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Composition and Status of Undergrowth of a Deforested Area in Bangladesh

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Abstract: The study described the composition and status of undergrowth (shrubs, herbs and grasses) in a degraded deforested area of Chittagong (South) forest division, Chittagong, Bangladesh. A stratified random quadrat method was used in the study. The area on the whole consists of 45 species of undergrowth of 31 families. Shrubs layer includes 14 species of 12 families and herbs and grasses include 31 species of 19 families. Among the shrubs *Clerodendrum viscosum* shows the highest density (94 plants/100 m²) and *Cassia alata* shows the lowest density (8 plants/100 m²). The highest frequency was found in *Clerodendrum viscosum* (50%) and lowest frequency was found in *Corchorus capsularis* (5%). The highest abundance was recorded in *Corchorus capsularis* (13) followed by *Ipomoea fistulosa* (11) and *Lantana camara* (11). Among the herbs and grasses *Imperata cylindrica* shows the highest density, frequency and abundance (7638 plants/100 m², 77% and 394, respectively) followed by *Cynodon dactylon* (687 plants/100 m²), Unidentified-4 (265 plants/100 m²). The lowest frequency (5%) and abundance (3) were recorded in *Pueraria* sp. and *Musa paradisiaca*, respectively. Abundance frequency ratio of each shrubs, herbs and grasses are >0.05 showing the contagious nature of each species distribution.

Key words: Degraded forest, biodiversity conservation, undergrowth, A/F ratio

INTRODUCTION

Biodiversity is a concept, which refers to the range of variation or differences among some set of entities within the living world^[1]. Biodiversity or biological diversity pertains to the diversity of biological organisms, both animals and plants in a region, country; continent or the world^[2]. Total forest area of Bangladesh is 1,334 000 ha of which natural forest is about 709000 ha and plantation is about 625000 ha. From 1990-2000, 7% natural forest is reduced and 4% plantation is increased^[3]. Bangladesh has a rich biological heritage of flowering plants. An estimated 5000 species of angiosperms alone are available in the forest of Bangladesh of which 2260 species are reported from Chittagong^[4]. In 1990s only 3.7% Tropical forest protection has been provided in Bangladesh and 12 tree species were threatened^[5]. A large portion of diversity already lost due to the multidimensional (e.g. illicit felling, natural calamities etc.) problem facing the forest of Bangladesh. After the Convention of Biological Diversity Government of Bangladesh has taken a strategy to conserve the biological diversity of the country by providing adequate protection.

The study site was once a natural forest and then cleared for plantation of *Tectona grandis* and *Eucalyptus camaldulensis*. However the area was completely illicit felled. Now regeneration of felled trees

from coppice and natural regeneration of some other native species were started with some undergrowth^[5]. Evaluation of biological diversity from conservation point of view in disturbed areas focuses on measuring richness and not more complex indices of heterogeneity^[6]. More frequently the number of species in certain taxa and vegetation types are measured but occasionally abiotic features are used^[7]. Much of the biodiversity in tropical forests resides in herbs, shrubs and small trees^[8]. No published information on the species composition and diversity in the shrubs, herbs and grasses in the study area is available. Therefore a need exist to identify the undergrowth and assess their diversity. Present study was conducted to determine the composition and status of undergrowth in the study area.

MATERIALS AND METHODS

Study site: The study was conducted in the degraded deforested area of Bamerchara and Danerchara at Sheelkup union of Banskhalia upazilla of Chittagong, Bangladesh. It lies between 21°51' to 22°11' N latitude and 91°51' to 92°03' E longitude^[9]. It is a reserved forest under Jaldi beat of Jaldi range of Chittagong (south) forest division^[10]. Government has declared it as a biodiversity conservation area and some protection has been provided in the area. Both the lakes are connected with a narrow

channel and surrounded with small hills. The climate is typically sub tropical with a long dry season extending from October to May. From June to September the southwest monsoons provide the majority of the average rainfall of about 2540 mm, average temperature vary from 39.4 to 8.3°C throughout the year, the humidity is very high throughout the year^[9].

