BDEE 2021
The 1st International Electronic Conference on Biological Diversity, Ecology and Evolution
15–31 MARCH 2021 | ONLINE
Chaired by PROF. DR. MICHAEL WINK
diversity MDPI

Historical composition of zooplankton as an indicator of eutrophication in tropical aquatic systems: the case of lake Amatitlán, Central America

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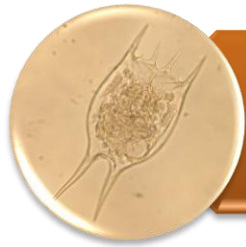
Introduction

Zooplankton biodiversity is deemed as a reliable indicator of water quality. (Cervantes-Martínez, *et al.*, 2018)

Zooplankton diversity knowledge is emerging, principally in the neotropical region (José de Paggi et al., 2020)

Common bioindicators of water quality



Rotifers

Cladocerans

Copepods

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Habitat destruction and the occurrence of exotic species are factors that engage biodiversity, ecosystems, and environmental services

Eutrophication of Lake Amatitlán is known over 40 years ago (Ellenberg, 2014)

Governmental authorities and researchers have arisen to address this problem (AMSA, 2015)

Most of the studies are more focused on environmental conditions than biological variables

It receives over the 50% of residual waters from Guatemala City

Lake Amatitlán is the 4th largest lake and emblematic lake in the country

Lake Amatitlán (Cervantes-Martínez, 2017)

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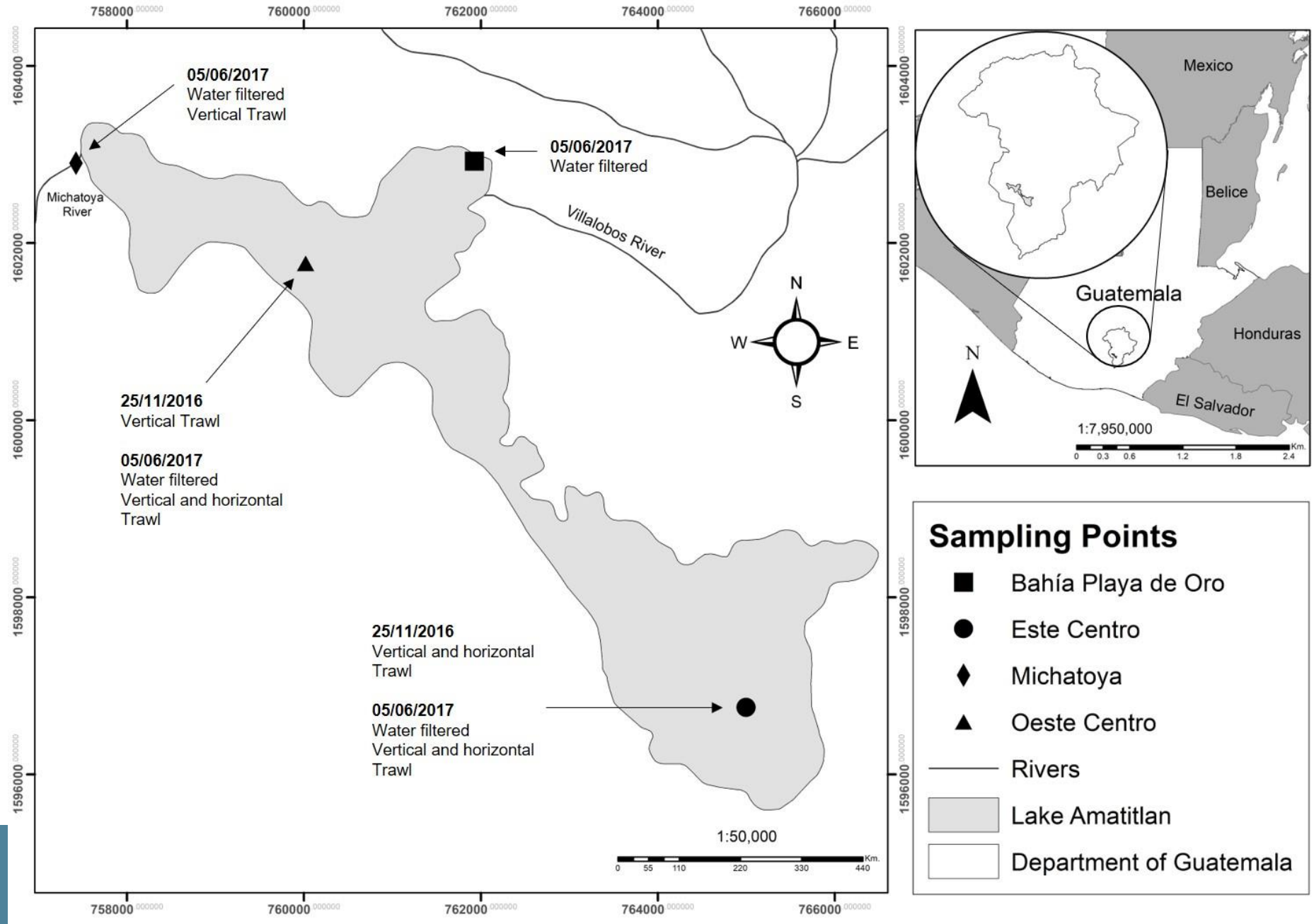
We present the actual and historic zooplankton diversity and its relationship with environmental values

