and *Rhododendron zeylanicum* Booth were confined to the peak.

In this peak vegetation 58% of the species were represented by less than 10 individuals in the area sampled. The dominant families were Myrtaceae, Rubiaceae, Lauraceae, symplocaceae and Melastomataceae while the dominant species were *Syzygium sclerophyllum, S. revolutum* and *Osbeckia buxifolia.* The endemicity of the species at the peak was 50% and higher than that in the vegetation sampled at the lower elevations of this reserve. The soils at the peak showed lower nutrient levels as compared to that recorded in the lower elevations.