

Pilot Study Of Anthropic Impacts On The Pará River And Tracuateua River In The Metropolitan Region Of Belém - Pa (Brazil)

Aureliano da Silva Guedes, PhD*

Professor at Federal University of Pará/Campus of Ananindeua/Chemistry Faculty, PostDoc ICPD.

Aureliano da Silva Guedes II

Master of Science in Risk Management and Disasters/UFPA

Bruna de Souza Rodrigues

Student of Chemistry course at Federal University of Pará/Campus of Ananindeua

Ana Alice Pantoja de Freitas

Student of Chemistry course at Federal University of Pará/Campus of Ananindeua

Evani Vitória Damasceno Botelho

Student of Chemistry course at Federal University of Pará/Campus of Ananindeua

Laura Beatriz da Silva Moraes

Student of Chemistry course at Federal University of Pará/Campus of Ananindeua

Renata Gabrirla da Cruz Batista

Student of Chemistry course at Federal University of Pará/Campus of Ananindeua

Abstract:

The pilot research had as main objective recognise and discuss the geosocioenvironmental realities with emphasis in the quality of the water of Pará River in the stretch of Furo das Marinhas and Tracuateua River in the metropolitan region of Belém. Field research was made, with exploratory traits, as part of the technical scientific contents of the discipline Introduction to the Environmental Science from Chemistry course in the Campus of Ananindeua from the Federal University of Pará. It was examined in locus the conditions of water in those rivers, from where quali-quantitative physicochemical samples were collected and analysed to identify the quality of water in part of the hydrographic basin. The analyses were determined following the procedures conceded by Guedes (2023). Through this, it was understood the challenges faced, with proposal of solutions to promote and preserve de water resources. As conclusion, it is observed the presence of detritus and sewage on the stretches of Pará River, causing impacts on health and environment, needing public policies of garbage collection and selective garbage collection, as well as Investments on environmental education.

Key words: *Environment, Hydrographic basin, Limnology, Environmental impacts.*

Date of Submission: 20-09-2023

Date of Acceptance: 30-09-2023

I. Introduction

Around 75% of planet Earth is made up of water, however the growing water crisis is a global concern that has intensified in recent years. The scarcity of potable water and poor management of water resources are negatively impacting several countries and regions around the world. The increasing demand for water due to the increase in population, excessive use and waste of this finite resource, climate change and pollution of water bodies are some of the main factors contributing to this crisis¹.

Every year, the number of deaths due to drinking contaminated water is much higher than deaths due to violence, including war. It is necessary to evaluate possible causes, such as incorrect disposal of sewage and food companies that improperly dispose of waste in nearby rivers, in which families living nearby to these rivers will subsequently consume the same water without any type of treatment².

By this, the objective of this paper is to discuss the environmental reality with an emphasis on the water quality of the Tracuateua River and Pará River, in the stretch between Santa Barbara and the district of Mosqueiro, in the Metropolitan Region of Belém. As specific objective, it was sought to diagnose whether the stretches in question already contain trace elements of heavy metals that could cause impacts on human health through anthropogenic pollution of limnological resources, as part of the research project "Environmental impacts of

urbanisation on water resources in Metropolitan Region of Belém and its effects on the health of local populations and the environment: A brief look by geomedicine” by the team of Professor Aureliano da Silva Guedes.

II. Method

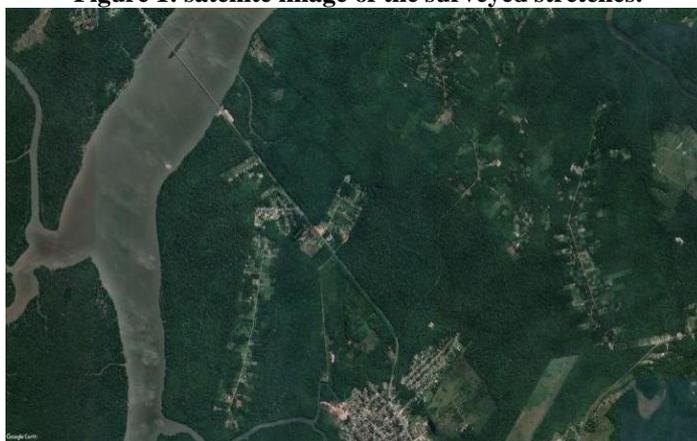
The team moved from Ananindeua to the Santa Barbara/Mosqueiro region to carry out field research, where three stops were made to collect samples and carry out quali-quantitative chemical analyses. As a reference and support instrument for field research, Guedes' travel plan was used (2023)³.

