



## Exploration of the ichthyofauna of the Celike River, Leuser Ecosystem Area, East Aceh Regency, Aceh Province

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### ARTICLE INFO

### ABSTRACT

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It is necessary to collect data on the species of fish that live in a body of water, one of which is by carrying out an inventory of fish species. The method used is purposive sampling in places that are thought to have lots of fish, are easy to reach and represent the river area. The research parameters in this activity are the level of diversity, level of uniformity, level of dominance, level of species richness, level of similarity, distribution pattern, relationship between length and weight and condition factors. The aim of this research is to provide real benefits in an effort to find out the potential of what species of fish are found in the Leuser Ecosystem, especially the Celike River. There are 13 species of fish found in the Celike River in the Leuser Conservation Area, East Aceh, belonging to 7 families with a total of 132 individuals. The diversity index value is classified as moderate with a value for station 1 of 1.26 and station 4 of 1.49. The highest uniformity index is at station 5 and station 3. The uniformity index value at these stations has the same index ( $E = \text{stable } 0.91$ ). Stations 2, 3, 4, 5 and station 6 have the highest dominance index values in the high category ( $C=0.87-1.18$ ).

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### Introduction

Rivers have a hydrological role and function as fishing areas for fishermen. Fish are very important for the environmental ecosystem and can be used as biological indicators of water quality (Rahman and Khairoh, 2012). It is necessary to collect data on the species of fish that live in a body of water, one of which is by carrying out an inventory of fish species. It is important to carry out an inventory of fish species in waters with the aim of being a basis for knowing the distribution of fish species and fisheries potential in an area. Apart from that, inventory can also be useful for knowing the species of fish that dominate both in terms of consumption and ornamental fish. According to Affandi (2005), a map

of the distribution and fisheries potential of a region can be formed by carrying out an inventory of fish species in water locations. The public can also find out and recognize the abundance and distribution of fish species in Indonesian waters through inventory data. Inventory data information can also be used as a basis for utilizing waters in an area.

Ikti fauna is a scientific study related to fish that examines all aspects of their life, as a natural aquatic resource that continues to be researched and used for various life needs, including fisheries in freshwater, marine, estuary and other aquatic environments. Public water areas, especially fresh waters, are inhabited by various aquatic biota, including freshwater fish. According to Hubert *et al.* (2015).

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Indonesia has various species of fish, consisting of 84 families which are then divided into 1218 species. Indonesia is a mega biodiversity country after Brazil (Muchlisin and Azizah, 2009). These fisheries resources need to be protected and utilized as a source of food and livelihood for communities around waters, especially fresh waters such as rivers.

Research on ichthyofauna in different rivers in Aceh has been widely carried out, including the Lembang River, South Aceh Regency and the Alas River in Southeast Aceh Regency (Hadiaty, 2005), the Tripa Peat Swamp Forest, Aceh Province (Muchlisin et al., 2015), the Kluet River South Aceh Regency (Mardianti et al., 2017), the Aceh River (Dekar et al., 2018), the Meureubo River, West Aceh (Irhami et al., 2018), waters in the coal mining area of the Mifa Bersaudara Company, West Aceh Regency (Nur et al., 2019), and in the Alas River in Subulussalam City (Maghfiriadi et al., 2019).

Celike river has several channels with different types of currents. celike river channels are some fast and some slow. the challenge in this research is that access from one station to another must go through a long journey by passing large rocks in the river and through the forest. This causes, Information about fish diversity in the Celike River is currently still very limited, this may be because conducting research on fish diversity in Indonesia is not easy. So there are many obstacles faced in this research, such as limited funding because taxonomic research is not a priority even though Indonesia is the second mega biodiversity country after Brazil. Another obstacle is limited access to the research location, because the research location is far from the city center so it requires transportation that is appropriate to the type of research location (Hadiaty et al., 2019).

Ichthyofauna studies are needed to reveal fish diversity, inventory fish species that have potential for ornamental and consumption fish (Maghfiriadi et al., 2019). This research needs to be carried out as part of data collection and become a basic reference for formulating river water conservation strategies. Therefore, this research focuses on the comprehensive ichthyofauna in the Celike River, Leuser Ecosystem Area, Serbajadi District, East Aceh Regency, Aceh Province.

## Materials and Methods

### Location and time of research

This research was conducted in the Celike River, East Aceh Regency. Time of research in Juli 2024. Data identification and analysis was carried out at the Marine Biology Laboratory, Faculty of Marine Affairs and Fisheries, Syiah Kuala University.