Experiments

Sampling Sites



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Material and Methods

Sampling Methods

Biotic variables: Horizontal and vertical trawls, filtering a known volume of water

Abiotic variables: were collected *in situ*.

- water temperature
- pH
- dissolved oxygen (O_2)
- Total dissolved solids (TDS)
- conductivity

Laboratory Analysis

Species richness: identify specimens to the lowest taxonomic level possible

Species abundance: calculed the abundance (ind/L).

Statistical Analysis

PCA test were performed to know significant diferences in both years

MVSP Multi-Variate Statistical Package

Abiotic databases were provided by the Autoridad de Manejo Sustentable de la cuenca del lago Amatitlán (AMSA) **for 2016 and 2017**

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Results and discussion

Species richness

1910-2012

Lowest richness with just 2 records: *Keratella cochlearis* and *Filinia longiseta*

Highest richness with 7 known species including *Daphnia, Ceriodaphnia, Bosmina* and *Chydorus* species

Records of 3 calanoids:
- *Arctodiaptomus dorsalis*
- *Mastigodiaptomus albuquerquensis*

and the endemic species:
- ***M. amatitlanensis***

2016-2017

Highest richness, increased 75% with 12 new records including Monogononta and Bdelloidea

Lowest richness with just **one** cladoceran: *Ceriodaphnia* sp.

Records of:
- *A. dorsalis*

And two cyclopoid exotic copepods for this lake and Guatemala:
- *Mesocyclops thermocyclopoides*
- *Thermocyclops crassus*

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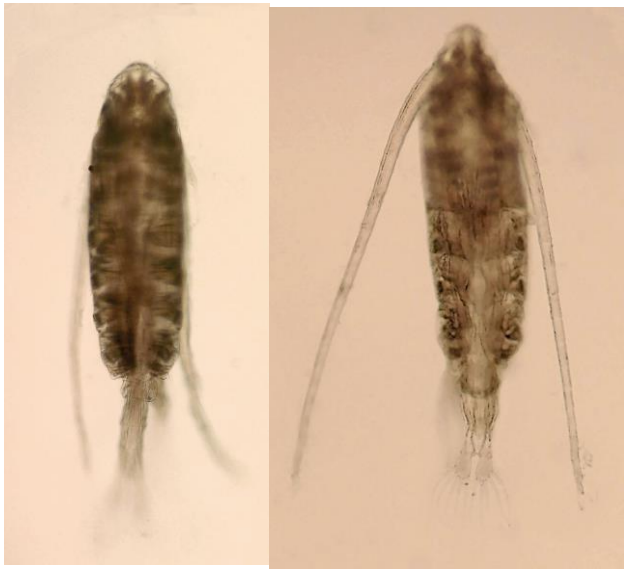
Este Centro was the site with the highest species richness (12 spp) and with larger zooplankton (cladocerans and copepods)

