



The Role of Conservation Patterns of Habitat Types on Plant Species Diversity of a Tropical Forest in Bangladesh



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Introduction

The biodiversity in the tropics is mainly threatened by land use changes as well as conservation problems induced by continued increasing anthropogenic pressures. Nevertheless, especially natural and semi-natural ecosystems still host a high number of species. This is especially true for Bangladesh experiencing with the ever-increasing population density. Understanding tropical biodiversity requires not to record species lists but also to analyze the role of conservation pattern of habitats on biodiversity. Precise and quantitative data are urgently needed in order to analyze recent patterns of biodiversity conservation and to enable future comparative studies.

Hypothesis

I test the hypothesis that species distribution and richness patterns of plant species (alpha-diversity) vary with respect to the spatial variability of ecological site conditions of habitat types related to conservation patterns.

Materials and Methods

- I conducted the study in protected areas of Bangladesh, where spatially explicit assessments of biodiversity conservation patterns at the landscape level are lacking as in many tropical countries Fig. 1(a).
- I applied a representative, unbiased and systematic sampling procedure on plant species diversity combined with information on land uses, soils, and conservation patterns Fig. 1(b).
- I used digital elevation models, satellite images, and systematic sampling techniques to locate the sampling sites throughout the study areas based on terrain attributes, land uses, and land cover classes.
- I used multivariate statistics and geostatistics to the gathered bioinformation to find out the most prominent and effective conservation patterns for biodiversity as well as to identify the major drivers of biodiversity loss.

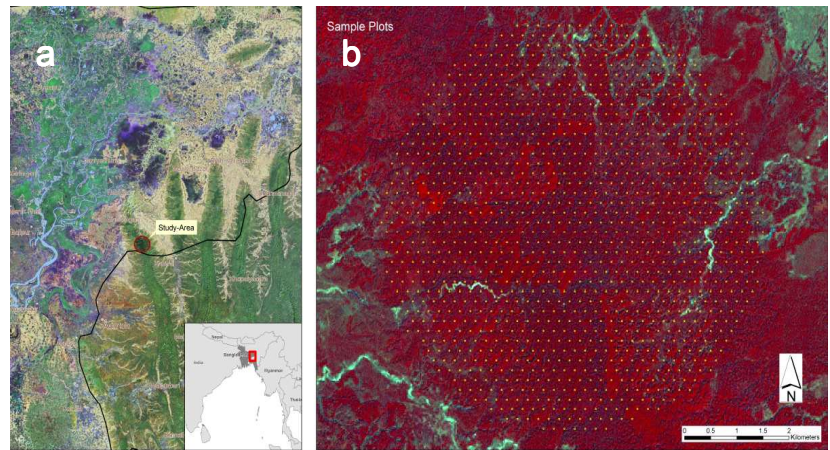


Fig. 1: Study area with mainly forested landscapes in eastern Bangladesh (a) and systematic spatial arrangement of plant records (b).

Results and Discussion

- The highest species diversity occurs in the national park and decreases in human induced land uses (Fig. 2).
- This terrestrial pattern of decreasing diversity seem to occur with the increasing number of disturbances i.e. in surrounding areas which are highly disturbed and occupied mainly with tea gardens and plantations where diversity is less due to the selection of certain tree species (Fig. 3)
- Species richness considerably varies with the conservation status (protection) where disturbances are minimal or absent and significantly increased in highly conserved or protected areas such as national park and reserve forest indicating the importance of nature reserves and protected areas in Bangladesh (Fig. 4)

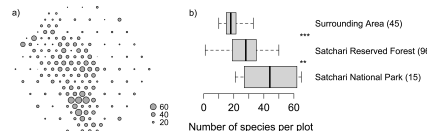


Fig. 2: a) Species richness in the 10m radius plots. b) Plots with a higher protection status host significantly more species (t-test). Values in brackets indicate the number of plots in each class.

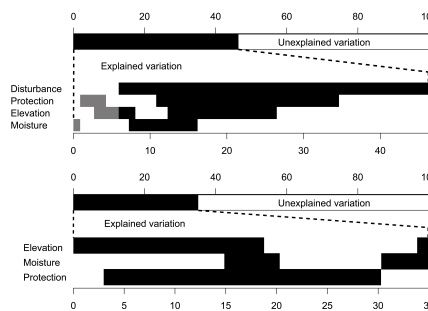


Fig. 3: Variation partitioning reveals that a large fraction of explained variation is shared by disturbance regime, elevation and protection status. Shaded in grey is that part of variation that can be explained without colinearity with the disturbance regime.

- Natural as well as protected forests are more diverse than planted forests while the planted forests restore native biodiversity in productive landscapes (see also Stephens & Wagner, 2007; Carnus *et al.*, 2003).

Conclusion

- The best way to conserve biodiversity in Bangladesh forest ecosystems is to declare protected areas and to develop an integrated management framework for biodiversity conservation where one of the primary goals will be the sustainable use of forest biodiversity.
- Our approach is appropriate for future comparisons and enables to identify major drivers for biodiversity within specific landscapes. Additionally, this approach refers to remote sensing applications and suggests more future studies in the tropics.