



Assessment of Pollutants in Water and Sediment Samples in Lake Chad, Baga, North Eastern Nigeria

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ABSTRACT

The purpose of this research is to determine the levels of some physicochemical parameters in water and sediment samples from Kwantanturare in Lake Chad, Baga, Borno State, Nigeria. Water samples were collected from five points designated as S₁ to S₅ for the determination of biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO) total dissolved solid (TDS), total suspended solid (TSS) anions and trace element. Sediment samples were also collected for the determination of heavy metals and total organic carbon (TOC). These parameters were determined using approved standard procedures. The levels of heavy metals in the water and sediment samples were determined using atomic absorption spectrophotometer (AAS). The concentrations of DO, BOD, COD, TSS, TDS, TOC, nitrite, nitrate, Phosphate, Sulphate, and Chloride in the water samples from the five sampling points were higher than the WHO limits for the protection of fish and other aquatic life. The concentrations of Fe, Mn, Cu, Cd, Pb, Ni and Co in the water samples were higher than the WHO guideline limits, indicating severe pollution of this portion of Lake Chad. This high level of heavy metals in the water samples is expected owing to runoff of wastewater from agricultural activities within the study area. However, the concentrations of all the metals in the sediment samples were higher than the recommended values stipulated by WHO; indicating that the sediment samples from this portion of Lake Chad were also polluted by heavy metals. Results of Analysis of variance (ANOVA) revealed that the concentrations of all the parameters studied were statistically significant among the sampling points. The prolonged presence of heavy metals in the water and sediment samples from this portion of Lake Chad give cause for concern with time. The results of the study implies that continuous monitoring has to be carried out to ascertain the long-term impact of anthropogenic inputs to take remedial measures so as to ensure the health of aquatic life.

KEYWORDS

Physicochemical; Water; Sediment; Kwantanturare; Baga; Lake Chad

Cite this paper

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References

- [1] B. Abida, S. Harikrishna, K. Irfanulla, M. Ramaiah, K. Veena and K. Vinutha, " Analysis of Flouride Level in Water and Fish Species of Sankey, Bellandur and Madivala Lakes of Bangalore. *Rasayan*," *Journal of Chemistry*, Vol. 1, No. 3, 2008, pp. 596-601.
- [2] J. O. Keith and D. C. H. Plowes, " Considerations of Wildlife Resources and Land Use in Chad," USAID Technical, Paper 47, 1997.
- [3] I. F. Balk and J. H. Koeman., " Future Hazards of Pesticide Use with Special Reference to West Africa and Southeast Asia," IUCN Commission on Ecology, Paper No. 6. IUCN, Gland, Switzerland, 1984
- [4] W. C. Mullié, P. J. Verwey, A. G. Berends, J. W. Everts, F. Sene and J. H. Koeman, " The Impact of Pesticides on Palearctic Migratory Birds in the Western Sahel," ICBP Technical, 1991, Cambridge, pp. 37-61.