Copepods Recorded



Arctodiaptomus dorsalis

Widely spread in America (Reid, 2007)

Thermocyclops crassus

Euro-Asiatic species (Gutiérrez-Aguirre 2000)

Mesocyclops thermocyclopoides

Afro-Asiatic species (Gutiérrez-Aguirre 2003)

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Species abundance

80% of the total abundance

Rotifers were the species with the highest abundance in all sites. Dominant species:
Keratella ameriacana (304 ind/L)
Brachionus havanaensis (109 ind/L)

Cladocerans were absent

20% of the total abundance

Immature stages of cyclopoids had an abundance of 0.2 – 2.33 ind/L

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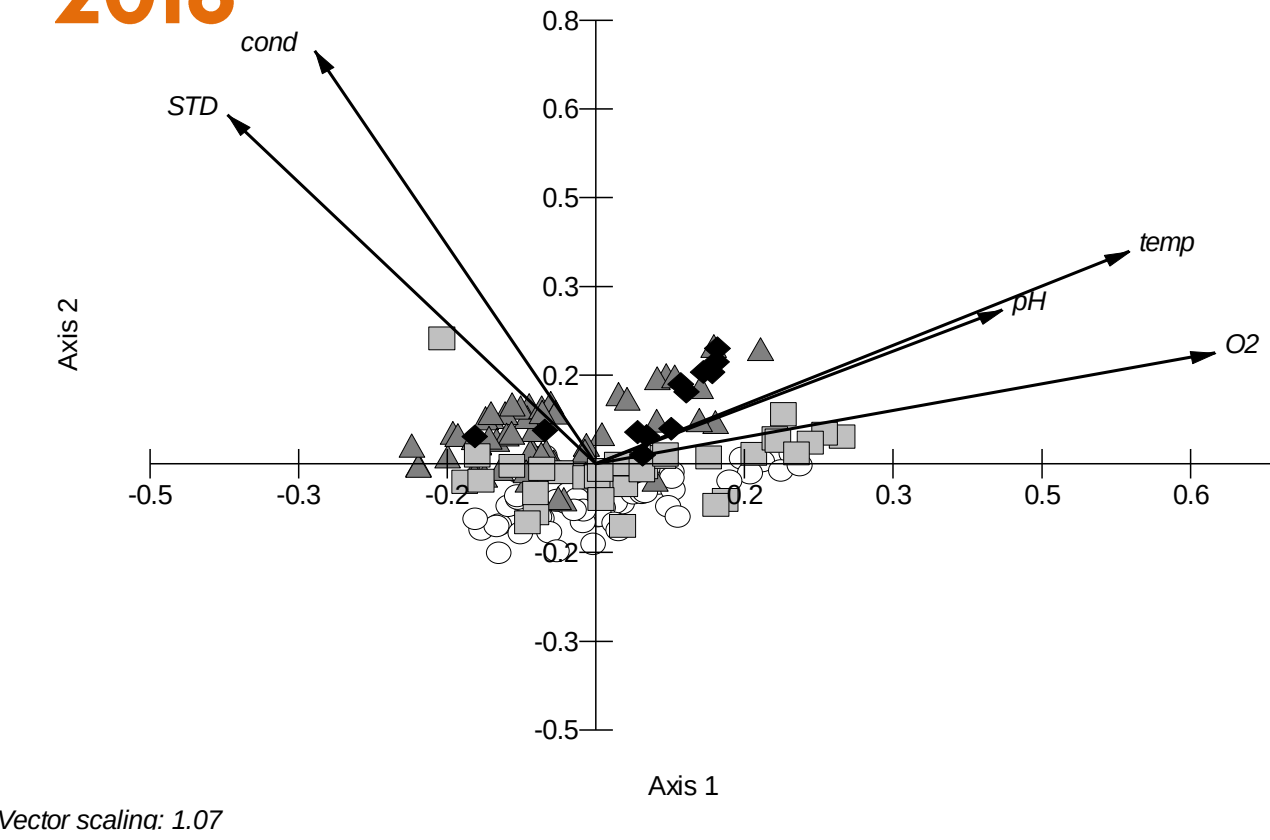
Species abundance behavior had relation with the eutrophication of the lake, because the presence of microzooplankton (like rotifers) was considerably higher than species of larger sizes (Fontaneto & De Smet, 2015)

