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Studies on Macrophyte Diversity in Lalbandh Wetland, Birbhum, West Bengal, India

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Abstract

The present work reveals the macrophyte diversity of Lalbandh, a freshwater wetland in Birbhum District of West Bengal. Seasonally species were counted and identified from the wetland during consecutive three years (2013-2016). Family Poaceae shows the highest distribution in the wetland. Agglomerative hierarchical clustering (AHC) analysis represents the relationship among all species and heterogeneity of dominance of species was noticed throughout the study area. Non metric multidimensional scaling (NMDS) represents relative differences of the macrophytes. According to our study it was revealed that Lalbandh possess a higher diversity of macrophytes which contain a stable ecosystem in this wetland.

Key words: Aquatic Plants, Distribution, Diversity, Wetland.

Introduction

Wetlands are perhaps the most interesting landscapes in the world to have earned global importance during the last few decades. It serves as richest ecosystems, offering ‘sanctuary’ to a wide diversity of plants and animals. In addition, they play key roles, for example provisioning and maintaining water quality⁹. Wetland ecosystem forms an important environment for aquatic, semi-aquatic and moisture loving floral and faunal associations. Wetlands have been extensively investigated for their ecology, management, conservation and restoration^{8,11,4,6}. To maintain wetland ecosystems and all the roles they fulfil in the preservation of water quality and biodiversity. Macrophytes are valuable as indicators of water and sediment quality². They help to improve water quality directly through oxygenation and nutrient recycling and indirectly by providing surface for water purifying algae, fungi and bacteria⁷. Macrophytic study of Birbhum district are documented in last two decades^{13,12,5}. The present aim of this study was to examine the presence of macrophytes and their distribution and abundance in Lalbandh wetland of Birbhum district.

Materials and methods

Study site

This man-made perennial wetland is located between 23°41′15″N latitude and 87°40′50″E longitude near the township of Shantinekatan in Bolpur-Sriniketan Block and covers an area of approximately 18.92 acres. This wetland is under government ownership. The water source is the run-off from adjacent uplands. The depth of this wetland ranges from 2 ft (May) to 15 ft (August-September).

Observation on Macrophytes

The study of macrophyte is most important phases to understand and analyzed the status. During February 2013 to January 2016 consecutively three years we visited and surveyed the area of Lalbandh wetland and the data were collected. Macrophytic species in different seasons were noted and identified using standard literature by Cook's³. Agglomerative Hierarchical Cluster (AHC) analysis of all species and their distribution trends were

determined using XLSTAT 10TM software¹. Non-metric multidimensional scaling was applied to portray the differences in multiple variables in reduced scales or axes¹⁰.

Results and discussion

In the present study 46 species belonging to 23 families were recorded. Among all families Poaceae indicates the most dominant family in the wetland. Next to it Asteraceae stands the second most dominant family (Figure 1). The results of the cluster analysis is shown in Figure 2 indicating the total number of macrophytes could be grouped into four different clusters with varying representation of the species numbers. The results of the cluster analysis is shown in Figure 2 indicating the total number of plant species could be grouped into four different clusters with varying representation of the species numbers. While two clusters, 1 and 2 consisted of thirteen and twenty five species respectively while the clusters 3 and 4 included respectively six and two species of macrophytes (Figure 2). Using the proximity matrix representing the similarity in the abundance of the macrophytes, a non metric multidimensional scaling could portray the differences among the different plant species pair. As shown in the biplot (Figure 3) the differences among the species pairs were considerable though the distribution in the quadrats remained clumped for few species, indicating their similar contribution to the abundance of the species ensembles in the sites concerned. Similar observation was found in Sujana and Sivaperuman¹⁴.

Conclusion

Thus from the results it is apparent that the wetland sites in the Lalbandh considerable heterogeneity of the macrophytes. It also provides useful information about water quality and ecosystem health. However, only long-term studies of macrophyte changes can provide critical information about changes in water quality. Consequently, long-term studies in aquatic macrophytes in the Lalbandh wetland will be necessary and essential for watershed management and protection of these valuable and unique water resources.

