

IMPACTS OF AGRICULTURE IN CHINA

Agricultural Processes in Guangzhou and Foshan, China Visibly Influence Water Quality and Phytoplankton Community

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This study aimed to gain a better understanding of the distribution of non-point source (NPS) pollutants and their possible impacts in Guangzhou and Foshan, China. Data collected by local citizen scientists in 2015 was utilized in this study and a focused study on phytoplankton dynamics was then conducted by professional researchers in 2016. Results showed that agricultural processes influence eutrophication and phytoplankton biodiversity.

Xu et al. (2017) Sci Total Environ. 590-591: 361-69.

Aims

The study aimed to:

- determine the conditions of nutrient concentrations, turbidity levels, and dynamics of algae occurrences for a range of water bodies in Guangzhou and Foshan (both in Guangdong province of China)
- compare the temporal variations of water quality with phytoplankton dynamics in three key seasons of the agricultural process- fallow, sowing and rainy season



Approach

Trained citizen scientists collected nutrient concentration (nitrate and phosphate) and turbidity data, and recorded observations of the presence of algae from sites in urban, periurban and agricultural areas in Guangzhou and Foshan, China. Measurements were taken monthly and were uploaded onto a global online database. Citizen science data from eight assigned sampling sites in 2015 were used in this study.

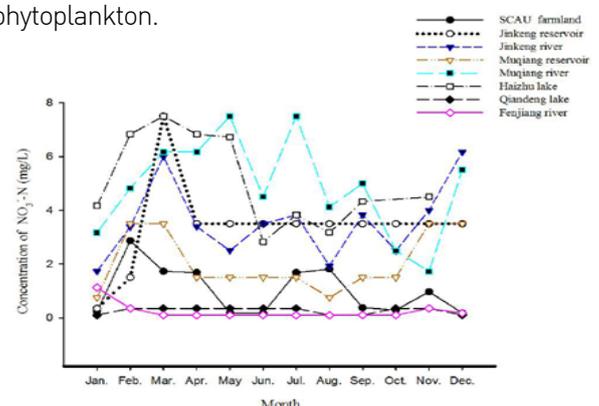
A focused study on phytoplankton dynamics was conducted by professional researchers in 2016. Water samples were collected in three key seasons in the agricultural process- fallow (February), sowing (April) and rainy (June) seasons. Physical-chemical measurements such as dissolved oxygen (DO), total nitrogen (TN) and total phosphorus (TP), and biological measurements such as variation of species of phytoplankton were also obtained.

Impacts

Agricultural activities and urbanization were associated to multiple impacts on a range of water bodies in the Guangdong province. This study showed that agricultural processes have a clear influence on water quality. Future studies should identify other diffuse sources of nutrient loadings. With this information, local authorities would be better equipped to manage the growing impacts of economic and agricultural activities on major water sources.

Key results

- Clear links were identified between nutrient concentration and agricultural activities were identified.
- Nitrate concentrations peaked in late winter and early spring in response to agricultural nitrogen-containing fertilizers application in the same timeframe. Phosphate concentrations peaked in the summer and autumn in response to phosphorus-based fertilizers application.
- Phytoplankton species changed with water quality and indirectly to agricultural land use; Bacillariophyceae during fallow season, Chlorophyceae in the rainy season and with Cyanobacteria in co-existence throughout the agricultural periods. Dissolved oxygen and total carbon were the primary factors influencing the taxa of phytoplankton.



Monthly mean concentrations of Nitrate in 2015. Nitrate concentrations peaked in late winter and early spring in correspondence to agricultural nitrogen-containing fertilizers applications in the same timeframes.