

Diversity of Emergent Macrophytes in Two Rural Lakes of Kashmir Himalaya

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ABSTRACT

The present investigation deals with the diversity of emergent macrophytes in two rural lakes of Kashmir Himalaya under varying degrees of ecological stress. The study revealed significant variations not only in species composition but also in other community features of frequency, density, abundance and Importance Value Index. Out of total 28 species of macrophytes recorded from the Ahansar lake, 13 species comprised the emergent community as against the Manasbal lake where 10 species comprised the emergent community out of a total of 23 species. *Phragmites australis*, *Myriophyllum verticillatum*, *Typha angustata* were the three most frequent species with the mean frequency values of 36.66, 20.47 and 11.90 respectively in the Ahansar lake in comparison to the Manasbal lake where *Phragmites australis*, *Typha angustata*, *Nasturtium officinale* and *Sagittaria sagittifolia* recorded highest mean frequency values of 9.04, 6.66, 4.28 and 4.28 respectively. In general, Ahansar lake depicted complex physiognomy of emergents with each species contributing significant proportion to the Importance Value Index (IVI).

Keywords: Macrophytes, Emergents, Diversity, Himalayan Lakes, Kashmir

INTRODUCTION

The increased human interference in and around the aquatic ecosystems has accelerated the aging of lakes manifold. These interferences not only affect the physico-chemical environment but also pose a great threat to the rich and diverse gene pool sustained by these invaluable natural ecosystems. The vast array of lakes, located at different geographical co-ordinates in the Vale of Kashmir, are also subjected to a multitude of human activities resulting in the deterioration of their environment and subsequently disturbing the ecology of both plant and animal communities.

Macrophytes, the higher vascular plants of aquatic habitats which perform a dominant role in determining structure and function of freshwater lakes, have received little attention in Kashmir Himalaya from their ecological point of view (Kaul and Zutshi, 1967; Zutshi and Vass, 1971, 76; Kaul *et al.*, 1978; Handoo and Kaul, 1982; Kaul, 1982; Pandit, 1984, 99 and 2002). In the present paper an attempt has been made to evaluate the present trophic condition of the two rural lakes of

Kashmir Himalaya based on the ecological status of emergent macrophytic community contributing a significant proportion to the primary production of these ecosystems.

STUDY AREA

The two rural freshwater lakes selected for the present study were Manasbal and Ahansar. Manasbal is a medium sized lake situated at an altitude of 1585m (a.s.l) with an overall surface area of 2.80 km² and maximum depth of 12.5m. The lake harbours luxuriant growth of macrophytes especially submergeds forming dense meadows and rooted floating-leaf types, the emergent vegetation being restricted to small isolated patches in the littorals (Fig. 1). Ahansar is a small sized lake lying at the same altitude as that of the Manasbal lake with an overall surface area of 0.80 km² and the maximum depth of 5.5m. The lake supports complex growth of macrophytes of all life-forms with extensive coverage of rooted floating-leaf types and emergents in the littorals (Fig. 2) and submergeds towards the deeper zones.

MATERIAL AND METHODS

The study was undertaken on monthly basis from April 2002 to October 2002 during the growing period of macrophytes. The random quadrat method was followed for studying various structural features of macrophytic community. The quadrats of definite size (1m²) were laid randomly at the various study sites and the macrophytes occurring in each quadrat were listed specieswise and the individuals of each species counted to work out the various quantitative community features including frequency, density, abundance and Importance Value Index (IVI) besides the species richness using various formulae (Misra, 1968; Margalef, 1969).

RESULTS AND DISCUSSION

The occurrence and abundance of macrophytes in aquatic habitats is governed by a set of environmental factors. In contrast to lotic waters which are almost devoid of any macrophytic growth due to fast water currents, shallow lakes and wetlands are heavily infested with macrophytes. The present investigation revealed discernible variations in the structural attributes of emergent macrophytes inhabiting the two lakes (Table 1). Manasbal, the deepest valley lake of Kashmir, had limited emergent zone comprising about 5 – 10% of the lake and being restricted to small patches while as the comparatively shallower Ahansar lake had an extended zone of emergent vegetation covering about 30 – 35% of the lake all along its periphery.

