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Present status of aquatic macrophytes of the wetlands of Nalbari district of Assam, India

Upen Deka* and Sarada Kanta Sarma

Department of Botany, Gauhati University, Guwahati, Assam, India

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ABSTRACT

The present investigation deals with the documentation of aquatic macrophytes from the wetlands of Nalbari district of Assam India situated at the global position between 26^0 $10'$ N to 26^0 $47'$ N latitude and 90^0 $15'$ E to 91^0 $10'$ E longitude . The study was carried out in four important wetlands of the district viz. Batua kamakhya beel, Borbilla beel, Borali beel and Ghoga beel for a period of two years i.e. January 2012 to December 2013. All the four wetlands are perennial in nature that remains covered by water along with its aquatic vegetation almost throughout the year. These four wetlands cover a total area of more than 200 hectares. During the investigation the wetlands were visited regularly twice in a month for two years and species growing there were recorded. During the present study, 137 macrophytic species belonging to 114 genera and 53 families have been reported. Poaceae was the most dominant families with 15 species followed by Asteraceae (13 species), Cyperaceae (11 species), Nympheaceae (7 species), and Araceae (6 species).Twenty eight families were represented by one species each. But unfortunately, such very resourceful wetlands of the district are gradually degrading due to various natural and manmade activities like recurring flood that causes heavy siltation, construction of dykes, development of commercial fisheries, excessive growth of invasive aquatic weeds mainly Eichhornia crassipes (Mart.)S.L., Leersia hexandra SW and Hymenachne acutigluma (Steud)Gill which are suppressing the growth of other associated species.

Key words: Wetlands, Macrophytic species, Degradation, Assam.

INTRODUCTION

Aquatic and wetland plants are mostly confined to the marshes and wetland habitats. These waterlogged or wet soils form the diverse habitats for specific aquatic plant communities, which in a broader sense is known as wetland. They are ecologically characterized by the presence of water i.e. fresh, brakish, saline or euthropic; hydric soil; at least a few hydrophytic vegetation and also by the absence of flood intolerant vegetation. “Wetland” is the collective term for marshes, swamps, bogs and similar areas and are the source of many valuable aquatic flora and fauna and endangered species [1]. Although wetlands cover only six percent of the earth’s surface[2], they provide habitats for about 20 percent of the earth’s total biological diversity [3].

The freshwater, perennial, large, lentic water bodies are popularly known as ‘beel’ in Assam [4]. The large aquatic plants, also known as “aquatic macrophyte” are the important source of food, fodder, herbal medicine and domestic household materials for the people residing in its vicinities.

Wetlands that provide benefits are of two categories- ecological and economical. In the ecological terms, wetland plants, both living or their debris are of significance in retaining the requisite carbon and methane balance of our environment and thus maintaining green house equilibria [5].Therefore, wetland plants having floating or emergent leaves are considered to be an important tool in reducing global rise in temperature [6].

Submerged plants are the generators of oxygen in the aquatic system. In controlled growth situations, either naturally or by human interference, aquatic plants can purify water, but if uncontrolled growth takes place, they can

reach the levels of pests and are frequently regarded as aquatic weeds. Aquatic plants can reduce biological oxygen demand, and these plants are now exploited for biofiltration of organic waste in the wastewater treatment systems [6].

Several works relating to aquatic and wetland flora have been carried out by many workers throughout the world including various parts of India [7,8,9,10,11,12]. In Assam some researchers have reported about the wetlands and the aquatic plant of the state [13,14,15]. The works regarding the ecological studies of aquatic macrophytes of Assam were done by the few workers [16,17,18]. Other notable workers [19] carried out the phytosociological investigation visa vis human impact on two wetlands of Sonitpur district of Assam. More recently quantative analysis of macrophytes and physicochemical properties of water of two wetlands were also reported from the Nalbari district of Assam [20]. Significant works on Subansiri river ecosystem of North East India were carried out like statistical overview of certain physicochemical parameters [21], influence of riparian flora on the river bank health of Subansiri river [22], pre-impact studies of the 2000 MW lower subansiri dam on certain aquatic environmental aspects of downstream of the river Subansiri with special reference to plankton and fishes [23]. Utilization of wetland resources by the rural people of Nagaon district of Assam was carried out by earlier worker [24]

