Effects of Water Quality and Phytoplankton Structure and Dynamics on Fish Kill Events in Lake Buhi, Philippines

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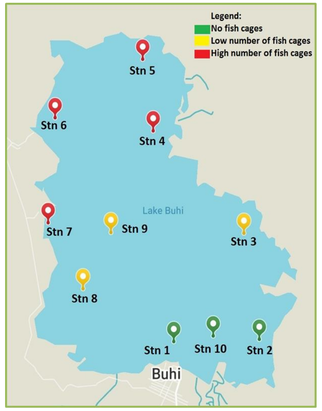
Introduction

Fish kills are a serious global issue that have significant influence on the environment and the public. It could be an indicator of environmental stress, deteriorating aquatic ecosystems, water quality problems, or contamination with toxic pollutants. It has impacts on the economy, environment, and human health. It can occur due to several reasons including harmful algal blooms (HABs), influx of toxic substances, dissolved oxygen (DO) depletion, and/or eutrophication.

In this study, the phytoplankton community was studied for its capability as bio-indicators to determine water body health and status.

This study aimed to determine the physico-chemical properties of Lake Buhi and phytoplankton structure and dynamics in the advent and aftermath of a fish kill event.

Methodology



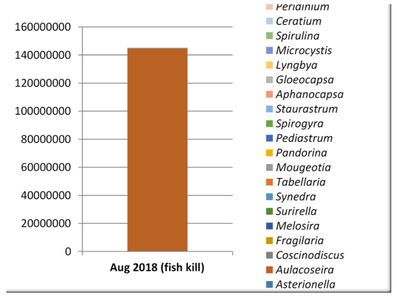
Sampling site selection

Plankton collection

In situ water quality assessment

Processing, filtering, identification, and quantification of phytoplankton

Results



Total population density of phytoplankton collected from Lake Buhi in August 2018 fish kill event

Month	Water Quality Index (WQI)		Shannon Diversity Index (SDI)		Palmer Pollution Index (PPI)		Dominant genera	Relative Abundance
	Score	Category	Score	Category	Score	Category		
2018 Apr	51.2	Poor	1.88	M	2-3	A	*Staurastrum*	26.8
2018 May	44.6	Good	2.22	M	2-5	A	*Staurastrum*	2.42
2018 Jun	68.8	Poor	1.38	M	2-4	A	*Aulacoseira*	63.2
2018 Jul	80.1	Very Poor	0.35	H	11-16	M-P	*Microspora*	90.1
2018 Aug (fish kill)	75.4	Very Poor	0.023	H	6-13	A-M	*Aulacoseira*	99.7
2018 Aug	65.1	Poor	0.27	H	4-7	A	*Microspora*	97.4
2018 Sep	96.0	Very Poor	1.05	M	5-8	A	*Microspora*	69.3
2018 Oct	86.1	Very Poor	0.28	H	6-11	A-M	*Microspora*	95.5
2018 Nov	115.2	Unsuitable	0.47	H	9-16	A-P	*Microspora*	90.8
2018 Dec	107.2	Unsuitable	0.12	H	2-7	A	*Microspora*	98.3
2019 Jan	61.9	Poor	0.45	H	7	A	*Microspora*	91.7
2019 Feb	74.9	Poor	0.48	H	5-13	A-M	Microspora	90.4
2019 Mar	80.9	Very Poor	1.45	M	8	A	*Tetraspora*	56.6
2019 Apr	113.3	Unsuitable	1.56	M	3-8	A	*Tetraspora*	51.4
Average	**79.8**	**Very Poor**						

For Shannon Diversity Index, the study adopted the diversity cale (in relation to water quality) developed by Wilhmn and Dorris (1968) such that, H>3=clean water, H=1-3=Moderate pollution and H<1=Heavy pollution ; Following numerical values for pollution classification of Palmer (1969), 0-10 = Absence or Lack of organic pollution, 10-15= Moderate pollution, 15-20= Probable high organic pollution, 20 or more = Confirms high organic pollution.

Conclusions

1. The occurrence of fish kill in Lake Buhi is indeed an indication that the lake's ecosystems health and water quality have been degraded
2. The phytoplankton composition is mainly influenced by natural (typhoon, flooding, landslide) and anthropogenic (nutrient inputs, urbanization) activities.
3. Phytoplankton are considered suitable indicators of the long-term health of the lake ecosystem and can be used in assessing its status.

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References

120 references mostly journal articles, book chapters and technical reports were used in the introductory background, review of related literature, discussion of results, implications and limitations. These references can be found in the full paper submitted for conference proceedings.