

Short Notes

Survey of Freshwater Fish in Kadamaian Area, Western Sabah

Chen-Lin Soo^{1*}, Hairul Hafiz Mahsol¹, Simon Kuyun¹, Maxwell Kwang Sing Ginol¹, Azrie Alliamat¹, Nur Syafiqah Shamsul Kamal²

¹*Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia*

²*Forest Research Centre, Sabah Forestry Department, P.O. Box 1407, 90715 Sandakan, Sabah, Malaysia*

*Corresponding author: soo@ums.edu.my

Abstract

The freshwater fish fauna was surveyed in forest streams located in the Kadamaian area, Sabah during the Borneo Geographic Expedition 2019. Fish samples were obtained from six stations by electrofishing from an upstream to downstream direction. A total of four families, 12 genera, and 14 species of fish were recorded from the present study. The most dominant family was Cyprinidae (10 species; 71.43%), followed by Gastromyzontidae (2 species; 14.29%), Nemacheilidae (1 species; 7.14%), and Mastacembelidae (1 species; 7.14%). The number of species was low in upstream stations at higher altitude but substantially higher in downstream stations with lower altitude. Economically valuable fish, *Tor tambra* was found at all stations. *Gastromyzon monticola* which is endemic to Sabah was also recorded at most stations.

Keywords: Freshwater fish, *Tor tambra*, *Gastromyzon monticola*, forest streams, Kadamaian, Sabah

Introduction

The survey and documentation of freshwater fishes have been continuously undertaken in Sabah (Ahmad et al., 2006; Jimmy et al., 2010; Kottelat & Tan, 2011; Wilkinson & Tan, 2018). Ng et al., (2017) reported that there are approximately 166 freshwater fish species in Sabah. However, documentation of fish fauna in Sabah's forest streams is still limited and patchy, mainly due to unequal sampling efforts and sampling difficulties in rural areas (Ng et al., 2017; Nyanti et al., 2019).

The Borneo Geographic Expedition 2019: Kadamaian, jointly organized by the Institute for Tropical Biology and Conservation (ITBC) and Sabah Parks was held from 14th to 25th October, 2019. One of the many objectives of the scientific expedition was to carry out an inventory of fish fauna in Kadamaian area of Kota

Belud, which is located immediately to the north west of Kinabalu Park. The baseline information obtained during the expedition can be utilised as a first step to develop an effective conservation strategy in the area adjacent to Kinabalu Park.

Methodology

A three-day survey of freshwater fish fauna was conducted in Kadamaian area during the Borneo Geographic Expedition 2019 (Figure 1). Freshwater fish samples were obtained from a total of six sampling stations from an upstream to downstream direction covering a total streamline length of 10 km. Stream habitats changed from the upstream to downstream direction where stations in the upstream are shaded with a closed canopy and consist mostly of falls whereas the canopy cover of stations in the downstream are open (Figure 2). GPS coordinates and elevations were taken at each station by using a Portable Global Positioning System (Garmin GPSMAP® 645). Table 1 summarizes the details of sampling regime and station. The fish samples were collected using an electrofishing device powered by a 1000 watt portable generator (Elemax Honda SHX1000). The stunned fish were then collected using scoop nets (1 cm mesh size). The electroshocking process was carried out at a stream length of approximately 200 m. Fish samples were identified to the species level using available taxonomic keys (Inger & Chin, 2002; Kottelat & Tan, 2008; Mohsin & Ambak, 1983; Roberts, 1989; Tan, 2006). Samples that were unidentifiable in the field were first fixed in 10% formalin and later preserved in 70% ethanol for further identification in the laboratory. Finally, the taxonomic status was confirmed with online global databases of fish species (Froese & Pauly, 2019; van der Laan et al., 2020).

