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IDENTIFICATION OF FISH SPECIES IN RIVER WATERS BENGALON, SANGATTA AND SURROUNDING AREAS IN KUTAI DISTRICT EAST KALIMANTAN PROVINCE

Identifikasi Jenis – jenis Ikan Perairan Umum Darat (PUD) Sungai Bengalon, Sangatta Dan Sekitarnya Di Kabupaten Kutai Timur Provinsi Kalimantan Timur

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ABSTRACT

The waters of the Bengalon River, Sangatta and surrounding areas are affected by community activities as well as coal mining and oil palm plantations. Fish are one of the aquatic biota affected by these activities. The unavailability of river fish species data is a particular concern in evaluating the condition of river waters. The availability of fish species data is considered important for decision-making considerations that will be applied in an area. As a sustainability effort, monitoring, identification and inventory of river fish in the East Kutai Regency area were carried out. This research was conducted in November 2021-May 2022 in Bengalon River, Sangatta and surrounding areas. Fish identification was carried out at the Hydroceanography Laboratory, Faculty of Fisheries and Marine Science, Mulawarman University. Fish data were analyzed descriptively. Based on the research data, rivers in East Kutai district are dominated by the Cyprinidae family. A total of 43 fish species were identified, 10 of which were marine fish species, generally fishes that live around estuaries (brackish water), including species that live in the sea.

Keywords: Cyprinidae, East Kutai, Fish, River

ABSTRAK

Sungai Bengalon, Sangatta dan sekitarnya terpengaruh oleh aktivitas masyarakat serta pertambangan batu bara dan perkebunan kelapa sawit. Ikan merupakan salah satu biota akuatik

yang terdampak kegiatan tersebut. Tidak tersedianya data spesies ikan sungai menjadi perhatian khusus dalam mengevaluasi kondisi perairan sungai. Ketersediaan data spesies ikan dianggap penting untuk pertimbangan pengambilan keputusan yang akan diberlakukan di suatu wilayah. Sebagai upaya keberlanjutan, maka dilakukan monitoring, identifikasi dan inventarisasi ikan sungai di wilayah Kabupaten Kutai Timur. Penelitian ini dilakukan pada bulan November 2021-Mei 2022 di Sungai Bengalon, Sangatta dan sekitarnya. Identifikasi ikan dilakukan di laboratorium Hidrooseanografi Fakultas Perikanan dan Ilmu Kelautan, Universitas Mulawarman. Data ikan dianalisis secara deskriptif. Berdasarkan data hasil penelitian, sungai di kabupaten Kutai Timur didominasi oleh famili *Cyprinidae*. Sebanyak 43 spesies ikan yang teridentifikasi, 10 spesies diantaranya adalah spesies ikan laut, umumnya ikan-ikan yang hidup di sekitar muara (air payau), termasuk spesies yang hidup di laut.

Kata Kunci: Cyprinidae, Ikan, Kutai Timur, Sungai

INTRODUCTION

Ecosystem stability and sustainability are the main focus in the discussion of ecology. In the process of biological systems, portfolio effects occur in ecosystems (Schindler *et al.*, 2015). Diverse populations experience interrelated dynamics in dealing with environmental changes (Moore *et al.*, 2010). Anthropogenic activities affect river ecosystems, namely the forestry, agriculture, mining and industrial sectors (Akhtar *et al.*, 2021; Adam *et al.*, 2018). Rivers contain various complex habitats in them, and depend on the shape of the landscape to filter anthropogenic influences on the ecosystem (Brennan *et al.*, 2019).

The health of the river environment depends on the ecological properties of the terrestrial environment such as land use (Mamun *et al.*, 2022). In addition, physical factors of the river environment such as speed, height, dissolved oxygen, and substrate affect the community structure and patterns of fish diversity (Riofrío *et al.*, 2022; Hu *et al.*, 2019). The dynamics of climate change are thought to be faster than the ability of fish species to adapt to their environment (Radinger *et al.*, 2017; Olden *et al.*, 2010; Hilborn *et al.*, 2003). The abundance of fish species diversity is an indicator of the health of river ecosystems (Olaya *et al.*, 2012). The impact of human activities causes phenotypic changes that affect population dynamics and fish species diversity (Kern *et al.*, 2019). River fish experience a shift in habitat distribution due to anthropogenic sources entering the aquatic ecosystem (Radinger *et al.*, 2017; Castello *et al.*, 2016). This has an impact on the biodiversity of native species being degraded (Kartamihardja, 2019). The importance of maintaining the diversity of aquatic populations is an important factor in stabilizing environmental ecosystems (Schindler *et al.*, 2010; Moore *et al.*, 2010).