Many terrestrial weeds are also found in the ecotone region of wetlands that possess several medicinal properties. The study of such weeds having medicinal properties from the crop fields have already been reported [25], many of which grow in the ecotone region of wetlands of Nalbari district of Assam as well. Studies on medicinal plants which also grow in the same ecotone region and are used by Bodo tribe of Nalbari district of Assam, traditional use of such type of weeds used as herbal medicine by Madahi tribe of Nalbari district of Assam, and ethnomedicinal uses of plant species which also grow well in the ecotone region of wetlands and terrestrial habitats, used by the Sarania tribe of Nalbari district of Assam have already been reported by earlier workers [26,27,28]. The study on herbal medicines obtained from the plant species growing in the marshy habitats of wetlands are used by the common people in Barpeta district of Assam situated in the adjacent area of the present study site was also carried out by the earlier worker [29]. So far no elaborate study regarding the aquatic macrophytes of Nalbari district of Assam has been done. Therefore the present study has been carried out for documentation of aquatic macrophytes from the wetlands of Nalbari district of Assam and also to report its present status.

MATERIALS AND METHODS

Study area:

Nalbari district of Assam extends from 26^0 $10^/$ N to 26^0 $47^/$ N latitude and 90^0 $15^/$ E to 91^0 $10^/$ E longitude. The district is bounded in the north by the Indo-Bhutan International boundary, in east and south by Kamrup district and the west is bounded by Barpeta district. The maximum and minimum temperatures of the district are 35^oC and 6^oC respectively. The normal annual rainfall in the district is 2685.5 mm. The district has many ponds, tanks, rivers, ditches, low-lying water logged areas, rice fields and wetlands locally known as *beels* which are ideal habitats for many aquatic, semi aquatic wetland and marshy plants. The four wetlands covered during the present investigation are the most significant ones of the district. The two largest wetlands of the district i.e. Batua kamakhya beel and Borbilla beel are situated in south-western and western side of the district covering an area of 65 hectares and 55 hectares respectively. Other two wetlands Borali beel and Ghoga beel are situated in east and northeast side of the district covering a total area of more than 100 hectares. Batua kamakhya beel and Borbilla beel are facing disturbances of both natural as well as man induced. The other two wetlands Borali beel and Ghoga beel confronts mainly natural disturbances of very high intensity in the form of flood during the summer of every year, caused by the river Pagladia which is a tributary of the river Brahmaputra.

During the present study, monthly surveys to record, collect and identify the aquatic macrophytes were carried out from January 2012 to December 2013, not only in the four wetlands as mentioned but also in the other aquatic habitats of the study area. Adequate field trips were undertaken during the study period to collect and record precisely the macrophytic species. Since most of the hydrophytic species are herbaceous, they were uprooted completely and pressed under newspapers in the field itself after proper washing .For submerged aquatic macrophytes drying papers were changed every alternate day. After drying, the dried specimens were poisoned by dipping the whole specimen in saturated solution of mercuric chloride (HgCl2) in absolute ethyle alcohol. The poisoned specimens were then mounted on harbarium sheets by following the usual laboratory techniques. Some of the specimens with their flowers and fruits and even the whole plants have been preserved in FAA solution.

The plant species were identified with the help of available literatures particularly the local floras, and monographs and also by matching the species at the herbaria of department of Botany, Gauhati University, Guwahati and Kanjilal Herbarium, Shillong, Assam, India.

The macrophyte species were categorized by following the system presented by earlier worker [30].

