South East Asian Marine Sciences Journal (SEAMAS)
Journal Homepage: https://journal.stedca.com/index.php/seamas

Composition of main and bycatch in the drift net gear at PPI Air Bangis

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Article Info
Keyword:
Main Catch,
Bycatch,
Drift gill net,

Received:
20 January 2025
Accepted:
23 February 2025
Published:
01 March 2025

Abstract
With 72.56 km of coastline, Air Bangis is one of the largest fish producers in West Pasaman. West Sumatra has a vast marine area with hundreds of islands running north to south. At PPI Air Bangis, drift gillnets are used in the Pangkalan and Pini areas. Pangkalan Island is about 7 miles away, and Pini Island is 60 miles away. The fishing grounds greatly influence the amount of catch, what variables affect the catch in different fishing grounds, and what types of catch are caught in different fishing grounds. The method used was direct interviews in the fishing waters to classify the types of species and count the number of species caught by the drift gillnet gear. Fishermen were also interviewed to determine the standard main and bycatch. These results were analyzed using descriptive statistical analysis and tabulated in tables and graphs. Overall, the number of species caught by drift gillnet gear. Site distance, vessel capacity, and water conditions greatly influenced the effectiveness of the fishing grounds. In 6 GT vessels, the highest main catch was 58%, and the highest bycatch was 42%. On 3 GT vessels, the highest main catch was 57%, and bycatch was 43%. To maximize fish catch, proper and planned selection of fishing sites is essential while considering external factors such as selectivity of fishing gear used and weather conditions. Thus, tools such as echosounder can greatly help fishermen locate where fish congregate.

1. INTRODUCTION

Air Bangis is one of the largest fish producers in West Pasaman, with a coastline length of 72.56 km. West Sumatra has a vast marine area encompassing hundreds of islands from north to south. Many of these islands provide high biological resources. However, until now, its sustainability has not been managed and monitored correctly. West Sumatra's marine area covers approximately 138,750 km² with 375 km of coastline. In addition, 186 islands stretch from the north to the south of West Sumatra, which have great potential for fisheries and marine resources. Gill net is a passive type of fishing gear; in other words, this fishing gear only waits for the fish to swim, and then it will hit the net body. This fishing gear is also very selective because the fish if the diameter of its body is smaller than the size of the mesh itself, then the fish will pass; on the contrary, if the diameter is equal to or greater than the size of the mesh, then the fish will be caught. The number of gill net-type fishing gear in PPI airbags is more than 200 units of tools. The types of fishing gear in general used by fishermen in PPI airbags are boat began fishing gear, gillnet, trammel net, and purse seine. One fishing gear used at PPI Air Bangis is drift gill net fishing gear with 3 GT-6 GT vessels.

Drift gill nets are fishing gear designed to catch fish passively when the net drifts with the ocean current. Here's an explanation: A drift gill net, also known as a drift gill net, is a device for catching fish.

It consists of a net with a specific eye size designed to drift above or slightly below the water's surface. It is usually set at night and allowed to drift with the ocean currents. Fish that hit the net while swimming will be trapped inside their gills, making moving difficult. Various types of fish, such as *Scomberomorini, Parastromateus niger, Lutjanus* sp, *Trichiurus* sp, and *Callorhinchus milii*, are often caught with drift gill nets. The drift gillnet gear used at the Air Bangis PPI has a mesh size of about 3 and 4 inches.

The operating area of the drift gill net at PPI Air Bangis is operated in the Pangkalan and Pini areas, with a distance to the Pangkalan island of about 7 miles. In comparison, the distance to Pini Island is 60 miles. The gill net fishing area strongly influences the amount of catch. The main catch of 3 GT vessels is *Parastromateus niger,* while 6 GT vessels are *Scomberomorus commerson*. Since their catches will be marketed directly, drift gillnet fishermen at PPI Air Bangis only deliver them to the Fishing Harbour. Utilizing or capturing fish resources through certain technologies or tools is known as capture fisheries. The economic principle of capture fisheries is meeting demand by achieving the most significant possible profit (Susaniati et al., 2011).

2. RESEARCH METHODS

Time and Place

This research will be conducted from 15 May to 6 June 2024 at one of the largest PPIs in West Pasaman, PPI Air Bangis, in West Sumatra Province.

Material and Tools

The method used in composing the catch at PPI Air Bangis in West Pasaman, conducted by direct interviews in fishing waters, helps classify the type of species and count the number of species caught by drift gill net fishing gear.

