

Some limnological investigations of Sarkoot pond located in Kishtwar, District Doda, J&K State

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ABSTRACT

The present investigation embodies morphometric and physico-chemical data on Sarkoot pond located at Kishtwar ($33^{\circ}.0'$ – $34^{\circ}.0'$ N Latitude and $75^{\circ}.0'$ – $76^{\circ}.45'$ E longitude) in district Doda of J&K state, Kishtwar, where this pond is situated in highly mountainous area lying at an altitude of 5300 feet and is bestowed with number of natural ponds. The Sarkoot pond with its present expanse of 37.33 kanals is presently being put to the illogical and undesired use, thus being a recipient of sewage from Sarkoot and Baigana villages. The expanse and depth of Sarkoot pond though promises, healthy and voluminous production has remained hither to unexploited scientifically. The pond being picturesque can be developed as a tourist spot once restored with its pristine beauty, its water quality improved and fish cultured and introduced for sport, marketing or for amelioration of economic condition of natives. It is, therefore, that the pond was selected for present studies related to the assessment of water quality alongwith the morphometric features so as to understand the diversity in community structure of inhabiting biota and its qualitative and quantitative abundance related with changing season.

Keywords: Physico-chemical, morphometric characteristics, seasonal changes and Sarkoot Pond.

INTRODUCTION

Physico-chemical parameters play a vital role in determining the distributional pattern, qualitative and quantitative abundance and inter-relationships among organisms inhabiting a particular aquatic ecosystem. Abiotic conditions of a water body also reveal the diversity and habitat condition of organisms acquiring different niches in an aquatic medium thus providing information about biological, physiological and chemical requirements of inhabiting fauna, needed for their better growth and survival. A considerable amount of literature is available on physico-chemical dynamics of lentic water bodies, viz., Gopal *et al.* (1981), Katiyar and Belsare (1997) and Singh and Dass (2002). Present paper deals with the morphometric and physico-chemical study of Sarkoot Pond in Kishtwar, investigated from March 2002 to February 2003.

STUDY AREA

The Sarkoot pond lies in the heart of Sarkoot village, Kishtwar on the north-western corner of Chowgan in distt. Doda of J&K state. It lies at an altitude of 53.00 ft and is a natural earthen pond having an area of 37.33 kanals and maximum depth of 12 feet at the centre and 2 feet at the margins (Data collected from the Deptt. Of Fisheries, Kishtwar). The source of water in Sarkoot pond is rain, water from the catchment areas and also sewage flushed in through a drain that caters to both Sarkoot village and Baigana village.

MATERIAL AND METHODS

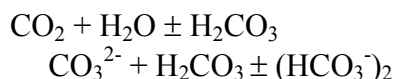
Three sampling sites (S-I, S-II, S-III) were selected along the Sarkoot pond and monthly sampling was carried during March 2002 to February 2003. Physico-chemical parameters were determined following the standard methods cut lined by I.S.I. (1973) and A.P.H.A. (1985).

RESULTS AND DISCUSSION

The Sarkoot pond after dividing into three study stations (S-I, S-II & S-III) was studied for various physico-chemical conditions and mean values along with \pm SD of the physico-chemical condition is presented in Table 1.

Atmospheric temperature of the study area ranged from a minimum of 6°C (January) and maximum of 32°C (June). The water temperature fluctuated according to atmospheric temperature ranging from minimum of 2°C in January to a maximum of 18 \pm 0.28°C in June. The water temperature and atmospheric temperature recorded high during summers may be attributed to increased photoperiod and day length whereas minima of these values may be due to shorter photoperiod as a consequence of decline in day length.

pH values in Sarkoot pond varied from 5.0 (April) to 7.9 (September). Increase in pH may be associated with increase in DO produced as a result of photosynthesis as has been emphasized by Sreenivasan (1967 a, b), Unni (1972), Otsuki and Wetzel (1974), Sehgal (1980) and Khajuria (1992). Goldman & Horne (1983) also discussed the fact that changes in pH in lentic water body are generally governed by FCO_2 , CO_3^{2-} , HCO_3^- complex operating as per the following mechanism:



Decrease in pH is in accordance with the decline in CO_3^{2-} concentration and rise in HCO_3^- content. Further, the great variability in the pH of the Sarkoot pond (Table 1) seemingly may be due to influx of sewage into pond that results in the production of higher amount of Free Carbondioxide (FCO_2) than the amount that could be compensated by buffering capacity of pond.

