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SHORT NOTE [NOTA CORTA]

SPECIES RICHNESS OF CLIMBERS IN NATURAL AND SUCCESSIONAL STANDS OF MADHUPUR SAL (*Shorea robusta* C.F. Gaertn) FOREST, BANGLADESH

[RIQUEZA DE ESPECIES TREPADORAS EN UN BOSQUE DE *Shorea robusta* C.F. Gaertn SIN PERTURBACIÓN Y DE SUCESIÓN, EN BANGLADESH]

Md. Mizanur Rahman[1*], Fatema Begum[2], Ainun Nishat[3], Kazi Kamrul Islam[4] and Harald Vacik[1]

[1]Institute of Silviculture, University of Natural Resources and Applied Life Sciences, Vienna, Austria. e-mail: mizan.rahman@boku.ac.at, mizan_peroj@yahoo.com
[2]Department of Agronomy, Bangladesh Agricultural University, Mymensingh-2202
[3]International Union for the Conservation of Nature (IUCN), Bangladesh Country Office
[4]Department of Agroforestry, Bangladesh Agricultural University, Mymensingh-2202
**Corresponding author*

SUMMARY

Climber species richness and population structure were investigated in natural and successional stand in Madhupur Sal forest of Bangladesh. Species richness varied between the natural and successional stand. The natural stand showed the higher species richness (25 species from 20 genera and 15 families) than successional stand (7 species from 7 genera and 6 families). Climber diversity was higher in natural stand than the successional stand. The concentration of dominance was higher in successional stand due to highly abundance of a single species (*Mikania micrantha*). It was found that species richness of climbers was related to the species richness of trees.

Key words: Abundance; dominance; human interference; species richness.

RESUMEN

La riqueza y estructura poblacional fue investigada en un bosque de *Shorea robusta* C.F. Gaertn sin perturbación y de sucesión en Bangladesh. Se encontró cambios en la riqueza, siendo mayor el número de especies en el bosque sin perturbación (25 especies de 20 géneros y 15 familias vs. 7 especies de 7 generos y 6 familias). La diversidad de trepadoreas fue también mayor en el bosque sin perturbar. La concentración de la dominancia fue mayor en el bosque de sucesión debido a la elevada abundancia de una sola especie (*Mikania micrantha*). Se encontró que la riqueza de las especies de trepadoreas esta relacionada con la riqueza de especies de árboles.

Palabras clave: Abundancia; dominancia; interferencia humana; riqueza de especies.

INTRODUCTION

The Sal (*Shorea robusta* C.F. Gaertn) forest of Bangladesh is a part of the tropical moist deciduous forests, locally known as the inland Sal forest (Rashid *et al.*, 1995). Madhupur Sal forest is the largest patch, which have a high economical and ecological significance in the central part of Bangladesh. But unfortunately this forest area is degraded, denuded and encroached to such an extent that it has lost the main features of the original Sal forests (Rahman *et al.*, 2007, Rashid and Mia, 2001). The remaining forests are comprised of few natural, some successional and many plantation patches. Both the natural and successional forests belong to core area, but the natural forests are more protected than the successional forests. In past, the successional forests were totally cleared and later on regenerated naturally (Webb and Sah, 2003). Anthropogenic disturbances like logging, litter sweeping, regeneration destruction, soil digging, cutting of shrubs, and collection of climbers and herbs are more prominent in the successional forest than the natural ones. Traditional Sal forests have been losing its floral and habitat diversity due to human interventions. The biodiversity of Sal forests is very wide and interesting both from ecological and conservation point of view. Along with tree, shrub and herb, climber is an integrated part of its biodiversity (Alam, 1995). Climbers are locally used as vegetables and source of medicine. Recently, the interests in producing multiple products from Sal forests have increased; accordingly, a study on the impact of clearcutting on the diversity of climbers is of major concern. On the other hand, a few quantitative climber inventories are available from India (Chittibabu and Parthasarathy, 2000, Kadavul and Parthasarathy, 1999,

Muthuramkumar and Parthasarathy, 2000, Padaki and Parthasarathy, 2000), but in Bangladesh no inventories or studies on climber diversity were done so far. The present study aims to determine the diversity of climber in the Madhupur Sal forests and to assess the role of the level of clearcutting on its diversity.

