



Species Diversity and Distribution of Macrophytes in Chupisar wetland Ecosystem, West Bengal, India

Momezul Haque¹, Sankar Narayan Sinha^{2}*

¹ & ²Department of Botany, University of Kalyani, Kalyani 741235, West Bengal, India

*Email: sinhasn62@yahoo.co.in

ABSTRACT

Biological spectrum of vegetation is the index of the phytoclimate, deduction of which is based on diverse life-forms composing the flora. Life form and leaf size spectra indicates climatic and human disturbance of a particular area. Literature dealing with the life form and leaf size spectra shows that very little work or practically no work has been made in Chupisar wetland. In view of this, the present work was under taken in this wetland. According to the Cook's classification system of hydrophytic plants, eight categories of life forms are there. These are Epihydantes, Helophytes, Hyperhydantes, Plankton, Pleustophytes, Rosulate, Tenagophytes, and Vittate.

Keywords: Phytoclimate, Chupisar, Epihydantes, Hyperhydantes, Vittate.

Introduction

Biospectrum of vegetation is an important factor of phytoclimate, decline of which is based on diversified life-forms constituting the flora. (Bouri T. and Mukherjee. A., 2011). The life-form can be considered as the ultimate. Life-form study is thus an important part in describing vegetation, ranking next to floristic composition. (Jafari et.al 2016). Leaf size classes have been established to be very positive for plant associations. The leaf size knowledge may help in understanding the physiological processes of plants and plant communities. (Wang et.al. 2019) Life form and leaf size spectra indicate climatic and human disturbance of a particular area. (Khan, et.al. 2018). Literature dealing with the life form and leaf size spectra shows that very little work or practically no work has been made in Chupisar wetland.(Malik et.al. 2007). In view of this, the present work was under taken in this wetland.

Among different types of aquatic ecosystems, wetlands are very resourceful and productive ecosystems which provides both direct and indirect services to mankind. (Banerjee, L.K. and Kumar, P.S. 2000). Further, these wetland ecosystem services account for nearabout half of the total global ecosystem values, ranking first among all. Wetlands cover almost 6% of the surface area of the world. Wetlands minimize pollution and contamination by functioning as natural filters, and by depositing water during monsoon, they act as buffers and avoid floods. (Dhote et.al. 2021) Plants growing in wetlands can be classified into different categories and groupings. Cook proposes one form of categorization. According to the Cook's (Cook, C.D.K. 1996). Classification system of hydrophytic plants, eight categories of life forms are there. These are Epihydantes, Helophytes, Hyperhydantes, Plankton, Pleustophytes, Rosulate, Tenagophytes, and Vittate.(Cook, C.D.K. 1996) and(Khanet al. 2022).The recent research area bears important characteristics for the survival of all types of flora. However, except for a few short studies from the wetlands on specific plant characteristics, no substantial research has been carried out in the chupisar wetland area.(Parveen, et.al. 2014). Keeping these aims in mind, the present study was designed to investigate the diversity and distribution of wetland plants in chupisar water bodies (habitats) of a less explored area of West Bengal.(Parveen, et.al. 2014).

MATERIALS AND METHODS

Field Survey and Data Collection

Systematic study was conducted in the Chupisar wetland to survey the flora. Field trips were planned to study this wetland to obtain plant species covering the wetland environment. The wetland plant specimens were procured by standard method from the wetland environment. The data collection included date of collection, collection number, habitat occurrenceand flowering season. All the important information regarding wetland plants was documented in the field notebook on the spot. The wetland plant specimens collected in the field were pressed, dried out, and preserved properly in accordance with the standard method as given by Krishnasamy et al.2014., Voucher specimens of wetland plants were deposited in the herbarium of the Department of Botany, Kalyani University, Kalyani, India on standard herbarium sheets is 28 × 11.5 cm.

WORKING PROCEDURE

Wetland Flora Identification

The Flora of Bengal was used for taxonomic identification of the collected wetland plants (Beg, A., 1976), (Ali, S.I., and Qaiser, M., 1995), (Nasir, E., and Ali, S.I., 1971), and (Cook, et.al. 1974) at the Herbarium of the Department of Botany, Kalyani University, Kalyani, India. For the evaluation of morphological characteristics such as vegetative and reproductive traits 4-5 samples per species were examined under a microscope (Kyowa SZF, 0.75X–3.4X), and the results were compared to that of Flora of Bengal (Beg, A., 1976), (Ali, S.I., and Qaiser, M., 1995), (Nasir, E., and Ali, S.I., 1971), and (Cook, et.al. 1974).

