

**THE OBSERVATION OF PHYSICOCHEMICAL WATER QUALITY
PARAMETERS AT TAMAN TUAN FUAD STEPHEN LAKE**

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UNIVERSITI MALAYSIA SABAH

**THIS DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR THE BACHELOR OF SCIENCE WITH HONORS**

**AQUACULTURE PROGRAMME
SCHOOL OF SCIENCE AND TECHNOLOGY
UNIVERSITI MALAYSIA SABAH**

MARCH 2007



UMS
UNIVERSITI MALAYSIA SABAH

BORANG PENGESAHAN STATUS TESIS@

JUDUL: THE OBSERVATION OF PHYSICOCHEMICAL WATER
QUALITY PARAMETERS AT TAMAN TUN FUAD STEPHAN LAKE

Ijazah: Ijazah Sarjana Muda Sains dengan Kejurian (Akuakultur)

SESI PENGAJIAN: 2004/2007

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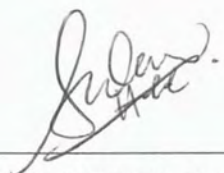
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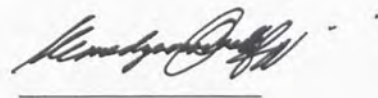
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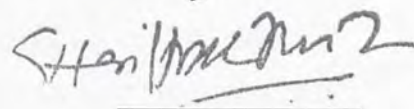
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APPRECIATION

Firsly, I would like to take this opportunity to thanks God for His blessing in me throughout whole year in this project. I would also like to express my thanks and high appreciation to School of Science and Technology (SST) and Borneo Marine Research Institute (BMRI) , Universiti Malaysia Sabah on all the facilities and help provided in assisting me to finish my final year project.

Special thanks were given to my supervisor, Dr. Sujjat Al-Azad and my co-supervisor, Dr. Sitti Raehanah Muhd. Shaleh for all their advice, guide and courage given to me. Also, not forget to all others aquaculture lecturers no matter directly or indirectly supporting me all the time.

My sincere appreciations also give to En. Asri, for their guide and assist in lab. Without his help, I might not able to finish the project on time.

Not forget to Mr. Lingkan Linggi, as the park maintenance supervisor for his guide and care during my visit to Taman Tuan Fuad Stephen, Kota Kinabalu. His precious information about Taman Tuan Fuad help me a lot in finishing this report, and take care of me all the time in the search of suitable fields for my project at Taman Tuan Fuad Stephen.

My high appreciation was also gave to Mr. Ho Teck Yung for his guide and teach in statistic analysis. His help and guide have taught me a lot of new thing and make me realize how important statistic is.

Finally, I want to thanks my friends and family for their support and courage during my hard time in this project, especially my both parents on their financial and moral support. Special thanks also to Chung Yuh Fei, Tan Chit Dah, Liew Sit Fun and Stanley Wong Vun Yee for the help they given all the time. Thank you very much.

ABSTRAK

Kajian ke atas parameter fiziko-kimia seperti suhu, pH, kandungan oksigen terlarut (DO) dan nutrien (kandungan nitrogen keseluruhan, nitrat, nitrit, ammonia dan kandungan fosforus keseluruhan) telah dijalankan di tasik Taman Tun Fuad Stephen, Kota Kinabalu dari tempoh masa Januari 2007 hingga Februari 2007. Sampel diambil dan dikumpul dari tasik secara mingguan. Dalam kajian ini, parameter *in-situ* seperti pH, suhu dan oksigen terlarut direkodkan semasa berada di tapak kajian manakala analisis nutrien dilakukan di dalam makmal. Keputusan dari analisis ANOVA-satu-hala (One-Way ANOVA) menunjukkan bahawa tiadanya perbezaan yang bermakna bagi setiap parameter *in-situ* (pH, suhu dan oksigen terlarut) di keenam-enam stesen kajian ($p > 0.05$). Min keseluruhan bagi suhu adalah 27.58 ± 1.39 °C, pH pula adalah 6.48 ± 0.183 , manakala oksigen terlarut adalah 4.00 ± 0.626 mg/L. Bagi analisis *ex-situ* pula, keputusan menunjukkan bahawa terdapatnya perbezaan bermakna bagi setiap parameter pada stesen yang tertentu ($p < 0.05$). Min keseluruhan bagi setiap parameter yang telah diperolehi sepanjang kajian ini adalah; Ammonia 0.802 ± 0.883 mg/L, nitrite dan nitrate 1.422 ± 0.764 mg/L, nitrogen keseluruhan 4.261 ± 0.884 mg/L dan fosforus keseluruhan 0.5863 ± 0.200 mg/L. Daripada kajian yang telah dilakukan, adalah didapati bahawa kandungan nutrient dalam tasik Taman Tun Fuad Stephen adalah sesuai untuk aktiviti akuakultur, namun nilai pH dan DO yang dimiliki adalah dibawah kesesuaian bagi sesetengah aktiviti akuakultur.

