

Water analysis of some water bodies of Kashmir

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Abstract

The present study was carried out in various water bodies of Kashmir to assess seasonal change in temperature, transparency and pH. Significant change was observed in all the parameters, confirms that changing environment have direct impact on the physico-chemical parameters of water which in turn effects on the biotic and abiotic conditions of water body.

Keywords: Temperature, Transparency, pH.

Introduction

The natural water bodies have undergone reduction in size or have completely disappeared due to increasing human pressure. Deterioration of the water takes place by the addition of the nutrients from anthropogenic activities prevalent in the catchment. Mostly the fishes are affected by the media in which they live. Due to deforestation and other detrimental human activities in the catchment areas of the lakes like Dal, Anchar, Manasbal and Wular, siltation has increased and resulted in the breeding grounds of fishes. This further has aggravated the habitat conditions, thus resulting in decrease of fish population. The chemical and physical changes may induce changes in the composition and population of plankton and also the destruction of spawning grounds.

Reproduction is one of the most important considerations in understanding the ecology of animals. The survival of any species in seasonally changing environments depends on the development of mechanisms that permit it to adjust physiological functions to changes in that environment. Reproduction would therefore, be expected to occur during the season that assures maximum survival of young.

Fecundity is yet another factor of great significance to fish biology. Apart from its biological significance and being a major reproductive capacity of the females, the analysis of the fecundity data and its relationship with

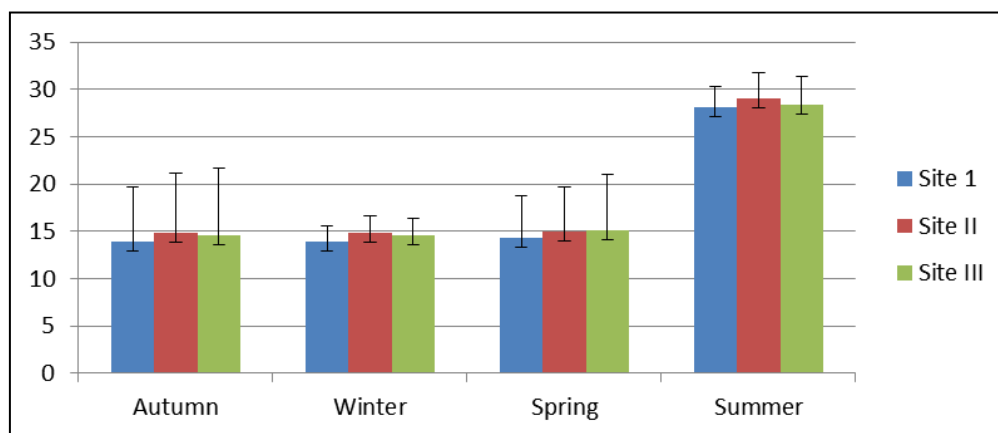
other morphological characters like size, age and weight have often been used to provide a reliable index of density dependent factors affecting the size of population. The valley of Kashmir is a land of lakes, rivers, springs and fast running streams. The important ones being the Wullar Lake, the enchanting Dal Lake, The Manasbal lake, The Anchar lake, The Nigeen lake, The Jhelum river, Snow fed streams like the Sind stream, The Lidder, The Erin and The Madumati.

Water temperature

The sites depicted differential fluctuations in their water temperature with wide variations in some and narrow in others. In the present study, water temperature ranged between a minimum of 2.20C in the month of January at site I to a maximum of 20.40C in the month of August at site III. However, the highest (22.1 and lowest (1.0) seasonal mean values were recorded in summer at site II and in winter.

Table 1: Mean \pm S.D variations in water temperature ($^{\circ}$ C)

| Seasons | Site I | Site II | Site III |
|---------|----------------|----------------|----------------|
| Autumn | 13.9 \pm 5.8 | 14.9 \pm 6.3 | 14.6 \pm 7.1 |
| Winter | 13.9 \pm 1.7 | 14.9 \pm 1.7 | 14.6 \pm 1.8 |
| Spring | 14.3 \pm 4.5 | 15.0 \pm 4.7 | 15.1 \pm 5.9 |
| Summer | 28.1 \pm 2.2 | 29.1 \pm 2.6 | 28.4 \pm 3.0 |

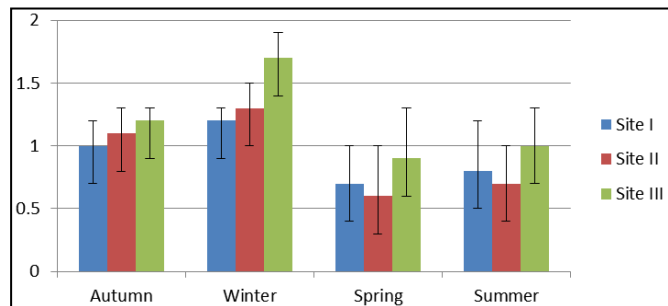


Transparency

The transparency of water fluctuated both spatially and temporally. In general, the highest transparency values were recorded in winter season and lowest in summer season. The seasonal mean values of transparency varied from a minimum of 0.6 m in summer at site II to a maximum of 1.7 ± 0.2 m at site III in winter.