MATERIAL AND METHODS

The study was conducted at the core area of Rasulpur and successional forest of Rajabari area under Madhupur Garh (Figure 1). The core area of Rasulpur is considered as natural patch locally, which is more protected than the successional forests. Most of the portion of the core area of Rajabari regenerated naturally after clear cutting and considered as successional forests. In natural forests no clearcutting was done in near past time. Both the sites belong to the bio-ecological zone of Madhupur Sal Tract having above normal flood level (Nishat *et al.*, 2002). The soils are moderately to strongly acidic (Richards and Hassan 1988) and the annual rainfall is 2030-2290 mm while the maximum temperature is 34 °C and the minimum 11 °C (Islam *et al.*, 2007).

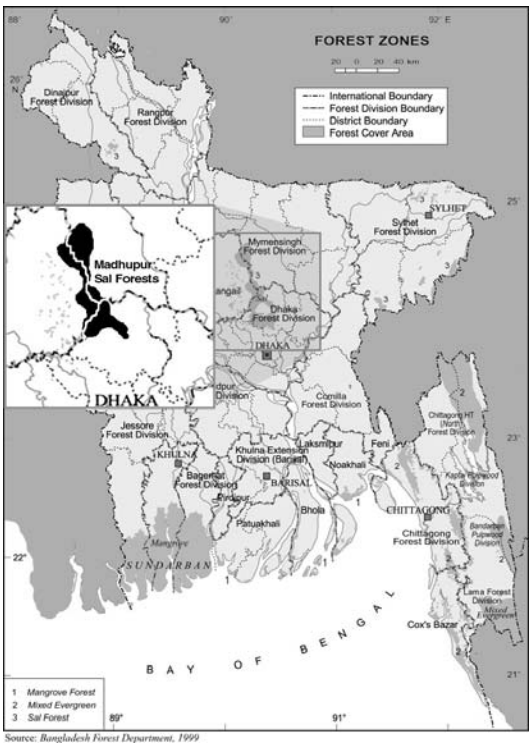

Figure 1. Map of the study areas and a sample plot

The study was carried out during November 2006-January 2007. Thirty circular plots from Rasulpur and 30 from Rajabari area were established randomly. The area of each plot was 300m^2 having 9.77 m radius. The species name and frequency of tree and climber were enlisted. The vegetation was quantitatively analysed by abundance of tree and climber following Curtis and McIntosh (1950). The relative abundance was determined according to Phillips (1959). Based on the data investigated the Motyka's Similarity Index between near natural and successional forests was calculated according to Mueller-Dambois and Ellenberg (1974):

$$SI\ (\%) = 2c/(a+b)\,x100$$

Where:
c is the number of species common to both forests, *a* number of species in forest A and *b* the number of species in forest B.

The Shannon-Wiener diversity index (Shannon and Wiener 1963) was calculated from the following formula given by Magurran (1988):

$$\bar{H} = -\sum_{i=1}^{s} p_i \ln p_i$$

Where:
p_i is the proportion of the *i*th species and the number of all individuals of all species (n_i/N).

Simpson's index (Simpson 1949) measured the concentration of dominance (CD):

$$CD = -\sum_{i=1}^{s} (p_i)^2$$

Where:
p_i is the same as for the Shannon-Wiener information function.

Simple linear regression was used to evaluate the linear relationship between the species richness of trees and climbers.

RESULTS

Composition, richness and overlapping

Climber species richness varied between the natural and the successional forests (Table 1). The plots in the natural forests showed a higher species richness (25) than the plots in the successional stand. The Shannon-Wiener Index or diversity index was higher in the natural forests (2.75) than in the successional forests, where the concentration of dominance was higher in the successional forests. The similarity index between natural and successional forests was 43.75%. The abundance of climbers (N/ha) was 156.7 in the natural stand, where 46.7 in the successional stand (Table 3).

