

Survey of wetland macrophytes of Goalpara district of Assam, India

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Abstract

Present paper deals with the survey of aquatic and wetland macrophytes of Goalpara district of Assam. The district is located on the south bank of the river Brahmaputra. Survey was carried out from April, 2010 to March, 2012. A total of 132 species belonging to Angiosperms and Pteridophytes were recorded, out of which 126 species are Angiosperms and 06 species are Pteridophytes. It was interesting to note that *Nelumbo nucifera* Gaertner occurs only in two perennial wetlands of Kumbri and Bakaitari of the study area.

Key words: Aquatic macrophytes, Wetland, Goalpara district.

INTRODUCTION

The district of Goalpara is situated just beneath the South bank of the river Brahmaputra. It lies in between 25° 45' N to 26° 10' N latitude along the foot hills of the Meghalaya Plateau and longitudinally from 90° 0' E to 91° 15' E. Maximum numbers of fresh water wetlands are situated within the boundary of this district and most of them are generally seasonally water logged while, some are perennial. The channels of the river Brahmaputra meet with the beels, ponds, wetlands and the tributaries, thereby enriches the water bodies and shelter a good number of aquatic macrophytes.

Aquatic macrophytes are the most essential component as producer for the aquatic ecosystem. The plant parts are used as food by different aquatic animals especially fishes and birds. The roots of submerged and free floating plants provide shelter to the fishes and other aquatic fauna. The peripheral reeds and mats of aquatic vegetation are used as nest by some aquatic birds.

Significant contributions on the aquatic macrophytes of Indian fresh water have been made by many authors like Agharkar (1923); Biswas & Calder (1937); Mirashi (1954); Maheswari (1960); Subramanyam (1962); Naik (1964); Vyas (1964); Mazumdar (1965); Sahai & Sinha (1968); Kausik (1969); Rao & Vema 1970, 1972, 1973, 1974, 1976); Singh & Singh (1972); Jain & Hajra (1975); Deb (1976); Kak (1985); Naskar (1990); Lavania *et al* (1990); Cook (1996), Gupta (2001) and Sarkar *et al.* (2008). In Assam, Kanjilal *et al.* (1934-40) mentioned some aquatic angiosperms in the "*Flora of Assam*". The work carried out by Satyanarayana (1962) on Hydrophytic vegetation of Jalukbari is the pioneer work in this field. Recently, in Assam and in North-East India, contribution on aquatic and marshland plants have been made by a number of authors. Pathak (1990) investigated the hydrophytic

flora of Guwahati and its vicinity. Malakar (1995) surveyed the aquatic angiosperms of Cachar district. Similar studies on aquatic plants have been made by Baruah & Baruah (2000) carried out hydrophytic studies of Kaziranga National park, Assam. Dhar *et al* (2004) on aquatic macrophytes of Baskandi lake of Barak basin. Gogoi (2006) carried out macrophytic diversity of Deepar Beel. Barooah & Mahanta (2006) studied aquatic angiosperms of Biswanath Chariali, Assam. Sarkar *et al* (2008) studied on aquatic and marshland plants of Kamrup District. Bhowmik & Datta (2011) gave an account on aquatic and marshland plants in West Tripura. Usefulness of wetland plants of NE India were also recorded by many workers (Sarma & Saikia 2010).

Though the hydrophytic vegetation is quite rich in the district, there is little work done on aquatic and wetland plants (Sarma & Devi 1999; Nath 2012; Haque & Devi 2014). Therefore, a study was undertaken to document thoroughly the Macrophytic diversity of aquatic and wetland habitats of Goalpara District, Assam.

