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Macrophytes Diversity in Wetlands of North Dinajpur District, West Bengal, India

Sudeshna Mukherjee and Sujit Kumar Mandal*

Taxonomy of Angiosperms and Biosystematics Laboratory, Department of Botany
Sidho Kanho Birsha University, Purulia-723 104, India
**E-mail: smondal.bot@gmail.com*

***Abstract*:** Aquatic macrophytes comprise of taxonomically most diverse groups of macroscopic angiosperms that have great ecological impact to aquatic ecosystem. Macrophytes perform significant role in aquatic food webs and serve as host for others different ecological function as these are the most important element of aquatic ecosystem. The aim of the present study is to analysis the floristic composition and diversity of macrophytes from10 selected study areas along with their proper documentation for further research. The configuration of entire work are survey of selected wetlands, information gathered from local people, collection of macrophytes, documentation, description, and identification of collected species followed by checking their accepted names. The 66 species of vascular plants under 50 genera belonging to 27 families were recorded. Poaceae is the most dominant family with 11species.This study may consider as an important database of documented aquatic macrophytes from selected wetlands in North Dinajpur district which enables the future research work regarding this field and also may generate the global awareness about conservation of biodiversity of the concerned district.

***Keywords*:** Macrophytes, Diversity, Wetlands, North Dinajpur

Wetlands are the transitional zone between terrestrial and aquatic ecosystem, where the land is covered with shallow water and water table is at superficial level. The aquatic ecosystems are also considered as most productive ecosystem that play a major role in maintaining the wide range of biodiversity (Paul 2022). Aquatic macrophytes are the integral bioindicator of aquatic ecosystem which provide substratum for different invertebrates, serve as primary producers (Pagag and Borthakur 2020) and also involve in different ecological processes such as biomineralization, transpiration, sedimentation, nutrient recycling, accumulation of heavy metals, shaping and structuring of the ecosystem (Tiwari and Sandya 2022), food chain as the basic source of energy, shelter for other invertebrates, amphibians and birds (Chaudhury and Devkota 2021, Maybel 2022). The macrophytes include angiosperms, bryophytes and pteridophytes and all of they are may be of different categories like submerged, emergent, floating, free-floating. Various anthropogenic activities like urbanization, industrialization, human disturbances etc detrimentally influencing both the quantitative and qualitative parameters of wetland ecosystem (Germ et al 2021, Deka et al 2022, Khan et al 2022). Except some ethnobotanical studies of terrestrial plants no considerable studies have been carried out in the selected district about the relatable field. The present research may consider as blue print to investigate and analysis the overall diversity and distribution of the aquatic macrophytes from different selected wetlands of a totally unexplored district which may be unique.

MATERIAL AND METHODS

Study area: The selected study area is North Dinajpur district of West Bengal. North Dinajpur district lies between 25. 11°N to 26.49° N latitude and between 87.49° E to 90.00° E longitude occupying the total area of 3142 sq. km. The main rivers of this district are Kulik, Mahananda, Nagar etc. The district is rich in alluvial soil and mostly sandy to sandy-loam in texture and porous along with thick forest. Organic content of alluvial soil is medium to high. Due to presence of high rich organic containing soil, it helps to grow paddy, jute and sugarcane etc. Climate of this district is characterized by hot-summer with high humidity, abundant rainfall and cold winter.

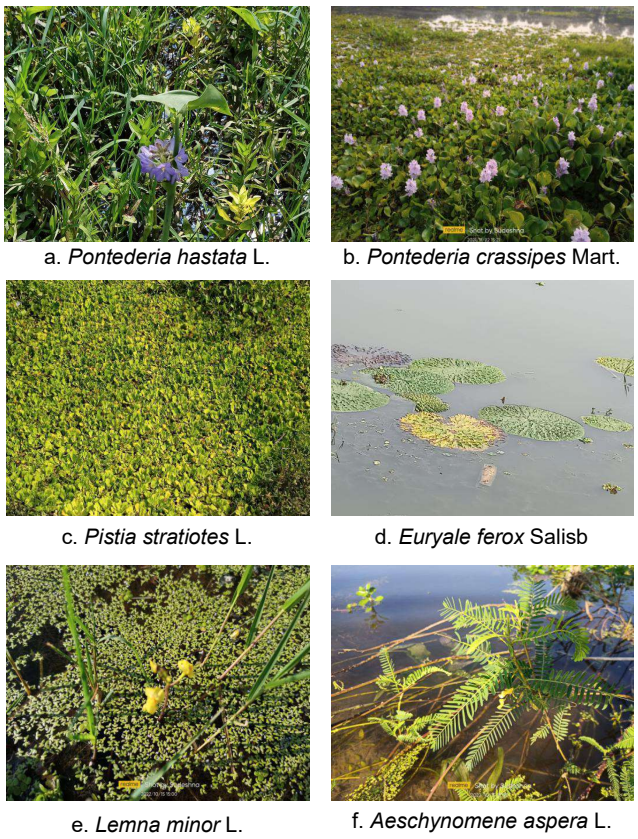
Samples collection methods and identification: The selected wetlands from study area were surveyed and visited at different season from November (2021) to December (2022). The collected macrophytes were dried properly by changing papers at regular interval and worked out of the specimen in the laboratory. For proper identification of the collected specimens different standard taxonomic literatures(Cook 1996, Mandal and Mukherjee 2012, 2017, Manjunatha et al 2019, Panchal et al 2019, Anyinkeng et al 2020, Chanda and Bhowmik 2020, Humane 2020, Metwally et al 2020, Ravi et al 2020, Badole et al 2021, Patel and Sahoo 2021, Philippov and Komarova 2021, Rahangdale

