PLANT DIVERSITY OF THE HAKALUKI HAOR OF BANGLADESH AND ITS MANAGEMENT ISSUES

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Abstract

The plant diversity of Hakaluki Haor of Bangladesh, an Ecologically Critical Area (ECA), has been assessed and recognized 187 species of which 179 species belonging to 58 angiosperm families and eight species belonging to pteridophytes to be growing naturally. Of these, 72 species of angiosperms and five species of pteridophytes are truly aquatic. Out of 187 species, 144 (77%) were recorded to have been used locally for their potential values. The most important characteristic of this haor, as assessed, is its richest wetland biodiversity with flora and fauna which are the sources of environmental management providing the livelihood of more than one million people living around it. Over exploitation, interruption of upstream water flow, excessive human interferences and lack of conservation management becoming the threats to this wetland biodiversity at a degree of higher rates which causing a condition of environmental degradation. The plants of the area are enumerated with their potential values and status of occurrence for planning and implementing proper conservation management of the threatened taxa.

Key words: Hakaluki haor, biodiversity, livelihood, Ecologically Critical Area, conservation management

INTRODUCTION

Bangladesh is a tropical country with humid climate. There are many low-lying haors with rich wetland vegetations. Among them, the Hakaluki Haor is the biggest fresh water Haor in Bangladesh with high density of natural biodiversity resources and the source of livelihood of millions of people of the surrounding area.

The Hakaluki Haor lies between 92°01'-92°09'E longitude and 24°35'-24°44'N latitude and comprises about 24,000 hectors of land under Sylhet and Moulvi Bazar districts situated in five upazilas, *viz*. Baralekha, Juri, Kulaura, Fenchugonj and Golapgonj with 22%, 17%, 29%, 13% and 19% lands, respectively. It is surrounded by *Bhatera Pahar* in the west and *Patharia-Madhab Hill* in the east and *Juri river* runs by the south east side of the Haor while the river Kushiara runs through the north east part of the Haor. It is very closer to Karimgonj of Assam (India) and the river Kushiara along with the river Surma originated from the Barak river of Assam and fully dependent on the upstream flow. The Hakaluki is composed of about 47 major haors and more than 600 beels or freshwater lakes, nearly half of which are seasonal (Ahmed 2013), and the basin of the haor is made

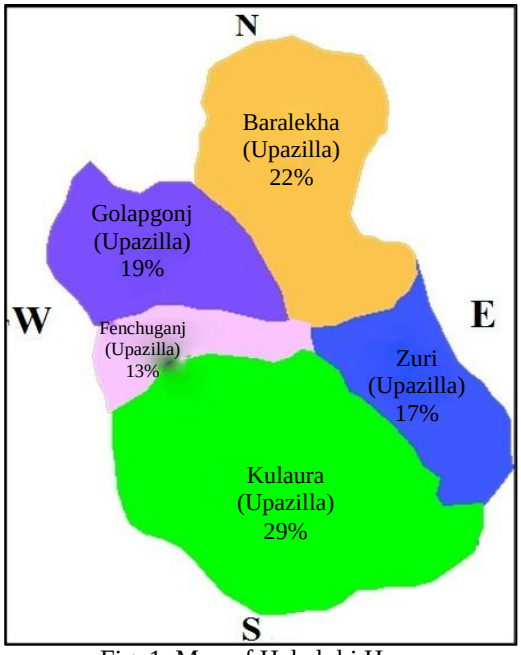

Fig. 1. Map of Hakaluki Haor

up of an extensive alluvial plain supporting a variety of wetland habitats. More than 50% of the total aquatic plants of Bangladesh are assessed to be growing in this Haor. The haor area comprises fertile land for agriculture and plays an excellent role as breeding ground of sweet water fishes in monsoon seasons and harbors about 107 indigenous species of fishes. Many species of food, medicine and other potential values grow naturally in this haor area round the various seasons (monsoon and dry) of the year. The Livelihood of more than one million populations of Moulvi Bazar and Sylhet districts directly or indirectly depends on the biodiversity, agro-biodiversity and agro-fishery resources of the Hakaluki haor. It provides food and shelter of 112 migratory and 305 local species of birds (Rahman and Ahmed 2012, Warne 2005). Due to human interferences for the exploitation of biodiversity, climate change and environmental degradation many more indigenous species of plant, fish and other animals of the area are facing threats to various degrees and declining at an alarming rate.

Fig. 2. Floating fishing in late monsoon

Fig. 3. Traditional fishing traps in full monsoon

The ecosystem of the area is vulnerable. Some globally important and threatened species, as has been reported from this Haor biodiversity, are: madantak, palaces fish-eagle, tortoise etc. of which about 11 species of tortoise have already been extinct from the haor (Warne 2005). Among plant species, makna, chisra, satamul, anantamul, and nalkhagra etc. are noteworthy. Considering the state of declining biodiversity and necessity of conservation, the Government of Bangladesh has declared this Haor as an important Ecologically Critical Area (ECA) in 1999. Following the proposal of IUCN, the Hour has also been declared as a wild-life sanctuary.

