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Water monitoring and quality analysis for the management of Narmada Mahseer (*Tor tor*) culture

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Abstract
Water is called as a "liquid gold". So keep the water clean is our responsibility. My working experiences in observing the flow of water in Mahseer fish pond and ensuring it is quality is the reason for this discussion. A satisfactory fish production is totally dependent on the physical, chemical and biological qualities of water. So, successful pond management requires for understanding the water quality. Water quality is analyzed by variables like – Temperature, pH, Dissolved Oxygen (DO), Free Carbon dioxide (CO_2), Turbidity, Alkalinity, Total Hardness etc. In the present study water quality management in Mahseer culture have been examined to make aware the Mahseer culturist about the importance of water quality parameter that determine the health of a pond and the optimum level of parameter that should be required for Mahseer culture for better growth. In this study I further discusses the how looks a good water quality and the poor water quality and their effects in pond and how it should be improve.

Keywords: Fish, water quality, assessment and monitoring, ponds, parameter

Introduction
Tor tor is commonly known as the Tor Mahseer or Tor barb, is a species of cyprinid fish found in fast flowing rivers and streams with rocky bottoms in Bangladesh, Bhutan, Nepal, India and Pakistan. It is a commercially important food and game fish. Its population is rapidly declining in its native range due to overfishing and construction of dams in the Narmada River.
Water quality refers to anything in the water, be it physical, chemical or biological that effects the production of fish.
Water monitoring and analysis of water parameter is the daily duty to ensure the water quality. Fishes can attack with diseases and other problems due to poor water quality. So, daily water monitoring is very important to control the pond problems. To carryout proper water monitoring and to get exact data for fulfill the result there must be present right equipment and manpower with expertise.

Water Source and Supply
There are two main sources of water to ponds
1. Surface Water – Drainage, Irrigation, Rain, Natural water.
2. Ground Water – Borehole water.

Ground water supplies from of different levels. Major water supplies to the pond through borehole, natural water supplies to the pond at minor level because it is high cost of construction and pumping.

Temperature: Water temperature of course expresses how hot or cold the water is. Technically heat is an indicator of the kinetic energy of water or energy of motion. Increasing temperature indicates increasing energy or molecular motion of water.
Water temperature affects the growth and reproduction of living organisms. Many animals use temperature as a signal for when to reproduce and when to migrate. Generally, animals and plants grow faster of warmer temperatures, although all organisms have an upper temperature limit.

Desirable limit: According to Delince (1992) [5] water temperature between 30-35 ^{0}C is tolerable to fish.

Bhatnagar *et al.* (2004) [1] suggested the levels of temperature as 28-32 ^{0}C good for tropical major carps, <12 ^{0}C is lethal but good for cold water species.

Temperature range in Narmada Mahseer (*Tor tor*) culture from August 2018 to November 2018:
August – 24.5 ^{0}C September – 24.5 ^{0}C October – 23 ^{0}C November – 21 ^{0}C