Dissolved oxygen of Sarkoot pond varied from minimum of 2 ± 0.86 mg/l (June, 2002) to the maximum of 8.6 ± 0.94 mg/l (September 2002) Table (1).

Fall in DO level during Summer (June) when temperature acquires maxima may be due to (i) mud metabolism (ii) metabolism of biotic micro-invertebrates and vertebrates (iii) Scum formation and cessation of photosynthesis due to algal cover of the water surface and (iv) low miscibility of gases in water (Jhingran, 1975 and Khalaf and McDonald, 1975) at higher temperatures.

The higher value of DO recorded during winters could be due to greater solubility of gases at low temperature as has also been opined by Jhingran (1975) and Khalaf and McDonald (1975).

Free Carbondioxide was recorded highest in August 7.0 mg/l and lowest in the month of March 1.3 ± 0.94 mg/l in Sarkoot pond. The presently recorded variation in FCO_2 may be attributed to:

- (i) Draining in of sewage in Sarkoot pond.
- (ii) Autonomic buffering capacity of the Sarkoot pond as is quite evident from the higher load of bicarbonates recorded (Table 1).

Carbonate recorded an annual variation of 0.0 – 2.0 mg/l and its presence has been recorded only during the month of March (Table 1). The bicarbonate was found to vary from a minimum of 284.6 ± 28.75 mg/l in June to maximum of 772.6 ± 14.37 mg/l in October.

The inverse relationship between FCO_2 and CO_3^{2-} has already been well documented by Welch (1952), Goldman and Horne (1983), Patil *et al.* (1985), Puri (1989) and Khajuria (1992).

Free Carbondioxide (FCO_2) converts insoluble carbonate (CO_3^{2-}) into soluble bicarbonate (HCO_3^-). Water rich in FCO_2 is comparatively less alkaline and vice versa as stated by Atkins (1926), Rao (1955), Saha (1981).

The presently recorded October increase in HCO_3^- could be attributed to the mixing of water due to sudden fluctuations in temperature during this month (October).

Chloride concentration varied from minimum of 85.3 ± 0.94 mg/l (March) to maximum of 313.3 ± 9.42 mg/l (November). The increase in chloride concentration in winters in Sarkoot pond may be attributed to (i) water – soil (bottom) interaction (bottom of Sarkoot pond being rich in decaying organic matter) and (ii) less consumption of chloride by the aquatic vegetation during winter.

Ca^{++} and Mg^{++} showed an annual variation from 14.03 ± 0.32 mg/l (June) to 58.82 ± 1.89 mg/l (November) and 7.70 ± 2.06 mg/l (September) to 24.8 ± 2.51 mg/l (January) respectively. The Ca^{++} acquires maxima in winter due to its greater solubility at lower temperature whereas increase in the concentration of Mg^{++} in winters was also recorded by Choe and Kwak (1971), Wetzel (1975), Sehgal (1980) and Kumar (1990).

Table 1: Seasonal variation in Physico-chemical parameters of Sarkoot pond from March 2002 – February 2003

