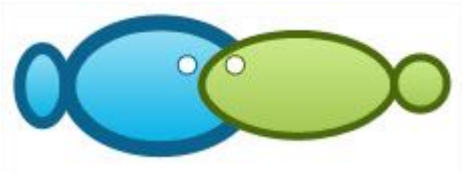

Seasonal variations in water quality of a tropical reservoir: considerations for cage aquaculture expansion

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Abstract. A study of water quality of the 30 year-old Batang Ai hydroelectric reservoir at different depths and locations was conducted to give a better understanding of the water quality status for aquaculture expansion. The study was conducted at four locations where two were identified as potential cage culture sites but nearby current operations. Temperature and dissolved oxygen (DO) profilings and 13 other parameters at 0.2, 10 and 20 meters depths were also studied. It was found that the difference in DO between seasons were significant. Pockets of high nutrients and hydrogen sulphide were observed at 10 and 20 m nearby the two cage culture sites in dry season. Additionally, regardless of season, those sites showed significantly higher 10 m and 20 m suspended solids. At one of the locations near cage culture, dry season total phosphorus and ammonia were the highest at all depths and chlorophyll-*a* was at eutrophic level at 10 m depth. All these are attributed to aquaculture waste, pre-marketing fish processing and the lack of mixing. Water Quality Index shows that the 0.2 m depth is suitable for sensitive aquatic organism. However, dry season 10 m water column of the two potential cage culture sites was polluted. Though the cages do not normally extend to 10 m deep, when overturn occurs, it could cause fish kills. Thus, in reservoir cage culture, elimination of reservoir pre-market processing is crucial and considerations have to be made on the proximity to the current operations and dry season water quality limitations.

Key Words: aquaculture, thermocline, nutrients, oxycline, sulphide, trophic state.

Introduction. Tropical reservoirs are suitable places for fish cage culture especially in developing countries where it can alleviate poverty through increased and low cost food production (Kaggwa et al 2011). Those created by hydroelectric dams have large surface area and volume of water and thus, are ideal locations for inland cage aquaculture as an alternative livelihood for the displaced people and an effective non-water-consumptive secondary use of the reservoir resources (De Silva & Phillips 2007). The 30 year-old Batang Ai Reservoir located in the rural area of Sarawak state on Borneo Island is without exception. It has been an important source of freshwater fish since wild fish from inland rivers is not able to meet the demand. The Batang Ai Reservoir, 85 km^2 in surface area, was created when the dam was built in 1984. With the support of the Sarawak Government, cage culture began in 1993 (Pusin 1995) with a production of 3 metric tons. From 1995 to 2010, the annual production fluctuated between 142 and 449 metric tons and the maximum reached 744 metric tons in 2011 with *Oreochromis* sp. being the dominant species cultured. During those 15 years, local owners' production totalled 1.7% and it contributed to the rural livelihood. Subsequently, the Sarawak Land Consolidation and Rehabilitation (SALCRA) was appointed by the State government as the lead agency to implement the Batang Ai Integrated Fish Cage Culture Project which is a large-scale, technology-focused, sustainable and integrated freshwater aquaculture project aiming to produce high value and quality fresh tilapia fish for both the local and international