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A Preliminary Recorded of Fishes at Selected Headwater Streams Before Establishing of Royal Belum State Park, Perak

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Abstract

A total of 30 fish species from 14 families were recorded during the survey at selected headwater streams of Belum Forest Reserve of Temengor Reservoir between June to December 1998. Family Cyprinidae was the dominant family which contributed 46.7% followed by Channidae (10.7%) and Bagridae (6.7%). Out of 30 species, only four species such as *Devario regina, Rasbora paviana, Osteochilus hasselti* and *Hampala macrolepidota* were sampled from all sampling stations. One specimen of freshwater puffer fish, *Poa leiurus, was* recorded at Sungai Ta eng. Distance, water velocity, river depth, types of substrate and physio-chemical parameter played an important role in determining species composition, diversity, biomass and species distribution. As there are many headwater streams in Temengor Reservoir still unexplored, the fish species number at Temengor Reservoir assume higher than been recorded before.

Keywords: Diversity, Fish species, Temengor reservoir.

1. Introduction

The second largest man-made lake in Peninsular Malaysia is Temengor Reservoir which is located 45 km from Gerik and 427 km from the Straits of Malacca (Ali, 2000) (Figure 1). The catchment area of Temengor Reservoir is 320,257 ha, consisted of three main Forest Reserves i.e. Belum Forest Reserve (134,167 ha), Grik Forest Reserve (37,220ha) and Temengor Forest Reserve (148,870 ha) (Davidson et al., 1995).

Generally, the Temengor Reservoir can be divided into two main areas: an undisturbed area located to the north and a disturbed area located to the south of the Banding Bridge. This distinction arises from historical logging activities in the southern part of the Temengor Reservoir, which occurred about 30 years ago. Additionally, ongoing logging activities continue to impact this southern area. As the northern area has been gazetted as security area, there were no logging activities were allowed. With the loss of forest cover, it would increase sediment load into the streams. As a results high sediment load in streams would affects the survival of aquatic fauna especially aquatic insect which act as food source for fishes. Temengor Reservoir which comprised of primary and secondary forests in its catchment areas also provides suitable habitat for several large mammalian species (Davidson et al, 1995).

Freshwater fishes diversity in South East Asia is high when compared to others region beside Amazon tropical forest. According to Kotellat et al., (1993), freshwater fishes of Southeast Asia are poorly studied group at fauna since information regarding distribution, population dynamics and threat is incomplete. From an estimated 1,000 sp. in the region, more 200 species can be found

in Peninsular Malaysia (Zakaria-Ismail, 1994). Cyprinidae forms the dominant freshwater fishes family in the region (Zakaria-Ismail, 1994; Rainboth, 1996).

There are few studies that been carried out about fish diversity and population of Temengor Reservoir since it inundated in 1979 (Khoo et al.,1982; Zakaria-Ismail and Lim 1995; Zakaria-Ismail and Sabariah, 1995; Shah and Ali, 2000). Almost of these previous studies are concentrated in main river of Temengor Reservoir or lentic zone. However, not much is known about fishes and its community especially that inhabits at Temengor Reservoir headwater streams (lotic zone). Therefore, the objective of this study is to obtain fish species composition data and to compare its distribution between headwater streams of undisturbed catchment areas located in the northern region of the Temengor Reservoir.

METHODS

Sampling was carried out from June to December 1998. Three headwater streams located in the northern part of the East–West Highway (classified as undisturbed forest-Belum Forest Reserve) were selected during the study period. The locations of these streams, namely Sungai Taeng, Sungai Kaik, and Sungai Temin, based on GPS, are shown in Table 1 and Figure 1. At all identified streams, pools and riffles were counted, marked, and measured (including width, depth, and flow) before fish sampling was conducted.

