FRESHWATER FISHES FROM BARIO, KELABIT HIGHLANDS SARAWAK

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ABSTRACT

The fish communities of the Bario, Kelabit Highlands Sarawak were sampled at eight selected stations from Sg. Dappur and its tributaries. Twenty-four species belonging to 7 families and 19 genera were recorded from the area. The fish fauna was dominated by Cyprinidae and Balitoridae comprising approximately 57.9% and 38.2% respectively. During the survey the areas within the proximity of the sampling sites were relatively undisturbed except for small-scale clearing for subsistence farming. Pressures on the riverine environment and communities due to fishing activities by the native Kelabits were also minimal.

INTRODUCTION

The Baram River is the major drainage system for eastern part of Sarawak. It flows north from the Tama Abu Mountain Range which separates Sarawak from the Kalimantan Indonesia. It empties into the South China Sea at approximately 22km north of Miri. The Bario Highland at altitude 1,200m a.s.l. forms the uppermost catchment of the Baram River Watershed.

The freshwater fish fauna of the lower Baram River has been previously recorded by Watson & Balon (1984); in which a total of 57 species was reported. However little information on the fish fauna of the upper Baram River was available. Our present survey was carried out during the Scientific Journey Through Borneo - The Bario Expedition organized by the Universiti Malaysia Sarawak (UNIMAS) from 10-20 April 1995. Its objective was to make an inventory of the fish fauna present in the Bario area; to serve as a baseline data that will be valuable to assess future environmental impacts of economic development on the area.

METHODOLOGY

Fish collections were made at eight selected stations namely Station 1 (Pa' Tenungan), Station 2 (the confluence of Pa' Dappur and Pa' Tenungan), Station 3 (Pa' Manaliu), Station 4 (Pa' Unimas), Station *5* (Padi Field at Bario Asal), Station 6 (Pa' Arul Dalan), Station 7 (Pa' Marario) and Station 8 (Pa' Ukat) (Figure 1). Selection of these stations were made based on their representation of the overall habitat and accessibility during the sampling period. With the exception of Station 2, specimens from other stations were collected using electrofishing device consisting of two copper electrodes on wooden handles powered by a 500-watt portable AC generator. Fishes were then collected using small mesh size seine net, dip nets or caught by hands. At each station, a distance of approximately 60m was sampled covering both

the ripples and pool areas. Electrofishing device was used at all these stations because the streams were narrow (width ranges from 1.5 to 4m), shallow (depth ranges from 0.3m to 1.2m) and relatively fast flowing with rocky/pebbles bottom. Station 2 was sampled using gill nets of different mesh sizes and hooks and lines. Gill nets were placed for a period of 48 hours and checked at regular intervals whereas fishing using hooks and lines were carried out during the day.

All specimens were fixed in 10% formalin and later preserved in 70% ethanol. All fish specimens collected during this study period were deposited in the Museum of Ichthyology Universiti Malaysia Sarawak.

RESULTS AND DISCUSSION

Fish Fauna: Twenty-four species belonging to 7 families and 19 genera were caught from the study area (Table 1). Out of the 518 fish specimens collected during the study period, 57.9% was represented by the family Cyprinidae and 38.2% by the family Balitoridae. The rests were from the family Bagridae, Clariidae, Cichlidae, Anabantidae and Mastacembelidae

Table 1: List of fish species and their numbers caught from Dappur River and its tributes

Family	Species	Number Caught
Anabantidae	Anabas testudineus	3
Bagridae	Mystus baramensis	5
	Leiocassis robustus	
Balitiridae	Gastromyzon borneensis	76
	Glaniopsis hanitschi	2
	Parhomaloptera microstoma	2
	Protomyzon borneensis	92
	Sundoreonectes sabanus	26
Cichlidae	Oreochromis mossambicus	3
	Oreochromis niloticus	1
Clariidae	Clarias batrachus	4
Cyprinidae	Hampala bimaculata	2
	Lobochelius bo	3
	Lobochelius achwanenfeldii	3
	Nematabramis borneensis	168
	Osteochelius pleurotaenia	3
	Paracrossochelius acerus	4
	Puntius sealei	2
	Rasbora argyrotaenia	21
	Rasbora lateristriata	7
	Tor duoronensis	74
	Tor soro	11
	Tor tambroides	2
Mastacembelidae	Mastacembelus unicolor	1

comprising 1.5%, 0.8%, 0.8%, 0.6% and 0.2% respectively (Figure 2). Lowe-McConnell

(1975) reported that Cyprinidae commonly dominated the rivers found in the whole of Southeast Asia. In Western Borneo, about one-third of all freshwater fishes belong to the family Cyprinidae (Roberts, 1989). The same phenomena was observed for rivers at lower altitudes in Sabah (Inger & Chin, 1990). In the upper Batang Rajang approximately 66% of the fish caught was represented by this family (Nyanti et al., 1995). In the Bario Highlands, this family was commonly caught from Sg. Dappur and its larger tributaries.

