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Evolution on the Water quality in Sergipe hinterland reservoirs, Northeast Brazil

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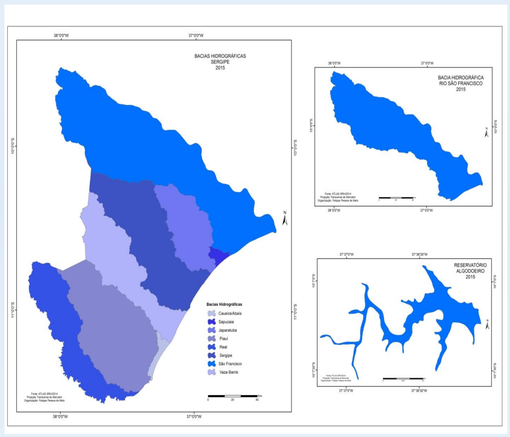
INTRODUCTION

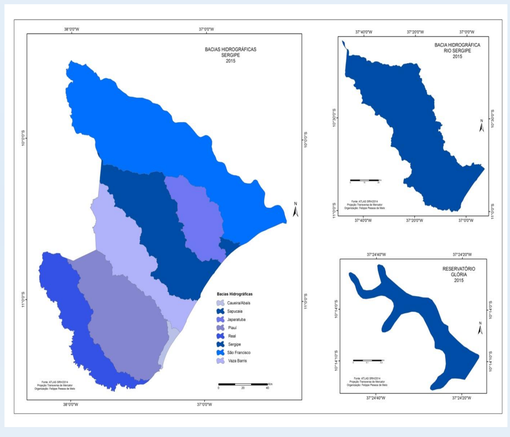
Due to the climatic and geomorphological conditions of the Northeast, Brazil, water resources are scarce, and measures are required to guarantee their supply for most of the year. The Trophic State Index (TSI) is responsible for estimating the degree of trophic aquatic systems. In this scenario, the present work aims to evaluate the water quality of the Algodoeiro and Nossa Senhora da Glória Reservoirs in Sergipe located in the São Francisco river basin and the Sergipe river basin, respectively, through the Reservoir Water Quality Index and determine The Trophic State Index for the referred reservoirs, observing if there was an evolution of the trophic degree and the water quality of these reservoirs over the monitored period, in order to offer information which can help in the actions related to the quality improvement of these lentic environments.

METHODOLOGICAL PROCEDURES

Study Areas



Reservoir of Algodoeiro in Nossa Senhora da Glória



Reservoir of Glória in Nossa Senhora da Glória

Location of reservoirs, sampling points and their geographical coordinates

Reservoir		Glória		Algodoeiro	
Spring	River Basin	Pau do Cedro creek Sergipe		Alagadiço creek São Francisco	
City		N. S. da Glória		N. S. da Glória	
Coordinates	Geographical	Lat.10º 14' 4"	Long.37º 24' 17,5"	Lat.10º 7' 8"	Long.37º 36' 2,1"
	UTM	X: 674.696	Y: 8.868.002	X: 653.248	Y: 8.881.070
Construction year		1958		1966	
Responsible		DNOCS		DNOCS	

Parameters, requirement of sampling, preservation and analysis of samples

Variables	Recipient	Volume	Preservation	Conservation	Validity	Methods
COD	Glass	200 mL	--	Refrigerated	28 days	SWEWW 2510B
Total phosphorus	Glass	200 mL	H_2SO_4 until pH <2	Refrigerated between 4 and 5°C	28 days	SWEWW 4500P
Total nitrogen	Polyethylene or inert polymer	200 mL	H_2SO_4 until pH <2	Analyze as quickly as possible or refrigerated between 4 to 5°C	7 days	SWEWW 4500
Inorganic Nitrogen total	Polyethylene or inert polymer	1.000 mL	Filter in membrane 0,45µm	Analyze as quickly as possible or refrigerated between 4 to 5°C	24 hours 48 hours 48 hours	US-EPA 300.0 US-EPA 300.0 SWEWW 4500P
Dissolved Oxygen (DO)	Glass for DO with tamp Grinding	300 mL	2mL of manganous sulfate e 2mL of alkali iodide + azide	--		SWEWW 2510C
Chlorophylla	Polyethylene or inert polymer	1.000 mL	Filter in membrane 0,45µm	Refrigerated between 4 and 5°C		ICP OES

RESULTS AND DISCUSSIONS

All collection, conservation and analysis procedures followed the methodologies described in the Standard Methods for the Examination of Water and Wasterwater, American Public Health Association, 22nd Ed., 2012 (APHA, 2012). It is important to emphasize that all the analytical determinations were performed at the Water and Dumping Laboratory of the Technological and Research Institute of the State of Sergipe (ITPS).

First condition: IQAR according to IAP

IQAR Calculation Results

Reservoir	IQAR (JUN/2013 to AUG/2013)	IQAR (NOV/2013 to JAN/2014)	IQAR (JUN/2014 to AUG/2014)
Algodoeiro	4.0	4.30	3.51
N. Senhora da Glória	4.38	4.61	3.43

When analyzing the results it is verified that although the rains have modified the class to which the reservoir belongs, it is noted that some parameters such as Phosphorus, DO and chlorophyll-a reveal the true condition of the reservoir and that there is a very thin line since the result of 3.43 is very close to the value of 3.51 for which the reservoir would remain as critically degraded.

Second condition: modified IQAR (IQARM)

Modified IQAR

Reservoir	IQAR (JUN/2013 to AUG/2013)	IQAR (NOV/2013 to JAN/2014)	IQAR (JUN/2014 to AUG/2014)
Algodoeiro	3.59	3.71	3.14
N. Senhora da Glória	3.92	3.97	3.08

In the condition for the Modified IQAR there was a change to both reservoirs regarding the class which they represent, leaving the condition from critically degraded to moderately degraded, although this condition indicates that the reservoirs are in poor condition, but the difference between these results may be due to the amount of rain of the month of August of 2014 that were greater than the one of the winter of 2013, collaborating for a dilution of the parameters.

Trophic State Index (TSI)

TSI medium

Trophic State	Algodoeiro - Alagadiço creek	N. S. da Glória - Pau de Cedro creek
TSI (P)	59.22	72.56
TSI (CL)	58.38	60.58
TSI	58.89	66.55

Analyzing this index for the Algodoeiro and Glória reservoirs, it was verified that the Algodoeiro one was classified almost all year as mesotrophic, i. e., it is considered a body of water with intermediate productivity, with possible implications on water quality, but acceptable levels in most cases. The Glória reservoir obtained a supereutrophic trophic degree in the first campaign and in the second campaign the trophic degree changed to hypereutrophic. The latter indicates a degree of trophy in which water bodies are significantly affected by high concentrations of nutrients and organic matter, compromising their uses.

CONCLUSIONS

This work shows that it is necessary to adopt measures aimed at the control and reduction of nutrients and organic loads in the water, discarded to contain the eutrophication process of these reservoirs. The reservoirs of the Algodoeiro and Glória, according to the results obtained and analyzed in the present work, require type of control, since the water of these reservoirs were classified as unfit for human consumption, according to CONAMA Resolution no. 357/2005.

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ACKNOWLEDGMENTS

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