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Effects of water quality on the growth of freshwater fishes in Medininagar, Palamu, Jharkhand, India

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Abstract : This paper represents the effects of water quality on the growth of freshwater fishes have immense significance for Medininagar, Jharkhand where large population depend on fishing not only as food source but also for their livelihood. Fish is the main aquatic vertebrate as far as nutritional point of view and concerned due to its high protein content. It is required to correlate the growth of fish with respect to local environment that surround the water body and influence water quality. The members of Cyprinidae family dominate in fish population. There are few ponds which contain water throughout the year and forms only source for supply of fishes in Palamu. The ponds and other water bodies are not fully exploited for fish culture. It has been suggested that water pollution is the leading world wide cause of death and diseases. However, fishes are very sensitive to wide variety of toxicants especially pesticides which cause deleterious effects through accumulation¹.

Key words: Freshwater fishes, water quality, Cyprinidae, Palamu, Growth, Population

INTRODUCTION

It is observed that there is great effects of water quality on the growth of freshwater fishes in Medininagar, Palamu, which causes serious health hazards to living system because of their rapid fat solubility and bioaccumulation in non target organisms. Even at low concentration, pesticides may exert several adverse effects which could be monitored at biochemical, molecular and behavioural levels. The factors affecting water quality with pesticides and their residues include drainage, rainfall, microbial activity, soil temperature, treatment surface, application rate as well as the solubility, mobility and

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pesticides. It is seen that water pollution is a major cause of global concern as it leads to onset of numerous fatal diseases. Pesticides have been associated with reduced hatching blue sac disease and swim-up syndrome mortalities in lake trout eggs yet,² these studies indicated that the concentration of pesticides necessary to effect eggs were much higher than the level found in fish eggs. Accumulation of pesticides in the water bodies primarily effects in the non-target organism especially fish and yet deposited. These fishes through food chains effects humans and causes deleterious effects. Thus, it has been suggested that water pollution i.e. water quality is the leading world wide cause of death and disease. However, effect of water quality on the growth of freshwater fishes have immense significance for Jharkhand where large population defend

on fishing not only as food source but also for their livelihood.

The members of Cyprinidae family dominate the fish population. The survey is based on present observations and earlier reports. There are few ponds which contain water throughout the year and form the only source for supply of fishes in Palamu. The ponds and other water bodies are not fully exploited for fish culture.

MATERIALS AND METHODS



Fig. 1- *Cirrhinus mrigala*

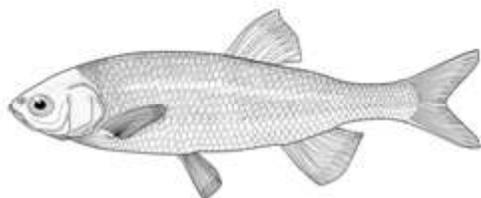


Fig. 2- *Catla catla*

Periodical estimates of fish growth and yield in relation to water samples were collected and analysed for computation of fish population dynamics and impact of physico-chemical complexes on fish yield of the water bodies. The whole exercise also involved network analysis and rendering of food chains/food web of the existing ecosystems. Analytical studies in the selected ponds were carried out over 3 years (2015-2018 in different seasons). Mean values are presented here. Physico-chemical parameters and biomass of most organisms were studied and analyzed as given by Saxena.³ Identification of fish was assisted by the publication of Chakraborty.⁴ Fish species *Labio rohita*, *Catla catla*, *Cirrhinus mrigala* were selected for study. Purification of ponds is carried out by using calcium carbonate or phosphate after every 15 days. For oxygen generation, potassium permanganate is used. Temperature is normally around 20°C except in cold weather. Temperature of the water affects the activity, behaviour, feeding, growth and reproduction of all fishes.

Metabolic rates in fish double for each 18°C rise in temperature. Temperature also determines the amount of dissolved gases in the water. The cooler the water the more soluble the gas. Temperature plays a major role in the physical process called thermal stratification. Water has a high-heat capacity and unique density qualities. Water has its maximum density at 39.2°F. In spring, water temperatures are nearly equal at all pond depths. As a result nutrients, dissolved gases and fish wastes are evenly mixed throughout the pond. As the days become warmer, the surface water becomes warmer and lighter while the cooler-denser water forms a layer underneath. Circulation of the colder bottom water is prevented because of the different densities between the two layers of water. Dissolved oxygen levels decrease in the bottom layer since photosynthesis and contact with the air is reduced. The already low oxygen levels are further reduced through decomposition of water products, which settle to the pond bottom.

RESULTS AND DISCUSSIONS

Knowing biological information about growth reflects the general well-being and fish adaptation to the environment.⁵ The behavioural response of fish towards toxicant was grossly dependent on concentration and length of exposure. Freshwater fishes rely more on aquatic gas exchange obtaining about 95% oxygen from water as only about 5.0% of obtained is obtained from air under normal bimodal conditions. Fishes were often observed swimming with jerky movements on the surface of water and tried to jump out of aquaria. For optimal growth of most fish species, desirable pH range is 6.5 – 9.0 and levels below 6.5 leads to a decrease of reproduction.⁶ Also, a literature review concerning pH values for lakes indicates that usually are found in the range 7.3 – 9.2.⁷ A value of pH lower than 8.4 could indicate that the respiratory processes in a water reservoir are greater than the photosynthetic processes, while alkaline pH higher than 8.8 could produce death of the fish.⁸ Yang et al; (2011) claimed that the increase in ammonia concentration in pond water may cause toxicity to aquatic organisms. However, toxicity of ammonia to fish varies with fish species, age or other quality parameters.^{6,9} Both human and fish health could be affected by microorganisms and infections can represent the cause of losses in freshwater fish.¹⁰

The microbial pollution in the aquatic ecosystem gets accumulated in the tissues of fishes and thus they become unfit for human consumption.¹¹ In addition, it has been reported that fungal contamination of fish may constitute a public health hazards, due to mycotoxin production.¹² This fact could be a general interest if one takes into account that fishermen encountered in the studied area use to keep, cook and eat their catch.

CONCLUSION

Assuming the values of all the abiotic and biotic parameters, the studied area was found to be not within the suitable range for well-being of both analyzed fish species. Although recreational fishing is often practiced in the study site, we strongly recommended caution regarding the consumption of water and fish caught from ponds. However, fish represents an important part of a healthy diet, can be eaten by people who catch it.

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