Dominant genera in terms of the total number of individuals caught were represented by Nematabramis, Protomyzon, Tor and Gastromyzon representing 32.4%, 17.8%, 16.8% and 14.7% respectively (Figure 3). The list of species caught at each station and the ranges of lengths and weights were shown in Table 2. Most of the larger size species were caught from Station 2 since the river at this station was wider and deeper. The study was carried out during a rainy season when a significant difference was observed between the turbidity of Sg. Dappur (NTU value is 240) and its tributaries (NTU value ranges between 10 to 69) (Lau Seng et al., 1995). It was interesting to note that Tor spp. would 'seek shelter' in tributaries having clear water and relatively low current velocity, such as Pa' Tenungan. Similar observation was found for this genera at Sg. Bahau, a tributary of Batang Balui. In both tributaries, Tor species was observed to occupy the first 30m of the tributaries from the confluence of the main river. The depth of the river after this stretch could have been too shallow for the species to survive successfully. The density of the Tor spp. during this period was high (about 4 individuals/m^3). This preference for a specific location along the tributaries could have served as a transient shelter for the fish during the rainy season because it has been generally observed that during drier period, Tor spp. chose to live in swift, clear and rock-bottom streams.

The smaller tributaries (Pa' Arul Dalan, Pa' Marario) normally have steep gradient and highly variable and unpredictable flow regimes. Such conditions have been known to produce highly unstable aquatic habitats that can affect fish population and distribution resulting in the reduction of community complexity (Bain et al., 1988). In such habitat, fish would tend to mature relatively earlier. This was observed in one specimen of female Puntius sealei caught from Pa' Marario which indicated to have produced mature eggs when its total length was only 6.5cm. The family Balitoridae was normally found in the smaller and high altitude tributaries with rocky bottom and clear fast flowing water. Some of these species were aerodynamically shaped and seemed to have adapted well to living in such condition.

Stomach content analyses of some species from most families of fish caught indicated vegetable matter and insects as the most commonly eaten food. Other food eaten included worms and small shrimps. The importance of terrestrial debris, especially leaves, as a food web base for stream invertebrates and subsequently fish, has been well documented (Cummins et al. (1973). On smaller an steep gradient tributaries of Sg. Dappur, there was no large pools for accumulation of organic detritus. The rugged topography caused the organic material to be carried through the system by high current velocities even before it could be consumed directly or converted into food organisms. However, during dry season the residency time for these allocthonous material was known to increase. Unfortunately there was less terrestrial input during this time. The loss of detritus input which could effectively

Table 2. List of species and the total number caught (N), total length (TL) and standard deviation (SD)

in cm, standard length (SL) and standard deviation in cm and weight (WT) and standard deviation in gm from each station.