In the various cases described above, fish are the aquatic population affected. There are coal mining areas and palm oil plantation industrial areas. Both industries intersect with the Bengalon River, Sangatta River, and surrounding rivers which of course can affect aquatic biota such as fish. The unavailability of river fish species data is a special concern in evaluating river water conditions. The availability of fish species data is considered important for decision-making considerations that will be implemented in an area. As an effort for sustainability, monitoring, identification and inventory of river fish are carried out in the East Kutai Regency area.

RESEARCH METHODS

Time and Place of Reasearch

The research was conducted in Kutai Timur Regency, East Kalimantan, from November 2021 to May 2022. There were 20 sampling points for the research. The

distribution of sampling locations (points) based on the geographical coordinates of fishing during the research in the Sangatta River, Bengalon River and its surroundings is presented in Figure 1. Fish identification was carried out in the Hydroceneography Laboratory, Faculty of Fisheries and Marine Sciences, Mulawarman University, Samarinda.

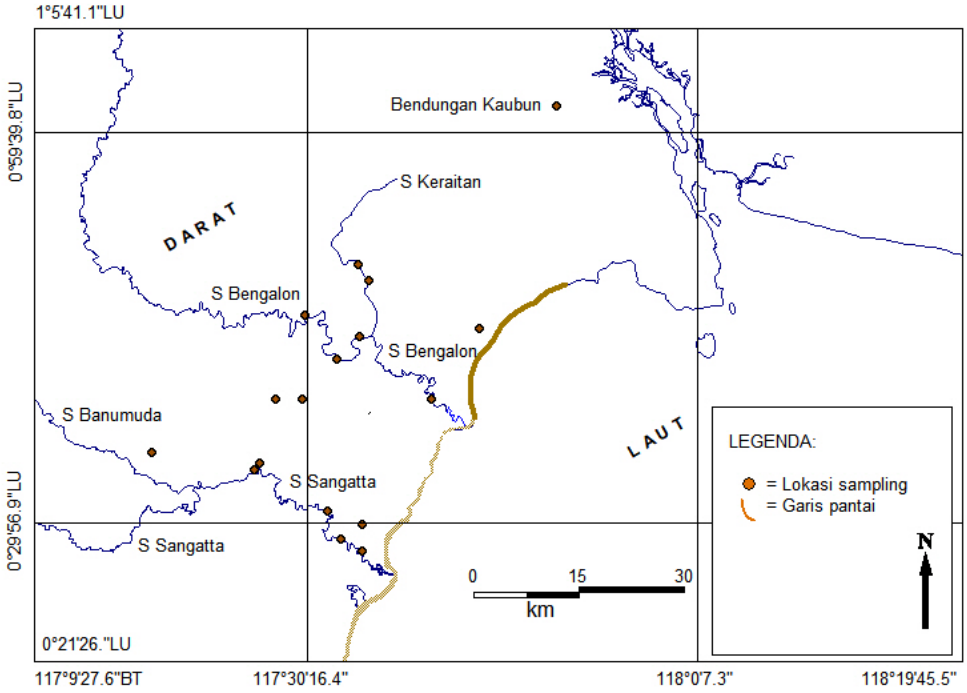

Figure 1. Geographical distribution of fishing sampling locations (points) in the Bengalon River, Sangatta River and surrounding areas, East Kutai district.

The location of the research and sampling of fish capture was carried out from the estuary to the upstream of Sangatta River and Bengalon River and around the two rivers, including the estuary of Kenyamukan River, Pinang River and Mahoni Bengalon River. The sampling points and traditional fishing gear used in this study are presented in Table 1. In this study, shrimp gillnets (long-tailed gillnets, trammel nets) were also used because they have better ability to catch fish or shrimp (Park & Kim, 2004)

Table 1. Sampling locations (points) and fishing gear used in the research in the Sangatta River, Kenyamukan River estuary, Pinang River estuary and Mahoni Bengalon River.

No	Name of sampling location (point)	Fishing gear				
		Fishing	Traps	Nets	Gill net	Trammel net
1	WQ 11 kamp kajang, Sangatta River	√	-	√	√	√
2	WQ 10 old sangatta market, Sangat River	-	-	√	-	√
3	MWQ 01 estuary Murung River, Sangatta River	√	-	√	-	√
4	WQ 08 Estuary of Bendili River, Sangatta River	√	-	√	√	√
5	SSH-WQ 09B upstream, Sangatta River	√	-	√	√	√
6	BWQ 47 estuary of Pinang River	√	-	√	-	√
7	SHM Mahoni River	√	√	√	-	√
8	SBT Benu Tua River	√	-	√	-	√
9	BWQ 02 Bengalon River	√	√	√	-	√
10	TBN Bengalon River	√	√	√	√	√
11	BWQ 10 Bengalon River	√	-	-	√	√
12	MSRG Bengalon River	√	√	-	√	√
13	BWQ 08 Sekurau Atas River	√	√	-	-	√
14	BWQ 11Segading River	√	√	√	√	√
15	Bendungan Kaubun	√	√	√	-	√
16	SITE 5 muara S Kellu Lembak	-	√	√	-	√
17	BWQ 05 Lembak	√	-	-	-	√
18	HD	√	-	-	-	√
19	MSPD	√	-	√	-	√
20	SKM S Kenyamukan, S Sangatta	√	-	√	-	√