Fig. 4. Aquatic plant diversity in full monsoon

Fig. 5. *Eurayle ferox* Salisb – a critically endangered sp.

The proposed Tipaimukh dam, if completed, will disrupt the upstream flow and create a great irreversible ecological and environmental disaster to the Hakaluki Haor biodiversity which will directly

affect the livelihood of millions of people of that part of Sylhet. However, the efficient conservation management for the sustainable use of the biodiversity components of the Haor depends on its complete inventory of the species diversity and assessment of the degree of threats to the vulnerable species. The efficient management and sustainable use of the biodiversity components of the Haor depend on its complete inventory of the species diversity including the assessment of degree of threats to the vulnerable species.

Hence this research project has been under taken following Ramsar Convention to make complete inventory of the species diversity of the Hakaluki haor area and assessment of their conservation status for planning and development of the National Conservation Strategy.

MATERIAL AND METHODS

The investigation with the assessment of plant diversity was carried out by repeated field trips throughout the area during various seasons (dry and monsoons) between the years 2010 and 2012. The collections of plant specimens at fertile stage were made and preserved at the herbarium of Chittagong University as voucher specimens. Nomenclatural identification of the plants of the area, either collected or observed, was made following standard taxonomic method (Rahman *et al.* 2012, Uddin *et al.* 2013) by consulting relevant literature, different herbaria and experts. Relevant literature on floristic, medicinal, nomenclatural updates and red lists were: Ahmed *et al*. (2008, 2008a, 2008b, 2009, 2009a, 2009b), Hooker (1872-1897), Khan (1972-1987), Khan and Halim (1987), Khan and Rahman (1989-2002), Khan *et al*. (1994), Khan *et al*. (2001), Khanam and Hassan (2008), Kirtikar *et al*. (1935), Kunkel (1984), Mirza and Rahman (1997), Naskar (1993), Naskar and Bakshi (1987), Nishat (1933), Prain (1903, 1903a), Rahman (2013), Ahmed (2013), Rahman and Ahmed (2012), Rashid and Rahman (2011, 2012), Siddiqui (2007, 2007a), Warne (2005), and Yusuf *et al*. (1997, 2009). Consulted herbaria were Bangladesh National Herbarium (DACB), Dhaka University Salarkhan Herbarium (DUSH), Bangladesh Forest Research Institute Herbarium (BFRIH), Bangladesh Council for Scientific and Industrial Research Herbarium (BCSIRH) and Herbarium of Chittagong University (HCU).

Data obtained from field study and literature survey have been analysed and summarized in Table 1. All identified species are enumerated in Table 2, each cited with bangle name(s) wherever available, habit, habitat, phenology, potential values and status of occurrence. Families are arranged alphabetically, genera and species under each family are also arranged in alphabetical order. Pteridophytes are placed at the beginning followed by Magnoliopsida (dicots) and Liliopsida (monocots).

RESULTS AND DISCUSSION

From this study, a total of 187 species belonging to 64 families is recognized to grow naturally in the Hakaluki haor area in both dry and monsoon seasons of the year out of which eight species are pteridophytes, 72 monocots and 107 dicots. 138 species were identified from the collection of specimens and 49 from observations during field trips. It reveals from Table 1 that out of eight pteridophytic species, five are aquatic; out of 72 monocots, 40 are aquatic while out of 107 dicots, 29 are aquatic in habitats. Habit analysis shows that herbs are dominated by 160 species followed by shrubs, trees and climbing herbs represented by 11, 10 and 6, respectively. Data on potential values show that 144 species are variously used by local people as sources of livelihood of which 85 as medicinal, 20 as food, 12 as cattle food and 27 as varietal purposes. Status occurrence of the species, so far determined, as

summarized in Table 1, reveals that 81 are common while 106 fall under different threatened categories facing environmental threats at various degrees mostly due to human interferences.

Table 1. Summary of the analyzed data of the biodiversity of the Hakaluki Hoar between the years 2010 and 2012.

