

Phosphorus in Batang Ai Hydroelectric Dam Reservoir, Sarawak, Malaysia

¹T.Y. Ling, ¹T.Z.E. Lee and ²L. Nyanti

¹Department of Chemistry, Faculty of Resource Science and Technology,
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

²Department of Aquatic Science, Faculty of Resource Science and Technology,
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

Abstract: Phosphorus is the nutrient that is responsible for eutrophication in reservoirs and lakes. Batang Ai Hydroelectric Dam Reservoir has been used for aquaculture for 20 years. However, little information is available on phosphorus concentration in the reservoir. Therefore, in this study, different forms of phosphorus were determined at six stations. Results shows that concentrations of total phosphorus depends on the season whereby rainy season and high water level showed lower concentrations (24.90-38.59 µg/L) than dry season and low water level (45.94-67.28 µg/L). In addition, during dry season, near the aquaculture station in the reservoir, higher total phosphorus (67.3 µg/L) but lower dissolved total phosphorus (23.90 µg/L) and higher organic fraction (25.55 µg/L) and lower dissolved organic fractions (9.74 µg/L) were observed. The second highest total phosphorus was located upstream in Batang Ai during wet season and it was high in organic form attributable to grey and black water and domestic animal waste. Outflow total phosphorus showed higher concentration during dry than wet season and it was much higher in dissolved organic form than dissolved reactive form. During dry season, outflow total organic phosphorus was twice the inflow but during wet season, the opposite was observed.

Key words: Cage culture • Hydroelectric dam • Reservoir water quality • Inland aquaculture

INTRODUCTION

Phosphorus is the nutrient that is limiting in lakes and reservoirs. However, anthropogenic input has resulted in an increase in its concentration and thus it has been responsible for eutrophication in lakes and reservoirs in different parts of the world which leads to fish kills. Anthropogenic inputs include human waste, uneaten feed and waste from aquaculture and excess fertilizers used in agricultural land. Aquaculture provides the necessary protein food source for the rural and urban populations as natural catch cannot meet the increasing demand of fish products. In Indonesia, unsustainable development of fish cage aquaculture, specifically, overcrowding and water column overturns resulted in numerous large fish kills in Saguling Reservoir [1]. In Cirata Reservoir in Indonesia where intensive aquaculture took place, it was

reported that the concentrations of phosphate and ammonia were quite high in the anoxic hypolimnion [2]. In Changshou Reservoir in China, it has been reported that water source from upstream was heavily polluted by industrial and domestic wastes with runoff and aquaculture as other inputs [3]. In comparing the risk to river eutrophication from sewage-effluent phosphorus and agricultural phosphorus in UK, different forms of phosphorus were investigated and it was found that phosphorus were predominantly soluble reactive phosphorus which is indicative of point, rather than diffuse, sources [4]. In characterization of phosphorus sources in rural watersheds in UK it was suggested that sources associated with the functioning of rural communities (impervious surfaces, detergents and wastewater) might be more ecologically relevant than those associated with land based agriculture [5].

Corresponding Author: Teck-Yee Ling, Faculty of Resource Science and Technology,
Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia.
Tel.: +60 82-583040.