

Research Article

EFFECT OF WATER TEMPERATURE ON RESPIRATORY RATE OF FISH, *CIRRHINUS MRIGALA*

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ABSTRACT

Due to global warming, increase in atmospheric temperature is the matter of great discussing issues among the scientists. Temperature as an important abiotic factor showed influence on the physiochemical parameters of all living organism on earth. Now a day's aquatic animals including fishes are constantly exposed to these changed biological factors. The present study was therefore carried to assess the impact of different temperature range (10°C and 35°C) on the respiratory rate of fresh water fish *Cirrhinus mrigala*. In our results we find that as the temperature increases the respiratory rate of *Cirrhinus mrigala* was also increases. Hence, at maximum temperature (35°C) an increased in respiratory rate was recorded while at low temperature (10°C) the respiratory rate was found to be decreased in the fish.

Keywords: *Cirrhinus mrigala*, Respiratory Rate, Temperature

INTRODUCTION

Now a day's variations in the seasons are much more than previous era. Global warming is the major problem of this century, which alters the natural environment conditions, it including: quality of water, abrupt increase/decrease in temperature and increase level of pollutions. These changes in environmental conditions directly affect the natural biodiversity. Hence, increase/ decrease in the environmental temperature directly or indirectly affect living animals. These variations become more prominent for aquatic animals e.g. change in the pH and temperature of water show adverse effects on the fishes and other aquatic animals. As we know that life in aquatic ecosystem is depends on water quality. The alteration of the physicochemical parameters of water affects the biota on its number and diversity. The inland fishery resources of India consisting of rivers, canals, estuaries, lagoons, reservoirs, lakes and ponds have a rich fish production potential; Boyd (1982); Crasser and Edwards (1987); Das (2003); Saravanan *et al.*,(2003). As the adverse conditions of water increases it produce highly stress on fishes (Capkin *et al.*, 2006; Singh and Mishra, 2009). Keeping these things in mind an experiment was carried out in which respiratory rate of fish, *Cirrhinus mrigala* was studied at different water temperatures (10°C and 35°C).

MATERIALS AND METHODS

Experimental Design: Experimental fish were obtained from a Govt. fish seed farm, Jhajjar Haryana (India). Prior to start of experiment, fishes were acclimatized under experimental conditions in laboratory for 2 weeks. After then three experimental groups were formed which were maintained at different temperatures. Fish (Body weight (BW) 0.5 to 1.20g) were randomly distributed @ 5 fish in each group.

Groups I: Act as a control and fishes maintained at room temperature 20 °C,

Group II: fishes maintained for 10 °C

Group III: fishes maintained for 35 °C

All fish were fed with formulated diet with feeding rate 5% BWd⁻¹. Each group of fish were exposed to their respective diet for four hours thereafter, the uneaten feed was siphoned out.

Respiratory Rate: Respiratory rate was studied by Number of times gills open per minute.

RESULTS AND DISCUSSION

In the present investigation, respiratory rate of freshwater fish *Cirrhinus mrigala* was studied with temperature variations (10°C and 35°C). In the result of this study mean respiratory rate of fish *Cirrhinus*

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mrigala was ranges from 50 to 95.8 respectively, this shows that respiratory rate was increased as the temperature increases (Table 1, Figure 1).

Table 1: Effect of Temperature on Respiration Rate of *Cirrhinus mrigala*

Respiration Rate of Fish (Number of Times Gills Open Per Minute)		Fish 1	Fish 2	Fish 3	Fish 4	Fish 5	Mean
Normal	20 °C	79	78	72	75	76	76
Ice Added	10 °C	62	45	48	39	56	50
Warm Water Added	35 °C	105	97	89	91	97	95.8

