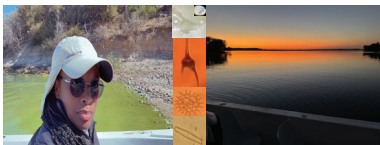


TROPIC STATE OF THE MASSINGIR RESERVOIR BASED ON THE TSI & MBFG



Introduction

Climate variability and anthropogenic pressures may compromise water quality and threaten phytoplankton biodiversity. This communication presents and discusses the results of research on the physicochemical factors controlling phytoplankton composition carried out in the Massingir Reservoir.

The reservoir is formed by damming the transboundary Olfants River, which originates in South Africa and flows into the Indian Ocean in Mozambique. At its source, the river has experienced increasing anthropogenic pressure, including agriculture, discharge of untreated sewage and mining, which contribute to pollution^{1,2}.

The reservoir is important for water supply, irrigation, fisheries and tourism, however, poor water quality poses a risk to public health and aquatic biodiversity.

Therefore, phytoplankton MBFGs can be used as functional bioindicators to assess the trophic status of the reservoir (as a proxy for water quality), supporting transboundary management and sustainable use of this resource.

Objectives

General objective

To assess the trophic status of the Massingir Reservoir using the Trophic Status Index (TSI) and Morphology-Based Functional Groups (MBFG) across stations.

Specific objectives:

- To determine the physical and chemical parameters and the.
- To determine the MBFG and phytoplankton biomass.
- Compare trophic states based on the TSI and MBFG.
- Correlate MBFG of phytoplankton with physical and chemical parameters.

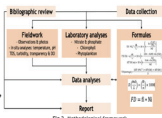
Study area

- Gaza province - South of Mozambique (fig 1)
- Long: 23° 52'30"E.
- Lat: 32° 00'16"S.
- Climate: semi-arid.
- Built between 1972 and 1977 on the Olfants River, which rises in South Africa
- 27 sampling points around the lake.



Methods

- Bibliographic review.
- 2 sampling campaigns in each season (S.): Nov 2024 (rainy-s.) & Jul 2025 (dry-s.).
- Sample analysis (fig. 2): Physical and chemical & phytoplankton composition.
- Data analysis in Excel and R: wilcoxon test, TSI, Functional Dominance, Redundancy Analysis (RDA) & ANOVA.



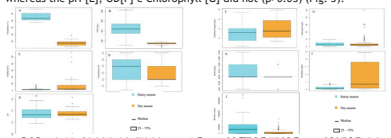
Bibliography

- Adde-Bediala, A. (2024). Spatiotemporal assessment of nutrients in the floodplain sub-catchment of the Olfants River basin, South Africa. *Applied Ecology and Environment Research*, 22(3):2411-2423. https://doi.org/10.15666/aer/2203_2411-2423.
- Adde-Bediala, A. (2025). Risk of Chemical Pollution in Olfants River Basin, South Africa: Human Health Implications. *Limited Review*, 25 (1). <https://doi.org/10.13501/limitedreview25010001>.
- Edwards, F. de A. (1998). *Fundamentos de Limnologia*. 2ª Ed. - Rio de Janeiro: Interciência.
- Lampert, W. e U. Sommer (2007). *Limnology: The Ecology of Lakes and Streams*. 2ª edição. Oxford University Press.
- Li, J. Y., Feng, C., Zhang, Y., Liang, M., Wu, H. L., & Lu, F. S. (2022). Alometric release of nitrogen and phosphorus from sediments mediated by bacteria determines water eutrophication in coastal river basins of Bohai Bay. *Ecological Engineering*, 202, 115826. <https://doi.org/10.1016/j.ecoleng.2022.115826>.
- United States Environmental Protection Agency-USEPA (2020). National Aquatic Resource Surveys. National River and Stream Assessment 2013-2014. Data and metadata files. <https://www.epa.gov/national-aquatic-resource-surveys/data-national-aquatic-resource-surveys>.
- Zak, S., Stadler, M., Jansen, H. S., Eggenhoer, S., Carstensen, M., v., Audet, J., Strand, J. A., Feuerbach, P., Hoffmann, C. C., Christen, B., Hilt, S., Rousset, M., Stockan, J., Watson, H., Hockrath, G., & Romang, B. (2019). An Assessment of the Ineffectiveness of Integrated Buffer Zones in Northwestern Europe. *Journal of Environmental Quality*, 49(2), 375. <https://doi.org/10.2134/jeq2018.03.0036>.

Mery Rodrigues
Eduardo Mondlane University (Mozambique)
Faculty of Science, Department of Biological Sciences
mery.b.rodrigues@uem.ac.mz
Leonilde Matombe
Eduardo Mondlane University (Mozambique)
Faculty of Science, Department of Biological Sciences
leonilde.matombe@uem.ac.mz
Aidate Mussagy
Eduardo Mondlane University (Mozambique)
Faculty of Science, Department of Biological Sciences
amusagv@uem.ac.mz

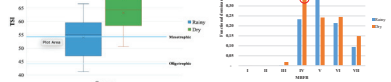
Results

The temperature[A], TDS [B], turbidity[C], transparency[D], NO₃⁻[H], PO₄³⁻[I] e biomass[J] presented significant differences between seasons (p<0.05), whereas the pH [E], OD[F] e Chlorophyll [G] did not (p>0.05) (Fig. 3).

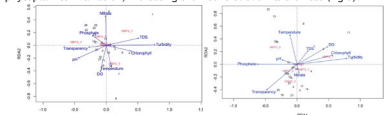


The TSI varies from mesotrophic (54.1) to eutrophic (63.2) in rainy & dry seasons respectively (fig. 4)

The dominant MBFG shifted from mesotrophic (IV) to eutrophic (IV), with 78% reduction in biomass (fig. 5)



The TDS, turbidity & PO₄³⁻ (p<0.05) explained more than 50% of the phytoplankton variation, indicating their control over its biomass (fig. 6)



Discussion

The TSI & MBFG of phytoplankton yielded the same trophic status in each season. The increase in phosphates (particularly in the upstream region), likely from point and diffuse sources into the Olfants River^{1,2}, resulted in a shift from mesotrophic conditions (rainy season) to eutrophic conditions (dry season), followed by a *Microcystis* bloom and increased turbidity, which reduced phytoplankton biomass by 78%. This finding is consistent with those reported by several authors^{3-4,5,7}, who indicate that algal blooms and high turbidity reduce light availability and, consequently, affect phytoplankton composition.

Conclusion

The reservoir exhibited high concentrations of PO₄³⁻, TDS and turbidity, indicating physico-chemical contamination of the water originating from the Olfants River, which negatively affected phytoplankton composition. Phytoplankton, as a bioindicator of trophic status, proved to be an efficient and useful tool for environmental monitoring. The reservoir water may not be suitable for consumption, irrigation or fisheries due to environmental contamination and the presence of *Microcystis* blooms, which are potentially toxin-producing. Water treatment prior to use is recommended, along with the establishment of a systematic water quality monitoring programme in coordination with managers in South Africa.