### Data collection

Fish samples were taken using several fishing tools, namely nets, fishing rods, nets and rakes. The research location was then selected from 6 stations. At each station, fish samples were caught using a net measuring 6 cubits with a mesh of 0.5 inches, each sampling using the net was carried out 15 times in one day, while the net installed from 08.00 – 14.00 WIB and checked every three hours. The types of nets used are 1 inch, 0.5 inch and 1.5 inch in size which are installed at each observation station with a distance between nets of around 50 m. In rocky river areas where nets and nets are difficult to use, fishing is carried out using scoops, because small fish are very difficult to catch using nets (Maghfiriadi et al., 2019).

### Identification and Morphological Observation

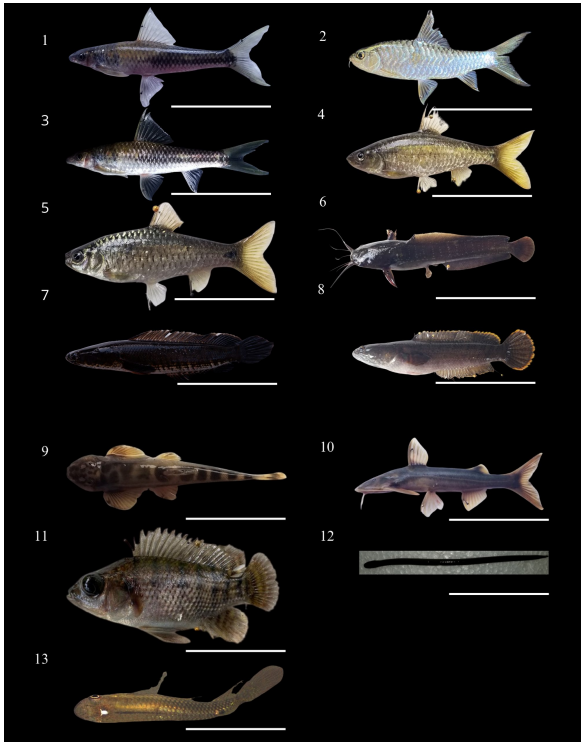
The Fish samples were collected based on similar morphological characteristics and their numbers were counted based on species. Each species of large fish was positioned on a tray and then photographed fresh with its head pointing to the left (Sukmono et al., 2013), while small fish were placed in an aquarium and then photographed alive. Three individuals of each species were taken to preserve them, then placed in a plastic container containing 4% formalin, then given a code name (Saainin, 1989).

Fish identification is based on morphological and morphometric characteristics by referring to identification books, journals, websites and various other reference sources. Reference sources used in fish identification are, Freshwater Fishes of Western Indonesia and Sulawesi (Kottelat and Whitten, 1996), The Fishes of the Batang Hari Drainage, Sumatra, with description of six new species (Tan and Kottelat, 2009), Fishes of the Greater Mekong Ecosystem With Species List and Photographic Atlas (Rainboth et al., 2012), 101 Freshwater Ornamental Fish of the Archipelago (Said and Hidayat, 2015). Freshwater Fish in the Bukit Tigapuluh Ecosystem (Sukmono and Margaretha, 2017), Website fishbase.

### Data analysis

The composition of fish species collected was analyzed descriptively in the form of tables and figures. Calculations of the values for the level of diversity (Shannon and Wiener), uniformity (Evenness), dominance (Simpson), species richness (Margalef), similarity (Sorensen) distribution patterns (Morisita) as well as analysis of growth patterns and fish condition factors are carried out using the formula as follows. various references related to the observed parameters, such as the level of diversity

(Shannon-Wiener), the level of uniformity (Magurran, 2004), the level of dominance (Odum, 1993), the level of species richness (Magurran, 2004), the level of similarity (Magurran, 2004), distribution patterns (Nao et al., 2021).