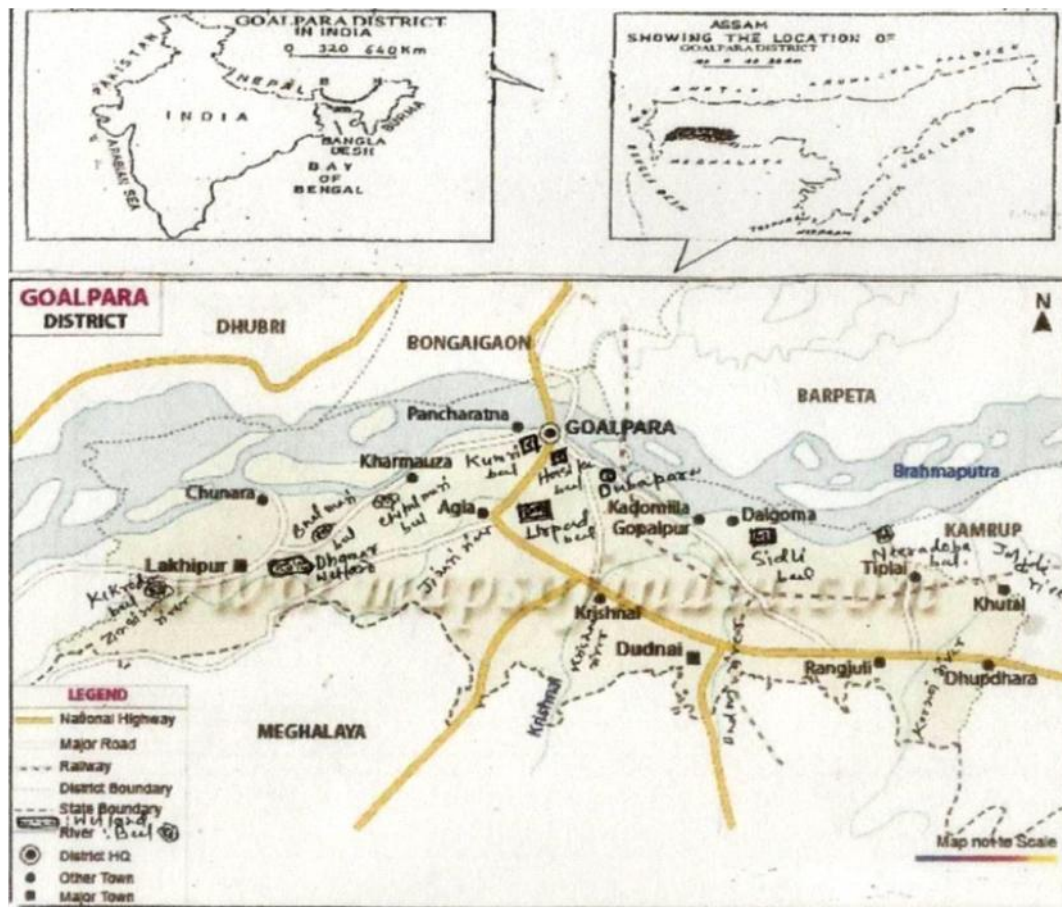


Figure 1. Location map of the study area (maps not to scale)

Study Area

District Goalpara lies on the western part of Assam stretching from Dhupdhora in the east to Udmari in the west. The region lies in between $25^{\circ} 45' N$ to and $26^{\circ} 10' N$ latitude along the Northern foot hills of the Meghalaya plateau and the Southern Bank of the River Brahmaputra and longitudinally from $90^{\circ} 0' E$ to $91^{\circ} 15' E$. The region stretches about 69 km

in a North South line, while it is 93 km in the East-West direction along the National Highway No. 37. It covers an area of 1824 sq km (Anonymous 2013).

There are as many as 50 large and small sized wetlands present in the study area. Important beels of the study area are: Urapad, Sidli, Nolonga, Hashila, Kumri, Neeradoba, Kekera, Chakla, Dhamar, Jamlai, Bakaitari, Garomari, Sekseki, Matia, Bualmari, Khailsamari, Chullipara, Kekeradora, Padyabari, Bherveri, Garuchutka, Dhanbari beel and also marshlands and swamps. The active flood plain zone with charlands and marshy tract covers about 29 % of the total area of the district.

There are five Tributaries and sub-tributaries viz. Deosila, Kornoi, Dudhnoi, Krishnai, Jinari and Jinjiram. All of them have their origin from the same source in the southern part of Meghalaya. All these rivers and tributaries meet with beels by their channels in different ways and enrich the water bodies with different aquatic biodiversity. Urapad, Sidli, Kumri, Hasila, Neeradoba, Ververi, Sekseki, Bualmari, Khailsamari beels are perennial while Dhamar, Bakaitari, kekradora, Garomari, Matia, Hekera, Garuchutka and chakla are seasonally water logged.

MATERIALS AND METHODS

Extensive field survey was carried out from April, 2010 to March, 2012 in deep to shallow water covered areas as well as on the periphery of water bodies in the district. Specimens were collected at their flowering and fruiting stages at regular intervals covering all the four seasons of the year e.g Winter (December – February), Pre-monsoon (March – May), Monsoon or Summer (June – September), and Retreating monsoon (October – November).

Pressed, dried and poisoned specimens were made into mounted on herbarium sheets following Jain & Rao (1977). Specimens were identified by consulting relevant literature and Herbarium of Botany Departmen, Gauhati University (GUBH) and at ASSAM. Correct nomenclature was determined by consulting online taxonomic literature (www.theplantlist.org).

The identified taxa were enumerated in Table-1 with different recorded species were arranged alphabetically with their botanical names, phenophases, growth forms, reference to voucher specimens and the locality of occurrence.

The following groups are the aquatic macrophytes growing in various depths of water and were classified into different growth forms or micro- habit groups according to Daubenmire (1947).

1. Wetland helophytes (WH) ,
2. Emergent anchored hydrophytes (EAH) ,
3. Floating leaved anchored hydrophytes (FLAH),
4. Suspended hydrophytes (SH) ,
5. Floating hydrophytes (FH),
6. Floating shoots anchored hydrophytes (FSAH) and Submerged anchored hydrophytes (SAH).

