

# The freshwater fishes and species status of peatland areas in Central Kalimantan, Indonesia

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## ABSTRACT

Peatland is the unique ecosystem, it has the ability to absorb water up to nine times that volume. Therefore, the peat area becomes a source of water for the lower area and habitat of many fish species. The information about fish diversity of peatland in Central Kalimantan is limited especially from former One Million Hectares Peatland Project. The aims of this study were to assess fish diversity, abundance, potency, and species status. The study using survey methods both rainy and dry season based on catch per unit of effort (CPUE). The gears were gill net, cast net, and lift net/anco. Fish samples were preserved, then identified and deposited in Zoology Museum Bogor. The result were recorded 67 fish species belonging to 19 families, Cyprinidae is dominant family with 28 species; and recorded 47 species then totally 114 species. The fish diversity in dry season is higher than rainy season. The ranges of fish diversity among stations 5-25 species and 8-16 species in dry and rainy, respectively; St.7 is highest diversity in dry season with 25 species. *Osteochilus spilurus* is the most abundant (21 ind./st) during rainy and *Cyclocheilichthys armatus* during dry season (20 ind./st.). Mostly species potential for consume fish. Species status were 7 endemics of Kalimantan, 1 protected species (*Chitala borneensis*), and 1 introduced (*Trichopodus pectoralis*).

**Key words :** Fish diversity, Peatland, Species status, Abundance.

## Introduction

Indonesia is the islands country consists of more than 17,000 islands with various ecosystems and habitat types. The freshwater areas of Indonesia is about 55 million hectares covered river 11.95 million ha, lake and reservoir 2.1 million ha, and swamps 39.4 million ha (Ambari, 2019). The freshwater fishes reported at least 1,248 species (Widjaja *et al.*, 2014), and then Dudgeon (2000) predicted more than 1,700 species. Previously, the freshwater fish of Papua were reported by Allen (1991) that 321 species and Kottelat *et al.* (1993) recorded 900 species of West Indonesia and Sulawesi.

Indonesia possesses vast area of peatland and is the 4th country with biggest peatland in the world

after Canada, Russia and USA. Indonesia's peatland is the biggest tropical peatland in the world that covers about 50% of the total world tropical peatland (Giesen and Sari, 2018). However, over the past 2-3 decades most of Indonesia's peat swamp forests in Sumatra and Kalimantan have largely been logged, drained and converted to plantations or lie idle in a degraded state. While logging and plantations have brought wealth, the transition has come at a cost, and peatland development has led to a significant increase in emissions, and peatland fires that have major economic and health impacts. One of them is peatland areas in Central Kalimantan, especially former area of 'One Million Hectares Peatland Project'. Besides anthropogenic activity were impacted to fish community both spe-

cies and fish production.

The fish diversity of peatland forest in Indonesia reached 104 species that distributed in Riau, Jambi, and Central Kalimantan (Haryono, 2011). Then, specifically study about fish in Central Kalimantan peatland areas was being done many researchers (Silustiyarto *et al.*, 2007; Nurdawati *et al.*, 2007; Haryono, 2012; Thornton *et al.*, 2016). Some fish species of peatland areas is unique because have bright color therefore potential for ornamental fish. For example, the Asian bony tongue or arowana, rasboras, and osphronemids are most popular as ornamental fish.

Hitherto, information about fish community and related aspects in Central Kalimantan peatland areas is limited therefore needed study. The aims of this study were to assess the fish diversity, abundance, potency, and species status.

## Materials and Methods

Fishes were sampled from peatland waters in Central Kalimantan Province especially former area of 'One Million Hectares Peatland Project'. This areas categories as black water habitats with pH ranges 3.83 to 5.2 and water color from brownish to blackish. The surrounding areas consist of naturally peat swamp forest, secondary forest, rice field, rubber plantation, and fishermen settlement.

