ECOLOGY AND DIVERSITY OF PLANKTONS IN LAKES OF UCHALLI WETLANDS COMPLEX, PAKISTAN

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ABSTRACT

Limnological studies have been made by several workers in Pakistan and abroad, keeping in view their strong impact on wetland's biodiversity. At Uchalli Wetlands Complex no significant contribution were made prior to this communication. Uchalli Wetlands Complex is a Ramsar site in Pakistan where globally endangered species visit every year. In the present study the results on physico-chemical characteristics of water along with plankton ecology of three lakes are highlighted. The results revealed that among total 103 species of planktons, 51 were found in Uchalli, 47 in Khabbaki and 39 in Jahalar lake, and 31 % species were phytoplanktons, while 69 % were zooplanktons.

Keywords: Bio-chemical water analysis, Planktonic analysis, Uchalli Wetlands Complex, Pakistan.

INTRODUCTION

The "Uchalli Wetlands Complex" (72 14°E, 32 29°N) is a special type of wetland, found in the Salt Range, north-central part of the Punjab, Pakistan. This Complex is a Ramsar site (number 818 declared since 1996) and is a combination of three independent wetlands viz; Uchalli, Khabbaki and Jahlar. These wetlands are surrounded by mountain ranges formed by limestone, sandstone and clay scattered over the whole of the area. The sandstone is laminated by white cream colour, dark red or purple brown. Limestone occurs in pure, laminated and compact form generally in the higher reaches. On the southern side strata of gypseous red-marl are greatly exposed. Salt layer normally lies at the lowest level but subsequent upheavals have so tiered the layers that at many places the salt layers are exposed, due to washing away of the topside. The geological interest of the site is very high and is also responsible for the nature of present landscape.

These wetland sites covered about 1,243 hectares originally, while large portion of the water bodies is subjected to natural drought conditions. Human presence in recent times has resulted in substantial areas being reclaimed for agriculture. Large areas previously under water have been drained due to drought conditions and there has been a continuous trend in the last few years towards reduction of water in the lakes.

These lakes and the ecosystem they support are not only shrinking in their surface area but are also experiencing deterioration of water quality. This poses a serious health hazard to wildlife in general and birds in particular. As a consequence, a number of ecological changes mainly by natural and human pressure, the health and very life of the lakes is threatened.

MATERIALS AND METHODS

Water Sampling: Water analyses were made by the standard methods (APHA, 1992). The main purpose of sampling was to determine the quality of water in its natural state. The quality of water varies with time in a water body due to various natural and human induced factors. The sampling frequencies adopted for monitoring was monthly for three years from April 2001 to March 2004, earlier data from September 1992 to June 1996 were also analyzed along with present investigations, totally, two samples were taken from each lake each time using one liter plastic bottles and labeled. The sample bottle were labelled describing the name of the water body, date, time, sampling-point, and conditions under which it was sampled. Sampling was conducted during 10.00 a.m. to 2.00 p. m. Total number of water samples collected were 36 from Uchalli, 14 from Khabbaki (dried in June 2002) and 36 from Jahlar.

Preservation of the Water Sample: Between the times a sample was collected and analysed in the laboratory, physical, chemical and biochemical reactions may take place in the sample container leading to changes in the intrinsic quality of the sample, making it necessary to prevent or minimize these changes, suitable preservatives such as formalin was added to the sample. Highly unstable parameters such as pH, temperature, transparency, conductivity, dissolved oxygen etc. were measured at the sampling site.

Determination of Physio-Chemical Characteristic of Water: Water sample were collected from 30 cm below the water surface. Before sampling the plastic bottles were soaked in dilute hydrochloric acid solution (2.5 % HCl), washed three times with distilled water and dried.

In the field, the containers were rinsed about three times with the same water to be sampled. The analysis of the lake's water was done as per the standard methods (APHA, 1992) in the laboratory Zoology Department, University of the Punjab, Lahore, Pakistan.