RESULT AND DISCUSSION

The present surveys on aquatic macrophytes were conducted in different types of wetlands including beels, along the river banks and ephemeral water bodies of the District of Goalpara. The results are presented in Tables 1 & 2.

Table 1. Aquatic Angiosperms recorded from different wetlands of the Goalpara district of Assam [Abbreviations used: WH = Wetland helophytes; EAH = Emergent anchored hydrophytes; FH = Floating hydrophytes; SH = Suspended hydrophytes; FLAH = Floating leaved anchored hydrophytes; FSAH = Floating shoots anchored hydrophytes; SAH = Submerged anchored hydrophytes; Veg = Vegetative stage. Fls & frts = Flowering and fruiting time. WL = wetland]

Name of Taxa [Family]; Voucher specimen	Seasonal phenophases				Habit /Micro-habit	Locality (River/ Beel/ WL)
	Winter	Pre-monsoon	Monsoon	Retreating monsoon		
<i>Aeschynomene aspera</i> Linnaeus [Leguminosae: Faboideae]; N.A. Haque 068	Veg	Veg	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Aeschynomene indica</i> Linnaeus [Leguminosae: Faboideae]; N.A. Haque 093	Veg	Veg	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Ageratum conyzoides</i> (Linnaeus) Linnaeus [Asteraceae]; N.A. Haque 095	–	Veg	Fls & frts	Veg	WH	Dhamar WL & Bakaitari
<i>Alisma plantago-aquatica</i> Linnaeus [Alismataceae]; N.A. Haque 084	Veg	Fls & frts	Veg	–	FLAH	Dhamar WL & Hasila beel
<i>Alternanthera philoxeroides</i> (Martius) Grisebach [Amaranthaceae]; N.A. Haque 027	–	Veg	Fls & frts	Veg	WH	Dhamar WL & Urpada beel
<i>Alternanthera sessilis</i> (Linnaeus) R. Brown ex A.P. de Candolle [Amaranthaceae]; N.A. Haque 002	–	Veg	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Amaranthus spinosus</i> Linnaeus [Amaranthaceae]; N.A. Haque 113	–	Veg	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Amaranthus viridis</i> Linnaeus [Amaranthaceae]; N.A. Haque 115	–	Veg	Fls & frts	Fls & frts	WH	Bakaitari WL
<i>Aponogeton crispus</i> Thunberg [Aponogetonaceae]; N.A. Haque 022	–	Fls & frts	Veg	–	SH	Urpada & Neeradoba beel
<i>Arundo donax</i> Linnaeus [Poaceae]; N.A. Haque 060	–	Veg	Fls & frts	Veg	WH	Dhamar WL
<i>Blumea fistulosa</i> (Roxburgh) Kurz [Asteraceae]; N.A. Haque 116	–	Veg	Fls & frts	Veg	WH	Bakaitari; Jaljali river bank
<i>Butomopsis latifolia</i> D. Don [Butomaceae]; N.A. Haque 107	–	Veg	Fls & frts	Veg	FLAH	Hasila & Urpada beel
<i>Bulbostylis junciformis</i> (Kunth) C.B. Clarke [Cyperaceae]; N.A. Haque 120	Veg	Fls & frts	Fls & frts	Veg	WH	Urpada beel
<i>Calystegia sepium</i> (Linnaeus) R. Brown [Convolvulaceae]; N.A. Haque 070	Fls & frts	–	Veg	Fls & frts	WH	Jaljali and Kornoi river bank
<i>Cardamine hirtuta</i> Linnaeus [Brassicaceae]; N.A. Haque 055	–	Veg	Fls & frts	Fls & frts	WH	Kornoi river bank
<i>Centella asiatica</i> (Linnaeus) Urban [Apiaceae]; N.A. Haque 073	Fls & frts	Veg	–	–	WH	Neeradoba; Sidli beel area
<i>Ceratophyllum demersum</i> Linnaeus [Ceratophyllaceae]; N.A. Haque 032	Veg	Fls & frts	Fls & frts	Veg	SH	Dhamar WL
<i>Chenopodium album</i> Linnaeus [Amaranthaceae]; N.A. Haque 033	Fls & frts	Veg	–	–	WH	Neeradoba beel
<i>Chrysopogon zizanioides</i> (Linnaeus) Roberty [Poaceae]; N.A. Haque 092	–	Veg	Fls. & frts	Veg	WH	Neeradoba beel
<i>Colocasia esculenta</i> (Linnaeus) Schott [Araceae]; N.A. Haque 056	Veg	Fls & frts	Fls & frts	Veg	WH	Urpada & Sidli beel
<i>Commelina benghalensis</i> Linnaeus [Commelinaceae]; N.A. Haque 048	–	Veg	Fls & frts	Veg	WH	Dhamar & Neeradoba beel
<i>Commelina diffusa</i> Burman f. [Commelinaceae]; N.A. Haque 016	–	Veg	Fls & frts	Veg	WH	Dhamar & Neeradoba beel.
<i>Coix lacryma-jobi</i> Linnaeus [Poaceae]; N.A. Haque 046	–	–	Fls & frts	Veg	WH	Dhamar WL