Eight sampling stations were set up for this

study, namely St.1 Sungai Purun (S 02°14.007 E 114° 41.778), St.2 Sungai Arai (S 01°57.665 E 114° 53.074), St.3 Sungai Mantangai (S 02°30.081 E 114° 31.369), St.4 Sebangau Hilir (S 02°56.867 E 113° 51.531), St.5 Sebangau Hulu (S 02°17.819 E 113° 54.291), St.6 Sungai Mengkutup (S 01°54.409 E 114° 09.129), St.7 Danau Pangen (S 02°14.821 E 113° 28.847), and St. 8 Sungai Bulan (S 02°38.117 E 113° 32.797) (Fig. 1). The number stations for fish sampling both rainy and dry season were 6 and 8, respectively.

Study begins interview with local people and fishermen, then continued sampling in the field. Fish sampling was be done using survey methods base on cath per unit of effort (CPUE). To obtain as much species as possible, both active and passive sampling gears were applied. Fish fauna were sampled using monofilament gill nets with different mesh sizes (1.0, 2.0, and 3.0 inches). Gill nets were placed at a suitable depth each stations along time 4 hours. Samples were also obtained using cast net with diameter 3 m and traditional fishing method locally known as 'anco' that lift net with operated along 1 hour each stations. Fish sampled counted both number species and number individuals each species of stations.

Fish specimens were collected and preserved in 10% formalin then put to Fish Laboratory, Research Center for Biology-LIPI Cibinong, West Java Province. Fish specimens were cleaned and soaked in water along 3-4 hours, then placed in 70% alcohols.

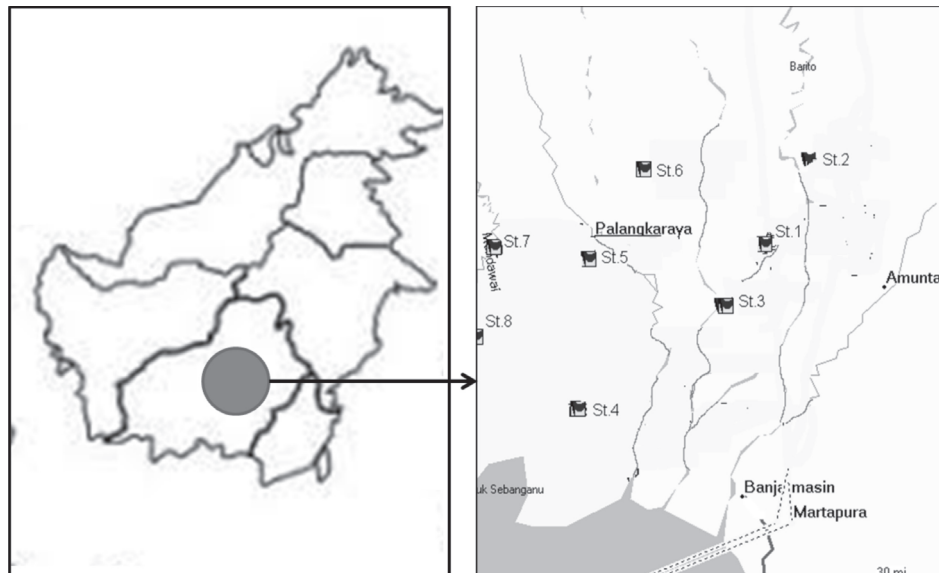


Fig. 1. Maps showing sampling stations at peatland areas in Central Kalimantan (Source: Modification based on GPS Garmin maps)

The specimens were positively identified in the laboratory using standard methods and taxon-specific and regional literature. Species name were identified using identification guide books (Allen, 1991; Kottelat *et al.*, 1993; Roberts, 1993; Axelrods *et al.*, 1995; Brittan, 2005). The valid name refer two literatures (Eschmeyer, 1998; Froese and Pauly, 2019). Data analysis about abundance of fish species calculated as follows:

$$\text{Abundance} = N_i / N_{\text{St}_i} \quad \dots (1)$$

Where,  $N_i$  = number individual of species- $i$ ;  
 $N_{\text{St}_i}$  = number station founded species- $i$

Species status refer to geographic distribution for endemic species and regulation for protected species.