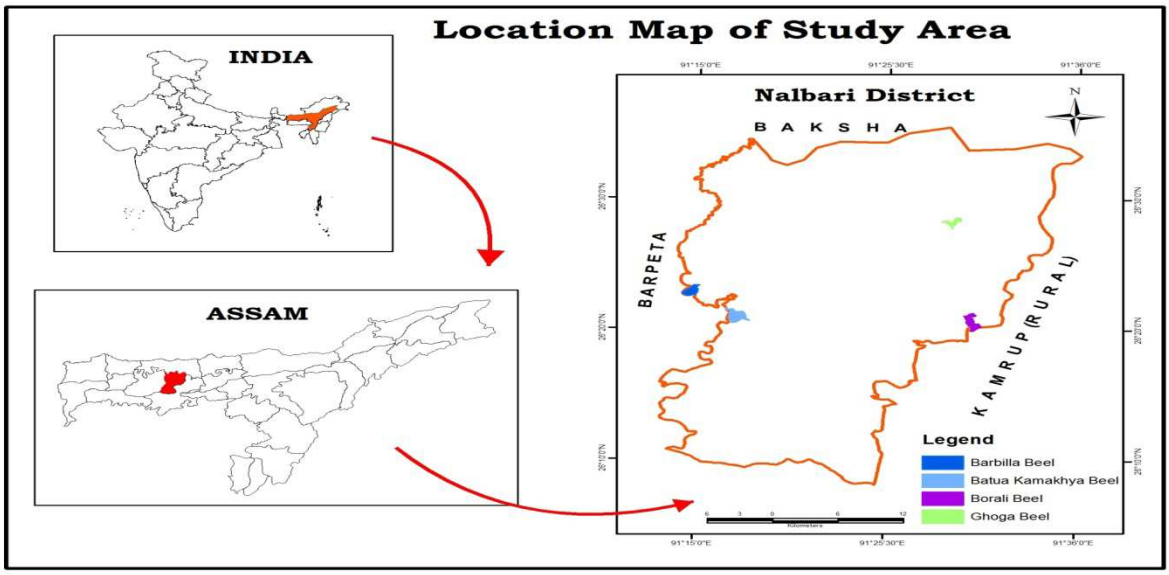

Figure 1: Map showing the location of the study sites of the Nalbari district of Assam, India

RESULTS AND DISCUSSION

During the present study, 137 macrophytic species belonging to 114 genera and 53 families have been reported from the wetlands of the Nalbari district of Assam as shown in Table1. Dominant families were Poaceae with 15 species followed by Asteraceae (13 species), Cyperaceae (11 species), Nymphaeaceae (7 species), and Araceae (6 species). Twenty eight families namely Caesalpiniaceae, Zinziberaceae, Aponogetonace, Papaveraceae, Brassicaceae, Arecaceae, Cannabaceae, Ceratophyllaceae, Boraginaceae, Equisetaceae, Lemiaceae, Haloragaceae, Oxalidaceae, Pandanaceae, Verbenaceae, Potamogetonaceae, Urticaceae, Salicaceae, Combretaceae, Typhaceae, Malvaceae, Azollaceae, Perkariaceae, Dryopteridaceae, Marseliaceae, Salviniaceae, Lentilariaceae and Cannaceae were monospecific (Table:2).

Table 1: List of aquatic macrophytic species from the wetlands of Nalbari district of Assam, India

[H= Herb, Us= Undershrub, Sh= Shrub, Cl= Climber, ST= Small tree, SM=Swampy and Marshy, EA= Emergent Anchored, FF= Free Floating, RFL= Rooted with Floating Leaved, SA= Submerged Anchored, SS= Submerged Suspended]