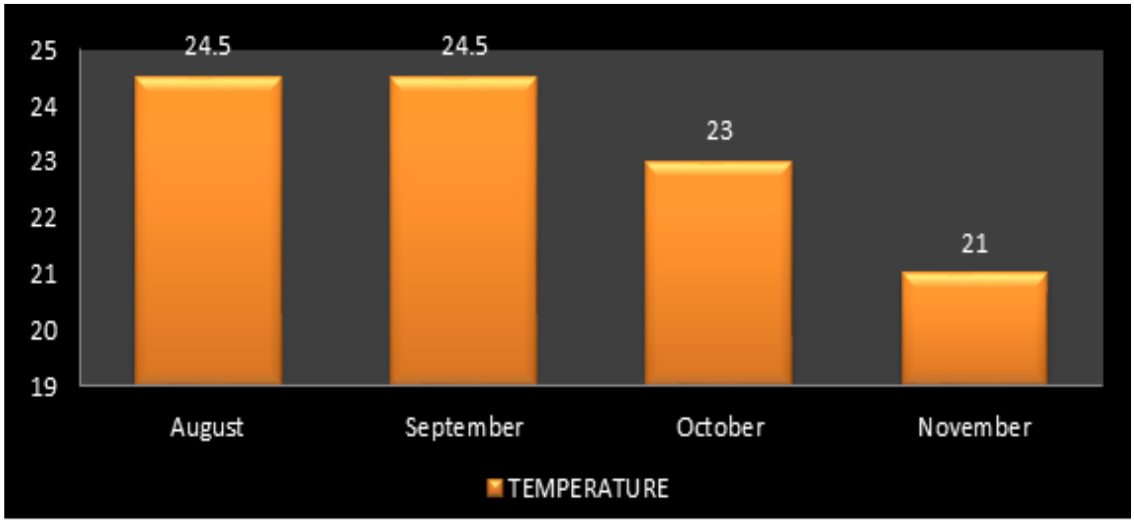

Fig 1: Showing temperature fluctuation during culture period

Remadies
- Water exchange.
- Planting trees.
- Artificial shades.

pH: pH is a measurement of how acidic or basic water is. The range goes from 0-14, with 7 being neutral. pH of less than 7 indicate acidity, where as a pH of greater than 7 indicates a base. pH is really a measure of relative amount of free hydrogen and hydroxide ions in the water. Water that has more free hydrogen ions is acidic, where as water that has more free hydroxide ions is basic.
The 'p' of pH denotes the power of the hydrogen ion activity in mol/lit.

Desirable limit: Fish have an average blood pH 7.4, a little change from this value, between 7.0 – 8.5 is optimum and healthy to fish life. For biological productivity pH range between 7-8.5 is perfect. pH range between 4.0 – 6.5 and 9-11 can stressed the fish and fish can die in the range of below 4 or greater than 11 (Ekubo and Abowei, 2011).

pH range in Narmada Mahseer (*Tor tor*) culture from August 2018 to November 2018
August – 8.55 September – 9.33 October – 9.95 November – 9.75

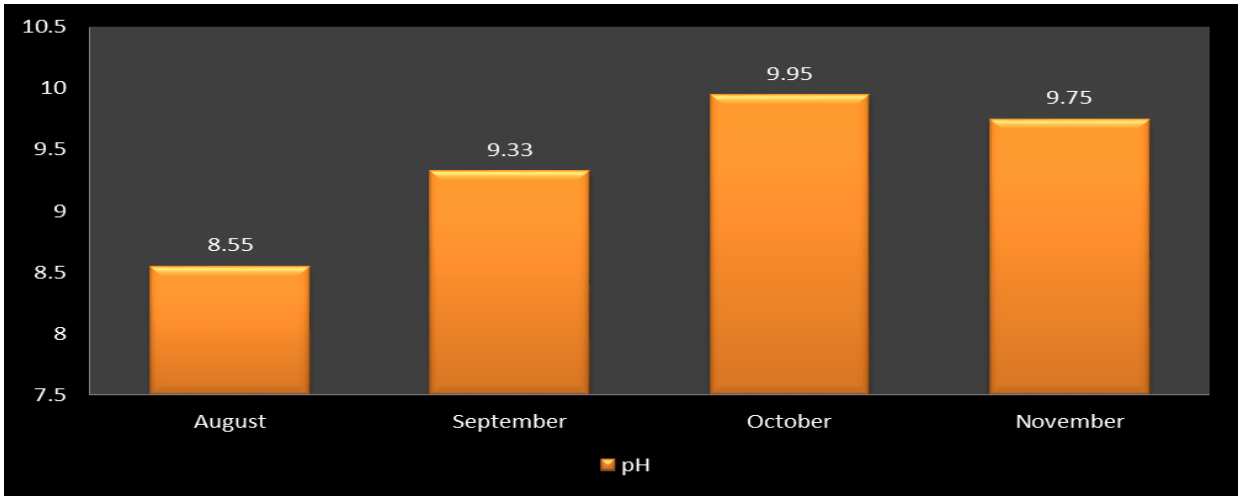

Fig 2: Showing pH fluctuation during culture period

Remadies
- To decrease pH add gypsum ($CaSO_4$ @ 2.47 kg/bigha) or cow dung (Organic manure).
- To increase pH add quicklime (CaO).
- To control water pH lime should be used @ 5-10 kg/bigha/month.

