



Physicochemical Analysis and aquatic macrophytes in the los Ortices lagoon,Santander,Colombia

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ABSTRACT

The Los Ortices lagoon is located 1.581 meters above sea level within the province of Garcia Rovira in the department of Santander (Colombia, South America). A substantial reduction of the entire ecological system of the lagoon is taking place due to a combination of geological, environmental, and anthropogenic factors. A preliminary study showed the site to have a high percentage of endemic species. The following plants were found to be present for the families: *Polygonaceae*, *Asteraceae*, *Menyanthaceae*, *Verbenaceae*, *Lamiaceae*, *Poaceae* and *Onagraceae*.

Key Words: Ortices lagoon, Santander, Aquatic plants, Almorzadero

Análisis físico-químico y macrófitas acuáticas de la laguna de los Ortices, Santander, Colombia

RESUMEN:

La laguna de los Ortices está localizada a 1581msnm en la provincia de García Rovira del Departamento de Santander. La laguna es un sitio que ecológicamente presenta una reducción de su espejo de agua, probablemente debido a la combinación de diversos factores como los geológicos, ambientales y antropogénicos. El presente trabajo hace parte de un estudio preliminar y presenta las familias de macrófitas acuáticas, entre las que se encuentran: *Polygonaceae*, *Asteraceae*, *Menyanthaceae*, *Verbenaceae*, *Lamiaceae*, *Poaceae* and *Onagraceae*. El monitoreo de estos sistemas hídricos es de vital importancia para futuros trabajos de desarrollo ambiental que permitan el desarrollo de políticas de cuidado y conservación de la única laguna de clima cálido enmarcada en la zona del paramo del Almorzadero.

Palabras clave: Laguna de Ortices, Santander, Plantas acuáticas, Almorzadero.

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INTRODUCTION

The study zone is Andean forest in the Norwest located in the Almorzadero paramo in the Santander state. The Garcia Rovira province have 12 municipalities, the Los Ortices Lagoon is located almost 104 kilometers away from Bucaramanga or 12 kilometers from San Andres, the temperature is around 19° C. See figure1.

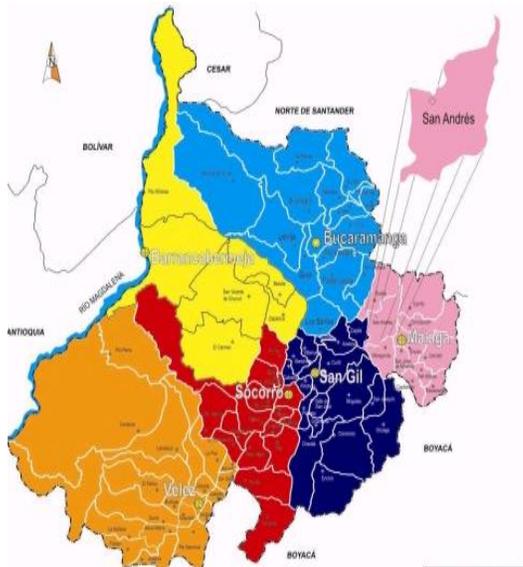


Figure 1: Localization the San Andres in Santander.

The Los Ortices lagoon is like a mirror of water around the Chicamocha and Guaca rivers. There is a basin in the middle with the majestic Chicamocha Mountains around it. There are two modalities for water precipitation. There are two rain seasons in April-May and September–October and one dry season during the months of December-February. Cas, 2009

Materials and Methods

Field site

The Los Ortices lagoon is located in the Department of Santander state, 1,580 meters above the sea level. (Latitude of 6° 43`

, 72° 52` Longitude). It presents morphogenetic processes that are subject to geological structure and environmental factors as a consequence of anthropogenic processes.

In the area, the most common crop is sugar cane surrounded by *Polygonum punctatum* and in minor proportion corn and coffee. People do not use water for consuming neither to irrigate because the composition and qualities are no good. The natural most abundant vegetation in the ecosystem are *Prosopis Juliflora*, *Crescentia kujete*, *Opuntias sp*, *Erytrina glauca*, *Gliricidia Cepium*, *Pithecellobium dulce*, *Guasuma ulmifolia* y *Bauhinia*. www.sanandres-santander.gov.co.