The first sample collection was carried out in the municipality of Santa Bárbara, on the bridge over the Tracuateua River at Km 32, PA-391, a water sample was collected and analysed with a pH measuring test, to verify the numbering on the pH scale, acidity/alkalinity that the sample indicated, and in addition to this, the multiparameter test was also used. Then, the conductivity and temperature parameters were checked, with the aid of a thermometer and digital conductivity meter. Furthermore, the Secchi disk was used to check the transparency and turbidity level of the river water. And it was important to observe the area, to verify the presence of domestic waste.

The second collection stretch was marked by the presence of natural pools, located at Km 35 on PA-391. In this sense, in the natural pools it was observed how those responsible dealt with the environmental issue in relation to the Pará River, seeking, in their own way, to preserve the environment as a way of attracting tourists by generating economic value for their properties.

The third point located at Furo das Marinhas, at Km 23, PA-391, on the Mosqueiro bridge, where the Pará River meets. Quali-quantitative analysis research was carried out in the same way as was carried out in the first stretch, and *in locus* observation was carried out.

Figure 1: satellite image of the surveyed stretches.



Source: Google maps by Professor Artur Santos, in July 2023.

III. Results and discussion

In the first stretch, it was observed that there is the presence of communities around the bridge over the Tracuateua river, located at PA-391/Km 32, where the existence of debris on the banks of the river was observed, which has a direct impact on the local pollution, which can cause illness to residents in that area. The analyses carried out with the river water sample are shown on table 1.

Figure 2: Household waste



Source: Authors, 2023.

At Km 35, where there are natural pools, there were observed the preservation of the ciliary forest and alternatives for the minimal intervention in the environment. Furthermore, tourism is an important economic activity there. It was observed that in the course of the Tracuateua River stretched of the Pará River, in natural pools it is not cut or interrupted, but only a part is diverted for the existence and maintenance of natural pools, where this water, in about 10 meters, is returned to this course of the river.

At the point where Furo das Marinhas and the Mosqueiro bridge meet, in the hydrographic basin of Pará, there are well-established ecosystems, dominated by mangroves, which contribute to the region's rich biodiversity, housing a wide variety of fauna species. and flora, including: *Macrobrachium amazonicum* (Amazon River prawn), *Aratus pisonii*. (Mangrove tree-climbing crab, aratu, etc.) and the *Cebus apella* (capuchin monkey)⁴.

In socio-economic aspects, fishing activities were observed, and there was also the presence of matapis for shrimp fishing and ponds for their storage (terms used by local collectors of freshwater shrimp). However, it is important to highlight the possible environmental impacts associated with economic activities in the region. The disorderly exploitation of natural resources, such as deforestation for the construction of houses, plantations, installation of companies, among others, which contributes to anthropogenic pollution of rivers, which, if not well guided, can compromise the environment. The results of the analyses carried out in the established stretches of the rivers are in table 1.

Figure 3: Pond and matapi



Source: Authors, 2023.

Figure 4: Waste on the river.



Source: Authors, 2023.

In this sense, the presence of ciliary forest, high tide and the existence of aquatic animals were observed at the three observation points.

Table 1- values of physical and chemical parameters

Analysis	Sample 1 Tracuateua River	Sample 2 Furo das Marinhas
Electrical conductivity	0,114	2,736
Total of Dissolved Solids	0,057 ppm	na 1,378 ppm
pH (test)	6,0	6,0
Temp. (°C)	29,7 (°C)	31,2 (°C)
Copper	0	1
Lead	0	0
Mercury	0	0
Hardness	25	100
Transparency (Secchi disc)	49 cm	67 cm

Source: Authors, 2023.

Based on quantitative and qualitative analyses using multiparameter test and pH test, electrical conductivity and dissolvable solids analysis equipment, the following analytical considerations are made:

In quantitative analyses, of local temperature with digital thermometers, multiparameter test, electrical conductivity of water and dissolved solids, they were useful for measuring variables related to water quality. This includes measuring pH, which indicates the acidity or alkalinity of the water.