Physiochemical parameters

2016



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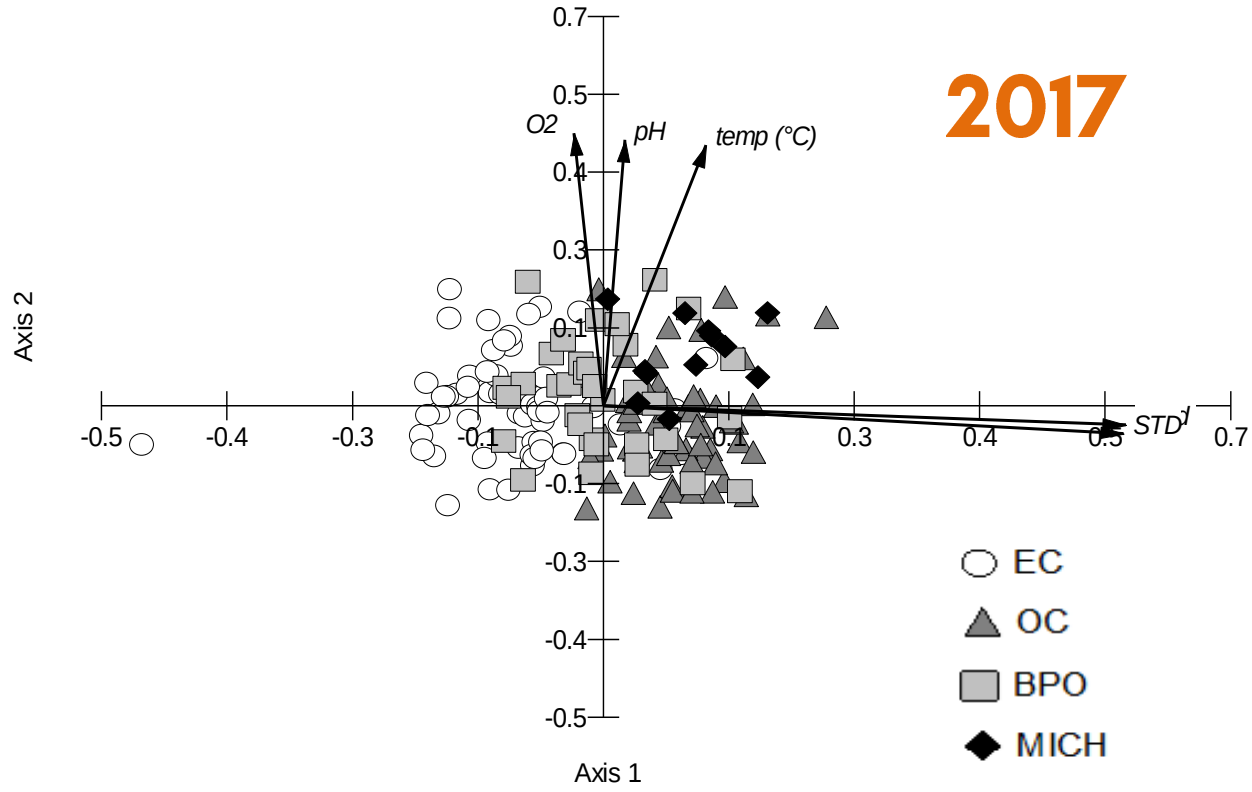
Axis 1 pH (36 and 37% variability)
Axis 2 Temperature (24 and 29% variability)

2017



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Este Centro separates from Oeste Centro

