Ichthyofauna in coal mining area of Mifa Bersaudara Company, Aceh Barat District, Indonesia

F M Nur¹, A S Batubara², M Abdan², M Syukran², Z A Muchlisin²*

¹Master Program in Biology, Faculty of Mathematics and Natural Sciences, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia
²Department of Aquaculture, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh 23111, Indonesia

*Email: muchlisinza@unsyiah.ac.id

Abstract. Mifa Bersaudara Company (PT. Mifa Bersaudara) is one of the mining company operated in Aceh Barat District, Indonesia. Several small rivers and peat swamps are present in the concession area of the company. These waters have potency on fisheries; however, presently, there was no data on the ichthyofauna in the concession area of this company. Hence, the objective of the present study was to inventory the ichthyofauna in the small rivers and swamps around the concession area of PT. Mifa Bersaudara as a baseline data for monitoring program in the future. The sampling was done from 28 to 29 January 2019 at 12 sampling sites. The fish sample was caught using the casting net and fish trap from 06.00 AM to 5.00 PM. A total of 659 individual of fishes were sampled during the survey, it belongs to 7 orders, 11 families, 17 genera and 23 species. Cyprinidae and Rasbora argyrotaenia are the predominant family and species, respectively. One species of alien fish Oreochromis niloticus was recorded during the study.

1. Introduction

Sumatra is the second largest island after Kalimantan in Indonesia. Wargasasmita[1] was recorded 589 species of freshwater fish in Sumatra, of these 58 species are endemic and 14 species are endangered. However, it is estimated that there are still many other species that have not been discovered in Sumatra, this may be due to the lack of study and exploration in this region [2].

Sumatra Island is divided into 10 provinces, and Aceh is one of the biggest provinces in Sumatra. Aceh Province is known to have a high diversity of freshwater fish, for example, Hadiaty[3] was recorded 64 species, 36 families of in Ketambe and Suak Belimbing, Leuser Ecosystem. Nasution[4] reported 30 species, 27 families in Aceh Besar, Mardiati[5] recorded 23 species and 19 families in the Kluet River in South Aceh and Muchlisin et.al. [6] reported that there were 73 species and 34 families in the Tripa peat swamp. A comprehensive study of fish biodiversity in Aceh was reported by Muchlisin and Azizah[7], they have recorded 114 species, 69 genera, 41 families and 12 orders of freshwater fish from several regions in Aceh. The fish that are reported besides being potential for consumption fish, also have the potential as ornamental fish [8].
Aceh Barat is one of the districts in Aceh Province, here operates the PT. Mifa Bersaudara company engaged in coal mining. PT. Mifa Bersaudara has a concession area of 3,134 hectares [9], wherein the area there are present several tributaries and swamp that have potential in fish species. Presently, there was no data on fish diversity in this concession area, this data is essential as a bioindicator of waters health [10] and baseline data for monitoring the environmental impacts.

In general, studies on fish diversity in Aceh Barat district is scare. To date, the study was focusing only on the Meurebo River[7, 11-13], this river is one of the main rivers in Aceh Barat. However, information on fish biodiversity from small creeks and tributaries, especially in the concession area of PT. Mifa Bersaudara was not available. Therefore, this paper reports the fish fauna from this area as basic information for environmental monitoring and to plan the conservation strategy in the future.

2. Materials and Methods

2.1 Location and time

The sampling was done from 28 to 29 January 2019 at five locations and 12 sampling sites. The fish sample was caught using the casting net and fish trap from 06.00 AM to 5.00 PM. The coordinate of each location was presented in Table 1.

| No. | Location       | Coordinate                                      |
|-----|----------------|-------------------------------------------------|
| 1.  | Krueng Bale    | 04° 11.729’ N / 096° 14.145'E                   |
|     |                | 04° 11.943’ N / 096° 13.005'E                   |
|     |                | 04° 11.694’ N / 096° 12.839'E                   |
|     |                | 04° 11.681’ N / 096° 12.761’ E                  |
| 2.  | Sumber Batu    | 04° 10.610’ N / 096° 15.822’ E                  |
| 3.  | Buloh          | 04° 10.380’ N / 096° 15.794’ E                  |
|     |                | 04° 08.419’ N / 096° 14.196’ E                  |
| 4.  | KruengToejoh   | 04° 10.214’ N / 096° 14.564’ E                  |
|     |                | 04° 10.449’ N / 096° 10.162’ E                  |
|     |                | 04° 10.603’ N / 096° 10.259’ E                  |
|     |                | 04° 10.825’ N / 096° 10.344’ E                  |
| 5.  | Peunaga Cut Ujung | 04° 06.601’ N / 096° 11.593’ E              |

2.2 Sampling procedure and taxonomic identification

The sampling location was determined purposively at in location that is suspected of being fish and accessible. The casting and trap were operated randomly in the waters. The representative of collected species was taken and photographed before preserving in 10% formalin then transported to Laboratory of Ichthyology, Syiah Kuala University for further analysis. The fish samples were identified based on Kottelat et al. [12] and Nelson et al. [14].