Data Analysis

Drift gill net catch data were analyzed using decisive statistical analysis tabulated in tables and graphs using Microsoft Excel 2010 software to show the difference between main and bycatch. To determine the relative abundance, the formula was used as follows:

$$\text{MainCatch} \frac{\text{Total amount of main catch}}{\text{Total number of catches}} = X\ 100\%$$

$$\text{By Catch} = \frac{\text{Total amount Bycatch}}{\text{Total number of catches}}\ X\ 100\%$$

$$\text{Discard} = \frac{\text{Total amount discard}}{\text{Total number of catches}} X\ 100\%$$

3. RESULTS AND DISCUSSION

Drift Gillnet Catch Area

Air Bangis Coastal Fishing Port (PPI) is in Beremas River District, West Pasaman Regency, West Sumatra Province, Indonesia. Geographically, PPI Air Bangis has coordinates around 0°11 'LU (North latitude) and 99°35' BT (East longitude). Its location on the west coast of Sumatra gives it direct access to the waters of the Indian Ocean, which are rich in fish resources. Air Bangis Coastal Fishing Harbour (PPI) is one of the fishing locations in West Sumatra, Indonesia.

Drift gill nets are fishing gear often used in fisheries to catch fish that live on the water's surface. It differs from bottom gill nets in that drift gill nets operate by being allowed to drift with the water current. Structure and design: a net made of strong, durable materials such as nylon or other synthetic materials. These nets are usually long and high enough to reach the water column where fish swim. Selecting fishing gear is important so that the results are optimal and do not damage the aquatic ecosystem. Gill nets are passive fishing gear installed in the swimming path of fish or fish groups. Because this fishing gear is selective, only fish with a body size smaller than the mesh will be caught (Purwaningsih, 2017). At PPI Air Bangis, nine drift gill net fishing gear units are operated. At the time of the study, the drift gillnet fishing gear was on 3 GT -6 GT vessels that handle loading and unloading. The 3 GT vessels have a net

length of 1,400 m and a width of 10 m, while the 6 GT vessels have a length of 1,600 m and a height of 13 m. Images of drifting gills are as follows:

Figure 1. Drift gill nets.

Drift Gill Net Operation Technique

Drift gill net operation is a fishing method that uses a long net that is allowed to drift with the water current. The fishermen's interviews show several stages of drift gill net operation: In preparing to go to sea on drift gill nets at PPI Air Bangis, the preparation time depends on the activity being carried out. For vessels measuring 3 GT to 6 GT, preparation for going to sea in the afternoon and returning in the morning takes about 30 minutes. This involves checking and preparing fishing gear and ensuring everything is ready before leaving. Meanwhile, if the preparation for going to sea is carried out for 2 to 3 days, the time required for preparation for going there can range from 3 to 5 hours. This longer preparation generally includes more defished checks, maintenance of fishing gear, and preparation of materials needed to ensure smooth sailing and fishing.

Interviews with fishermen on 3 GT and 6 GT vessels showed the same net-setting activities and timing. Before starting fishing activities, the drift gillnets on these vessels are first identified. To do this, conventional instinct and experience are still used. At around 6.00 pm, the fishermen began to lower the net. Before that, the ship's engine was first turned off because the position of the ship shifted towards the back. One of the crew members controls an oar at the bow of the boat; the oar serves as a substitute for the rudder to straighten the net. To straighten the net. The oars are set, and the other fishermen must lower the marker, buoys, weights, and marker within plus or minus one hour and thirty minutes. The introductory rope, tied to the anchor at the boat's bow, is tied to the upper ris rope at the fisherman's end. To prevent the net from getting entangled and stretched out in the water, throwing the buoy and sinker must be adequately done (Runny, 2017).

Gill nets do immersion drift for about 6 hours, from 8.00 pm until 01.00 am. At the time of removal, the net is well arranged to make it easier during the next operation (Sudirman et al., 2004). After more than 6 hours of fishing gear is left in the water, fishermen start the ship's engine to stabilize the ship when pulling fishing gear. In the hauling process, two people are needed to pull the fishing gear; one crew member pulls the net on the upper riser rope and sits at the ship's bow, while the other crew member pulls on the lower riser rope, sitting on the ship's deck. The hauling process took ± 2 hours because, during the withdrawal of fishing gear, the crew pulling on the lower ris rope had difficulty releasing the fish caught by twisting. After all the catches and nets are pulled up, sorting activities are carried out (Hastuti et al., 2013).

Catchment Area

Catchment area fertile: 1) near-shore waters, especially those close to estuaries; and 2) shallow waters, because they constantly get stirred up bottom waters rich in nutrients. Its fishing grounds are in deep water with a mesh size of 3 inches to 4 inches and a water depth of about ±30 meters. This gear operates at PPI Air Bangis, 7 miles from the Pangkalan island, and requires a journey time of ± 1 hour.