BPO separates from Michatoya

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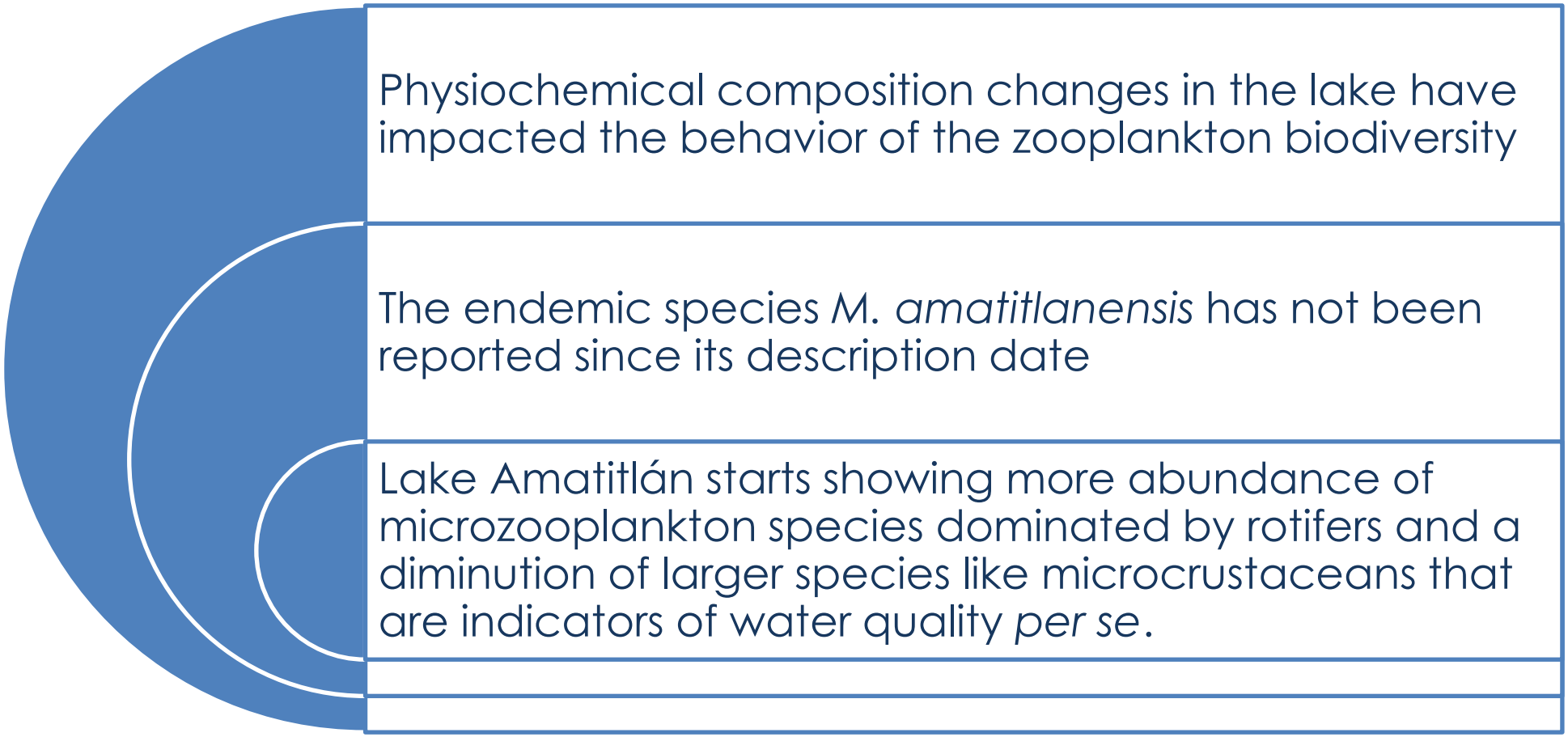
Conclusion



It is convenient to consider EC as a potential area for conservation since it presents better environmental conditions for the conservation and preservation of zooplankton biodiversity.

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Acknowledgements

- Dr. Manuel Elías-Gutiérrez for the invitation
- AMSA for providing the studying material
- University of Quintana Roo
- El Colegio de la Frontera Sur
- National Council of Science and Technology

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