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RESEARCH ARTICLE

Native tree species diversity of Rampahar Natural Forest Reserve in Rangamati South Forest Division, Bangladesh

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Abstract: Tropical forests of Bangladesh are facing rapid loss in floristic diversity and resultant changes of vegetation necessitates the assessment of plant composition and diversity. The present study was conducted to assess the composition of native tree species of Rampahar Forest Reserve of Rangamati hill district, Bangladesh. Rampahar is a remnant tropical semi-evergreen natural forest extending to an area of 648 ha. Simple random sampling method with 20 m × 20 m sized 20 and 5 m × 5 m sized 10 samples plots were used to study both tree species composition and seedling status of tree species. A total of 50 tree species under 28 families and 15 regenerating tree species under 13 families were recorded in the study area. Family Moraceae possessed the highest number of tree species (6 species) while families Anacardiaceae and Sterculiaceae possessed the highest number (2 species) for regenerating tree species. The survey indicated that *Protium serratum* (Wall. *ex* Colebr.) Engl. is the most dominant tree species with the highest relative density (RD), relative frequency (RF) and importance value index (IVI). Basal area of all the tree species was 13.13 m^2/ha where *Ficus religiosa* was represented by the highest basal area (1.14 m^2/ha). *Protium serratum* was also a dominant regenerating tree species with highest RD (15.24%), RF (16.30%) and IVI (50.09). The native trees species of this remnant forest need attention for immediate conservation programs to prevent further degradation of the forest.

Keywords: Conservation initiatives, importance value index, native tree species, Rampahar Forest Reserve, tree composition.

INTRODUCTION

Rampahar along with Sitapahar was declared as the first forest reserve within the Chittagong Hill Tracts (CHTs) in 1875 (Chowdhury, 2006). The under explored forest area of Rampahar represents tropical rainforest mainly of semi-evergreen to evergreen type of vegetation. It is situated in Kaptai upazila under Rangamati district. Administratively, the area belongs to Kaptai Forest Range under the management of Rangamati South Forest Division (Uddin and Hassan, 2012). The hilly area of the reserve, which is about 648 ha in extent, is occupied by remnant natural forests (Khan and Monirul, 2008).

A comprehensive list of flora and fauna including all lower plants and animals along with their present conservation status and recovery plan is needed for proper conservation and management of biodiversity in reserves. Habitat monitoring is, therefore important in the assessment of national biodiversity sustainability (Nath *et al*., 2000). In the past ecologists and taxonomists have been mostly concerned about the diversity of plants, animals and their interactions within ecosystems and landscapes (Whittaker, 1975; Magurran, 1988). Forests represent the storehouse of diversity. Thus, the conservation of its diversity is both a matter of insurance and investment in order to ensure sustainable improvement of agriculture, forestry and fisheries production. Conservation of biodiversity also sustains different services of forest ecosystems; as a buffer against harmful environmental changes, as a source of raw material for scientific and industrial innovation and as a matter of moral principle (IUCN, 1980).

Several floristic inventories have been progressed throughout the country over the past few decades. Those had resulted in the compilation of a number of checklists (Khan and Banu, 1969; Khan *et al*., 1994; Rahman and Hassan, 1995; Rahman and Uddin, 1997; Uddin *et al*., 1998; Uddin and Rahman, 1999; Khan and Huq, 2001; Uddin and Hassan, 2004; Uddin and Hassan, 2010; Hossain *et al*., 2013; Rashid and Chowdhury, 2013; Hossain and Hossain, 2014). However, many areas of the country have been either poorly investigated or remain unexplored to date. Floristic collections are essential for expanding the holdings from those under-represented areas in order to conserve biodiversity of the country. Recently, the Forest Department of Bangladesh has declared the Rampahar Forest Reserve as a part of Kaptai National Park and has taken various initiatives for the conservation and sustainable management of the plant genetic resources of the area (Uddin and Hassan, 2012). Even though, systematically published floristic account has not yet been prepared for the Rampahar Forest Reserve, the reserve is one of the most important representative sites of natural forest patches of South-Eastern Bangladesh. Therefore, the present study was undertaken to determine the structure, composition and to construct an inventory of native tree species in Rampahar Forest Reserve. This inventory of native tree species generates baseline information to monitor changes in species composition and to undertake conservation and management activity of the reserve in future.