Sl no	Scientific name	Family	Habit	Habitat	Life form
1	*Acorus calamus* Linn.	Araceae	H	Perennial	SM
2	*Achyranthus aspera* L.	Amaranthaceae	H	Annual	EA
3	*Adenostoma levinae*	Asteraceae	H	Annual	SM
4	*Aeschynomene aspera* L.	Papilionaceae	Us	Annual	EA
5	*A. indica* L.	Papilionaceae	Us	Annual	EA
6	*Ageratum conyzoides* L.	Asteraceae	H	Annual	SM
7	*Alisma plantago* L.	Alismaceae	H	Perennial	SM
8	*Alocasia indica* (Lour) Koch	Araceae	H	Perennial	SM
9	*Alpinia allughas* (Retz.)Rosc.	Zingiberaceae	Sh	Perennial	SM
10	*Alternanthera philoxeroides* (Mar) Grisep.	Amaranthaceae	H	Perennial	EA
11	*A. sessilis* (L.) R.Br.ex DC.	Amaranthaceae	H	Perennial	SM
12	*Amaranthus virides* L.	Amaranthaceae	H	Annual	SM
13	*A. spinosus* L.	Amaranthaceae	H	Annual	SM
14	*Amorphophallus campanulatus* (Roxb.) Bl.	Araceae	H	Perennial	SM
15	*Aponogeton appendiculatus* H.Brug	Aponogetonaceae	H	Annual	SA
16	*Argemone mexicana* L.	Papaveraceae	H	Perennial	SM
17	*Aurundo donax* L.	Poaceae	H	Annual	EA
18	*Auxonopus compressus* (Sw.) P. Beauv.	Poaceae	H	Perennial	SM
19	*Azolla pinnata R.Br.*	Azollaceae	H	Annual	FF
20	*Bacopa monnieri* (L.) Penn.	Scrophulariaceae	H	Perennial	SM
21	*Blumea laciniata* (Roxb.) DC.	Asteraceae	H	Annual	SM
22	*Brassica junceae* (L.) Czern.	Brassicaceae	H	Annual	SM
23	*Calamus erectus*	Arecaceae	Sh	Perennial	SM
24	*Canabis sativa L.*	Cannabinaceae	Sh	Perennial	SM
25	*Carex baceans* Nees	Hydrocharitaceae	H	Perennial	SM

