Ichthyofauna of Aceh River, Aceh Province, Indonesia

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Abstract. Information on fish fauna in Aceh Besar District, Aceh Province, Indonesia is scarce; hence, the objectives of the present study was to documented and to the analysis of the fish fauna in Aceh Besar District, Indonesia. The sampling was conducted from May 2016 to February 2017 at seven sampling locations around Aceh Besar District (Inong River, Seulimum River, Kreumireu River, Jreu River, Daroy River, and Naeuk River) and Banda Aceh City (the Aceh River Mouth at Lampulo and Alue Naga). The fish samples were caught using several fishing gears such as; casting nets, gillnets, handnet, and fish trap. The fish samples were taxonomically identification using Kottelat et al. (1993) and Nelson (1994). The results showed that a total of 250 individual of fishes belongs to 44 species, 34 genera and 25 families were recorded during the study. Oreochromis niloticus the alien species was widely distributed in Aceh Besar and Banda Aceh waters followed by Gerres filamentosus, Channa sariata and Puntius brevis.

1. Introduction

Indonesia is known as a mega-biodiversity country just after Brazil [1]. There are two biodiversity hotspots in Indonesia, namely Sunda Land and Wallacea [2]. For example, Indonesia has spectacular and unique flora and fauna, although the land is only 1.3% of all land on earth, but Indonesia has 10% of the world's flowers species, 12% of the world's mammal species, 16% of all reptile and amphibian species, 17% of all bird species, and 25% of all fish species of the world [3].

In term of fish, Indonesia has more than 4000 species of fishes [4], of these 1193 species are freshwater fish [5, 6]. The previous study by Muchlisin and Siti-Azizah [1] in 17 locations around Aceh Province, they have recorded 114 species of freshwater and brackish water fishes. The other study by Muchlisin et al. [7] in deforested Tripa peat swamp forest, Nagan Raya and Aceh Barat Daya Districts they found 73 species of freshwater fishes. In addition, Nasir et al. [22] reported 12 species of freshwater fish in Geumpang River, Pidie District. However, there is very limited information on the fish biodiversity in other regions of Aceh.

One of the areas that have not been intensively studied is the Aceh River and its tributaries. This river upstream in Aceh Besar Regency and its downstream in the Banda Aceh city, Indonesia. The Aceh River has several tributaries, including the Daroy River, Seulimum River, Keumireu River, Inong River, and Lamyong River. The entire water flows from the tributary is discharges into the main river, the Aceh River which empties into Lampulo and the Alue Naga area, Banda Aceh City.

Although research on fish is still limited in the Aceh river; However, studies related to plankton biodiversity and heavy metals concentration in fish and oyster have been reported by Jannah and Muchlisin [8] and Supriatno and Lelifajri [9] respectively. Hence, the objective of the present study was...
to inventory the fish fauna of the Aceh River and its tributaries. This data would be completed the information on the fish species in Aceh waters.

2. Materials and Methods

2.1 Time and site

The research was conducted from May 2016 to February 2017 in Aceh River. The river is divided into three regions, namely Upstream, Middle Stream and Downstream (Figure 1), every region has a different habitat characteristic (Table 1). The sampling sites are determined purposively at a location that is suspected to be existed of fish based on information from local fishermen. The sampled fishes were taxonomically identified in the Laboratory of Ichthyology, Faculty of Marine and Fisheries, Syiah Kuala University, Banda Aceh, Indonesia.

Figure 1. The map of Aceh Besar District and Banda Aceh City showing the sampling location

2.2 Sampling

The sampling was conducted at 11 location along the river (Table 1) using various fishing gears such as gillnets, casting nets, hooks, and trap. The sampling activity was done from 08.00 AM to 08.00 PM. The sampled fishes were counted, photographed then preserved in 10% formalin. The fish bigger than 20 cm were injected with 10% formalin into their body cavity to make sure the internal organ was not decayed. The fish sample then transported to the laboratory for further analysis.

