

Research Article

Patterns of Fish Assemblage, Growth, and Diet Composition in a Tropical River between Two Cascading Hydropower Dams

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Construction of cascade dams has been shown to have impacts on fish assemblages and biodiversity. Yet, there is no literature on fish assemblages in the Murum River that connects the cascading Bakun and Murum dams in Sarawak, Malaysia. Hence, study on this modified ecosystem is necessitated to better understand the effects of the cascade dam construction on fish fauna. For this, fish samples were caught at five stations located along the river during both dry and wet seasons. Environmental parameters were taken concurrently with fish sampling. Length-weight relationship, condition factors, and diet composition of selected fish species in the river were also determined. The present study demonstrated that there are indications of the impact of cascading dams on the formation of a complex ecosystem in the Murum River, that is, changing from the shallow downstream of the Murum Dam to the deep transitional and inundated zone of the Bakun reservoir. The transitional zone in the Murum River exhibited the lowest fish species diversity, richness, and evenness during the dry season due to low pH and DO coupled with high turbidity. The biological indices improved when the water quality improved during the wet season. On the contrary, the diversity and evenness indices at the inundated tributary station decreased remarkably during the wet season, likely due to the migration of fish during the onset of the rainy season. This study showed that *Barbonymus schwanenfeldii* has a wider feeding habit which contributes to its higher distribution and abundance in the Murum River. The growth patterns of *B. schwanenfeldii*, *Cyclocheilichthys apogon*, *Hampala macrolepidota*, *Lobocheilos ovalis*, and *Osteochilus enneaporos* were better during wet than dry season. Overall, the condition factor of all native fish species in the Murum River was in poor to fair condition, whereas the exotic species, *Oreochromis mossambicus*, exhibited excellent condition (K value > 2) for both seasons. The increase in the number of *O. mossambicus* coupled with its high condition factor indicates biological intrusion and a potential threat to the native fish species in the Murum River. Continuous monitoring is essential to detect in-time risk issues associated with environmental degradation and biological invasion in this regulated and inundated river ecosystem.

1. Introduction

Physical structures such as dams and reservoirs were made to fulfil man's needs for the purposes of power generation, flood control, recreation, agriculture, and industry. Dam impoundment inevitably modifies the natural regime of its downstream rivers and has resulted in environmental degradation [1–3]. The fluctuations of flow and environmental

conditions could lead to alteration of aquatic biodiversity in the downstream river [4]. Nyanti [5] demonstrated that the downstream river of the tropical Batang Ai Dam is extremely shallow and slow flowing when the power generation is halted, and no water is discharged from the powerhouse, which has subsequently reduced the fish abundance in the river. In addition, seasonal changes in the hydrology of the downstream river could also lead to differences in fish assemblages [6].