TDS (Total Dissolved Solids): Dissolved solids refer to any minerals, salts, metals, cautions or anions dissolved in water. Total Dissolved Solids (TDS) comprises inorganic salts (Principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulphate) and some small amounts of organic matter that are dissolved in water.

Desirable limits
In a study by the World Health Organization, a panel of tasters came to the following conclusion about the preferable level of TDS in water –

TDS

Level of TDS (mg/lit)	Rating
150-300	Excellent
300-600	Good
600-900	Fair
900-1200	Poor
Above 1200	Unacceptable

TDS range in Narmada Mahseer (*Tor tor*) culture from August 2018 to November 2018
August – 302.5 September – 295 October – 305 November – 325

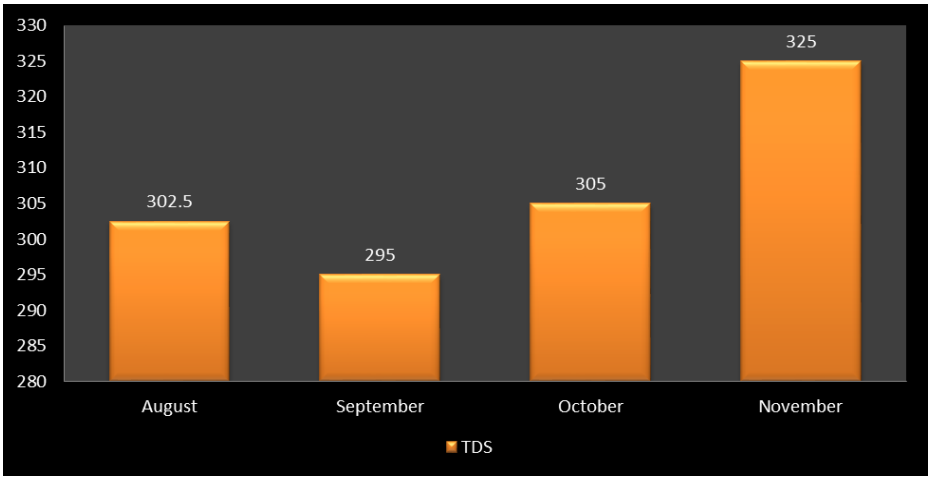

Fig 3: Showing TDS fluctuation during culture period

FREE CO_2: Carbon dioxide is present in water in the form of a dissolved gas. Surface water normally contain less than 10 ppm free CO_2, while some ground waters may easily exceed that concentration.
Free CO_2 in water exists naturally in varying amounts, but a large amount of Carbon dioxide in water creates acidic water conditions. When CO_2 dissolves in water it yields Carbonic acid (H_2CO_3). Carbon dioxide is commonly found in water from photosynthesis or in water sources originating from limestone bearing rock. Fish can tolerate concentration of 10 ppm provided DO concentrations are high.
When the oxygen concentration in waters containing organic matter is reduced, the carbon dioxide concentration rises. The rise in carbon dioxide makes it makes it more difficult for fish to use the limited amount of oxygen present. To take on fresh oxygen, fish must first discharge the carbon dioxide in their blood streams and this is a much slower process when there are high concentration of carbon dioxide in the water itself.

Desirable limits: Bhatnagar *et al.* (2004) [1] suggested 5-8 ppm is essential for photosynthetic activity, 12-15 ppm is sublethal to fishes and 50-60 ppm is lethal to fishes.
The free Carbon dioxide less than 5 mg/lit in water supporting good fish population (Santosh and Singh, 2007).