Classification of Wetland Plants

In accordance with the concept of Cook, vascular plants of aquatic and wetland environments are classified into eight categories on the basis of their growth forms. (Cook, C.D.K. 1996) and (Khan. et. al.) The different growth forms are as follows: 1. Plants whose root penetrate the substrate whereas leaves and/or stems float on but not present over the water surface. species of this group are connected with soil, water, and air. 2. Helophyte: These plants are not physiologically bound to water but tolerate longer periods of submergence. 3. Hyperhydate: plants whose roots penetrate the substrate but leaves and/or stems comes out above the water surface. Like Epihydate, these plants are connected with soil, water, and air. 4. Plankton: plants present in the zone between the bottom and the lower surface of the water, i.e., below the water surface they are free swimming. 5. Pleustophyte: plants free-floating on the water surface, not attached to or penetrating the substrate. 6. Rosulate: These submerged plants having rosette leaves are rooted in the substrate, 7. Tenagophyte: plants with the young stage submerged in or floating on water and the adult stage are terrestrial. 8. Submerged plants, rooted in the substrate, leaves arranged along elongated stems.

RESULTS AND DISCUSSIONS

Floristic Composition

To cover the distribution of vegetation of the wetlands in the research area, seventeen areas were selected for study. The present study reveals that the study area possesses 66 species of wetland plants belong to 46 genera and 29 families. Different growth forms were recorded in the study area dominated by swampy (26 species, 39.39%), followed by Emergent Anchored (20 species, 31.74%), Rooted Floating (9 species, 13.63%), Free Floating (7 species, 10.6%), Submerged Suspended (3 species, 3.03%) and Submerged Anchored (3 species, 3.03%) Nonetheless, pteridophytes were recorded in lowest numbers. Previous investigations on wetland plants in adjacent areas exhibited a very low number of findings in respect of the number of plant species (Parveen, et.al. 2014).

The most diverse family of wetland plants is Poaceae, with 10 taxa, followed by Cyperaceae, with 5 species, and Asteraceae with 4 species. Aside from that, there are 11 families with only one species, accounting for around 39 percent of the overall family composition in the region. There are four families with three species, ten families with two species. On the other hand, based on generic diversity, there are 20 genera (total 66 genera) with one species, accounting for 29.88 percent of the total genera recorded in the district.

Classification of Wetland Plants

In the present study, the wetland plants are classified based on Cook's classification system. It is interesting to note that amongst all the eight life forms, namely, Helophyte, Epihydate, , Plankton, Hyperhydate, , Pleustophyte, Rosulate, Tenagophyte, and Vittate, as laid down in the Cook classification system, six life forms are reported from the Purbasthali II sub-division. The Epihydate and Rosulate life form were absent. All recorded plant species along with their family name, growth form and life form are given in detail in Supplementary Table S1. The values noted for each life form, number of plants, and percentage (%) are: Helophyte—3—9.09%; Hyperhydate—13—39.39%; Plankton—3—9.09%; Pleustophyte—7—21.21%; Tenagophyte—4—12.12%; Vittate—1—3.03%. Table 2 and Figure 2 indicate the overall number and percentage of each life form.

Table No 1: Life form of aquatic macrophytes of the wetland Chupisar.

Sl.no.	Life form	No. of species
1	Free Floating	7
2	Submerged Suspended	2
3	Submerged Anchored	2
4	Rooted Floating	9
5	Emergent Anchored	20
6	Swampy	26
7	Total	66

Figure 1 Species Distribution

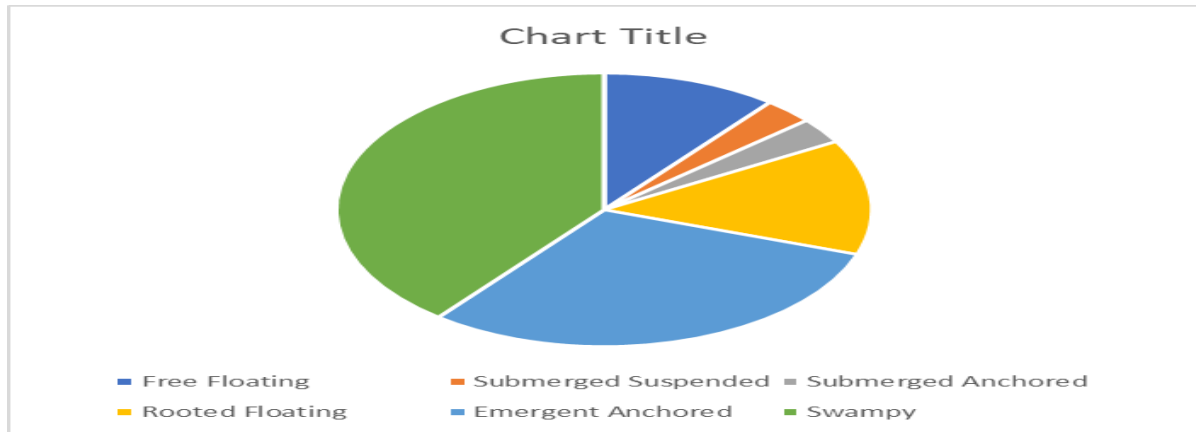


Table 2: Overall number and percentage of each life form.