and Rahangdale 2021, Reshi et al 2021, Badra et al 2022, Chowdhury and Chowdhury 2022, Jeffry et al 2022, Jogd and 2022, Mishra and Singh 2022,Sahu and Roy 2022). POWO (Plants of the World Online) was used for the verification of the accepted names of the identified specimen. Plant specimens were mounted on the herbarium sheets for the preservation after drying properly. The prepared herbarium sheets were deposited in the herbarium of Taxonomy of Angiosperms and Biosystematics Laboratory, Department of Botany, Sidho Kanho Birsha University, Purulia.

RESULTS AND DISCUSSION

The present study reveals the documentation of macrophytes from different wetlands of research area to cover the vegetational distribution. For this study 10 wetlands were selected primarily for diversity analysis from different blocks of the North Dinajpur District (Table 1). A total of 66 species of macrophytes having 50 genera, belonging to 27 families were collected from the selected wetlands (Table 2). Among 27 families Poaceae was the most dominant family comprising of 11 species subsequently by Cyperaceae with 9 species (Fig. 2). Some of the macrophytes like *Pontederia hastata, Ipomoea aquatica, Acmella uliginosa* showed very common occurrences in 10 of the study site. Contradictorily *Najas indica, Neptunia oleracea, Marsilea minuta, Scirpus expansus* and *Utricularia inflexa* were very rare in their distribution. According to the habitat four different category of macrophytes were documented among which emergent species were 43, showing the highest percentage i. e. 65 %. Similarly lowest percentage was shown by rooted with floating leaves i. e. 4 % only.

Present status of macrophytes: Maximum number of macrophytes were documented from Chaitan Beel (22



a. *Pontederia hastata* L. b. *Pontederia crassipes* Mart.
c. *Pistia stratiotes* L. d. *Euryale ferox* Salisb
e. *Lemna minor* L. f. *Aeschynomene aspera* L.

Fig. 1. A few macrophytes of North Dinajpur district

Table 1. General information of wetlands in North Dinajpur District, West Bengal

Name of the wetlands	Block	Latitude	Longitude	Nearest village/town	Size in acres	Ownership pattern	Types of Wetland
Atkora Beel	Hemtabad	25.59 °N	88.22° E	Atkora, Malgram	62	Pr	P
Bagbari Beel	Itahar	25.55 °N	88.19° E	Chalunia, Gothlu	8.75	G	S
Chaitan Beel	Raiganj	25.66 °N	88.12° E	Malgram, Malancha	12	Pr	P
Chingri Beel	Itahar	25.54° N	88.19° E	Tilla, Mahagachi	187.5	G	P
Gidisha Beel	Kaliaganj	25.55 °N	88.19° E	Rainagar, Puyaltore	250	Pr	P
Gobra Beel	Raiganj	25.59 °N	88.13° E	Kuitore, Kalitala	312	Pr	S
Gothlu Beel	Itahar	25.47 °N	88.16° E	Gothlu, Bankur	32	Pr	P
Jogdol Beel	Raiganj	25.58°N	88.14° E	Dangapara Mahisbathan	100	G	P
Noyapara Beel	Raiganj	25.64 °N	88.12° E	Gheshor, Taherpur	19	Pr	P
Ranipur Beel	Itahar	25.55° N	88.19° E	Tilna, Bhadrashila	625	G	P

