The bottom gillnet catch composition in Sasak Ranah Pasisie coastal water, Pasaman Barat regency

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Abstract. This research aimed to determine the catch composition of the bottom gillnet at Sasak Ranah Pasisie coastal water, Pasaman Barat Regency, West Sumatera. The research was conducted from January to February 2019 with total of 15 fishing trip using the bottom gillnet. The gillnet used 100 m of length, 3 m of width, and 2 inches of mesh size. Each of fish sample was identified, counted, measured their length and weight, and determined the way of fish captured by gillnets. The result showed that fish catches composition using bottom gillnet consist of 26 species, i.e., 22 species of fish, two species of crabs, and two species of shrimps. The highest catch was Common ponyfish (Leiognathus sp.) as much as 23%. The other captured species were Silver grunt (Pomadasys sp.) 20,2%; Leaftail croaker (Otolithes sp.) 14,5%; Largehead hairtail (Trichiurus sp.) 6%; Moustached thryssa (Thryssa sp.) 5%; and Black pomfret (Parastromateus sp.) 5%. Based on the way of fish captured on the bottom gillnet, the predominantly fish were wedged as much as 39% from the total of fish catches, followed by gilled (30%), entangled (26%), and snagged (6%).

1. Introduction  
Pasaman Barat Regency located in the very west of Sumatera Island in West Sumatera Province. The vast area of Pasaman Barat Regency is 3,864,02 km² with the length of coastal line reaches along 152 km. The coastal line stretches almost half of West Sumatera Province’s coastal path, which around 40,5% [1]. Based on administrative areas, West Pasaman Regency consist of 11 Sub-districts, 19 Nagari (village level), and 202 Jorong (village office level), with five of eleven districts of West Pasaman Regency directly bordering the Indian Ocean namely Beremas river, Koto Balingka, Aua river, Sasak Ranah Pasisie, and Kinali [2]. Pasaman Barat has considerable fisheries and potential marine, which can use to support the importance of productive economic as well as conservation and future development mainstays. The fisheries catch production of Pasaman Barat Regency keeps improving every year, shown by in 2010 the fisheries catch production obtained 46,781 tons increased to 95,000 tons in 2018 [3]. The important commercial fish and high export value of the catch are tuna, skipjack, shrimp, red snapper, long-jawed mackerel, mackerel, anchovies, groupers, swordfish, pomfret, giant trevally, crab, cob, Spanish mackerel fish, squid, and cuttlefish. The fish catch production in Pasaman Barat has a good quality and is not less competitive compared to other areas which also produce fish captured in Indonesia. Besides being marketed in West Sumatera, the fish catch sold in other provinces even to foreign countries as well.
Sasak Ranah Pasisie coastal water located near the center of the Regency City, and it has easy access to reach, that makes coast of Sasak become one of the destinations most visited by sightseers. Sasak coastal area located directly adjacent to the Indian Ocean, and near to the river mouth, therefore it is also known as "Muaro Sasak" by the local community. The fisheries and marine potential of Sasak coastal area is quite large and consist of fish catch, fish processing, fish marketing or trade, marine tourism, and mangroves [4]. Sasak Ranah Pasisie coastal water can produces no less than 5,544 tons per year from capture fisheries [3]. Therefore, by this great potential of fisheries, it becomes an opportunity for Sasak Ranah Pasisie community around the coast by doing on fishing activities.

Gillnet is the most dominant fishing gear used by fishermen in coast of Sasak. Gillnet was broadly spread in almost all the sea waters in Indonesia including Kalimantan Island, North and South Java coastline, Papua and Sumatera seawater. The gillnet fishing gear caught the fish behind the gill cover that matches the size of the net. As the fish struggles to free itself, it becomes more entangled. The net sheet is transparent, therefore it can trapping fish that swim when the gear operated in a column of water.

Sasak people who work as fishermen are around 500 people; they use various fishing gears for catching, such as square folding trap, hand line, fishing line, large net, gillnet, and purse. In 2017, there were around 30 of fishermen from Sasak coastal community using gillnet fishing gear, and each of fishermen applies at least 3-5 units [3]. Fishermen choose to use gillnets because they commonly want to get more fish catches. Fish catches in Sasak coast intended for trade and some for consumption. The activity of catch fishing in Sasak Ranah Pasisie mostly centered in Jorong Pasa Lamo, because there are numerous fish markets and it closed to the centre of Regency City.

The study about catch composition with bottom gillnet in Pasaman Barat Regency has never been conducted. Therefore, the further analysis about fisheries activity in Sasak Ranah Pasisie coastal water especially using bottom gillnet is needed. Based from this study, hopefully it can provide a source of information or data reference to improving fisheries resources management, especially for coastal areas of Sasak Ranah Pasisie.