2.3 Data analysis

The data were presented in tables and graphs then analysed descriptively by comparing the data with previous studies and other relevant reports.
3. Results and Discussions

A total of 659 fish samples were caught during sampling, it belongs to 22 species, 17 genera, 11 families, and seven orders (Table 2 and Table 3). Cyprinidae is a predominant family in this region (Table 3 and Figure 2). According to Kotellat et al. [12], Cyprinidae is the largest family of freshwater fish in the world, including in Indonesia [7, 15-20]. Rasbora argyrotaenia and Cyclocheilichthys armatus are the most abundant species of fishes in the concession area of PT. Mifa Bersaudara, these species are commonly found in Krueng Bale and Sumber Batu villages, respectively. The Puntius binotatus was distributed widely with the frequency of incidence of 60%.

One alien fish species O. niloticus was recorded in Krueng Bale, this species may originate from larvae released un-attentionally from the aquaculture pond during flooding. However, the number of alien fish species in the concession area of PT. Mifa Bersaudara was lower than other regions in Aceh that have been reported previously, for example in Danau Laut Tawar, 6 species [21], three species in the Tripa peat swamp [6], 2 species in Lake Lauik Tawar, Simuelue island [22], 7 species in Krueng Aceh River [17, 21]. Therefore in general the waters in this region are still quite safe from invasion of alien fish species, this condition must be maintained by controlling the spread of existing invasive fish and prohibiting the introduction of other alien fish species into this region. Several scientists have reported the negative impact of the alien species on the native species, for example, the predation [23], competition on feeding and habitat [24] and diseases transmission [25].

Several species of the fish found in this area have potency as the target for aquaculture, for example C. lucius, C. striata, A. testudineus, C. teijsmanni, C. apogon, C. armatus, C. heteronema, K. limpok, L. kuhlii, H. spilopterus, O. niloticus, O. vittatus, P. binotatus, P. brevis, T. trichopterus, while A. miops, B. imbellis, S. gymnopomus, L. macrolepis, R. argyrotaenia, R. lateristriata have potency as ornamental fish.

Table 2. Ordo, Family, Genus, and species offishes in Coal Mining Area of Mifa Bersaudara Company

| Order      | Family          | Species           | Location | Total ind. | Foi (%) |
|------------|-----------------|-------------------|----------|------------|---------|
| Perciformes| Ambassidae      | Ambassismiops     | KB L     | 4          | 20      |
|            | Belontidae      | Bettaimbellis     | SB       | 1          | 20      |
| Anabantiformes| Belontidae    | Trichopodustrichopterus | 9 SB | 20 |
| Anabantidae| Anabastestudineus| -                 | B       | 1          | 20      |
| Chanidae   | Channalucius    | -                  | K       | 1          | 20      |
|            | Channasstriata | -                  | T       | 3          | 40      |
| Siluriformes| Clariidae      | Clariasteijsmanni | SB       | 2          | 20      |
| Siluridae  | Kryptopteruslimpok | -               | PC      | 10         | 40      |
|                | Order          | Family   | Genera | Species |
|----------------|----------------|----------|--------|---------|
| Bagridae       | Hemibagrusnemurus | - 8 - - - | 8      | 20      |
| Cypriniformes  | Cyprinidae     | Cyclocheilichthys apogon | 5 - - - - | 5 20 |
|                |                | Cyclocheilichthysarmatus | 27 6 - - - | 33 40 |
|                |                | Cyclocheilichthysheteronema | 4 - - - - | 4 20 |
|                |                | Labiobarbuskuhlii | - - 2 - - | 2 20 |
|                |                | Osteochilusvittatus | 4 - - - - | 4 20 |
|                |                | Puntius binotatus | 6 - 4 14 - | 24 60 |
|                |                | Puntius brevis | - - 2 - - | 2 20 |
|                |                | Rasbora argyrotaenia | 514 - - - - | 514 20 |
|                |                | Rasbora lateri striata | 27 - - - - | 27 20 |
| Gobiiformes    | Gobiidae       | Glossogobiusgiuris | - - - - | 1 20 |
|                |                | Stenogobiusgymnopomus | - - - - | 2 20 |
| Mugiliformes   | Mugilidae      | Liza macrolepis | - - - - | 1 20 |
| Labriformes    | Cichlidae      | Oreochromisniloticus | 1 - - - - | 1 20 |

Note: FoI= Frequency of incidence  KB= Krueng Bale, SB= Sumber batu, BL= Buloh, KT= Krueng tujuh, PC= Peunaga cut ujung

Table 3. The composition of the order, family, genera, and species of freshwater fishes in Coal Mining Area of Mifa Bersaudara Company, Aceh Barat District
4. Conclusion
A total of 659 individual of fishes were sampled during the survey, it belonged to 7 orders, 11 families, 17 genera, and 23 species. Cyprinidae and *Rasbora argyrotaenia* are the predominant family and species, respectively. One species of alien fish *O. niloticus* was recorded during the study.

**Acknowledgments**
This study was supported by PT. MIFA Bersaudara, therefore, the authors thank PT. Mifa Bersaudara for financial and facilities supports during the study.

