Research Article

Impact of flood on water chemistry of chatlam wetland reserve- pampore in Jammu and Kashmir state

Sajjad-ul- akbar wani[1,2], S Ishaque[1], K Ahmad[2*], Jahangir M Reshi

[1]Department of Zoology, Microbiology and Bioinformatics, Government Madhav Science P.G College, Ujjain M.P INDIA,
[2]Centre for Mountain Wildlife Sciences, Faculty of Veterinary Sciences and Animal Husbandry, Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar 190006, Kashmir, Jammu and Kashmir, INDIA.
Email: sajjadnaturals@gmail.com sajjadnaturals@gmail.com

Abstract

The present study was carried out on the Physico-chemical analysis of water samples taken from the Chatlam wetland reserve in Saffron town Pampore of Jammu and Kashmir. The samples were collected in air tight PVC bottles on the basis of topography and approachability on monthly basis during four seasons (spring, summer, autumn and winter). Before the September 2014 historical flood, parameters like total dissolved salts, total alkalinity, concentration of chloride, total alkalinity, turbidity, dissolved oxygen, Ortho-phosphate, nitrate and fluoride were analyzed and depicted slight variations in different seasons. But most importantly the post flood status showed a different and a remarkable change in water chemistry of Chatlam wetland. The reason could be the overflow of the flood water from the river Jhelum flowing on its west via saffron town. Therefore the rate of eutrophication accelerated and the accumulation of mud despoiled the photosynthetic activities of the aquatic flora because of the high turbidity. Moreover the sprayed pesticides and insecticides in the nearby plateau orchards (apple and pear) run -off into the wetland as a result bio magnification takes place in the food chains of ecosystem where toxic chemicals were inhaled by the fishes and waterfowl leading to their death as of ecological imbalance. The pre and post flood parameters recorded an unusual pattern with immense variations. Besides, the basic nature of water at post flood was because of detergents, salts and other domestic sewage that directly got accessed into the wetland.

Key Word: Chatlam wetland, saffron town, topography, eutrophication, bio magnification

Address for Correspondence
Dr. Sajjad-ul- akbar wani, Department of Zoology, Microbiology and Bioinformatics, Government Madhav Science P.G College, Ujjain M.P INDIA
Email: sajjadnaturals@gmail.com sajjadnaturals@gmail.com

Access this article online	
Quick Response Code:	Website: www.statperson.com
	Accessed Date: 26 March 2018