ABSTRACT

Study on physicochemical parameters such as temperature, pH, dissolve oxygen and nutrient (total nitrogen, nitrate, nitrite, ammonia and total phosphorus) was conducted in the lake in Taman Tun Fuad Stephen within January 2007 to February 2007. Samples were collected from the lake on a weekly basis. During the analysis, the *in-situ* parameter had been recorded which include pH, temperature and Dissolved Oxygen (DO) while the nutrient analyze had done in lab. The result of One-Way ANOVA showed that there were no significant different among the in-situ parameter at each station ($P > 0.05$). Total mean of the temperature was 27.58 ± 1.39 °C, pH was 6.48 ± 0.183 , and dissolve oxygen (DO) was 4.00 ± 0.626 mg/L. While for *ex-situ* analysis, it had showed significant different at some station ($P < 0.05$). Total mean of ammonia was 0.802 ± 0.883 mg/L, while total mean concentration of nitrite and nitrate were 1.422 ± 0.764 mg/L, the total nitrogen was 4.261 ± 0.884 mg/L and finally the mean of total phosphorus concentration 0.5863 ± 0.200 mg/L were recorded during the study period. However, nutrient in this lake is suitable for aquaculture activity but pH and DO shows that the lake is under pressure of certain activities.



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LIST OF SYMBOLS

%	percentage
=	equal
x	multiply
/	per



UNITS

°C	Degree Celsius
μg	Microgram
cm	Centimeter
g	Gram
L	Liter
M	Molar
mg	Milligram
ml	Milliliter
mm	Millimeter
nm	Nanometer



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CHAPTER 1

INTRODUCTION

A nutrient is either a chemical element or compound used in an organism's metabolism or physiology. Nutrients such as nitrogen, phosphorus are material for the phytoplanktonic growth.

1.1 Nitrogen

Nitrogen (N) is the most important nutrients limiting plant growth in terrestrial and aquatic ecosystems. While moderate to high levels of available nitrogen in soil are desirable for crop and pasture production, high levels of soluble N in aquatic ecosystems often lead to excessive growth of algae and other plants, which can reduce oxygen levels and kill fish as plants die and decompose.



The process by which bodies of water gradually increase in plant life due to excess nutrient loading is called eutrophication.

Nitrate is found in nature in very small amounts because of the ongoing growth and decay process. When plants and animals die and decompose, ammonia is produced. Bacteria usually turn the ammonia into nitrate. Pollutants such as sewage or manure however, contain much higher levels of nitrates. High levels of nitrate may get into groundwater or streams from fertilized fields, lawns, golf courses, from septic system effluent, or from runoff of manure. Nitrate is a nutrient that helps plants to grow. An excess of nitrates in the water can result in a rapid growth of algae and other plants. A massive growth of aquatic plant life can change the water significantly. Water becomes murky, and the water temperature warms. When the plant life dies and starts to decompose, bacteria use up all the oxygen. The oxygen level gets so low that many types of fish and insects can no longer survive in the lake. Excess nitrates can start a chain reaction that has very serious effects. Nitrates are a form of nitrogen, which is found in several different forms in terrestrial and aquatic ecosystems. While ammonia is the principle nitrogenous waste product excreted by crustaceans and most fishes. Ammonia concentration which higher than 7mg/L may due to stress and die of the fishes (Parker,2002)