Note: √ = used; - = not used

Tools and Materials

During the research, the tools and materials used were:

1. Land vehicles
2. Dongfeng motorboat
3. Coolfix camera
4. GPS (global positioning system)
5. Fish gill net
6. Shrimp gill net (trammel net)
7. Cash net
8. Fishing rod (hook and line)
9. Bubu
10. Scoop
11. Bucket
12. Coolbox
13. Plastic clip
14. Samples of caught fish

Data analysis

The geographical coordinates of fishing sampling points were determined and recorded using Garmin GPSMAP 160 s, the coordinates were plotted and mapped with MapInfo Pro 16.0, the sample fish were photographed using a Coolpix camera. Fish data were analyzed using the Shannon winner_H, Sympson_D, Evenness_e and Margalef_R indices and calculated with the help of PAST (PAlaeontological STatistics) version 4 software to determine the community structure. Identification of fish species was carried out based on morphological observations. Identification of fish species refers to various references including research reports and scientific publications such as Suyatna et al., (2022), Suyatna *et al.*, (2021), Maidie (2020), FishBase (2018), Suyatna *et al.*, (2017[a]), Suyatna *et al.*, (2017[b]), Suyatna *et al.*, (2010), Kottelat & Whitten (1996).

RESULT

The wide distribution of fish based on the number of sampling points where the fish were found can be seen in Table 2. In the table, the Seluang and Salap fish are the most widely distributed, while the Baung, Hampala and Puyau fish are each at 10 points, while the marine fish that is widely distributed in fresh water (rivers) is the Bulan-bulan fish, found at 13 points.

Table 2. Distribution of fish species based on fishing sampling locations (points) in the Sangatta, Bengalon and surrounding rivers.

No	Nama ikan	Lokasi/titik sampling																				Jml
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	ind
1	Salap a (15)	-	-	√	√	√	√	-	√	√	√	√	√	-	√	√	√	√	√	√	-	303
2	Salap b (11)	-	-	-	-	-	-	√	√	√	√	√	√	-	√	√	√	√	-	√	-	122
3	Baung (10)	-	-	-	-	√	√	√	-	-	√	-	-	√	-	√	√	√	√	√	-	25
4	Baung muara (9)	-	√	-	-	-	-	-	-	√	√	√	-	-	-	-	√	√	√	√	√	109
5	Baung kuning (2)	-	-	-	√	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
6	Puyau (5)	-	-	-	√	√	√	√	√	-	-	-	-	-	√	-	-	-	-	-	-	171
7	Puyau a (10)	-	-	-	-	-	-	-	-	√	√	√	√	√	-	√	√	√	√	√	-	402
8	Puyau b (11)	-	-	-	-	-	√	√	√	√	√	√	√	-	√	-	√	-	√	√	-	1
9	Seluang (16)	-	√	-	√	√	√	√	√	√	√	-	√	√	√	√	√	√	√	√	-	111
10	Hampala (10)	-	-	√	√	√	√	-	√		-	-	√	-	√	-	-	√	√	-	-	23
11	Buin (2)	-	-	-	√	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	22
12	Buin a (3)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	√	√	-	-	9
13	Wader (1)	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	1
14	Lalang (2)	-	-	-	-	-	-	√	-	-	-	-	-	-	√	-	-	-	-	-	-	10
15	Patin (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	1
16	Sidat (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	1
17	Parangparang (1)	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-	1
18	Lele keli (3)	-	-	-	-	-	-	√	√	-	-	-	-	-	√	-	-	-	-	-	-	8
19	Lele keli a (1)	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-	1
20	Lepok (5)	-	-	-	-	-	-	√	-	-	-	√	-	-	√	-	-	√	-	√	-	9
21	Lais (7)	-	-	-	-	-	-	-	-	√	√	√	√	-	-	-	-	√	√	√	-	91
22	Sepat jawa (3)	-	-	-	-	-	√	√	-	-	-	-	-	-	-	√	-	-	-	-	-	20
23	Pepuyu (4)	-	-	-	-	-	√	√	√	-	-	-	-	-	-	-	-	-	-	-	√	22
24	Biawan (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	-	3
25	Otek (2)	√	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	-	-	-	11
26	Otek a (1)	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	137

