

The itchyofauna of Maliau Basin Conservation Area, Sabah, Malaysia, with special reference to the stream near Ginseng Camp

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ABSTRACT. A survey of itchyofauna was done at Sungai Ginseng, located in the interior part of Maliau Basin Conservation Area (MBCA). The diversity of itchyofauna in MBCA was found to be very low. The five-day survey discovered only two species of fish, *Puntius sealei* and *Hemibagrus nemurus*. The abundance of fish in deep pool was higher compared to runs and riffles. The simple fish community found in this study reflects the uniqueness of both the habitat and the fish community surviving in this ecosystem.

Keywords: Itchyofauna, fish, Maliau Basin.

INTRODUCTION

Located in the middle of the southern part of Sabah, Maliau Basin has its own uniqueness as stated by Mykura (1988) in Martin-Smith *et al.* (1996), with a variety of forest types ranging from submontane mossy heat forest to lowland dipterocarp forest (Maryati, 1996). There is one large hydrological channel, Sungai Maliau, and its radiating tributaries form unique and important catchments for the south-central zone of Sabah (Anton & Johan, 1996). It consists of first and second order single catchments, streams, rivers and hundreds of waterfalls that are mainly remain unnamed.

Two surveys were done by Marsh in 1988 and Martin-Smith *et al.* (1996). During the first survey, Marsh (1988) in Martin-Smith *et al.* (1996) recorded three species of fish and

one species of crustacean comprising *Puntius sealei* (Herre 1993), *Hemibagrus nemurus* (Valenciennes 1839), *Betta unimaculata* (Popta 1905) and *Parathelpusa valida*. Marsh obtained the itchy- and crustacean fauna from Sungai Maliau, and within two small streams, one of which drains from a hill dipterocarp forest (with altitude 450 m a.s.l.) and the other from a blackwater stream (with altitude 950 m a.s.l.).

In the second survey, Martin-Smith *et al.* (1996) reconfirms the same three species of fish. *Puntius sealei* and *H. nemurus* were only recorded from the main channel of Sungai Maliau while *Betta unimaculata* was found in small tributaries at different altitudes (up to 1000 m a.s.l.). Two species of crustacean fauna were also recorded; *Thelphusula* sp. (Family: Gecaranucidae) from Sungai Maliau and *Macrobrachium sabanus* (Family: Palaemonidae) from highly acidic streams within heath and submontane forests. They also did some samplings at high elevation of dark water streams, but neither fish nor crustacean was found there.

We joined an expedition to Ginseng Camp organised by Universiti Malaysia Sabah and the Sabah Foundation. Both previous samplings were done at the main channel of Sungai Maliau and small streams around Seraya Camp and 88 Camp, but none was reported from Ginseng Camp. The objectives of this survey were to make an inventory of freshwater fish and crustaceans and to determine the fish

assemblage within micro-habitats (run, riffle, pool) along Sungai Ginseng.

MATERIALS AND METHODS

Fish collections were made at six stations. Three stations were set up at the upper part (above the Ginseng waterfall and upwards) of Sungai Ginseng, while three other stations were set up at the lower parts from the waterfall. Sampling stations selection was made based on the representation of the habitat characteristic and accessibility during the sampling period.

Random stratified sampling was used in these surveys. Sampling was partitioned by designating each site into one of these habitat classes; run (fast non-turbulent unidirectional water flow, maximum depth to 0.6m), riffle (fast turbulent unidirectional water flow, maximum depth usually < 0.3m) and pool (low water velocity with multidirectional water flow, maximum depth varies to every pool but usually > 0.5m).

Fishes were collected using an electro fishing device consisting of two copper electrodes on wooden handles powered by a 500-watt portable (model: Yamaha) AC generator for about 30 minutes at each station. Copper electrodes were attached to the generator. Fishes were then scooped using dip-nets. However, the electro fishing device was used only at stations above the Ginseng waterfall (at upper part of Sungai Ginseng).

This method cannot be implemented at the downstream stations. The stream at the lower parts after waterfall passed through gorges, with swift flow and deep channel. Therefore, only the gill netting method with different mesh size was used. Gill nets were set up for four days and examined at regular intervals.

Following sampling of fish, the dimensions of the habitat were also recorded including the mean width and mean depth of each station. All fish were identified and their standard length measurements were taken before fixing in 10% formalin, and later preserved in 70% ethanol (after 1-2 weeks) in the laboratory. All fish specimens collected during the expedition were preserved and deposited in BORNEENSIS at the Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah.

RESULTS AND DISCUSSIONS

Only two species of fish (*Hemibagrus nemurus* and *Puntius sealei*) were caught out of three species that were previously recorded. No crustacean was found during this expedition. A total of 71 individuals were caught during four days of the sampling period. Bagrid fish (*Hemibagrus nemurus*) made up 55.8% of the catch, while the rest is represented by Cyprinid fish (*Puntius sealei*) with 44.2 %. Fish catch per station is summarized in Table 1.