Categories		No. of species			
		Pteridophytes	**Dicots**	**Monocots**	**Total**
Species	Total	8	107	72	187
	collected	6	77	55	138
	Observed	2	30	17	49
Habit type	Herbs	7	84	69	160
	Climbing herbs	1	4	1	6
	Shrubs	0	10	1	11
	Trees	0	9	1	10
Potential values 144	Medicinal	2	73	10	85
	Food (Vegetable & Fruits edible)	0	10	10	20
	Cattle food	0	0	12	12
	Others*	2	9	16	27
	Not known	4	20	24	48
Status of Occurrence	CR	0	1	0	1
	R	0	6	0	6
	VU	0	2	0	2
	EN	0	1	0	1
	nt	0	1	6	7
	cd	0	1	2	3
	lc	0	49	37	86
	Com	8	46	27	81
Habitat 74+113	Aquatic	2	10	16	28
	Submerged aquatic	0	6	10	16
	Free floating aquatic	3	0	5	8
	Floating aquatic	0	13	9	22
	Terrestrial	3	78	32	113

Others* - Sand binder, Organic manure, Making Shitalpati, mates and busket, House cleaner, Water purifier, Fish food, Hedge plant, Fire wood; CR=Critically endangered, R=Rare, VU=Vulnerable, EN=Endangered, nt= Near threatened, cd= conservation dependent, lc=least concern, Com=Common.

The study identifies that the Hakaluki haor is the biggest wetland of Bangladesh with richest biodiversity resources (flora, fauna, agro-biodiversity, agro-fishery etc.) composed of 187 vascular plant species. It provides the sources of lively hood directly or indirectly of one million people, breeding ground of 107 indigenous species of sweet water fishes, food and shelter of 112 migratory and 305 local species of birds. Most of the aquatic plants species and their habitats within the Haor area are largely under threat. Over exploitation, hunting, and other human interferences are likely to be unbalancing the environmental components and made the haor ecologically critical area (ECA).

Table 2. Enumeration of the plant taxa of the Hakaluki hoar between the years 2010 and 2012.

Group	Family	Species	Vernacular name(s)	Potential values	Habit	Habitat	Phenology (Fl.-Fr.)	Status of occurance	VS no.
Pteridophytes	Azollaceae	*Azolla pinnata* R. Br.	*Azola*	Or. ma.	Herb	FFQ	Non fl.	Com	Obs
	Lygodiaceae	*Lygodium flexuosum* (L.) Sw.	*Lata Dekhia*	Orn.	Cl. herb	Ter	Non fl.	Com	L.8657
	Pteridaceae	*Ceratopteris thalictroides* (L.) Brongn.	*Agunjala shak*	-	Herb	Aq	Non fl.	Com	L.7733
		Pteris vittata L.	*Dhekia*	-	Herb	Ter	Non fl.	Com	L.7155
	Salviniaceae	*Salvinia cucullata* Roxb.	*Indur kani*	Med	Herb	FFQ	Non fl.	Com	L.8311
		Salvinia natans (L.) All.	-	Med	Herb	FFQ	Non fl.	Com	Obs
	Sinopteridaceae	*Cheilanthes albomarginata* C.B. Clarke	*Rupali dhekia*	-	Erect herb	Ter	Non fl.	Com	L.8318
	Thelypteridaceae	*Ampelopteris prolifera* (Retz.) Copel	*Dhekia Shak*	-	Erect herb	Aq	Non fl.	Com	L.8317
Magnoliopsida (Dicots)	Acanthaceae	*Hygrophila schulli* (Buch.-Ham.) M.R. & S.M. Almeida	*Kanta Kalika*	Med	Erect herb	Ter	10-1	lc	Obs
		Justicia gendarussa Burm.f.	*Jagat Madan*	Med	Erect herb	Ter	2-3	Com	L.8676B
		Rungia pectinata (L.) Nees	*Moinkhar*	-	Herb	Ter	11-5	lc	L.7143
	Amaranthaceae	*Achyranthes aspera* L.	*Apang*	Med	Erect herb	Ter	4-10	Com	L.7154
		Alternanthera philoxeroides (Mart.) Griseb.	*Helencha*	Veg	Herb	Aq	4-7	lc	L.7154A
		Alternanthera sessilis (L.) R. Br. *ex* DC.	*Highchha*	Med	Pro herb	Ter	1-12	lc	L.7740
		Amaranthus spinosus L.	*Kochua haag*	Med	Erect herb	Ter	1-12	Com	L.7740A
		Amaranthus tricolor L.	*Denga*	Veg	Erect herb	Ter	1-12	lc	Obs
		Centrostachys aquatica (R. Br.) Wall.	-	-	Herb	Aq	1-12	R	L.7156
	Apiaceae	*Centella asiatica* (L.) Urban	*Thankuni*	Med	Herb	Ter	3-12	Com	L.9587A
		Hydrocotyle sibthorpioides Lam.		Veg	Herb	Ter	1-12	lc	Obs
		Oenanthe javanica (Blume) DC.	*Bashi gaach*	Med, Veg	Herb	Ter	4-8	lc	L.6757
	Asclepiadaceae	*Calotropis procera* (Aiton) R. Br.	*Akand*	Med	Shrub	Ter	4-7	lc	Obs
		Oxystelma secamone (L.) Karst.	*Dudhia lata*	Med	Tw. herb	Ter	8-9	lc	L.7725
	Asteraceae	*Ageratum conyzoides* (L.) L.	*Ochunti, Fulkuri*	Med	Herb	Ter	11-1	Com	L.6756
		Eclipta alba (L.) Hassk.	*Kesaraj, Kesuti*	Med	Erect herb	Ter	1-12	Com	L.9647