26	*Canna indicaL.*	Cannaceae	H	Perennial	SM
27	*Cassia tora* L.	Caesalpiniaceae	H	Perennial	SM
28	*Caytonis* spp.	Poaceae	H	Annual	SM
29	*Centella asiatica* (L.) Urban	Apiaceae	H	Annual	SM
30	*Ceratophyllum demersum* L.	Ceratophyllaceae	H	Annual	SS
31	*Ceratopteris thalictroides* Brogn	Perkariaceae	H	Annual	SM
32	*Chelaenthus* sp.	Pteridaceae	H	Perennial	SM
33	*Colocasia esculenta* (L.) Schott.	Araceae	H	Perennial	SM
34	*Commelina benghalensis* L.	Commelinaceae	H	Annual	SM
35	*Cuphea balsamona* Chem et Sahlocht	Lythraceae	H	Annual	SM
36	*Coffea benghalensis* Wall.ex.Roxb.	Rubiaceae	Sh	Perennial	SM
37	*Cynodon dactylon* (L) Pers.	Poaceae	H	Perennial	SM
38	*Cynoglossum zeylanicum* (Vahl.) Thunb.ex Lehm.	Boraginaceae	H	Annual	SM
39	*Cyperus bulbosus* Vahl.	Cyperaceae	H	Annual	EA
40	*C. compressus* L.	Cyperaceae	H	Annual	EA
41	*C. corymbosus* Rottb.	Cyperaceae	H	Perennial	EA
42	*C.rotundus* L.	Cyperaceae	H	Annual	EA
43	*Dentella repens* Forst.	Rubiaceae	H	Annual	SM
44	*Desmodium triflorum* (L.) DC.	Fabaceae	H	Perennial	SM
45	*Diplazium esculentum*(Retz.)Sw. ex Schard	Pteridaceae	H	Perennial	SM
46	*Dryopteris* sp.	Dryopteridaceae	H	Perennial	SM
47	*Eclipta prostrata* (L.) L.	Asteraceae	H	Perennial	SM
48	*Eichhornia crassipes* (Mart.) S.L.	Pontederiaceae	H	Perennial	FF
49	*Elaeocharis dulcis* (Burm.F.) Henschel.	Cyperaceae	H	Annual	EA
50	*Elephantopus scaber* L.	Asteraceae	H	Annual	SM
51	*Enhydra fluctuans* Lour.	Asteraceae	H	Annual	SM
52	*Equisetum ramosissimum* Desf.	Equisetaceae	H	Annual	SM
53	*Euphorbia hirta* L.	Euphorbiaceae	H	Annual	SM
54	*Euryale ferox* Salisb.	Nymphaeaceae	H	Perennial	RFL
55	*Fimbristylis bisumbellata*	Cyperaceae	H	Annual	EA
56	*Grangea maderaspatana* (L.) Poir.	Asteraceae	H	Annual	SM
57	*Hydrilla verticillata* (L.f.) Royle.	Hydrocharitaceae	H	Annual	SA
58	*Hydrocotyl sibthorpioides* Lmmk.	Apiaceae	H	Annual	SM
59	*Hygrophila polysperma* (Roxb.) T.Anders.	Acanthaceae	H	Annual	SA
60	*Hygroryza aristata* (Retz.) Nees.	Poaceae	H	Perennial	RFL
61	*Hymenachne acutigluma* (Steud) Gill.	Poaceae	H	Perennial	EA
62	*H. assamica* Hitch	Poaceae	H	Perennial	EA
63	*Imperata cyllindrica* (L.) P. Beauv.	Poaceae	H	Perennial	SA
64	*Ipomoea aquatica* Forssk.	Convolvulaceae	H	Annual	RFL
65	*I. carnea* Jaeq.	Convolvulaceae	Sh	Perennial	EA
66	*Ischemum albens*	Asteraceae	H	Perennial	EA
67	*Jussiea repens*	Onagraceae	H	Annual	SM
68	*Kyllinga monocephela* Roxb.	Cyperaceae	H	Perennial	EA
69	*Lasia spinosa* Thw.	Araceae	Sh	Perennial	SA
70	*Leersia hexandra* Sw.	Poaceae	H	Perennial	EA
71	*Lemna purpusilla* Torrey	Lemnaceae	H	Annual	FF
72	*Leucas aspera* Link	Lemiaceae	H	Perennial	SM
73	*Limnophila indica* (L.)Druce	Scrophulariaceae	H	Annual	SA
74	*L. heterophylla* (Roxb.) Ben	Scrophulariaceae	H	Annual	SA
75	*Ludwigia adscandens* (L.) Hara	Onagraceae	H	Annual	RFL
76	*L. parviflora* Roxb.	Onagraceae	H	Perennial	EA
77	*L. perennis* L.	Onagraceae	H	Perennial	EA
78	*L.octavalis*	Onagraceae	H	Perennial	EA
79	*Majus regosa*	Scrophulariaceae	H	Perennial	SM
80	*Marsalia quadrifolia L.*	Marseliaceae	H	Annual	EA
81	*Mikania micrantha* Willd.	Asteraceae	H	Perennial	SM
82	*Monochoria hastata* Presl.	Pontederiaceae	H	Perennial	EA
83	*M. vaginalis* C.Presl.	Pontederiaceae	H	Annual	EA
84	*Murdania nudiflora*	Commelinaceae	H	Annual	SM
85	*Myriophyllum tuberculatum* Roxb.	Haloragaceae	H	Annual	RFL
86	*Najas indica* (Willd.) Cham.	Najadaceae	H	Annual	SA
87	*Najas minor* All.	Najadaceae	H	Annual	SA
88	*Nelumbo nucifera Geartn.*	Nymphaeaceae	H	Perennial	RFL
89	*Nymphaea alba* L.	Nymphaeaceae	H	Perennial	RFL
90	*N.nouchali* Burm.f.	Nymphaeaceae	H	Perennial	RFL
91	*N.rubra* Roxb.ex Salisb.	Nymphaeaceae	H	Perennial	RFL
92	*Nymphoides cristata* (Roxb.)Kuntze	Nymphaeaceae	H	Perennial	RFL
93	*N.indica* (L.) Kuntze	Nymphaeaceae	H	Perennial	RFL
94	*Oldenlindia corymbosa* L.	Rubiaceae	H	Annual	EA
95	*Oplismenus compositus* Beauv.	Poaceae	H	Annual	SM
96	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae	H	Annual	SA

