

PHYTOSOCIOLOGY OF MACROPHYTES IN MIRGUND WETLAND OF KASHMIR HIMALAYA

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ABSTRACT

The present investigation on Mirgund wetland, undertaken during the year 2006, deals with the phytosociological characters in the wetland ecosystem. Overall 16 species of macrophytes belonging to 13 families were reported from the wetland. In general, the density was maximum for *Batrachium* and minimum for *Alisma plantago-aquatica*. The maximum values for frequency and abundance were obtained for *Eleocharis palustris* and *Batrachium* respectively. The wetland is at present undergoing eutrophication.

Key words: Mirgund, wetland, macrophytes, phytosociology, Kashmir

INTRODUCTION

Macrophytes play an important role in functioning of the aquatic ecosystem. Abiotic features in an aquatic ecosystem are more influenced by macrophytes, as oxygen concentration may vary from traces to supersaturation or even may be absent depending upon the extent of macrophytic activity in the system. They also play important role in pollution abatement by providing sufficient means of nutrient removal. This could be achieved by maintaining the balance between the nutrient present in water, uptake of nutrients from sediments by the macrophytes and

when the peaks within the macrophytes are achieved. Macrophytes act as nutrient pumps for the ecosystem by taking in nutrients from deep layers and releasing them at the surface after death and decay (Pandit, 1999). Macrophytes are also used as manure and in medicines (Pandit, 1999). In view of dominance and ecological importance of macrophytes in wetlands, the present study was undertaken to obtain a baseline data on the phytosociology of macrophytes in a very important wetland of Kashmir, Mirgund.

STUDY AREA

Mirgund wetland is a shallow freshwater body associated with reed beds and riverine marshes on the River Jhelum. Wetland spreads over an area of 300ha at an altitude of 1580m within the geographical coordinates of 33°34' N and 74°45' E. The depth of the wetland varies between 0.4m to 1m. The shoreline is occupied by willow (*Salix* sp.) plantation all around the wetland. Earthen bunds have been constructed to maintain the water level and to control siltation. The Department of Wildlife Protection Jammu and Kashmir manages the wetland reserve as waterfowl habitat.

MATERIAL AND METHODS

Four study sites were chosen for sampling purpose from March, 2006 to June, 2006.

Depth and water temperature were recorded on the spot. The community features of macrophytes were worked out on monthly basis by random quadrat method using quadrats of definite size (1m²). The macrophytes were collected, sorted out, listed species-wise and counted to work out various community characteristics viz.-frequency, density and abundance (Misra, 1968).

RESULTS

The present study revealed the presence of a total of sixteen species of macrophytes belonging to 13 families including 11 species of emergents, 2 species rooted floating leaf type and 3 submerges (Table 1).

Table 1. Species composition of macrophytes in Mirgund wetland

Families	Plant Taxa
Alismataceae	<i>Batrachium</i> sp.
Alismataceae	<i>Sagittaria sagittifolia</i>
Alismataceae	<i>Alisma plantago-aquatica</i>
Apiaceae	<i>Sium latijugum</i>
Ceratophyllaceae	<i>Ceratophyllum demersum</i>
Cyperaceae	<i>Eleocharis palustris</i>
Equisitaceae	<i>Equisetum</i> sp.
Lamiaceae	<i>Lycopus europus</i>
Monyanthaecae	<i>Menyanthese trifoliata</i>
Monyanthaecae	<i>Nymphoides peltatum</i>
Marsiliaeaceae	<i>Marsilia quadrifolia</i>
Poaceae	<i>Phragmites australis</i>
Polygonaceae	<i>Polygonum hydropiper</i>
Potamogetonaceae	<i>Potamogeton lucens</i>
Sparganiaceae	<i>Sparganium erectum</i>
Typhaceae	<i>Typha angustata</i>

Density

As depicted in tables 2-4, the highest density (72.6) was recorded for *Batrachium* sp. at site I in May and lowest values of density (0.11) were recorded at site I for *Typha angustata* and *Stium latijugum* in March, *Lycopus eropus* and *Equisitum* sp. in April, and *Equisitum* sp. in May. In terms of relative density the highest value (49.40) was noted for *Batrachium* sp. at site I against the lowest (0.06) being recording for *Alisma plantago-aquatica* at site I in March.