27	Otek b (5)	√	√	√	-	-	-	-	-	-	√	-	-	-	-	-	-	-	-	√	-	2
28	Betutu (3)	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	√	√	-	4
29	Betutu b (1)	-	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
30	Gabus (5)	-	-	-	-	-	√	√	-	-	-	-	-	-	-	√	-	-	-	√	√	14
31	Gobi b (4)	√	√	-	-	-	-	-	-	-	√	-	-	√	-	-	-	-	-	-		6
32	Gobi a (4)	-	-	√	-	-	√	-	-	√	√	-	-	-	-	-	-	-	-	-	-	3
33	Gobi hitam (1)	-	-	-	-	-	-	-	-	-	-	-	-	√		-	-	-	-	-	-	3
34	Sumpit (4)	-	-	√	√	√	√	-	-	-	-	-	-	-	-	-	-	-	-			7
35	Gulamah (2)	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	6
36	Belanak (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	√	1
37	Lidah (1)	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
38	Kaca a (1)	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
39	Kaca b (3)	√	√	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28
40	Bulan bulan (13)	√	√	√	√	-	-	-	-	√	√	-	√	√	-	-	√	√	√	√	√	50
41	Kakap putih (1)	-	-	-	-	-	-	-	-	-	-	-	-	√	-	-	-	-	-	-	-	1
42	Trakulu (1)	-	-	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
43	Teri (1)	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
																					1750	

Description: √= caught, - = not caught, the numbers in the second column show the number of distributions based on sampling points.

Taxonomically, of the 43 species identified, 10 species of marine fish come from the Actinopterygii class: (1) order Cypriniformes: family Cyprinidae with 12 species, (2) order Siluriformes consisting of family Bagridae 3 species, family Ariidae 3 species, family Clariidae 2 species, family Pangasidae 1 species and family Siluridae 2 species, (3) order Anguilliformes: family Anguillidae 1 species, (4) order Anabantiformes: family Osphronemidae 1 species, family Anabantidae 1 species, family Helostomatidae 1 species, family Channidae 1 species, (5) order Gobiiformes: family Butidae 1 species, family Eleotridae 1 species, family Gobiidae 3 species, (6) order Perciformes: family Toxotidae 1 species, family Sciaenidae 1 species, family Ambassidae/ Chandidae 1 species, family Lutjanidae 1 species, family Carangidae 1 species, (7) order Mugiliformes: family Mugilidae 1 species, (8) order Pleuronectiformes family Cynoglossidae 1 species, (9) order Elopiformes: family Megalopidae 1 species, (10) order Clupeiformes: family Engraulidae 1 species.

In general, the length and weight of fish from all research samples can be seen in Figure 2. The largest fish size is in the range of 10 to 20 cm in length and weighs between 25 to 100 gr, only the largest eel (*Anguilla* sp) with a length of 46.5 cm and a weight of 920 gr. To determine the structure of fish communities in the rivers of East Kutai Regency using the species diversity approach, all data on the number of individual fish species at each location/sampling point were calculated using the Shannon winner_h, Evenness_e^H/S, Equitability_j and Margalef richness_r indices and the results are presented in Table 3 and Figure 3-6. The species and number of individual fish at each sampling point can be seen in Figure 7.