	Enhydra fluctuans DC.	*Helencha, Hingcha*	Med	Herb	Aq	1-4	Com	Obs
	Gnaphalium luteo-album L.	*Baro-kumra*	Med	Erect herb	Ter	3-8	lc	L.6785
	Grangea maderaspatana (L.) Desf.	*Nemuti*	Med	Herb	Ter	12-5	lc	L.8340
	Sphaeranthus indicus L.	*Chagul nati, Murmuri*	Med	Erect herb	Ter	1-12	lc	L.6766
	Xanthium indicum Roxb.	*Ghagra, Bon-okra*	Med	Erect herb	Ter	1-12	Com	L.6775
	Youngia japonica (L.) DC.	-	-	Erect herb	Ter	8-1	lc	Obs
Balsaminaceae	*Hydrocera triflora* (L.) Wight & Arn.	*Dumuti*	-	Herb	Aq	6-10	lc	Obs
Boraginaceae	*Heliotropium indicum* L.	*Hatisur*	Med	Erect herb	Ter	1-12	Com	L.8338A
Brassicaceae	*Rorippa palustris* (L.) Besser	*Panisarisha*	Med	Herb	Ter	3-10	R	L.8338
Caesalpiniaceae	*Senna sophera* (L.) Roxb.	*Kalkasunda*	Med	Shrub	Ter	11-7	Com	L.8323
Capparaceae	*Cleome gynandra* L.	*Sada Hurhuria,*	Med	Erect herb	Ter	1-12	Com	L.8341
	Crateva magna (Lour.) DC.	*Barun*	Med	Tree	Ter	1-6	Com	L.7719
Ceratophyllaceae	*Ceratophyllum demersum* L.	-	-	Herb	Sm	8-9	lc	L.9583
	Ceratophyllum submersum L.	-	-	Herb	Sm	9-11	R	L.9610
Convolvulaceae	*Ipomoea aquatica* Florssk.	*Kalmilata*	Med, Veg	Tr. Herb	FQ	1-12	Com	L.8441
	Ipomoea fistulosa Mart. *ex* Choisy	*Dhol kalmi*	Hedge plant	Erect Shrub	Ter	1-12	Com	Obs
	Ipomoea pileata Roxb.	-	-	Tw. herb	Ter	10-1	lc	L.9601
	Ipomoea yomae Kurz	-	-	Cl. herb	Ter	10-1	R	Obs
	Stictocardia campanulata (L.) Merr.	-	-	Woody Twiner	Ter	11-2	lc	L.7735
Droseraceae	*Aldrovanda vesiculosa* L.	*Malacca, jhangi*	-	Herb	Sm	1-12	CR	Obs.
Euphorbiaceae	*Croton bonplandianus* Baill.	*Morsa*	Med	Herb	Ter	1-12	Com	L.7732
	Croton roxburghii N.P. Balakr.	*Chuka, Putri*	Med	Shrub	Ter	4-11	lc	L.9587
	Euphorbia hirta L.	*Dudhia*	Med	Herb	Ter	1-12	Com	L.9607
	Phyllanthus reticulatus Poir.	*Chitki, Pankushi*	Med	Shrub	Ter	3-10	Com	L.6773
	Ricinus communis L.	*Bheranda, Rendi*	Med	Shrub	Ter	1-12	Com	L.8918
Fabaceae	*Crotalaria pallida* Aiton	*Jhun jhuni, Atosi*	Med	Herb	Ter	10-1	lc	L.7731
	Desmodium gangeticum (L.) DC.	*Salpani, Chalani*	Med	USh	Ter	4-11	lc	Obs
	Desmodium triflorum (L.) DC.	*Kulalia, Kodalia*	Med	Herb	Ter	1-12	lc	Obs
	Pongamia pinnata (L.) Pierre	*Kerum, Koros*	Or.Ma.	Tree	Ter	7-12	lc	L.7717
Haloragraceae	*Myriophyllum tetrandrum* Roxb.	-	Or.Ma.	Herb	FQ	NK	Com	Obs
	Myriophyllum tuberculatum Roxb.	*Kata heola*	Or.Ma.	Herb	Sm	NK	Com	L.9172

