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Attribute based classification of hydrophytes and it's relationship to habitat utilization in Madayipara, Kannur District, Kerala

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Abstract

Aquatic plants play a crucial role in a wide range of aquatic environments. True aquatics or hydrophytes, spend their entire lives in water, but emergent aquatics or seasonal aquatics, are more amphibious and can survive seasonal drying. Plants that grow in water have a unique combination of temporal, spatial, chemical, physical, and biological characteristics. There are over 100 families of vascular aquatic plants are in worldwide. The hydrophytes found around the ponds of Madayipara are selected and categorized on the basis of different attributes and identity the relationship to habitat utilization.

Keywords: attribute, hydrophytes, habitat utilization, Madayipara, wet phase

Introduction

The use of different biological characteristics to organise organisms into nontaxonomic classes has offered a valuable alternative approach to studying the ecology of a broad variety of plant types over the last 20 years. Madayipara is a moody, erratic beauty. Each season, the hillock reacts in a unique way. This 950-acre plateau is a lush green carpet after the rains. It's a sea of blue and white flowers with a touch of spring. The long thatching grass takes on a golden hue in the fall. It has lost its colour in the sweltering summer, and the hill has taken on a hay-colored hue. Madayipara shines brightly even on a sweltering April afternoon.

Plants that have adapted to life in water are known as aquatic plants (saltwater or freshwater). To differentiate them from algae and other microphytes, they are also called hydrophytes or macrophytes. A macrophyte is an emergent, submergent, or floating plant that grows in or near water. Macrophytes provide cover for fish and a substrate for aquatic invertebrates in lakes and rivers. Aquatic plants come in a range of shapes and sizes, with some being emergent and rooted on the bottom and others being submerged. Others are free-floating, while others are anchored to impoundment banks and have adapted to a semi-aquatic climate. Such habitat can be found along canal banks, rivers, and the edges of water bodies.

In this study, hydrophytes categorized on the basis of five attributes, and each attributes are again subdivided into different traits. The selected attributes are Habitat, Mode of reproduction, Leaf type, Leaf area, rooting at nodes. Then prepared a short list of 70-80 plants found around the ponds or shallow depression filled with water in Madayipara. In which all types of plants are present. Detailed information are received through the field experience.

Materials and methods

Study area

Madayipara is a flat topped hillock overlooking Payangadi town on the northern bank of Kuppam river, located in Madayi village, at latitude 12°2' N and longitude 75° 16'E, about 21 Km. north of Kannur town, the district headquarters of Kannur district in Kerala (Sreedharamenon, 1957) [18]. The river Kuppam, "bending slightly and passing under the guns of an old ruined fort of the Kolathiris" (Logan, 1887) [8] on th south eastern edge of Madayipara, suddenly turns due south at Payangadi and takes a course parallel to the sea to meet the larger Valapattanam river at Matakkara, finally discharging in to the Lakshadweep Sea at Azhikkal. A maximum temperature of 33.9° C is experienced in the month of May and a minimum temperature of 18.9° C. in December. The area experiences a maximum humidity of 98.5% during the month of July and a minimum humidity of 44.9% during the month of December.

Field survey

Prepared a short list of 80 species of occurring in freshwater habitats in Madayipara for which information on traits and habitat utilization could be obtained. Non hydrophytes were also included. Maximum informations are provided by field observation. The field visit was conducted during the August 2020 to December 2020. Different types of hydrophytes with different season are identified on the basis of characteristic features. Plant specimens growing in seasonal pools in and near perennial Jewish Pond, Vadukuntha Pond, Parakkulam and Madayi Pond were collected, identified by standard methods and documented by photographs. Photographs were taken to describe the nature of study area. The data were mainly collected on the basis of obtained plants. Based upon the collected data the plants are categorized on the basis of attribute. The collected plant species were identified by referring The Flora of Presidency of Madras (and Fischer 1915-1936) and by also by the help of Dr. K. P Prashandh, Head of department of Botany, Sreenarayana college, kannur.