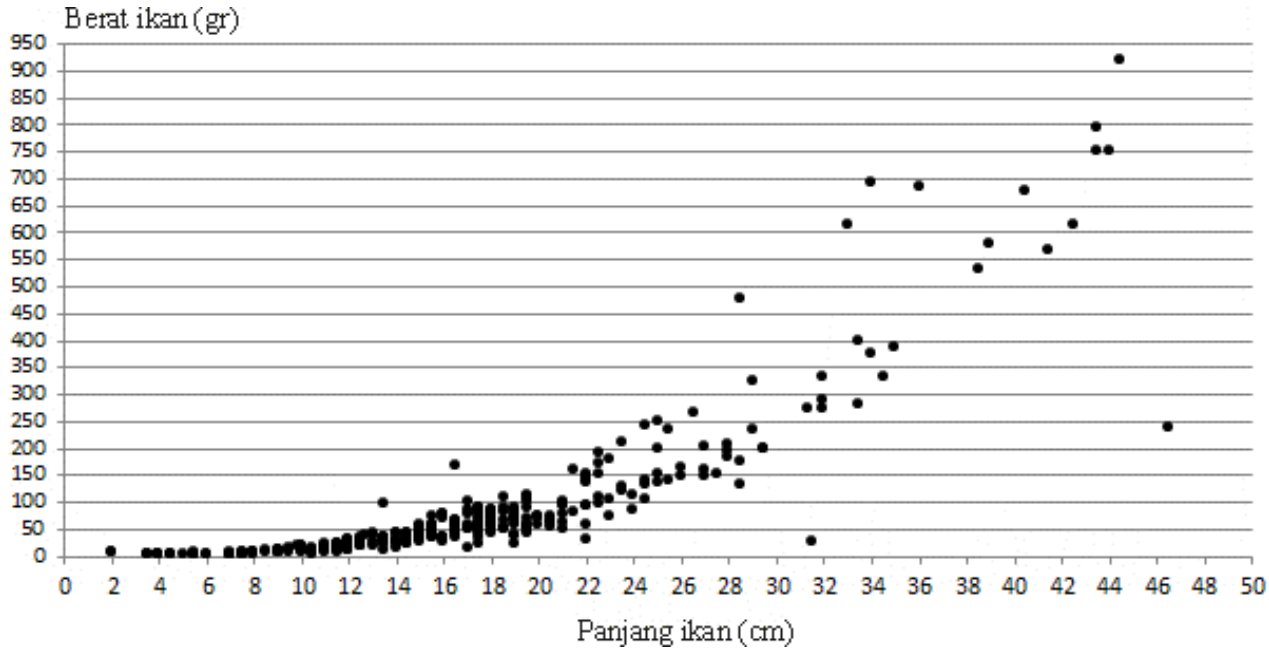

Figure 2. Fish size of all samples caught at all sampling locations (points) during the study (n=1750ind).

Table 3. Fish diversity index per sampling location (point) during the survey conducted in East Kutai district.

	Taxa_s	Jml ind	Shann_h	Domin_d	Evenn_e^h/s	Equitab_j	Margalef_r
WQ 11	10	47	2,004	0,169	0,742	0,870	2,338
WQ 10	7	76	1,032	0,487	0,401	0,530	1,385
MWQ 01	7	76	1,032	0,487	0,401	0,530	1,385
WQ 08	8	77	1,424	0,314	0,519	0,685	1,611
SSH-WQ 09B	8	48	1,629	0,291	0,638	0,784	1,808
SKM	5	73	0,575	0,750	0,355	0,357	0,932
BWQ 47	11	95	1,895	0,178	0,605	0,790	2,196
SHM	12	80	2,147	0,145	0,713	0,864	2,51
SBT	10	58	1,609	0,284	0,500	0,699	2,217
BWQ 02	10	105	1,669	0,283	0,531	0,725	1,934
TBN	14	80	2,254	0,132	0,681	0,854	2,967
BWQ 10	7	70	1,783	0,180	0,849	0,916	1,412
MSRG	10	70	1,723	0,239	0,560	0,748	2,118
BWQ 08	8	20	1,677	0,260	0,669	0,807	2,337
BWQ 11	10	37	1,833	0,207	0,625	0,796	2,492
Bend Kaubun	7	181	0,792	0,566	0,315	0,407	1,154
SITE 5	9	197	1,14	0,442	0,347	0,519	1,514
BWQ 05	12	66	2,143	0,141	0,710	0,862	2,626
HD	13	91	1,979	0,196	0,556	0,771	2,660
MSPD	15	256	2,029	0,174	0,507	0,749	2,525