Families, genera and species

Enumeration of climber families, genera and species showed the presence of 15 families with 20 genera in the natural forests, and 6 families with 7 genera in the successional stand (Table 2). Out of the 15 families in the natural stand, 10 families consisted of a single species whereas 5 families had more than 1 species. Only 2 genera had more than 1 species in natural stand, but in the successional stand no genera had more than 1 species.

Dominance and rarity

Dominance was calculated on the basis of relative abundance of different species, which varied greatly between the plots in the natural and successional forests. *Smilax macrophylla* was recorded as the most dominant species in the natural stand followed by *Calamus tenuis*, *Ficus scandens* and *Scindapsus officinalis*. The *Dioscorea hispida*, *Pothos scandens* and *Coccinia grandis* were considered as the rarest species in the natural stand. *Mikania micrantha* was the most dominant species in the successional stand contributing 52% of the total abundance (Table 3).

Relationship between species richness of climbers and trees

The species richness of trees was 40 in natural stand, whereas 5 in successional stand (Table 1). There was a strong positive correlation (R=0.61) between the species richness of trees and climbers (Figure 2) at 0.000 level of significance. With the increase of the species richness of trees, the species richness of climbers increased.

Table 1. Species diversity index of climber and tree in natural and successional stand.

	Similarity Index (%)	Species richness		Diversity Index		Dominance Index	
		Natural	Successional	Natural	Successional	Natural	Successional
Climber	43.75	25	07	2.77	1.43	0.08	0.33
Tree	22.22	40	5	2.11	0.29	0.26	0.89

Table 2. Taxonomical description of climber in natural and successional stands.

Family	Natural		Successional	
	Genera	Species	Genera	Species
Acanthaceae	1	1		
Apocynaceae	1	1		
Araceae	2	2	1	1
Arecaceae	1	1		
Asparagaceae	1	1		
Asteraceae	1	1	1	1
Caesalpiniaceae	2	2		
Compositae	1	1	1	1
Cucurbitaceae	3	4	2	2
Dioscoreaceae	1	5		
Fabaceae	1	1		
Moraceae	1	1		
Piperaceae	1	1		
Smilacaceae	1	1	1	1
Vitaceae	2	2	1	1
Total	20	25	7	7

Table 3. Abundance (A=N/ha) and relative abundance (RA) of climbers in natural and successional stand.

Botanical name	Local name	Natural stand		Successional stand	
		A	RA	A	RA
Asparagus racemosus Willd.	Shotomuli	2.2	0.01	--	--
Bauhinia vahlii Wight et Arn.	Bidipata	6.1	0.04	--	--
Caesalpinia bonducella F.	Nata karanj	1.7	0.01	--	--
Calamus tenuis Roxb.	Bet	20.0	0.13	--	--
Cissus adnata Roxb.	Paniyalata	2.8	0.02	--	--
Coccinia cordifolia (L.) Cogn.	Keoyakanthal	4.4	0.03	--	--
Coccinia grandis (L.) Voigt.	Telakucha	0.6	0.00	0.6	0.01
Dioscorea alata L.	Chuprialu	6.7	0.04	--	--
Dioscorea bulbifera L.	Metaalu	7.2	0.05	--	--
Dioscorea hispida Dennst.	Bishalu	0.6	0.00	--	--
Dioscorea pentaphylla L.	Jhumalu	1.1	0.01	--	--
Dioscorea tomentosa Koen. Ex Spreng.	Shuorialu	1.7	0.01	--	--
Ficus scandens Roxb.	Dumurlata	17.2	0.11	--	--
Ichnocarpus frutescens (L.) R. Br.	Kalidudhi	2.2	0.01	--	--
Melothria maderaspatana (L.) Cogn.	Patilalau	3.9	0.02	--	--
Mikania cordata (Burm. f.) B.L. Rob.	Germanlata	3.3	0.02	2.8	0.06
Mikania micrantha (L.) Kunth.	Assamlata	10.6	0.07	24.4	0.52
Piper chaba W. Hunter	Chai	7.8	0.05	--	--
Pothos scandens L.	Kalalata	0.6	0.00	--	--
Scindapsus officinalis (Roxb.) Schott	Pipul	17.2	0.11	4.4	0.10
Smilax macrophylla Roxb.	Kumarilata	23.9	0.15	6.7	0.14
Spatholobus parviflorus (Roxb. ex DC.) Kuntze	Goalialata	5.0	0.03	--	--
Thunbergia grandiflora Roxb.	Nillata	1.1	0.01	--	--
Trichosanthes bracteata (Lam.) Voigt.	Makal	5.6	0.04	6.7	0.14
Vitis quadrangularis (L.) Wall. ex Wight	Harjora	3.3	0.02	1.1	0.02
Total		156.7	1	46.7	1