97	*Oxlis corniculata* L.	Oxalidaceae	H	Annual	SM
98	*Pandanus fascicularis* Lamk.	Pandanaceae	Sh	Perennial	SM
99	*Panicum repens* L.	Poaceae	H	Annual	SM
100	*Parthenium hysterophorus* L.	Asteraceae	H	Perennial	SM
101	*Phragmites karka* Trin.ex steud.	Poaceae	H	Perennial	EA
102	*Phyla nodiflora* (L.) Greene	Verbenaceae	H	Annual	SM
103	*Phyllanthus nururi* L.	Euphorbiaceae	H	Perennial	SM
104	*Pistia stratiotes* L.	Araceae	H	Annual	FF
105	*Polygonum barbatum* L.	Polygonaceae	H	Annual	EA
106	*P.glabrum* Willd.	Polygonaceae	H	Annual	SM
107	*P. hydropipper* L.	Polygonaceae	H	Annual	EA
108	*Pongamia pinnata* (L.) Pierre	Fabaceae	H	Annual	SM
109	*Potomogeton crispus* L.	Potamogetonaceae	H	Annual	SA
110	*Pouzolzia zeylanica* (L.)Benn.	Urticaceae	H	Annual	SM
111	*Rotala densiflora* Koehne	Lythraceae	H	Annual	SM
112	*Rumex dentatus* L.	Polygonaceae	H	Annual	SM
113	*R.nepalensis* Spreng.	Polygonaceae	H	Annual	SM
114	*Rungia parviflora* (Retz.) Nees.	Acanthaceae	H	Perennial	SM
115	*Saccharum spontaenum* L.	Poaceae	H	Perennial	EA
116	*Sagittaria sagittifolia* L.	Alismaceae	H	Perennial	EA
117	*Salix tetrasperma* Roxb.	Salicaceae	ST	Perennial	SM
118	*Salvinia molesta Mitcheel.*	Salviniaceae	H	Annual	FF
119	*Schoenoplectus articulatus* (L.)	Cyperaceae	H	Perennial	EA
120	*S. grossuss* (L.fil.)	Cyperaceae	H	Perennial	EA
121	*Scirpus articulatus* L.	Cyperaceae	H	Perennial	EA
122	*S.*sp.	Cyperaceae	H	Annual	EA
123	*Scoparia dulcis* L.	Scrophulariaceae	H	Annual	EA
124	*Setaria verticillata* (L.) P.Beauv.	Poaceae	H	Annual	SM
125	*Spilanthus paniculata* DC.	Asteraceae	H	Annual	EA
126	*S. clava* DC	Asterraceae	H	Annual	EA
127	*Spirodela polyrrhiza* (L.)Schl.	Lemnaceae	H	Annual	FF
128	*Tetrastigma obovatum*	Papilionaceae	Cl	Perennial	SM
129	*Trapa bispinosa* (Roxb.) Makino	Trapaceae	H	Perennial	RFL
130	*T. natans* L.	Trapaceae	H	Perennial	RFL
131	*Typha elephantina* Roxb.	Typhaceae	H	Perennial	EA
132	*Urena lobata* L.	Malvaceae	H	Perennial	SM
133	*Utricularia exoleta* R.Br.	Lentibulariaceae	H	Annual	SS
134	*Valisnaria spiralis* Linn.	Hydrocharitaceae	H	Perennial	SA
135	*Vernonia cinerea* (L.) Lees.	Asteraceae	H	Perennial	SM
136	*Vetiveria zizanoides* (L.) Nass	Poaceae	H	Perennial	SM
137	*Xanthium strumarium* L.	Asteraceae	H	Perennial	SM