Methods: Stratified random sampling was used in the study. Thirty sample plots were selected at Danerchara and 10 sample plots were selected at Bamerchara proportionally on the map and finally identified in the field. Sample size 2×2 m was selected using species area curve^[11]. All the species and individuals of shrubs and herbs and grasses in the plot are counted. Herbarium of each species was prepared from representative sample. The collected specimens were identified following^[12,13] and taxonomists of Bangladesh Forest Research Institute, Chittagong. Density, frequency and abundance, were calculated following^[14,15]. Abundance frequency ratio (A/F) was calculated according to Curtis and Cottam^[16] (<0.025-regular, 0.025 to 0.05-random, >0.05-contagious distribution). Data was collected during February 2003 to August 2003.

RESULTS

Species composition: Shrubs layer consists of 14 species of 12 families. Family Caesalpiniaceae and Verbinaceae dominate containing 2 species each and remaining family contains 1 species each (Table 1). Thirty one species of herbs and grasses of 19 families are recorded in the study area (Table 2). However, 3 species of Graminnae family and 2 species of Rubiaceae family were unidentified. Graminnae family is dominated containing 8 species followed by Polygonaceae (3 species) Convolvulaceae and Rubiaceae (2 species each). The remaining family contains 1 species each.

Density, frequency, abundance and abundance frequency ratio: Among the shrubs *Clerodendrum viscosum* shows the highest density (94 plants/100 m²) followed by *Eupatorium odoratum* (86 plants/100 m²), *Ipomoea fistulosa* (74 plants/100 m²) and lowest density was found at *Cassia alata* (8 plants/100 m²). The highest frequency was found in *Clerodendrum viscosum* (50%) followed by *Eupatorium odoratum* (47.5%) and lowest frequency was found in *Corchorus capsularis* (5%). The highest abundance was recorded in *Corchorus capsularis* (13), followed by *Ipomoea fistulosa* (11), *Lantana camara* (11) and *Urena lobata* (8). The lowest abundance was found in *Cassia alata* (3) (Table 3). Each species of shrubs

Table 1: Shrub species of the study area with their species and family name

Family name	Species name	Local name
Araliaceae	<i>Aralia</i> sp.	Not known
Caesalpiniaceae	<i>Cassia alata</i> L.	Dadmari
	<i>Cassia occidentalis</i> L.	Tolikoroi
Compositae	<i>Eupatorium odoratum</i> L.	Assamtree
Convolvulaceae	<i>Ipomoea fistulosa</i> Mart.Ex Choisy	Dolkolomi
Fabaceae	<i>Cajanus cajan</i>	Arhar
Leguminosae	<i>Desmodium</i> sp.	Not known
Malvaceae	<i>Urena lobata</i> L.	Atlera
Melastomaceae	<i>Melastoma malabathricum</i> L.	Tea indicator
Myrsinaceae	<i>Mæsa ramentaceæ</i> A. DC.	Maricha
Scropulariaceae	<i>Celsia coromandelica</i> Vahl.	Kukurmuta
Tiliaceae	<i>Corchorus capsularis</i> L.	Naricha
Verbenaceae	<i>Clerodendrum viscosum</i> Vent.	Bhant
	<i>Lantana camera</i> L. var.	Lantana

