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CYANOBACTERIAL COMPOSITION AND SELECTED WATER QUALITY PARAMETERS FROM TWO DIFFERENT TYPES OF *Tor tambroides* REARING PONDS

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ABSTRACT

The composition of cyanobacteria in two *Tor tambroides* rearing ponds, namely HDPE pond and earthen pond located in Sedan, Sarawak were presented in relation with water quality parameters. Twenty species belonging to 11 genera of cyanobacteria were recorded from both ponds. Five genera of the cyanobacteria namely *Synechocystis, Oscillatoria, Chroococcus, Nostoc* and *Pleurocapsa* were common in both ponds. The presence of cyanobacteria genera *Microcystis, Anabaena* and *Oscillatoria* entails the potential risk of cyanotoxin bioaccumulation and biomagnification in food chain. Several cyanobacteria genera that could be used as bio-indicator were also identified namely *Microcystis* and *Oscillatoria*. The cell density of cyanobacteria showed strong positive correlation with pH in HDPE pond and strong positive correlation with turbidity in earthen pond. This indicated that, orthophosphate and nitrate are not the only factors that influence cyanobacteria composition in aquaculture ponds but also environmental factors such as turbidity, light, other phytoplankton groups and nutrients such as ammonia-nitrogen. High cyanobacteria densities with higher number of species identified in the earthen pond compared to the HDPE pond showed that an earthen pond can be considered an optimal habitat for cyanobacteria.

Keywords: cyanobacteria, earthen, HDPE, nutrients. *Tor tambroides*

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INTRODUCTION

Cyanobacteria are considered important in freshwater aquaculture because they often represent a large fraction of a total algal biomass (Boyd & Tucker, 1998). However, the presence of bloom-forming species will also give significant impact because they are generally undesirable components of the plankton community (Boyd & Tucker, 1998).

Bloom-forming cyanobacteria are not a desired source of primary production for food chains in most aquaculture systems due to the poor oxygenation of water characteristics. Besides that, they can form obnoxious surface scum. Certain species may produce odorous metabolites that confer undesirable flavours on the cultured animal (Robin *et al.*, 2006), produce compounds that are toxic to fish (Boyd & Tucker, 1998) and will also have effects on the higher trophic levels (Magalhaes *et al.*, 2003).

According to Gibson & Smith (1982), cyanobacteria are widely distributed and represent at least 22 genera, including over 90 species. Relatively, few studies of aquaculture pond cyanobacteria and other phytoplankton assemblages have been conducted, but it appears that the cyanobacteria in aquaculture ponds have similar diversity rates with the other habitats (Boyd & Tucker, 1998).

Many scientific reports (Chorus & Bartram, 1999; Wetzel, 2001) have shown the proliferation of cyanobacteria in water bodies as bloom is associated with enrichment nutrients such as nitrate, ammonium and phosphate. High concentration of these nutrients that are degradation products from organic waste and uneaten food during fish cultivation may promote the rapid growth of cyanobacteria (Kankaanpaa *et al.*, 2004).

Toxic cyanobacteria found throughout the world have potential to cause harm to animal and human health (Prommana *et al.*, 2006). The most frequently reported toxin-producing cyanobacteria genus is *Microcystis* (Botes *et al.*, 1982) which are capable of producing microcystins – cyclic peptide hepatotoxins and tumour promoters.

Tor tambroides (also known locally as *empurau*) are valuable fish which has significant cultural and economic importance in Sarawak, Malaysia. This species is distributed throughout Southeast Asia from Indonesia to southern China (Roberts, 1999). In order to increase

the production potential of this species, the Government has established an Indigenous Fisheries Research and Production Centre (IFRPC) in Tarat, Serian, Sarawak in order to conduct research related with the artificial propagation of *Tor*.

The purpose of this study is to establish a baseline database of the freshwater cyanobacteria species found in *Tor tambroides* rearing ponds with the aim of enhancing risk assessment of potential cyanotoxin contamination of water and bioaccumulation in fishes. The potential cyanobacteria species or genera that could be used as bio-indicator were also identified.

MATERIALS AND METHODS

Sampling Sites

The field site consists of two *Tor tambroides* rearing ponds at IFRPC Tarat, Serian district in Sarawak (Fig. 1). The two ponds were chosen according to their substrate types. Pond AP22 is an earthen pond layered with black HDPE (High Density Polyethylene) which has been stocked with 120 individuals of F1 *empurau* fries. P12 is an earthen pond stocked with 70 individuals of F1 *empurau* juveniles. The mean depth of both ponds was approximately 0.4 m. The surface areas of Pond AP22 and P12 are 495 m^2 (33 × 15 m) and 648 m^2 (36 × 18 m) respectively. Sampling was conducted from February 2007 to January 2008. AP22 is referred to as HDPE pond and Pond P12 will be referred to as an earthen pond.

Cyanobacteria Sampling and Water Quality Parameters Collection

Cyanobacteria samples from the waters subsurface were collected using 2/ Van Dorn Bottle and sieved through 20 µm net. Specimens retained in the sieves were kept in separate plastic bottles, preserved with Lugol's solution and transported back to laboratory for species identification and enumeration. During sampling, selected ambient physico-chemical parameters namely temperature, pH, dissolved oxygen (DO) and turbidity were measured *in situ* using Horiba's Multiprobe W-22XD Series. The values were recorded in triplicates. Subsurface water samples were also taken for chlorophyll *a* determination, suspended solid (SS) and nutrients for spectrophotometric analysis.

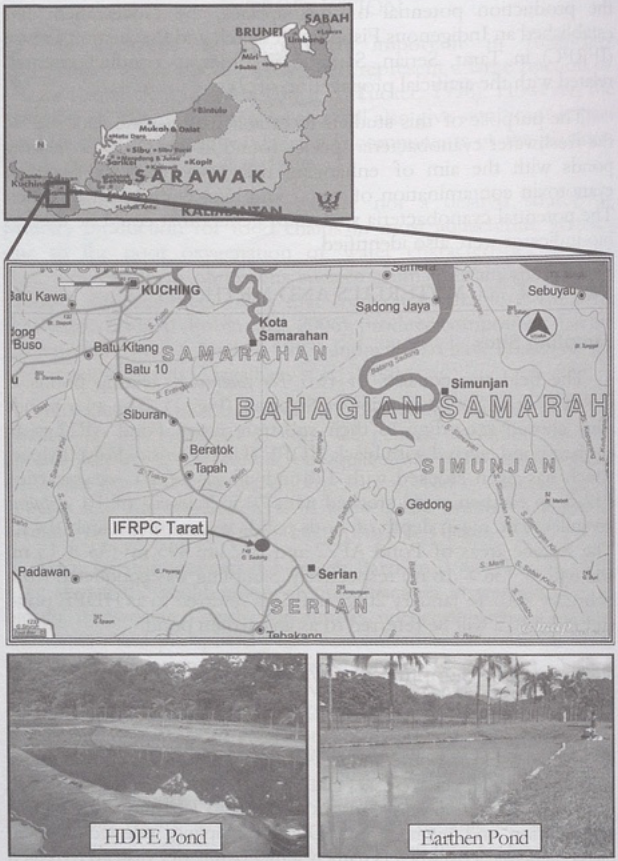

Fig. 1: Map showing the sampling location at IFRPC Tarat and the HDPE and earthen ponds.