2. Materials and Methods
The material used in this study was fish caught by fishermen using bottom gillnet at Sasak Ranah Pasisie coastal water in January-February 2019. The method was experimental fishing used bottom gillnet with the following specification in net length by 100 m, net width by 3 m, and mesh size 2 inches, which operated in seawaters with a depth of 5-12 m. The experiment were done in 15 trips, with one day one trip time (the soak time around two hours). Fish identification follows the guidance of the pages www.fishbase.se, www.inaturalist.org, and the FAO Species Identification Guide for Fishery Purposes.

**Figure 1.** Map location of fish sampling in Sasak Ranah Pasisie coastal water.
3. Results and Discussion

3.1. The catch composition

3.1.1. The catch composition based on species. The total catch composition of the bottom gillnet in the coast of Sasak Ranah Pasisie were 26 individual species consist of 22 species of fish, two species of crab, and two species of shrimp, composed of 7 orders with 19 families. The highest capture were Common ponyfish (*Leiognathus* sp.) with 23% and Olive grunt (*Pomadasys* sp.) with 20.2% from the total of catches. In contrast, the smallest number of fish group catches were Barracuda fish (*Sphyraena* sp.), Shrimp scad (*Alepes* sp.), Sardinella (*Sardinella* sp.), Scad fish (*Alepes* sp.), Unicorn leatherjacket filefish (*Aluterus* sp.), White pomfret (*Pampus* sp.), Spotted pilchard (*Amblygaster* sp.), and Elongate ilisha (*Ilisha* sp.) 0.6%, respectively. The crab group consist of Blood-spot swimming crabs (*Portunus* sp.) 1.3% and Blue swimming crab (*Portunus* sp.) 0.6%, while the shrimp group consist of two species, that were Indian prawn (*Penaeus* sp.) 0.6% and Mantis shrimp (*Oratosquilla* sp.) 0.6%.

The composition and proportion in percentage of catch es using bottom gillnet in Sasak Ranah Pasisie coastal water shown in Table 1.

Table 1. The catch composition of bottom gillnet in Sasak Ranah Pasisie coastal water.

| No | Local Name       | General Name          | Scientific Name       | N  | %   |
|----|------------------|-----------------------|-----------------------|----|-----|
| 1  | Balato           | Yellowtail scad       | *Atule* sp.           | 2  | 1.3 |
| 2  | Baledang         | Largehead hairtail    | *Trichiurus* sp.      | 9  | 6   |
| 3  | Batai-batai      | Shrimp scad           | *Alepes* sp.          | 1  | 0.6 |
| 4  | Bawal hitam      | Black pomfret         | *Parastromateus* sp.  | 8  | 5   |
| 5  | Bawal putih      | Silver pomfret        | *Pampus* sp.          | 1  | 0.6 |
| 6  | Cincilak         | Elongate ilisha       | *Ilisha* sp.          | 1  | 0.6 |
| 7  | Gaguak           | Sea catfish           | *Plicofollis* sp.     | 5  | 3.1 |
| 8  | Galamo           | Tigertooth croacker   | *Otolithes* sp.       | 23 | 14.5|
| 9  | Galimin          | Scad fish             | *Alepes* sp.          | 1  | 0.6 |
| 10 | Jaguang          | leatherjacket filefish| *Aluterus* sp.        | 1  | 0.6 |
| 11 | Kaliang-kaliang  | Torpedo scad          | *Megalaspi* sp.       | 2  | 1.3 |
| 12 | Kantalang        | Queenfish             | *Scomberoides* sp.    | 7  | 4.4 |
| 13 | Kapeh-kapeh      | False trevaly         | *Lactarius* sp.       | 4  | 2.5 |
| 14 | Kase             | Anchovies             | *Thryssa* sp.         | 8  | 5   |
| 15 | Kerong putiah    | Olive grunt           | *Pomadasys* sp.       | 32 | 20.2|
| 16 | Lidah-lidah      | Tonguesole            | *Cynoglossus* sp.     | 2  | 1.3 |
| 17 | Maco             | Common ponyfish       | *Leiognathus* sp.     | 36 | 23  |
| 18 | Maniang          | Fringescalar sardinella| *Sardinella* sp.     | 1  | 0.6 |
| 19 | Sinangih         | Yellowthread threadfin| *Filimanus* sp.       | 2  | 1.3 |
| 20 | Suaso            | Short mackerel        | *Rastrelliger* sp.    | 5  | 3.2 |
| 21 | Tamban           | Smoothbelly sardinella| *Amblygaster* sp.     | 1  | 0.6 |
| 22 | Tete             | Barracuda             | *Sphyraena* sp.       | 1  | 0.6 |
| 23 | Kapitiang karang | Blue swimming crab    | *Portunus* sp.        | 1  | 0.6 |
The most commonly caught species were the families of *Leiognathidae* and *Carangidae*. Those are the most commercial and crucial fish group which become the main target of fishermen's catches. This fish crowd consists of small pelagic fish that live in groups. The small pelagic fish tend to be dense in waters with depths of 0–50 meters [5], hence these fish groups mostly caught in gillnets that operated at the bottom of streams with a depth of ± 5-12 m.