Table 2: Herbs and grasses of the study area with their species and family name

Family name	Species name	Local name
Amaranthaceae	<i>Alternanthera philoxeroides</i> (Mart.) Griseb	Helencha
Amrytadaceae	<i>Curculigo recurvata</i> Dryand	Bidripata
Araceae	<i>Colocasia esculenta</i> (L.) Schott	Kachu
Compositae	<i>Mikania cordata</i> (Brum.f.) Rob.	Assamlata
Convolvulaceae	<i>Convolvulus</i> sp.	Notknown
	<i>Ipomoea pescaprae</i> (L.) R.Br.	Chagalkuri
Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Banalu
Fabaceae	<i>Phaseolus mungo</i> L.	Mashkalai
Gramineae	<i>Cynodon dactylon</i> Pers.	Durbaghas
	<i>Imperata cylindrical</i> (L.) P. Beauv.	Chan
	<i>Oplisma</i> sp.	Notknown
	<i>Saccharum spontaneum</i> L.	Kash
	<i>Thysanolaena maxima</i> (Roxb.)	Jharu
	Unidentified-1	
	Unidentified-2	
	Unidentified-3	
Leguminosae	<i>Derris trifoliata</i> Lour.	Kalilata
Mimosaceae	<i>Mimosa pudica</i>	Lajjabati
Musaceae	<i>Musa paradisiaca</i>	Banana
Papilionaceae	<i>Pueraria</i> sp.	Notknown
Passifloraceae	<i>Passiflora foetida</i> L.	Jhumkolata
Polygonaceae	<i>Polygonum barbatum</i> L.	Bakunjabaj
	<i>Polygonum hydropiper</i> L.	Bishkatali
	<i>Polygonum</i> sp.	Not known
Pteridophyta group	<i>Diopteris</i> sp.	Fem
	<i>Dryopteris rigida</i>	Fem
Rubiaceae	Unidentified-4	
	Unidentified-5	
Schizaeaceae	<i>Lygodium palmatum</i>	Notknown
Solanaceae	<i>Physalis minima</i> L.	Bantepari
Zingiberaceae	<i>Curcuma zeoderica</i> Rosc.	Phulga

shows the abundance frequency ratio of > 0.05 which indicate the contagious distribution of each species. Table 4 shows the density, frequency, abundance and abundance frequency ratio of herbs and grasses in the study area. *Imperata cylindrical* shows the highest density (7638 plants/100 m²) followed by *Cynodon dactylon* (687 plants/100 m²), Unidentified-4 (265 plants/100 m²) and *Mimosa pudica* (233 plants/100 m²). *Pueraria* sp. shows the lowest density (5 plants/100m²) and remaining species shows the density less than 120 plants/100 m² each in the study area.

Table 3: Density, frequency, abundance and abundance frequency ratio (A/F) of shrubs in the study area

Species name	Density (plants/100 m ²)	Frequency (%)	Abundance	A/F
<i>Aralia</i> sp.	28.75	27.5	4.18	0.15
<i>Cajanus cajan</i>	13.13	12.5	4.20	0.34
<i>Cassia alata</i>	8.13	10.0	3.25	0.33
<i>Cassia occidentalis</i>	11.25	7.5	6.00	0.80
<i>Celsia coromandelica</i>	19.38	12.5	6.20	0.50
<i>Clerodendrum viscosum</i>	94.38	50.0	7.55	0.15
<i>Corchorus capsularis</i>	16.25	5.0	13.00	2.60
<i>Desmodium</i> sp.	11.88	10.0	4.75	0.48
<i>Eupatorium odoratum</i>	86.25	47.5	7.26	0.15
<i>Ipomoea fistulosa</i>	73.75	27.5	10.73	0.39
<i>Lantana camara</i>	66.25	25.0	10.60	0.42
<i>Maesa ramentacea</i>	24.38	12.5	7.80	0.62
<i>Melastoma malabathricum</i>	21.25	15.0	5.67	0.38
<i>Urena lobata</i>	25.63	12.5	8.20	0.66
Total	500.63	275.0	99.39	

Table 4: Density, frequency, abundance and abundance frequency ratio (A/F) of herbs and grasses in the study area.