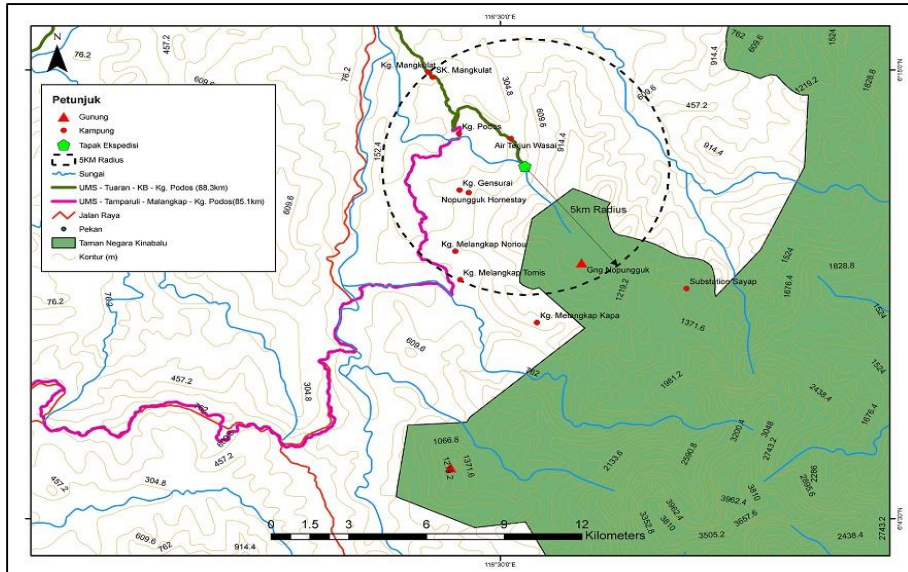


Figure 1. The map of Kadamaian and study area covered in the present expedition as indicated by dash circle.



Figure 2. Upstream habitat (a) with closed canopy cover that is mostly consisted of boulders and falls compared with downstream habitat (b) with open canopy cover.

Table 1. The details of the sampling regime and sampling locations in the present study.

Station no./stream	GPS Coordinates	Sampling Date	Elevation (m asl)
St 1: Sg. Malawan	N06°12'01.2" E116°30'50.3"	22 Oct 2019	615
St 2: Sg. Malawan	N06°12'45.3" E116°30'30.7"	22 Oct 2019	565
St 3: Sg. Malawan	N06°12'40.6" E116°30'30.6"	24 Oct 2019	379
St 4: Sg. Kopongian	N06°12'41.1" E116°30'31.2"	24 Oct 2019	381
St 5: Sg. Malawan	N06°13'22.8" E116°28'11.6"	23 Oct 2019	123
St 6: Sg. Kasiaan	N06°13'22.2" E116°28'12.0"	23 Oct 2019	111

Results and Discussion

A total of four families, 12 genera, and 14 species were recorded in forest streams located in the Kadamaian watershed. The low number of fish species recorded in the present study is not uncommon given this study has set out to document mainly the diversity of a small distance of forest streams within a short span of time during the expedition. Fish species numbers ranging from two to 19 species were also recorded in previous ichthyofauna surveys that were conducted in a short period of time (Ahmad et al., 2006; Jimmy et al., 2010; Rahim et al., 2002). Apart from the brief collection time, high elevation and low primary productivity of rivers may also be reasons for low number of fish species (Jimmy et al., 2010; Rahim et al., 2002).

Figure 3 shows that the most dominant family was Cyprinidae with 10 species (71.43%), followed by Gastromyzontidae (2 species; 14.29%), Nemacheilidae (1 species; 7.14%), and Mastacembelidae (1 species; 7.14%). Samat (1990) recorded a total of 22 fish species with Cyprinidae being the most dominant family in Kinabalu Park which is adjacent to the present study area. Dominance by the family Cyprinidae in the present forest stream is also similar to that in Maliau Basin Conservation Area, Sabah (Sade & Biun, 2012), Sarawak forest stream (Nyanti et al., 2019), Royal Belum Forest Reserve in Perak (Sharir et al., 2019), Pahang National Park (Farinordin et al., 2016) and Ulu Muda Forest Reserve in Kedah (Sah et al., 2012).