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MATERIALS AND METHODS

The study was conducted in the remnant natural forest of Rampahar, Kaptai under Rangamati South Forest Division, Bangladesh. It lies approximately at the intersection of $92^0$13´E and $22^0$32´N and is about 60 km away from Chittagong City (Chowdhury, 2006). The area of Rampahar block is about 648 ha extending from east to west. The altitude of valley bottoms ranges from 30 to 90 meters above the sea level and maximum elevation is about 500 m (Uddin and Hassan, 2012; Rashid and Chowdhury, 2013). The reserve is located within a mixed evergreen forest biographic zone and numerous streams flow through it (Khan and Monirul, 2008). The perennial springs as well as the river Karnaphuli are the sources of water supply in the reserve during the winter. On the other hand, due to the abundance of rainfall, there is no dearth of water for vegetation during the rainy season which is incidentally the growing season of the plants. Rampahar Forest Reserve is bounded by degraded hills with a tribal settlement on the West and the river Karnaphuli on the South. *Tectona grandis* plantation of Chitmarom Forest Beat lies on the East and North which is being separated by a channel known as '*Baluchhara*'. Geologically, the area belongs to the Pliocene and Miocene epoch of the tertiary period. The area is irregularly rugged and consists of a series of ridges and valleys running from north to south.

Soil is mainly yellowish-brown to reddish-brown loams which grade into broken shale or sandstone at a depth of 30 - 120 cm. The valley soil is mainly acid loams and clays subject to seasonal flooding (Chowdhury, 1970). The humus composition is high but its degree of accumulation varies from place to place depending on topography. Usually more deposition is found on flat land and on the bed of channel and less on the undulating hills (Uddin and Hassan, 2012). The average temperature of the study area ranges from 19.9 °C to 28.3 °C, while the average annual rain fall is about 2900 mm and average annual relative humidity is about 78 %. The climate of this region is characterized by mainly three distinct seasons: a hot, humid summer from March to June; a cool, rainy monsoon season from June to October, and a cool, dry winter from October to March (Uddin *et al*., 1998).

The natural forest type of Kaptai forest reserve is semi-evergreen comprising of both evergreen and deciduous plants. *Anogeissus acuminata*, *Aphanamixis polystachya, Artocarpus chama*, *Dipterocarpus turbinatus, Garcinia cowa* and *Protium serratum* are some of the commonly occurring evergreen plants in the natural forest. Besides, *Alstonia scholaris*, *Bischofia javanica*, *Bombax ceiba*, *Dillenia pentagyna*, *Erythrina variegata*, *Firmiana colorata* and *Lagerstroemia speciosa* are some of the deciduous plants that occur frequently in the area.

The study area was visited prior to the field work in 2009, to have a general idea of the site, topography, accessibility and species composition. A complete stratified random quadrat sampling method was adapted for this study. Through reconnaissance survey the forest area was stratified into three habitats, e.g. valley, mid slope and ridge. In each habitat, 20 sample plots (20 m × 20 m) were laid for the assessment of tree species composition and 10 sample plots (5 m × 5 m) were laid for the assessment of seedlings. Regenerated trees having ≤ 2 cm diameter at breast height (DBH) was considered as seedlings. In the regeneration plots the name and number of seedlings were recorded. The optimum quadrat size (20 m × 20 m) was determined by applying a species area curve as described by Sharma (1979) and Gareth (1991). Within each plot the name and number of all tree species were recorded. DBH of all trees greater than or equal to 5 cm and total height were measured using diameter tape (made in Germany) and Spiegel Relascope (made in Austria) respectively. The common tree species were identified directly in the field, while the fertile samples of the unknown tree species were collected for the preparation of herbarium specimens. The collected specimens were identified and species names were checked following Prain (1903), Heinig (1925), Raizada (1941), Sinclair (1956), Siddiqui *et al*. (2007), Ahmed *et al*. (2008) and with the help of taxonomists

Table 1: The list of equations used for calculating phytosociological characters of the vegetation.