1.2 Phosphorous

Phosphorous is usually found in water in the form of phosphates (PO_4^{3-}). It gets by means of rain and the water cycle. Once the phosphorous on/in the ground is caught in the runoff, it will travel to a pond or lake. When there is an increase in phosphates in the water, it can cause an overgrowth of aquatic algae, who feed on phosphates. This buildup is called eutrophication, which can be detected by a "rotten egg" smell. This buildup is also apparent with turbidity. The buildup can choke other plants to death, and completely take over the ecosystem. Also, the buildup is an ideal environment for aerobic bacteria, and they flock to the area. They then consume all the oxygen in the area, causing almost all aquatic animal life to perish due to asphyxiation. This relates to ammonia because after the fish die, they release ammonia into the surrounding ecosystem, which, in high concentration, can be deadly. This almost entirely eliminates the possibility of life returning to the general area.

1.3 The Important Of Experiment

This experiment had been set to absorb the parameter of nutrient and to identify the changing factor of the parameter of nutrient at the lake of Taman Tun Fuad Stephen.

Besides that, the result of this experiment can be used as addition information for UMS as a reference for future study.

1.4 Objective

1. To determine the concentration of nutrient (nitrates, nitrites, ammonia, total nitrogen and total phosphorus) in the lake of Taman Tun Fuad Stephen.
2. To compare parameters of *in-situ* at the lake of Taman Tun Fuad Stephen.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Any classification of "nutrients" is likely to be arbitrary given the status of nutrition as a developing science. Researchers are becoming more aware of a wider range of nutrients essential for health. Organism can metabolise organic compounds to use for their energy content, for structural purposes (growth or replacement of living structures), or for participation in chemical reactions necessary for life. The discovery of the group of nutrients called phytonutrients reinforces the provisional nature of our knowledge (Almazan and Boyd, 1978). We know little about phytonutrients - organic compounds from plants - which play an essential role in the normal functioning of a body and have complex hormonal effects on health or play an active role in the amelioration of disease.

In this context, certain mineral compounds can have an adverse impact on water quality because of their ability to promote excessive plant and algae growth. This process is called eutrophication. An excessive growth of aquatic plants can clog waterways (see giant salvinia for example), and over-stimulation of algae and microbes can lead to an algal bloom and oxygen depletion.

2.2 Type of Nutrients

2.2.1 Nitrate, nitrite, nitrogen and ammonia

These forms of nitrogen include ammonia (NH_3), nitrates (NO_3), and nitrites (NO_2). Together with phosphorus, nitrates in excess amounts can accelerate eutrophication, causing dramatic increases in aquatic plant growth and changes in the types of plants and animals that live in the stream. This, in turn, affects dissolved oxygen, temperature, and other indicators. Excess nitrates can cause hypoxia (low levels of dissolved oxygen) and can become toxic to warm-blooded animals at higher concentrations (10 mg/L) or higher under certain conditions. The natural level of ammonia or nitrate in surface water is typically low (less than 1 mg/L); in the effluent of wastewater treatment plants, it can range up to 30 mg/L. Ammonia concentration which higher then 7mg/L may due to stress and die of the fishes (Parker,2002)