Electrical conductivity, which is related to the concentration of ions present in water, and temperature, can indicate water quality, as they provide important information to evaluate water quality for different uses, such as: human consumption, agriculture and industry. The results of the electrical conductivity test indicated values of 0.144 ppm at point one and 2.736 ppm at point two, which shows expected normality, given that the part of the Pará river studied receives influence from the Atlantic Ocean and the Tracuateua river is supplied by the Pará River, however with many springs diluting the salts of its stretch.

There were variations in the temperature of the samples, at the point of Santa Bárbara, at the bridge over the Tracuateua River at Km 32, PA-391, it was 29.7 C° and at Furo das Marinhas, at Km 39, PA-391, at Mosqueiro bridge, it was 31.2 C°.

Temperature is a vital parameter in the control of aquatic life, influencing several parameters, both physical and chemical⁵.

It must be highlighted that the hardness of the water at point one is 25, and at point two, 100.

In qualitative analyses, the pH test used to evaluate the pH of the water are coated with indicators of different colours, which change according to the pH of the solution in which they are immersed. pH test can quickly and practically indicate whether the water is acidic, neutral, or alkaline, and at what level, based on the colour resulting from the reaction of the indicator with the solution (see table 1).

As for the data from the multiparameter test, the presence of lead (Pb) or mercury (Hg) was not identified in the two points analysed. However, regarding the presence of copper (Cu), only in the study stretch of the Pará River, it presented 1 trace, highlighting that, in Brazil, pollution is considered contaminant from 1.3 onwards, but an analysis of the spiring is needed to establish preventive measures.

Regarding the Secchi disc, visibility is qualitative, as it depends on the researchers' visualization of the disc. However, the presence of the type of mineral contained in the sediment, the presence of ciliary forest, among others, influence the colour of the water, which cannot be implicated as an indicator of pollution, even though the visibility of the Secchi disc does not exceed 49 centimetres in the stretch analysed from the Tracuateua River and 67 centimetres in the stretch of the Pará River in the Furo das Marinhas.

When observing the banks of the stretches of the analysed rivers, a large accumulation of waste was identified in the areas close to the banks of the Tracuateua River and, on the banks where the Pará River mangrove forest is located, in Furo das Marinhas, which is an indication of the need to establish public policies for waste collection, including selectively and investments in environmental education.

IV. Conclusions

From this research on water samples collected in the region, it is possible, together with the study of limnology, to develop planning measures for water resource management, to monitor actions that recover and conserve the aquatic ecosystem, in addition to using limnological studies as a prognosis of environmental disasters or minimising impacts.

It is noteworthy that, in natural pools areas, the presence of ciliary forest and care for the environment was observed, which indicates that this preservation is associated with tourism, as in other analysed areas, where there were communities residing nearby, there was incorrect disposal of waste by the population, which leads to negative impacts on human health and the environment.

It is necessary to improve basic sanitation in the region, such as sewage treatment, the removal of solid waste discarded on the banks of rivers, bridges, roads, and their recycling, as well as control and inspection by the responsible public bodies, communities and industries, so as not to compromise the water that is used for various purposes by the populations of the studied areas. Another important factor is the introduction of environmental education to the populations of the analysed locations, with the aim of raising awareness about the environment, which can increase both the quality of water in the region, raise socioeconomic standards, as well as the preservation of local fauna and flora.

References

- [1]. Bigelli, Eduardo. Química Ambiental. Curitiba : Fael, 2015.
- [2]. Souza, Amílcar. Gerenciamento E Controle De Poluição Da Água E Do Solo. Curitiba : Fael, 2016.
- [3]. Guedes, Aureliano Da.S. Disciplina Introdução Ao Meio Ambiente: Pesquisa De Campo Sobre Impactos Ambientais Da Urbanização Nos Recursos Limnicos. Ananindeua-Pa: Campus Universitário De Ananindeua-Ufpa, 2023. (Roteiro De Viagem)
- [4]. Guedes, Aureliano; Guedes Ii, Aureliano; Guedes, Catarynna. Meio Ambiente E Limnologia. Belém : Pesquisadores Associados, 2023.
- [5]. Almeida, Wadson Rodrigo Ferreira De; Souza, Flavio Mendes De. Análise Físico-Química Da Qualidade Da Água Do Rio Pardo No Município De Cândido Sales–Ba. Id On Line. Revista De Psicologia 13 (43): 353-378, 2019.