WATER QUALITY OF PARICHHA DAM RESERVOIR IN RELATION TO FISHERIES IN JHANSI (U.P.) INDIA

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ABSTRACT

Physico-chemical characteristics of Parichha dam reservoir of Jhansi in Uttar Pradesh have been studied. The water temperature varied between 23.0 to 37.0°C. The transparency, pH, chlorides and total hardness were in the range of 100 to 145 cm, 7.8 to 9.2, 42.0 to 59.17 mg/l and 100-197 mg/l respectively. The total alkalinity, dissolved oxygen and total dissolved solids ranged between 193 to 389, 5.2 to 8.6 and 90 to 310 mg/l respectively. The study revealed that the reservoir water is suitable for fisheries.

Figure : 00	References : 19	Tables : 02

KEY WORDS : Fisheries, Jhansi, Reservoir, Uttar Pradesh, Water quality.

Introduction

The reservoir came into existence with impounding of Parichha dam in Jhansi (U.P.) India. The morphometric features are depicted (Table-1). The work on water quality of Parichha dam reservoir can provide valuable information to the planners, scientists and fishing authorities to check out strategies for the development of fisheries. There is meagre record of water quality of Parichha dam reservoir.

The study of physico-chemical characteristics of Parichha reservoir includes the water temperature, transparency, total dissolved solids, pH, chlorides, total hardness, dissolved oxygen, carbondioxide and total alkalinity.

Materials and Methods

The Parichha dam reservoir is situated at latitude 78⁰ 36' E and longitude 25⁰ 31' N at an elevation of approximately 258m above mean sea level in Bundelkhand region, district Jhansi, Uttar Pradesh.

The methods used for analysis of various physico-chemical parameters except pH are as given in methodology for water analysis[18]. The bottles used for collection of water samples were made up of Pyrex glass and were cleaned by boiling them in dilute HNO_3 followed by distilled water[5]. The characteristics like temperature, pH, conductivity, dissolved oxygen **etc.** were measured as early as possible after collection.

TABLE- 1: Morphometric features of Parichha dam reservoir in Jhansi district

1	River	Betwa
2	Location	Jhansi
3	Year of Construction	1881-86
4	Rainfall (mm)	989
5	Length of dam (m)	1174.69
6	Height of dam (m)	16.77
7	Water spread area (ha)	802
8	Irrigation potential (ha)	98500 (Approx.)

pH of the samples were determined by Equip-Tronics digital pH meter model EQ-610 using glass electrode. Specific conductance was measured by Equip-Tronics digital conductivity meter model EQ-660 A which is first calibrated by using standard KCl solution. Total dissolved solids was determined by standard method.[1] Total hardness and chlorids in the water samples were determined by literature with standard EDTA[10]. The dissolved oxygen in water samples was estimated by standard method.[20]

Results and Discussion

The water quality data of reservoir is depicted (Table-2). Among all the ecological factors, the water temperature can be considered as an important factor on which the spawning in fishes depends. In the Indian major carps, the optimum temperature range for successful induction of spawning have been suggested from 24 to 31^{0}C and beyond this range fish do not spawn[6]. As per observation in common carp, (*Cyprinus carpio*) gametogenesis may be completed in October but spawning does not occur until the water temperature rises above 17^{0}C, the minimum spawning temperature[3]. The rate of chemical and biological reactions is being doubled with every 10^{0}C increase in temperature. Warm water fish grow

the best at a temperature range[4] (25 to 32^{0}C). During the present study the minimum water temperature was recorded in November 2015 (23^{0}C) and the maximum in April 2016 (37^{0}C). Reservoirs having water temperature more than 22^{0}C are found to be highly productive[11]. The average water temperature during the present investigation was 27^{0}C. Hence the reservoir water is highly productive.

Transparency is a physical variable significant to production. During the present study secchi disc transparency ranged from 100 to 145 cm. The minimum transparency value was recorded in July 2015 while the maximum in April 2016. Present findings collaborate with findings of others[15,16] who reported the lowest transparency values in rainy season. The low values recorded during rainy season may be due to the heavy rains and winds of high velocity. Similarly high values during winter and summer period can be attributed to low moderate wind velocity. High secchi disc transparency values indicate low primary productivity by phytoplankton and consequent low fish production[8].

