Tree species diversity along an elevational gradient of Mt. Bokor, a table-shaped mountain in southwestern Cambodia

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https://doi.org/10.15017/1670397

出版情報：九州大学, 2016, 博士（理学）, 課程博士
バージョン：

（様式３）

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論 文 名　：Tree species diversity along an elevational gradient of Mt. Bokor, a table-shaped mountain in southwestern Cambodia
（南西カンボジアのテーブル状山地ボコー山における標高勾配に沿った樹木の種多様性）

区　　分　：甲

論　文　内　容　の　要　旨

Background: Although many studies have been made on extremely high tree species richness in tropical lowland rain forests, patterns of tree species richness in tropical montane forests are still remaining relatively poorly understood. In addition, measuring the biodiversity by only using species diversity of taxonomic level is inherently limited and could potentially obscure other diversity patterns. By incorporating other biodiversity dimensions as phylogenetic diversity and structure could give a better understanding of the biodiversity patterns and assemblages. Furthermore, some previous studies along an elevational gradient on a tropical mountain documented that plant species richness decreases with increasing elevation or shows a hump-shaped with a mid-peak. However, most of studies did not attempt to standardize the amount of sampling efforts.

Purpose: In this thesis, we carried on a series uniform sampling effort to qualify tree species richness. I also calculated phylogenetic diversity, phylogenetic structure (NRI and NTI), and diversification rate along the elevational gradient of Mt. Bokor, a table-shaped mountain in southwestern Cambodia and discuss the underlying mechanisms for the tree species richness pattern.

Location: Mt. Bokor, a table-shaped mountain in Bokor National Park, locating in southwest Cambodia.

Methods: I used two methods to record tree species richness: first, I recorded trees taller than 4 m in 20 uniform plots (5 x 100 m) placed at 266–1048-m elevation; and second, I collected specimens along an elevational gradient from 200 to 1048 m. For both datasets, I applied rarefaction, extrapolation and Chao1 estimator to standardize the sampling efforts. In addition, I used two DNA barcode segments, *rbcL* and *matK*, to construct the phylogenetic tree and calculate the phylogenetic diversity, phylogenetic structure and diversification rate of tree

species. I also applied methods of rarefaction and extrapolation to phylogenetic diversity that is underestimated due to the sampling completeness. In addition, I used both generalized linear model (GLM) and linear regression to test the relationships between species richness, phylogenetic diversity, phylogenetic structure, and diversification rate with elevation, and relationships between species richness with phylogenetic diversity, phylogenetic structure, and diversification rate.

Results: I recorded 464 tree species including 82 families and 230 genera (308 tree species from 20 plots and 389 tree species from the general collections) of Mt. Bokor. Species richness observed in 20 plots had a weak but non-significant correlation with elevation. Species richness estimated by rarefaction or Chao1 from both data sets also showed no significant correlations with elevation. Similarly, phylogenetic diversity, phylogenetic structure (NRI and NTI) and diversification rate of tree species also showed no significant relationships with elevation. In addition, species richness had no correlation with tree height and d.b.h. Neutral model parameters showed that a relatively high rate of speciation and a moderate rate of migration in Mt. Bokor.

Main Conclusion: Unlike many previous studies, tree species richness is nearly constant and high values along the elevational gradient of Mt. Bokor where temperature and precipitation are expected to vary. This pattern does not agree with any of the four common patterns between species richness and elevation summarized by McCain and Grytnes (2010). Similarly, phylogenetic diversity, phylogenetic structure (NRI and NTI) and diversification rate of tree species also kept constant values along the elevation gradient. Remarkably, the constant tree species richness pattern could be explained by the constant diversification rates of different elevations in Mt. Bokor. I suggested that the table–shaped geography with regional climate feathers could cause this special evolution history and species richness pattern of Mt. Bokor.