Name of Taxa [Family]; Voucher specimen	Seasonal phenophases				Habit /Micro-habit	Locality (River/ Beel/ WL)
	Winter	Pre-monsoon	Monsoon	Retreating monsoon		
<i>Clerodendrum infortunatum</i> Dennstedt [Lamiaceae]; N.A. Haque 086	Veg	Veg	Fls & frts	Fls & frts	WH	Neeradoba beel
<i>Croton bonplandianus</i> Baillon [Euphorbiaceae]; N.A. Haque 110	–	Veg	Fls & frts	Veg	WH	Dhamar WL & Urpada beel
<i>Cyanthillium cinereum</i> (Linnaeus) H. Robinson [Asteraceae]; N.A. Haque 013	Veg	Fls & frts	Fls & frts	Veg	WH	Bakaitari; Jaljali river bank
<i>Cynodon dactylon</i> (Linnaeus) Persoon [Poaceae]; N.A. Haque 061	Veg	Veg	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Cyperus difformis</i> Linnaeus [Cyperaceae]; N.A. Haque 101	–	Veg	Fls & frts	Veg	WH	Urpada & Kornoi river bank
<i>Cyperus digitatus</i> Roxburgh [Cyperaceae]; N.A. Haque 042	–	Veg	Fls & frts	Veg	WH	Neeradoba beel
<i>Cyperus odoratus</i> Linnaeus [Cyperaceae]; N.A. Haque 028	–	Veg	Fls & frts	Veg	WH	Urpada & Neeradoba beel
<i>Cyperus rotundus</i> Linnaeus [Cyperaceae]; N.A. Haque 067	–	Veg	Fls & frts	Veg	WH	Urpada beel
<i>Digitaria setigera</i> Roth [Poaceae]; N.A. Haque 078	–	Veg	Fls & frts	Fls & frts	WH	Kornoi river bank
<i>Dysphania ambrosioides</i> (Linnaeus) Mosyakin & Clemants [Amaranthaceae]; N.A. Haque 127	Fls & frts	Veg	–	–	WH	Dubapara river bank
<i>Eclipta prostrata</i> (Linnaeus) Linnaeus [Asteraceae]; N.A. Haque 001	–	Veg	Fls & frts	Veg	WH	Dhamar WL & Kornoi river bank
<i>Eichhornia crassipes</i> (Martius) Solms [Pontederiaceae]; N.A. Haque 064	Veg	Veg	Fls & frts	Fls & frts	FH	Urpada & Neeradoba beel
<i>Enhydra fluctuans</i> Loureiro [Asteraceae]; N.A. Haque 005	Veg	Fls & frts	Veg	–	EAH	Urpada; Neeradoba & Kornoi river bank
<i>Euryale ferox</i> Salisbury [Nymphaeaceae]; N.A. Haque 024	–	Veg	Fls & frts	Veg	FLAH	Urpada beel; Neeradoba beel
<i>Euphorbia hirta</i> Linnaeus [Euphorbiaceae]; N.A. Haque 014	–	Veg	Fls & frts	Veg	WH	Neeradoba; Kornoi river bank
<i>Evolvulus nummularius</i> (Linnaeus) Linnaeus [Convolvulaceae]; N.A. Haque 111	Veg	Veg	Fls & frts	Fls & frts	WH	Dhamar WL & Hasila beel
<i>Fimbristylis complanata</i> (Retzius) Link [Cyperaceae]; N.A. Haque 076	–	Veg	Fls & frts	Veg	WH	Neeradoba & Urpada beel
<i>Fimbristylis squarrosa</i> Vahl [Cyperaceae]; N.A. Haque 045	–	Veg	Fls & frts	Veg	WH	Neeradoba beel
<i>Grangea maderaspatana</i> (Linnaeus) Poiret [Asteraceae]; N.A. Haque 008	Veg	Fls & frts	Fls & frts	Veg	WH	Kornoi & Jaljali river bank
<i>Hydrilla verticillata</i> (Linnaeus f.) Royle [Hydrocharitaceae]; N.A. Haque 003	Fls & frts	Fls & frts	Veg	Veg	SH	Neeradoba & Garomari beel
<i>Hydrocharis dubia</i> (Blume) Backer [Hydrocharitaceae]; N.A. Haque 065	–	Veg	Fls & frts	Fls & frts	SH	Neeradoba & Dhamar WL
<i>Hydrolea zeylanica</i> (Linnaeus) Vahl [Hydroleaceae]; N.A. Haque 117	Veg	Fls & frts	Fls & frts	Fls & frts	WH	Urpada; Hasila Beel
<i>Hydrocotyle javanica</i> Thunberg [Araliaceae]; N.A. Haque 129	–	Veg	Fls & frts	Veg	WH	Neeradoba & Kornoi river bank
<i>Hygrophila difformis</i> Blume [Acanthaceae]; N.A. Haque 053	Fls & frts	Veg	–	Veg	WH	Urpada & Sidli beel
<i>Hygrophila auriculata</i> (Schumacher) Heine [Acanthaceae]; N.A. Haque 085	Fls & frts	Veg	–	Veg	WH	Hasila; Urpada & Sidli beel
<i>Hygroryza aristata</i> (Retzius) Nees ex Wight & Arnott [Poaceae]; N.A. Haque 077	Veg	Veg	Fls & frts	Fls & frts	FSAH	Neeradoba & Hasila beel
<i>Ipomoea aquatica</i> Forsskal [Convolvulaceae]; N.A. Haque 083	–	Veg	Fls & frts	Veg	FSAH	Urpada; Neeradoba beel