The species composition of the two lakes depicted certain degree of variability with only a few species common to both the lakes. Thus, the number of emergents recorded at Manasbal were only 9 out of a total of 23, while Ahansar registered 13 emergents out of total of 28 (Table 1). *Scirpus triquetus* was recorded only from the Manasbal lake, whereas *Echinochloa crusgalli*,

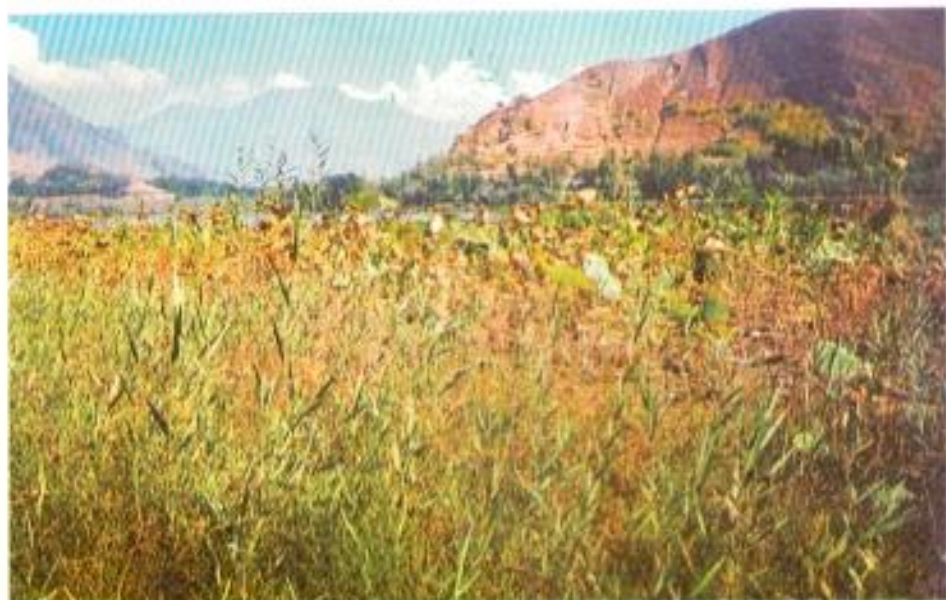


Fig. 1. Sparse growth of *Phragmites australis* intermixed with *Nelumbo nucifera* (in the background) in the littorals of Manasbal lake



Fig. 2. Young shoots of reed (*Phragmites australis*) emerging out during early growing season in Ahansar Lake.

Eleocharis palustris, *Hippuris vulgaris*, *Myriophyllum verticillatum*, *Polygonum amphibium* and *Sparganium ramosum* were the representative taxa of the Ahansar lake only. *Phragmites australis*, *Nasturtium officinale* and *Typha angustata* with the mean importance value index of 96.24, 54.75 and 33.84 respectively were the dominant emergent forms in the Manasbal lake. In contrast, *Phragmites australis*, *Myriophyllum verticillatum*, *Nasturtium officinale* and *Sparganium ramosum* revealed highest mean IVI values of 58.76, 45.11, 39.15 and 28.91 respectively in the Ahansar lake.

Table 1. Community features of emergent macrophytes (mean values) of Manasbal and Ahansar lakes.

S.No.	Species	Frequency	RF	Density	RD	Abun.	R.A.	IVI
MANASBAL LAKE								
01.	<i>Alisma plantago-aquatica</i>	0.95	2.81	0.02	1.37	0.57	3.03	7.21
02.	<i>Bidens cinnua</i>	0.95	2.81	0.03	2.06	0.50	2.66	7.53
03.	<i>Cyperus deformis</i>	1.90	5.62	0.05	3.44	1.21	6.43	15.49
04.	<i>Nasturtium officinale</i>	4.28	12.67	0.28	19.31	4.28	22.77	54.75
05.	<i>Phragmites australis</i>	9.04	26.76	0.55	37.93	5.93	31.55	96.24
06.	<i>Sagittaria sagittifolia</i>	4.28	12.67	0.09	6.20	1.69	8.99	27.86
07.	<i>Scirpus triquetar</i>	3.81	11.28	0.13	8.96	1.44	7.66	27.90
08.	<i>Typha angustata</i>	6.66	19.72	0.12	8.27	1.10	5.85	33.84
09.	<i>Slum latjugum</i>	1.90	5.62	0.08	5.51	2.07	11.01	22.14
AHANSAR LAKE								
01.	<i>Alisma plantago-aquatica</i>	2.86	2.33	0.04	1.19	0.76	2.57	6.09
02.	<i>Cyperus deformis</i>	2.38	1.94	0.08	2.39	1.43	4.85	9.18
03.	<i>Echinochloa crusgall</i>	2.86	2.33	0.05	1.49	0.67	2.27	6.09
04.	<i>Eleocharis palustris</i>	7.62	6.22	0.17	5.08	1.93	6.55	17.85
05.	<i>Hippuris vulgaris</i>	1.90	1.55	0.03	0.89	0.86	2.91	4.35
06.	<i>Myriophyllum verticillatum</i>	20.47	16.73	0.60	17.96	3.07	10.42	45.11
07.	<i>Nasturtium officinale</i>	7.62	6.22	0.49	14.67	5.38	18.26	39.15
08.	<i>Phragmites australis</i>	36.66	29.96	0.73	21.85	2.05	6.95	58.76
09.	<i>Polygonum amphibium</i>	5.71	4.76	0.15	4.49	2.33	7.90	17.15
10.	<i>Sagittaria sagittifolia</i>	9.52	7.78	0.25	7.48	2.56	8.68	23.94
11.	<i>Sparganium ramosum</i>	9.52	7.78	0.34	10.17	3.23	10.96	28.91
12.	<i>Typha angustata</i>	11.90	9.72	0.24	7.18	2.05	6.95	23.85
13.	<i>Slum latjugum</i>	3.33	2.72	0.17	5.08	3.14	10.65	18.45