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FIGURES

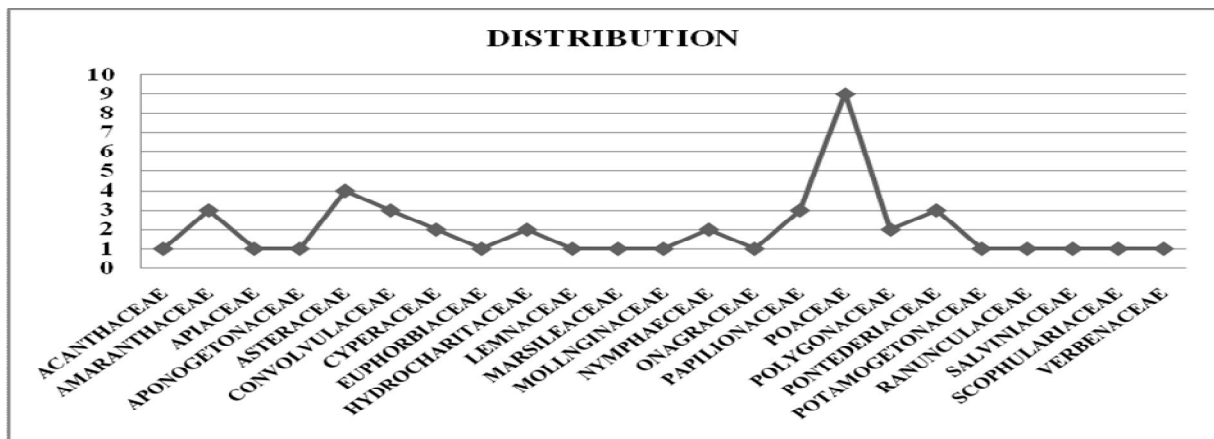