Hydrophyllaceae	*Leonurus sibiricus* L.	*Roktrodon*	Med	Erect herb	Ter	3-8	lc	L.8321
	Leucas aspera (Willd.) Link	*Dulfi, Chotohalkusa*	Med	Erect herb	Ter	8-11	lc	Obs
	Leucas ciliata Wall. *ex* Benth.	*Shetodron*	Med	Tall herb	Ter	4-12	VU	L.6780
	Leucas zeylanica (L.) R. Br.	*Gutta Tumba*	Med	Erect herb	Ter	5-10	lc	Obs
Lecythidaceae	*Barringtonia acutangula* (L.) Gaertn.	*Hijol, Kumia*	Med	Tree	Ter	5-9	Com	L.8322
Lentibulariaceae	*Utricularia gibba* L.	*Paanir fool*	-	Herb	Aq	1-5	Com	H.6357
	Utricularia aurea Lour.		-	Herb	FQ	2-5	Com	Obs
	Utricularia stellaris L.f.	*Jhangi*	-	Herb	FQ	2-5	Com	Obs
Lythraceae	*Lagerstroemia speciosa* (L.) Pers.	*Jarul*	Timber	Tree	Ter	2-7	Com	L.6758
	Rotala wallichii (Hook.f.) Koehne	-	Orn.	Herb	Aq	9-10	VU	L.8665
Malvaceae	*Abutilon indicum* (L.) Sw.	-	Med	Herb	Ter	6-9	lc	Obs
Menyanthaceae	*Nymphoides cristata* (Roxb.) Kuntze	*Panchuli*	-	Herb	FQ	10-2	Com	Obs
	Nymphoides hydrophylla (Lour.) Kuntze	*Jinarukh*	-	Herb	FQ	10-2	Com	Obs
	Nymphoides indica (L.) Kuntze	*Panchui*	-	Herb	FQ	10-2	Com	L.8645
Mimosaceae	*Mimosa pudica* L.	*Lajjabati*	Med	Herb	Ter	9-12	Com	L.8645A
Molluginaceae	*Glinus oppositifolius* (L.) A. DC.	*Gemashak*	Med	Herb	Ter	1-12	Com	L.7715
Moraceae	*Ficus benghalensis* L.	*Bot*	Med	Large Tree	Ter	5-8	Com	Obs
	Ficus hispida L.f.	*Dumur*	Med, Veg	Tree	Ter	8-12	lc	L.8355
	Ficus religiosa L.	*Ashwath, Panbot*	Med	Tree	Ter	3-10	Com	Obs
	Ficus sinuata Thunb.	*Paraboha*	Med	LS	Ter	1-4	R	L.8450
	Streblus asper Lour.	*Sheora, Agra*	-	Tree	Ter	3-6	Com	L.6751
Nelumbonaceae	*Nelumbo nucifera* Gaertn.	*Padma, Komol*	Med	Herb	FQ	4-10	lc	Obs
Nymphaeaceae	*Euryale ferox* Salisb.	*Makhna, Fukhol*	Med	Herb	FQ	3-11	EN	L.6765
	Nymphaea nouchali Burm.f.	*Nil sapla*	Med, Veg	Herb	FQ	7-10	Com	L.6765A
	Nymphaea pubescens Willd.	*Shala, Shaluk*	Med	Herb	FQ	7-10	lc	L.8932A
	Nymphaea rubra Roxb. *ex* Andrews	*Lal shapla*	Veg	Herb	FQ	8-1	R	Obs
Onagraceae	*Ludwigia adscendens* (L.) H. Hara	*Keshra-dam*	Med	Herb	Aq	6-9	Com	L.8932
	Ludwigia octovalvis (Jacq.) P.H. Raven	*Bhuikura*	Med	Herb	Ter	1-12	lc	L.8325
	Ludwigia palustris (L.) Elliott	*Paanilot*	Or.Ma	Cr. Herb	Aq	1-6	cd	L.8326

