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ZOOPLANKTON COMPOSITION, ABUNDANCE AND DIVERSITY IN DIFFERENT BIOTOPES ASSOCIATED WITH AROWANA AQUACULTURE

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This project report is submitted in partial fulfillment of the requirements for the degree of Bachelor of Agriculture (Aquaculture)

DEPARTMENT OF AQUACULTURE
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CERTIFICATION OF APPROVAL

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This is to certify that I have examined the final project report and all corrections have been made as recommended by the panel of examiners. This report complies with the recommended format stipulated in the AKU4999 project guidelines, Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia.

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ABSTRACT

This study is an effort to determine composition, abundance and diversity of zooplankton in three different biota (lake, canal and Arowana aquaculture pond) for 6 months period from March 2013 until August 2013. This study was conducted at Bukit Merah Lake, Perak (longitude of 5°2'00'' and latitude 100°40'00''). Physical-chemical parameters were recorded *in situ* using YSI multiparameter probe (Model 57). Water samples for nutrient analysis (NO_3-N, NO_2-N and PO_4-P) were collected using Van Dorn horizontal water sampler. Zooplankton samples were collected using standard zooplankton plankton net (35µm mesh size). Physical-chemical parameter and nutrient data were analyzed using SURFER 10 Golden Software. Zooplankton diversity index and species evenness were analyzed using PRIMER software package (version 6.1.9, PRIMER-E Ltd.) and SPSS (Statistical Package for the Social Sciences. Version 16) was used to determine significant difference and correlation between each of these factors. Zooplankton group consists of Rotifera (9 families), Copepoda (Cyclopoid and Calanoid) and Cladocera (2 families) were found in the study area. The zooplankton community was dominated by Rotifera that was smaller size compared to Copepoda and Cladocera. This could be due to the predation by fish that prefer larger size of zooplankton. Rotifera was significantly correlated with water temperature ($p<0.01$) and some indicator species (*Branchionus* spp., *Keratella* spp. and *Trichocerca* spp.) were present in low density. The diversity index and species evenness was highest in the canal. In conclusion, density of zooplankton was higher at lake and pond compared to the canal.

ABSTRAK

Kajian ini merupakan satu usaha untuk mengenalpasti komposisi, kehadiran dan kepelbagaian zooplankton di tiga biota yang berbeza (tasik, terusan and kolam ternakan Arowana) selama tempoh 6 bulan daripada Mac 2013 hingga Ogos 2013. Kajian ini telah dijalankan di Tasik Bukit Merah, Perak (longitud 5°2'00'' dan latitud 100°40'00''). Parameter fizikal-kimia diukur secara *in situ* menggunakan alat YSI multiparameter (Model 57). Sampel air untuk analisis (NO_3-N, NO_2-N and PO_4-P) diambil menggunakan 'Van Dorn horizontal water sampler'. Sampel zooplankton diambil menggunakan standard 'plankton net' (saiz mesh 35µm). Parameter fizikal-kimia dan data nutrien dianalisis menggunakan SURFER 10 Golden Software. Index kepelbagaian dan keserataan spesies dianalisis menggunakan PRIMER software package (version 6.1.9, PRIMER-E Ltd.) dan SPSS (Statistical Package for the Social Sciences. Version 16) juga digunakan untuk mengenalpasti perbezaan yang signifikan dan korelasi di antara setiap faktor yang ada. Kumpulan zooplankton terdiri daripada Rotifera (9 famili), Kopepoda (Cyclopoid and Calanoid) dan Kladosera (2 famili) telah dijumpai di tempat kajian. Komuniti zooplankton didominasi oleh Rotifera iaitu zooplankton yang bersaiz kecil berbanding Kopepoda dan Kladosera. Ini berkemungkinan disebabkan pemangsaan oleh ikan yang lebih memilih zooplankton yang bersaiz besar. Rotifera menunjukkan korelasi yang signifikan dengan suhu air ($p<0.01$) dan beberapa spesies indicator (*Branchionus* spp., *Keratella* spp. dan *Trichocerca* spp.) yang terdapat di kawasan kajian mempunyai kepadatan yang rendah. Indeks diversiti dan keserataan spesies adalah paling tinggi di terusan. Kesimpulannya, kepadatan zooplankton adalah lebih tinggi di tasik dan kolam berbanding terusan.

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LIST OF ABBREVIATIONS AND SYMBOLS

TEMP	Temperature
DO	Dissolved oxygen
COND	Conductivity
NO_3-N	Nitrate-N
NO_2-N	Nitrite-N
PO_4-P	Phosphate-P
UPW	Ultrapure water

CHAPTER 1

INTRODUCTION

Freshwater zooplanktons are mostly small (less than 1 mm long), but they play major roles in energy flow, linking various micro-organisms and the higher heterotrophs in aquatic food web (Shayestehfar *et al*., 2010). Zooplanktons also significantly contribute to the productivity in freshwater ecosystems (Sharma and Sharma, 2011). Other than that, they form a key component of the ecology of water bodies and their distributions are controlled by biotic and abiotic parameters (Echaniz *et al*., 2012).

Zooplanktons are good indicator of environmental conditions and aquatic health in a pond because they are sensitive to changes in water quality such as low dissolved oxygen, high nutrient levels, toxic contaminants and poor food quality. In addition, zooplankton association, abundance, richness and diversity can be used as indicator for water pollution in pisciculture management practice (Koli and Muley, 2012). According to Rahman and Hussain (2008), densities of zooplanktons are higher in culture ponds rather than non-culture ponds because of the effect by fertilizer and subsequent water quality changes in the ponds. Thus, it is very important to know how to enhance the plankton diversity, quantity and quality in the fish pond. This is because planktons are the primary trophic level of the pyramid in the pond and also a source of food for plankton-eating fish (Kutty, 1987).

Culturists often used fertilization to increase food base (phytoplankton) for zooplankton consumption because the increase of phytoplankton population may increase the zooplankton population. However, over-fertilization may also lead to other problems such as lower water quality, higher pH and lower morning dissolved oxygen compared to unfertilized ponds. This is because high phytoplankton population alone does not necessarily translate into higher zooplankton as they also feed on fungi and bacteria (Morris and Mischke, 1999). Zooplanktons are good food source of cultured fish especially fry fingerlings and juveniles (Zhang *et al.*, 2010). Production of live natural food (such as copepods and *Artemia*) is very important as the natural larval food consists of highly diverse plankton that is consumed by fish during their different larval stages (James, 1984).

Thus, the aim of this study is to determine the composition, abundance and diversity of zooplankton in Arowana aquaculture farm and its water source from Bukit Merah Lake and its canal.

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