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- [5] R. P. Richards and D. B. Baker, " Pesticide Concentration Patterns in Agricultural Drainage Networks in the Lake Erie Basin," *Environmental Toxicology and Chemistry*, Vol. 12, No. 1, 1992, pp. 13-26. doi: 10.1002/etc.5620120104
- [6] M. Radojevic and V. N. Bashkin, " Practical Environmental Analysis," The Royal Society of Chemistry, Cambridge, 1999, p. 466.
- [7] C. M. A. Ademoroti, " Standard Method for water and Effluents Analysis," Foludex Press Ltd., Ibadan, 1996, pp. 22-23,44-54,111-112.
- [8] HACH, " Water Analysis Handbook," 3rd Edition, HACH Company, Loveland, 1997.
- [9] R. Anon, " Standard Methods of Water and Wastewater Examination," 18th Edition, American Public Health Association, Washintong DC, 1992, pp. 2-172.
- [10] DAWF, " South Africa Water Quality Guideline 1: Domestic Water Use," 2nd Edition, Department of Water Affairs and Forestry, Pretoria, 1996.
- [11] D. Chapman, " Assessment of Injury to Fish Populations: Clark Fork River NPL Sites, Montana," In: J. Lipton, Ed., *Aquatic Resources Injury Assessment Report, Upper Clark Fork River Basin*, Montana Natural Resource Damage Assessment Program, Helena, Mont, 1993.
- [12] J. Das and B. C. Acharya, " Hydrology and Assessment of Lotic Water Quality in Cuttack City, India," *Water, Air, and Soil Pollution*, Vol. 150, 2003, pp. 163-175. doi: 10.1023/A:1026193514875
- [13] K. P. Singh, A. Malik and S. Minha, " Water Quality and Apportionment of Pollution Sources of Gomti River (India) Using Multivariate Statistical Techniques—Case Study," *Analytica Chimica Acta*, Vol. 538, No. 1-2, 2005, pp. 355-374. doi: 10.1016/j.aca.2005.02.006
- [14] H. Chang, " Spatial and Temporal Variations of Water Quality in the Han River and Its Tributaries, 1993-2002," *Water, Air, and Soil Pollution*, Vol. 161, No. 1-4, 2005, pp. 267-284. doi: 10.1007/s11270-005-4286-7
- [15] USEPA, " Volunteer Lake Monitoring: A Methods Manual," EPA 440/4-91-002. Office of Water US Environmental Protection Agency, Washington DC, 1999.
- [16] WHO, " World Health Organization Standard for Drinking Water," *Guidelines for Drinking Water Quality*, Vol. 1, Recommendation, France, WHO, 2002, 181 p.
- [17] J. C. Akan, E. A. Moses and V. O. Ogugbuaja, " Determination of Pollutant Levels in Mario Jose Tannery Effluents from Kano Metropolis, Nigeria," *Journal of Applied Science*, Vol. 7, No. 4, 2007, pp. 527-530. doi: 10.3923/jas.2007.527.530
- [18] M. Cotman, J. Zagorc-Koncan and A. Drolc, " Study of Impacts of Treated Wastewater to the Krka River, Slovenia," *Water Science and Technology*, Vol. 44, No. 6, 2001, pp. 47-54.
- [19] M. V. Ahipathy and E. T. Puttaiah, " Ecological Characteristics of Vrishabhavathy River in Banglore (India)," *Environmental Geology*, Vol. 49, No. 8, 2006, pp. 12171222. doi: 10.1007/s00254-005-0166-0
- [20] P. Helen, M. Neal, J. Alison, H. Linda and H. Wickham, " Water Quality of Treated Sewage Effluent in a Rural Area of the Upper Thames Basin, Southern England, and the Impacts of Such Effluents on Riverrine Phosphorus Concentrations," *Journal of Hydrology*, Vol. 304, No. 4, 2005, pp. 103-117.
- [21] A. Luiza, V. Alex, L. Reynaldo, B. Plinio and P. B. De Camargo, " Effects of Sewage on the Chemical Composition of Piracicaba River Brazil," *Water, Air, and Soil Pollution*, Vol. 110, 1999, pp. 67-79.
- [22] A. A. Olajire and F. E. Imeokparia, " Water Quality Assessment of Osun River: Studies on Inorganic Nutrients," *Environmental Monitoring and Assessment*, Vol. 69, No. 1, 2001, pp. 17-28. doi: 10.1023/A:1010796410829
- [23] N. Mladenov, K. Strzepek and O. M. Serumola, " Water Quality Assessment and Modeling of an Effluentdominated Stream, the Notwane River, Botswana," *Environmental Monitoring and Assessment*, Vol. 109, No. 1-3, 2005, pp. 97-121. doi: 10.1007/s10661-005-5842-8
- [24] K. Ravindra, M. Ameena, R. Monika and A. Kaushik, " Seasonal Variations in Physico-Chemical Characteristics of River Yamuna in Haryana and Its Ecological Best Design Use," *Journal of Environmental Monitoring*, Vol. 5, No. 3, 2005, pp. 419-426. doi: 10.1039/b301723k
- [25] K. Fytianos, A. Siumka, G. A. Zachariadis and S. Beltsios, " Assessment of the Quality Characteristics

- [26] K. Maya, K. N. Babu, D. Pabdmalal and P. Seralathan, " Hydrochemistry and Dissolved Nutrient Flux of Two Small Catchments Rivers, South-Western India," *Journal of Chemical Ecology*, Vol. 23, No. 1, 2007, pp. 13-27. doi:10.1080/02757540601084029
- [27] G. Fernandez and P. Moro, " Annual Performance of a Full Scale Activated-Sludge Plant, Biotic Components and New Criteria for Process Assessment," *Bioresource Technology*, Vol. 38, 1991, pp. 7-14.
- [28] WHO, " World Health Organization standard for Drinking Water," *Guidelines for Drinking Water Quality*, Vol. 1, Recommendation, France, WHO, 2004, 181 p.
- [29] B. Anglin-Brown, A. Armour-Brown and G. C. Lalor, " Heavy Metal Pollution in Jamaica 1: Survey of Cadmium, Lead and Zinc Concentrations in the Kintyre and Hope Flat Districts," *Environmental Geochemistry and Health*, Vol. 17, 1995, pp. 51-56.
- [30] S. A. Abbasi, N. Abbasi and R. Soni, " Heavy Metals in the Environment," Mittal Publications, Delhi, 1998, p. 314.
- [31] CPCB, " Central Pollution Control Board, Review of Water Quality Objectives, Requirements and Zoning and Classification for Indian Water Bodies," Government of India, Delhi, 2000, pp. 11-17.
- [32] USEPA, " Risk Assessment: Technical Background Information," 2002.
<http://www.epa.gov/reg3hwmd/risk>
- [33] E. J. O' Flaherty, " Chromium Toxicokinetics," In: R. A. Goyer and M. G. Clerian, Eds., *Toxicology of Metals: Biochemical Aspects*, Springer-Verlag, Heidelberg, 1995, pp. 315-328.
- [34] S. Dixit and S. Tiwari, " Impact Assessment of Heavy Metal Pollution of Shahpura Lake, Bhopal, India," *International Journal of Environmental Research*, Vol. 2, No. 1, 2008, pp. 37-42.
- [35] J. R. Turnland, " Copper Nutrition, Bioavailability and Influence of Dietary Factors," *Journal of American Dietetic Association*, Vol. 1, 1988, pp. 303-308.
- [36] A. J. L. Gomez, I. Giráldez, D. Sánchez-rodas and E. Morales, " Comparison of the Feasibility of Three Extraction Procedures for Trace Metal Partitioning in Sediments from South West Spain," *Science of*