Pr- Private, G- Government, P- Perennial, S- Seasonal

Table 2. An enumeration of macrophytes in wetlands of North Dinajpur District

Scientific names	Family	1	2	3	4	5	6	7	8	9	10	Availability
Acmella uliginosa (Sw.) Cass.	Asteraceae	+		+	+	+		+			+	C
Actinoscirpus grossus (L.f.) Goetgh.& D.A. Simpson	Cyperaceae		+			+					+	C
Aeschynomene aspera L.	Fabaceae		+		+				+			C
Albidella oligococca (F. Muell.) Lehtonen	Alismataceae			+								LC
Alopecurus arundinaceus Poir.	Poaceae	+										LC
Alternanthera philoxeroides (Mart.) Griseb.	Amaranthaceae			+								LC
A.sessilis(L.)DC.	Amaranthaceae								+			LC
Ammannia auriculata Willd.	Lythraceae		+	+								LC
Arenaria serpyllifolia L.	Caryophyllaceae										+	LC
Azolla filiculoides Lam.	Salviniaceae			+			+		+			C
A. pinnata R.Br.	Salviniaceae								+			LC
Caesulia axillaris Roxb.	Asteraceae										+	LC
Calamagrostis epigejos (L.) Roth	Poaceae							+				LC
Ceratophyllum muricatum Cham.	Ceratophyllaceae				+							LC
Colocasia esculenta(L.) Schott	Araceae						+					LC
Commelina diffusa Burm.f.	Commelinaceae				+							LC
Cyanotis axillaris (L.) D. Don ex Sweet	Commelinaceae					+			+			LC
Cynosurus cristatus L.	Poaceae		+		+				+			C
Cyperus amabilis Vahl	Cyperaceae	+										LC
C. difformis L.	Cyperaceae										+	LC
C. fuscus L.	Cyperaceae							+			+	LC
C. tenuispica Steud.	Cyperaceae		+									LC
Dactylis glomerata L.	Poaceae		+									LC
Echinochloa colonum (L.)Link	Poaceae			+							+	LC
Eclipta prostrata (L.) L.	Asteraceae			+								LC
Eleocharis atropurpurea (Retz.) J. Presl & C. Presl	Cyperaceae		+									LC
Euryale ferox Salisb.	Nymphaeaceae								+			LC
Holcus lanatus L.	Poaceae								+			LC
Hydrilla verticillata (L.f.) Royle	Hydrocharitaceae	+	+						+			C
Hygroryza aristata (Retz.) Nees ex Wright & Arn.	Poaceae			+								LC
Hypericum hirsutum L.	Hypericaceae		+									LC
Ipomoea aquatica Forssk.	Convolvulaceae	+			+		+	+	+	+	+	C
I. quamoclit L.	Convolvulaceae		+		+						+	C
Lemna gibba L.	Araceae				+		+					LC
L. minor L.	Araceae				+				+			LC
Limnophila heterophylla (Roxb.) Benth.	Plantaginaceae		+	+	+						+	C
L. indica (L.) Druce	Plantaginaceae						+					LC
Lindernia dubia (L.) Pennell	Linderniaceae				+							LC
Ludwigia adscendens (L.) H. Hara	Onagraceae			+	+		+	+	+	+	+	C
L. perennis L.	Onagraceae	+		+				+		+		C
Marsilea coromandelina Willd.	Marsileaceae							+				LC
M. minuta L.	Marsileaceae	+										LC
M. quadrifolia L.	Marsileaceae		+	+	+				+	+		C

Cont...

Table 2. An enumeration of macrophytes in wetlands of North Dinajpur District

Scientific names	Family	1	2	3	4	5	6	7	8	9	10	Availability
Murdannia pauciflora (G. Bruckn.) G. Bruckn.	Commelinaceae			+						+		LC
Najas indica (Willd.) Cham.	Hydrocharitaceae				+							LC
Neptunia oleracea Lour.	Fabaceae								+			LC
Nymphoides hydrophylla (Lour.) Kuntze	Menyanthaceae		+				+					LC
Panicum repens L.	Poaceae			+				+			+	C
Paspalum distichum L.	Poaceae		+									LC
Persicaria hydropiper (L.) Delarbre	Polygonaceae				+		+	+			+	C
P. longiseta (Bruijn) Kitag.	Polygonaceae						+					LC
Phleum pratense L.	Poaceae						+	+	+	+	+	C
Pistia stratiotes L.	Araceae	+	+	+			+	+		+		C
Pontederia crassipes Mart.	Pontederiaceae			+					+	+		C
P. hastata L.	Pontederiaceae		+	+	+	+	+	+	+		+	C
Rumex maritimus L.	Polygonaceae			+								LC
Salvinia molesta D. Mitch.	Salviniaceae							+	+			LC
Schoenoplectiella articulata (L.) Lye	Cyperaceae	+		+		+				+	+	C
S. corymbosa (Roth ex Roem.& Schult.) J.R. Starr & Jim. Mejias	Cyperaceae					+						LC
Scirpus expansus Fernald	Cyperaceae				+							LC
Setaria geminate (Forssk.)Veldkamp	Poaceae			+						+		LC
Succisa pratensis Moench	Caprifoliaceae					+			+		+	C
Torenia crustacea (L.) Cham. & Schltdl.	Linderniaceae		+	+	+	+		+	+		+	C
Utricularia aurea Lour.	Lentibulariaceae	+		+	+					+	+	C
U. australis R.Br.	Lentibulariaceae					+						LC
U. inflexa Forssk.	Lentibulariaceae		+									LC

