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Biological control of toxic cyanobacteria

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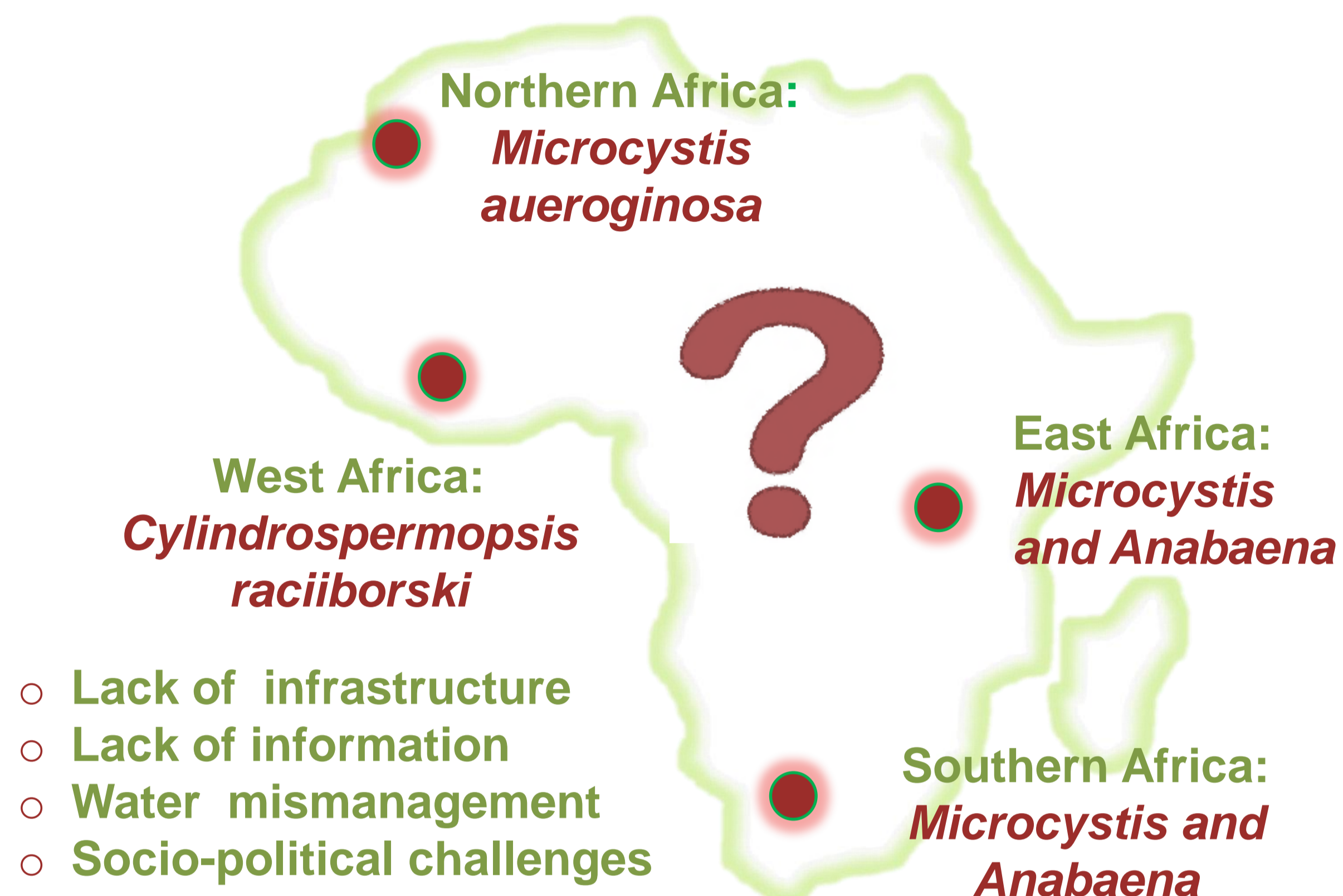
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Introduction

With the effects of climate change, harmful algal blooms (HABs) have become a global concern, with serious implications in water scarce countries such as South Africa.

There is a specific lack of information in the African continent regarding harmful algal blooms and their impacts in **over 30 countries**.