Frequency

It varies considerably between 10 and 100 (Table 3 and 4). The highest frequency (100) was recorded for *Nymphoides peltatum* and *Batrachium* sp. *Eleocharis palustris* at different sites for different months. *Batrachium* sp. maintained higher frequency of 100% at site I, II and III for the entire period of sites while *Nymphoides*

peltatum attained it at site I only for April and May 2006. Interestingly *Eleocharis palustris* registered the highest frequency at all the four sites and that for May only. The highest relative frequency (13.33) was obtained for *Eleocharis palustris* and *Batrachium* sp. in May at Site I, against the lowest value (1.29), being recorded for *Lycopus europus* and *Equisetum* sp. in April.

Abundance

The greater abundance (72.7) was recorded for *Batrachium* species at site I in May and the lowest (3.0) was recorded for *Menyanthese trifoliata* at site IV in April. On the other hand, the highest relative abundance (40.47) was recorded for *Eleocharis palustris* at site II in April against the lowest value of relative abundance (0.316) being obtained for *Polygonum hydropiper* at site III in April (Table 3 and 4).

Table 2. Community features of macrophytes at different selected sites in Mirgund wetland in March 2006

S. No.	Species	Site I					Site II					Site III					Site IV								
		F	R.F	D	R.D	A	R.A	F	R.F	D	R.D	A	R.A	F	R.F	D	R.D	A	R.A						
1	<i>Alisma plantago aquatica</i>	30	6.00	0.60	0.420	2.00	1.13	60	7.89	4.70	3.104	7.83	3.99	80	9.638	3.90	2.588	4.50	4.971	60	7.142	2.80	2.312	4.66	2.326
2	<i>Eleocharis palustris</i>	80	16.00	22.4	15.65	28.0	15.89	80	11.84	39.5	26.09	43.9	22.37	80	9.638	52.3	37.58	5.37	5.576	60	9.523	31.8	26.29	39.75	24.11
3	<i>Equisetum sp.</i>	-	-	-	-	-	-	40	5.263	3.40	2.245	8.50	4.333	40	4.819	1.80	1.294	4.50	4.971	70	8.333	3.50	2.890	5.00	3.032
4	<i>Lycopodium obscurum</i>	30	6.00	0.90	0.62	3.00	1.70	30	3.95	0.30	0.86	4.33	2.20	20	2.405	0.40	0.281	2.00	2.076	40	4.761	1.50	1.238	3.75	2.274
5	<i>Menyanthes trifoliata</i>	-	-	-	-	-	-	50	6.46	9.70	6.40	19.4	9.89	60	7.228	2.80	2.012	4.66	4.638	60	7.142	9.20	7.587	15.33	9.298
6	<i>Phragmites australis</i>	10	2.0	0.20	0.140	2.00	1.13	40	5.263	1.60	1.05	4.00	2.040	70	8.433	4.56	3.235	6.42	6.665	70	8.433	1.10	1.734	3.00	1.819
7	<i>Polygonum hydropiper</i>	80	16.00	5.70	3.98	8.14	4.62	80	10.52	5.40	3.56	6.75	3.44	80	9.688	4.20	3.019	5.25	5.450	70	8.333	5.10	4.211	7.28	4.415
8	<i>Sium latifolium</i>	10	2.00	0.16	6.070	1.00	0.56	40	5.263	1.40	0.924	3.50	1.784	40	4.814	1.30	0.934	3.25	3.374	60	7.142	2.40	1.981	4.00	2.426
9	<i>Sparganium erectum</i>	30	6.0	6.50	4.542	21.6	12.30	30	3.94	1.60	1.056	5.33	2.717	30	3.614	2.50	1.797	8.33	8.651	40	4.761	1.60	1.321	4.00	2.426
10	<i>Typha angustata</i>	10	2.0	0.10	0.069	1.00	0.56	80	10.52	12.3	8.124	45.0	7.806	70	8.431	8.30	5.966	11.85	12.30	70	8.333	13.2	10.90	16.85	11.433
11	<i>Nymphoides peltatum</i>	10	2.0	35.2	24.59	35.2	20.0	70	3.21	8.90	5.878	2.71	6.480	80	9.638	24.6	17.68	3.75	3.853	80	9.523	15.1	12.46	18.87	11.446
12	<i>Batrachium sp.</i>	10	20.0	70.7	49.41	70.7	40.12	10	13.15	58.6	38.70	58.6	29.87	90	10.84	24.3	17.68	27.00	28.03	80	9.323	28.3	23.37	35.37	21.454
13	<i>Potamogeton lucen</i>	20	4.0	0.70	0.489	3.50	2.08	50	6.572	3.00	1.98	6.00	0.059	80	10.84	5.50	6.110	9.44	9.808	60	7.142	4.50	2.715	5.00	3.032