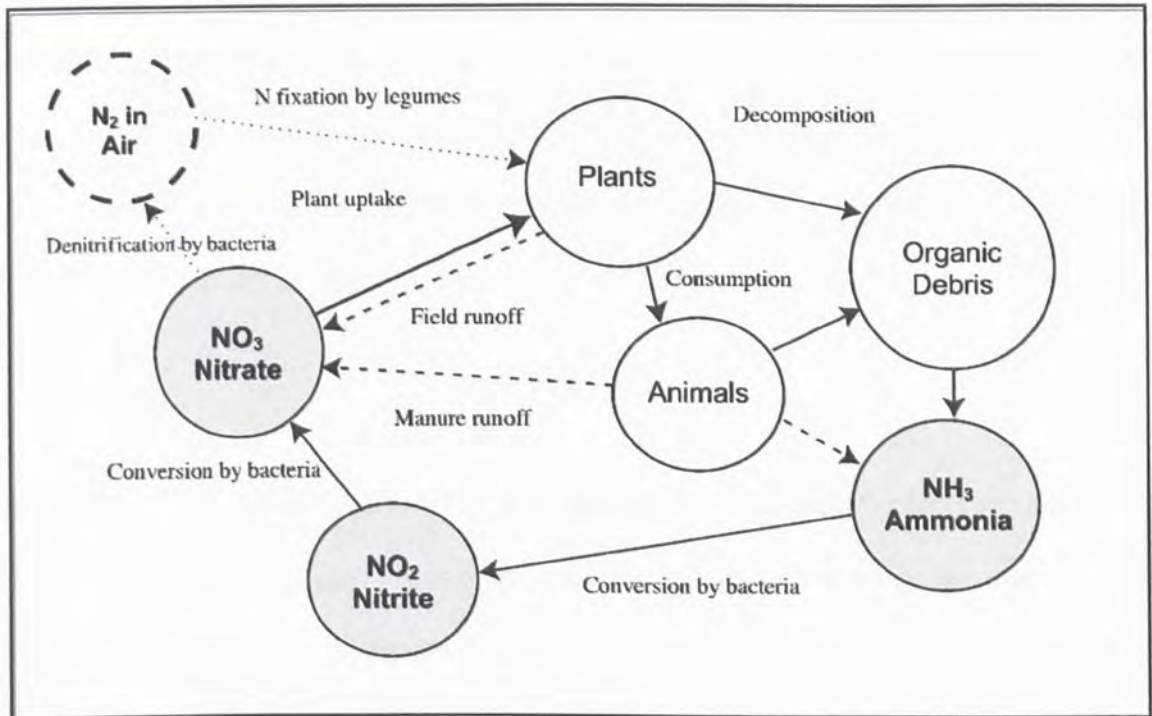


Figure 2.1 Nitrogen cycle in water

2.2.2 Phosphorous

Phosphates are a plant nutrient that can also be a pollutant. Phosphates in water contribute to the growth of algae, similar to nitrates. Adding phosphates to a body of water can accelerate plant growth and eventually damage an ecosystem by draining the oxygen levels when the plants decompose.

Phosphorous is usually present in natural waters as phosphate ($\text{PO}_4\text{-P}$). Phosphate has two different forms in our environment: organic phosphate, which is a part of living plants and animals, their by-products and their remains; and inorganic phosphate, which can be bound to soil particles or present in laundry detergents. Phosphorous is the factor to limiting the growth of phytoplankton in the water. (Caraco,1995)

Phosphorous is an essential element for life, an important nutrient for plants to grow. The number of aquatic plants growing in a particular area is dependent on the amount of phosphorous available. In an aquatic ecosystem, inorganic phosphate is rapidly taken up by algae and larger plants, resulting in algal blooms, increased biochemical oxygen demand and significant impacts on water quality.

Phosphorous from natural resources, such as forest fires and fallout from volcanic eruptions, is insignificant when compared to human-caused enrichments of water from nutrients such as phosphorous. Phosphorous is introduced into the environment from human activities such as: human and animal wastes, fertilizers, industrial wastes and human disturbance of the land and its vegetation. Because phosphorous acts as a plant nutrient, it also causes eutrophication. Eutrophication is the enrichment of water with nutrients, usually



phosphorous and nitrogen, which stimulates the growth of algal blooms and rooted aquatic vegetation. Eutrophication promotes more plant growth and decay, which in turn increases biochemical oxygen demand. Phosphates in excess amounts can have a significant impact on water quality.

2.3 Parameter *in situ*

Parameter *in situ* are the parameters which include temperature, pH and dissolve oxygen (DO). This kind of measurement may do instantly during the sample been collected.

2.3.1 Temperature

Temperature is one of the physical parameter which related to water (Rows and Isam , 1995) The rates of biological and chemical processes depend on temperature. Temperature affects the oxygen content of water (oxygen levels become lower as temperature increases); the rate of photosynthesis by aquatic plants; the metabolic rates of aquatic organisms; and the sensitivity of organisms to toxic wastes, parasites, and diseases.

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