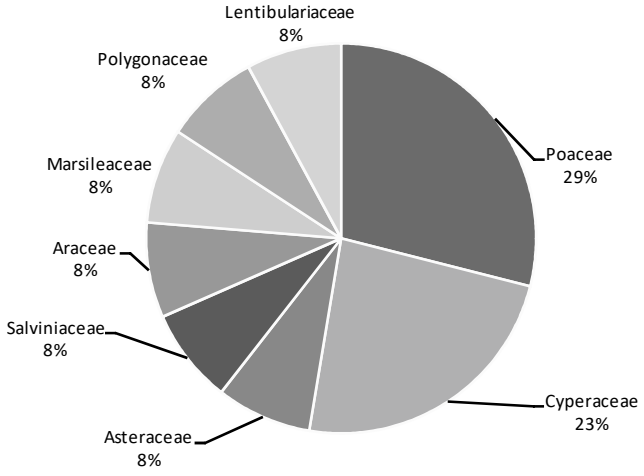


Fig. 2. Dominant families of macrophytes

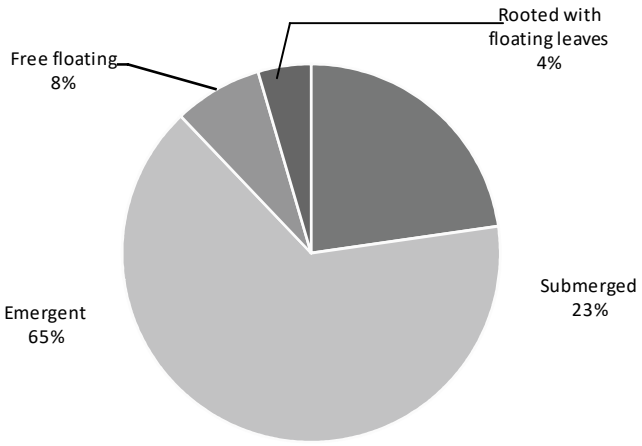


Fig. 3. Distribution of species according to habitat

species), Jogdal Beel (20 species). Chingri Beel and Ranipur Beel (each contain 19 species). Out of 66 species, *Pontederia hastata* was most dominant species as it was present in 8 different wetlands among the selected 10 wetlands. Other common species were *Ipomoea aquatica, Ludwigia adscendense* and *Torenia crustace*a all three were present in 7 of the 10 wetlands, followed by *Acmella uliginosa, Pistia stratiotes* were reported from 6 wetlands, and *Marsilea quadrifolia*, *Schoenoplectiella articulata, Utricularia aurea* were from 5 wetlands. There are some species of macrophytes also documented in this study which were confined to only a particular wetland from 10 of the study sites such as *Utricularia inflexa* from Bagbari Beel, *Utricularia australis* from Gidisha Beel, *Persicaria longiseta* from Gobra Beel, *Najas indica* from Chingri Beel, *Marsilea minuta* from Atkora Beel, *Marsilea coromandelina* from Gothlu Beel and so on.

The analysis of vegetational diversity and distribution of

macrophytes revealed the great fluctuation of environmental factors that have a major impact on the growth, abundance as well as physiognomy of the macrophytes community. The occurrence and agglomeration of particular macrophytes are significantly influenced by some natural factors confined to a particular environment. Similarly, some macrophytes are rare in their occurrence in certain wetlands in response to their growth and adaptation according to the environmental variation.

CONCLUSION

The overall assessment of the study also indicates the gradual degradation of the wetlands along with their rich macrophytes vegetation due to various anthropogenic activities like eutrophication, encroachment for building construction, efflux of industrial and drainage water, pollution, etc. Therefore, immediate necessary action should be taken for the conservation of macrophytes in their native region from degradation and sustainable use of the wetland.

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