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## Preliminary Study on Chlorophyll-*a* Concentrations and Phytoplankton Diversity in Huai Jorakhemak Reservoir, Buriram Province, Thailand

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**Abstract** The objectives of this study were to investigate the biomass as chlorophyll-*a* concentrations and phytoplankton diversity In Huai Jorakhemak Reservoir, Buriram Province, Thailand. Samples were collected from 6 stations at 5 dates between August to October 2018. The results showed that chlorophyll-*a* concentrations were ranging between 2.757-3.430  $\mu\text{g L}^{-1}$ . The highest chlorophyll-*a* concentrations in September 2018 had a mean value of  $3.43 \pm 0.67 \mu\text{g L}^{-1}$ . The phytoplankton comprised of 27 species. Highest species diversity was provided by the Division Chlorophyta with 18 species. Dominant taxa belonged to the genera *Botryococcus* sp. and *Sirogonium* sp. Our study also showed that the water quality in Huai Jorakhemak Reservoirs, Buriram Province, Thailand was oligotrophic status.

**Keywords:** Chlorophyll-*a*, Phytoplankton, Species diversity, Reservoir

### Introduction

Chlorophyll-*a* is the most common photosynthetic pigment found in all plants, algae, and cyanobacteria. It converts sunlight and carbon dioxide into organic compounds like carbohydrates while generating byproducts such as oxygen. Chlorophyll-*a* is often used as a means to measure the productivity of plants and algae in a water resource (Kansas Department of Health and Environment, 2011). The concentrations of chlorophyll-*a* provides a good assessment of the primary production in a water resource. The direct causes of algal blooms are often associated with increased total phosphorous (TP) and or total nitrogen (TN) levels in a water resource. TP and TN are referred as the causal or contributing variables of nutrient enrichment. In Thailand, small reservoirs often algal blooms are often caused by abundant nutrients, such as nitrogen and phosphorous. Ariyadej *et al.* (2008) reported that factors affecting the variation of phytoplankton biomass in the Banglang Reservoir (South of Thailand) were ammonia, alkalinity and turbidity. In Srinadharin Reservoir, Kanchanaburi Province (West of Thailand) Chlorophyll-*a* concentrations were positively correlated with total nitrogen, organic nitrogen, inorganic nitrogen, total phosphorus, ammonia nitrogen, water temperature and dissolved oxygen. It was negatively correlated with transparency, electrical conductivity and alkalinity (Lerdburoos *et al.* 2010). Huai Jorakhemak reservoir is a small reservoir of Buriram province (Northeast of Thailand). This reservoir is an important domestic waterway in the municipality and it provides a precious wetland in northeastern Thailand. This research provides firstly an account of algal productivity in terms of chlorophyll-*a*. The purpose of this study was to investigate the phytoplankton diversity and chlorophyll-*a* concentrations for the evaluation of water quality.

### Materials and Methods

The study site is Huai Jorakhemak reservoir (Figure 1) which is a relatively small reservoir in Buriram province, northeastern Thailand. This reservoir also provides a wetland, located at 14°53' 52" N and 103° 02' 10" E. The water storage area is 113.64 km<sup>2</sup> and average water depth is 7 meters. We were randomly collecting samples from 6 stations around the reservoir at 5 times between August to October 2018.

The phytoplankton sample was collected from the site and preserved in 4% formaldehyde for analysis in the laboratory according to Peerapornpisal (2013).

Water samples (1 L) were collected at the surface for further chlorophyll-*a* analysis. The chlorophyll-*a* concentrations were measured after extraction with 90% acetone, using a spectrophotometric method according to the APHA, AWWA, and WPCF (1992).

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Figure 1. Sampling stations at Huai Jorakhemak reservoir in Thailand.

## Results

The phytoplankton comprised of 27 species belonging to the following divisions: Chlorophyta (18), Cyanophyta (3), Bacillariophyta (4), Euglenophyta (1) and Pyrrhophyta (1) (Table 1). The highest species diversity was provided by the Division Chlorophyta with 18 species. Dominant taxa belonged to the genera *Botryococcus* sp. and *Sirogonium* sp.

Table 1. List of identified phytoplankton species in Huai Jorakhemak reservoir between August to October 2018.