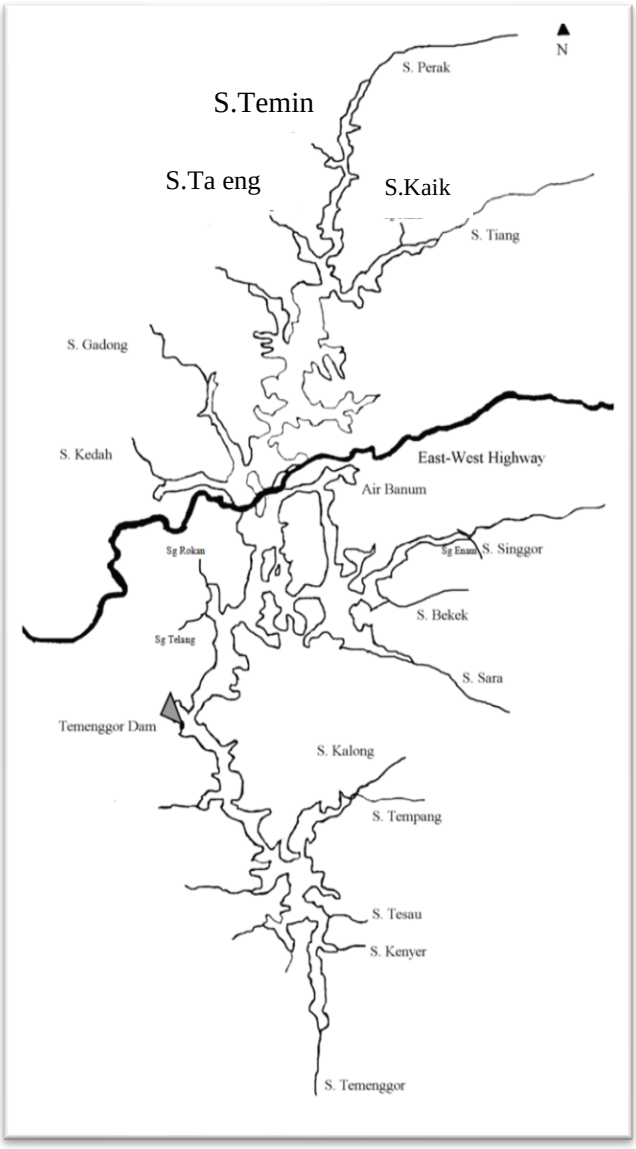

Figure 1. The map of stream at Temengor Reservoir.

Table 1. The location of selected headwater streams of fish species biodiversity and distribution study of Temengor Reservoir.

Streams	North	East
Sungai Ta eng	5° 40'51.38"	101° 21'28.64"
Sungai Temin	5° 42'30.48"	101° 21'45.34"
Sungai Kaik	5° 41'29.02"	101° 21'13.57"

Water physicochemical parameters, such as dissolved oxygen (DO) and temperature, were measured using the YSI meter Model 57, pH levels with the Orion Model 230A, conductivity with the YSI Meter Model 37, and current velocity (flow) at 0.6 of the stream depth using the Boy and Owen hydropeller.

A modified electrofishing device, fitted with a Honda EM650Z power generator, was used in the study. All pool and riffle sections were blocked using small-size block nets (placed at the upper and lower parts of each pool/riffle section) before one operator conducted the electroshocking. Two individuals were responsible for scooping up the fish that had been electrocuted, using scoop nets.

All caught fishes were immediately sorted and identified using a standard taxonomic key (Inger and Chin, 1965; Mohsin and Ambak, 1983; Kottelat et al., 1993; Rainboth, 1996). Measurements of total length (TL) and weight for each specimen were recorded before preservation in 10% formalin. Subsequently, these specimens were transported back to USM for further analysis.

3. Results and Discussion

3.1 Results

The data on physio-chemicals from all sampling stations was summarized in Table 2. Based on SPSS analysis, there were no significant differences between pools to riffles for all parameter except water velocity, whereas water flow in the riffles is faster compared to the pools ($p<0.05$) (Table 2).

Table 2. Mean water physico-chemical parameter at all sampling stations (June-December 1998**)**

Stations	DO (mg/L)	°C	pH	Conductivity (mS/cm)	TDS (mg/L)	Current flow (m/s)
Sungai Ta eng						
Pools	8.2 ± 0.4	24.5 ± 0.4	7.1 ± 0.1	0.064 ± 0.005	32.0 ± 1.9	0.285 ± 0.090
Riffles	8.1 ± 0.4	24.7 ± 0.4	7.1 ± 0.1	0.063 ± 0.004	32.0 ± 1.9	0.321 ± 0.056
Sungai Kaik						
Pools	7.4 ± 0.2	26.0 ± 0.1	7.2 ± 0.0	0.058 ± 0.004	35.9 ± 0.6	0.099 ± 0.021
Riffles	7.9 ± 0.2	25.8 ± 0.4	7.2 ± 0.1	0.068 ± 0.004	36.3 ± 0.5	0.143 ± 0.122
Sungai Temin						
Pools	8.2 ± 0.4	25.3 ± 6.2	7.4 ± 0.3	0.071 ± 0.007	37.0 ± 0.0	0.160 ± 0.105
Riffles	8.3 ± 0.3	25.3 ± 0.4	7.3 ± 0.1	0.007 ± 0.009	37.0 ± 0.1	0.392 ± 0.181