The Common ponyfish (*Leiognathus* sp.) has the highest percentage during the study. Common ponyfish lives in benthopelagic water which is from the bottom waters until it reaches the surface of the waters, with the depth less than 40m in coastal area around mangrove [6]. The existence of mangrove maintains the presence of Common ponyfish, which are still able to be seen around despite the west monsoon occurring. This species lives in the group by utilizing the river mouth as a place of spawn.

3.1.2 The catch composition based on group. The catch is dominated by fish species as much as 96.9%, while the other catch are crabs (1.9%) and shrimp (1.2%). The results obtained are the same as the results obtained from the research by Novita which have captured result of the dominant catch of fish species (99.675%) with a few additional types of crab (0.29%) and shrimp (0.035%) [7]. The same study was carried out by Pondaag that also obtained a dominant fish group (92.23%), with the additional catches of crabs (5%) and shrimp (1.67%) [8]. The results also slightly different from Kawarnidi’s studies that also obtained the dominant catch of fish species (99.3%) with octopus (0.7%) [9]. Both crabs and shrimps tend to live and obtain foods at the bottom of the water—consequently, these organisms have more chance of being trapped in gillnets.

![Figure 2](image-url). The catch composition using bottom gillnet based on group.
Figure 3. The catch composition based on trip using bottom gillnet in Sasak Ranah Pasisie.

The catches could be influenced by several factors such as fish behavior, seasonal fishing, location, soak time, and could be possible by the construction of the gillnet (e.g., depth of the net in the water column, net length, twine type, twine diameter).

3.2. The distribution of length and weight

The longest size of fish caught is 60 cm, and the shortest is 10 cm. As for the size of the most massive catch on the gillnet is 303 grams, while the smallest is 10 grams. The highly average size of catches is 38.94 cm with the shortest average size of 13.50 cm, while the most massive weight average of the dominant catch gained 111.40 grams and 24.00 grams for the smallest weight average.

Table 2. The distribution of length and weight based on dominating catches

| No | Local name | Scientific name | N  | Size | Min | Max | Average |
|----|------------|-----------------|----|------|-----|-----|---------|
| 1  | Maco       | *Leiognathus equulus* | 36 | L    | 10  | 16  | 13.56   |
|    |            |                 |    | W    | 17  | 60  | 42.06   |
| 2  | Kerong putiah | *Pomadasys olivaceus* | 32 | L    | 10  | 21  | 16.00   |
|    |            |                 |    | W    | 30  | 180 | 81.28   |
| 3  | Galamo     | *Otolithes ruber*  | 23 | L    | 14  | 30  | 19.35   |
|    |            |                 |    | W    | 25  | 303 | 78.78   |
| 4  | Baledang   | *Trichiurus lepturus* | 9  | L    | 25  | 60  | 38.94   |
|    |            |                 |    | W    | 30  | 212 | 71.22   |
| 5  | Kase       | *Thryssa* sp.    | 8  | L    | 12  | 15  | 13.50   |
|    |            |                 |    | W    | 10  | 30  | 24.00   |
| 6  | Bawal hitam | *Parastromateus niger* | 8  | L    | 15  | 21  | 17.25   |
|    |            |                 |    | W    | 64  | 177 | 111.40  |
| 7  | Kantalang  | *Scomberoides* sp.| 7  | L    | 15  | 18  | 16.86   |
|    |            |                 |    | W    | 27  | 41  | 36.29   |
| 8  | Suaso      | *Rastrelliger brachysoma* | 5  | L    | 16  | 20  | 18.20   |
|    |            |                 |    | W    | 28  | 97  | 71.00   |
| 9  | Gaguak     | *Plicofollis* sp.| 5  | L    | 18  | 22  | 19.40   |
|    |            |                 |    | W    | 49  | 112 | 74.00   |
| 10 | Kapeh-kapeh | *Lactarius lactarius* | 4  | L    | 15  | 16  | 15.38   |
|    |            |                 |    | W    | 34  | 45  | 38.50   |

Explanation: L = Length (cm); W = Weight (gr)
3.3. The distribution of catches based on the way of captured

The fish trapped in the gillnet are through different ways depending on the type and morphological shape of the fish's anatomy. Fish anatomy size also affects the location and position of fish caught in the net. Most of the fish caught with gillnet by wedged (39%), gilled (30%), entangled (26%), and only in small amount of fish caught by snagged (6%).