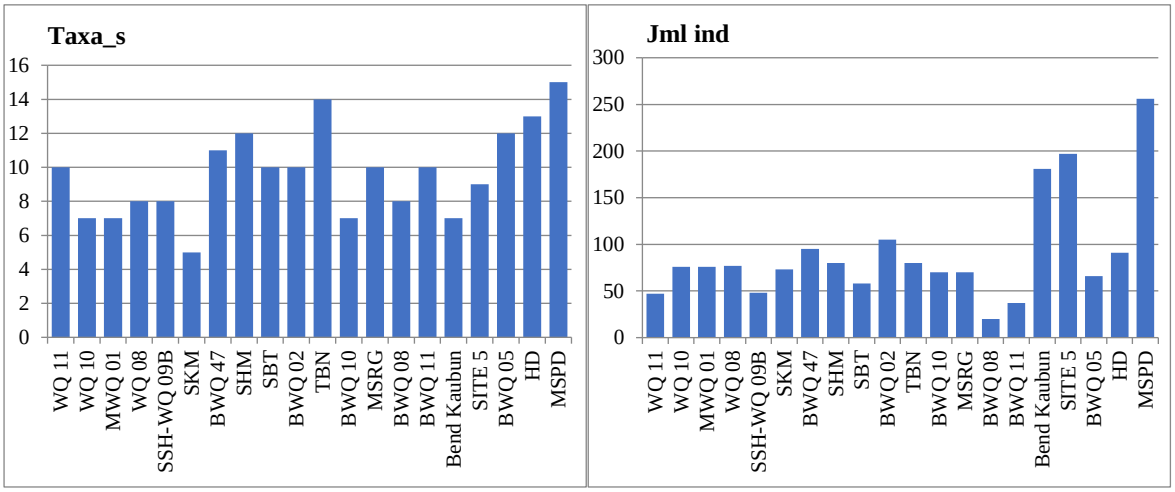

Figure 3. Number of taxa (left) and number of individual fish found at each sampling location (point) in the Bengalon River, Sangatta and surrounding areas, East Kutai district.

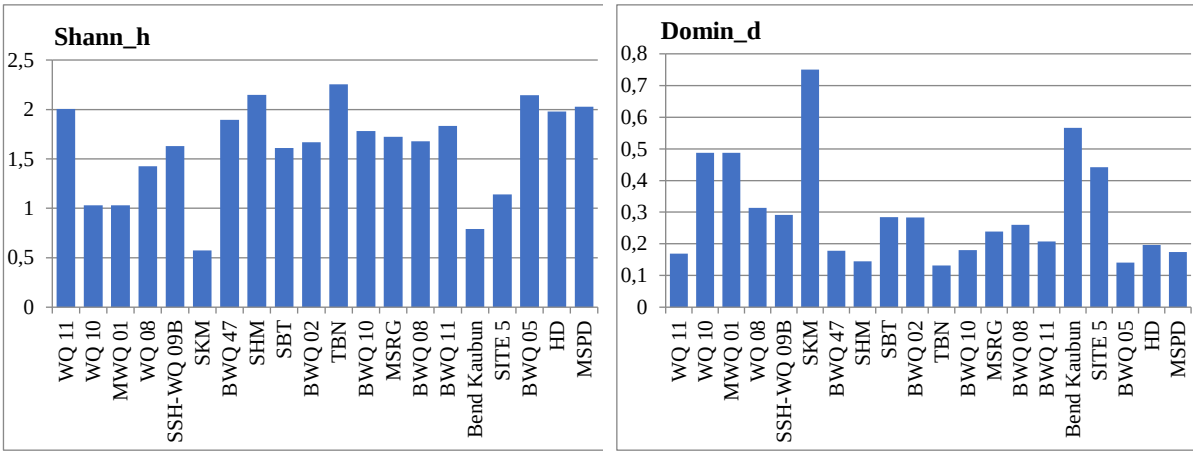

Figure 4. Dominance index_d (left) and Shannon winner_h at each sampling location (point) in the Bengalon River, Sangatta and surrounding areas, East Kutai district.

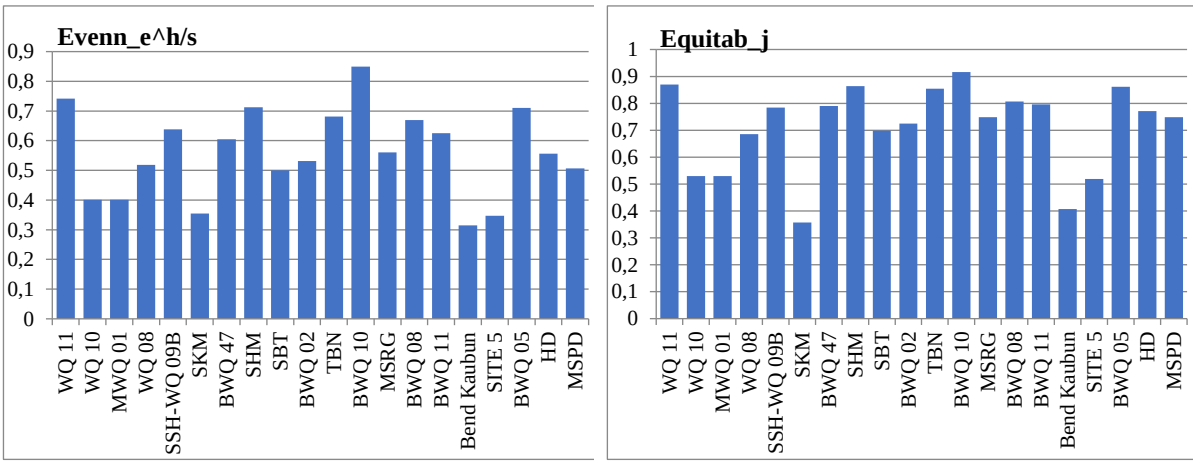

Figure 5. Evenness E (left) and Equitability J indices at each sampling location (point) in the Bengalon River, Sangatta and surrounding areas, East Kutai district.