A total of 30 species consisted of 14 families were identified during the study (Table 3). The list still incomplete and further study should be carried out as a lot of small headwater streams not been sampled yet. No protected fish species i.e. *Tor* spp. (kelah) and *Probarbus jullenii* (temoleh) under Perak Fisheries (Riverine) Rules 1992 been sampled during the present study. Cyprinidae is the most dominant family that represent 46.7% of species recorded followed by Channidae (10.0%), Bagridae (6.7%) whereas others are 36.6% (Table 3).

Table 3. Fish species checklist and distribution by stream and species

Family	Species	Sungai Ta eng	Sungai Temin	Sungai Kaik
Amblycipitidae	*Amblyceps foratum*	-	+	-
Bagridae	*Hemibagrus gracilis*	+	+	-
	Mystus singaringan	-	-	+
Belonidae	*Xenenthodon canciloides*	+	-	-
Channidae	*Channa micropeltes*	-	-	+
	Channa striatus	+	-	+
	Channa gachua	-	-	+
Clariidae	*Clarias teijsmanii*	-	-	+
Cyprinidae	*Cyclocheleichthys apogon*	+	+	-
	Devario regina	+	+	+
	Hampala macrolepidota	+	+	+
	Labiobarbus cf. lineatus	-	+	-
	Lobocheilos cf. rhabdoura	+	-	-
	**Mystacoleucus marginatus*	+	-	+
	Neolissochilus soroides	+	+	-
	Osteochilus hasselti	+	+	+
	Osteochilus microcephalus	+	-	+
	***Poropuntius deauratus*	+	+	-
	Barbodes binotatus	+	+	-
	Barbodes lateristriga	-	+	-
	Rasbora caudimaculata	+	+	-
	Rasbora paviana	+	+	+
Eleotridae	*Oxyeleotris marmoratus*	+	+	-
Gobiidae	*Pseudogobiopsis olligactis*	+	+	-
Mastacembilidae	*Mastacembelus armatus*	+	-	+
Nemachelidae	*Nemachilus cf. fasciatus*	+	-	-
Osphronematidae	*Osphronemus gouramy*	+	+	-
Sisoridae	*Glyptothorax platypogonoides*	+	-	-
Synbranchidae	****Monopterus albus*	+	+	-
Tetraodontidae	*Poa leiurus*	+	-	-
	TOTAL	23	17	12

Note: + present; - absent; * (recent nomenclature) = *Mystacoleucus obtusirostris*; ** = *Poropuntius normani*; *** = *Monopterus javanensis*

Four species such as *Devario regina*, *Hampala macrolepidota*, *Osteochilus hasselti* and *Rasbora paviana* were recorded at all sampling stations (Table 3). *D. regina* become the most dominant and the highest yielded of individuals comprising 28.8% of total cyprinids caught

followed by *R. paviana* (17.1%) and *O. hasselti* (12.4%) (Table 3). Study also discovered that the number of individual and biomass of fish species caught in the pools is higher when compared to the riffles.

One specimen of an endemic and considered to be rare freshwater puffer fish species (*Poa leiurus*) was recorded at Sungai Ta eng. This is the second time this species been recorded at Temengor Reservoir where the first recorded at Sungai Kedah. The fish species distribution between all sampling stations are shown in Table 3. Sungai Ta eng has recorded the highest fish species number with 23 species followed by Sungai Temin (17 species) and Sungai Kaik (12 species) (Table 3). The different of river morphology between sampling stations may become main factors to contribute these results. Further study need to carried out to confirm this assumption.

3.2 Discussion

Generally, the stream studied is like the typical to the highland stream although most of the sampling station is located between 200-300m a.s.l. (above sea level). According to Samat et al., (2002), the physical characteristics of the stream at 200m a.s.l. is relatively similar to streams located at highland (above 900 m a.s.l.) with rocky bottom and has high water flow, clear and low in temperature.