2.3 Taxonomic identification

In the laboratory, fish was washed in running water to neutralize the formalin, then the sample was taxonomically identified based on Kottelat et al. [5] and Nelson [10]. After identification, the sample was preserved in 10% formalin for a week then was transferred to 75% alcohol.
**Table 1.** The sampling location in Aceh River and its tributaries

| No | Region          | Sampling location          | Habitat characteristic                                         |
|----|-----------------|----------------------------|----------------------------------------------------------------|
| 1. | Upstream        | (1) Inong River, (2) Jantho River, (3) Seulimum River, (4) Kremireu River, (5) Montasik River | Mountains and hilly areas, fast river flow, shallow and rocky |
| 2. | Middle stream   | (1) Khea River, (2) Jreu River, (3) Daroy River, (4) Aneuk River | In some places to be hilly and even, the flow of the river has decreased moderately, the riverbed is sandy and deep |
| 3. | Downstream      | (1) Lampulo, (2) Aluae Naga | Settlement area, estuary and existing of the fishing port |

2.4 Data analysis
The data were presented in the tables, graphs and photo then analyzed descriptively by comparing with the other previous reports and references.

3. Results and Discussion
A total of 250 individual of fishes were sampled during the study, it was belonging to 12 orders, 25 families, 34 genera and 44 species (Table 2). The Order Perciformes was dominated with 13 families, 15 genera, and 20 species (Table 3). However, based on the family, Cyprinidae was predominant with 11 species (Figure 2).

Cyprinidae is the bigger family of freshwater fish in the world including Australia, Madagascar, New Zealand, and South America [5]. A similar finding was also reported in several parts of Indonesia, for example in Sumatra [1, 11, 12], and Borneo [13]. In addition, Zakaria and Basir [4] (1994) reported that Cyprinidae is also dominated the fish community in Bario Kalabit Highland, Malaysia and Yangtze BasinChina [15] and National Park in South Korea [16].

Five species of introduced fish species were recorded during the survey, namely; *Cyprinus carpio*, *Apocheilus panchax*, *Oreochromis niloticus*, , and *Hyposarcus pardalis*. Where, among the introduced species, *O. niloticus* were widely distributed. The previous study by Muchlisin[17] reported two species of alien fish in Aceh River, namely *Cyprinus carpio* and *Ctenopharyngodon idella*, and therefore there were three additional species of alien fish from this river after 6 six years of the previous report. But, in this study, we have not found *C. Idella*, probably the population of this grass carp has been decreased since intensive catches during the rainy season every year. This because the grass carp are unable to spawn outside their origin habitat [18], and therefore, no new recruitment has occurred.