Name of Taxa [Family]; Voucher specimen	Seasonal phenophases				Habit /Micro-habit	Locality (River/ Beel/ WL)
	Winter	Pre-monsoon	Monsoon	Retreating monsoon		
<i>Ipomoea carnea</i> Jacquin [Convolvulaceae]; N.A. Haque 125	Veg	Fls & frts	Fls & frts	Veg	WH	Urpada; Hasila beel
<i>Juncus prismatocarpus</i> R. Brown [Juncaceae]; N.A. Haque 079	–	Veg	Fls & frts	Veg	WH	Kumbri & Hasila beel
<i>Justicia diffusa</i> Willdenow [Acanthaceae]; N.A. Haque 012	Veg	Fls & frts	Fls & frts	Veg	WH	Bakaitari & Dhamar WL
<i>Kyllinga brevifolia</i> Rottbøll [Cyperaceae]; N.A. Haque 118	–	Veg	Fls & frts	Veg	WH	Urpada & Korno river bank
<i>Lemna minor</i> Linnaeus [Araceae]; N.A. Haque 097	Veg	–	Fls & frts	Fls & frts	FH	Hasila; Kumri & Urpada beel
<i>Lemna perpusilla</i> Torrey [Araceae]; N.A. Haque 123	–	Veg	Fls & frts	Veg	FH	Urpada & Kumbri beel
<i>Linnophila heterophylla</i> (Roxburgh) Benth [Plantaginaceae]; N.A. Haque 018	Fls & frts	–	Veg	Fls & frts	SAH	Urpada; Hasila beel
<i>Lindernia crustacea</i> (Linnaeus) F. Mueller [Linderniaceae]; N.A. Haque 080	Veg	Fls & frts	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Leucas aspera</i> (Willdenow) Link [Lamiaceae]; N.A. Haque 010	Fls & frts	Fls & frts	Fls & frts	Veg	WH	Korno river bank
<i>Lippia alba</i> (Miller) N.E. Brown ex Britton & P. Wilson [Verbenaceae]; N.A. Haque 054	Fls & frts	Fls & frts	Veg	–	WH	Jaljali & Korno river bank
<i>Ludwigia adscendens</i> (Linnaeus) H. Hara [Onagraceae]; N.A. Haque 088	Veg	Fls & frts	Fls & frts	Veg	FSAH	Urpada beel
<i>Ludwigia perennis</i> Linnaeus [Onagraceae]; N.A. Haque 105	Veg	Veg	Fls & frts	Veg	WH	Jaljali river bank
<i>Ludwigia peruviana</i> (Linnaeus) H. Hara [Onagraceae]; N.A. Haque 119	Veg	Veg	Fls & frts	Fls & frts	FSAH	Neeradoba beel; Dhamar WL
<i>Mazus pumilus</i> (Burman f.) Steenis [Phrymaceae]; N.A. Haque 089	Veg	Fls & frts	Fls & frts	Fls & frts	WH	Dhamar WL
<i>Melastoma malabathricum</i> Linnaeus [Melastomataceae]; N.A. Haque 122	Veg	Fls & frts	Fls & frts	Veg	WH	Bakaitari WL
<i>Merremia hederacea</i> (Burman f.) Hallier f. [Convolvulaceae]; N.A. Haque 131	Veg	Veg	–	Fls & frts	WH	Korno river bank & Neeradoba beel
<i>Monochoria hastata</i> (Linnaeus) Solms [Pontederiaceae]; N.A. Haque 031	Veg	Fls & frts	Fls & frts	Veg	WH	Matia & Hekera beel
<i>Monochoria vaginalis</i> (Burman f.) C. Presl [Pontederiaceae]; N.A. Haque 015	–	Veg	Fls & frts	Fls & frts	WH	Urpada & Bakaitari WL
<i>Mimosa pudica</i> Linnaeus [Leguminosae: Mimosoideae]; N.A. Haque 091	Veg	Fls & frts	Fls & frts	Veg	WH	Check cheki; Neeradoba beel
<i>Myriophyllum indicum</i> Willdenow [Haloragaceae]; N.A. Haque 051	Veg	Fls & frts	Fls & frts	Veg	EAH	Urpada beel & Dhamar WL
<i>Najas indica</i> (Willdenow) Chamiasso [Hydrocharitaceae]; N.A. Haque 037	Veg	–	Veg	Fls & frts	SH	Urpada & Sidli beel
<i>Najas minor</i> Allioni [Hydrocharitaceae]; N.A. Haque 004	Veg	–	Veg	Fls & frts	SH	Urpada & Sidli beel
<i>Nelumbo nucifera</i> Gaertner [Nelumbonaceae]; N.A. Haque 035	Veg	Fls & frts	Fls & frts	Veg	FLAH	Bakaitari; Kumbri beel
<i>Nymphaea pubescens</i> Willdenow [Nymphaeaceae]; N.A. Haque 011	–	–	Veg	Fls & frts	FLAH	Neeradoba; Urpada beel
<i>Nymphaea rubra</i> Roxburgh ex Andrews [Nymphaeaceae]; N.A. Haque 023	–	–	Veg	Fls & frts	FLAH	Sidli; Urpada; Hasila; Neeradoba beel