Phytosociological attributes	Formula	Equation no	References
Density (D)	$D = \frac{a}{b}$	1	Shukla and Chandel (2000)
Relative density (RD)	$RD = \frac{n}{N} \times 100$	2	Dallmeier *et al*. (1992), Misra (1968)
Frequency (F)	$F = \frac{c}{b}$	3	Shukla and Chandel (2000), Elzinga *et al.* (1998)
Relative frequency (RF)	$RF = \frac{F_i}{\sum_{i=1}^{S}(F_i)}$	4	Dallmeier *et al*. (1992), Misra (1968)
Abundance (A)	$A = \frac{n}{c}$	5	Shukla and Chandel (2000)
Relative abundance (RA)	$RA = \frac{A_i}{\sum_{i=1}^{S}(A_i)}$	6	Shukla and Chandel (2000)
Importance Value Index (IVI)	$IVI = RD + RF + RA$	7	Shukla and Chandel (2000), Dallmeier *et al* (1992)

from the Institute of Forestry and Environmental Sciences, University of Chittagong (IFESCU) and the Bangladesh Forest Research Institute (BFRI). The field data were compiled and analyzed for density, relative density (RD %), frequency, relative frequency (RF %), abundance, relative abundance (RA %) and Importance Value Index (IVI) according to Moore and Chapman (1986), Shukla and Chandel (1980) and Dallmeier *et al*. (1992). The basal area of individual tree was calculated according to Chaturvedi and Khanna (1982). The equations (Eqn. no. 1-7) used for calculation are listed in Table 1. Microsoft Excel and R software packages were used for data compilation and analysis.

RESULTS

Floristic composition

The study recorded a total of 50 tree species belonging to 28 families in Rampahar Forest Reserve. Among the families, Moraceae possessed the highest (6 species) number of species followed by Euphorbiaceae (5 species) and Meliaceae (4 species). Families Combretaceae, Fabaceae, and Verbenaceae possessed 3 species each while Anacardiaceae, Dilleniaceae, Lythraceae, Rubiaceae and Sterculiaceae possessed 2 species each. The remaining families possessed 1 species each (Table 2).

Status of saplings

Seedlings of 15 species were recorded belonging to 13 families in the Rampahar Forest Reserve. Among the families, Anacardiaceae and Sterculiaceae possessed the highest number of (2 species each) regenerating tree species. The remaining families possessed 1 species each (Table 3). Interestingly, seedlings of *Aphanamixis polystachya* was observed in spite of no mature trees of this species was recorded in the study area. May be the mature trees were cut due to human disturbances i.e. deforestation, illegal cutting etc.

Phytosociological characters of the tree species

Phytosociological characters of tree species at Rampahar Forest Reserve are shown in Table 4. The total basal area of all the tree species was 13.13 m^2/ha in the Rampahar Forest Reserve, whereas stem density was found to be 170 stem/ha. The species with the highest basal area was *Ficus religiosa* (1.14 m^2/ha) followed by *Bombax ceiba* (0.94 m^2/ha) and *Dillenia pentagyna* (0.78 m^2/ha) while maximum relative density was recorded in *Protium serratum* (17.69%) followed by *Lannea coromandelica* (6.63 %) and *Trewia nudiflora* (6.39 %). Although maximum relative dominance was recorded for *Ficus religiosa* (8.68 %) followed by *Bombax ceiba* (7.16 %) and *Dillenia pentagyna* (5.92%), maximum relative frequency was recorded in *Protium serratum* (11.97 %) followed by *Haldina cordifolia* (5.99 %) and *Lannea coromandelica* (5.99 %). The species with highest relative abundance was *Swintonia floribunda* (4.70 %) followed by *Trewia nudiflora* (3.70 %) and *Protium serratum* (3.32 %). *Protium serratum* with importance value index of 34.69 was the most dominant tree followed by *Haldina cordifolia* (19.10), *Lannea coromandelica* (18.30), *Bombax ceiba* (15.37) and *Anogeissus acuminata* (12.86).

Importance Value Index of seedlings

The importance value index of the seedlings of Rampahar Forest Reserve are shown in Table 5. The species with maximum relative density was *Protium serratum* (15.24%) followed by *Haldina cordifolia* (11.43%), *Pterospermum acerifolium* (9.52%), *Lannea coromandelica* (8.57%) and *Stereospermum colais* (8.57%). Although maximum relative frequency was found in *Protium serratum* (16.30%) followed by *Haldina cordifolia* (10.87%), *Pterospermum acerifolium* (9.747%) and *Lannea coromandelica* (8.70%), but the highest relative abundance was recorded in *Aphanamixis polystachya*, *Bombax ceiba* and *Diospyros blancoi* (7.86% each) followed by *Stereospermum colais* (7.58%), *Haldina cordifolia* (7.08%), and *Trewia nudiflora* (6.88%). The highest IVI of regenerating tree species was recorded highest in *Protium serratum* (50.09) followed by *Bombax ceiba* (39.37), *Haldina cordifolia* (38.38), *Lannea coromandelica* (34.29), and *Pterospermum acerifolium* (33.27). According to results *Protium serratum* is the dominant regenerating species of Rampahar Forest Reserve.