Species name	Density (plants/100 m ²)	Frequency (%)	Abundance	A/F
<i>Alternanthera philoxeroides</i>	53.13	10.00	21.25	2.13
<i>Colocasia esculenta</i>	17.50	10.00	7.00	0.70
<i>Convolvulus</i> sp.	28.75	22.50	5.11	0.23
<i>Curculigo recurvata</i>	23.75	15.00	6.33	0.42
<i>Curcuma zoderia</i>	22.50	17.50	5.14	0.29
<i>Cynodon dactylon</i>	687.50	27.50	100.00	3.64
<i>Derris trifoliata</i>	18.75	12.50	6.00	0.48
<i>Diopteris</i> sp.	19.38	10.00	7.75	0.78
<i>Dioscorea bulbifera</i>	11.25	7.50	6.00	0.80
<i>Dryopteris rigida</i>	26.88	12.50	8.60	0.69
<i>Imperata cylindrica</i>	7638.13	77.50	394.23	5.09
<i>Ipomoea pescaprae</i>	23.13	7.50	12.33	1.64
<i>Lygodium palmatum</i>	23.75	10.00	9.50	0.95
<i>Mikania cordata</i>	100.00	25.00	16.00	0.64
<i>Mimosa pudica</i>	233.13	75.00	12.43	0.17
<i>Musa paradisiaca</i>	14.38	17.50	3.29	0.19
<i>Oplisma</i> sp.	38.75	15.00	10.33	0.69
<i>Passiflora foetida</i>	38.75	12.50	12.40	0.99
<i>Phaseolus mungo</i>	98.75	17.50	22.57	1.29
<i>Physalis minima</i> L.	15.63	10.00	6.25	0.63
<i>Polygonum hydropiper</i>	65.63	17.50	15.00	0.86
<i>Polygonum</i> sp.	66.25	17.50	15.14	0.87
<i>Poygonum barbatum</i>	46.25	22.50	8.22	0.37
<i>Pueraria</i> sp.	5.63	5.00	4.50	0.90
<i>Saccharum spontaneum</i>	24.38	12.50	7.80	0.62
<i>Thysanolaena maxima</i>	36.25	10.00	14.50	1.45
Unidentified -1	115.63	17.50	26.43	1.51
Unidentified -2	100.00	15.00	26.67	1.78
Unidentified-3	196.25	22.50	34.89	1.55
Unidentified -4	265.00	20.00	53.00	2.65
Unidentified -5	31.25	12.50	10.00	0.80
Total	10086.25	585.00	888.67	

Imperata cylindrica shows the highest frequency (77%) followed by *Mimosa pudica* (75%) *Cynodon dactylon* (27%), *Mikania cordata* (25%), *Polygonum barbatum*, unidentified-3 and *Convolvulus* sp. (22% each). *Pueraria* sp. shows the lowest frequency (5%) among the herbs and grasses in the study area. Abundance was highest in *Imperata cylindrica* (394), followed by *Cynodon dactylon* (100), Unidentified-4 (53). The lowest abundance was

found in *Musa paradisiaca* (3.29). Abundance frequency ratio of each herbs and grasses are >0.05 showing the contagious nature of each species.

DISCUSSION

Under the plantation of *Anogeissus pendula* and *Hollarhina antidysenterica* sixteen and twelve species of ground flora were recorded, respectively^[17]. Chowdhury *et al.*^[18] recorded 114 species of undergrowth of *Tectona grandis* plantation at Ichamati forest beat of Chittagong, Bangladesh. The species composition of the area is very poor (Table 1 and 2). The area is dominated by *Tectona grandis* and *Eucalyptus camaldulensis*. Insufficient undergrowth of *Tectona grandis* plantation was due to broaden leaf canopy, microclimate and site topography^[19]. These research findings may be true for the study site also. It is a degraded site and requirement of species started recently due to some protection by the Government. So it could be enriched its species composition of undergrowth in the future if the providing protection will be accessible. Considering density, frequency and abundance the area is dominated by *Corchorus capsularis*, *Ipomoea fistulosa* and *Lantana camara* though density of *Clerodendrum viscosum*, *Eupatorium odoratum* and *Ipomoea fistulosa* are more and *Eupatorium odoratum*, *Aralia* sp. and *Ipomoea fistulosa* are frequently distributed in the shrubs layer (Table 3). *Imperata cylindrica* and *Cynodon dactylon* are dominated, denser and frequently distributed in the herbs and grasses layer of the study area (Table 4). The area was a natural forest and plantation of *Tectona grandis* and *Eucalyptus camaldulensis* were clearly illicit felled and was barren for sometimes. Then *Imperata cylindrica* and *Cynodon dactylon* covered the area. Contagious pattern illustrate a nature of natural vegetation^[17,20]. From abundance frequency ratio (A/F) of shrubs, herbs and grasses it is very obvious that the area again turning to a natural vegetation. Researches conducted in a number of tropical countries have shown that tree planting on a degraded tropical land can dramatically increase the native forest species diversity. Under appropriate conditions these plantations seem to catalyze natural forest succession by modifying understory microclimate conditions and soils, thereby creating a more favourable environment for the establishment of native forest flora and also for attracting seed dispersing wildlife which lead to the progressive enrichment of biological diversity^[17]. The coppice of *Tectona grandis* and *Eucalyptus camaldulensis* might act as a facilitator of the regeneration of shrubs and herbs from a completely

barren to a condition of conservation. Therefore, a proper protection from illicit felling of coppice and scientific management of undergrowth may lead the area as a biodiversity rich site in the country.