Name of Taxa [Family]; Voucher specimen	Seasonal phenophases				Habit /Micro-habit	Locality (River/ Beel/ WL)
	Winter	Pre-monsoon	Monsoon	Retreating monsoon		
<i>Nymphaea nouchali</i> Burman f. [Nymphaeaceae]; N.A. Haque 040	–	-	Veg	Fls & frts	FLAH	Urpad; Hasila; Neeradoba beel
<i>Nymphoides cristata</i> (Roxburgh) Kuntze [Menyanthaceae]; N.A. Haque 059	Veg	Fls & frts	Veg	-	FLAH	Kornoi; Jaljali river bank
<i>Nymphoides indica</i> (Linnaeus) Kuntze [Menyanthaceae]; N.A. Haque 038	Veg	Fls & frts	Veg	–	FLAH	Neeradoba; Dhamar WL
<i>Nymphoides hydrophylla</i> (Loureiro) Kuntze [Menyanthaceae]; N.A. Haque 047	–	–	Veg	Fls & frts	FLAH	Hasila; Urpad; Neeradoba beel
<i>Ocimum basilicum</i> Linnaeus [Lamiaceae]; N. A. Haque 096	Fls & frts	Fls & frts	Fls & frts	Veg	WH	Kornoi river bank
<i>Oenanthe javanica</i> (Blume) de Candolle [Apiaceae]; N.A. Haque 052	–	Veg	Fls & frts	Veg	WH	Sidli; Neeradoba beel area
<i>Oxalis corniculata</i> Linnaeus [Oxalidaceae]; N.A. Haque 069	Veg	Fls & frts	Fls & frts	Veg	WH	Neeradoba beel
<i>Oxalis latifolia</i> Kunth [Oxalidaceae]; N.A. Haque 006	Veg	Fls & frts	Fls & frts	Veg	WH	Neeradoba beel
<i>Paspalidium flavidum</i> (Retzius) A. Camus [Poaceae]; N.A. Haque 108	–	Veg	Fls & frts	Veg	WH	Neeradoba beel
<i>Paspalum scrobiculatum</i> Linnaeus [Poaceae]; N.A. Haque 030	–	Veg	Fls & frts	Veg	WH	Urpad beel
<i>Myriophyllum indicum</i> Willdenow [Haloragaceae]; N.A. Haque 051	Veg	Fls & frts	Fls & frts	Veg	EAH	Urpad beel & Dhamar WL
<i>Peperomia pellucida</i> (Linnaeus) Kunth [Piperaceae]; N.A. Haque 009	–	Veg	Fls & frts	Veg	WH	Dhamar WL, Kornoi river bank
<i>Persicaria barbata</i> (Linnaeus) H. Hara [Polygonaceae]; N.A. Haque 128	Veg	Fls & frts	Fls & Frts	Veg	WH	Dhamar WL
<i>Persicaria hydropiper</i> (Linnaeus) Delarbre [Polygonaceae]; N.A. Haque 099	–	Veg	Fls & frts	Veg	WH	Neeradoba & Urpad beel
<i>Persicaria glabra</i> (Willdenow) M. Gomez [Polygonaceae]; N.A. Haque 052	Fls & frts	Fls & frts	Veg	–	WH	Neeradoba beel, Kornoi river bank
<i>Persicaria orientalis</i> (Linnaeus) Spach [Polygonaceae]; N.A. Haque 130	–	Veg	Fls & frts	Veg	WH	Kornoi river bank, Dhamar WL
<i>Polygonum plebeium</i> R. Brown [Polygonaceae]; N.A. Haque 066	Veg	Fls & frts	Veg	–	WH	Neeradoba; Urpad beel
<i>Phragmites karka</i> (Retzius) Trinius ex Steudel [Poaceae]; N.A. Haque 075	–	Veg	Fls & frts	Veg	WH	Dhamar WL
<i>Physalis minima</i> Linnaeus [Solanaceae]; N.A. Haque 020	–	Veg	Fls & frts	Veg	WH	Kornoi river bank
<i>Phyla nodiflora</i> (Linnaeus) Greene [Verbenaceae]; N.A. Haque 132	Veg	Fls & frts	Fls & frts	Veg	WH	Dhamar & Kornoi river bank
<i>Pistia stratiotes</i> Linnaeus [Araceae]; N.A. Haque 043	–	Veg	Fls & frts	Veg	FH	Urpad; Kumbri & Neeradoba beel
<i>Potamogeton crispus</i> Linnaeus [Potamogetonaceae]; N.A. Haque 126	–	Fls & frts	Veg	–	SH	Neeradoba & Kornoi river
<i>Potamogeton pectinata</i> Linnaeus [Potamogetonaceae]; N.A. Haque 133	–	Fls & frts	Veg	–	SH	Neeradoba & Urpad beel
<i>Pouzolzia zeylanica</i> (Linnaeus) Bennett & R. Brown [Urticaceae]; N.A. Haque 106	–	Veg	Fls & frts	Veg	WH	Dhamar WL & Chitalmari beel
<i>Ranunculus sceleratus</i> Linnaeus [Ranunculaceae]; N.A. Haque 029	Veg	Fls & frts	Veg	-	WH	Kornoi; Jaljali river bank