INTRODUCTION

Wetlands provide habitats for various types of birds, mostly waterfowl, and they occupy these habitats according to their niches. Wetlands are those areas which remain waterlogged or sunken under water, seasonally or throughout the year. Generally, they provide a multitude of benefits to humanity that includes filtering our water, ensuring biodiversity, protecting our coastlines and mitigating climate change. The scientific estimates show that 64% of the world's wetlands have disappeared since 1900 and unfortunately the remaining ones are being degraded. These wetlands, which are waterlogged wealth of any region on earth, are repositories of priceless biodiversity, besides being sources of rich cultural heritage. They retain water during dry periods, thus keeping the water table high and relatively stable. During periods of flooding, they mitigate floods and trap suspended solids and attached nutrients. As one of the world's largest carbon stores, peat lands play a significant role in the regulation of greenhouse gas emissions and global climate (Anonymous, 2005). Globally, wetlands cover approximately 9 percent of the land surface but contain 35 percent of the terrestrial biosphere carbon pool. This enhanced capability of wetlands to store carbon is largely as a result of their productivity. Wetlands are considered to provide the best method of removing the carbon because of the lush vegetation which pulls carbon dioxide from the atmosphere into their root system. The carbon remains in the soil when the plant dies unless the soil is disturbed, as in farming. Although, wetlands can sequester carbon, they can also act as sources of greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Wetlands form the transitional zone between land and water systems, where saturation with water is the dominant factor, determining the nature of soil and the types of plant and animal communities living in and on it. The biodiversity of wetland habitats has some peculiar adaptive features to cope with verifying water levels, anaerobic soils and variations in salinity, all of which bring considerable stress and strain on the biodiversity existing there (Roy, 2005). Wetlands provide important locations for scientific research and play important role in educating people about biodiversity and natural processes. They are productive and dynamic systems of flora and fauna that sustain varied forms of life and perform useful functions in the maintenance of overall balance of nature. Moreover, they significantly influence the ecological and hydrological functions of a region. Wetlands are important feeding and breeding areas for wildlife and provide refuge to lot of waterfowl. This process slows the water's momentum and erosion potential, reduces flood heights and allows for ground water recharge which contributes the base flow of surface water systems during dry period. The ability of wetlands to store flood water reduces the risk of property damage and loss of life. This was accurately seen during the deadly flood in the Kashmir valley (in the first week of September, 2014), where havoc was created all around the dwelling population located in the vicinity of the river Jhelum. The Limnological studies in Kashmir were initiated by Mukherjee (1921, 1926, 1932) when he studied general ecology, biotic succession and bathymetry with special reference to light penetration in Dal Lake, Kashmir. In 1932, Yale University sent a scientific expedition to north India which visited Kashmir and Ladakh also. During this expedition, Prof. G.E Hutchinson collected some information on the limnology of Kashmir waters and the data collected by him were later on published in a series of papers (Edmondson and Hutchinson, 1934; Brehm, 1936; Brehm and Woltereck 1939; Hutchinson, 1939; Kiefer, 1939). However, the limnological work initiated by these pioneers got discontinued and further work on the waters of Kashmir , could only begin in late sixties (Kaul and Zutshi, 1967; Zutshi and Khan, 1978; Das *et al.,* 1969 and 1970).

Study Area

Pampore is a small town in the South of Kashmir, where some satellite wetlands are located and dotted with archaeological marvels, renowned for its cash crop saffron (Kesar) production, not only in Asia but throughout the globe for the best quality. It is situated on the eastern bank of the river Jhelum merely 11 km away from Srinagar city located at 34.02^0 N and 74.93^0 E with an average elevation of 1,574 meters (5,164 feet fsl). Chatlam wetland with an area of 850 kanals (approx.107 Acres) is situated on east of Pampore and is more or less, an oval shaped, with a recorded area of 2.1 sq. km. However, this wetland has got reduced to only 1.7 sq. km due to siltation and encroachment. The villages that are in close vicinity to this Reserve are Lalpora (Chatlam) and Meej on Northern side and Konibal-Munpora on eastern side, with Kranchu-Chandhara on Southern side. These satellite wetlands of Pampore in the valley are extremely important for its biodiversity and people.

MATERIAL AND METHODS

Regular surveys were carried out in the Chatlam CR of Pampore for developing information database that included Collection of Water samples from each zone/block of different waters.

A- Physical Parameters

- **Temperature -** Surface temperature of water was measured with a graduated mercury Thermometer on the spot.
- **Total dissolved salts (TDS) -** This was measured by using evaporating dish, chemical balance, desiccators and hot water bath by using