Taxa	Stations						Indicator*
	1	2	3	4	5	6	
Division Chlorophyta							
<i>Ankistrodesmus bibraianus</i>	-	+	-	-	-	+	MS
<i>Botryococcus</i> sp.	+	+	+	+	+	+	OS
<i>Chlorella</i> sp.	+	-	+	-	+	-	MS
<i>Closterium parvulum</i>	+	+	-	-	-	-	MS
<i>Cosmarium</i> sp.	+	+	+	-	-	+	OS
<i>Didymocystis</i> sp.	-	+	+	+	+	+	N
<i>Eudorina elegans</i>	+	-	-	+	+	+	OS
<i>Gonatozygon acutatum</i>	+	+	-	-	-	-	OS
<i>Gonium</i> sp.	+	+	+	+	-	+	ES
<i>Microspora</i> sp.	+	+	-	+	-	+	ES
<i>Scenedesmus acumina</i>	-	-	+	+	-	-	MS
<i>Sirogonium</i> sp.	+	+	+	+	+	+	N
<i>Sphaeroszma vertebratum</i>	+	-	-	-	-	+	N
<i>Spirogyra</i> sp.	+	+	-	+	+	+	MS
<i>Spondylosium nitens</i>	-	-	-	-	-	+	OS
<i>Staurodesmus</i> sp.	+	+	-	-	+	+	OS
<i>Treubaria setigera</i>	+	-	+	+	+	-	MS
<i>Zygnema</i> sp.	+	-	+	+	+	+	N
Division Cyanophyta							
<i>Aphanotsece</i> sp.	+	-	+	-	+	-	N
<i>Microcystis aeruginosa</i>	-	+	+	-	-	-	ES
<i>Oscillatrum vizagapatensis</i>	-	-	-	+	-	+	ES
Division Bacillariophyta							
<i>Brachysira neorhillis</i>	-	+	-	-	+	-	N
<i>Cymbella tumida</i>	-	+	-	-	+	-	OS
<i>Frustulia vulgaris</i>	+	-	+	-	-	-	N
<i>Gyrosigma scalproides</i>	-	-	-	+	-	+	N
Division Euglenophyta							
<i>Phacus orbicularis</i>	-	+	-	-	-	-	ES
Division Pyrrhophyta							
<i>Ceratium furcoides</i>	+	+	+	+	+	+	OS

+ Found, - Not found, \* Peerapornpisal (2013), OS - Oligotrophic status, MS - Mesotrophic status, ES - Eutrophic status, N - Not usable as water quality indicator

The chlorophyll-*a* concentrations were ranging between 2.757-3.430  $\mu\text{g L}^{-1}$ . The highest chlorophyll-*a* concentrations in September 2018 had a mean value of  $3.43\pm 0.67 \mu\text{g L}^{-1}$  (Figure 2).

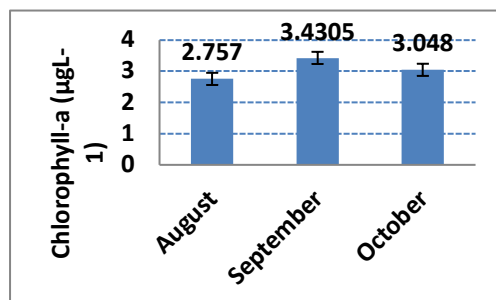


Figure 2. The chlorophyll-*a* concentrations in Huai Jorakhemak reservoir between August to October 2018.

### Discussion

Chlorophyll-*a* is a common measure of water quality and concentrations of algal abundance and productivity in aquatic environments. Higher concentrations typically indicate that poor water quality is maintained due to high nutrient concentrations (State Government of Victoria, 2019). One of the symptoms of degraded water quality condition is the increase of algal biomass as measured by the concentrations of chlorophyll-*a*. The water with high levels of nutrients from fertilizers, septic systems, sewage treatment plants and urban runoff may have high concentrations of chlorophyll-*a* and excess amounts of algae (United States Environmental Protection Agency, 2019). In this study we found a relatively high algal biodiversity with 27 species of phytoplankton, indicating that the reservoir has an oligotrophic status (OS). Concentrations of phytoplankton biomass, provided as chlorophyll-*a*, ranged from 2.75 to 3.43  $\mu\text{g L}^{-1}$ . A number of factors commonly affect the variations of phytoplankton biodiversity and abundance or biomass. Lerdburoos *et al.* (2010) reported that Srinadharin reservoir was oligotrophic, containing an average of 4.099  $\text{mg/m}^3$  of chlorophyll-*a* and its water quality was appropriate for the support of aquatic animal life. Ariyadej *et al.* (2008) informed that phytoplankton biomass provided as chlorophyll-*a* in Banglang Reservoir ranged from 0 to 12.57  $\text{mg/m}^3$ , averages ranged from 1.4 to 6.6  $\text{mg/m}^3$ . In conclusion, the Huai Jorakhaemak reservoir, Buriram Province, Thailand is of oligotrophic status and water quality is suitable for most aquatic animals such as fish.

### Acknowledgements

The authors would like to thank the Program of Fisheries Faculty of Agricultural Technology, Buriram Rajabhat University for the financial and facility support of this research.

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