**References**
[1] Wargasasmita S 2002 Ikan air tawar Sumatra yang terancam punah *Jurnal Iktiologi Indonesia* 2 41-9
[2] Kottelat M and Whitten T 1996 *Freshwater fishes of Western Indonesia and Sulawesi: additions and corrections*: Periplus Editions Hong Kong
[3] Hadiaty R K 2005 Keanekaragaman jenis ikan di Suau Balimbing dan Ketambe, Taman Nasional Gunung Leuser, Provinsi Nanggroe Aceh Darussalam *Indonesian Journal of Biology* 3
[4] Nasution T K 2015 Identifikasi dan Keanekaragaman jenis ikan di perairan mangrove pesisir timur kecamatan masjid raya kabupaten aceh besar *ETD Unsyiah*
[5] Mardianti M, Nasir M and Devira C N 2018 Keanekaragaman jenis ikan di sungai kluet kabupaten aceh selatan *Prosiding Biotik* 4
[6] Muchlisin Z, Akyun Q, Halim A, Rizka S, Sugianto S, Fadli N and Siti-Azizah M 2015 Ichthyofauna of Tripa peat swamp forest, Aceh province, Indonesia *Check List* 11 1
[7] Muchlisin Z A and Azizah S 2009 Diversity and distribution of freshwater fishes in Aceh waters, northern Sumatra Indonesia *International Journal of Zoological Research* 5 62-79

Figure 1. The composition of family based on species number.
[8] Muchlisin Z A 2013 Potency of freshwater fishes in Aceh waters as a basis for aquaculture development program Jurnal Iktiologi Indonesia13 91-6

[9] Mifacoal 2019 Solution coal.

[10] Mirza K and Prasetyo A 2000 Ikan sebagai bioindikator pencemaran Sungai Ciliwung J Med Konserv. 6 109-14

[11] Irhami S, Fithri A, Batubara A and Muchlisin Z 2018 Fish fauna of Meureubo River, Aceh Barat District, Indonesia. In: IOP Conference Series: Earth and Environmental Science: IOP Publishing) p 012023

[12] Kottelat M, Whitten A J, Kartikasari S N and Wirjoatmodjo S 1993 Ikan air tawar Indonesia bagian barat dan Sulawesi Jakarta (ID): Periplus Edition (HK) Ltd dan EMDI Project Indonesia

[13] Nasir M 2014 Keanekaragaman Jenis Ikan Air Tawar di Krueng Tujoh Kecamatan Meureubo Aceh Barat

[14] Nelson J S, Grande T C and Wilson M V H 2016 Fishes of the World: John Wiley & Sons)

[15] Ng P K L and Tan H H 1997 Freshwater fishes of Southeast Asia: potential for the aquarium fish trade and conservation issues Aquarium Sciences and Conservation1 79-90

[16] Nugroho R A, Santoso Y G G, Nur F M, Hariani N and Solikin S 2016 A preliminary study on the biodiversity of fish in the Suhui River, Muara Ancalong, East Kutai, Indonesia Aquaculture, Aquarium, Conservation & Legislation-International Journal of the Bioflux Society (AACL Bioflux)9

[17] Dekar M, Sarong M A, Batubara A S and Muchlisin Z A 2018 Ichthyofauna of Aceh River, Aceh Province, Indonesia. IOP Publishing) p 012024

[18] Nasir M, Munira M and Muchlisin Z 2018 Fish fauna in the Krueng Geumpang River, Indonesia. In: IOP Conference Series: Earth and Environmental Science: IOP Publishing) p 012023

[19] Timorya Y, Abdullah A, Batubara A and Muchlisin Z 2018 Conservation and economic status fishes in the Krueng Sabee River, Aceh Jaya District, Aceh Province, Indonesia. In: IOP Conference Series: Earth and Environmental Science: IOP Publishing) p 012044

[20] Timorya Y, Abdullah A, Batubara A S and Muchlisin Z A 2018 Conservation and economic status fishes in the Krueng Sabee River, Aceh Jaya District, Aceh Province, Indonesia IOP Conference Series: Earth and Environmental Science216 012044

[21] Muchlisin Z 2012 First report on introduced freshwater fishes in the waters of Aceh, Indonesia Archives of Polish Fisheries20 129-35

[22] Muchlisin Z A, Nurfadillah N, Arisa I I, Rahmah A, Putra D F, Nazir M and Zulham A 2017 Fish fauna of Lake Lauik Tawar and Lake Lauol, Simeulue Island, Indonesia Biodiversitas Journal of Biological Diversity18 752-7

[23] Nicola G G, Almodovar A and Elvira B 1996 The diet of introduced large-mouth bass, Micropterus salmoides, in the natural park of the Ruidera Lakes, Central Spain Polskie Archiwum Hydrobiologii43 179-84

[24] Alcaraz C and Garcia-Berthou E 2007 Food of an endangered cyprinodont (Aphanius iberus): ontogenetic diet shift and prey electivity Environmental Biology of Fishes78 193-207
[25] Yakupitiyage A, Bhujel R C J I M f t C and Ecosystems R U o A S i A 2005 Role of exotic species in aquaculture: problems and prospects in Indochina 169-83