Calculation (A-B)/$\times 10^6$ TDS mg l^{-1} = V Where A = Final

weight of the dish (g) B = Initial weight of the dish (g) C = Volume of sample taken (ml) Turbidity This was measured by using Secchi disc method and digital turbidity meter. Conductance This was measured by using conductivity Meter (EC meter) using conductivity cell. Chemical arameters pH: This was measured by pH meter and 'P' of pH denotes the power of the hydrogen ion activity in mole per Litre. Dissolved Oxygen This was pointed out by using modified Winkler's Method. The most important to all living organisms, dissolved oxygen was done at the site by collecting water from all zones without bubbling in the 250ml glass bottles. After collecting water inside these glass bottles without bubbling, 2ml of Manganous Sulphate solution and then same quantity of Alkaline Iodide-azide solution was dispensed with two separate droppers respectively. After this these bottles were shaken up and down at least six times and then allowed to settle down the brown precipitate. Then the samples were brought to limnological lab of Rangil in the ice box from where the precipitate was dissolved by adding 2 ml of concentrated sulphuric acid and then shaked.After this process, the suitable aliquot of 50 ml in a flask was taken and titrated with thiosulphate solution for pale straw colour. Then two drops of starch solution was added to it and then for further titration till the blue colour disappears. Dissolved oxygen (DO) in mgl^{-1}= (8✕ 1000×N) v /V Where =Volume of sample (ml)v=Volume of titrant used (ml) N=Normality of titrant Since, 1ml of 0.025 N Sodium thio sulphate solution is equilent to 0.2mg oxygen. Total Alkalinity This was pointed out by titrating the water samples with a standard solution of strong acid. Total Hardness This was calculated by standard EDTA titration method. Chloride, Nitrate and Ortho-Phosphate These were estimated by Spectrophotometer and by titration assembly. Post flood scenario of the water parameters of Chatlam wetland were investigated in a high profile Limnology Lab of Rangil, SKUAST Kashmir. Physico-chemical characteristics not only reflect the quality of an ecosystem but also its biological diversity (Ghavzan *et al.,* 2006).