Table1. Sampling location and number of fish caught along Sungai Ginseng.

Station	Fish Species	No. of Individual	Mean Size Range SL (cm)
1	<i>P. sealei</i>	5*	6.7±0.01
2	<i>P. sealei</i>	2*	7.1±0.01
3	-	-	-
4	<i>H. nemurus</i>	38	21.7±0.01
5	<i>P. sealei</i>	24	19.6±0.01
6	-	-	-
7	<i>H. nemurus</i>	2*	14.6±0.01

*Juvenile fish

Bagrid represent a major group of catfish in Borneo, together with catfish from the family Clariidae and Pangasiidae. The distribution of bagrid catfish is wider and can be found at most of lowland rivers and also hillstream forests. *Hemibagrus nemurus* is a benthopelagic and potamodromous freshwater fish, which occurs in most habitat types with slow current with depth ranging from five meters and below. The resilience of this species is moderate.

Puntius sealei lives in small streams (< 10m) in clear or slightly turbid with silt, sand or gravel bottoms (Inger & Chin, 2002). It is a benthopelagic fish and is a common resident in all streams in Borneo. It has high resilience.

Three fish surveys done in 1988, 1996 and 2005 within the MBCA area conclude that the fish diversity and abundance is relatively low. This is probably due to the low primary productivity of Maliau's blackwater streams as suggested by Hazebroek *et al.* (2004). The productivity of primary producers such as microalgae, which consist of phytoplankton and periphyton that provide food for fishes and other higher aquatic life such as prawns and crustaceans, is important. Microalgae is essential for fish larvae, prawn and crustacean as food and energy sources to survive and grow, but Anton *et al.* (1996) reported that there were only 35 species of freshwater microalgae in Maliau's stream which is considered as low productivity and not enough to support fish production.

Overall, the water in Sungai Ginseng was 'tea-coloured' with numerous habitat morphological characteristics ranging from deep pool below the waterfall with fast flowing water to a mixture of big riffles, deep flow and fast flowing riffle. The substrate consists of bedrock, boulder, cobble, pebble and gravel. The upstream of Sungai Ginseng is a moderate size for a hillstream; there is abundant riffle with large bedrock, boulders and some sand.

The downstream is larger than the upstream with abundant riffles, some shallow pools (except the deep pool just below Ginseng waterfall) and its substrate consists of large boulders, bedrock and some gravel with sand (Table 2).

Most of the fish at Sungai Ginseng congregate in deep pool (Station 4). All fish caught in this deep pool were adult. The possible explanation for this could be due to the condition of the habitat that is suitable for fish refuge especially during the dry season. Poulsen *et al.* (2002), conducted a research on deep pool ecology in the Mekong River Basin and noted that deep pools play a crucial role in the Mekong River ecosystem because it is a very important habitat for many fish species especially during the dry season. Deep pools are found just below the waterfall in Maliau's tributaries. Deep pools should be viewed as integrated parts of an overall ecosystem, rather than isolated fish habitats and an ecosystem approach should be promoted.

No fish were found in Station 3 and Station 5. It might be due to physical characteristics of the river, such as most of the area dominated by bedrock and were shallow. The distribution of these two fish species was influenced by habitat characteristics where the juvenile of *H.nemurus* were found in pool habitats while the *P.sealei* juvenile was found in riffles and runs. Only seven juvenile individuals of *P. sealei* were found in station 2 (fast flowing riffle) and station 1 (moderate flow run) while the juvenile individual of *H .nemurus* was found in small pool habitats (Station 6).

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Table 2. Characteristics of each station surveyed at six sampling stations in Sungai Ginseng.

Station	Location	Width (m)	Depth (m)	Description of sampling site
1	30-50m from above Ginseng waterfall (upstream section)	6-9	0.16-0.55	Moderate flow of runs with small boulders, some cobbles and gravels with mud and sand. Riparian zone dominated mainly by herbaceous plants. Water was light-tea coloured with turbid silt water.
2	100 m from station 1	5-7	0.25-0.48	Fast flowing riffle, with large boulders and bedrock. No stream vegetation. The riparian zone dominated by shrubs and some herbs. Water was light-tea coloured.
3	50 m from station 2	5-8	0.22-0.45	Moderate flowing riffle, with medium boulders, some bedrock and cobbles with light-tea coloured water. The river bank vegetation was as in station 2.
4	Below Ginseng waterfall	15-20	> 8	Very deep and pool between 2 series of Ginseng waterfall, shrubs and herbs dominated riverbank, bedrock. Riverbanks are rocky, with large boulders. The water was deeply tea coloured.
5	100m from station 4	6-10	0.28-0.52	Slow flowing run, riverbed dominated mainly by bedrock and large boulders, with light tea coloured water. Some macrophytes were found here.
6	50 m from station 5	7-10	0.55-1.4	A series of shallow pool occur in this station. The water was deeply tea coloured, with rocky and some sand at the bottom of the river.

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