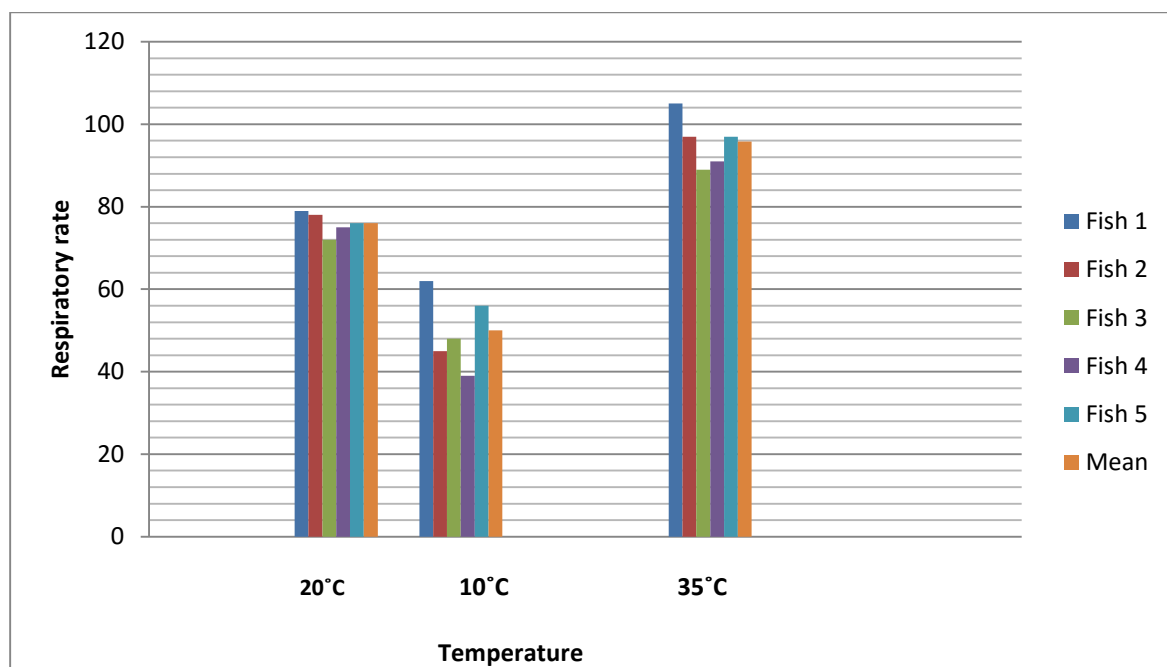


Figure 1: Respiration Rate of *Cirrhinus Mrigala*

At 35°C temperature maximum respiratory rate was recorded in *Cirrhinus mrigala* which was ranges from 89 to 105 respectively and its mean was also found to be highest (95.8) among all three groups (Table 1, Figure 1). But when fish *Cirrhinus mrigala* exposed to low temperature (10 °C) its respiratory rate was found to be decreases from 62 to 39 and its mean value was seen to be 50 (Table 1) as compared to control group fish where mean value for respiratory rate was 76 (Table 1, Figure 1). Hence, in the present study the impact of different temperatures on the freshwater fish, *Cirrhinus mrigala* showed increase in respiratory rate at 35°C temperature, while at 10°C temperature decrease in respiratory rate was observed as compared to normal temperature. Hence, this indicated that with Increase in temperature the metabolic rate of fish was also increased, which rise the oxygen demand, but reversibly it decrease oxygen solubility in water. Gillooly *et al.*, (2001) observed that the respiratory rate depends upon temperature and fishes felt stress with rise in temperature. Hence, rise in atmospheric temperature due to natural variations would directly influence the water temperature and ectothermic fishes (Curric *et al.*,

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1998). Guderley *et al.*, (1998) also showed that temperature act as growth rate modulator of the metabolic capacity of fish. Similarly, temperature stress response in Rainbow trout was observed by Wagner *et al.*, (1997).

Conclusion

This study indicates that the increase/decrease in temperature of water the respiratory rate of fish *Cirrhinus mrigala* was also increases/decreases accordingly. This show stress on the metabolic process of freshwater fishes. Thus, there is need of maintaining the environment temperature for preservation of local freshwater fishes for long time.

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