

## E-2 Studies on Wildlife Diversity in Tropical Forest Ecosystems (Final Report)

**Contact Person** Naoki Kachi  
Associate Professor  
Department of Biology, Faculty of Science  
Tokyo Metropolitan University  
Minami-Ohsawa 1-1, Hachioji, Tokyo, 192-03 Japan  
Phone +81-426-77-2584, Fax +81-426-772559  
E-mail kachi-naoki@c.metro-u.ac.jp

**Total Budget for 1993-1995** 115,171,000 Yen (FY1995 35,237,000 Yen)

**Key Words** Biological diversity, Plant ecophysiology, Genetic diversity,  
Plant-animal interaction, Seedling establishment.

- (1) Measurements of photosynthesis and stomatal conductance were conducted with leaves of four tropical tree species at the canopy in the lowland forest at Pasoh, Malaysia. Photosynthetic rates increased with increasing PFD (photon flux density) before noon and then declined. Measurements of photosynthesis and characteristics in *Elateriospermum tapos* grown in the lowland forest at Pasoh, Malaysia were conducted on leaves attached at various height from 34 m of the canopy level to 16 m using a canopy walkway. Leaf sizes increased with lowering height and were almost double of leaves of seedlings suggesting that the difference in leaf characteristics is mainly induced by the differences of PFD at the different levels.
- (2) Biological processes of tropical tree species in growth and development are strongly influenced by environmental factors. To estimate effects of environmental factors and ecophysiological processes, water relation characteristics of 5 dipterocarp species were studied using P-V method. And light- and temperature-photosynthesis relations of 6 dipterocarp species, photosynthesis and water use efficiency of 17 tropical species, diurnal changes in transpiration rate (Tr), leaf conductance to water vapor (Gw), and water potential on *Shorea leprosula* and *Acaia mangium* saplings, diurnal changes in Pn, Tr, Gw, and water potential of 3 dipterocarp species, and diurnal changes in Pn and Gw of *Dryobalanops aromatica* mature tree were studied.
- (3) To identify fine-scale functional differences among dipterocarp species in a tropical primary forest, seedling growth and survival in a forest gap were compared between *Shorea leprosula* and *Neobalanocarpus heimii*. In the gap, *Shorea* showed more enhanced growth and higher leaf turnover. Under the closed canopy, the survival rate was lower in *Shorea*. Regeneration of *Shorea* will be successful where gap formation is relatively frequent, while *Neobalanocarpus* may regenerate at places with infrequent gap formation. Three analyses of species diversity in a lowland dipterocarp forest were conducted to determine the nature of forest community dynamics with the data set obtained in a 50 ha plot in Pasoh Forest Reserve. Of the selected species for the analyses (444 species in total), 48 showed positive correlation with the distance from a conspecific adult. 35 species out of all those selected had their saplings clumped, while the adults were regularly or randomly distributed. Recruitment of saplings of species in the emergent or canopy layers increased significantly in proportion with mortality. This trend was not so apparent in the lower layers.
- (4) A molecular phylogeny of the Dipterocarpaceae subfamily Dipterocarpoideae was constructed by a chloroplast DNA analysis. The phylogenetic trees separate species with two different base chromosome numbers. Our conclusions agree with a phylogeny derived from traditional wood anatomy data analysis. We selected five mother trees in Pasoh reserved forest to investigate the outcrossing rate of *Neobalanocarpus heimii*. The outcrossing rate of this species was quite high. RAPD data also supported this result. We have investigated the genetic variation of mitochondrial DNA (mtDNA) and RAPD in *Hopea* species. The five species could be separated into three groups. This grouping resembles the taxonomic subsections of *Hopea* species. *Hopea* species have rather smaller diversities than *Shorea* species in RAPD analysis.