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Canopy Multi-layering and Woody Species Diversity in a Subtropical Evergreen Broadleaf Forest in Okinawa Island, Japan

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On the basis of canopy multi-layering, floristic composition, woody species diversity and spatial distributions of trees in a subtropical evergreen broadleaf forest grown in a silicate habitat, Okinawa Island, were investigated. Hozumi's *M-w* diagram showed that the forest consisted of four layers.

A total of 26 families, 43 genera, 60 species and 4684 individuals were recorded in a 750 m^2 plot. Rubiaceae was the most important family; *Castanopsis sieboldii* (Mak.) Hatusima, *Schima wallichii* (DC.) Korth., *Cinnamomum doederleinii* Engl. and *Elaeocarpus japonicus* S. et Z. were important as top layer's species and *Syzygium buxifolium* Hook. et Arn., *Antidesma japonicum* S. et Z., *Distylium racemosum* S. et Z., *Ardisia quinquegona* Bl., *Myrsine seguinii* Lev., *Tricalysia dubia* (Lindl.) Ohwi and *Randia canthioides* Champ. ex Benth. were important species in the second layers. In addition, *C. sieboldii* appeared in all layers with the highest importance value, especially with a tremendously high value of 44% in the top layer. It had the largest population size with a large number of trees, saplings and seedlings, which indicates that *C. sieboldii* is the most dominant and climax species in the forest. There were three groups of floristic composition in this forest. The most similar floristic composition was between the second and third layers. The floristic composition of the top and the lower three layers was moderately similar, though approximately one-third of the species were common to them. This forest is likely in compositional equilibrium, i.e. climax forest.

The values of the Shannon-Wiener index H' and the equitability index J' tended to increase from the top layer downward except the bottom layer. Small trees in the lower layers have a great contribution for maintaining high species diversity in this forest. The spatial distribution patterns of trees were found to be a random distribution in the total stand and lower three layers. In the top layer, however, the spatial distribution of trees showed a special trend, i.e. there seemed to exist a triple-clump structure. From the results of degree of overlapping of spatial distribution of trees between layers, it was found that trees of each layer can catch light necessary to photosynthesize.

Mean tree weight decreased from the top toward the bottom layer, whereas tree density increased from the top downward. This relationship was analogous to the process of self-thinning of plant populations.

The values of diversity indices H' and J' tended to increase from the top layer downward except the bottom layer. The values of H' and J' were respectively 4.83 bit and 0.82 for trees taller than 0.10 m. The lower layers contained many species relative to their smaller height ranges. High species diversity of the forest depended on small-sized trees in the lower layers.

The diversity index H' and equitability index J' were 4.82 bit and 0.81 for total trees, respectively. The forest showed a high diversity, which was comparable to those of subtropical forests grown in a limestone area. The forest stand consisted of four layers. The values of H' and J' increased with decreasing height of the layers except those of the bottom layer. It was shown that the diversity index H' for the total stand should be measured over a minimum sample area of 200 m^2.

The diversity index H' and equitability index J' were 4.82 bit and 0.81 for total trees, respectively. The forest stand consisted of four layers. The values of H' and J' increased with decreasing height of the layers except the values of H' and J' of the bottom layer. *Castanopsis sieboldii* (Mak.) Hatusima was the most dominant species in terms of importance value.

The values of the Shannon-Wiener index H' and equitability index J' tended to increase from the top layer downward except the bottom layer. The values of H' and J' were respectively 4.83 bit and 0.82 for trees taller than 0.10 m. The lower layers contained many species relative to their smaller height ranges. High species diversity of the forest depended on small-sized trees in the lower layers.