There is no previous literature that permits to know which kinds of plants there are in the lagoon and especially native aquatic plants near to the mirror of the water and the border. It is for this reason that this research has the objective of evaluating the physicochemical analysis in the water and describing the aquatic plant families that live in the lagoon. This project will formulate conservation strategies to preserve the limnetic ecosystem that can be used as a model for further study in the Almorzadero region. Figure 2.

Collection of samples

Samples were taken using an interceptive line which has three transects; water was put into a sterile bottle and this process was repeated at 3 different points.

two are in the borders and one in the middle of the lagoon, from west to east across the lagoon.

There have to standardized procedures for the physicochemical analyses Decreto 475 del 10 de Marzo de 1998. The water was tested in the laboratories of the University of Pamplona for: pH, conductivity, turbidity, color, alkalinity and chlorides.

Macrophytes samples:

The macrophytes were collected with sterile tweezers and placed in sterile polyethylene bags which were kept in a cool recipient until



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they were processed in the Catatumbo -Sarare herbarium and using the dichotomy key. Collections were made in February in 2009. (Suescun-Otero et al, www.apms.org. Milwaukee, Wisconsin, United States).

RESULTS AND DISCUSSION

The water characteristics found in the lagoon show that the three transects have minimal differences in quality because the surface of the lagoon is very clear. The only difference was that in the center of the lagoon there are not aquatic plants. See figure 3.

The average temperature is 19 °C. The pH is between 6.7 and 8.5 and the average is 7.5 which indicates a little alkalinity index. This variation might be due to chemical fertilizers for farming cultivation. The salinity is low because of the electrical conductivity is 265µS/cm with 177 mg/L (TDS).

Characteristics in the macrophytes:

Aquatic plants growing near to the water, the plant classification is: emergent, submerged, or floating. There are beneficial to lakes because they provide cover for fish and substrate for aquatic invertebrates. In addition, the absence of macrophytes may also indicate water quality problems as a result of excessive turbidity or herbicides. These plants are excellent indicators of watershed health because they:

- ❖ Respond to nutrients, light, toxic contaminants, metals, herbicides, turbidity, water level change, and salt.
- ❖ Are easily sampled through the use of transects or aerial photography.
- ❖ Do not require laboratory analysis.
- ❖ Are easily used for calculating simple abundance metrics.
- ❖ As indicators of environmental condition.

The figure: 4, 5, 6, and 7 choose the aquatic plants present in the lagoon

Taking into account the above features and using the dichotomy key by Harvestein & Falcon, 2001. That was described in the mirror-like water of the lagoon there were found 8 aquatic plant species and 1 non native species.

Table 1. A list of the plants was found in the lagoon

CONCLUSIONS

The Los Ortices lagoon is an aquatic ecosystem called like this because the Ortiz family discovered this region and settled in this place. It is an environmental patrimony of the province surrounded by legends and myths which gives it a cultural dimension.

Aquatic plants are a habitat and food resource for a variety of organisms. The role of plants is important for the ecosystem. The relationship between abundant, diverse, biomass, and plant growth was studied. The research found that 7 families in the lagoon and other non native species were invading and removing the community of the endemic plants.

The ecosystems of fundamental components in the hydro geographical basin are: sustainability, management, functions and ecological process. A substantial reduction of the entire ecological system of the lagoon is due to a combination of geological, environmental, and anthropogenic factors.

The project hopes to continue the control programs by studying diversity that permits recognizing the special features in the site. Despite the lagoon is located near the Paramo ecosystem, the water is warmer than the rest of the ecosystem. It is, however of vital importance for the water strategic plan in the Almorzadero biogeography Andean region.

It is important to recognize that this is the first international project to be published about the aquatic plants in the Los Ortices lagoon. It is important to show the species and how the aquatic classification to understand the ecology and the impact of human action on it. It is of vital importance to preserve the special ecological system in the Andean region to protect the biodiversity.

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In situ to determine the physical-chemical analysis facilitates to work with current data and permits to make comparisons within the established limits as part of the legislative framework for the different ways the use water. The physical-chemical analysis observed in the Los Ortices lagoon is on the required quality goods level.