Table 2: Mean± S.D variations in transparency (m)

| Seasons | Site I | Site II | Site III |
|---------|---------|---------|----------|
| Autumn | 1±0.2 | 1.1±0.2 | 1.2±0.1 |
| Winter | 1.2±0.1 | 1.3±0.2 | 1.7±0.2 |
| Spring | 0.7±0.3 | 0.6±0.4 | 0.9±0.4 |
| Summer | 0.8±0.4 | 0.7±0.3 | 1.0±0.3 |

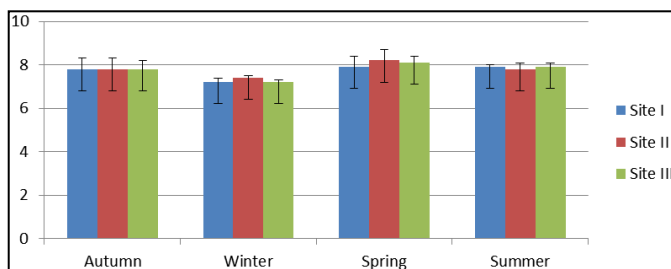


pH

The pH of any aquatic system is suggestive of the acid-base equilibrium maintained by various dissolved compounds. Further, pH is an important parameter which determines the suitability of water for various purposes. In the present study, the pH value was found to fluctuate from 7 to 9 at sites II and III in the months of December and May respectively, indicating that the waters were neutral to alkaline at various sites. The seasonal mean values of pH fluctuated between a minimum of 7.2 ± 0.1 in winter at site III and a maximum of 8.2 ± 0.5 in spring at site II.

Table 3

| Seasons | Site I | Site II | Site III |
|---------|---------|---------|----------|
| Autumn | 7.8±0.5 | 7.8±0.5 | 7.8±0.4 |
| Winter | 7.2±0.2 | 7.4±0.1 | 7.2±0.1 |
| Spring | 7.9±0.5 | 8.2±0.5 | 8.1±0.3 |
| Summer | 7.9±0.1 | 7.8±0.3 | 7.9±0.2 |



Discussion

The temperature of a water body plays an important role in the regulation and distribution pattern of biotic communities. It also alters the physico-chemical condition of the water like pH, conductivity, saturation level of gases and various forms of alkalinity.

Temperature of the surface waters often has an impact on chemical concentration. A rise in temperature of the water leads to the speeding up of the chemical reactions in water and reduces the solubility of gases. At elevated temperature metabolic activity of the organisms increases creating more and more demand for oxygen, but at the same time the solubility of oxygen decreases.

In the present study water temperature, fluctuated between a minimum of 2.2 °C in the month of January at site I to a maximum value of 20.2 °C in the month of August at site III. The air temperature, on the other hand, revealed a maximum of 33.5 °C in August and a minimum of 3.5 °C in the month of January. In general, consideration the difference between air and water temperature at various sites was about 1-1.5 °C.

The term pH reflects the activity of the hydrogen ion. In natural waters, pH shows diurnal and seasonal changes due to variation in photosynthetic activity wherein pH increases due to utilization of carbon dioxide in the process. Based on the affinity of the organisms towards a particular range of pH. The seasonal pH values not significant as the waters were well buffered. This is in conformity with Kaul *et al.* and Zutshi *et al.* (1980) who attributed the alkaline nature of Kashmir water bodies to the presence of calcium rich rocks (lacustrine deposits) in the catchment areas.

Dissolved oxygen is one of the essential limnological factors. In any aquatic ecosystem, dissolved oxygen is of paramount importance because it is critical to the survival of most forms of aquatic life besides being the most reliable criterion in assessing the trophic status and the magnitude of eutrophication (Edmondson, 1966). Its concentrations in natural water depend on the physical, chemical and biological activities in the water body (Zutshi and Vass 1978). Oxygen is used by the living organisms in the water for their survival. The source of oxygen in water is photosynthesis by phytoplankton and also oxygen dissolved from atmosphere.

Serruya and Serruya (1972) held that under saturation of oxygen, low temperature and instability of water masses are much favorable for physical enrichment of oxygen. Similar results were made by the Hannan (1979), Badge and Verma (1985), Kaur *et al.* (2000), Rather *et al.* (2001) [2]. Alkalinity plays an important role in determining the ability of water to support algal growth and other aquatic life. Biologists use it as a measure of water fertility.

The increase in alkalinity during winter may be attributed to the accumulation of bicarbonate ions in these months as the rate of their uptake is declined. The decrease in the alkalinity in summer is due to the fact that there is decrease in bicarbonate ions in summer because of its use by luxuriant growth of phytoplankton. These findings are in agreement with Sahai and Shrivastava (1976) who observed low concentration of bicarbonates in summer owing to the increased use by phytoplankton and submerged macrophytes.

The importance of free carbon dioxide for autotrophic plants is very well known as they are the primary producers on which the biotic components of aquatic ecosystem wholly depends. It is the basic raw material for the photosynthetic process. The two important sources

of carbon dioxide in aquatic media are: (a) physiological process of photosynthesis, and (b) diffusion from atmosphere this gas alters the pH of water by forming carbonic acid, which further dissociates into carbonates and bicarbonates. Hence the estimation of free carbon dioxide in aquatic medium is of great importance. Temperature is undoubtedly a primary important factor in determining the solubility of dissolved gases and their concentration in water. The present data clearly shows that temperature of water is of prime importance in determining the solubility of free CO₂. A perusal of data during the present study showed free carbon dioxide to range between 8mg/L and 28mg/L with maximum concentrations being obtained during colder months. With the onset of warmer months, the rate of photosynthesis increases and the free CO₂ content gradually decreases.

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