DISCUSSION

Natural forests are diverse in function and form, dynamic and important both economically and ecologically. Careful management of forest ecosystem will pave way for sustained use of existing flora but limited forest resources. The present study gives an idea about tree composition and regeneration status in natural forest of Rampahar Forest Reserve, Rangamati South Forest Division. A total of 50 tree species were recorded belonging to 28 families from Rampahar Forest Reserve during the study. However, Haider *et al*. (2013) recorded 1,051 tree individual per ha, belonging to 81 species, 59 genera and 33 families from natural forests of Moulvibazar in Sylhet Forest Division. Hossain *et al*. (1997) reported 85 tree species from the Bamu Reserve Forest of Cox's Bazar North Forest Division. In a similar natural forest of Cox's Bazar Forest Division, 215 stems/ha of the tree species was recorded by Haque and Alam (1988). Nath *et al*. (1998) found tree density of 381 stems/ha having DBH greater than 10 cm in Sitapahar Reserve Forest of Chittagong Hill Tracts (South) Forest Division while Ahmed and Haque (1993) recorded tree density of 257 stems/ha of DBH 10 cm and above from the natural forests of Ukhia Range in Cox's Bazar Forest Division. Species composition and tree density is comparatively poor in Rampahar Forest Reserve as indicated by the results of the present study. It is because of the deforestation, illegal felling and encroachment in the reserve by the local people living in adjacent villages.

Total basal area of all tree species was 13.13 m^2/ha in the Rampahar Forest Reserve, whereas, Rahman *et al*. (2000) reported a total basal area of 33.77 m^2/ha in Chunati Wildlife Sanctuary of Chittagong South Forest Division, Bangladesh. Nath *et al.* (1998) studied in Sitapahar Forest Reserve of Chittagong Hill Tracts (South) Forest Division

Table 2: List of tree species recorded from Rampahar Forest Reserve.

[Here, CD = Conservation Dependent, DD = Data Deficient, LC = Least Concern, NE = Not Evaluated, V = Vulnerable]