Table 2 shows that the species count was low in upstream stations at higher altitude, but there was substantially higher species count at downstream stations with lower altitude. This phenomenon was also observed in Maliau Basin, Sabah where fish was more diverse at downstream sites (Sade & Biun, 2012). The author attributed the increase of species diversity at the downstream area to the increase in habitat size, habitat diversity, and environmental stability. Nyanti et al., (2019) also demonstrated that elevation is one of the most significant factors related to fish assemblages in the upstream of Baleh River, Sarawak.

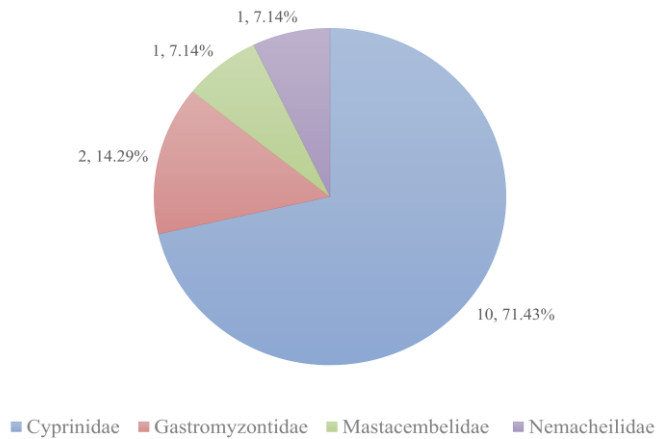


Figure 3. Number of fish species and percentage of the fish family recorded from six sampling stations in the study area.

Tor tambra, locally known as Pelian in Sabah, was recorded at all stations along forest streams. *Tor tambra*, which is known as a focal food species is expensive with high economic value (Ingram et al., 2007; Parenti & Lim, 2005; Pinder et al., 2019; Rachmatika et al., 2005). This fish is commonly found in mountainous forest streams with fast flowing water (Nyanti et al., 2019; Rachmatika et al., 2005; Rahim et al, 2002; Sharir et al., 2019). On the other hand, *Gastromyzon monticola* which is endemic to Sabah (Ng et al., 2017; Tan, 2006) was also found at almost all stations except station 2. Most of the fish species recorded in the present study is corroborated with previous records in Kinabalu Park (Samat, 1990).

Conclusion

A total of four families, 12 genera and 14 species of fish were recorded in forest streams located in the Kadamaian area, Kota Belud, Sabah. The four families are Cyprinidae, Gastromyzontidae, Nemacheilidae and Mastacembelidae, with the most dominant family being Cyprinidae. Altitudinal changes of fish species number were observed. Further study should be conducted to investigate the altitudinal changes of fish composition and biodiversity associated with environmental variables changes.

Table 2. Occurrence of freshwater fish fauna in the forest streams located in Kadamaian area, Kota Belud, Sabah.

Family	Species	Station 1	Station 2	Station 3	Station 4	Station 5	Station 6
Cyprinidae	<i>Barbodes sealei</i>	-	-	-	-	+	+
Cyprinidae	<i>Garra borneensis</i>	-	-	-	-	+	+
Cyprinidae	<i>Lobocheilus ovalis</i>	-	-	-	-	+	+
Cyprinidae	<i>Nematabramis everetti</i>	-	-	-	-	+	+
Cyprinidae	<i>Osteochilus chini</i>	-	-	-	-	+	-
Cyprinidae	<i>Paracrossophilus acerus</i>	-	-	-	-	-	+
Cyprinidae	<i>Rasbora hubbsi</i>	-	-	-	-	+	+
Cyprinidae	<i>Rasbora argyrotaenia</i>	-	-	-	-	+	-
Cyprinidae	<i>Rasbora sp</i>	-	-	-	-	-	+
Cyprinidae	<i>Tor tambra</i>	+	+	+	+	+	+
Gastromyzontidae	<i>Gastromyzon monticola</i>	+	-	+	+	+	+
Gastromyzontidae	<i>Protomyzon griswoldi</i>	-	-	-	+	-	-
Mastacembelidae	<i>Macragnathus keithi</i>	-	-	-	-	-	+
Nemacheilidae	<i>Nemacheilus olivaceus</i>	-	-	-	-	+	+

Note: + indicated presence whereas - indicated absence.

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