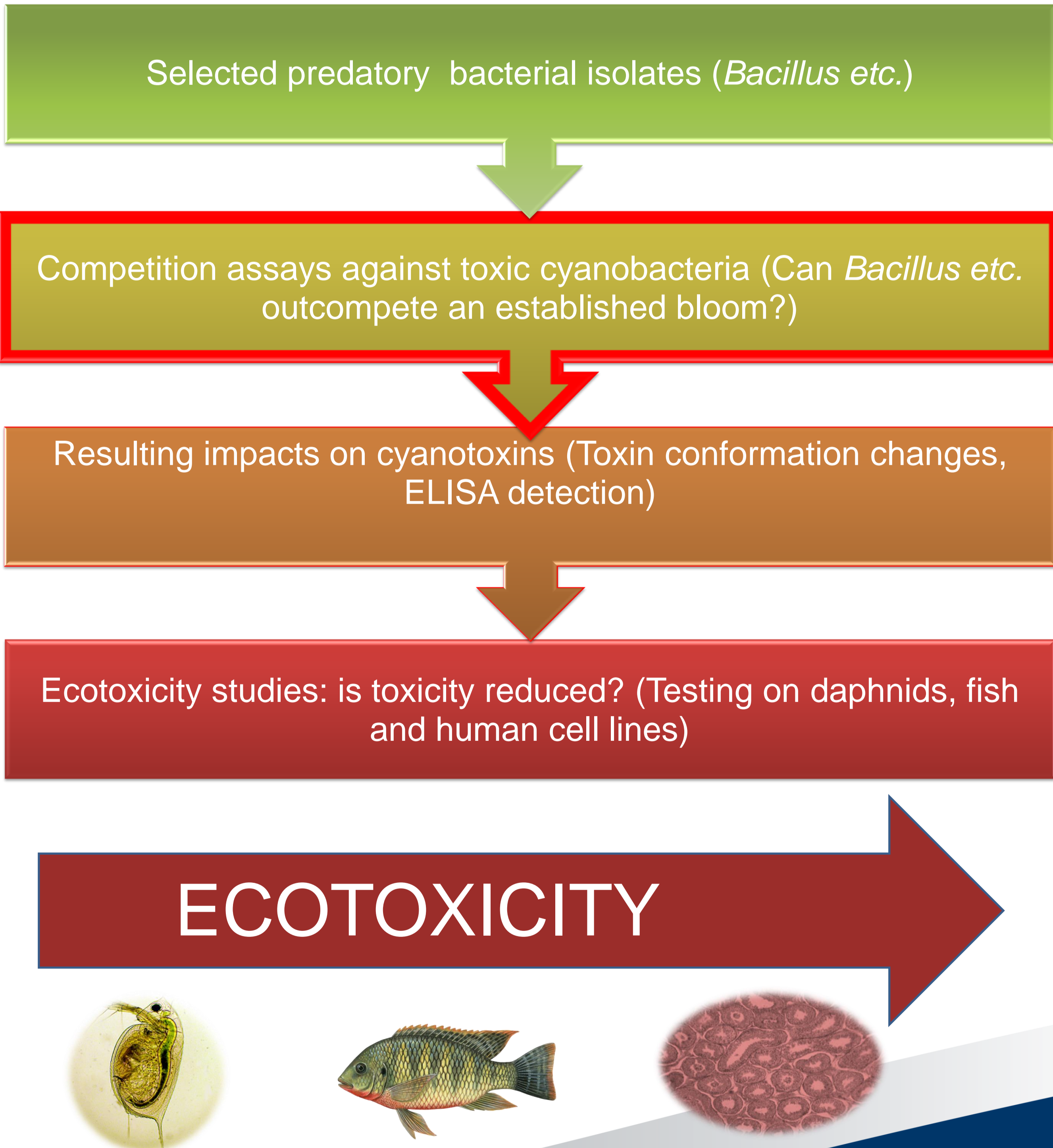
Biological control is a method of introducing natural enemies to control an organism and has been more successful using microorganisms



Bacterial isolates have been previously indicated in the control of cyanobacteria and although predatory, limited studies have been done on the eco-toxicity resulting from biocontrol as well as the changes to cyanotoxins, if any.