The pH is affected not only by levels of carbon dioxide but also by other organic and inorganic components of water. Further, any alteration in water pH is accompanied by changes in other physico-chemical parameters. In the present study pH ranged from 7.8 to 9.2. The minimum value was recorded in May 2015 while the maximum in January 2016. The pH range between 6.0 to 8.5 indicates medium productive nature of a reservoir, more than 8.5 highly productive and less than 6 low productive reservoirs[11]. In case of Parichha dam reservoir, the average pH value during the study period was observed to be 8.5 which indicated that the reservoir is a medium productive. It has been observed that change of pH may be one of the main factors which may induce the fish to spawn[12]. On the other hand it is suggested that the interaction of many ecological factors like high oxygen content, relatively low free CO_2 and slightly alkaline pH were essential for the breeding of *Schizothorax, Labeo, Puntius ad Barilius spp.* of Garhwal Himalaya[2].

During present investigation the total dissolved solids were high in summer followed by winter and monsoon. The investigation of CIFRI[7] also reported the range of total dissolved solids in Bhatghar reservoir of Maharashtra, being maximum in March and January, minimum in October and June at lentic and intermediate sectors of the

reservoir. In lotic sector it was maximum in December and minimum in July.

The dissolved oxygen is of great importance to all living organisms. It dissolves in water due to direct diffusion from air and/or photosynthetic activity of autotrophs. The diffusion of oxygen is dependent on temperature of water, its salinity, total dissolved solids, and movements of water **etc**. During the study period, the dissolved oxygen ranged from 5.2 to 8.6 mg/l. The high dissolved oxygen was found during monsoon, while lower values were recorded in summer.

Free carbon dioxide is an extremely necessary constituent in an aquatic environment[19]. Free carbon dioxide in water occurs due to respiration of aquatic biota, decomposition of organic matters and also due to infiltration through the soil. Carbon dioxide is an important component of the buffer system, which influences carbonate and bicarbonate concentrations in water. The fishes can tolerate a higher concentration of free carbon dioxide up to 60 mg/l, with a tendency to avoid as low[9] as 5 mg/l[9]. In the present investigation, free carbon dioxide generally varied between nil and 2.5 mg/ L. It was not detected in]anuary 2016 and April 2016.

Alkalinity of any water is mainly due to carbonates, bicarbonates and hydroxide. It is an index of nutrient status in a water body. The total alkalinity in Parichha dam reservoir ranged from 193 to 289 mg/l. The availability of carbon dioxide for primary production is related to alkalinity. Water with total alkalinity levels of 20 to 150 mg/L generally contains adequate quantity of carbon dioxide[4]. Water bodies having total alkalinity above 50 mg/l can be considered productive[13]. The total alkalinity observed[14] was in accordance with the present finding.

The term hardness is frequently used as the assessment of the water quality. This is governed by the concentration of calcium and magnesium salts, which combined largely with bicarbonate, carbonate, sulphates, chlorides and

TABLE- 2: Water quality of Parichha dam reservoir in Jhansi

1.	Water temperature ºC	23.0-37.0
2.	pH	7.8-9.2
3.	Transparency (cm)	100.0-145.0
4.	Total Dissolved Solids (mg/l)	90.0-310.0
5.	Chlorides (mg/l)	42.0-59.17
6.	Total hardness (mg/l)	100.0-197.0
7.	Dissolved oxygen (mg/l)	5.2-8.6
8.	Total alkalinity (mg/l)	193.0-289.0
9.	Free carbon dioxide (mg/l)	Nil-2.5

other anions of mineral acids. Desirable level of total hardness for fish culture generally fall within the range of 20.0 to 300.0 mg/L. It is suggested[17] that a total hardness of 50.0 mg/L calcium carbonate equivalent is the dividing line between soft and hard waters and according to above suggestion pond waters having a total hardness of 15.0mg/L or above are good for fish growth[17]. Based on the average hardness level, Parichha dam reservoir can be considered suitable for fisheries. During the present investigation the maximum total hardness (197.0 mg/l) was found in May 2016, its minima (100.0 mg/l) was recorded in October 2015. The higher values of total hardness were recorded during summer and lower values were recorded in the winter season.

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