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## Erratic changes in an air breathing catfish *Heteropneustes fossilis* due to effect of stress

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**Abstract-** Fish and fish products provide low fat resources and are very healthy substitute of red meat. Fish industry is growing very rapidly, it provides a good source of income. Hence, it is necessary to produce healthy quality of fishes. Fishes get affected by many environmental factors such as temperature, humidity, pH etc. Proper handling of the water body is also necessary for the production. In the current study, the effect of above factors and the erratic changes in air breathing catfish *Heteropneustes fossilis* were studied. The effect of these stressors were studied for a period of two weeks. Subsequent decrease in haemoglobin level and muscle glycogen level was observed. Glycogen content was decreased by 57% when exposed to temperature stress. Haemoglobin level is in relation with erythrocytes count. These erratic changes effects the growth of *Heteropneustes fossilis* which adversely effects the production.

**Key words:** Erratic changes, Haemoglobin, erythrocytes, *Heteropneustes fossilis*

### INTRODUCTION

Fishes are good source of income for human. The fishes are very much dependent on the natural source to feed themselves. They are part of moderate and important food supply in the world.<sup>1</sup> In past these products are thought to be unlimited but now it is realized that these products are finite and in knife edge with the physical chemical and biological factors of the aquatic environment. Fishes are considered as renewable source of income, but some factors such as overfishing pollution, overfishing, alteration in environment has depleted fish production.<sup>2</sup> Fishes are important recourses for human especially as food. Now a day's fish production has

become one of the best business worldwide. Fish industry is growing rapidly day by day therefore it is necessary to produce healthy quality of fishes. One of the main obstruction in fish farming is their growth and survival which are effected by many factors. In the current paper we are discussing the erratic changes due to role of stress in the production of fishes. Changes in fish are not completely natural,<sup>3</sup> what precautions should be taken by those who keep fish, is very important. We have taken a number of species of catfish *Heteropneustes fossilis* for this investigation. The erratic changes in *Heteropneustes fossilis* is monitored for a period of two weeks. *Heteropneustes fossilis* are commonly called as singhi and are found in freshwater. It is mainly found in freshwater ditches, marsh lands, swamps, ponds etc. It usually breeds

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in monsoon and in constricted water. It is omnivorous in nature. This catfish emanates poison from a gland on its pectoral fin spine to deliver a extremely painful sting to humans. It can tolerate slightly brackish water. It is in great demand due to its medicinal value also.<sup>4,6</sup>

## **MATERIALS & METHODS**

### **Study area**

Madhepura is one among the thirty-eight districts of Bihar situated in 25.920°N latitude and 86.792°E longitudes. The district is 29<sup>th</sup> largest in terms of area, whereas it is at 34<sup>th</sup> place in terms of population. The maximum temperature of this district ranges from 35°C to 41°C and the minimum temperature ranges between 7°C to 9°C. The average rain fall in this area is around 1300mm. The district is blessed by a river Kosi, which is an important source of water for agriculture, household use, fish culture etc. The district got its name because it stands at the centre of Kosi ravine, due to which it is termed as Madhyapura (centrally situated) and in due course transformed as Madhepura.

### **Samples collection**

Fifty adult live specimens of *Heteropneustes fossilis* irrespective of sex consideration were collected from the local market of Madhepura. Tanks were maintained at the normal room temperature. The fishes were brought and kept in tanks. The pH of the tanks was maintained near neutral. The pH above and below a certain threshold level is deemed dangerous for the survival of the fishes. The humidity of the lab was also optimum. A good supply of phytoplankton and zooplankton was provided in the tanks from time to time, to ensure proper nutrition to the fishes. Special care was taken while handling the live fishes as their sting can be very painful. It was seen that the tanks donot overcrowd avoiding turbidity. Turbidity usually decreases the photosynthesis rate.

### **Methods**

The fishes were kept in tanks at normal room temperature i.e., 28°C. Simple trial and error methods were used to see the affect of stress such as erratic increase or decrease in temperature, pH, humidity, turbidity, starvation, etc. on fishes. The duration of the experiment was 2 weeks.

### **Temperature**

The tanks were maintained at a normal temperature of 28°C for the first two days of the experiment. This

allowed the fishes to get acclimatized or adapted to the new surroundings. After 2 days the temperature of the tank was increased by 20 with the help of a blower. The fishes were observed at this stressful temperature for 24 hours. Next readings were taken at 48 hours and 96 hours respectively. The movement of fishes both upwards and downwards was seen.

### **pH**

The pH of the tank was kept near neutral for the first two days. The pH of the tank was naturally increased by adding baking soda. The pH increased from around 7 to about 8.3. The fishes were observed for next 24, 48 and 96 hours.

The pH can also be lowered from 7.5 to 6.5 by adding white vinegar to the tank.

### **Humidity**

The humidity on the tank was increased using a vaporizer. The vaporizer locally increases the humidity.

### **Turbidity**

Turbidity affects the amount of sunlight that goes to the bottom of a water body. More turbid water means less sunlight that reaches the water. Less sunlight means less photosynthesis which eventually leads to less food, therefore starvation. Turbidity was increased in the tanks by increasing the number floating plants that cover the surface. The activity of the fish in response to low light was observed.

### **Starvation**

After initial feeding of 2 days, the food provided was minimized by 50%. For the next 24 hours the fishes were observed. The next 48 hours the fishes were provided with only 25% of the food, followed by absolute starvation in the next 96 hours. The metabolic activities were observed carefully.

