

Occurrence of toxic algal bloom of *Microcystis ichthyoblade* in Corumana Reservoir, Mozambique, Africa.

Aidate Mussagy & Ivan Nerantzoulis
Eduardo Mondlane University



Abstract

A heavy algal bloom occurred in last years at Corumana Reservoir, South of Mozambique, Africa, where the lake surface was completely covered by masses of algae in a way never observed before. The algal bloom revealed that the bloom was entirely composed by single cyanobacteria, identified as *Microcystis ichthyoblade*. Microcystins were analyzed and high concentrations were detected. Fisherman interviewed during the period of the heavy bloom, reported that in contact with lake water, they had skin problems but not other symptoms were reported. The lake water is used by people living in the nearest villages, for fishing and drinking purposes, without any conventional water treatment. The high levels of microcystins observed raise concerns about the possible effects of the toxins on the health of the local people who are in their life time drinking water from this lake. These people have no knowledge regarding cyanobacteria and cyanotoxins and potential health consequences. The result of the present study might be a contribution to the knowledge of the biogeography of toxic cyanobacteria in African countries, but also raise the need to extend the cyanobacterial education to elucidate the water managers and local the people how to handle the situation when this kind of phenomenon occurs.



Figure 1. View of Algal Bloom at Corumana Reservoir

Background

In recent years, during some periods of the year blooms of cyanobacteria composed mainly by the genus *Microcystis* appeared more frequently in the plankton of several lakes in Mozambique. The presence of cyanobacteria has also reported from others tropical lakes in Africa (Dadheech *et al.*, 2009; Mhlanga *et al.*, 2006; Ndebele *et al.*, 2006).

Many cyanobacteria genera have been recognized to produce a range of hepatotoxic toxins-microtoxins. *Microcystis* seems to be the most common and cosmopolitan genus from which several variants of microcystins have been isolated and associated with health risk to human. Nevertheless, studies dealing with cyanobacteria and cyanotoxins in Mozambique are scarce.

Results & Discussion

Microscopic examination of the water samples showed the dominance of the genus *Microcystis*, particularly, the specie *Microcystis ichthyoblade*. Because species of the genus *Microcystis* are known as producers of toxins rises a concern whether this bloom is indeed toxigenic? Microcystin contents determined by ELISA test revealed the presence of microcystin. In the bloom of 2009 microcystin varied from 460 to 550 $\mu\text{g}/\text{l}$ and in 2011 varied from 46 to 5500 $\mu\text{g}/\text{l}$.

Fisherman interviewed during the period of the heavy bloom, reported that in contact with lake water, they had skin problems but not other symptoms were reported.

There is an increasing evidence that the predicted climate changes, associated with nutrient loading due to human developments will have an effect on algal blooms (Elliot, 2012). Mozambique is one of the Africa's most vulnerable country to climate change. Located on the south-eastern coast of the continent, it is exposed to a number of extreme weather events including droughts, floods and tropical cyclones. In addition, Corumana Reservoir is located in a largely agriculture area.

Although theoretical studies have predicted that *Microcystis* and other bloom forming cyanobacteria will dominate as a result of climate changes more effort is needed to understand the relationship between climate changes patterns and cyanobacteria blooms dynamics in African water resources.

When an algal bloom appeared for the first time in Corumana Reservoir in 2009 and, subsequently, in 2011 attracted attention from the water managers and people in the local community and they asked?

- What is this bright green scum ?
- Where does it come from? Is that bad ?
- Can we drink water and eat fish from the lake?

Methodology

- Water samples were collected at Corumana Reservoir during the bloom period and after in 2009 and in the next bloom in 2011.
- Corumana Reservoir is a man made lake located in Maputo, Mozambique. This tropical freshwater ecosystem receives water from Sabie River, a river that runs from South Africa to Mozambique. The lake is used mainly to supply water to the local community, fishing, irrigation and recreation.
- Collected water samples were observed under light microscope for species identification.
- Enzyme-linked immunosorbent assay (ELISA) was used for direct determination of total microcystins in natural water. The ELISA analysis was done by using the EnviroGard Microcystin Plate Kit.
- To understand the impact of these bloom to the local community a short interview was conducted.

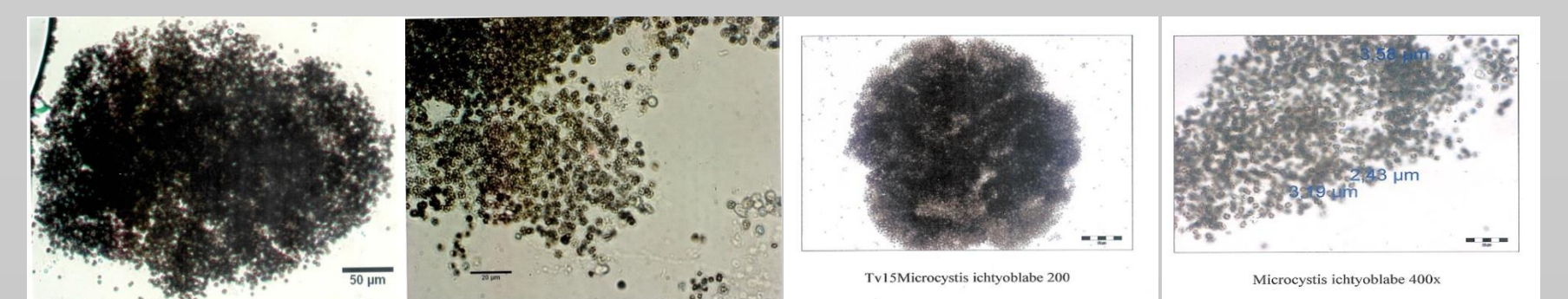


Figure 2. Microphotographs *Microcystis ichthyoblade* identified in algal bloom at Corumana Reservoir. (Photos from Gertrud Cronberg)

Microcystis ichthyoblade produces microcystin?

Yes!

Bloom from 2009 microcystin varied from 460 to 550 $\mu\text{g}/\text{l}$
Bloom from 2011 microcystin varied from 46 to 5500 $\mu\text{g}/\text{l}$.

References

- Dadheech P. K., Krienitz L., Kotut K., Ballot A. & Casper P., 2009. Molecular detection of uncultured cyanobacteria and aminotransferase domains for cyanotoxin production in sediments of different Kenyan lakes. *FEMS Microbiol Ecol* 68: 340-350.
- Elliot J.A., 2012. Is the future blue-green? A review of the current model predictions of how climate change could affect pelagic freshwater cyanobacteria. *Water research* 46: 1364-1371.
- Mhlanga L., Day J., Cronberg G., Chimbari M., Siziba N. & Annadotter H., 2006. Cyanobacteria and cyanotoxins in the source water from Lake Chivero, Harare, Zimbabwe, and the presence of cyanotoxins in drinking water. *African Journal of Aquatic Science* 31 (12) : 165-173.
- Ndebele M.R. & Magadza C.H. D., 2006. The occurrence of microcystin-LR in Lake Chivero, Zimbabwe. *Lakes & reservoirs: Research and Management* 11: 57-62.

Adress:

University Eduardo Mondlane, Faculty of Science, Department of Biological Science
E-mail: amussagy@uem.mz, ivann@uem.mz