## Results and Discussion

During study fish were collected in both rainy and dry season each 283 and 372 specimens, respectively. The species composition consists of 67 species belonging to 19 families (Table 1). Cyprinidae is dominant family with 28 species, following Siluridae and Bagridae each 7 and 6 species, respectively. Cyprinidae is dominant family because high-

est number of species and widest distributed in the world (Kottelat *et al.*, 1993). The number species of Cyprinidae reached 3,162 with distribution almost continentals except Australia (Froese and Pauly, 2019). Otherwise, 13 families in this area have 1 species. Cyprinidae, also dominant in others locations i.e. Rungan River (Silustiyarto *et al.*, 2007), Bukit Batu (Fahmi *et al.*, 2015), and Sebangau River (Thornton *et al.*, 2016).

The freshwater fishes in the present study most diverse compare with others areas in Central Kalimantan viz Raya lake that 27 species, Sababilah lake that 56 species, Ganting lake that 51 species, and Rungan River that 50 species (Silustiyarto *et al.*, 2007; Nurdawati *et al.*, 2007). Also compare with Sebangau River that recorded 27 species (Thornton *et al.*, 2016). Number fish specimen at rainy higher than dry season these are 372 individuals and 287 individuals, respectively. But, number species at rainy lower than dry season these are 39 and 55 species, respectively (Table 1). This case because at dry season, water level was decline then fish population focused and easy caught than rainy season.

The fish composition in this area almost categorize to primer division because can't tolerant to sa-

**Table 1.** Fish composition and abundance of Central Kalimantan peatland

Family (19)	Species (67)	Rainy			Dry		
		Ind.	St.	Abd.	Ind.	St.	Abd.
Notopteridae	<i>Chitala borneensis</i>	0	0	0.0	1	1	1.0
Cyprinidae	<i>Amblyrhynchichthys truncatus</i>	0	0	0.0	2	2	1.0
	<i>Anematichthys repasson</i>	0	0	0.0	1	1	1.0
	<i>Barbonymus schwanefeldii</i>	0	0	0.0	4	1	4.0
	<i>Brevibora dorsicellata</i>	0	0	0.0	2	2	1.0
	<i>Cyclocheilichthys apogon</i>	0	0	0.0	4	2	2.0
	<i>Cyclocheilichthys armatus</i>	0	0	0.0	20	1	20.0
	<i>Cyclocheilichthys jantochir</i>	0	0	0.0	1	1	1.0
	<i>Desmopuntius foerschi</i>	4	1	4.0	0	0	0.0
	<i>Desmopuntius rhomboocellatus</i>	13	2	6.5	15	1	15.0
	<i>Labiobarbus socellatus</i>	0	0	0.0	6	2	3.0
	<i>Leptobarbus hoevenii</i>	2	1	2.0	10	3	3.3
	<i>Luciosoma trinema</i>	3	1	3.0	2	2	1.0
	<i>Osteochilus vittatus</i>	0	0	0.0	1	1	1.0
	<i>Osteochilus kappeni</i>	0	0	0.0	1	1	1.0
	<i>Osteochilus kelabau</i>	0	0	0.0	2	2	1.0
	<i>Osteochilus triporos</i>	3	2	1.5	7	2	3.5
	<i>Osteochilus microcephalus</i>	1	1	1.0	2	1	2.0
	<i>Osteochilus spilurus</i>	42	2	21.0	0	0	0.0
	<i>Parachela oxygastroides</i>	0	0	0.0	7	2	3.5
	<i>Puntioplites waandersi</i>	8	1	8.0	0	0	0.0
<i>Rasbora caudimaculata</i>	0	0	0.0	1	1	1.0	
<i>Rasbora cephalotaenia</i>	47	4	11.8	9	3	3.0	

Table 1. Continued ...