RESULTS AND DISCUSSION

On the basis of topography and approachability at Chatlam CR, Four Zones/ blocks A,B,C and D were selected to carry out the present study The utility of all selected zones are multipurpose. In the early times, Chatlam water was used for drinking purpose by nearby Lalpora (Chatlam) and Konibal villages but now due to the continuous accession of unwanted substances of household garbage and silt into it prompted them to look for the advanced portable water by means of tap water and bore wells. The Chatlam wetland is used by the Farmers in providing water to their fields and also for drinking and bathing of their cattle. The pH, the logarithm of the reciprocal of the concentration of free hydrogen ions is governed to a large extent by the interaction of H^+ ions arising from the dissociation of H_2CO_3 and from ^-OH ions produced during the hydrolysis of bicarbonate in natural waters. During the year 2014 i-e, pre floods the pH was recorded maximum in April as 8.6 and the minimum reading was taken as 6.5 in August. There was a noteworthy and recordable variations at post-flood condition where the maximum pH was recorded as 12 in September and the minimum reading was found in August with 7.8 respectively. In most natural waters bicarbonates and sometimes carbonates are present in appreciable amounts and their salts get hydrolysed in solution and produce hydroxyl ions, thus raising the pH. As this parameter was recorded and found maximum in April as 237.8 mg/l and minimum range of 67.8 mg/l in August at pre-flood scenario. But after post 2014 floods it curtly reached to a record reading of maximum 517.8 mg/l in April that clearly indicated high rates of decomposition and excess amounts of carbonates of calcium and magnesium. Also the minimum alkalinity was recorded as 207.1 mg/l in September. Dissolved Oxygen (DO) is essential to the respiratory metabolism of most aquatic living organisms and is considered to be the lone factor which to a greater extent reveals the nature of the whole aquatic body at a glance. The occurrence of dissolved oxygen in water may be present by means of two phenomena (i) direct diffusion from air, and (ii) photosynthetic evolution by aquatic autotrophs. Dissolved oxygen of Chatlam wetland was recorded maximum with 9.5 mg/l in April and minimum as 5.9 mg/l in August at pre-flood condition, i-e before September 2014. But at post-flood conditions the dissolved oxygen jumped drastically showing statistically a dynamic difference with the maximum dissolved oxygen recorded in May as 13.1mg/l and minimum dissolved oxygen noted in January as 9.1 mg/l respectively. Conductivity is the numerical expression of the ability of a water sample to carry an electric current and could be a sign of the productivity of the water body. The more the conductivity of water the lesser is its resistance to electric flow, therefore indicating higher concentration of dissolved (ionized) salts and higher trophic status of the system. The Conductivity of water was recorded maximum 400 (µS/cm) in April and minimum as 140 (µS/cm) in August at pre-flood conditions. But the readings were observed sharply different on post flood scenario showing maximum conductivity of 900 (µS/cm) in April and minimum reading in June with 303 (µS/cm). In water , the universal solvent, a large number of dissolved solids like carbonates, bicarbonates, chlorides, sulphates, phosphates and nitrates of calcium, magnesium, sodium, potassium, iron, manganese etc are present that largely govern its Physico-chemical properties and thus have an indirect effect on the organisms. Pre-flood investigations showed a maximum reading of 290 mg/l of TDS in April and the minimum observation was found in in January with 105 mg/l. But this was compared to a recordable reading at post floods with the maximum of 500mg/l in April and minimum of 220 mg/l in October. The Ortho-Phosphate concentration was recorded maximum in April as 150 (µg/l) and minimum reading was observed as 15(µg/l) in August before the floods. But on post floods, position of Ortho-phosphate showed an abrupt increase to a maximum of 350 (µg/l) in April and the minimum concentration of the same parameter was found in August as 40 (µg/l). The radical increase after floods are likely to be a function of drainage basin, higher concentrations from agricultural land in vicinity and excretion by vetebrates especially birds and fishes. The sum total of the concentrations of alkaline earth metal cations (e.g. Ca^{++}, Mg^{++}) etc were increased significantly post floods in 2015-2016. Although, Pre flood observations showed a maximum hardness in April as 80 mg/l of $CaCO_3$ and a minimum concentrations in November as 20 mg/l of $CaCO_3$. But post flood observations showed a noticeable variation with the maximum of 195 mg/l of $CaCO_3$ in April and minimum reading of 140 mg/l of $CaCO_3$ in September respectively.Chloride concentration play metabolically active role in photolysis of water and photophosphorylation reactions in autotrophs. Their high concentrations are considered to be the indicators of pollution that are due to organic wastes of animal origin or industrial effluents, The pre-flood investigations showed a maximum chloride concentrations in December as 135.5 mg/l and a minimum chloride concentrations in June as 60 mg/l. But post flood observations showed a different story with maximum concentrations of 288 mg/l in April and minimum reading as 120 mg/l in October respectively. Nitrate is the most oxidized form of nitrogen and is an important plant nutrient. The nitrate value was recorded with a maximum reading of 53 (µg/l) in May and a minimum reading of 13(µg/l) in August at pre-flood conditions. This was compared to a recorded variation at post flood conditions with a maximum of 96 (µg/l) in March and the minimum recording of 60 (µg/l) in August respectively. This wide variability in the nitrate concentration may be due to leachate from leaf fall (Wetzel, 2001), influx of nitrates along with rain water from catchment area, variation in decomposition rate at diverse temperature regimes and contamination of wetland water with sewage washed away by surface run off (Zuber, 2007). Fluoride value was taken on pre-flood conditions and was recorded with a maximum of 0.9 mg/l in February and a minimum reading of 0.4 mg/l in September was noticed. But it was compared to Post-flood scenario where the fluoride content was recorded maximum as 1.4 mg/l in May and a minimum recordings of 0.6 mg/l in August respectively.Ammonia readily dissolves in water and forms ammonium hydroxide which dissociates to give ammonium (NH_4^+) and hydroxyl (OH^-) ions. The higher concentrations of ammonia are generally met in polluted waters. The maximum value of 260 (mg/l) was recorded in January and a minimum ammonia value was observed as 116 (mg/l) in September at pre-flood condition. Similarly, ammonia values varied by post floods with a maximum reading of 398 (mg/l) in January month and a minimum reading of 190 (mg/l) was observed in October. Such fluctuations in the values may be due to decomposition of organic matter, influx of overland flow especially from agricultural fields. Turbidity is caused by the suspended particles like clay, silt, colloidal organic particles and planktons in the fresh water ponds and lakes. Pre-flood observation was taken and it was found that the maximum turbidity was noted as 160 NTU in May and a minimum turbidity was recorded as 60 NTU in January. But post floods it changed remarkably with a maximum of 500 NTU in May and a minimum of 231 NTU in September respectively. Thus water chemistry of Chatlam wetland in Pampore was changed after the disastrous flood in September 2014. The reason could be the overflow of the flood water from the river Jhelum flowing on the west of saffron town. Therefore the rate of eutrophication accelerated and the sediments brought up by the river Jhelum got build up. Besides, the solid wastes and other silt got accessed into the wetland from the plateau villages that degraded the aesthetic beauty of the Chatlam wetland.