F = Frequency
D = Density
A = Abundance
RF = Relative Frequency
RD = Relative Density
RA = Relative Abundance

Table 3. Community features of macrophytes in Mirgund wetland at different selected sites in month of April 2006

S. No.	Species	Site I					Site II					Site III					Site IV								
		F	R.F	D	R.D	A	RA	F	R.F	D	R.D	A	RA	F	R.F	D	R.D	A	RA						
1	<i>Alisma plantago aquatica</i>	30	3.686	0.70	0.735	2.33	1.80	60	6.593	1.39	1.157	2.16	1.355	60	5.882	0.90	0.654	4.83	3.055	50	5.154	2.50	-	5.00	3.556
2	<i>Eleocharis palustris</i>	80	10.38	20.5	21.53	25.6	19.7	80	8.791	51.6	45.99	64.5	40.47	80	7.843	25.7	18.67	32.12	20.31	10	10.30	42.4	-	42.40	30.160
3	<i>Equisetum</i> sp.	10	1.298	0.10	0.105	1.00	0.77	60	6.593	2.90	2.582	4.85	3.031	60	5.882	25.8	8.75	9.66	6.110	30	3.092	1.50	-	3.00	2.134
4	<i>Lycopodium obscurum</i>	10	1.298	0.10	0.105	1.00	0.77	20	2.197	0.30	0.267	1.50	0.941	60	5.882	2.10	1.526	3.50	2.213	40	4.123	0.60	-	1.50	1.067
5	<i>Menyanthes trifoliata</i>	-	-	-	-	-	-	80	8.791	11.4	10.15	14.2	8.943	60	5.882	6.90	5.014	11.50	7.274	50	5.154	1.50	-	0.30	0.213
6	<i>Phragmites australis</i>	60	7.792	2.00	2.100	3.33	2.58	60	6.593	1.70	1.513	2.83	1.776	90	8.823	7.20	5.232	8.00	5.060	50	5.154	1.80	1.594	3.60	2.560
7	<i>Polygonum hydropiper</i>	80	10.38	3.60	3.991	4.75	3.68	60	6.593	1.20	1.068	2.00	1.255	60	5.882	3.00	2.180	0.55	0.316	70	7.215	2.10	1.860	3.00	2.134
8	<i>Sagittaria sagittifolia</i>	-	-	-	-	-	-	50	5.494	0.70	0.623	1.40	0.878	-	-	-	-	-	-	40	4.123	1.40	1.240	3.50	2.489
9	<i>Sium latifolium</i>	40	5.19	1.30	1.365	3.25	2.52	50	5.494	-	2.671	6.00	3.765	60	5.882	3.30	2.398	6.60	4.174	70	7.216	2.00	-	2.65	2.027
10	<i>Scirpium erectum</i>	40	5.19	3.50	3.676	8.75	6.78	80	8.791	9.00	8.014	11.2	7.060	70	6.852	9.20	6.685	13.14	6.311	60	6.187	2.90	2.578	4.63	3.435
11	<i>Typha angustata</i>	50	6.49	1.20	1.260	2.40	1.86	40	4.385	0.80	0.712	2.00	1.255	50	4.901	5.70	4.142	11.40	7.211	60	6.185	2.70	-	4.50	3.201
12	<i>Atastrea quadrifolia</i>	50	7.792	2.30	2.415	3.83	2.97	20	2.197	0.40	0.356	2.00	1.255	50	4.901	0.90	0.254	1.80	1.138	50	5.154	1.60	1.417	3.20	2.27
13	<i>Nymphoides peltatum</i>	10	13.98	12.5	14.18	13.5	10.7	80	8.791	6.40	5.699	8.00	5.020	60	5.882	3.90	2.804	6.50	4.111	90	9.278	9.70	8.591	10.77	7.66
14	<i>Batrachium</i> sp.	80	10.38	41.3	43.38	51.6	40.0	70	7.692	11.5	10.24	16.4	10.30	10	9.803	28.8	15.11	20.80	13.15	90	9.278	26.9	-	32.11	22.64
15	<i>Potamogeton lucens</i>	70	90.10	2.70	2.836	3.85	2.98	50	5.494	8.50	7.569	17.0	10.66	80	7.843	16.3	11.19	19.12	12.09	70	7.216	4.50	-	6.42	4.566
16	<i>Ceratophyllum demersum</i>	60	7.792	2.20	3.310	3.66	2.84	50	5.494	1.60	1.424	3.20	2.068	80	7.843	6.90	5.014	6.62	5.452	50	5.154	6.80	6.023	13.60	9.647