However, although in the current research the ions analysis was not made. Therefore, it is necessary to evaluate the concentration of ions Bicarbonate (H_2CO_3), carbonate (CO_3), Sulfate (SO_4),chloride (Cl) as well as cat ions as cat ions as sodium (Na^+), Potassium (K^+), Calcium ($Ca^{+ +}$), magnesium ($Mg^{+ +}$), in different times in a year which permit to know if there is any risk of inorganic contamination in the lagoon due to these elements.

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Figure 2. Los Ortices lagoon, San Andrés, Santander. Colombia.

Figure 3: Physicochemical analysis in the water

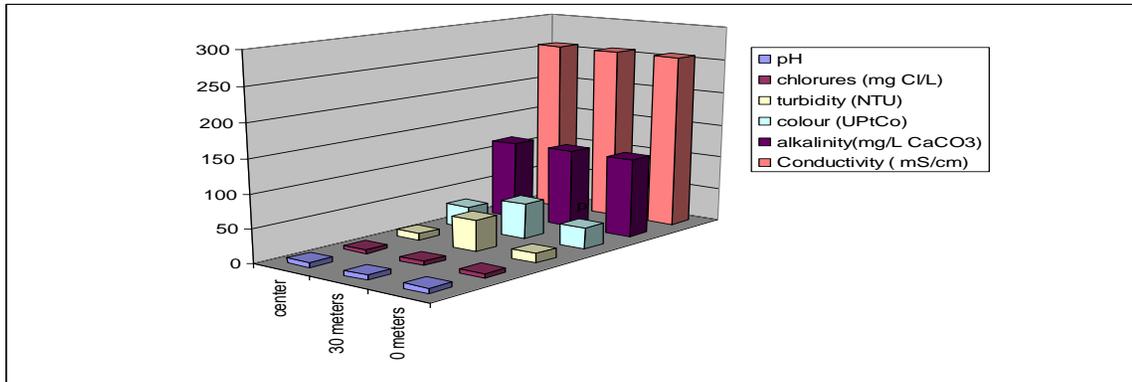


Figure 4: 4, 5, 6, and 7 choose the aquatic plants present in the lagoon



4 *Enea* sp
punctatum

5. *Paspalum* sp.

6. *Ludwigia palustris*

7. *Polygonum*

Table 1. A list of the plants was found in the lagoon

CLASS	FAMILY	GENUS	GROW HABITAT	AQUATIC CLASSIFICATION	NAME
Magnoliopsida	<i>Polygonaceae</i>	<i>Polygonum</i>	Decumbent	Palustre o amphibia (marsh plant)	<i>Polygonum punctatum</i>
Magnoliopsida	<i>Asteraceae</i>	<i>Mikania</i>	Escandent or prostrate	Palustre o amphibia (marsh plant)	<i>Mikania Micrantha</i>
Magnoliopsida	<i>Menyanthaceae</i>	<i>Nymphoides</i>	Rosette herb	rooted aquatic plants with floating leaves	<i>Nymphoides humboldtianum</i>
Magnoliopsida	<i>Verbenaceae</i>	<i>Stachytarpheta</i>	Erect herb	Palustre o amphibia (marsh plant)	<i>Stachytarpheta Cayenensis</i>
Magnoliopsida	<i>Lamiaceae</i>	<i>Salvia</i>	Prostrate herb	Palustre o amphibia (marsh plant)	<i>Salvia sp</i>
Liliopsida	<i>Poaceae</i>	<i>Pennisetum</i>	Rhizomatous herb	Palustre o amphibia (marsh plant)	<i>Pennisetum clandestinum</i>
Magnoliopsida	<i>Onagraceae</i>	<i>Ludwigia</i>	Procumbent herb	Palustre o amphibia (marsh plant)	<i>Ludwigia palustris</i>
Liliopsida	<i>Poaceae</i>	<i>Paspalum</i>	Graminoid	Palustre o amphibia	<i>Paspalum sp.</i>
Liliopsida	<i>Poaceae</i>	<i>Eleocharis</i>	Graminoid	Palustre o amphibia	<i>Eleocharis elegans</i>