Station	Family	Species	N	TL-SD	SL-SD	WT-SD
1	Bagridae	Leiocassis robustus	2	10.3 - 2.4	8.6 - 2.3	11.6 - 8.4
	Balitoridae	Gastromyzon borneensis	7	3.6 - 0.2	2.9 - 0.3	0.6 - 0.1
		Protomyzon borneensis	9	5.9 - 1.5	4.3 - 0.8	1.6 - 1.0
	Cyprinidae	Paracrossochelius acerus	3	4.9 - 1.1	4.1 - 0.7	0.9 - 0.4
		Rasbora lateristriata	1	16.5	13.0	28.4
2	Bagridae	Mystus baramensis	5	18.8 - 2.5	13.4 - 1.9	72.0 - 30.3
	Cyprinidae	Hampala bimaculata	1	21.5	15.5	100.0
		Osteochelius pleurotaenia	3	31.3 - 1.2	21.2	323.3 - 20.8
		Tor duoronensis	74	37.9 - 10.2	28.7	799.2 - 564.2
		Tor tambroides	1	12.2	9.6	20.9
	Mastacembelidae	Mastace,belus unicolor	1	42.5	41.5	230.0
3	Cyprinidae	Hampala bimaculata	1	13.5	11.0	23.6
		Lobochelius bo	3	17.8 - 6.3	14.0 - 0.5	45.2 - 8.2
		Lobochelius schwanenfeldii	3	17.2 - 0.7	13.5 - 0.4	46.9 - 6.9
		Rasbora lateristriata	3	12.8 - 0.5	10.4 - 0.2	13.9 - 0.9
		Tor soro	5	12.4 - 3.6	9.9 - 2.8	19.9 - 17.3
4	Balitoridae	Protomyzon borneensis	14	5.2 - 0.8	4.5 - 0.7	1.1 - 0.4
		Sundoreonectes sabanus	21	7.6 - 1.9	6.0 - 0.9	5.4 - 4.5
	Cyprinidae	Nematabramis borneensis	108	6.6 - 1.1	5.3 - 0.9	2.3 - 1.1
		Tor soro	1	6.0	4.6	1.9
5	Anabantidae	Anabas testudineus	3	8.5 - 2.1	6.7 - 1.5	11.9 - 8.3
	Cichlidae	Oreochromis mossambicus	2	10.6 - 1.5	8.3 - 1.9	18.5 - 9.8
		Oreochromis niloticus	2	10.6 - 1.5	6.7 - 1.5	11.9 - 8.3
6	Balitoridae	Gastromyzon borneensis	61	5.5 - 1.6	4.5 - 1.4	3.4 - 3.3
		Parhomaloptera microstoma	2	7.7 - 1.6	6.3 - 1.1	2.0 - 0.9
		Protomyzon borneensis	47	5.2 - 1.3	4.2 - 0.7	0.9 - 0.5
		Sundoreonectes sabanus	4	7.8 - 2.3	6.4 - 2.1	4.9 - 4.3
	Cyprinidae	Nematabramis borneensis	33	7.6 - 1.9	6.3 - 1.2	3.6 - 2.1
7	Balitoridae	Glaniopsis hanitschi	2	4.9 - 0.6	3.9 - 0.6	0.9 - 0.4
		Sundoreonectes sabanus	1	4.1	3.8	0.5
	Cyprinidae	Nematabramis borneensis	33	7.4 - 1.6	5.9 - 1.3	3.5 - 1.9
		Puntius sealei	2	6.6 - 0.1	5.1 - 0.1	3.6 - 0.5
		Rasbora lateristriata	3	11.7 - 1.4	9.4 - 1.3	11.0 - 5.8
		Tor Soro	5	15.4 - 6.0	12.2 - 5.1	49.6 - 47.9
8	Bagridae	Leiocassis robustus	1	9.8	8.0	9.6
	Balitoridae	Protomyzon borneensis	22	5.2 - 0.8	4.4 - 0.7	1.0 - 0.5
		Gastromyzon borneensis	8	4.5 - 1.5	3.7 - 1.2	1.4 - 1.1
	Cichlidae	Oreochromis mossambicus	1	9.0	7.2	12.7
	Clariidae	Clarias batrachus	4	11.6 - 2.9	10.1 - 2.7	13.4 - 10.9
	Cyprinidae	Nematabramis borneensis	25	8.9 - 0.9	7.1 - 0.7	5.2 - 1.6
		Paracrossochelius acerus	1	5.6	4.5	1.5
		Rasbora argyrotaenia	21	11.1 - 1.6	8.9 - 1.4	8.9 - 3.2
		Tor tambroides	1	14.2	11.6	25.9

constrict the food web coupled with highly variable physical parameters might contribute to the elimination of fish species directly or indirectly dependent on detritus.

Fishery: Fishing activities by the local community in the study area have been carried out on a very small scale. The streams in the proximity to the Kelabit settlement generally were incapable of providing ample fish supply to the inhabitants since these streams were small and

shallow and thus not very productive. Fishing activities were observed to be more popular at Sg. Dappur during the period of dry season. Even then relatively few families were able to travel far from their longhouses due to inavailability of suitable boats and outboard engines. At Station 2 where fish and other aquatic life were found to be more abundant, only one family has been fishing there. Currently the fish stock in these rivers is not experiencing severe pressures from fishing activities by the local inhabitants and the fish resource is likely to be harvested sustainably for a long time in the future. The fishing methods employed today include gill nets, cast nets, rod and line and traps.

The relatively low number of fish species recorded from the area is not surprising since Sg. Dappur is located at the upper reaches of Baram River. The presence of large number of Tor spp. caught from just one station may indicate the presence of large stock of this species from the area. At the moment Bario is almost undisturbed except for some areas cleared for small-scale cultivation and the fishing pressure is minimal. Any activities related to extensive deforestation may increase the siltation of these river systems, adversely affecting the natural habitat of these fishes and threaten their continued existence in the Bario Highlands. Currently, pressures from the fishing activities of the local Kelabit in habitants can be considered minimal but increasing fishery activities coupled with the introduction of non-traditional fishing methods may lead to the disappearance of some species in the future.

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