More fish species were recorded in the present study (30 species) when compared to the previous study by Khoo et al., (1987) and Zakaria-Ismail and Lim (1995), which recorded 22 species and 24 species, respectively. The different of using sampling gears and sampling locations may contribute to this species differences. Studies by Khoo et al., (1987) and Zakaria-Ismail and Lim (1995) more concentrated at river mouth and streams of selected main rivers such as Sungai Kejor, Sungai Singor, Sungai Sara and Sungai Temengor that located at the southern part of Temengor Reservoir with using varied of sampling gears such as gill-nets, scoop net and hook-line. Meanwhile, the present sampling location focusing sampling areas at headwater streams with cover 1st to 3rd order river. The maximum depth of these streams' pools not more than 1m, only an electroc-shocker was suitable to been used for fish sampling at each sampling station.

Therefore, more species could be found in Temengor Reservoir if more intensive sampling were carried out at low headwater streams of Temengor Reservoir. Result from the study indicated that most of these highland fishes such as Rasbora, Cyclocheilicthys, Barbodes, Oxygaster and Systomus are very common to lowland areas as mentioned by Samat et al., (2002). A rare freshwater puffer fish (P. leiurus) that were caught at Sungai Ta eng should be conserve. Beside Temengor Reservoir, this freshwater puffer fish also been reported at Kenyir Reservoir (Department of Fisheries, 1995). Recently, this species was caught during a survey along Sungai Kedah, further study should be carried out at unexplored rivers or stream to get more detail fish species information especially in undisturbed area.

Samat and Mazlan (2003) also indicated that several species such as Barbodes (Neossochilus) hexagonolepis, Glytothorax platypogonoides and Amblyceps foratum become dominant in disturbed forest compared to undisturbed forest. However, the present study result shown not much different when compared to all sampling stations. Therefore, a long-term study are needed to obtain more details information about this finding.

The same result also mentions by Magnan and Onge (1999) in their study where more sediment were recorded at the area which has been logged and caught with fire recently. In streams, the increase of temperature and sedimentation after timber harvest can affect the egg-to-fry survival by reducing the dissolve oxygen at spawning grounds and by forming physical barriers to emergence (Murphy and Hal, 1981; Murphy and Milner 1997).

Normally, the logging activities will lead soil erosion, which contributed a high sedimentation and suspended solid where spawning or breeding ground of selected fish species will be lost (Eaglin and Hubert, 1993; Magnan and Onge, 1999). This may true as result shown that the TSS reading at disturbed streams has little bit higher compared to undisturbed forest. Beside that, the high suspended solid will block the fish gill to respiration (Khan et al., 1996). A high-suspended solid also will decreased the survivability of fish eggs/larvae's.

Logging activities also removed the canopy covers that will lead a direct sunlight to the streams, which will increase water temperature and reducing the dissolve oxygen level at spawning grounds (Ringler and Hall, 1975). The same result also detected during the study (Table 2).

Parker (1991) has indicated the potentials effects of logging on stream environments such as the changes of inflow regime and channel morphology, changes in woody debris inputs and distribution with associated changes in physical habitats conditions, initial reduction in coarse detritus inputs (leaves and twigs from the forest canopy) followed by changes in detrital composition as watershed passes through different stages and lastly changes in inputs and transport of nutrient and other chemical constituents. This such changes in stream environments can produce significant changes in stream biota like fish, aquatic insects and amphibians.

Ishak et al., (1999) noted that all specimens that were caught in secondary forest were widespread than localized species which were found mainly in primary forest. This is true as more single specimens of each family were found in primary forest.

The distribution of fish species in small streams of Temengor Reservoir are very much dependent on their adaptations to habitat and environment. Thus, the common species such as *D. regina, R. paviana, O. hasselti* and *H. macrolepidota* become more dominant species within disturbed and undisturbed forest.

4. Conclusion

As conclusion, headwater streams ecosystem is important to maintain fish biodiversity especially at big and deep reservoir such as Temengor Reservoir as it will be acting as spawning and breeding ground of selected fish species. As there are many headwater streams in Belum Forest Reserve unexplored, it is assume that fish species number will be increased to be recorded. Further study should be carried out to obtain more information about fish diversity in Temengor Reservoir.

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