Family (19)	Species (67)	Rainy			Dry		
		Ind.	St.	Abd.	Ind.	St.	Abd.
	<i>Rasbora einthovenii</i>	49	3	16.3	0	0	0.0
	<i>Rasbora lateristriata</i>	29	2	14.5	0	0	0.0
	<i>Rasbora tornieri</i>	0	0	0.0	11	2	5.5
	<i>Rasbora</i> sp.	15	2	7.5	0	0	0.0
	<i>Striuntius lineatus</i>	4	1	4.0	13	2	6.5
	<i>Thynnichthys polylepis</i>	0	0	0.0	3	1	3.0
Balitoridae	<i>Nemacheilus selangoricus</i>	2	1	2.0	2	1	2.0
	<i>Nemacheilus spiniferus</i>	10	1	10.0	0	0	0.0
Bagridae	<i>Bagrichthys micranodus</i>	0	0	0.0	1	1	1.0
	<i>Hemibagrus nemurus</i>	4	3	1.3	2	2	1.0
	<i>Mystus sabanus</i>	0	0	0.0	6	1	6.0
	<i>Mystus micracanthus</i>	2	1	2.0	2	1	2.0
	<i>Mystus nigriceps</i>	0	0	0.0	2	1	2.0
	<i>Leiocassis micropogon</i>	3	1	3.0	5	1	5.0
Clariidae	<i>Clarias meladerma</i>	0	0	0.0	3	2	1.5
	<i>Clarias nieuhofi</i>	0	0	0.0	1	1	1.0
	<i>Clarias</i> cf. <i>teijsmanni</i>	3	2	1.5	3	1	3.0
Pangasidae	<i>Pangasius</i> sp.	6	2	3.0	0	0	0.0
Siluridae	<i>Phalacrotonotus apogon</i>	0	0	0.0	2	1	2.0
	<i>Kryptopterus impok</i>	3	1	3.0	6	0	0.0
	<i>Kryptopterus macrocephalus</i>	0	0	0.0	13	3	4.3
	<i>Ompok hypophthalmus</i>	4	2	2.0	3	2	1.5
	<i>Ompok leiacanthus</i>	0	0	0.0	1	1	1.0
	<i>Silurichthys hasselti</i>	0	0	0.0	2	1	2.0
	<i>Wallago leeri</i>	3	1	3.0	1	1	1.0
Chacidae	<i>Chaca bankanensis</i>	0	0	0.0	2	1	2.0
Hemiramphidae	<i>Hemiramphodon pogognathus</i>	2	1	2.0	13	1	13.0
Chandidae	<i>Parambassis</i> sp.	0	0	0.0	1	1	1.0
Nandidae	<i>Nandus nebulosus</i>	2	1	2.0	4	2	2.0
Pristolepididae	<i>Pristolepis fasciata</i>	9	5	1.8	17	6	2.8
Eleotrididae	<i>Oxyeleotris marmorata</i>	2	1	2.0	1	1	1.0
Luciocephalidae	<i>Luciocephalus pulcher</i>	1	1	1.0	3	2	1.5
Helostomatidae	<i>Helostoma temmincki</i>	3	2	1.5	6	4	1.5
Anabantidae	<i>Anabas testudineus</i>	13	4	3.3	6	3	2.0
Belontiidae	<i>Belontia hasselti</i>	11	5	2.2	16	4	4.0
	<i>Betta</i> sp.	10	2	5.0	10	1	10.0
	<i>Trichopodus leerii</i>	6	2	3.0	3	1	3.0
	<i>Trichopodus pectoralis</i>	0	0	0.0	1	1	1.0
	<i>Trichopodus trichopterus</i>	22	3	7.3	12	4	3.0
Channidae	<i>Channa lucius</i>	18	3	6.0	8	3	2.7
	<i>Channa striata</i>	8	4	2.0	2	2	1.0
	<i>Channa micropeltes</i>	3	1	3.0	0	0	0.0
	<i>Channa pleuorpthalmus</i>	1	1	1.0	2	2	1.0
Mastacembelidae	<i>Mastacembelus unicolor</i>	1	1	1.0	0	0	0.0
	Number individu			372 ind.			287 ind.
	Number species			39 species			55 species

Note: Ind. = Individu; St.= Station; Abd = Abundance (ind./st.)

lity (Kottelat *et al.*, 1993). While, some families can tolerant to salinity viz. Hemirhamphidae, Chandidae and Nandidae. The fish composition

among stations that at rainy season ranges 8 to 16 species and at dry season 5 to 25 species (Figure 2). St. 7 (Danau Pangen) highest among station, this

location included upper Katingan basin and part of Antang Lake. This location also named 'Jalan Danau Pangen' because has function for boat traffic of fishermen to this lake. Condition of this lake has natural vegetation, pH ranges 4.58-4.70, dissolve oxygen ranges 3.89-4.19 ppm, and depth 2.9-4.8 m. These factors were suitable support to many fish species.

