

## THE INLAND FISHERIES WITH SPECIAL REFERENCE TO TEMENGOR AND BERSIA RESERVOIRS, PERAK

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### ABSTRACT

Temengor and Bersia reservoirs which were constructed mainly for the purpose of hydropower generation and flood mitigation have contributed towards the inland fisheries of Malaysia. However, the contribution towards the total fish landings from these reservoirs is poorly documented. Hence, a study on inland fisheries has been conducted in two consecutive reservoirs along Sungai Perak. A monthly study on fish diversity and distribution at these two reservoirs had been carried out for ten months between August 2009 and December 2010. A total of 20 species, which comprised of eight families, was recorded during this study. Cyprinidae was the most dominant family in terms of the number caught in Temengor and Bersia reservoirs with 94% and 78%, respectively while the other families were only represented by one or two species. Nineteen species were recorded in Temengor whereas 16 species were recorded in Bersia. Shannon-Wiener diversity and evenness indices were higher in Bersia Reservoir (2.030; 0.732) as compared to Temengor Reservoir (1.921; 0.653). In particular, total catch in both lakes showed that *Osteochilus vittatus* and *Cyclocheilichthys apogon* were two dominant species caught during this study. Based on Mann-Whitney U Test, there is no significant difference ( $p>0.05$ ) between the total individual number per species caught in Temengor and Bersia reservoirs. Therefore, Temengor Dam does not affect the fish abundance of Bersia Reservoir.

**Key words:** reservoir, inland fisheries, fish diversity and distribution, Cyprinidae

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### INTRODUCTION

The biodiversity of inland fisheries in Malaysia is interesting and well documented. Zakaria-Ismail (1994) stated that the species composition of freshwater fish in Peninsular Malaysia is mainly influenced by Siamese and Indonesian elements. This phenomenon is apparently due to the fact that Peninsular Malaysia is bounded by Thailand in the north and Indonesian archipelago in the south.

Studies on the diversity and distribution of freshwater fish are not merely about taxonomy of the organisms in question, but also the environmental condition of the habitats they live in (Izzati and Abdullah, 2010). According to Harris (1995), the distribution and composition of fish species in each habitat are highly correlated with various factors including availability of food, water current, breeding sites, limnological characteristics and the physico-chemical properties of the water body.

There are studies on inland fisheries in Temengor Reservoir which is the second largest

reservoir in Peninsular Malaysia after Kenyir Reservoir. This area supports a diverse species of fishes (Hashim *et al.*, 2012; Hamid *et al.*, 2012) including the two endangered species, mahseer (*Tor tambroides*) and Malaysian carp (*Probarbus jullieni*). However, the information on freshwater fishes in Bersia Reservoir is limited. In view of the present status of inland fisheries in Temengor and Bersia reservoirs, this study was conducted for two objectives; to study on diversity and distribution of fish of these two reservoirs and to compare the fish community structures between these two reservoirs.

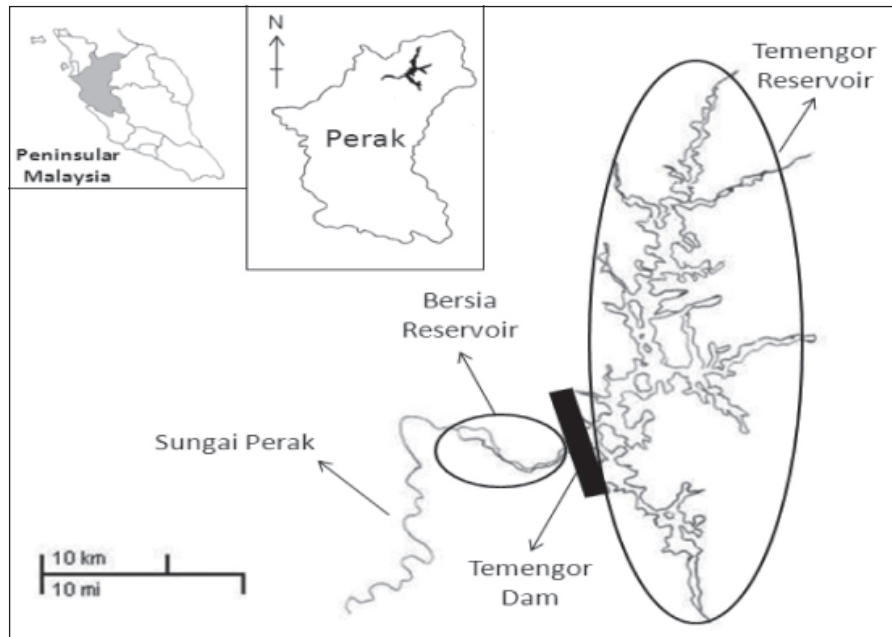
### MATERIALS AND METHODS

#### Study sites

This study was conducted in two consecutive reservoirs which are located at upper Sungai Perak basin in Hulu Gerik district, northern Peninsular Malaysia (Figure 1). The Bersia Reservoir is located below the Temengor Reservoir and these two reservoirs are separated by the Temengor Dam.

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**Fig. 1.** Location of Temengor Reservoir and Bersia Reservoir at the upper part of Sungai Perak basin (Inset: Map of Peninsular Malaysia and Perak state).

Temengor Reservoir and Bersia Reservoir serve as important hydroelectricity sources.

### Fish sampling

A monthly sampling was conducted for ten months between August 2009 and December 2010. During each sampling excursion, six sets of experimental gill nets (250 cm vertical length x 2976 cm total width) with five different stretch mesh sizes (3.7 cm, 5 cm, 6.5 cm, 7.5 cm, 10 cm) were deployed randomly and left overnight. All samples were weighed and total lengths were measured to the nearest 0.1 g and 0.1 cm respectively.