Sl.No	Life Forms	No. of Plants	Percentage of Plants
1	Helophyte	4	12.12
2	Hyperhydate	13	39.39
3	Plankton	3	9.09
4	Pleustophyte	7	21.21
5	Tenagophyte	4	12.12
6	Vittate	1	3.03

CONCLUSIONS

The selected research area i.e. Chupisar Wetland is an important source of aquatic plants. The study revealed that 66 aquatic macrophytic species belong to 46 genera and 29 families. Poaceae is the most prevalent family with 8 genera which includes 10 species. Cyperaceae, Asteraceae, Hydrocheritaceae successively come with 5, 4 and 3 species respectively. The study enumerated maximum macrophytes are Swampy type followed by Emergent Anchored then Rooted Floating then Free floating and lowest number of species found Submerged Suspended and Submerged Anchored.

Under Cook's system of classification the maximum number of life forms found Hyperhydrate i.e., 39.39% followed by Pleustophyte, Tenagophyte, Helophyte, Plankton and Vittae respectively. Earth Summit Rio+20 held in 2012 in Rio de Janeiro emphasized the need to conserve the biodiversity of the earth that related with conservation of aquatic Macrophytes in regional basis. Heterogeneous assemblage of aquatic macrophyte found in studied area.

REFERENCES

- Ali, S.I., Qaiser, M. (1995): Flora of Pakistan; Department of Botany, University of Karachi: Karachi, Pakistan.
- Ali, S.I., Nasir, Y.J., (1989): Flora of Pakistan; Department of Botany, University of Karachi, Karachi and National Herbarium: Islamabad, Pakistan.
- Bouris, T. and Mukherjee, A. (2011): "Biological spectrum of Bankati forest areas in Burdwan District, West Bengal." *Indian Journal of Scientific Research*, pp. 57.
- Banerjee, L.K. and Kumar, P.S.(2000): An overview of vascular plant diversity of wetlands, its conservation and sustainable development in India. *EN VIS new Patter*. No. 7.
- Beg, A., (1976): Flora of Peshawar District and Khyber Agency. "*Pak. J. For.*" Volume III, Part I. 26, 48-75
- Cook, C.D.K. (1996): Aquatic and Wetland Plants of India; *Oxford University Press*: Oxford, UK, ISBN 0198548214.
- Cook, C.D.K.; Gut, B.J.; Rix, E.M.; Schneller, J., (1974): Water Plants of the World: A Manual for the Identification of the Genera of Freshwater Macrophytes; *Springer*: Amsterdam, The Netherlands, ISBN 9061930243.
- Dhote, M., Singh, A., Basumatary, J., Dey, A., Mulye, A., Singh, A., and Karmakar, S.(2021): Urban Wetland/Water Bodies Management Guidelines. "*Namami Gange*". School Of Planning & Architecture, New Delhi. Volume I.
- Ghosai, S.K., Santra, S.C. and Mukherjee, P.K.(1993): Phenological studies in aquatic macrophyte plants of lower Gangetic delta, West Bengal, India. *Feddes Repertorium*. 104, 93-111.
- Jafari, Z., Kianian, M.K., Aslani, F. and Akbarlo, M. (2016): Floristic Composition, Life Forms and Geographical Distribution (Case Study: Lashgardar Rangelands of Malayer, Iran). *Journal of Environmental Science and Technology*, 9: 140-148.

- Keddy, Paul. (2000): Wetland Ecology: Principles and Conservation. *Cambridge University Press, Cambridge, United Kingdom*. 614.
- Khan, W., Khan, S.M., Ahmad, H., Alqarawi, A.A., Shah, G. M., Hussain, M. and Abd-Allah, E.E. (2018): Life forms, leaf size spectra, regeneration capacity and diversity of plant species grown in the Thandiani forests, district Abbottabad, Khyber Pakhtunkhwa, Pakistan. "*Saudi Journal of Biology*." Vol 25, issue 1, Pages 94-100.
- Khan, K., Shah, G.M., Saqib, Z., Rahman, I.U., Haq, S.M., Khan, M.A., Ali, N., Sakhi, S., Aziz-ud-Din, Nawaz, G. (2022): Species Diversity and Distribution of Macrophytes in Different Wetland Ecosystems. *Appl. Sci.*, 12, 4467.
- Krishnasamy, J., Rajendran, A., Sarvalingam, A. (2014): Ornamental aquatic and semi-aquatic plants in Coimbatore district. "*Biolife*.", 2, 557–571.
- Malik, Z.H., Hussain, F. and Malik, N.Z. (2007): Life form and Leaf Size Spectra of Plant Communities Harboring Ganga Chotti and Bedori Hills During 1999-2000. "*International Journal of Agriculture & Biology*." Vol. 9, No. 6.
- Nasir, E.; Ali, S.I., (1971): Flora West of Pakistan; University of Karachi, Karachi and National Herbarium: Islamabad, Pakistan.
- Parveen, M., Chatterjee, N. C., and Tah , J. (2014): Study of Macrophyte-Diversity with Reference to their Phyto-Sociological Study in Chupisar, West Bengal. "*International Journal of pure & Applied Bioscience*." 2 (2): 131- 136.
- Wang, C., He, J., Zaho, T.H., Cao, Y., Wang, G., Sun, B., Yan, X., Guo, W. and Li, M.H. (2019): The smaller the leaf is the faster the leaf water loses in a temperate forest "*Front Plant Sci*." pp 54.