SN	Local name	Scientific Name	Family	Conservation status[1]
1	Tatuya-koroi	*Albizia odoratissima* (L.f.) Benth.	Fabaceae	LC
2	Chattian	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	LC
3	Shiuri	*Anogeissus acuminata* (Roxb. *ex* DC.) Wall. *ex* Guillem. & Perr.	Combretaceae	DD
4	Pitraj	*Aphanamixis polystachya* (Wall.) R.Parker	Meliaceae	LC
5	Chapalish	*Artocarpus chama* Buch.-Ham.	Moraceae	NE but seems rare
6	Bharta	*Artocarpus lacucha* Buch.-Ham.	Moraceae	LC
7	Lotkon	*Baccaurea ramiflora* Lour.	Euphorbiaceae	LC
8	Kanjal-Bhadi	*Bischofia javanica* Blume	Euphorbiaceae	LC
9	Shimul	*Bombax ceiba* L.	Bombacaceae	LC
10	Bormala	*Callicarpa arborea* Roxb.	Verbenaceae	LC
11	Bonsonalu	*Cassia nodosa* Buch.-Hum. *ex* Roxb.	Fabaceae	LC
12	Chakrashi	*Chukrasia tabularis* A. Juss.	Meliaceae	LC
13	Chalta	*Dillenia indica* L.	Dilleniaceae	LC
14	Hargoja	*Dillenia pentagyna* Roxb.	Dilleniaceae	DD
15	Gab	*Diospyros blancoi* A. DC.	Ebenaceae	LC
16	Garjan	*Dipterocarpus turbinatus* Gaertn.	Dipterocarpaceae	LC
17	Bandarhola	*Duabanga grandiflora* (Roxb. ex DC.) Walp.	Lythraceae	LC
18	Jalpai	*Elaeocarpus tectorius* (Lour.) Poir.	Elaeocarpaceae	LC
19	Mander	*Erythrina variegata* L.	Fabaceae	
20	Bara-Dumur	*Ficus auriculata* Lour.	Moraceae	LC
21	Dumur	*Ficus hispida* L.f.	Moraceae	LC
22	Aswath	*Ficus religiosa* L.	Moraceae	LC
23	Udal	*Firmiana colorata* (Roxb.) R.Br.	Sterculiaceae	NE but seems rare
24	Kao	*Garcinia cowa* Roxb. ex DC	Clusiaceae	LC
25	Gamar	*Gmelina arborea* Roxb.	Verbenaceae	LC
26	Achargola	*Grewia nervosa* (Lour.) Panigrahi	Tiliaceae	LC
27	Haldu	*Haldina cordifolia* (Roxb.) Ridsdale	Rubiaceae	CD
28	Jarul	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	LC
29	Bhadi	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	LC
30	Bura	*Macaranga denticulata* (Blume) Müll.Arg.	Euphorbiaceae	LC
31	Kom	*Neonauclea sessilifolia* (Roxb.) Merr.	Rubiaceae	LC
32	Tali	*Palaquium polyanthum* (Wall. *ex* G.Don) Baill.	Sapotaceae	NE but seems rare
33	Amloki	*Phyllanthus emblica* L.	Euphorbiaceae	LC
34	Gutguttya	*Protium serratum* (Wall. *ex* Colebr.) Engl.	Burseraceae	LC
35	Moss	*Pterospermum acerifolium* (L.) Willd.	Sterculiaceae	LC
36	Batna	*Quercus gomeziana* A.Camus	Fagaceae	DD
37	Kanak	*Schima wallichii* (DC) Korth	Theaceae	LC
38	Kusum	*Schleichera oleosa* (Lour.) Merr.	Sapindaceae	NE but seems rare
39	Dharmara	*Stereospermum colais* (Buch.-Ham. *ex* Dillwyn) Mabb.	Bignoniaceae	NE but seems rare
40	Sheora	*Streblus asper* Lour.	Moraceae	LC
41	Civit	*Swintonia floribunda* Griff.	Anacardiaceae	V
42	Puti-jam	*Syzygium fruticosum* DC.	Myrtaceae	LC
43	Bohera	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	LC
44	Kat-badam	*Terminalia catappa* L.	Combretaceae	LC
45	Chandul	*Tetrameles nudiflora* R. Br.	Datiscaceae	NE
46	Toon	*Toona ciliata* M.Roem.	Meliaceae	CD
47	Pitali	*Trewia nudiflora* L.	Euphorbiaceae	LC
48	Goda	*Vitex glabrata* R.Br.	Verbenaceae	LC
49	Bonlichu	*Walsura robusta* Roxb.	Meliaceae	LC
50	Bajna	*Zanthoxylum rhetsa* (Roxb.) DC.	Rutaceae	LC

Ahmed *et al*. (2008).

Table 3: Regenerating tree species in Rampahar Forest Reserve.

Sl. No.	Local name	Scientific name	Family
1	Pitraj	*Aphanamixis polystachya*	Meliaceae
2	Chapalish	*Artocarpus chama*	Moraceae
3	Shimul	*Bombax ceiba*	Bombacaceae
4	Hurgoza	*Dillenia pentagyna*	Dilleniaceae
5	Gab	*Diospyros blancoi*	Ebenaceae
6	Jalpai	*Elaeocarpus tectorius*	Elaeocarpaceae
7	Haldu	*Haldina cordifolia*	Rubiaceae
8	Bhadi	*Lannea coromandelica*	Anacardiaceae
9	Gutguttya	*Protium serratum*	Burseraceae
10	Moss	*Pterospermum accrifolium*	Sterculiaceae
11	Kanak	*Schima wallichii*	Theaceae
12	Dharmara	*Stereospermum colais*	Sterculiaceae
13	Civit	*Swintonia floribunda*	Anacardiaceae
14	Jam	*Syzygium fruticosum*	Myrtaceae
15	Pitali	*Trewia nudiflora*	Euphorbiaceae

Table 4: Quantitative structure of the tree species of Rampahar Forest Reserve.