There are four seasons: the west season runs from October to December; the north season runs from January to March; the east season runs from April to June; and the south season runs from July to September. The west season is often called the lean season because the waves are very strong during this period, so fishermen cannot go to sea.

Fishermen at PPI Air Bangis on Pangkal Island and Pini Island only use compasses and their intuition to find drift gillnet fishing grounds. Pangkal Island is about 7 miles from the harbor, while Pini Island is about 60 miles away. Fishermen go to both islands with 3 GT or 6 GT boats. Based on interviews with fishermen, the fishing location dramatically influences the catch. The farther away the fishing location, the greater the possibility of getting better and abundant results, as not all fishers are willing to travel long distances. On Pangkal Island, fishing is done at a depth of 30 meters and below, while on Pini Island, the fishing depth reaches 60 meters and below. In addition, the water conditions on Pini Island are cleaner than those on Pangkal Island, contributing to better catch on Pini Island.

Composition of Drift Gill Net Catches

The results of the study, the fish caught at PPI Air Bangis are: *S.commersoni, Chirocentrus dorab, Bramidae, Euthynnus affinis, Scoliodon laticaudus,* and *Macolor niger* can be seen in Table 1.

Table 1. Catches based on total weight

Date	Catch			
	Total weight (kg) 3 GT	Number of individuals (Fish)	Total weight (kg) 6 GT	Number of individuals (fish)
24 May 2024	75	82	103	117
25 May 2024	91	100	115	129
27 May 2024	80	59	125	123
28 May 2024	115	139	125	144
29 May 2024	103	115	130	137
Total	464	495	598	650

Table 1 shows the number of catches in drift gill nets on 3 GT and 6 GT vessels. On 3 GT vessels, fishing was carried out 5 times, once operating for about one day. The total catch caught during the study was 464 kg and 495 fish. The most caught catches was 115 kg on 28 May 2024, and the most caught catches in terms of fish was 139 fish. Meanwhile, the 6 GT ship was caught 5 times, once operating for about a day. The total catch caught during the study amounted to 598 kg and as many as 650 fish. The most catches were 130 kg on 29 May 2024, and the most catches in terms of fish were 144 on 28 May 2024. A diagram of the catch (kg) with drift gillnet gear on 3 GT and 6 GT vessels for 5 days can be seen in Figure 2.

The types of fish caught and the specific weight of fish per (kg) for 5 days and 10 trips can be seen above. The most caught fish is *S. commersoni* in 3 GT vessels weighing 180 (kg), while in 6 GT vessels weighing 240 (kg). The last fish caught is based on the amount of weight (kg) *C. drab* with a total weight of 40 (kg) on a 3 GT boat, while on a 6 GT boat, the total weight is 55 (kg). Data on the number of individuals (fish) is converted into a graph to see the differences in the types of fish caught on 3 GT and 6 GT vessels in the form of individuals (fish) at the time of the study can be seen in Figure 3. It can be seen above the type of fish caught and the number of individuals (fish) for 5 days and 10 trips. The most caught fish is the *S. commersoni*. In 3 GT vessels, the number of individuals is 161 (fish), while in 6 GT vessels, the number is 200 (fish). The last fish caught by number. Individuals (fish) are *S. laticaudus,* with 40 individuals (fish) on 3 GT vessels, while 6 GT vessels are fish. *E. affinis* with 48 individuals.

