Proc. Indian natn. Sci Acad. **B47** No. 5 pp 652-655 (1981)

Potamology of the Stream Chakagadera in Relation to the Productivity of Coldwater Minor Carps in Garhwal Himalaya

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(Received 22 May 1981)

The paper deals with potamology of the stream Chakagadera, a tributary of Mandakini in relation to productivity of minor carps in Garhwal Himalaya. High temperature range of 12.2–21.6°C, *p*H range of 7.5 to 8.4, low velocity (0.193–0.377 m/sec.) and shallow pockets of water of Chakagadera are favourable for minor carps.

Key Words: Potamology, Chakagadera, Minor carps

Introduction

Various authors including Pruthi (1933), Chacko and Ganpati (1949), Alikunhi et al. (1955), Das and Srivastava (1956), Das (1964), Moitra and Bhattacharya (1965), and Das and Pathani (1978) have studied the hydrobiology of some rivers, lakes, and ponds in relation to the fish production. However, very little information is available (Badola 1979, Dobriyal & Singh 1981) on physico-chemical conditions and their impact on fish production in Garhwal Himalaya. During bioecological studies on *Barilius* spp., *Puntius chilinoides* and *Noemacheilus* spp., higher productivity of these minor carps was observed in the tributaries than in the main hillstreams. Hence, it was considered desirable to study the potamology of Chakagadera, a tributary of the Mandakini at Agastyamuni at an elevation of about 700 m.

Material and Methods

The study was conducted from February 1980 to January 1981. Temperature, *p*H, turbidity, velocity, free CO_2, dissolved oxygen, carbonates, bicarbonates, and total alkalinity were determined by standard methods (Anonymous 1975, Welch 1948). The velocity of water was determined in m/sec. by using the following formula:

$$V = 0.0185 + 0.7172\ R$$

where V = Velocity, R = Revolution/sec.

Observations

Physico-chemical parameters of Chakagadera are shown in table 1.

Meteorological and physical conditions

The weather was clear throughout the period of investigation except in January and

Table 1 *Seasonal variations in the physico-chemical conditions of Chakagadera during 1980–81*

Month	Air temp. (°C)	Water temp. (°C)	Weather	Colour of water	Turbidity (%)	Velocity (m/sec)	*p*H	Dissolved oxygen (ppm)	Free CO_2 (ppm)	Carbo-nates (ppm)	Bicarbo-nates (ppm)	Total alkalinity (ppm)
February	14.8	12.2	Clear	Green	1.0	0.260	7.6	13.8	4.5	Nil	21	21
March	21.6	14.8	Cloudy	Green	2.0	0.274	7.7	12.0	6.6	Nil	23	23
April	22.0	15.7	Clear	Green	3.0	0.267	7.7	11.1	7.9	Nil	24	24
May	28.1	15.0	Clear	Green	5.0	0.294	7.8	10.2	8.3	Nil	24	24
June	28.7	14.7	Clear	Green	4.0	0.290	7.7	10.1	9.2	Nil	25	25
July	28.6	18.6	Rainy	Turbid	62.0	0.377	7.6	12.0	7.5	Nil	23	23
August	21.7	20.0	Rainy	Turbid	56.0	0.368	7.5	12.3	7.2	Nil	20	20
September	22.8	21.6	Clear	Green	6.0	0.297	8.1	12.1	7.2	Nil	30	30
October	21.0	21.0	Clear	Green	4.0	0.269	8.3	8.7	8.9	Nil	30	30
November	17.0	16.2	Clear	Green	3.0	0.267	8.4	9.3	7.2	Nil	36	36
December	16.0	14.2	Clear	Green	2.0	0.197	8.0	11.6	6.3	Nil	26	26
January	12.0	13.1	Semi Cloudy	Green	0.5	0.193	7.7	12.7	5.2	Nil	22	22

March when it was cloudy and in July and August when it was rainy. The atmospheric temperature was highest in June (28.7°C) and lowest in January (12.0°C). The colour of water was always green except during the rainy season when it was turbid-brown. The turbidity was maximum in July (62%) and minimum in January (0.5%). The water temperature was highest in September (21.6°C), and lowest in February (12.2°C). The velocity of water was highest in July (0.377 m/sec.), and lowest in January (0.193 m/sec.).

Chemical conditions

A *p*H range of 7.5 to 8.4 was observed which shows a positive relationship with the total alkalinity variation. *p*H values show a negative relationship with the dissolved oxygen content with an exception in June and November. The maximum concentration of dissolved oxygen was obtained in February (13.8 ppm), and minimum in October (8.7 ppm). Free carbon-dioxide was always present, maximum concentration of 9.2 ppm was recorded in June and minimum 4.5 ppm in February. Total alkalinity was only due to bicarbonates, carbonates being always absent. The maximum concentration of 36 ppm was recorded in November and minimum of 20 ppm in August.

Discussion

Temperature is one of the most important factors affecting plankton and fish production. The water temperature of Chakagadera (12.2–21.6°C) is higher than that of the Mandakini. In the tributary 7.01 plankters /l of water were observed in January when the water temperature was 13.1°C. But during the same month, 4.05 plankters /l of water were recorded in the river Mandakini at a water temperature of 6.7°C. This observation lends support to the view of Worthington (1954). The higher temperature of the tributary is favourable for minor carps to breed, since the temperature for the spawning of *Barilius* sps has been reported to be from 20.5 to 22.5°C (Badola 1979).

The *p*H range of 7.5 to 8.4 corresponds with that recorded by us for the Mandakini. Das and Srivastava (1956), and Moitra and Bhattacharya (1965) held the opinion that a high *p*H coincides with a rise in phytoplankters, a condition favourable for minor carps. The low velocity (0.193–0.377 m/sec), and less depth of Chakagadera than the river Mandakini ($V \simeq 0.305$–0.520 m/sec), are also favourable for minor carps to flourish, as suggested by Badola (1979) for *Barilius* and *Puntius* spp. A gradual rise in the dissolved oxygen content from 8.7 ppm in October to 13.8 ppm in February is also conducive for the carp population (Moitra & Bhattacharya 1965). The free CO_2 ranged from 4.5 to 9.2 ppm. In the tributary the dissolved oxygen and free CO_2 values show an inverse relationship with each other, while in the river Mandakini a positive relationship between the two values has been noticed. This is probably due to the temperature variation as we also observed the same negative relationship in the river Nayar which is also warmer than the river Mandakini. According to Badola (1979) the breeding grounds of *Barilius* sps. occur in the neighbouring stagnant water. They lay their eggs in the shallow pockets of water under stones. The rock pools and shallow pockets of water support a variety of insects and their larvae and a carpet of algae and other microflora providing a lush grazing ground which accounts for their high production in tributaries and small streams like the one described here.

Acknowledgement

The authors are grateful to the Department of Science and Technology, New Delhi for financial assistance.

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