Oxalidaceae	*Oxalis corniculata* L.	*Amrul*	Med	Cr. herb	Wet land	1-12	Com	L.7153
Papilionaceae	*Aeschynomene indica* L.	*Bhathshola*	Or.Ma.	Erect herb	Wet land	7-10	Com	Obs
	Sesbania javanica Miq.	*Kathsola*	Or.Ma.	Erect herb	Aq	1-5	Com	L.8641
Polygonaceae	*Persicaria barbata* (L.) H. Hara	*Bekhanjabaj*	Med	Herb	Wet land	8-4	Com	L.6790
	Persicaria dichotoma (Blume) Masam.	-	Med	Herb	Wet land	5-11	lc	L.8647
	Persicaria hydropiper (L.) Delarbre	*Bishkatali*	Med	Herb	Wet land	4-8	Com	L.9105
	Persicaria orientalis (L.) Spach	*Baro panimaric*	Med	Herb	Wet land	3-8	lc	L.7156A
	Persicaria tomentosa (Willd.) Sasaki	*Pani-bishkatali*	Med	Herb	Wet land	11-1	lc	L.6771
	Polygonum pubescens Blume	*Lal-bishkatali*	Med	Herb	Wet land	4-6	lc	L.6770
	Rumex dentatus L.	*Bon palong*	Med	Herb	Wet land	1-5	Com	L.7720
Rubiaceae	*Dentella serpyllifolia* Wall. *ex* Craib	*Bhuipat*	-	Herb	Ter	12-7	lc	L.6768
	Hedyotis diffusa Willd.	-	Med	Erect herb	Ter	7-12	lc	L.7731
	Hedyotis scandens Roxb.	*Bish lata*	Med	Cl. herb	Ter	2-4	lc	Obs
Sapindaceae	*Cardiospermum halicacabum* L.	*Phutka, Noaphutki*	Med	Cl. herb	Ter	5-11	lc	Obs
Scrophulariaceae	*Dopatrium junceum* (Roxb.) Buch.-Ham. *ex* Benth.	*Binsowan*	-	Erect herb	Ter	6-12	lc	L.6772
	Limnophila heterophylla (Roxb.) Benth.	-	-	Herb	Sm	8-11	lc	L.8673
	Limnophila indica (L.) Druce	*Karpur*	Med	Herb	Ter	2-10	lc	L.9174
	Limnophila sessiliflora Blume	*Kata hewla*	Med	Herb	Ter	2-9	lc	L.9173
	Lindernia anagallis (Burm.f.) Pennell	*Hookna lot*	Med	Pro/Ce herb	Ter	3-11	lc	L.7734
	Lindernia ruellioides (Colsm.) Pennell	-	Med	Cr herb	Ter	5-1	lc	L.9143
	Scoparia dulcis L.	*Bon dhonia*	Med	Herb	Ter	1-12	Com	L.6752
Solanaceae	*Solanum nigrum* L.	*Khanchan*	Med	Herb	Ter	2-7	Com	L.7721
	Solanum virginianum L.	*Kantakari*	Med	Herb	Ter	1-2	lc	L.8476A
Sterculiaceae	*Abroma augusta* (L.) L.f.	*Tambal, Ulatkambal*	Med	Shrub/ small Tree	Ter	6-12	nt	L.8953
Tiliaceae	*Corchorus aestuans* L.	*Janglipat, Titapat*	Med	Shrub	Ter	6-2	lc	L.7727
	Triumfetta annua L.	-	Med, Veg	Erect herb	Ter	12-3	lc	Obs

	Trapaceae	*Trapa bisponosa* Roxb.	*Paniphal, Singara*	Med, Fruits edible	Herb	Sm	5-7	Com	L.6766
		Trapa incisa Siebold & Zucc.	*Kata Singhara, Laal hingaair*	Med	Herb	FQ	5-7	Com	Obs
	Urticaceae	*Pouzolzia zeylanica* (L.) Benn. & R. Br.	*Kullaruki*	Med	Herb	Ter	6-12	lc	L.6787
	Verbanaceae	*Lippia alba* (Mill.) N.E. Br. *ex* Britton & Wilson	*Pichas, Pichas-lakri*	Sand binder	Shrub	Ter	1-12	Com	L.7724
Liliopsida (Monocots)	Alismataceae	*Alisma plantago* L.	-	Med	Herb	Aq	6-9	cd	L.9625
		Sagittaria guayanensis subsp. *lappula* (D. Don) Bogin	-	Cattle food	Herb	Aq	6-9	lc	L.9618
		Sagittaria sagittifolia L.	*Muyamuya*	Veg	Herb	Aq	6-9	lc	Obs
	Aponogetonaceae	*Aponogeton appendiculatus* Bruggen	*Ghechu*	Veg	Herb	FQ	5-10	Com	L.9616
		Aponogeton echinatus Roxb.	*Ghechu*	Veg	Herb	FQ	4-10	Com	Obs
		Aponogeton natans (L.) Engl. & Krause	*Ghechu*	Veg	Herb	FQ	4-10	nt	L.9620
	Araceae	*Colocasia esculenta* (L.) Schott	*Kachu*	Med	Herb	Ter	5-10	Com	Obs
		Cryptocoryne ciliata (Roxb.) Fisch. *ex* Wydler	*Kerali*	-	Herb	Aq	5-10	lc	L.9124A
		Cryptocoryne retrospiralis (Roxb.) Kunth	-	-	Herb	Aq	11-3	lc	L.9117
		Pistia stratiotes L.	*Topa pana*	Med	Herb	FFQ	10-3	Com	L.8889A
	Commelinaceae	*Commelina benghalensis* L.	*Kanchira*	Med	Cr. herb	Ter	2-12	Com	Obs
		Commelina diffusa Burm.f.	-	Veg	Herb	Ter	1-12	Com	Obs
	Cyperaceae	*Courtoisina cyperoides* (Roxb.) Sojak	*Teen horaghas*	-	Herb	Ter	6-11	lc	L.7151
		Cyperus compactus Retz.	-	-	Herb	Ter	9-3	lc	L.8871
		Cyperus cyperoides (L.) Kuntze	*Bar guthubi, Kusha*	Veg	Herb	Ter	1-12	lc	L.6762
		Eleocharis dulcis (Burm.f.) Trin. *ex* Hensch.	-	Veg	Herb	Ter	5-12	lc	L.6754
		Fimbristylis miliacea (L.) Vahl	*Piaji ghaas*	-	Herb	Ter	5-11	lc	L.9128
		Fimbristylis ovata (Burm.f.) J. Kern	*Marmari*	Or. Ma.	Herb	Ter	1-12	lc	L.9347
		Kyllinga brevifolia Rottb.	-	Cattle food	Herb	Ter	3-12	lc	L.9107
		Schoenoplectus articulatus (L.) Palla	*Putputi chechra*	Med	Herb	Ter	10-3	lc	L.6753
		Schoenoplectus grossus (L.f.) Palla Area new record	*Kaach sisrile*	Making mats	Herb	Aq	8-12	lc	L.7156