Free CO_2 range in Narmada Mahseer (*Tor tor*) culture from August 2018 to November 2018
August-0 September-1.7 October-4.3 November-3.0

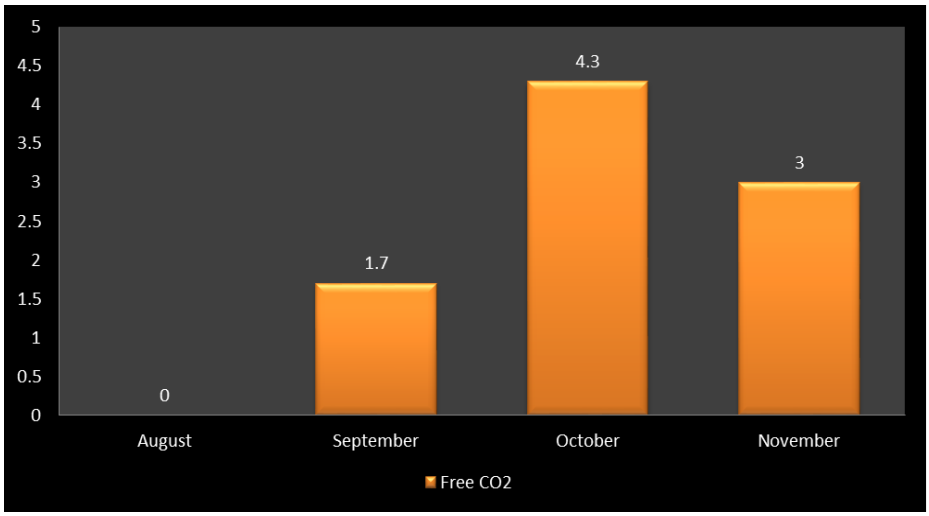

Fig 4: Showing free CO_2 fluctuation during culture period

Remadies

- Use lime ($CaCO_3$) or Sodium bicarbonate ($NaHCO_3$).
- Apply potassium permanganate @ 250 gm for 0.1 hectare.

Dissolved Oxygen: Dissolved Oxygen is the amount of gaseous (O_2) dissolved in the water. Oxygen enters the water by direct absorption from the atmosphere, by rapid movement, or as a waste product of plant photosynthesis. Water temperature and the volume of moving water can affect dissolved oxygen levels. Oxygen dissolves easier in cooler water than warmer water.
Adequate dissolved oxygen is important for good water quality and necessary to all forms of life. Dissolved Oxygen levels that drop below 5.0 mg/lit cause stress to aquatic life. Lower concentrations cause greater stress. Oxygen levels that go below 1-2 mg/lit for a few hours may result in large fish kill.

Desirable limits: According to Bhatnagar and Singh (2010) and Bhatnagar *et al.* (2004) [1] Do level >5 ppm is essential to support good fish production.

Dissolved Oxygen (DO) range in Narmada Mahseer (*Tor tor*) culture from August 2018 to November 2018
August-7.8 September-7.86 October-7.46 November-8.18