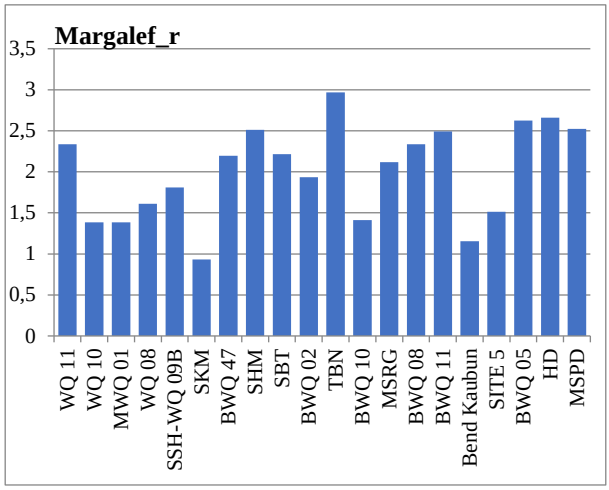

Figure 6. Margalef R index at each sampling point (location) at each sampling location (point) in the Bengalon River, Sangatta and surrounding areas, East Kutai district.

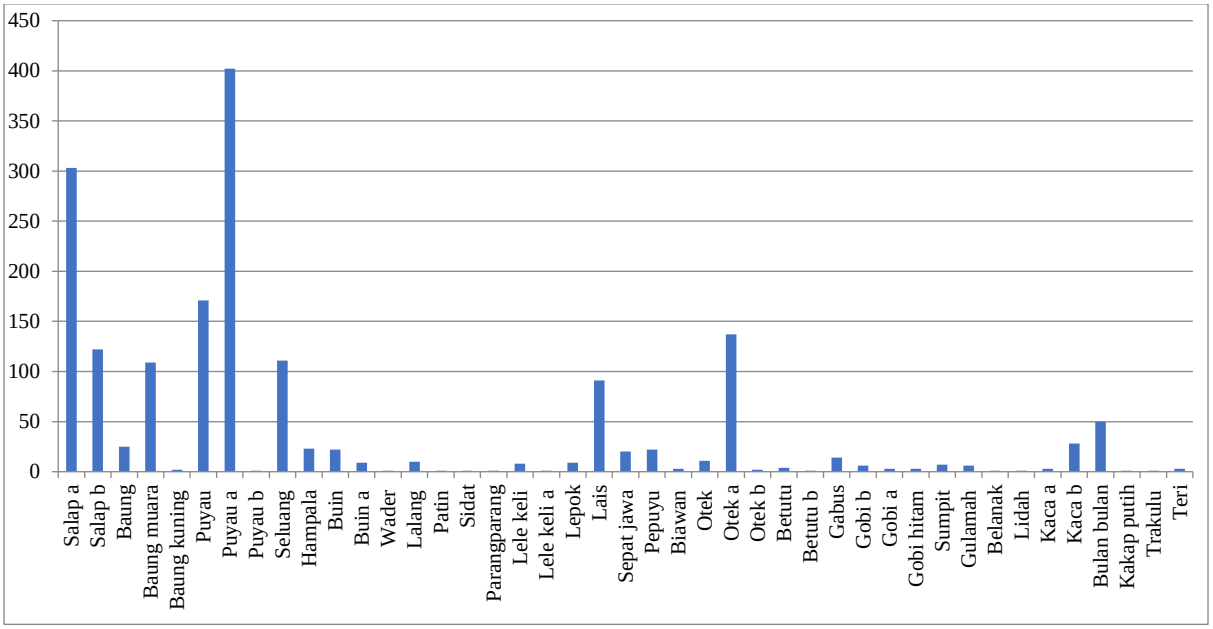

Figure 7. Fish species (x-axis) and number of individuals (y-axis) at each sampling location (point) in the Bengalon River, Sangatta and its surroundings, East Kutai Regency (n= 1750).

Table 4. Diversity index value of the total number of individuals of each species for all sampling locations (points) in the Bengalon River, Sangatta and its surroundings during the study in East Kutai Regency.

	Taxa_S	43
	Individuals	1750
No	Diversity	Nilai indeks
1	Dominance_D (dominance)	0.1161
2	Shannon_H (diversity)	2.573
3	Evenness_e^H/S (equality)	0.3047
4	Equitability_J (equality)	0.684
5	Margalef (species richness)	5.624

Source: Processed primary data (2022)

DISCUSSION

Based on the diversity index values of fish caught at all sampling points/locations in East Kutai, it shows that the population size for each fish species (Shannon index), dominance (dominance index), and fish uniformity (Equitability index) are at a moderate level, while for the Margalef index or species richness, the index value according to Wahyuningsih *et al.*, (2019) shows a relatively high level of species richness.