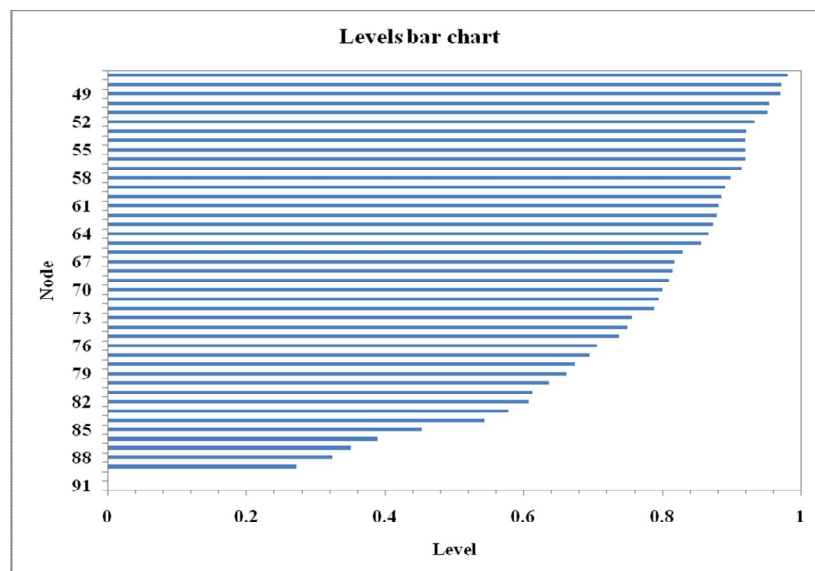
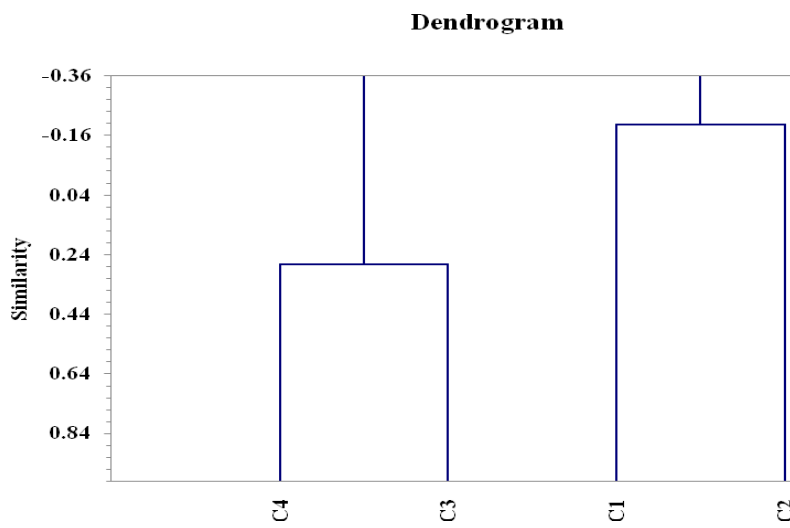
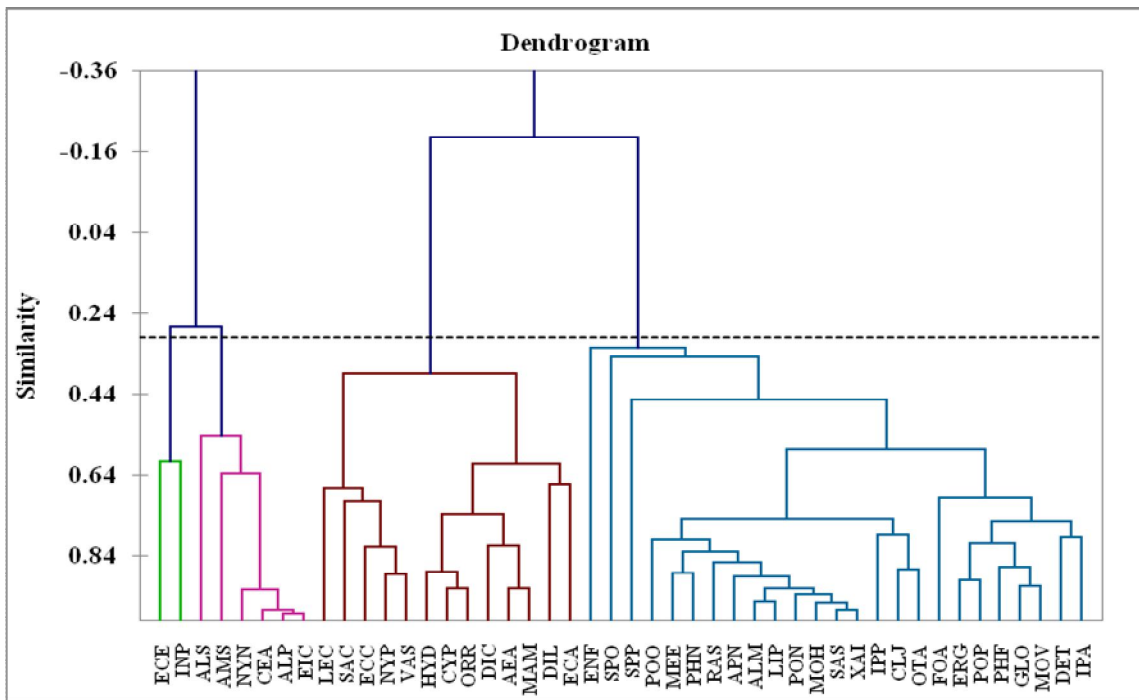