Name of Taxa [Family]; Voucher specimen	Seasonal phenophases				Habit /Micro-habit	Locality (River/ Beel/ WL)
	Winter	Pre-monsoon	Monsoon	Retreating monsoon		
<i>Rorippa indica</i> (Linnaeus) Hiern [Brassicaceae]; N.A. Haque 021	Veg	Fls & frts	Fls & frts	Fls & frts	WH	Urpada beel
<i>Rotala rotundifolia</i> (Buchanan-Hamilton ex Roxburgh) Koehne [Lythraceae]; N.A. Haque 124	Veg	Veg	Fls & frts	Fls & frts	EAH	Neeradoba & Dhamar WL
<i>Rungia pectinata</i> (Linnaeus) Nees [Acanthaceae]; N.A. Haque 007	Veg	Fls & frts	Fls & frts	Veg	WH	Kornoi river bank & Dhamar WL
<i>Rumex dentatus</i> Linnaeus [Polygonaceae]; N.A. Haque 112	Fls & frts	Fls & frts	Veg	–	WH	Jaljali river bank
<i>Rumex nepalensis</i> Sprengel [Polygonaceae]; N.A. Haque 008	Fls & frts	Fls & frts	Veg	–	WH	Jaljali river bank
<i>Saccharum spontaneum</i> Linnaeus [Poaceae]; N.A. Haque 090	Veg	–	Veg	Fls & frts	WH	Jaljali river bank
<i>Sagittaria sagittifolia</i> Linnaeus [Alismataceae]; N.A. Haque 044	–	Veg	Fls & frts	Veg	FLAH	Urpada beel
<i>Schenoplectiella articulata</i> (Linnaeus) Lye [Cyperaceae]; N.A. Haque 058	Veg	–	Veg	Fls & frts	WH	Urpada beel
<i>Schumannianthus dichotomus</i> (Roxburgh) Gagnepain [Marantaceae]; N.A. Haque 041	Veg	Fls & frts	Fls & frts	Veg	WH	Dubapara River bank
<i>Spilanthes acmella</i> (Linnaeus) Linnaeus [Asteraceae]; N.A. Haque 039	Veg	Veg	Fls & frts	Fls & frts	WH	Kornoi river bank
<i>Spirodela polyrrhiza</i> (Linnaeus) Schleiden [Araceae]; N.A. Haque 050	–	Veg	Fls & frts	Veg	FH	Urpada beel
<i>Scoparia dulcis</i> Linnaeus [Plantaginaceae]; N.A. Haque 017	Veg	Fls & frts	Fls & frts	Fls & frts	WH	Dhamar WL; Lakhipur
<i>Senna tora</i> (Linnaeus) Roxburgh [Leguminosae: Caesalpinioideae]; N.A. Haque 072	–	Fls & frts	Fls & frts	Veg	WH	Kornoi river bank
<i>Senna sophera</i> (Linnaeus) Roxburgh [Leguminosae: Caesalpinioideae]; N.A. Haque 063	–	Fls & frts	Fls & frts	Veg	WH	Hasila beel & Kornoi river bank
<i>Solanum americanum</i> Miller [Solanaceae]; N.A. Haque 081	Fls & frts	Fls & frts	Fls & frts	Veg	WH	Hasila beel
<i>Solanum torvum</i> Swartz [Solanaceae]; N.A. Haque 082	Fls & frts	Fls & frts	Fls & frts	Veg	WH	Kornoi river bank & Hasila beel
<i>Tridax procumbens</i> (Linnaeus) Linnaeus [Asteraceae]; N.A. Haque 026	–	Veg	Fls & frts	Veg	WH	Dhamar & Kornoi river bank
<i>Trapa natans</i> var. <i>bispinosa</i> (Roxburgh) Makino [Lythraceae]; N.A. Haque 074	Veg	Fls & frts	Fls & frts	Veg	EAH	Neeradoba; Urpada & Hasila beels
<i>Utricularia stellaris</i> Linnaeus f. [Lentibulariaceae]; N.A. Haque 100	–	Veg	Fls & frts	Veg	SAH	Urpada; Neeradoba beel
<i>Vallisneria spiralis</i> Linnaeus [Hydrocharitaceae]; N.A. Haque 083	–	Veg	Fls & frts	Fls & frts	SH	Neeradoba & Hekera beel
<i>Wolffia arrhiza</i> (Linnaeus) Horkel ex C.F.H. Wimmer [Araceae]; N.A. Haque 094	–	Veg	Fls & frts	Veg	FH	Neeradoba & Urpada beel
<i>Wolffiella gladiata</i> (Hegelmaier) Hegelmaier [Araceae]; N.A. Haque 121	–	Veg	Fls & frts	Veg	FH	Urpada beel