Biological Analysis (Plankton Study): The plankton samples were taken monthly from three lakes, 40 litre water passed through Wisconsin plankton net and the collected samples were immediately fixed in 4 per cent formalin solution (Mason, 1967) and stored in refrigerator. For counting of cells Haemocytometer, Sedgwick Rafter cell and strip count method were used as described by Bauer (1990) and APHA (1992).

For zooplankton analysis sample was stratified by filters mesh size (64, 193, 341 μm) and preserved in plastic bottles. Identification and counting of zooplanktons were done with compound microscope and Sedgwick-Rafter (S-R) cell. The study of both phytoplankton and zooplankton was at generic level. Identification of plankton was done with the help of available literature. (Ward and Whipple, 1959; Stewart, 1972; Prescott, 1984; Islam and Tahmida, 1970).

RESULTS AND DISCUSSION

Variations in physico-chemical parameters during the years are presented in the Table 1.

Table 1 : Ranges of principal physico-chemical features of the Uchalli Wetlands Complex.

Variables	Khabbaki Lake		Uchalli Lake		Jahlar Lake	
	Range	Mean	Range	Mean	Range	Mean
Colour	Light green		Grayish		Greenish	
PH	8.80–10.59	9.576667	8.65–10.13	9.22333	7.82–9.21	8.433333
Transparency (cm)	28-55	45.5	35-80	62.25	44-90	72.25
Total Dissolved Solids (mg L^{-1})	17820-26341	21662	15340-19327	17644.8	8280-11832	10060.66
Dissolved Oxygen (mg L^{-1})	2.23-6.10	3.96	3.72-11.55	6.31	2.1-9.56	4.93
Total Suspended Solids (mg L^{-1})	1315-2130	1775.083	1770-2130	1933.67	770-1130	949.583
Conductivity (mS cm^{-1})	45.4-88.6	67.32417	34.3-83.6	64.9417	13.4-75.9	43.21666
Salinity (mg L^{-1})	33.2-55.7	47.1475	22.1-54.9	43.4167	10.10-49.60	28.86083
Free CO_2 ppm	1-9	4.83	1-9	5.75	1-11	7.58
Calcium (mg L^{-1})	320-800	602.6667	120-330	242.083	145-390	311.3333
Magnesium (mg L^{-1})	1200-1750	1482.083	1050-1450	1200.00	600-950	779.5833
Sodium (mg L-1)	435-943	716.6667	821-1342	1108.33	642-979	830.8333
Potassium (mg L-1)	435-623	525.3333	178-321	262.25	117-378	265
Sulphate (mg L^{-1})	2222-2552	2391	2384-3534	2863.42	1189-1821	1466.916
Chloride (mg L^{-1})	3192-4921	3753.583	3528-6341	4644.58	1429-2225	1785.333
Carbonates (mg L^{-1})	250-755	552.0833	150-540	336.417	340-845	595.6666
Bicarbonate (mg L^{-1})	340-645	495.8333	230-660	402.083	450-790	577.9166
Alkalinity as $CaCO_3$ (mg L^{-1})	590-1400	1047.917	380-1200	738.5	790-1625	1173.583
Hardness as $CaCO_3$ (mg L^{-1})	1880-2410	2153.333	1430-2110	1741.25	780-1440	1128.333
Total Phosphorus (μg L^{-1})	0.2-0.8	0.625	0.4-1.2	0.71333	0.6-0.9	0.6975
Nitrate-nitrogen (μg L^{-1})	0.66-3.76	2.27	0.25-1.45	0.78917	0.22-2.23	1.414166
BOD (mg L^{-1})	15-23	18.91667	13-17	14.6667	14-21	17.66666
COD (mg L^{-1})	660-870	765	620-831	760.833	329-628	472.4166

Phytoplankton: Phytoplanktons were divided in two major groups, algae and fungi. In all 27 species of algae, and five species of Fungi, were recorded from the lakes. Algae and fungi constituted 84 and 16% of the phytoplankton diversity of the lakes, while phytoplankton collectively added 31% to the total plankton diversity of the lakes.