Table 2. List of families with number of genera and species of wetland of Nalbari district of Assam, India

Sl no	**Top families**	**Genera**	**Species**
1	Poaceae	14	15
2	Asteraceae	13	13
3	Cyperaceae	6	11
4	Nymphaeaceae	5	7
5	Araceae	6	6
6	Scrophulariaceae	4	5
7	Onagraceae	2	5
8	Polygonaceae	2	5
9	Amaranthaceae	3	5
10	Hydrocharitaceae	4	4
11	Papilionaceae	2	3
12	Pontederiaceae	2	3
13	Rubiaceae	3	3
14	Euphorbiaceae	2	2
15	Lythraceae	2	2
16	Alismataceae	2	2
17	Apiaceae	2	2
18	Commelinaceae	2	2
19	Fabaceae	2	2
20	Convolvulaceae	1	2
21	Najadaceae	1	2
22	Acanthaceae	2	2
23	Trapaceae	1	2
24	Lemnaceae	2	2
25	Pteridaceae	2	2
26	Caesalpiniaceae	1	1

27	Zinziberaceae	1	1
28	Aponogetonaceae	1	1
29	Papaveraceae	1	1
30	Brassicaceae	1	1
31	Arecaceae	1	1
32	Cannabaceae	1	1
33	Ceratophyllaceae	1	1
34	Boraginaceae	1	1
35	Equisetaceae	1	1
36	Lemiaceae	1	1
37	Haloragaceae	1	1
38	Oxalidaceae	1	1
39	Pandanaceae	1	1
40	Verbenaceae	1	1
41	Potamogetonaceae	1	1
42	Urticaceae	1	1
43	Salicaceae	1	1
44	Perkariaceae	1	1
45	Combretaceae	1	1
46	Typhaceae	1	1
47	Malvaceae	1	1
48	Lentibulariaceae	1	1
49	Dryopteridaceae	1	1
50	Marseliaceae	1	1
51	Salviniaceae	1	1
52	Azollaceae	1	1
53	Cannaceae	1	1

The macrophyte species were categorized into six categories such as Free Floating (FF), Submerged Suspended (SS), Submerged Anchored (SA), Rooted with Floating Leaved (RFL), Emergent Anchored (EA), Swampy and Marshy (SM) following the system of Weaver and Clement (1929) and Daubenmire (1947).In terms of number of plant species, swampy and marshy species showed the largest number (68 species) followed by emergent enchored (36 species), rooted with floating leaved (13 species), submerged anchored (12 species), free floating (6 species) and submerged suspended (2 species).

Table 3: Life form of aquatic macrophytes of the study area

Sl no	Life form	Number of species
1	Free Floating	6
2	Submerged Suspended	2
3	Submerged Anchored	12
4	Rooted with Floating Leaved	13
5	Emergent Anchored	36
6	Swampy and Marshy	68

