Analysis of catch composition in Gampong Deah Raya, Syiah Kuala, Banda Aceh

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Abstract. Gill nets are fishing tools that are commonly found in coastal areas, one of them located in Gampong Deah Raya. Various catches caught by fishermen would most likely affect the aquatic ecosystem. Information on gillnet catches is insufficient yet the needs of the information are most urgent. This study aims to determine the composition and the size of the catch based on Fishbase literature and journals. This study has been done from January until March 2019 in Deah Raya, Syiah Kuala, Banda Aceh. The method used in this research a descriptive survey. The results of this study indicated that there were 31 species of fish caught using gill nets and the total samples obtained during the study were as many as 6048, there were 3 species that frequently captured namely Leiognathus sp., Nemipterus sp., and Selar crumenophthalmus, and proper catches as many as 3,381 or 56% and not fit to catch as many as 2,667 or as many as 44%.

1. Introduction
A gillnet is one of the fishing gears that is used widely by fishermen in Deah Raya waters. There are three types based on their depth of passage, likes surface gill net, midwater gill net and bottom gill net [1]. The gillnet in Deah Raya included to bottom gill net, is a passive fishing gear made of rectangular netting material with the same mesh size and operated on the bottom of water to catch demersal fish [2]. The name gill nets are based on the fact that the fish catch are entangled in the operculum [3]. The number of bottom gill net in Deah Raya in 2019 is 32 units with a total catch estimated at ± 1.000 kg/day.

The fisherman caught various kinds of fish that would most likely affect the aquatic ecosystem that eventually disturbs the sustainability of the population [4]. According to Mallawa et al. [5], to see a disruption of the aquatic ecosystem could be determined from the smallest fish caught that has an impact on the fishermen's income. Therefore, the use of fishing gear must have a care to aquatic ecosystem sustainability and minimizing the negative impact on another biota [6]. Research on catch composition has also been conducted by Nelcy et al. [7], show that the composition of gill nets in Singkil Regency was dominated by mackerel as the main catch and bycatch in the form of wolf harring and sharks. The catch composition of gill nets in Krueng Raya Waters shows that mostly caught is yellowtail fish (19%), and the least is sharks (0.4%) [8].

One indicator that fish resources are well managed if the average size of the lenght at first captured are equal or greater than the size of the lenght at first mature (Lc ≥ Lm) [9], this is to avoid recruitment
and growth overfishing in fish stocks [10,11,12]. Good fishing management if the fish caught 90% have done reproduction or reach an optimum size, so that fish stocks remain stable [13,14]. Analysis of the catch composition of gill nets is more urgent, considering the importance of maintaining the availability of fish in nature and to determine the sustainability of fisheries business in Gampong Deah Raya. This research aimed to determine the composition of the catch and the size of the catches as well as the proper caught fish in Gampong Deah Raya, Syiah Kuala, Banda Aceh.

2. Material and Methods
This research was conducted from January until March 2020 in Gampong Deah Raya, Syiah Kuala, Banda Aceh.

![Research location in Gampong Deah Raya, Banda Aceh.](image)

Data collected in this research were primary data (the amount of catch composition, total length measurement, and catch weight), and secondary data (catch-worthy size). Primary data were collected through questionnaires which were distributed to 32 respondents and secondary data collected from books and journal. The description of the fishing catch composition was analyzed by using the descriptive method. The measurement of fish length was carried out using the long frequency distribution method. The fishing catch composition of each type is included in the class and the total length measurement interval. The determination of the number of classes is calculated using the surges rule using the following formula [15].

\[ K = 1 + 3.3 \log n \]

Where:
- \( K \) = Number of classes
- \( n \) = Number of samples

Furthermore, the class interval is determined by the formula:

\[ p = \frac{R}{K} \]

Where:
- \( P \) = Class hose
- \( R \) = Many Classes
- \( K \) = Range (the highest fish length – the lowest fish length)

3. Results and Discussion
3.1. Fishing catch composition

The fishing catch compositions of bottom gill net units in Gampong Deah Raya, Banda Aceh during the research are Ponyfishes (*Leiognathus* sp.), Threadfin Bream (*Nemipterus* sp.), and Bigeye Scad (*Selar crumenophthalmus* Bloch).

Table 1. Fishing catch composition of bottom gill net in Deah Raya, Banda Aceh.

| No | Common name       | Latin name                     | Amount (ind) | Weight (kg) |
|----|-------------------|--------------------------------|--------------|-------------|
| 1  | Ponyfishes        | *Leiognathus* sp.              | 996          | 22.54       |
| 2  | Threadfin Bream   | *Nemipterus* sp.               | 936          | 70.46       |
| 3  | Bigeye Scad       | *Selar crumenophthalmus*       | 862          | 46.13       |

3.1.1. Decent size to catch

The distribution of the catch size is grouped into two categories, namely the total length and the weight of the fish. The categories are commonly used as indicators to determine the size of a species. Morphometric measurements are carried out after the fish are separated from the gill nets. Measuring the total length of the fish is done using a ruler or tape measure. Meanwhile, the measurement of fish weight was carried out using digital scales. Measurement of the total length of fish was carried out for all types of catch. Gonad mature rate for each type of fish refers to the Fishbase and several journals.