Fig. 1: Presence of families throughout the study site





Class	1	2	3	4
Objects	13	25	6	2
Sum of weights	13	25	6	2
Within-class variance	805708.0000	1835718.8567	754931.3333	90596.5000
Minimum distance to centroid	294.8697	147.5370	334.8739	212.8339
Average distance to centroid	682.3777	631.2074	726.7072	212.8339
Maximum distance to centroid	2367.6941	6052.5303	1358.5594	212.8339
	AEA	ALM	ALP	ECE
	CYP	APN	ALS	INP
	DIC	CLJ	AMS	
	DIL	DET	CEA	
	ECA	ENF	EIC	
	ECC	ERG	NYN	
	HYD	FOA		
	LEC	GLO		
	MAM	IPA		
	NYP	IPP		
	ORR	LIP		
	SAC	MEE		
	VAS	MOH		
		MOV		
		OTA		
		PHN		
		POO		
		POP		
		PHF		
		PON		
		RAS		
		SPP		
		SPO		
		SAS		
		XAI		

ABBREVIATIONS: AEA- *Aeschynomene aspera*, ALM- *Alysicarpus monilifer*, ALP- *Alternanthera paronychoides*, ALS- *Alternanthera sessilis*, APN- *Apenogeton natans*, AMS- *Amaranthus spinosus*, CEA- *Centella asiatica*, CLJ- *Coix lachryma-jobi*, CYP- *Cyperus pilosus*, DET- *Desmodium triflorum*, DIC- *Digittaria ciliaris*, DIL- *Digittaria longifolia*, ECA- *Eclipta alba*, ENF- *Enydra fluctuans*, ERG- *Eragrostis gangetica*, ECC- *Echinochloa colona*, ECE- *Echinochloa erussgalli*, EIC- *Eichhornia crassipes*, FOA- *Fombristytis aestivates*, GLO- *Glinus oppositifolius*, HYD- *Hygrophila difformis*, IPA- *Ipomoea aquatica*, IPP- *Ipomoea obscura*, INP- *Indwigia perennis*, LIP- *Lindernia pusilla*, LEC- *Leptochloa chinensis*, MEE- *Merremia emerginata*, MOH- *Monochoria hastate*, MOV- *Monochoria vaginalis*, MAM- *Marsilea minuta*, NYN- *Nymphaea nouchali*, NYP- *Nymphaea pubescens*, OTA- *Ottelia alismoides*, ORR- *Oryza rufipogon*, PHN- *Phyla nodiflora*, POO- *Polygonum orientale*, POP- *Polygonum plebeium*, PHF- *Phyllanthus fraternus*, PON- *Potamogeton nodosus*, RAS- *Ranunculus seleratus*, SPP- *Spilanthes paniculata*, SPO- *Spirodela polyrrhiza*, SAS- *Saccharum spontaneum*, SAC- *Salvinia cuculata*, VAS- *Vallisneria spiralis*, XAI- *Xanthium indicum*.

Fig. 2: The results of the agglomerative hierarchical clustering of the macrophytes observed in the study area based on the relative abundance in the sites in each season

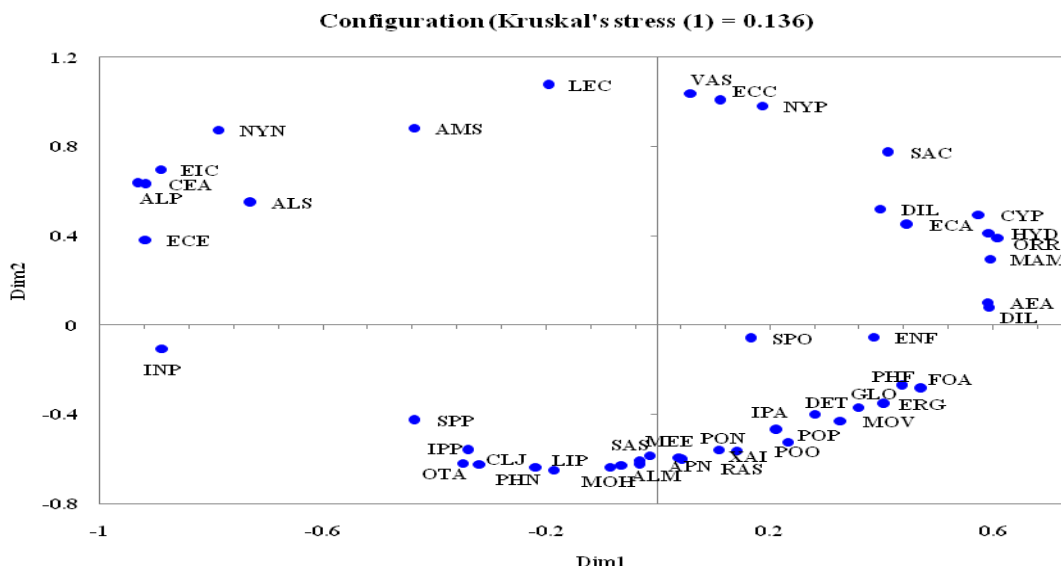


Fig 3: The biplot representing the ordination of the macrophytic plants as obtained through non-metric multidimensional scaling (NMDS) based on the proximity matrix build on the similarity in the relative abundance of the species concerned. (Abbreviations as shown in Fig. 2)