# GLOBAL DRIVERS OF ALGAL BLOOMS

## Quantification of phytoplankton bloom dynamics by citizen scientists in urban and peri-urban environments

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The study used data from 13 cities (250 water bodies) to examine the capacity of trained community members in assessing elevated phytoplankton (microalgae) densities in urban and peri-urban freshwater ecosystems. Nutrient concentrations and land use observations were used to examine possible drivers of algal blooms. Results showed a link between high phytoplankton density and nutrients and indicated that citizen science measurements showed a good relationship to standard laboratory measurements of phytoplankton density. *Castilla et al. (2015) Environ. Monit. Assess. 187: 690*

## Aims

The study aimed to:

- determine if elevated phytoplankton (microalgae) density can be detected effectively by citizen scientists, compared to standard laboratory techniques.
- study possible drivers of eutrophication and potentially harmful algal blooms in urban catchments.

## Approach

This study was conducted at two scales: globally, using data from 13 cities in the HSBC Water Programme, and locally, with more detailed measurements from São Paulo and Curitiba in Brazil and Hong Kong in China.

Global data included the cities Boston, Buffalo and Chicago (USA), Buenos Aires (Argentina), Curitiba, São Paulo and Rio de Janeiro (Brazil), Delhi (India), Guangzhou and Hong Kong (China), Mexico D.F. (Mexico), Jakarta (Indonesia) and Vancouver (Canada). 2,048 measurements were collected between April 2013 and September 2014 by trained citizen scientists.

Measurements of phytoplankton density were also made using optical microscopy by professional scientists in São Paulo, Curitiba and Hong Kong. Global land cover data and global watershed boundaries were cross-referenced with the field data.

## Impacts

Trained citizen scientists observed elevated algae concentrations across a wide range of environments and ecosystems. This demonstrated that citizens that could provide complementary data for statutory monitoring and to complement field studies of catchment dynamics. More than 2,000 datasets were obtained by citizen scientists, an equivalent of thousands of hours of effort that scientists were not required in order to obtain this information.

## Key results

- Citizen scientist and laboratory measurements of phytoplankton density were similarly correlated to turbidity and water colour measurements, suggesting that citizen scientists can take accurate estimates of algal blooms.
- Significant positive relationships were found between nutrients (mainly phosphate) and phytoplankton presence (recorded by citizen scientists) and phytoplankton density (recorded by professional scientists).
- In terms of land cover, algae presence was significantly higher in areas of cropland and artificial surfaces and lower in vegetated areas.

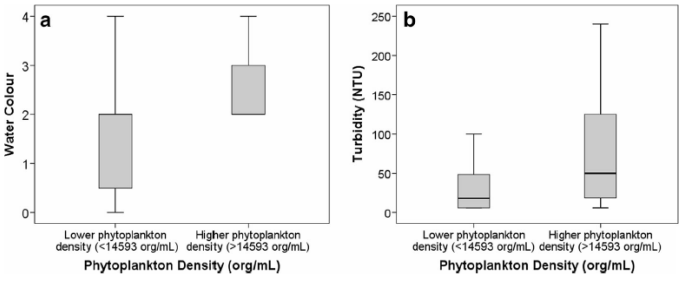


Figure shows a) phytoplankton density (org/mL) versus water colour (water colour: 0 clear, 1 yellow, 2 brown, 3 green, 4 other) for samples from São Paulo and Curitiba (n=56). b) Phytoplankton density (org/mL) versus turbidity (NTU) for samples from São Paulo and Curitiba (n=56)

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