Hydrocharitaceae	*Blyxa aubertii* Rich.	*Parua ghas*	-	Herb	Sm	1-12	Com	L.8676A
	Blyxa japonica (Miq.) Maxim. *ex* Aschers. & Gurke	-	-	Herb	Sm	1-12	nt	Obs
	Hydrilla verticillata (L.f.) Royle	*Jhangi, Kureli*	Fish food	Herb	Sm	1-12	Com	L.8667
	Hydrocharis dubia (Blume) Backer	-	-	Herb	FFQ	1-12	cd	F.621
	Nechamandra alternifolia (Roxb.) Thw.	*Rasnajhangi*	-	Herb	Sm	2-10	Com	L.8675
	Ottelia alismoides (L.) Pers.	*Ramkarala*	Veg	Herb	Sm	7-10	Com	L.8912
	Vallisneria spiralis L.	*Patseola*	-	Herb	Sm	10-3	Com	L.9565
Lemnaceae	*Lemna perpusilla* Torr.	*Khudipana*	Water purifier	Herb	FFQ	11-5	lc	L.8474A
	Lemna trisulca L.	-	Fish food	Herb	Flo/ Sm	Occasionally	lc	L.9202
	Spirodela polyrrhiza (L.) Schleid.	*Tetulpana*	Water purifier	Herb	FFQ	Occasionally	lc	L.9588A
	Wolffia arrhiza (L.) Horkel *ex* Wimmer	*Shujipana*	Or. Ma.	Herb	FQ	Rarely	lc	L.8474A
Liliaceae	*Asparagus racemosus* Willd.	*Shatamuli*	Med	USh/herb	Ter	11-3	nt	Obs
Limnocharitaceae	*Butomopsis latifolia* (D. Don) Kunth	-	Veg	Herb	Aq	Not on record	lc	Obs
	Limnocharis flava (L.) Buchenau	-	-	Herb	Aq	6-9	lc	L.9176
Marantaceae	*Schumannianthus dichotomus* (Roxb.) Gagnep.	*Pati pata, Patibet*	Making Shitalpati	Erect herb	Ter	12-3	Com	L.6788
Najadaceae	*Najas gracillima* (A. Braun *ex* Engelm.) Magnus	*Paani ghaas*	-	Herb	Aq	6-9	lc	L.8889
	Najas graminea Delile		Fish food	Herb	Sm	7-9	lc	Obs
Poaceae	*Arundinella decempedalis* (Kuntze) Janowsky	-	-	Herb	Ter	8-11	nt	L.9171
	Bothriochloa pertusa (L.) A. Camus	*Barboda ghas*	-	Herb	Ter	8-2	nt	L.7148
	Cenchrus echinatus L.	-	-	Herb	Ter	10-1	lc	L.8343
	Chrysopogon aciculatus (Retz.) Trin.	*Lengra, Premkata*	Sand binder	Herb	Ter	1-12	Com	L.7149
	Chrysopogon fulvus (Spreng.) Chiov.	*Babon dugra*	-	Herb	Ter	1-12	Com	L.7726
	Cynodon dactylon (L.) Pers.	*Durba, Dugra*	Cattle food	Herb	Ter	1-12	Com	L.8339
	Cyrtococcum oxyphyllum (Steud.) Stapf	-	Cattle food	Cr. herb	Ter	1-12	Com	L.9653A
	Digitaria sanguinalis (L.) Scop.	*Makunjali*	Cattle food	Herb	Ter	5-10	Com	L.6782
	Echinochloa crusgalli (L.) P. Beauv.	*Bara shama ghas*	Cattle food	Herb	Ter	4-10	lc	Obs
	Hygroryza aristata (Retz.) Nees. *ex* Wight & Arn.	*Puti pata*	Cattle food	Herb	FQ	10-2	Com	L.8675A