![Graph showing distribution of catches](image_url)

Figure 3. The distribution of catches based on the way of captured.

The dominant catch is the Common ponyfish (*Leiognathus equulus*) and Olive grunt (*Pomadasys olivaceus*). Olive grunt mainly entangled in the gills and dorsal fins because the leaves of the olive grunt fish fins widen upright with hard and sharp radius. Whereas Tigertooth croaker (*Otolithes ruber*) are caught in many parts of the mouth and head, because these fish have a large mouth hole and operculum shape equipped with sharp teeth shape, making it possible to get entangled in gillnets in this section. Largehead hairtail (*Trichiurus lepturus*) is the fourth dominant catch that trapped in gillnets in the opening of the mouth and teeth that are attached to the net sheet (string). Crackle anchovy (*Thryssa* sp.) and Black pomfret (*Parastromateus niger*) are the fifth dominant catches caught in the large hole of the operculum. Both of these fish found entangled in the dorsal and caudal fins, although the shape of the fins is different. Black pomfret which has the form of a fin-like a long crescent moon, while the crackle fins are small and upright like a needle, causing the fish to catch in the gillnets in that section quickly.

Most of the catches of the bottom gillnets on coast of Sasak Ranah Pasisie intertwined in wedged and gilled, meaning that the dominant fish caught in the net around the body and the dorsal fin of the fish. The techniques variations of fish entangled in gillnets occur due to the morphological state of the body that the fish catches. For example, the Common ponyfish has a small head size with a reasonably high back arch and a dorsal fin which is hard-toed upright, causing this fish to overhaul in the dorsal fin and operculum hole quickly. Most researchers have assumed that by wedged and gilled of fishes in gillnets are the most important technique of capture, and that entangled method can be ignored [10], [11]. The entangled method supposed to be ignored because is preposed to be less size-selective rather than other method of capture. However, in another studies, entangled method is still important for specific species target.

The least caught method is snagged, which has a higher chance of escape or flee from meshes, because the head of the fish not entirely entangled in the net, and only surrounds the back of the fish's eye. Therefore, the fish will escape easily when resisting or when swimming left or right in a column of water. The condition of catching fish is very dependent on the size and resistance of the fish to escape from the net meshes [12]. Smaller fish have a more flexible body size (for example Largehead hairtail) against the hole of the net, hence it has a higher chance to escape but still possible to get snagged or
gilled in the gillnet. The process of how to catch fish is closely related to the size of the morphology and abundance of stocks in the catchment area [13]. One example is the Largehead hairtail has a long and flat body shape, but has a sharp and large tooth shape, making this fish quickly entangled in the trap. While fish that have a larger body size than the size of a net have a higher risk of darting as a result of resistance when caught up to escape, such as the Tigertooth croaker and Olive grunt.

Overall the fish caught in fewer amounts generally have a reasonably small body size, while dominant fish caught usually have body sizes and head shapes that are larger than the net, causing them to have a higher chance of being trapped in the net eye. Almost all types of catches categorized as commercial fish groups, which mostly found in May-August during the monsoon, which is characterized by low rainfall [14]. The study was conducted in January-February during the occurrence of the monsoon winds that took place in November-February with quite high of rainfall, so the number of fish caught during the study was relatively small but with a reasonably high species composition.

According to the season, the catching effort conducted also affected the type and amount of fish caught [15]. The factors that influence captures include the distribution of fish, the condition of the aquatic environment, the catch location, the equipment construction, the time operation of gears, and the net's amount of stocking. The net sheet used as the material must have slight stimulation to the fish's vision because they will avoid the net if the shade of the catch is too contrasting with the color of the waters. Another factor that influences the fish catch is the strain in the net's range, which results in pressure on the body of the net sheet and the fish that will affect their ability to escape from the trap.

4. Conclusion

The total catch composition of the bottom gillnet in the coast of Sasak Ranah Pasisie were 26 individual species consist of 22 species of fish, two species of crab, and two species of shrimp, composed of 7 orders with 19 families. The catches were dominated by Common ponyfish (*Leiognathus* sp.) (23%). Other types of fish caught include Olive Grunt (*Pomadasys* sp.) (20.2%), Tigertooth croaker (*Otolithes* sp.) (14.5%), Largehead hairtail (*Trichiurus* sp.) (6.0%), anchovies (*Thryssa* sp.) (5.0%), and black pomfret (*Parastromateus* sp.) (5.0%). Crabs and shrimp caught in small amounts, and the most way of fish intertwined by gillnets were through wedged and gilled, 39% and 30%, respectively.

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