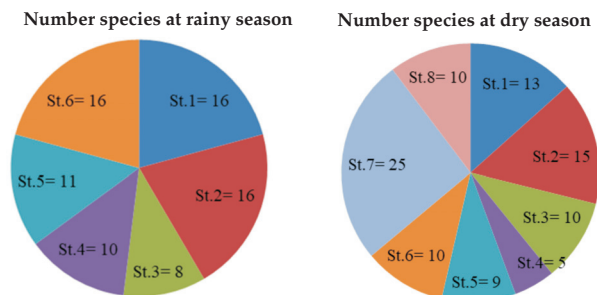


Fig. 2. Fish composition among stations both rainy and dry seasons

The ranges abundance among species are 1 to 21 ind./st. at rainy season and 1 to 20 ind./st. at dry season (Table 1). Species most abundant is *O. spilurus* at rainy season and *C. armatus* at dry season. This condition showed two species aboved most adapted and possibly faster in reproduction. The first species is smallest *Osteochilus* with standard length about 75 mm and maximal length 102 mm, also the smallest number of lateral line scales that 27-29 scales, no tubercles or pores on snout. A large black spot near the end of the caudal peduncle (Kottelat *et al.*, 1993). This species was common and abundant in creeks and small water bodies in the forest; distribution Sundaland (Froese and Pauly, 2019). The second species has middle size, maximal length 230 mm and common length 150 mm. Generally, only one pair of maxillary barbells present; a black spot at caudal base, rows of black spot along scale rows. Inhabits rivers during the dry season and migrates to floodplains to spawn during the rainy season. Reproduction takes place relatively late in the high-water season during September and October (Kottelat *et al.*, 1993; Froese and Pauly, 2019).

Based on potency, the fish of peatland in this areas grouped to 1) consume fish, 2) ornamental fish, and 3) both consume and ornamental fish. One of the most popular consume fish namely 'jelawat' (*L. hoevenii*). This species wide distributed in tropical from Thailand, Sumatra and Kalimantan; maximal

length 100 cm and weight 10 kg, but common length 50 cm. Found most often in freely flowing rivers and streams and seasonally on floodplains (Froese and Pauly, 2019). This species important food fish kept cages or caught in open waters. Its flesh expensive (Kottelat *et al.*, 1993). The ornamental fish commonly possess unique of body shape, color, or behavior (Axelrods *et al.*, 1995). Many species potential for ornamental fish including *Desmopuntius* spp. *S. lineatus*, *Rasbora* spp. and *Nemacheilus* spp. Finally, species potential both fish consume and ornamental fish among others *C. borneensis*, *C. jantochir*, *O. marmorata*, *S. hasselti*, and *C. pleurophthalmus*.

In the present study were founded 7 endemics fish of Kalimantan these are *C. jantochir*, *O. kelabau*, *D. foerschi*, *D. rhomboocelatus*, *N. spiniferus*, *B. micranodus*, and *M. sabanus*. Almost species in present study are indigenous species, and 1 species categorized to introduce species that *T. pectoralis*. Then, *Chitala borneensis* is protected species based on Indonesian regulation PP. No. 7/ 1999.

## Conclusion

The fish diversity in Central Kalimantan peatland areas consist of 67 species belonging to 19 families, and recorded 47 then totally 114 species. Cyprinidae is dominant family with 29 species. The most abundant species is *O. spilurus* at rainy season (21 ind./st.) and *C. armatus* at dry season (20 ind./st.). Species status were 7 endemics species, 1 protected species, and mostly indigenous species except *T. pectoralis*. Based on potency, mostly species in this areas potential for consume fish.

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