[here, RD = Relative Density, *RDo = Relative Dominance, BA = Basal Area, RA = Relative Abundance, IVI = Importance Value Index*]

Sl. No.	Name of species	RD (%)	RDo (%)	RF (%)	BA (m^2/ha)	RA(%)	IVI
1	*Albizia odoratissima*	1.47	2.44	1.76	0.32	1.88	7.56
2	*Alstonia scholaris*	0.74	2.56	1.06	0.34	1.57	5.92
3	*Anogeissus acuminata*	4.42	1.86	4.23	0.25	2.35	12.86
4	*Aphanamixis polystachya*	4.18	1.80	4.23	0.24	2.22	12.42
5	*Artocarpus chama*	0.49	0.90	0.35	0.12	3.13	4.88
6	*Artocarpus lacucha*	0.25	0.86	0.35	0.11	1.57	3.03
7	*Baccaurea ramiflora*	0.74	0.37	1.06	0.05	1.57	3.73
8	*Bischofia javanica*	0.98	1.49	1.41	0.20	1.57	5.45
9	*Bombax ceiba*	2.95	7.16	3.17	0.94	2.09	15.37
10	*Callicarpa arborea*	3.19	0.65	2.82	0.09	2.55	9.20
11	*Cassia nodose*	0.25	2.08	0.35	0.27	1.57	4.24
12	*Chukrasia tabularis*	0.49	4.25	0.70	0.56	1.57	7.01
13	*Dillenia indica*	1.72	0.74	1.41	0.10	2.74	6.61
14	*Dillenia pentagyna*	0.98	5.92	1.41	0.78	1.57	9.87
15	*Diospyros blancoi*	1.23	0.45	1.76	0.06	1.57	5.00
16	*Dipterocarpus turbinatus*	0.25	0.24	0.35	0.03	1.57	2.41
17	*Duabanga grandifolia*	0.74	1.64	1.06	0.22	1.57	5.00
18	*Elaeocarpus tectorius*	0.98	1.09	1.41	0.14	1.57	5.05
19	*Erythrina variegata*	2.95	1.87	3.52	0.25	1.88	10.22
20	*Ficus auriculata*	0.25	1.68	0.35	0.22	1.57	3.84
21	*Ficus hispida*	0.74	0.38	0.70	0.05	2.35	4.17
22	*Ficus religiosa*	0.74	8.68	1.06	1.14	1.57	12.04
23	*Firmiana colorata*	0.98	4.23	1.41	0.56	1.57	8.19
24	*Garcinia cowa*	0.74	1.27	1.06	0.17	1.57	4.63
25	*Gmelina arborea*	0.74	1.96	1.06	0.26	1.57	5.32
26	*Grewia nervosa*	0.49	0.37	0.70	0.05	1.57	3.13
27	*Haldina cordifolia*	6.14	4.67	5.99	0.61	2.30	19.10
28	*Lagerstroemia speciosa*	0.74	0.50	1.06	0.07	1.57	3.86
29	*Lannea coromandelica*	6.63	3.19	5.99	0.42	2.49	18.30
30	*Macaranga denticulata*	0.74	0.28	0.70	0.04	2.35	4.07
31	*Neonauclea sessilifolia*	1.23	2.44	1.41	0.32	1.96	7.04
32	*Palaquium polyanthum*	0.25	1.56	0.35	0.21	1.57	3.72

Sl. No.	Name of species	RD (%)	RDo (%)	RF (%)	BA (m^2/ha)	RA(%)	IVI
33	*Phyllanthus embelica*	0.49	0.70	0.70	0.09	1.57	3.46
34	*Protium serratum*	17.69	1.71	11.97	0.22	3.32	34.69
35	*Pterospermum acerifolium*	4.18	1.57	4.93	0.21	1.90	12.58
36	*Quercus gomeziana*	1.47	2.29	1.41	0.30	2.35	7.52
37	*Schima wallichii*	0.49	0.90	0.70	0.12	1.57	3.67
38	*Schleichera oleosa*	0.25	0.77	0.35	0.10	1.57	2.93
39	*Stereospermum colais*	2.70	2.70	3.17	0.35	1.91	10.49
40	*Streblus asper*	0.98	0.60	1.06	0.08	2.09	4.73
41	*Swintonia floribunda*	1.47	1.58	0.70	0.21	4.70	8.46
42	*Syzygium fruticosum*	1.23	1.74	1.41	0.23	1.96	6.33
43	*Terminalia bellirica*	2.95	3.98	3.52	0.52	1.88	12.33
44	*Terminalia catappa*	1.47	0.73	1.41	0.10	2.35	5.96
45	*Tetrameles nudiflora*	1.23	4.03	1.76	0.53	1.57	8.58
46	*Toona ciliata*	0.98	1.15	1.41	0.15	1.57	5.11
47	*Trewia nudiflora*	6.39	1.20	3.87	0.16	3.70	15.16
48	*Vitex glabrata*	3.44	2.26	3.52	0.30	2.19	11.42
49	*Walsura robusta*	1.97	1.31	2.46	0.17	1.79	7.53
50	*Zanthoxylum rhetsa*	1.23	1.20	1.41	0.16	1.96	5.80