## **RESULTS & DISCUSSION**

It was seen that introduction of stress in any form be it temperature, pH, humidity, turbidity or starvation leads to restlessness in the initial period. However, if the stress is continued, the fish slowly gets accustomed to the change. If, however, the changes are too erratic the fish's metabolic state is compromised and it slowly settles down at the bottom of the tank. The respiration rate slows down, slowing down all other activities requiring rapid energy as well.

### Temperature

When fishes are exposed to high temperature their central nervous system recognizes the threat and gets activated. It shows physiological stress response and release catecholamines hormones whose secretion gets continuous increase with the increase of stress.<sup>7</sup> The secretion of cortisol hormones is not as rapid as release of catecholamines hormones. Fishes seem to tolerate small fluctuations in temperature.<sup>8</sup> The fish increases its metabolic activities with increase in temperature but only upto a threshold temperature. Higher temperatures increase the respiration rate, which increases the need of oxygen. It has effects on the rate of reproduction, usually decreasing it.

### pH

Increase in pH up to 8.3 usually does not harm the fish productivity, but decreases it gradually. The optimum pH for fish's maximum productivity is between 6.5 to 7.4. Any increase or decrease in pH from the threshold can affect the hormonal equations, leading to loss in vigor or egg production.

### Humidity

The humidity is not seen to exert any effects on the metabolic activity of the fish.

### Turbidity

Initially turbidity doesnot seem to affect the fishes metabolic activity, however on the long run, it decreases the photosynthetic rate, hampering the phytoplankton and zooplankton's mass. This can lead to starvation in the absence of any addition of food manually.

### Starvation

The physiological processes affect organs like liver, skeletal muscles, stomach, during starvation. Changes in the metabolic processes like breathing, oxidation states, intermediates formed, enzymatic action etc are all followed by starvation.

Initial starvation process is followed by lessened respiration rate, slow movement, and finally cessation of any bodily metabolism. Long periods of starvation usually accounts for hibernation. However in this case, repeated starvation caused loss in mass, less vigor, no reproduction and eventually death.

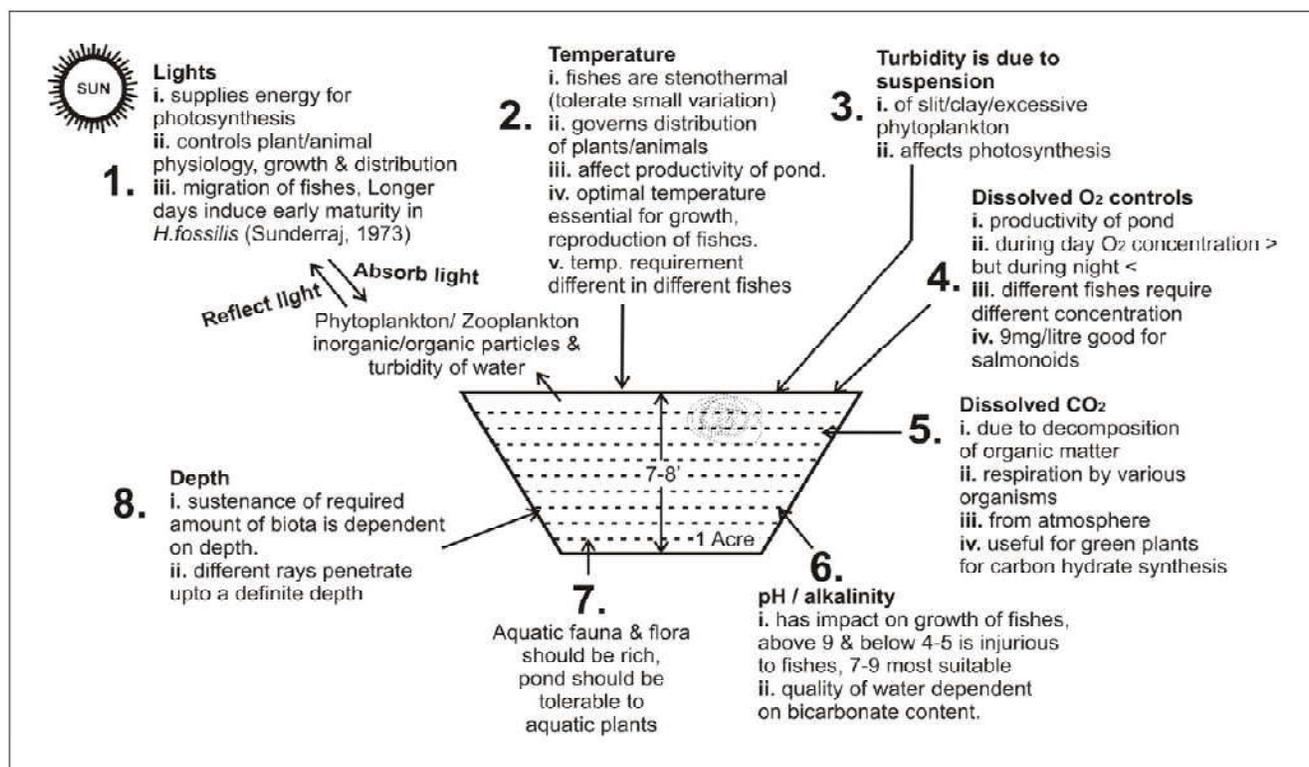


Fig. 1- Conditions of a pond is dependent upon above parameters

## CONCLUSION

From the above study it was concluded that the stress can affect the production of fish. All types of stressors can cause depletion of glycogen level in muscle which adversely effect the quality. This study also concludes that fishes are good indicators of aquatic pollution. By maintaining the water quality properly one can produce a good quality of fishes.

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