F = Frequency
D = Density
A = Abundance
RF = Relative Frequency
RD = Relative Density
RA = Relative Abundance

Table 4. Community features of macrophytes in Mirgund wetland at different selected sites for the month of May 2006

S. No.	Species	Site I					Site II					Site III					Site IV								
		F	RF	D	RD	A	RA	F	RF	D	RD	A	RA	F	RF	D	RD	A	RA	F	RF	D	RD	A	RA
1	<i>Alisma plantago aquatica</i>	60	8.000	2.80	1.853	4.66	2.24	60	6.315	1.80	1.58	36.0	2.252	70	5.833	4.20	2.908	6.00	3.604	70	6.363	4.10	3.448	5.85	3.952
2	<i>Filocharis palustris</i>	10	13.33	20.1	13.30	20.1	9.66	10	10.52	47.2	41.47	47.2	35.43	10	8.333	45.1	31.23	45.10	27.07	10	9.090	41.0	34.48	41.0	24.20
3	<i>Equisetum</i> sp	10	1.333	0.10	0.066	1.00	0.48	20	2.105	0.20	0.175	1.00	0.750	60	5.000	2.20	1.523	3.66	2.198	60	5.454	5.60	4.709	9.33	4.277
4	<i>Lycopus cbeche</i>	-	-	-	-	-	-	-	-	-	-	-	-	60	5.000	1.90	1.315	5.00	1.898	30	2.727	0.90	0.756	3.00	2.027
5	<i>Menyanthes trifoliata</i>	20	2.666	0.70	0.463	3.50	1.68	70	7.368	6.90	6.063	9.85	7.394	70	5.833	3.50	2.423	5.00	3.004	70	6.363	6.40	5.382	9.40	6.351
6	<i>Phragmites australis</i>	30	4.000	0.40	0.254	1.33	0.63	70	7.368	2.20	1.933	3.14	2.357	60	5.00	2.60	1.800	4.33	2.601	80	7.272	3.70	3.118	4.62	3.121
7	<i>Polygonum hydropiper</i>	90	12.00	10.1	6.684	11.2	5.39	80	8.421	3.70	3.251	3.87	2.905	70	5.833	2.70	1.869	3.85	2.313	80	7.272	3.56	2.993	4.37	2.952
8	<i>Sagittaria sagittifolia</i>	-	-	-	-	-	-	60	6.315	2.84	2.495	4.66	3.498	50	4.160	1.90	1.315	3.81	2.289	40	3.636	1.40	1.177	3.50	2.364
9	<i>Sium latyugum</i>	40	5.333	0.70	0.463	1.75	0.84	40	4.210	0.90	0.790	2.5	1.876	90	7.500	4.70	3.047	4.88	2.931	80	5.454	2.70	2.270	4.50	3.040
10	<i>Sparganium erectum</i>	40	5.333	0.80	0.579	2.00	0.96	50	5.263	1.50	1.318	3.00	2.252	90	7.500	3.90	2.700	6.55	3.935	90	8.181	7.20	5.055	8.00	5.405
11	<i>Typha angustata</i>	20	2.666	5.00	3.309	2.00	0.96	40	4.210	0.80	0.702	2.00	1.501	70	5.833	2.10	1.454	3.00	1.802	80	7.272	5.00	4.205	2.25	4.222
12	<i>Maslea quadrifolia</i>	80	10.66	17.1	11.31	21.3	10.2	60	6.315	1.80	1.581	3.00	2.252	80	6.666	2.80	1.939	3.50	2.102	30	2.72	0.90	0.756	3.00	2.027
13	<i>Nymphaeodes peltatum</i>	10	13.33	8.20	12.04	18.2	8.75	90	9.473	11.7	10.28	13.0	9.959	80	6.666	9.20	6.371	11.50	6.909	90	6.181	10.3	8.662	11.44	7.729