REFERENCES

1. CBD, 1992. Convention on biological diversity. Text and Annexes, the Interim Secretariat for the CBD Geneva Executive Centre.
2. Negi, S.S., 1993. Biodiversity and its Conservation. Indus Publishing Company, New Delhi, India, pp: 343.
3. Anonymous, 2000. Earth trends country profile. <http://earthtrends.wri.org>
4. Anonymous, 1992. Forestry sector review. Forestry Master Plan, Project 372001/23, Bangladesh (TA No. 1355-BAN), Appendix-2
5. Anonymous, 2003. Office information collected from Jaldi beat office of Chittagong (south) Forest Division. Chittagong, Bangladesh.
6. Margules, C. and M.B. Usher, 1981. Criteria used in assessing wildlife conservation potential. A Review Biol. Conserv., 21. In Soni, P., H.B. Vasistha and O. Kumar, Eds. Biological diversity in surface mined areas after reclamation. Indian Forester, 115: 475-482.
7. Smith, P.G.R., 1984. Identifying and evaluating environmental significant areas in the North-west territories a review a proposed evaluation system and test application. M.S. Thesis, University of Waterloo, Canada.
8. Nath, T.K., M.K. Hossain and M.K. Alam, 2000. Assessment of tree species diversity of Sitapahar forest reserve, Chittagong hill tracts (south) forest division, Bangladesh. Indian Forest., 126: 16-21.
9. GOB, 1996. Land and soil utilization booklet. Banskhali, Chittagong. Ministry of Agriculture. Dhaka, Bangladesh.
10. Mabud, A., 2001. Integrated Forest Management Plan for the Chittagong Forest Division (2000-2009). Final Draft. Book 1. Forest Department. Ministry of Environment and Forests. Dhaka, Bangladesh.
11. Gareth, W., 1991. Techniques and Field Work in Ecology. Collins Educational Publishers, Hammersmith, London, w 68 JB., pp: 125.
12. Prain, D., 1903. Bengal Plants. Vol. 1 and 2, Calcutta.
13. Heining, R.L., 1925. List of Plants of Chittagong Collectorate and Hill Tracts. Darjeeling India, pp: 84.
14. Moore, P.D. and S.B. Chapman (Eds.), 1986. Methods in Plant Ecology. Blackwell Scientific Publications, Oxford, pp: 550.
15. Shukla, S.R. and S.P. Chandal, 1980. Plant Ecology. 4th Edn. S. Chandel and Co. Ramnagar, New Delhi-10055, pp: 197.
16. Curtis, J.T. and G. Cottam, 1956. Plant Ecology Work Book: Laboratory Field Reference Manual. Bugess Publishing Co., Minnesota, pp: 193.
17. Verma, R.K., D.K. Shadangi and N.G. Totey, 1999. Species diversity under plantation raised on a degraded land. The Malaysian Forest., 62: 95-106.
18. Chowdhury, M.A.M., M.K. Hossain, T.K. Osman and M.A. Gafur, 1985. Studies on the undergrowth of Teak (*Tectona grandis*) at Ichamati Forest beat, Chittagong. III. Relations between soil properties and dominants undergrowths. Chittagong University Studies, Part II: Science, 9: 42-49.
19. Haque, A.K.M., 1977. Soil erosion in teak plantations. Proceedings, First Bangladesh National Conference on Forestry, Dhaka (Feb, 11-15), 8: 80-83.
20. Odum, E.P., 1971. Fundamentals of Ecology. W. B. Sounder Co. Philadelphia. USA.