Table 2. Aquatic Pteridophytes recorded from different wetlands of the Goalpara district of Assam

Name of Taxa [Famiy]; <i>Voucher specimen</i>	Period of occurrence	Habit	Locality
<i>Azolla pinnata</i> R. Brown [Azollaceae]; <i>N.A. Haque 019</i>	Throughout the Year	FA	Jaljali river bank
<i>Ceratopteris thalictroides</i> (Linnaeus) Brongniart [Pteridaceae]; <i>N.A. Haque 103</i>	July – September	FLAH	Urpada beel
<i>Marsilea minuta</i> Linnaeus [Marsileaceae]; <i>N.A. Haque 010</i>	- do -	FLAH	Urpada & Neeradoba
<i>Salvinia adnata</i> Desvaux [Salviniaceae]; <i>N.A. Haque 087</i>	- do -	FA	Urpada beel
<i>Salvinia cucullata</i> Roxburgh [Salviniaceae]; <i>N.A. Haque 069</i>	- do -	EA	Urpada beel
<i>Salvinia natans</i> (Linnaeus) Allioni [Salviniaceae]; <i>N.A. Haque 036</i>	- do -	FA	Jaljali river bank

Total 132 species of aquatic macrophytes (Angiosperms and Pteridophytes) covering 107 genera from 46 families have been recorded (**Table 3**). Out of which 126 species are Angiosperms from 103 genera and 42 families; and 6 species under 4 genera representing 4 families are Pteridophytes. Of the angiosperms 81 species from 68 genera and 30 families are dicotyledonous and 45 species from 35 genera and 12 families are monocotyledonous.

Table 3: Numerical representation of aquatic macrophytes in Goalpara district:

Taxa		No. of taxa		
		Family	Genera	Species
Angiosperms	Dicotyledons	30	68	81
	Monocotyledons	12	35	45
Pteridophytes		04	04	06
TOTAL		46	107	132

The hydrophytes are rapidly growing and forming a dense mat on major part of the water bodies. The middle of the water bodies are dominated by various submerged and free floating macrophytes whereas the sedges, grasses and few reeds are dominating in the peripheral areas. Among the recorded hydrophytes, the predominant families are Asteraceae (9 spp.), Cyperaceae (9 spp.) and Poaceae (9 spp.) followed by Araceae (7 spp.).

Number of species recorded from various wetlands are as follows: Urpada – 45 spp.; Neeradoba – 42 spp.; Hasila – 18 spp.; Sidli – 07 spp.; Kumri – 05 spp.; Chekcheki – 02 spp.; Hekera – 02 spp.; Matia – 01 spp.; Chitalmari – 01 spp.; Garomari – 01 spp. and in wetlands like Dhamar – 30 spp.; Bakaitari – 06 spp. and in river bank of Korno – 30 spp.; Jaljali – 14 spp.; Dubapara – 01 spp.

It was observed that all hydrophytes do not show similar phenophases. Out of total 132 species, Angiosperms showing phenophase in different seasons were: Winter – 69 spp.; Pre-Monsoon – 119 spp.; Monsoon – 117 spp. and Retreating-Monsoon – 107 spp. Species

which showed phenophases round the year belong to Dicot (32); Monocot (08) and Aquatic fern (05). It is interesting to note that *Nelumbo nucifera* Gaertner occurs only in two perennial wetlands viz. Kumbri and Bakaitari.

Though the aquatic vegetation is very interesting with rich floral diversity in this district; the extremely high degree of anthropogenic interferences is steadily degrading the habitat and the vegetation is quickly losing its elements. Mostly different developmental projects for urbanization have been affecting the aquatic vegetation. So it is utmost important to take proper conservative measures to maintain biological diversity of all these wetlands.

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