In general, the number of introduced species in Aceh River was lower compared to Lake Laut Tawar with six species [17], but higher than the Tripa peat swamp with three species of *Pterygoplichthys pardalis*, *Oreochromis niloticus* and *Trichopodus pectoralis* [7] and Geumpang River with two species of *O. mossambicus* and *O. niloticus* [22].In general, there is two type of fishes found in Aceh River, true freshwater and peripheral fishes. Among the true freshwater fishes, *Tor tambra* and *T. soro* have higher economic value [19], while among the peripheral fishes the Lutjanidae (snapper) and Carangidae (traveller fishes) also have high economic value [20, 21, 23].
| Ordo         | Family       | Genus       | Species                      |
|--------------|--------------|-------------|------------------------------|
| Clupeiformes | Clupeidae    | Dussumiera  | Dussumieria acuta            |
|              |              | Dussumieria elopsoides |                |
|              |              | Ambasis     | Ambasis uroraenia            |
|              |              | Cyprinus    | Cyprinus carpio              |
|              |              | Cychloeichthys | Cychloeichthys enoplos       |
|              |              | Osteochilus | Osteochilus borneensis       |
|              | Cyprinidae   | Puntius     | Puntius brevis               |
|              |              |             | Puntius chola                |
|              |              | Rasbora     | Rasbora aurotaenia           |
|              |              | Tor         | Tor soro                     |
|              |              | Rasbora     | Rasbora argyrotaenia         |
|              |              | Tor         | Tor tambroides               |
|              | Aplocheilidae| Aplocheilus | Aplocheilus panchax          |
| Elopiformes  | Megalopidae  | Megalops    | Megalops cyprinoides         |
|              |              |             | Anabas                       |
|              | Anabantidae  | Osphremus   | Osphremus goramy             |
| Labyrinthici |              |             | Anabas testudineus           |
|              | Mugilidae    | Liza        | Liza tade                    |
| Ostariophysis| Ariidae      | Arius       | Arius thalassinus            |
|              | Bagridae     | mytus       | Mytus bimacatus              |
|              | Ambassidae   | Ambassis    | Ambassis agassizi            |
|              | Gobiidae     | Bathygobius | Bathygobius cyclopterus       |
|              |              | Stenogobius | Stenogobius gymnopomus       |
|              |              | Carangoides | Carangoides malabaricus      |
| Carangidae   | Caranx       |             | Caranx sexfasciatus          |
|              | Channidae    | Channa      | Channa gachua                |
|              |              |             | Channa sriata                |
|              | Tetraodontida| Terapon     | Terapon jarbu                |
|              | Serranidae   | Epinephelus | Epinephelus malabaricus      |
|              | Gerreidae    | Gerres      | Gerres filamentosus          |
|              | Leiognathida | Eableekeria | Eableekeria splendes         |
|              |              | Secutor     | Secutor interruptus          |
| Lutjanidae   | Lutjanus     |             | Lutjanus argentimaculatus    |
|              |              |             | Lutjanus monostigma          |
|              |              |             | Lutjanus russelli            |
|              | Cichlidae    | Oreoichromis| Oreoichromis niloticus       |
|              | Osphronemidae| Trichopodus  | Trichopodus pectoralis       |
|              | Siganidae    | Siganus     | Siganus javus                |
|              | sparidae     | Acanthopagrus| Acanthopagrus latus          |
| Percomorphi  |              |             |                             |
| Siluriformes |              |             |                             |
|              | Leigonathida | Leigonathus | Leigonathus equatulus        |
|              | Loricariidae | Hyposarcus  | Hyposarcus pardalis          |
| Tetraodontiformes |              |              | Chelonodon patoca           |
|              | Tetraodontida| Chelonodon  |                             |
|              | Engraulidae  | Stolephorus | Stolephorus commersoni       |
|              |              |             |                             |
Table 3. The composition of the order, family, genera, and species of fishes found in Aceh River and its tributaries

| No. | Ordo             | ∑ Family | ∑ Genera | ∑ Species |
|-----|------------------|----------|----------|-----------|
| 1.  | Clupeiformes     | 1        | 1        | 2         |
| 2.  | Cypriniformes    | 1        | 7        | 11        |
| 3.  | Cyprinodontiformes| 1        | 1        | 1         |
| 4.  | Elopiformes      | 1        | 1        | 1         |
| 5.  | Labyrinthici     | 1        | 2        | 2         |
| 6.  | Mugiliformes     | 1        | 1        | 1         |
| 7.  | Ostariophys      | 1        | 2        | 2         |
| 8.  | Perciformes      | 13       | 15       | 20        |
| 9.  | Percomorphi      | 1        | 1        | 1         |
| 10. | Siluriformes     | 1        | 1        | 1         |
| 11. | Tetraodontiformes| 1        | 1        | 1         |
| 12. | Engraulidae      | 1        | 1        | 1         |

| Total | 24 | 34 | 44 |

Figure 2. The composition of family based on species number
4. Conclusion
A total of 25 families and 44 species of fishes were found in the Aceh River. The Perciformes was predominant in terms of the family and genera numbers, while Cyprinidae is predominant based on species number.

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