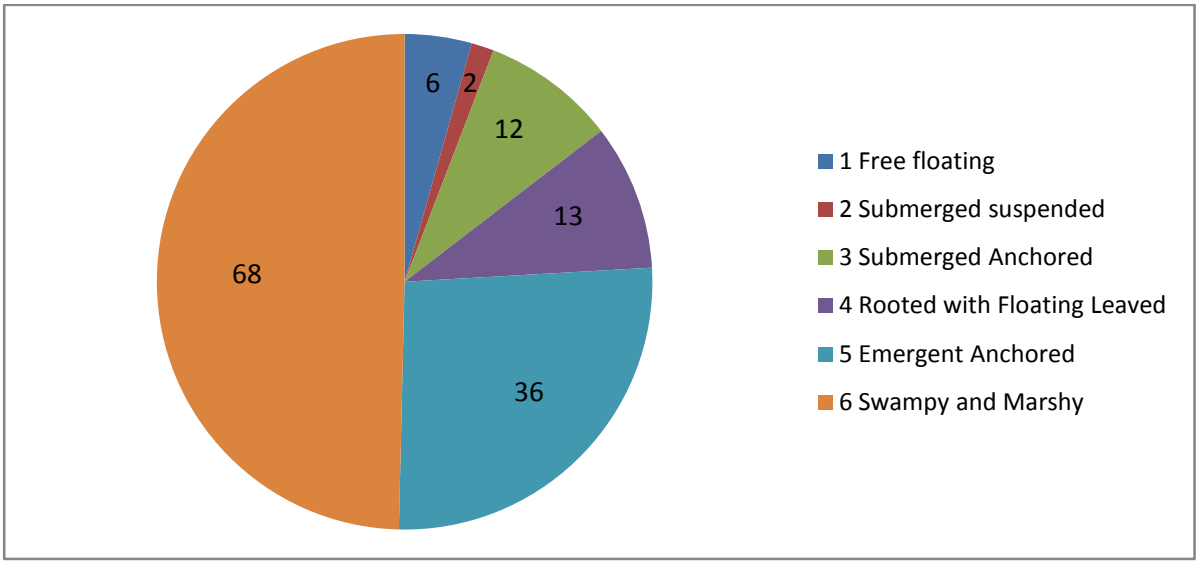

Figure2: Pi diagram showing the composition of life form of aquatic macrophytes of the wetlands of the study area

Nalbari district has many unique natural wetlands that act as a source of livelihood for the people living in the vicinities of those wetlands. They collect resources from these wetlands for different purposes like vegetables, medicines, fodders, biofertilizers and religious activities.

But unfortunately majority of the wetlands of the district are facing tremendous anthropogenic as well as natural pressures like the process of eutrophication due to the gradual decay of excessively growing aquatic weeds mainly *Eichhornia crassipes, Leersia hexandra, Hymenachne acutigluma,* siltation as a result of flood, encroachment due to construction of houses, cultivation during the winter season near the wetland areas, construction of dykes to protect the nearby villages from flood, luxuriant growth of invasive exotic aquatic weed *Eichhornia crassipes*, lack of sufficient inlet and outlet channel of the wetlands and newly developed commercial fisheries inside the wetland areas, which have directly influenced not only its floral diversity but faunal diversity as well. The natural disturbance in the form of annual flood by the river Pagladia badly affects the macrophytic community structure of the Borali beel where the purely aquatic plant communities are replaced by some patches supporting alluvial grasslands. The study also indicates that the population of few economically important species like *Euryale ferox, Trapa natans,* and *Nelumbo nucifera* are alarmingly reducing in the wetlands of the study area. This is due to the aggressive growth of invasive exotic aquatic weed *Eichhornia crassipes* and luxuriant growth of *Leersia hexandra.* The heavy siltation after flood by the river Pagladia in Borali beel and Ghoga beel wetlands are causing shrinkage of the population sizes of *Nelumbo nucifera* and *Euryale ferox.* On the other hand heavy grazing by domestic buffaloes during certain periods of the year also seasonally affects the aquatic plant community structure of Borbilla beel as well as of Batua kamakhya beel of Nalbari district.

Leersia hexandra *Nelumbo nucifera* *Trapa natans*

Hygroryza aristata *Nymphaea alba* *Hymenachne acutigluma*

Ipomoea aquatica *Nymphoides indicum* *Euryale ferox*

Figure3: Few important resource yielding plant species of the study area

CONCLUSION

The dependency on the wetlands by the people living in the vicinities of the wetlands of the Nalbari district is decreasing . This decrease of dependency on the wetlands is mainly caused by the depletion of fish diversity along with some economically important plant species like *Euryale ferox, Trapa natans,* and *Nelumbo nucifera, Ipomoea aquatica, ,Enhydra fluctuans, Nymphaea rubra, Hygroryza aristata* etc. as a result of degradation of the wetlands of the study area. This reflects the deteriorating conditions of the wetlands of the study area as sustainable aquatic ecosystems.

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