

## E-1. Analysis of the Environment and Structure of the Ecosystem of Tropical Forest (Final Report)

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1. Population structures of major tree species and distributions of palm, bamboo and canopy gap were studied in a hill dipterocarp forest at Semangkok Forest Reserve, Peninsula Malaysia. All trees larger than 15 cm in GBH (Girth at Breast Height) were tagged and measured GBH on March, 1993 and March - April, 1995. Seed production, seedling establishment were examined in the 2 ha core area. The spatial and size structures of 30 abundant species were made using cluster analysis. These 30 species were divided into ridge- and slope-groups. Four size groups (emergent, canopy, understory and others) were recognized. The distribution of *Shorea curtisii* is restricted to the ridge and upper slope which is completely overlapped with that of palm. This result suggests the strong cohabitation of *S.curtisii* with palm. This palm appeared 40% of 5 m x 5 m quadrats in the 6 ha plot. Distribution pattern of bamboo, which prevents regeneration of tree species, was restricted to lower slope.
2. The phenology of trees grown in a tropical rain forest has been studied. The measurements were carried out at three different sites; 1: 2 ha permanent research plot in the Pasoh Forest Reserve in Peninsular Malaysia, 2: a hill forest at Semangkok, 3: a secondary forest of *Dipterocarpus baudii* in FRIM campus. The seasonal changes in growth rate of trunk diameter were determined to demonstrate the species specific seasonal changes of growth using an aluminum dendrometer. Among 37 species and 170 individuals, the growth rate of 50% individuals was less than 1 mm·yr<sup>-1</sup> and no increase in diameter could be detected in 20 species. The growth rate was influenced by the precipitation. The trend of diameter growth in several species was coincided with leaf fall. Judging from the leaf fall pattern, the life span of leaves in most of trees was ca. 6 months. In the secondary forest of *Dipterocarpus baudii*, the amounts of fallen leaves and stipules were 63% and 12%, of the total amount of fallen litters, respectively. The total amount of litters in 1991 was 12.8 ton·ha<sup>-1</sup>·y<sup>-1</sup>, while that in 1992 was 9.6 ton·ha<sup>-1</sup>·y<sup>-1</sup>. Seasonal trends of total litters, leaf and stipule liters of *Dipterocarpus baudii* had two peaks a year and were synchronized over two years. The variations of litter fall were significantly correlated with the precipitation.
3. A long-term and large-scale census of small mammal population was carried out in three types of forest: primary, secondary (selectively logged in 1960's) and seasonal water-logged forests in Pasoh. Seventeen species of small mammals including rats, squirrels and tree shrews were recorded during two-years monthly trappings. Rats were equally trapped both at primary and secondary forest, while squirrels were less abundant in the secondary forest than others. This may be due to shortage of large trees which produce a large amount of fruits. Forty years since logging may not be enough time for the small mammal community to recover from the disturbance by logging.
4. Vertical distribution of scolytid beetles and their role on turnover of dead branches in a tropical rain forest was studied using attractant traps on the tower. A half of dead branches were attacked by scolytid beetles and 55% of dead branches on a canopy were injured. This result indicates that beetles accelerate the turnover of dead branches. Scarabaeidae were caught in the traps with eugenol, medlyl benzoate and linalool. Mordellidae were caught by traps of benzyl acetate, methyl benzoate or linalool, though 70% were caught by linalool traps. Curculionidae were caught in benyl acetate, methyl benzoate and linalool. However, only a total 37 individuals of Cerambycidae were collected.