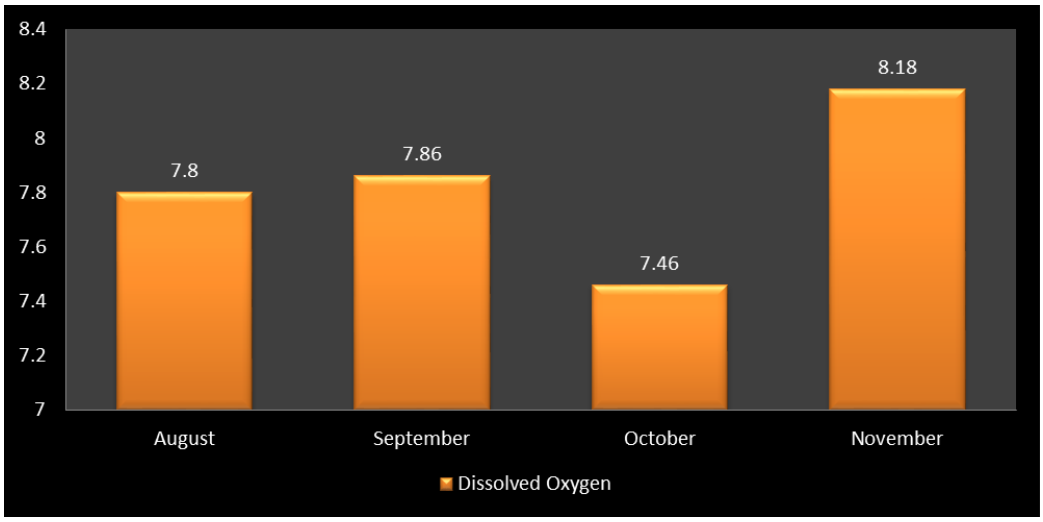

Fig 5: Showing Dissolve Oxygen fluctuation during culture period

Remadies

- Avoid over fish stocking.
- Recycling of water and use of aerators.
- To manage DO level, over application of fertilizers and organic manure should be avoided.
- Physical control of aquatic plants and also management of phytoplankton biomass.

Total Hardness: Total Hardness is a measurement of the mineral content in a water sample that is irreversible by boiling. Therefore, Total Hardness can be equivalent to the total calcium and magnesium hardness.

Desirable limits: According to Bhatnagar *et al.* (2004) [1] hardness values less than 200 ppm causes stress, 75-150 ppm is optimum for fish culture and >300 ppm is lethal to fish.

Total Hardness range in Narmada Mahseer (*Tor tor*) culture at Barwah forest division M.P. from August 2018 to November 2018
August-188 September-181 October-189.7 November-206

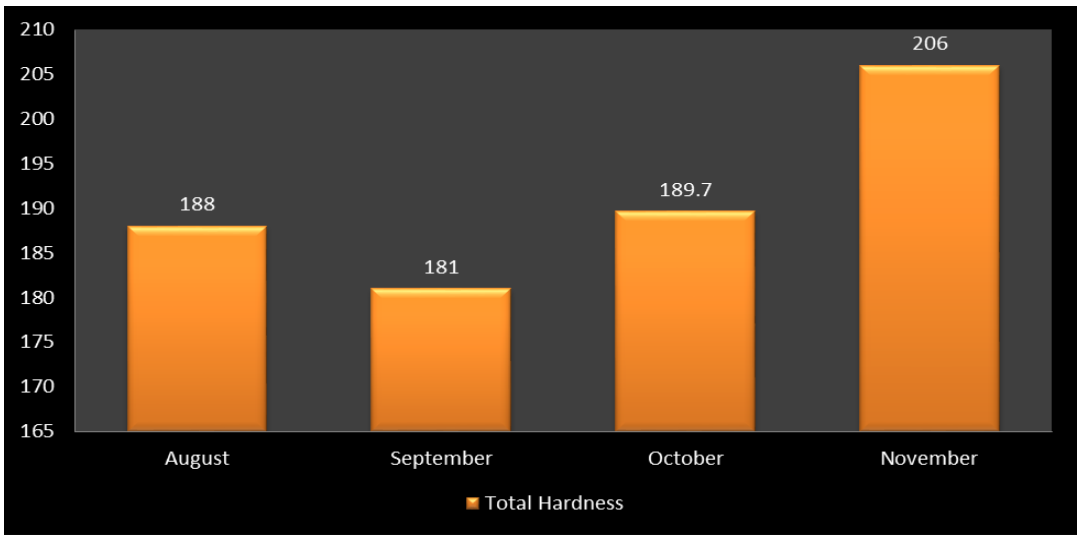

Fig 6: Showing total hardness fluctuation during culture period

Remadies: Add quicklime/alum/both and add Zeolite to reduce hardness.

Alkalinity: Alkalinity refers to the total amount of bases in water expressed in mg/lit of equivalent calcium carbonate. A base is a substance that releases hydroxyl ions (OH^-) when dissolved in water. In most waters these bases are principally bicarbonate (HCO_3) ions and carbonate ions (CO_3^{2-}). These ions are the buffers in water that is they buffer the water against sudden changes in pH. They can do this by absorbing hydrogen ions when the water becomes basic. Waters of low alkalinity (<20 mg/lit) are poorly buffered and the removal of carbon dioxide (CO_2) during photosynthesis results in rapidly rising pH. Waters with greater than 20 mg/lit alkalinity have greater buffering capacity and prevent large fluctuations in pH during photosynthesis.