In the current study, five traits were selected and for the purpose of identification those traits were subdivided. Such as: Leaf shape such as lanceolate linear etc.and Leaf area traits *viz*, small (below 1cm2), medium (1 to 20 cm2), large

(20 – 100cm2), extra-large (above 100cm2) were also studied. Presence of rooting at nodes were also recorded. Mode reproduction parameters like rhizome, fragmentation, budding, tubers and seeds were also noticed. Habitats of collected plant species.

Result and Discussion

In this study, 75 plants were collected from Madayipara, Kannur. From the total 75 plants, which includes 51 plants in Poaceae family, 4 plants in Scrophulariaceae, 3 plants in Eriocaulaceae, 2 plants in Lamiaceae, 2 plants in Lythraceae, 2 plants in Pedaliaceae. and Droseraceae, Acanthaceae, Rubiaceae, Lentibulariaceae, Hydrocharitaceae, Menyanthaceae, Marsileaceae, Araceae, Isoetaceae, Amaranthaceae families contains only one plant. In that collected plant category Poaceae is the dominant family. While cross checking the given traits we can understand that most of the plants has rooting at nodes. Then maximum number of plants are reproduced by seeds, only few plants are here to reproduce by other methods. Then the plant's leaf type is mainly lanceolate and linear. Maximum number of plants contains small leaf area.

Table 1: Number of selected plants with family

Sl. No.	Family	No. of Plants
1	Poaceae	51
2	Scrophulariaceae	4
3	Eriocaulaceae	3
4	Lamiaceae	2
5	Lythraceae	2
6	Pedaliaceae	2
7	Droseraceae	1
8	Acanthaceae	1
9	Rubiaceae	1
10	Lentibulariaceae	1
11	Hydrocharitaceae	1
12	Menyanthaceae	1
13	Marseliaceae	1
14	Araceae	1
15	Isoetaceae	1
16	Amaranthaceae	1

- Habitat- Marshy area, Sandy places, Submerged, Free floating
- Leaf type- Tubular, capillary and entire
- Leaf area- Small below 1cm2, Medium 1 to 20 cm2, Large 20 – 100cm2, Extra-large above
- 100cm2
- Rooting at nodes - Yes or No
- Mode of reproduction- Rhizome, Fragmentation, budding, tubers, seeds.

Table 2: Attributes based classification of plants

Sl. No.	attributes	No. of Plants
1	Rooting at nodes	Yes-58 No- 13
2	Habitat	Wet-45 Dry-26
3	Mode of reproduction	Seeds-67 Rhizomes -5 Fragmentation -1
4	Leaf type	Linear -32 Lanceolate -34 Ovate-6
5	Leaf area	Small-62 Medium -10

Fig 1: Graphical representation of attribute based classification

The composition and structure of the vegetation in a wetland is also influenced by changes to hydrology and soil salinity, catchment runoff and disturbance etc. Vegetation sampling was conducted in four sites in 25 m belted plots placed perpendicular to the pond bank at 0–5 m, 5–10 m, 10–15 m, 15–20 m, and 20–25 m distance classes. At each site, 10 plots were sampled at each distance class and plant species analysis was used to determine the characteristic species at each distance class.

Table 3: vegetation sampling: perpendicular to the pond bank at 0–5 m, 5–10 m, 10– 15 m, 15–20 m, and 20–25 m distance classes.