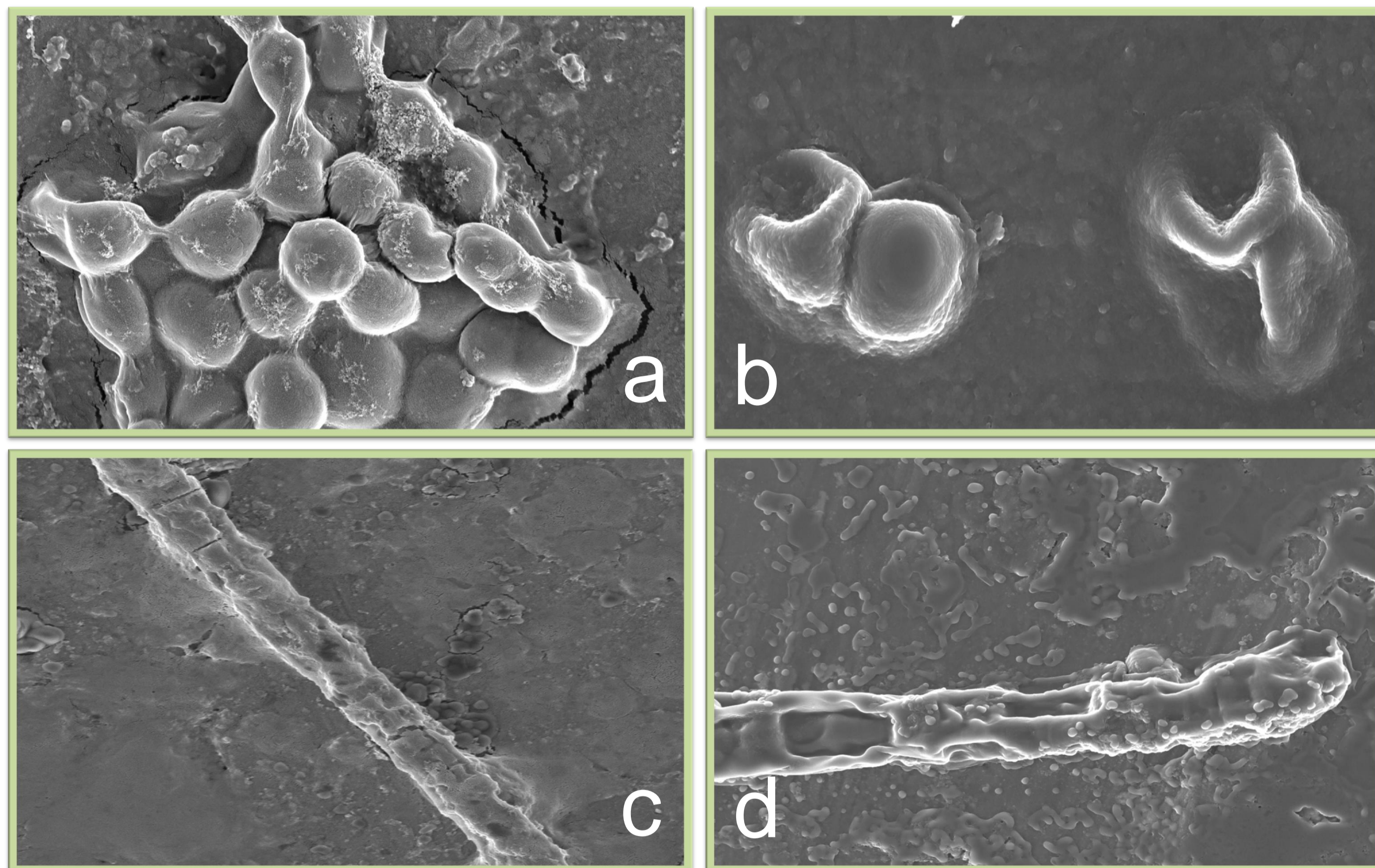
Research Plan

The study will be conducted at whole cell level and with specific metabolites and toxins, with eco-toxicity studied at three trophic levels.