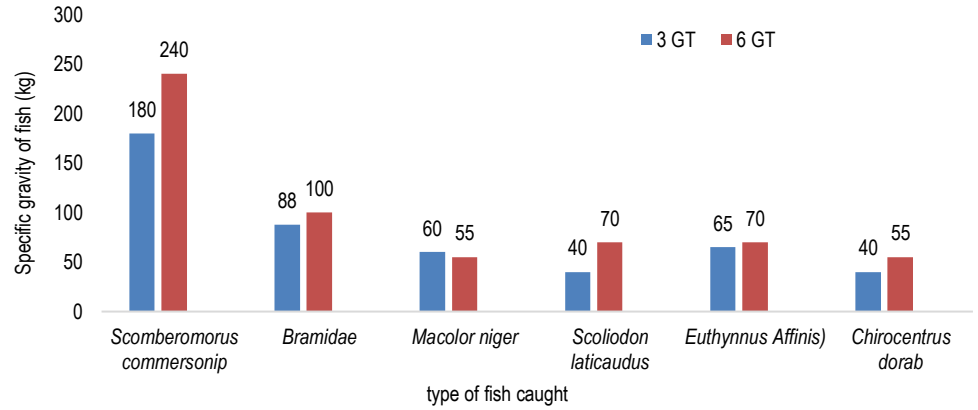

Figure 2. Catches on 3 GT and 6 GT vessels' total weight

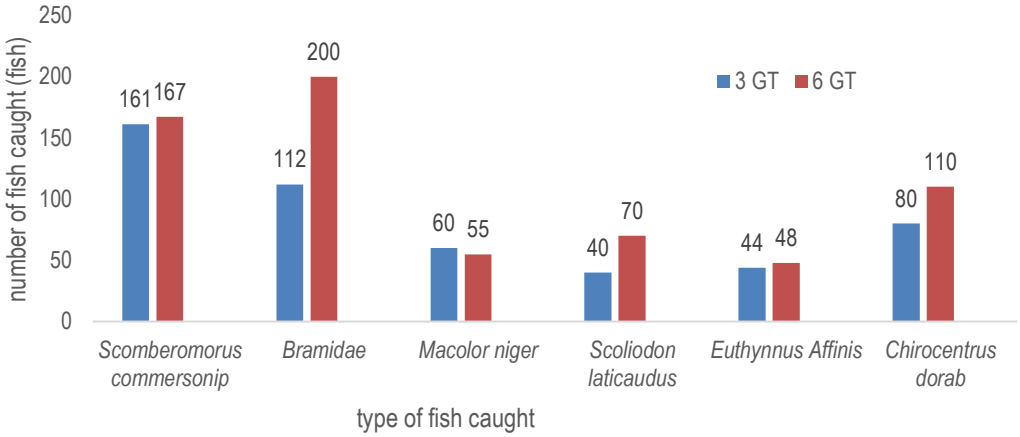

Figure 3. The type of catch in 3 GT and 6 GT vessels for 5 days in number of individuals

Catch of 3 GT Vessel Catching at the Pangkalan of 7 Mile Fishing Area

Operation of drift nets in the fishing area at the Pangkalan island during the study with a total of 6 types of fish consisting of mackerel, pomfret, black snapper, shark, and mackerel. The catch results can be seen in Table 2.

Table 2. Catches of 3 GT vessels catching at the Pangkalan of the catch area at 7 Miles

Number	Type of Catch	Total Catch	
		Kg	Fish
1	*S. commersonip*	198	133
2	*Bramidae*	70	140
3	*M.niger*	60	60
4	*S. laticaudus*	40	40
5	*E. affinis*	65	44
6	*C. dorab*	40	80

In Table 2, *S.commersoni* is the type of fish that most fishermen catch. 3 GT vessels reached 198 kg with 133 individuals (fish), and the lowest catch was 40 kg of *S. laticaudus*, with 40 and 80 *Chirocentrus dorab*. The catch of the 3 GT boats caught at the Pangkalan of the fishing grounds at 7 miles from the weight count can be seen in Table 3.

Table 3. Catches of 3 GT vessels catching at the Pangkalan of the fishing area at 7 miles in kg

Number	Type of Catch	Total Catch	
		Kg	Percentage
1	*S. commersoni*	198	42
2	*Bramidae*	70	15
3	*M. niger*	60	13
4	*S. laticaudus*	40	8
5	*E. affinis*	65	14
6	*C. dorab*	40	8
	Total	473	100

View the catch caught during the study by weight (kg) in percentage form. The catch of the 3 GT boats caught at the Pangkalan of the fishing area at 7 miles from the fish unit can be seen in Table 4.

Table 4. Catches of 3 GT vessels catching at the Pangkalan of the fishing area at 7 miles in fish

Number	Type of Catch	Total catch	
		Fish	Percentage
1	*S. commersoni*	133	27
2	*Bramidae*	140	28
3	*M. niger*	60	12
4	*S. laticaudus*	40	8
5	*E. affinis*	44	9
6	*C. dorab*	80	16
	Total	497	100

Catches of 6 GT Vessels Catching at 60-Mile Catch Area

During the study, the fish species caught at PPI Air Bangis were: *S.commersonip, C. dorab, Bramidae, E.affinis, S. laticaudus,* and *M.niger.* The catch results can be seen in Table 5.

Table 5. Catches of 6 GT vessels are catching in the Pini-catching area at 60 miles.

Number	Type of catch	Total catch	
		Kg	fish
1	*S. commersoni*	248	167
2	*Bramidae*	100	200
3	*M. niger*	65	65
4	*S. laticaudus*	60	60
5	*E. affinis*	70	48
6	*C. dorab*	55	110

In the table, Fishermen most often catch *S. commersoni*, as shown above. The vessel was 6 GT, weighing 248 kg, and had a total number of individuals (fish) of 167. *C. dorab*, weighing 55 kg, and the least number of individuals (fish) caught was 48. To draw a histogram of the catch according to weight and fish counts. The catches of 6 GT vessels fishing in the pini fishing grounds at 60 miles from the weight counts can be seen in Table 6.