Table 3.1: June - July months

Sl. No	Species	Distance away from water body				
		0–5 m	5–10 m	10–15 m	15–20 m	20–25 m
1	*Drosera indica L.*	X	X	X		
2	*Neanotis tubulosa(G. Don)Mabb*	X	X			
3	*Lindernia ciliata (Colsm.)pennell*	X	X	X		
4	*Lindernia viscosa (Hornem.)Merr*	X	X	X		
5	*Rhamphicarpa longiflora Benth*		X	X		
6	*Sopubia delphinifolia (L.)G. Don*		X	X		
8	*Utricularia malabarica*	X	X			
9	*Justicia japonica Thunb.*		X			
10	*Eriocaulon cuspidatum Dalzell*	X				
11	*Eriocaulon lanceolatum miq.ex.korn*	X				
12	*Eriocaulon xeranthemum Mart.*	X				
13	*Apluda mutica L.*			X	X	X
14	*Apocopis mangalorensis Hochst.*					
15	*Arundinella cannanorica Hochst*			X		X
16	*Arundinella metzii Hochst.ex miq*			X	X	X
17	*Axonopus compressus(sw.)p.*			X	X	X
18	*Bhidea fischeri*					X
19	*Cymbopogon flexuosus (Nees ex steud.)w.watson*					
20	*Cynodon dactylon (L.)pers.*	X	X			
21	*Cyrtococcum trigonum(Retz.)A. Camus*		X	X		
22	*Dactyloctenium aegypticum (L.)Willd.*	X	X	X		
23	*Digitaria ciliaris (Retz.)Koeler*			X	X	

24	*Dimeria bialataC. E. C. Fisch*			X	X	
25	*Dimeria hohenackeri Hochst.ex. miq*			X	X	
26	*Echinochloa colona L.*		X			
27	*Eragrostis tenella L.*	X	X	X		
28	*Eragrostis tenuifolia(A.Rich.) steud.*	X	X			
29	*Eragrostis unioloides Retz.*	X	X	X		
30	*Eragrostis viscosa (Retz.)Trin*	X	X	X		
31	*Heteropogon contortus (L.)*			X	X	X
32	*Ischaemum copeanum L.*			X	X	
33	*Ischaemum elimalayanum sreek.*			X	X	
34	*Ischaemum indicum (Houtt.)Mer.*			X	X	
35	*Ischaemum jayachandranii sreek.*			X	X	
36	*Ischaemum malabaricum L.*				X	X
37	*Ischaemum muticum L.*				X	
38	*Ischaemum pappinisseriensis L.*				X	
39	*Ischaemum raui L.*			X	X	
40	*Ischaemum zeylanicolum L.*			X	X	
41	*Oplismenus compositus L.*		X	X	X	
43	*Oryza rufipogon Griff*	X	X	X		
44	*Panicum repens L.*		X	X		
45	*Paspalam scrobiculatum Linn.*		X	X		
46	*Pennisetum polystachyon(L.)schult*				X	X
47	*Perotis indica (L.)kuntze*		X	X		
48	*Rottboellia cochin-chinensis (Lour.)Clayton*			X	X	
49	*Sacciolepis interrupta willd.*			X	X	
50	*Setaria pumila (poir.)Roem*				X	X
51	*Sopubia delphinifolia (L.)G. Don*		*X*	*X*		
52	*Utricularia cecillii P. Taylor*	*X*	*X*			

Table 3.2: August - September Months

Sl. No	Species	Distance away from water body				
		0–5 m	5–10 m	10–15 m	15–20 m	20–25 m
1	*Rotala malabarica L.*	X				
2	*Rotala malampuzhensis R. V. Nair ex C. D. K. Cook*	X				
3	*Nymphoides krishnakesara var. bispinosa*	X				
4	*Cryptocoryne spiralis(Roxb)Kunth*	X				
5	*Marsilea minuta L.*	X				
6	*Blyxa octandra(Roxb.)Planch. Ex Thwaites*	X				
7	*lsoetes coromandelina L.*	X				

Table 3.3: September –October Months

Sl. No	Species	Distance away from water body				
		0–5 m	5–10 m	10–15 m	15–20 m	20–25 m
1	*Sesamum orientale L.*		X		X	
2	*Sesamum radiatum Schumach*			X	X	X
3	*Arundinella cannanorica Hochst.*					
4	*Arundinella metzii Hochst.ex miq*					X
5	*Dimeria hohenackeri Hochst.ex miq*			X	X	X
6	*Ischaemum indicum (Houtt.)mer*				X	X
7	*Ischaemum jayachandranii Sreek.*				X	X
8	*Ischaemum muticum L.*				X	X
9	*Ischaemum pappinisseriensis L.*			X	X	
10	*Ischaemum raui L.*			X		
11	*Ischaemum zeylanicolum L.*			X	X	
12	*Panicum repens L.*		X	X	X	X
13	*Paspalam scrobiculatum Linn.*		X	X	X	X
14	*Panicum brevifolium L.*		X	X	X	X
15	*Celosia argentia var.*			X	X	X