Desirable limits: Bhatnagar *et al*. (2004) [1] suggested that <20 ppm indicates poor status of water body, 20-50 ppm shows low to medium, 80-200 ppm is desirable for prawn/fish and >300 ppm is undesirable due to non-availability of CO_2. According to Wurts and Durborow (1992) alkalinity between 75 to 200 mg/lit, but not less than 20 mg/lit is ideal in an aquaculture pond.

Alkalinity range in Narmada Mahseer (*Tor tor*) culture from August 2018 to November 2018

August-190 September-191.7 October-198.3 November-158.6

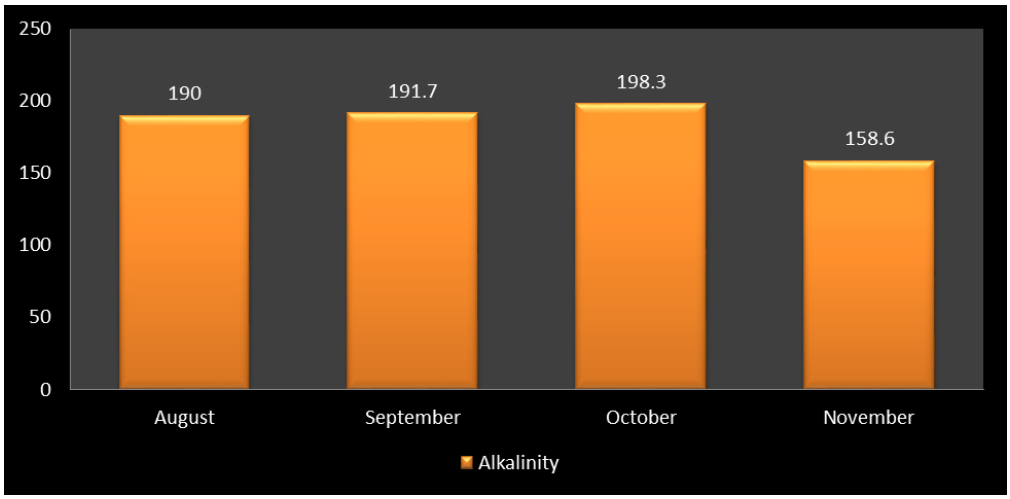

Fig 7: Showing alkalinity fluctuation during culture period

Remadies

- If Alkalinity <50 mg/lit, Dolomite can be used to the pond with water @ 3-3.5 kg/bigha in evening time.

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References

1. Bhatnagar A, Jana SN, Garg SK, Patra BC, Singh G, Barman UK. Water quality management in aquaculture, In: Course Manual of summerschool on development of sustainable aquaculture technology in fresh and saline waters, CCS Haryana Agriculture, Hisar (India), 2004, 203-210.
2. Bhatnagar A, Devi P. Water quality guidelines for the management of pond fish culture, 2013, 1980-1997.
3. Banerjea SM. Water quality and soil condition of fish ponds in some states of India in relation to fish production, Indian Journal of fisheries, 1967; 14:115-144.
4. Boyd CE, Lichtkoppler F. Water Quality Management in fish ponds. Research and Development Series No. 22, International Centre for Aquaculture (J.C.A.A) Experimental Station Auburn University, Alabama, 1979, 45-47.
5. Delince G. The ecology of the fish pond ecosystem, Kluwer Academic Publisers London, 1992, 230.
6. Kiran BR. Physico-chemical characteristics of fish ponds of Bhadra project at Karnataka, RASAYAN Journal of Chemistry. 2010; 3(4):671-676.
7. Swann LD. A Fish Farmer's Guide to understanding water quality, Aquaculture extension Illinois, Purdue University, Indiana Sea Grant Program Fact Sheet AS, 1997, 503.
8. Upadhyaya MP. Seminar on inland fisheries development in U.P., 1964, 127-135.
9. Sewell RBS. On mortality of fishes, Journal of the Asiatic Society of Bengal, 1927; 22:177-204.
10. Stumn W, Morgan JJ. An introduction emphasizing chemical equilibrium in natural waters, Aquatic chemistry. 2nd ED., John Wiley and Sons, New York, 1981, 780.