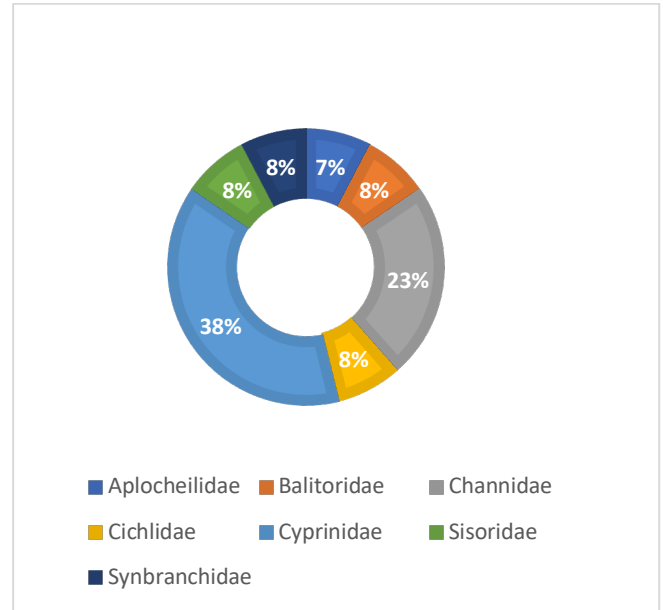


**Figure 1.** Species of fish found in the Celik, (1 dan 3) *Crossocheilus oblongus*, (2) *Neolissochilus soro*, (4) *Barbodes brevis*, (5) *Barbodes binotatus*, (6) *Clarias teijsmanni*, (7) *Channa striata*, (8) *Channa limbate*, (9) *Homaloptera ripleyi*, (10) *Mystus gulio*, (11) *Pristolepis fasciata*, (12) *Monopterus albus*, and (13) *Aplocheilus panax*.

### Results

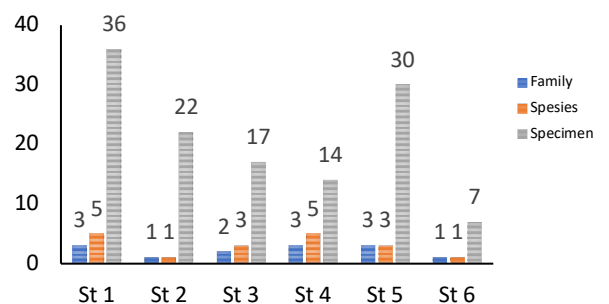
The results of the species of fish found in the Celike River in the Leuser Conservation Area, East Aceh were 13 species belonging to 7 families, with a total of 132 individuals (Figure 1 and Table 1). The fish that are often found are dominated by 4 species, namely 40 jurung fish (*Tor tambra*), 34 gemoh fish (*Tor soro*), followed by 20 ili fish (*Homaloptera ripleyi*) and keprass fish (*Barbodes binotatus*) 10 heads. Some of the fish species that were least frequently encountered were snakehead fish (*Channa striata*) with a total of 1 fish, 1 eel fish (*Monopterus albus*), 3 snakehead fish (*Barbodes brevis*), and 3 catfish (*Clarias teijsmanni*). The number of fish species found

can be seen in Figure 2. If we look at the percentage of catches based on the family, cyprinidae is the family most commonly found in the Celike River, this indicates that this family dominates in that location (Figure 2).



**Figure 2.** Percentage of Family Catches

Based on the sampling station, there are differences ranging from highest to lowest. Station 1 and station 5 have the highest contribution of families, species and specimens, station 1 has three families, five species and 36 specimens, station 5 has a contribution of three families, three species and 30 specimens. Meanwhile, at station 6 there is one family, one species and 7 specimens. The distribution of families, species and specimens can be seen in Figure 3.



**Figure 3.** Distribution of families, species, specimens according to data collection stations

**Table 1.** Index of sampling stations on the Celike River

Diversity variables	Berawang Palong	Atang Bangkar	Alur Muhur	Alur Betung	Alur Cilike	Alur Kloak
Shannon-Wiener (H')	1.26	0.00	0.95	1.49	0.92	0.00
Uniformity (E)	0.62	0.00	0.91	0.62	0.91	0.00
Dominance (C)	0.61	1.00	0.88	0.87	1.18	1.00

**Table 2.** Fish Distribution pattern in the Celike River

No	Spesies	Individual Total	Id	Ip	Distribution pattern
1	<i>Tor soro</i>	34	23.82	0.506	Grouping
2	<i>Tor tambra</i>	40	16.32	0.402	Grouping
3	<i>Crossocheilus cobitis</i>	2	45	0.029	Grouping
4	<i>Barbodes brevis</i>	3	45	0.059	Grouping
5	<i>Barbodes binotatus</i>	10	16	0.091	Grouping
6	<i>Clarias teijsmanni</i>	3	45	0.059	Grouping
7	<i>Channa striata</i>	1	-	-	Not detected
8	<i>Channa limbata</i>	3	45	0.059	Grouping
9	<i>Homalopterula ripleyi</i>	20	8.71	0.114	Grouping
10	<i>Glyptothorax platypogon</i>	4	45	0.088	Grouping
11	<i>Oreochromis mossambicus</i>	6	12	0.037	Grouping
12	<i>Monopterus albus</i>	1	-	-	Not detected
13	<i>Aplocheilichthys pancax</i>	5	18	0.045	Grouping
Total		132			
Grouping		11	85%		
Not Detected		2	15%		