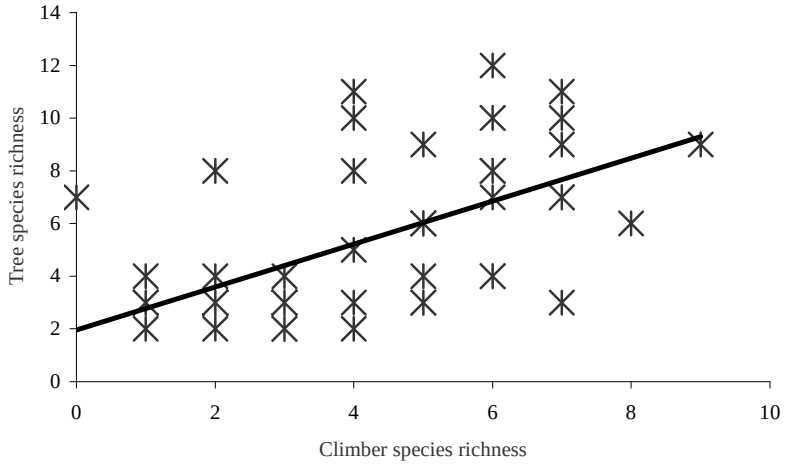

Figure 2. Correlation between the species richness of tree and climber

DISCUSSION

The overall structural pattern of the climber community revealed that both stands are dominated by Kumarilata (*Smilax macrophylla*), Assamlata (*Mikania micrantha*) and Pipul (*Scindapsus officinalis*).Assamlata (*Mikania micrantha*) was the most abundant species in successional standcontributing 52% of the total abundance in the successional stand. *Mikania micrantha* is a pioneer species with wide adaptation range from gaps in the forest to stressed areas in Bangladesh..

The Madupur Sal forests are considered to face a severe threat for their existence due to high anthropogenic disturbances occurred inside and outside the boundary (Rahman *et al.* 2009). The role of gaps may be an important factor for highly dominance of *Mikania micrantha* in the successional stand. The natural stand had a high abundance of climber species due to restricted access of human and presence of many tree species. Unrestricted and open accessibility may cause enhanced utilization if the forest resources and this eventually lead to a species-poor state (Murali *et al.* 1996, Vetaas 1993). As in tropical forest, climbers use diversified tree species as their hosts (Chittibabu and Parthasarathy 2001) the species richness of climbers was high positively correlated with tree species richness in this study also.

The effect of clear cutting followed by protection on the community of climbers has been noticed here. Within 10 years, successional stands recovered on average 28% of the climber species of the natural stand (25 vs.7). The tree species regained only 12% of the species of the natural stand in the same time. So, the rate of return of the climber species in a successional stand was higher than that of tree species.

CONCLUSIONS

This study provides insight to the state of the diversity of climbers in natural and successional forests. Clearcutting with protection has not been proved a viable management for maintaining the species richness of climbers. Selective felling might be a better option to keep diverse tree species for hosting diverse climber species and pay some more attention on conservation aspects at least in the area of the National park.

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