R.F = Relative frequency; R.D. = Relative density; Abun. = Abundance;
 R.A = Relative abundance; IVI = Importance Value Index

The shallowing of lakes by the sedimentation of large quantities of both autochthonous and allochthonous material including silt often lead to the faster spreading of emergent reed swamp communities (Pandit, 1992). Extensive coverage of lake littorals with reed beds of *Phragmites australis*, *Sparganium ramosum* and *Typha angustata* confirm the highly evolved and higher productive state of the Ahansar lake as compared to the Manasbal lake where *Phragmites australis* and *Typha angustata* show patchy distribution with insignificant densities (Hutchinson, 1975). Zutshi and Vass (1982) and Pandit (1992) opined that emergents are the known opportunistic colonizers, once colonizing a particular habitat are difficult to dislodge. The same very fact seems to explain the greater establishment of the reed swamp communities in the Ahansar lake where water level fluctuations expose appreciable portion of the littorals to be colonized by these opportunistic species.

An evaluation of the trophic state of lakes on the basis of species richness indicates meso-eutrophic lakes to support higher species richness of macrophytes than either oligotrophic or highly eutrophic lakes (Rorslett, 1991). The higher species richness of emergents in Ahansar lake (Fig. 3) again suggests its higher level of productive status than the Manasbal lake.

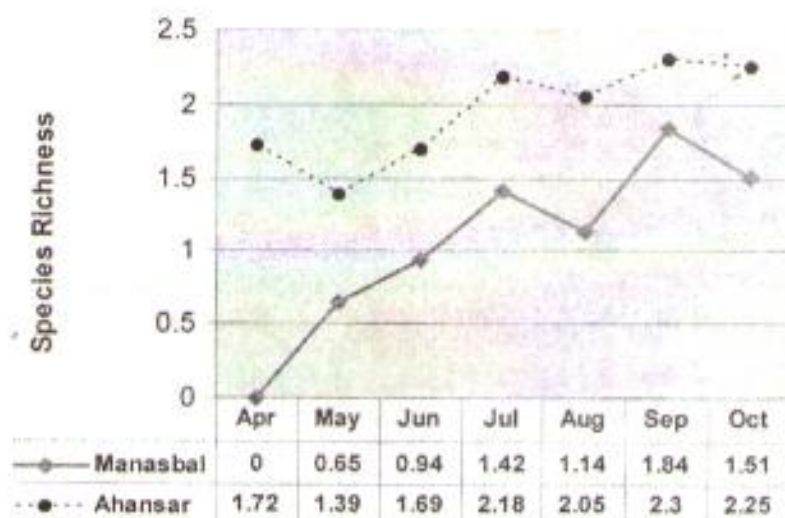


Fig. 3. Monthly values of species richness of emergent macrophytes in two lakes

A perusal of data shows that among emergents *Sparganium ramosum*, *Myriophyllum verticillatum*, *Sagittaria sagittifolia*, *Polygonum amphibium* and *Alisma plantago-aquatica* to be indicators of eutrophication (Hejney and Husak, 1978; Pandit, 1984). The absence of *S. ramosum*, *M. verticillatum* and *P. amphibium* together with the insignificant IVI of other species in the Manasbal lake and flourishing of all these indicator species with appreciable / significant importance value index in the Ahansar lake clearly establishes the fact that the Ahansar lake is at higher level of trophic evolution than the Manasbal lake.

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