14	<i>Batrachium</i> sp	10	13.33	72.6	48.04	72.6	34.9	50	9.473	25.8	22.67	28.6	21.51	10	8.333	45.7	31.64	45.70	27.09	80	7.272	13.3	11.18	16.62	11.22
15	<i>Potamogeton lucens</i>	20	2.666	0.90	0.585	45.0	21.7	90	9.473	6.00	5.272	6.66	5.00	80	6.666	4.10	2.839	5.120	3.076	80	7.272	10.5	8.830	13.12	8.864
16	<i>Ceratophyllum demersum</i>	40	5.333	1.60	1.058	3.20	1.53	30	3.157	0.50	0.439	1.66	1.246	70	5.833	1.90	1.315	5.470	6.777	60	5.454	2.40	2.018	4.00	2.702

F = Frequency
D = Density
A = Abundance
RF = Relative Frequency
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DISCUSSION

The fresh water bodies of Kashmir especially the lentic system including lakes and wetland support luxuriant growth of macrophytes. These macrophytes to a greater extent determine the structure and functioning of the aquatic ecosystems. Mirgund, a shallower wetland, harbours diverse nature of macrophytic vegetation dominated by the emergent class.

The structure of aquatic plant communities is influenced directly or indirectly by changes in water quality. Water level fluctuations are one of the important factors, which determine the species richness of macrophytic communities (Zutshi and Gopal, 1990). The Mirgund wetland having maximum depth of 1m provides suitable habitat for the growth of emergent vegetation. Its hydrological sequence is determined by the emergent vegetation as the fluctuation in water level paves ways to some opportunistic species of emergent to emerge on newly created land masses within the wetland (Kumar and Pandit, 2005). Nutrient enrichment of waters by domestic sewage or otherwise cause drastic changes in the biomass of aquatic plants and alter their species composition (Phillips *et al.*, 1978).

The appreciable values of frequency, density and abundance depicted by species like *Sparganium erectum*, *Polygonum amphibium*, *Alisma plantago-aquatica* and *Potamogeton lucens* indicate nutrient enriched condition of the wetland as the species have been advocated to be the indicators of eutrophication (Clark *et al.*,

1978; Pandit, 2002)

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