The frequency distribution of the total length of Ponyfishes (*Leiognathus* sp.) are caught at most between 10.66-11.21 cm, while the size of the length at first mature is 10.7 cm which refers to the Fishbase. The distribution of Ponyfishes (*Leiognathus* sp.) can be presented in Figure 2.

![Figure 2. Frequency distribution of Ponyfishes (*Leiognathus* sp.).](image)

Most of the Threadfin Bream (*Nemipterus* sp.) were caught between 15.69-17.34 cm. The Length at first mature of Threadfin Bream was 16.6 cm and the frequency distribution of the total length is presented in Figure 3. Threadfin Bream (*Nemipterus* sp.) were caught on the right side of the line at length at first mature, which was 16.6 cm in length. This can be interpreted that Threadfin Bream (*Nemipterus* sp.) caught in gill nets have met the criteria for catching or fish that are fit to be caught.

The total length distribution of Bigeye Scad (*Selar crumenophthalmus*) is the most widely caught at a length of 15.6-16.54 cm. Meanwhile, the size of the length at first mature was 17 cm. The frequency spread of Bigeye Scad (*Selar crumenophthalmus*) can be seen in Figure 4.

Based on the picture above, most of the Bigeye Scad (*Selar crumenophthalmus*) caught are to the left of the length at first mature line. It can be concluded that the caught Bigeye Scad were still immature gonads, so the catch of Bigeye Scad was not yet viable.
Indonesian waters include tropical waters that are rich in the diversity of fish species. This is by the results of research in Deah Raya where the fish resources in the area are quite diverse, both in types and sizes. The composition of catches that are often caught in Deah Raya can be seen in Table 1. These catches were also found in the research of Fransina et al. [16] and Lucky et al. [17], where the catch in gillnet fishing gear was found in the type of Bigeye Scad (*Selar crumenophthalmus*), Ponyfishes (*Leiognathus* sp.), Silver biddes (*Garres* spp.). The composition of the catch that was mostly obtained was seen from the number of fish caught, namely 996 Ponyfishes (*Leiognathus* sp.) with sizes mostly found in class 10.6-11.21 cm. This is different from Muhammad's [18] research where the results of research in the waters of West Aceh, Meulaboh were found the size of of Ponyfishes (*Leiognathus* sp.) mostly found at 15.5 cm. This difference is thought to be due to different fishing locations and different environmental conditions. This variation in size between the same species from various geographical locations is influenced by environmental factors such as nutrition, temperature, the season of the year in which the fish grows. According to Hardianto, et al. [19] aquatic environmental factors greatly affect the growth of an organism.

Ecologically, Ponyfishes (*Leiognathus* sp.) is plankton-eating fish that greatly affects the food chain in the ecosystem. Ponyfishes (*Leiognathus equulus*) is food for predatory fish so that it can determine
the presence of carnivorous fish populations. A large population of prey generally stimulates predator growth and density. It can be concluded that if the fish population decreases, it can indirectly cause the predatory fish population (carnivore) to tend to decline [20].

Table 1 shows that the fish caught according to weight were Threadfin Bream (Nemipterus sp.) with the total catch obtained during the study was 22.54 kg. Threadfin Bream (Nemipterus sp.) is an economically important fish so that this fish becomes the target fish for catching and the location of this fishing activity is by the habitat of Threadfin Bream. The habitat of Threadfin Bream (Nemipterus sp.) lives in the bottom of the waters with muddy or sandy sub-extracts and is non-migratory [21]. This is consistent with the condition of Deah Raya waters, where fishermen use gill net fishing gear which operates in sandy and muddy areas.

Based on the results of interviews with fishermen, information was obtained that in February the catch obtained was less, this was influenced by the western season in the west season there were hydro-oceanographic factors such as wind and currents which were constraints in fishing activities. According to Umar [22], if the current speed is too fast, the fishing gear cannot be stretched perfectly to obstruct the movement of fish so that it affects the catch. In the west season, the intensity of high rainfall is accompanied by very strong winds that cause big waves. The occurrence of the west and east monsoons will have an impact on the catch.

In general, the catch of gill nets in Gampong Deah Raya can be categorized as fish worthy of being caught. Based on Figures 1, 2, and 3, it can be seen that fish that are fit to be caught are more dominant than fish that are not fit to be caught. The size of the fish obtained during the study had undergone the first maturity of the gonads so that the fish was categorized as fish fit to be caught. The catch size refers to the Fishbase and also the journal. There were 3,381 fish fit to catch or 56%, while the fish that were not fit to catch was 2,667 or 44%. This is because the gillnet fishing gear is one of the selective fishing gears. According to Alinda et al. (2017), the millennium gillnet fishing gear is a selective fishing gear based on fish size. Fish that are fit to be caught are adult fish or fish that have entered the reproductive phase through the size of the fish. Research on the size of fish fit to be caught is very important. This is because the size of the fish is fit for capture is one of the references in determining the management of fishery resources based on information on the size of the fish caught with certain fishing gears.

4. Conclusion

The research result showed that there are 3 dominant fish caught, namely: Ponyfishes (Leiognathus sp.), Threadfin Bream (Nemipterus sp.), and Bigeye Scad (Selar crumenophthalmus). The size of the fish obtained during the study had undergone the first maturity of the gonads so that the fish was categorized as fish fit to be caught. There was 3,381 fish fit to catch or 56%, while the fish that were not fit to catch were 2,667 or 44%.

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