### Data analyses

Fish diversity ( $H'$ ) was measured using the Shannon-Weaver index. The evenness ( $J'$ ) was determined using Pielou index. Species richness was calculated following Margalef index and Mann-Whitney U Test for non-parametric analysis was used to test for the differences in the fish diversity between the two reservoirs.

## RESULTS AND DISCUSSION

Out of 20 species recorded during this study (Table 1), Cyprinidae was the most dominant family in terms of the number of specimens caught in Temengor and Bersia reservoirs with 94% and 78%, respectively while the other families were only represented by one or two species. The highest percentage of Cyprinidae in both Temengor and

Bersia reservoirs was in agreement with other studies in most other areas of the world including Southeast Asia (Zakaria-Ismail, 1994) and Australia (Kottelat *et al.*, 1993). Rathod and Khedkar (2011) also noted that Cyprinidae was the dominant family in Gangapur Dam, India.

A total of 1204 individuals were captured in Temengor Reservoir whereas 561 individuals were captured in Bersia Reservoir (Table 2). Total catch in both lakes showed that *Osteochilus vittatus* and *Cyclocheilichthys apogon* were two dominant species that dominated the catches. Based on Mann-Whitney U Test, there was no significant difference ( $p > 0.05$ ) in terms of the total number of individuals between the Temengor and Bersia reservoirs. The diversity index of fish communities in Temengor Reservoir (1.921) and Bersia Reservoir (2.030) could be categorized as moderate levels as suggested by Montana Department of Environmental Quality (2009). The evenness index, which indicates if the total individual was dominated by one or two species, was higher in Bersia Reservoir in comparison to Temengor Reservoir represented by 0.732 and 0.653, respectively. In Bersia Reservoir, the individuals in the community were equally distributed among the species. However in Temengor Reservoir, most of the individuals belonged to *O. vittatus*. In this study, the species richness was slightly higher in Temengor Reservoir. The highest species richness in this reservoir was probably related to components of reservoir size (surface area) and energy availability (net primary productivity) as suggested by Gue'gan *et al.* (1998). Furthermore,

**Table 1.** Species checklist by family recorded in Temengor and Bersia reservoirs

No	Family	Species	Temengor	Bersia
1	Bagridae	<i>Hemibagrus nemurus</i>	+	+
2		<i>Mystus singaringan</i>	+	+
3	Channidae	<i>Channa micropeltes</i>	+	+
4		<i>Channa striata</i>	+	+
5	Cichlidae	<i>Cichla ocellaris</i>	+	-
6		<i>Oreochromis niloticus</i>	+	-
7	Cyprinidae	<i>Oxygaster anomalura</i>	+	+
8		<i>Cyclocheilichthys apogon</i>	+	+
9		<i>Hampala macrolepidota</i>	+	+
10		<i>Labiobarbus leptochilus</i>	+	+
11		<i>Labiobarbus ocellatus</i>	+	-
12		<i>Mystacoleucus marginatus</i>	+	+
13		<i>Osteochilus vittatus</i>	+	+
14		<i>Poropuntius smedleyi</i>	+	-
15		<i>Barbonymus gonionetus</i>	-	+
16		<i>Barbonymus schwanenfeldii</i>	+	+
17	Eleotridae	<i>Oxyeleotris marmoratus</i>	+	+
18	Nandidae	<i>Pristolepis fasciata</i>	+	+
19	Notopteridae	<i>Notopterus notopterus</i>	+	+
20	Osphronomidae	<i>Osphronemus goramy</i>	+	+
		Total number of species found	19	16
		Total number of family found	8	7

Note: +: present, -: absent

**Table 2.** Shannon-Weiner Species Diversity (H'), Evenness (E) and Species Richness (D'') indices by reservoir

Reservoir	Total species	Total individual	Diversity Index (H')	Evenness Index (E)	Species richness (D'')
Temengor	19	1204	1.921	0.653	5.843
Bersia	16	561	2.030	0.732	5.457

Zakaria *et al.* (1999) concluded that several environmental factors, such as the physico-chemical characteristics of the water quality, topographical, hydrological regime and habitat destruction, could influence the species richness, diversity and species survival in aquatic ecosystems. The distribution and structure of fish community can be very diverse, depending on both biotic and abiotic conditions of the water body featuring the food availability and oxygen content (Gophen *et al.*, 1998).

Even though Temengor and Bersia reservoirs were separated by Temengor Dam, results have shown that the total individuals caught in the Temengor Reservoir were relatively similar with the Bersia Reservoir. The presence of dam in consecutive reservoirs will influence the environmental conditions and inland fisheries in the latter reservoir. However, based on the results from Mann-Whitney which indicated the same individual number per species caught in these two consecutive reservoirs,

therefore, Temengor Dam has no effect on the abundance of inland fisheries in Bersia Reservoir.

## CONCLUSION

The study reveals that Temengor and Bersia reservoirs are behaving like other Malaysian reservoirs/lake where the Cyprinidae dominates the overall catch composition. Based on the results from the Mann-Whitney test, there is no significant difference ( $p > 0.05$ ) between the Temengor and Bersia in terms of total number of individual. Therefore, the Temengor Dam does not affect the fish abundance of Bersia Reservoir. This study has contributed to the knowledge of fish distribution at the two reservoirs. It is hoped that the findings could assist fisheries scientist and managers to formulate a reliable management plan for future conservation and restoration.

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