ACKNOWLEDGEMENTS

We are highly thankful to the help, support and necessary permission provided by the Wildlife Protection Department, J and K Government during the study. The sincere help and moral support provided by Dr. Khursheed Ahmad, Prof. and Head Division of Wildlife Management SKUAST-Kashmir are highly acknowledged. The encouragement and help provided by Dr. Monisa Malik and Mr. Rauf Ahmad, the wildlife activist during the study are highly acknowledged.

REFERENCES

1. Anonymous (2005): Carbon Sequestration, Greenhouse Gas Emissions and Nebraska Agriculture, Background and Potential.
2. Brehm, V. (1936): Yale North India Expedition Article XVI. Report on Cladocera. Ibid. 10: 283-287.
3. Brehm, V. and Woltereck, R. (1939): International Review of Hydrobiology. Die Daphniden der Yale – Northindia Expedition. Int. Revue ges. Hydrobiol. 39: 1-19.
4. Das, S. M.; Daftari, S.; Singh, H.; Akhtar, S.; Chowdhuri, S. and Ahmad, N. (1969): Studies on organic production in high altitude lakes of Kashmir-The general ecology and zooplankton of Kashmir lakes. *Kashmir Science, 6*(1-2), 1–22.
5. Das, S. M. and Subla, B. A. (1970): The Pamir Kashmir theory of origin, evolution and distribution of Kashmir fishes with their general ecology. *Kashmir Science,7*, 1–15.
6. Edmondson, W.R. and Hutchinson, G.E. (1934): Report on Rotatoria. Article IX. Yale North India Expedition. Men. Conn. Acad. Arts., Sci., 10: 153 - 186.
7. Ghavzan, W.J.; Gunale, V.R. and Trivedy, R.K. (2006): Limnological evaluation of an urban freshwater river with special reference to phytoplankton. Poll. Res., 25: 259-268.
8. Kaul, V. and Zutshi, D.P. (1967): A study of aquatic and marshland vegetation of Srinagar lakes. Proc. Nat.Inst. Sci. India, Vol. 33 pp 111-128.

9. Kiefer. (1939): Scientific results of the Yale North Indian Expedition. Biological report nMem. Indan Musm. 18: 83-203.
10. Mukherjee, S. K. (1921): The Dal lake (Kashmir) A study in biotic succession. In Proceedings of 8th Indian Science Congress, Abstract, pp. 185.
11. Mukherjee, S. K. (1926): Aquatic and Marshland vegetation of the Dal lake of Kashmir. In Proceedings of Linnean Society London, Abstract. p. 55.
12. Mukherjee, S. K. (1932): Bathymetric survey of Dal Lake of Kashmir with special reference to the penetration of active rays to the different depths of water and effect on the incidence of vegetation. In Proceedings of 19th Indian Sciences Congress, Abstract, pp. 328.
13. Zutshi, D.P and Khan, M.A. (1978): 'On Lake Typology of Kashmir'. In: 'Environment Physiology and Ecology of Plants' (Edt. by D.N. Sen and R.P. Bangal) B.Singh and M. Pal Singh, Dehradun, pp: 465-472.
14. Wetzel, R.G. (2001): Limnology: Lake and River Ecosystems. 3rd Edition. Academic Press: AHarcourt Science and Technology Company, 525B Street, Suite 1900, San Diego, California. Pp 351-357.
15. Zuber, S.M. (2007): Ecology and Economic valuation of Lake Mansar, Jammu. Thesis submitted with Department of Zoology, University of Jammu, Jammu and Kashmir state.

Source of Support: None Declared
Conflict of Interest: None Declared