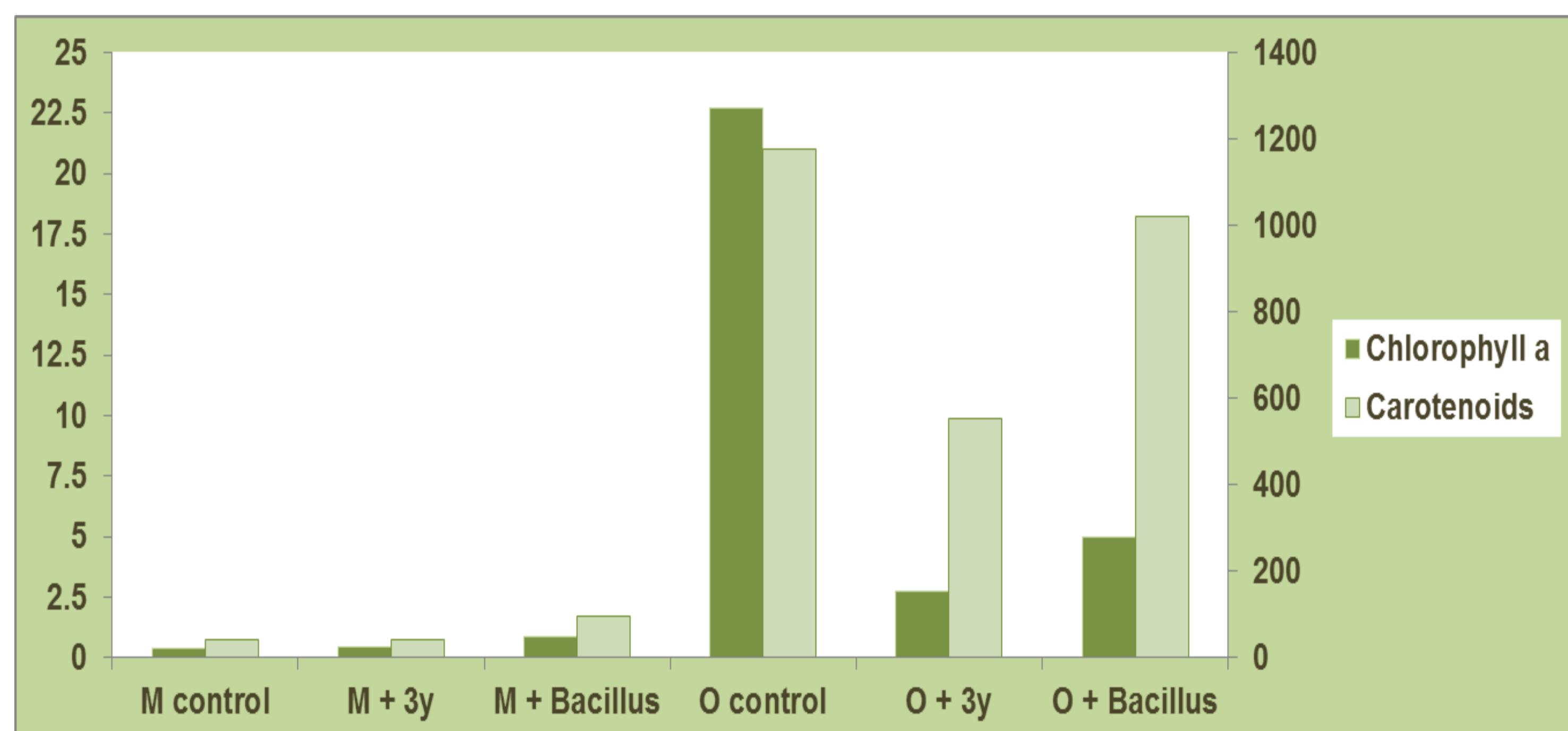


Bacteria as biocontrol agents

Bacillus and *Pseudomonas* sp. are among the commonly used microorganisms for bioremediation purposes. Using *Bacillus mycoides* as a reference, bacterial isolates were selected from bloom waters and exposed in ratios of 1:2 to non axenic *Microcystis* and *Oscillatoria* over 4 days.



Scanning electron micrographs (5000x) of *Microcystis* sp. (a,b) and *Oscillatoria* sp. (c,d) before and after treatment with isolate 3y, a coccoid, motile bacterium, after 4 days at ambient, static conditions in 100ml of BG-11



An example of chlorophyll and total carotenoid changes with the addition of bacterial isolates 3y and *Bacillus mycoides* to non-axenic *Microcystis* and *Oscillatoria* sp., after 4 days at ambient, static conditions

Potential Outcomes and applications

- If successful, the biocontrol agents may produce conformational changes to the cyanobacterial toxins or reduced eco-toxicity effects
- The laboratory study may give insight into the factors inhibiting the natural balance of predatory bacteria and cyanobacteria under bloom conditions.
- There is potential for upscaling the treatment process if effective

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