View the catch caught during the study by unit (kg) as a percentage graph. The catch of 6 GT. Vessels caught in the stingray fishing grounds at a distance of 60 miles from the fish unit can be seen in Table 7.

Table 6. Catch of 6 GT vessels at Pini fishing area at 60 miles in kg unit

Number	Type of catch	Total catch	
		Kg	Percentage
1	*S. commersoni*	248	46
2	*Bramidae*	100	18
3	*M. niger*	65	12
4	*S. laticaudus*	60	12
5	*E. affinis*	70	11
6	*C. dorab*	55	11
	total	598	100

Table 7. Catch of 6 GT vessels in the pini fishing area at 60 miles in the fish unit

Number	Type of Catch	Total catch	
		Fish	Percentage
1	*S. commersoni*	167	26
2	*Bramidae*	200	31
3	*M. niger*	65	10
4	*S. laticaudus*	60	9
5	*E. affinis*	48	7
6	*C. dorab*	110	17
	total	650	100

Comparison of Main and Bycatch of 3 GT and 6 GT Vessels

The main catch is fish that have high economic value and are a priority for fishermen. The main targets of drift gill nets on 3 GT vessels are *Scomberomorus commersonip* and *Bramidae*. *Bramidae* is a type of schooling demersal fish with a relatively large size and high economic value. This causes pomfret to become one of the main targets for fishermen. Meanwhile, bycatch, also known as bycatch, is not included in the main target catch but has high economic value. According to Nofrizal (2018), fishermen do not want bycatch, even though it has high economic value. Below is a comparison diagram of the main and bycatch of a 3 GT vessel.

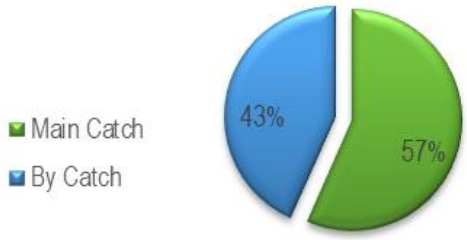

Figure 4. Comparison of main and side catches of 3 GT vessel

The main catch is the main target of drift gillnet gear. Fish with high economic value are the main catch, *and S. commersoni* and *Bramidae* are the main targets of 6 GT drift gillnets. The schooling of demersal fish and pomfret is costly and extensive. However, bycatch, also known as bycatch, is not included in the main target catch but has a high economic value. Nofrizal (2018) explains that bycatch is fish that fishermen do not want, even though it has a relatively high economic value. A diagram of the main and bycatch comparison on a 6 GT vessel is as follows:

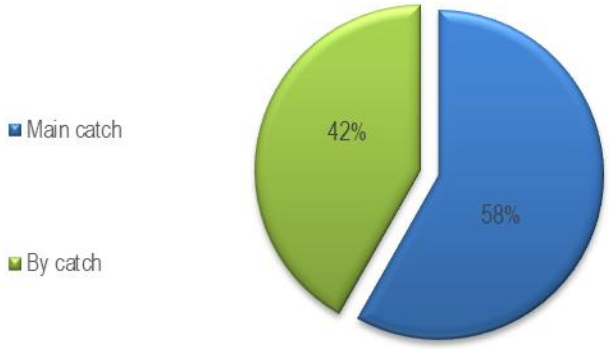

Figure 4. Comparison of main and side catches of 6 GT vessel

4. CONCLUSIONS

The difference in catches between 3 GT and 6 GT vessels is due to different operational capacities and ranges, where 6 GT vessels can reach farther fishing areas with more abundant results than 3 GT vessels. During the study, the most caught fish was mackerel in the 6 GT boat with a weight of 248 (kg) with 167 (fish), and the least caught was *C.dorab* with a weight of 55 (kg) with 110 (fish), while in the 3 GT boat, the most caught fish was *S.commersoni* with a weight of 198 (kg) with 133 (fish) and the least fish was *C. dorab* with a weight of 40 (kg) with 80 (fish). Based on the comparison of catches between 3 GT boats and 6 GT boats, the catch caught on 3 GT boats on the Pangkalan Island with a distance of 7 miles at the time of the study where in terms of weight (kg) the main catch was 57%, and the bycatch was 43%. While on the 6 GT boat on Pini Island with a distance of 60 miles, the main catch was 58%, and the bycatch was 42%.

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