## Discussion

Based on the calculation results, the diversity index value for station 1 is 1.26, station 4 is 1.49. In accordance with the data displayed, it is known that the diversity index value at stations 1 and 4 is in the medium category, and the lowest is at stations 2, 3, 5 and station 6. Meanwhile, the diversity index can be seen in table 1. The diversity index is categorized as high if  $H' > 3$ , it is said to be medium if  $H' < 3$ , and low if  $H' < 1$  Shanon-Wiener (Krebs, 1989). Based on the calculation results and compared with the diversity index value categories, it can be said that each station has a low and medium diversity index, meaning that no one has a high diversity index value. This is because the number of species per individual at each station is less evenly distributed. The diversity index has a large value if all individuals come from different genera or species, while the smallest value if all individuals come from one genus or one species with a relatively even number of each individual, and

vice versa. If a community is distributed unevenly, its diversity is low (Odum, 1993).

The highest uniformity index is found at station 5 and station 3. The uniformity index value at these stations has the same index ( $E = 0.91$  stable), the low uniformity index is found at stations 1, 2, 4, and at station 6. A low uniformity index value shows that the species of fish caught at each station show that the fish are not evenly distributed, this occurs due to differences in water quality (Kawaroe et al., 2001). The low uniformity index value at the three stations is also thought to be due to unfavorable environmental conditions and also the dominance of certain species (Asriyana et al., 2009). The uniformity value criteria, if  $E$  is close to 0 then the evenness between species is low, and if  $E$  is close to 1 then the evenness between species is relatively even or the number of individuals of each species is relatively the same (Jukri et al., 2013). According to Sibueca et al. (2016) the uniformity index ( $E$ ) value at each station ranges

from 0.61-0.89. This value states that fish have a wide distribution in each research location.

It can be explained that the dominance index value at each station has a medium to highest value. The fish dominance index is categorized as low ( $C = 0.00 < D \leq 0.50$ ). The highest and moderate values were detected at station 1 ( $C = 0.61$ ; medium category) stations 2, 3, 4, 5 and station 6 had the highest values ( $C = 0.87-1.18$ ; high category). The high value of the dominance index is due to the presence of fish species from the Cyprinidae family, because the characteristics of this fish are that it likes habitats with weak and moderate river flows (Rainboth, 1996). This is in accordance with the characteristics of each station, namely weak to medium current. Hubert et al. (2015) stated that Cyprinidae is the dominant fish family in Indonesia's freshwater ecosystem, especially in areas on the Sunda shelf. However, the Cyprinidae family tends to be sensitive to changes in the aquatic environment. Previous research revealed a decline in the composition of the Cyprinidae family due to water pollution in rivers, for example, the Karnataka River, India, and the Pahang River, Malaysia (Shetty et al. 2015; Rashid et al. 2018).

A community that has low species diversity is influenced by a low uniformity index and also the dominance of one or a few species (Efendi, 2013). The richness of fish species, abundance and structure of fish communities in rivers depends on habitat conditions, increasing water volume in rivers, the presence of predators and competition for food (Simanjuntak, 2012; Jackson et al., 2001). The collection obtained at each station varies greatly, we can see this in Table 2 which shows the catch and also the status of the species when viewed based on the IUCN.

The results of the analysis of distribution patterns in the Celike River generally show a grouping distribution pattern. The distribution of fish in an area depends on habitat, type, vegetation and environmental factors such as pH, dissolved oxygen and brightness. Uniform distribution patterns generally occur in aquatic environments in fish habitats compared to group patterns. The uniform distribution pattern is caused by relatively homogeneous waters, the condition of the aquatic environment can be determined from the values of temperature, pH and dissolved oxygen conditions and competition between individuals for food to achieve equal distribution in space. Organisms with uniform distribution patterns are thought to be able to utilize factors throughout the environment in such a way that they exist across all gradients in the habitat

(Odum, 1996). Grouping of distribution patterns occurs due to the absence of competition between species to meet food resource needs. Distribution grouping can occur due to the gathering of individuals in a habitat as a response strategy to changes in weather and seasons, as well as changes in habitat and reproductive processes. This will make it easier for fish to adapt to changes in aquatic environmental conditions when distributed in groups (Wahyuni, et al. 2022).

## Conclusion

The research results show that the level of diversity of the Celike River is in the medium category. Stations 1 and 4 have the highest diversity compared to other stations with values of 1.26 and 1.49 respectively. The uniformity index value is classified in the stable category with a stable value of  $E = 0.91$ . There are 13 species of fish found in the Celike River in the Leuser Conservation Area, East Aceh, belonging to 7 families, with a total of 132 individuals. Cyprinidae is the family most commonly found in the Celike River. Stations 2, 3, 4, 5 and station 6 have the highest dominance index values in the high category ( $C = 0.87- 1.18$ ).

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