	Imperata cylindrica (L). Raeusch.	*Ulu, Chau, Ulukhar*	House cleaner	Herb	Ter	6-10	Com	L.7152
	Oplismenus burmanni (Retz.) P. Beauv.	-	Cattle food	Tr. herb	Ter	9-1	lc	L.8453
	Oryza rufipogon Griff.	*Buno dhan*	Cattle food	Herb	Aq	9-3	nt	L.9344
	Panicum paludosum Roxb.	*Barti, Borali*	Cattle food	Herb	Aq	1-12	lc	L.8653
	Panicum curviflorum Hornem.	*Jupi kanta*	Cattle food	Herb	Ter	7-1	lc	L.9617
	Paspalidium punctatum (Burm.) A. Camus	*Petinar*	-	Herb	Ter	8-3	lc	L.8644
	Phragmites karka (Retz.) Trin. & Steud.	*Nalkhagra*	Med	Erect herb	Ter	1-12	lc	Obs
	Pogonatherum crinitum (Thunb.) Kunth	*Boro duba*	-	Herb	Ter	1-12	lc	L.8314
	Porteresia coarctata (Roxb.) Tateoka	*Dhani ghas, Harakata*	Soil binder	Herb	Aq	7-1	lc	L.9126
	Pseudoraphis brunoniana (Griff.) Pilg.	-	-	Herb	Aq	9-12	lc	L.9658
	Setaria glauca (L.) P. Beauv.	*Kauri*	Cattle food	Herb	Ter	11-4	lc	L.6789
	Thyrsostachys oliveri Gamble	*Burma bans, Rema*	House holding Materials	Culms/ Tall Tree	Ter	11-2	lc	L.7739
	Thysanolaena latifolia (Roxb. *ex* Hornem) Honda	*Jharuful*	House cleaner	Shrub	Ter	3-7	Com	L.8316
Pontederiaceae	*Eichhornia crassipes* (Mart.) Solms	*Jarmani, Kachuripana*	Or.Ma.	Herb	FFQ	9-4	Com	F.617
	Monochoria hastata (L.) Solms	*Jolphena, Kechoir*	Med	Herb	Aq	1-12	Com	L.8474A
	Monochoria vaginalis (Burm.f.) Presl	*Nukha, Sarkachu*	Med	Herb	Aq	5-1	Com	L.8470
Potamogetonaceae	*Potamogeton crispus* L.	-	Veg	Herb	Sm	12-2	Com	Obs
	Potamogeton mucronatus Presl	-	-	Herb	FQ	11-12	Com	Obs
	Potamogeton nodosus Poir.	-	-	Herb	FQ	1-12	lc	Obs
	Potamogeton octandrus Poir.	-	-	Herb	FQ	12-2	lc	Obs
	Potamogeton pectinatus L.	-	-	Herb	Sm	1-6	lc	Obs
Ruppiaceae	*Ruppia maritima* L.	-	-	Herb	Sm	4-5	Com	Obs
Typhaceae	*Typha domingensis* Pers.	*Hogla*	Fencing	Herb	Ter	3-5	Com	L.9595
Zingiberaceae	*Alpinia nigra* (Gaertn.) Burtt	*Thara, Hintal*	Med	Herb	Ter	9-1	lc	L.6775

[CR= Critically Endangered; VU = Vulnerable; R = Rare; cd = conservation dependent; nt = near threatened; lc = least concern; DD= Data Deficiency; NE = Not Evaluated; Com = Common; Cult = Cultivated; Obs = Observed; LS = Large shrub; Climbing herb = Cl. herb; Creeping Herb = Cr. Herb; Proherb = Prostrate herb; Tw. herb = Twining herb; Tr. Herb = Trailing herb; Aq = Aquatic; Ter = Terrestrial; Sm = Submerged Aquatic; FFQ = Free Floating aquatic; FQ = Floating aquatic; Med = Medicinal; Or. ma. = Organic Manure; Orn. = Ornamental; Veg = Vegetable; Fl = Flowering; Fr = Fruiting; Non fl. = Non Flowering Plant; VS = Voucher specimen]

The inundation period in the rainy season is decreasing from six to less than three months due to insufficient flow of natural water. There is no proper conservative management for the Haor vegetation yet undertaken by the government. It is, therefore, an important environmental issue, as per Ramsar Convention, to save the wetland biodiversity of the Hakaluki Haor through planning and implementing proper conservative management.

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