Months	Atm. Temp. (°C)	H ₂ O Temp. (°C)	pH	FCO ₂ mg/l	Do mg/l	CO ₃ ²⁻ mg/l	HCO ₃ ⁻ mg/l	Cl ⁻ mg/l	Ca ⁺⁺ mg/l	Mg ⁺⁺ mg/l
March	18 ± 0.00	9.6 ± 0.14	7.6± 0.00	1.3± 0.94	8.3± 0.33	2	335.5±24.20	85.3±0.94	17.90±4.14	9.23±2.07
April	25 ± 0.00	14.4± 0.09	5.0± 0.00	4.6± 0.94	2.5± 0.94	absent	299.9±7.21	117.3±8.99	16.30±3.60	13.77±2.29
May	30 ± 0.00	16.9 ± 0.12	6.0± 0.74	4.6± 0.94	3.4± 0.89	Absent	333.8±22.89	115.3±8.05	18.04±5.90	12.96±4.13
June	32 ± 0.00	18.0 ± 0.28	5.8± 0.18	6.0± 0.24	2.0± 0.86	Absent	284.6±28.75	150.0±7.11	14.03±0.32	7.77±0.19
July	26 ± 0.00	15.9 ± 0.09	6.7± 0.21	6.6± 0.47	2.4± 0.41	Absent	286.0±37.99	145.3±10.49	16.04±3.27	10.58±2.12
August	25 ± 0.00	15.3 ± 0.26	6.6± 0.12	7.0± 0.00	3.2± 0.41	Absent	345.6±38.04	150.0±7.11	18.98±2.10	14.58±1.98
Sept.	22 ± 0.00	13.8 ± 0.00	7.9± 0.00	1.4± 0.37	8.6± 0.94	Absent	681.1±28.75	153.3±9.42	20.71±3.40	7.70±2.06
Oct.	20 ± 0.00	9.3 ± 0.23	7.5± 0.04	2.6± 0.47	7.6± 0.56	Absent	772.6±14.37	149.6±17.7	26.50±3.88	13.76±7.30
Nov.	17± 0.00	6.5 ± 0.26	6.8± 0.04	3.0± 0.00	4.6± 0.58	Absent	432.0±25.91	313.3±9.42	58.82±1.89	11.34±1.14
Dec.	10 ± 0.00	4.0 ± 0.00	7.8± 0.00	2.3± 0.47	7.9± 0.09	Absent	386.3±51.84	211.3±1.88	20.50±3.34	12.15±1.98
Jan.	6 ± 0.00	2.0 ± 0.00	7.6± 0.00	2.6± 0.47	7.4± 0.66	Absent	426.0±6.20	176±1.63	34.38±1.07	24.8±2.51
Feb.	8 ± 0.00	4.0 ± 0.16	7.8± 0.04	2.6± 0.47	8.2± 0.37	Absent	403.6±26.88	170±1.63	33.24±0.83	23.43±1.56
	6-32	2-18	5.0-7.9	1.3-7.0	2.0-8.6	0-2	284.6 – 772.6	85.3-313.3	14.03-58.82	7.70-2.48

Waters with 20-60 mg/l are fairly productive and Sarkoot pond falls in this category.

A healthy amount of presence of nutrients thus supports the present contention that pond is worthy of introduction of some kind of consumer (third trophic level) that could re-establish the tropic homeostasis in a manner that ecosystem refurbishes its animal protein production for human consumption.

Table 2: Mean of Physico-chemical Parameters of Sarkoot Pond at Kishtwar

S. No.	Parameters	Minimum	Maximum
1.	Air temperature (°C)	6	32
2.	Water temperature (°C)	2.0	18.0
3.	pH	5.0	7.9
4.	FCO ₂ (mg/l)	1.3	7.0
5.	DO (mg/l)	2.0	8.6
6.	CO ₃ ²⁻ (mg/l)	0.0	2.0
7.	HCO ₃ ⁻ (mg/l)	284.6	772.6
8.	Ca ⁺⁺ (mg/l)	14.03	58.8
9.	Mg ⁺⁺ (mg/l)	7.7	24.8
10.	Cl ⁻ (mg/l)	85.3	313.3

Table 3: Morphometric and meteorological data of Sarkoot Pond

Parameters	Values
Height above mean sea level (M)	5300 feet
Longitude	75° .0' – 76° .45' E
Latitude	33° .0' -34° .0' N
Area	37.33 Kanals
Depth at the Margins of Pond	2 feet
Depth at the Centre of the Pond	12 feet