Cyprinidae is the largest fish family of all freshwater fish families, at least 2000 family members are known to represent 10% of fish species from all fish species in the world or around 25% of freshwater fish species. This group of fish is known as Cyprinids (Cyprinids) which are stenohaline so they are unable to adapt to salty or brackish waters, even if they can, they cannot reproduce (Mekong Fisheries Network Newsletter, 1998). Catfish, Baung and Manyung are known or termed catfishes. In each country generally has its own family, the catfish family in South America Pimelodidae, in Africa and Asia Bagridae, in Europe and Asia Siluridae, and in Australia, Papua New Guinea and on the continental land of tropical areas to the temperate zone is Ariidae; there are as many as 37 families with 3,407 species (Armbruster, 2011).

Otek fish is also called Keting, Senggiringan, Lundu and others (*Mystus* sp, *Macrones* sp), Baung (*Arius* sp) and fish that have whiskers (*moustaches*) including Lele fish (*Clarias* sp) are included in the name of Cat fish or catfishes. Lele fish is a group of catfishes family Clariidae, this group of fish is called air-breathing catfishes because they are able to breathe using direct air or walking catfishes because they are able to crawl or walk, generally found in Africa and Asia including in Indonesia, among others in Kalimantan (Borneo). For fish species from river habitats, among others are Betutu (*Eleotris melanosoma*), Seluang (*Rasbora argyrotaenia*), Hampala (*Hampala macrolepidota*), Salap (*Barbonymus schwanenfeldii*), Puyau fish (*Osteochilus vittatus*), Buin fish (*Cyclocheilichthys armatus*), Nilem fish (Labiobarbus leptocheilus), Baung (Hemibagrus nemurus), Snakehead fish (*Channa striata*), Javanese Sepat fish (*Trichopodus trichopterus*), Lepok fish (*Ompok bimaculatus*), Puyu/pepuyu fish (*Anabas testudineus*), Keli catfish (*Clarias batrachus*) and others, for those living in estuary habitats, among others are Bulan-bulan fish (*Megalops cyprinoides*), Kaca fish (*Ambassis interrupta*), Gulamah (*Jhonius coitor*), Sumpit fish (*Toxotes jaculatrix*), and from the habitat sea, namely White fish or Trakulu (*Caranx papuensis*).

River fish found in the Sangatta River, at the mouth of the Kenyamukan River, the mouth of the Pinang River, and the Mahoni Bengalon River are also found in Lake Semayang, Lake Melintang and the Black River (peat waters in Kutai Kartanegara Regency; as well as fish originating from estuary habitats, are also found in these waters (Suyatna *et al.*, 2017), while fish originating from estuary habitats found in the Sangatta River, at the mouth of the Kenyamukan River, the mouth of the Pinang River, and the Mahoni Bengalon River are found on the coast of the Mahakam Delta estuary (Suyatna *et al.*, 2010). The general problem of river fish is facing many threats both from the influence of settlements and industry which cause habitat degradation. In addition, flooding can also cause plants and trees that are rich in food to be lost even though they are barriers to erosion and abrasion of cliffs and riverbanks (Pusey & Arthington, 2003).

Changes in riverbank conditions, hydrological changes, climate change, high levels of fish utilization and the presence of invasive fish are factors that prevent fish from migrating to rivers. Fish migration or also known as fish migration is the movement of fish from one place to another on a certain path and regular time (Metcalfe *et al.*, 2002). Migration can be done from sea to land and vice versa in the sea only or in fresh water only, this behavior has various purposes, some fish species migrate long distances of more than 300 km to spawn (Jennings & Zigler, 2009). These factors can cause many fish taxa on earth to be threatened and the river itself is a lotic ecosystem, supplied by various small rivers that collectively form a catchment

basin (Hynes, 1970; Dynesius & Nilsson, 1994). In this world, about 77% of rivers have changed, (Holmlund & Hammer 1999).

Sangatta and Bengalon rivers and other rivers around them have the same function as described above and also face the same problems. Therefore, attention to the river and the fish that live in it must be a shared task, especially for parties who have activities around it that can be a source of impact, so it is expected to continue to update through research whose results can be used as considerations in determining policies or decision-making related to the use of the river and all its aspects.

CONCLUSION

Based on the research data, the rivers in East Kutai Regency are dominated by the Cyprinidae family. A total of 43 fish species were identified, 10 of which are marine fish species, generally fish that live around the estuary (brackish water), including species that live in the sea. In order to identify more fish species, research should be conducted throughout the year.

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