Zooplankton: Zooplanktons were divided in sub groups viz Protozoa, Rhizopoda, Turbellaria, Rotifera, Copepoda, Nematoda, Cladocera and Hirudinea represented 33.8, 23.9, 15.5, 12.7, 5.7, 4.2, 2.8 and 1.4% of the zooplankton organisms respectively and collectively added to 69 % of planktons diversity of the lakes.

Numbers of species of different taxa of planktons are shown in Fig. 1.

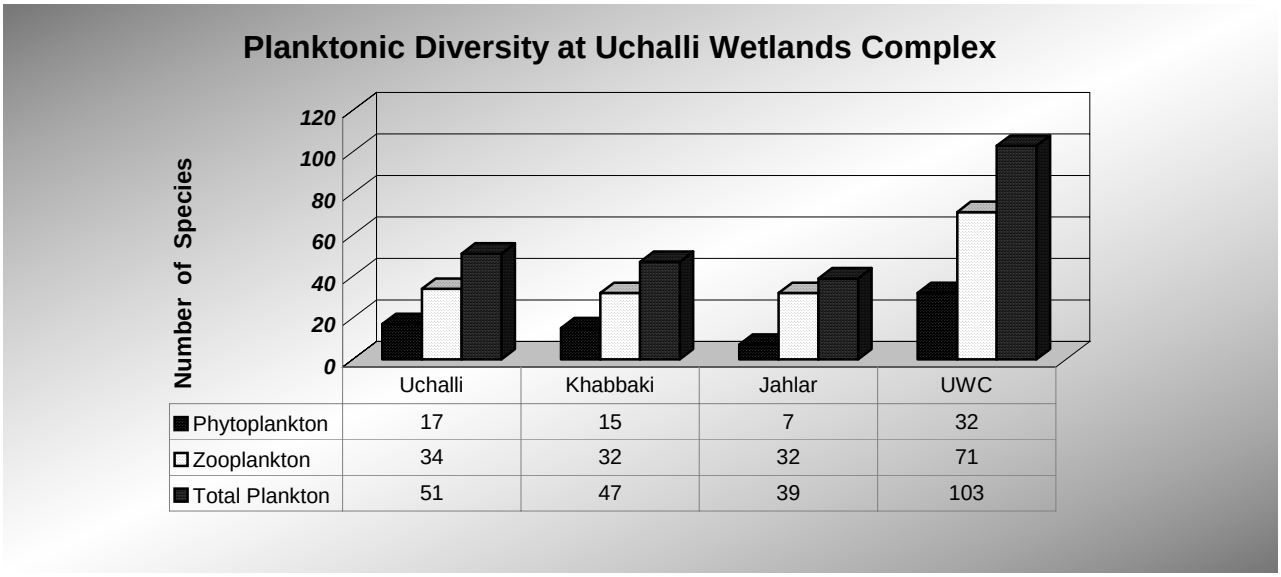

Figure 1: Planktonic diversity at Uchalli Wetlands Complex.

The results revealed that as a result of agricultural run-off and anthropogenic activities in the surrounding areas, waters of the three wetlands were highly alkaline and heavily concentrated by nutrients, high total dissolved solids, alkalinity and hardness, resulting in weed infestation, algal blooms, oxygen deficiency, odour, which has attained eutrophic condition.

The lakes support a total of 103 plankton species; diversity includes 27 species of Algae, 24 species of Protozoan, 17 species of Rhizopods, 11 species of Turbellaria and 9 species of Rotifers. Other variety recorded was, Fungi, 5 species, Copepods, 4 species, Nematodes 3 species and Cladocera two species. One Hirudinea species was also recorded from Khabbaki lake when sufficient water was present in the Lake. Seasonal changes in weather due to factors such as temperature and rainfall had marked effect on plankton flora and fauna may have seasonal variations in their numbers and composition.

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