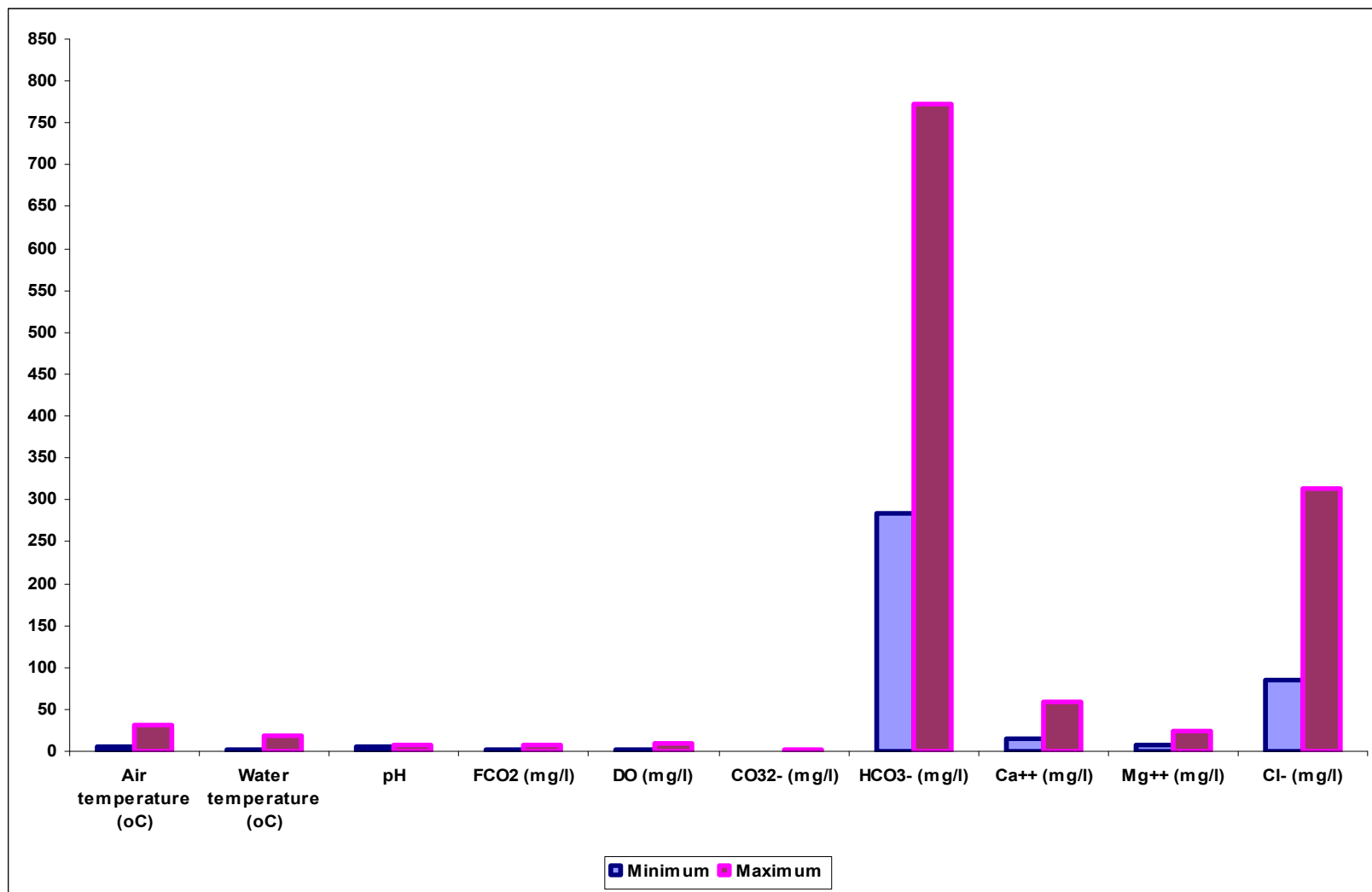


Fig. a: Mean values of Physico-chemical Parameters of Sarkoot Pond at Kishtwar

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