Here, 23 plants are found in between 0-5m from pond, then 26 plants are present in between 5-10 m, Around 42 plants found in between 10-15 m. Maximum number of plants are present in that distance. 35plants are there in between 15-20m, and 22 plants present in between 20-25m.

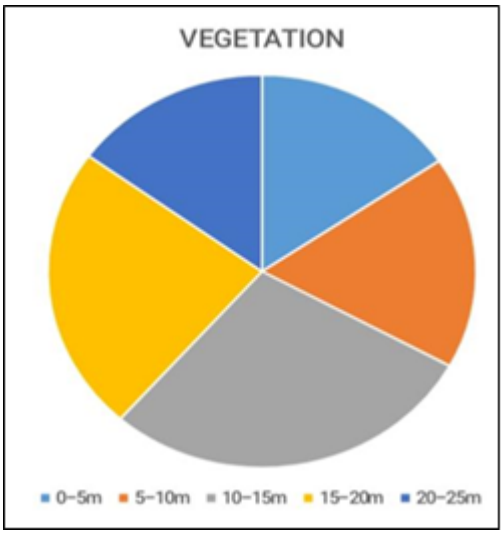

Fig 2: vegetation sampling

Three seasons, *viz*. pre-monsoon (March – May), Monsoon (June – November) and post-monsoon (December – February) can generally be recognized on the plateau. The seasonal pools in the plateau are varying in their area, depth, soil cover and soil texture. The pools are just depressions on the plateau, either on laterite rock or on soiled areas. If it is on rocks, thin layers of soil rich in organic matter has been noted, which support the vegetation. The pools get dried up in pre-monsoon and post-monsoon periods. They become water logged with the onset of southwest monsoon and dry up after the retreat of northeast monsoon. List of some of the endemic species identified from the seasonal pools of Madayippara Lateritic Plateau after the first shower in May end or early June every year. A series of species are noticed progressively until they become dry in the months of October-November. Almost all species are herbaceous and most of them complete their life cycle in a short period, as the pools dry up. The notable and dominant species in the seasonal pool are *Geissaspis spp., Isachne veldkampii, Murdannia spp., Neanotis subtilis, Rotala spp., Eriocaulon spp., Utricularia spp., Blyxa spp., Drosera indica, Lindernia spp., Nymphoides krishnakesara, Oryza ruf ipogon, Rhamphicarpa longiflor*.

The current study is an effort to explore the floristic diversity of Kerala's wetlands. However, the report currently excludes many of the state's natural small ponds and streams, which are thought to be rich in floristic biodiversity. The study could identify a good number of macrophytes, especially Angiosperms, from the Madayipara, Kannur.

Conclusion

Functional homogenisation occurs across many areas and organism groups, thereby seriously affecting biodiversity loss and ecosystem functioning. It is important to study how functional features of aquatic plants have changed during season wise. The study examined whether aquatic plant communities showed different spatial patterns in functional composition and functional richness in relation to main environmental drivers between the time periods. Studies on species in functional space to assess if species with certain sets of traits have become more common or rare in the study period. It is also important that changes in the relationship between functional community composition and the environment since the aquatic plant communities showed different patterns in functional composition between the seasonal periods. The current study, is an effort to explore the floristic diversity of Kerala's wetlands. However, the report currently excludes many of the state's natural small ponds and streams, which are thought to be rich in floristic biodiversity. The study could identify a good number of macrophytes, especially Angiosperms, from the Madayipara, Kannur.

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