Table 5: Quantitative structure of the seedlings naturally occurring in Rampahar Forest Reserve.
[*here, RD = Relative Density, RF = Relative Frequency, RA = Relative Abundance, IVI = Importance Value Index*]

Sl. No.	Name of species	RD (%)	RF (%)	RA (%)	IVI
1	*Haldina cordifolia*	11.43	10.87	7.08	29.38
2	*Aphanamixis polystachya*	7.62	6.52	7.86	22
3	*Artocarpus chama*	3.81	4.35	5.9	14.06
4	*Bombax ceiba*	7.62	6.52	7.86	22
5	*Protium serratum*	15.24	16.3	6.29	37.83
6	*Dillenia pentagyna*	2.86	3.26	5.9	12.02
7	*Diospyros blancoi*	3.81	3.26	7.86	14.93
8	*Elaeocarpus tectorius*	2.86	3.26	5.9	12.02
9	*Lannea coromandelica*	8.57	8.7	6.63	23.9
10	*Pterospermum acerifolium*	9.52	9.78	6.55	25.85
11	*Schima wallichii*	0.95	1.09	5.9	7.94
12	*Stereospermum colais*	8.57	7.61	7.58	23.76
13	*Swintonia floribunda*	2.86	3.26	5.9	12.02
14	*Syzygium fruticosum*	7.62	8.7	5.9	22.22
15	*Trewia nudiflora*	6.67	6.52	6.88	20.07
Total		**100**	**100**	**100**	**300**

and found 53.5 m^2/ha of basal area. In another study, Sha (1990) found basal area of 30.87 m^2/ha in a tropical rain forest of Western Ghats of India. Neto *et al*. (1990) found 14.99 m^2/ha basal area in dry deciduous woodland in Brazil. Ferreira and Merona (1998) reported a total basal area of 25.4 m^2/ha from Terra Frime Forest in Central Amazonia. In comparison to the above studies Rampahar Forest Reserve at Kaptai has a poor basal area; it is due to the less stem density which is resulted from logging in the forest.

Nath *et al.* (1998) studied a 2 ha area of Sitapahar Forest Reserve of Chittagong Hill Tracts, Bangladesh and found that there are 85 tree species (>10 cm dbh) of 68 genera under 36 families and the Euphorbiaceae was the dominant family, which is supported by the present study. Rahman (2002) studied in the natural and enrichment plantation area of Baraitali Forest of Chunati Range, Chittagong (South) Forest Division, Bangladesh and found 59 tree species (>10 cm dbh), which is also supported by the present study and indicates that the Rampahar Forest Reserve at Kaptai is more or less rich in floral diversity of tree species.

It has been observed that there exists a great demand and supply gap of fuel wood and other associated timber in this study area, which ultimately increases the pressure of pilferage and illicit felling of trees from forest. It was also reported that most of the regenerated seedlings could not survive due to human interference especially fuel wood collectors. In order to maintain the species diversity of the study area, an ecologically sound management system is desirable with minimum disturbance. There

is need to have inventory, information system, research and development network and a framework of legal provisions for identification, assessment and monitoring of biodiversity to make this forest functionally viable. At the same time, further investigation is required to increase the understanding and development of appropriate silvicultural practices suite to the wide variety of situations in which the study area is situated.

CONCLUSION

The present study provides findings of the tree composition and regeneration status of Rampahar Forest Reserve, Rangamati South Forest Division. The forest harbors high biodiversity. However, the natural regeneration process of the forest seems to be poor. Most of the plants were belonged to the "Least Concern" conservation status, *Swintonia floribunda* was reported to be 'Vulnerable' whereas some other species such as *Artocarpus chama, Firmiana colorata, Palaquium polyanthum, Schleichera oleosa* and *Stereospermum colais* were considered as "Not Evaluated" and seem getting rare in the forest.

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