JURNAL PERIKANAN DAN KELAUTAN
Volume 28 No. 3, October 2023: 291-298

e-issn : 2721-8902
p-issn : 0853-7607

Comparison of Bottom Gillnet Catches with Different Mesh Sizes in the Waters of Sungai Jambat Village, Sadu District

Perbandingan Hasil Tangkapan Bottom Gillnet dengan Ukuran Mata Jaring yang Berbeda di Perairan Desa Sungai Jambat Kecamatan Sadu

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Received
17 January 2023

Accepted
20 May 2023

Abstract

Sadu District is located in East Tanjung Jabung Regency and consists of 9 villages, one of which is Sungai Jambat Village which is characterized by turbid, wavy, muddy, and sandy waters. The majority of fishermen in Sungai Jambat Village use bottom gillnet fishing gear with a mesh size of 3.5 inches and 4 inches. The purpose of this study was to compare the catches of bottom gillnet with mesh sizes of 3.5 inches and 4 inches in the waters of Sungai Jambat Village. The method used in this research is the experimental fishing method. The data collected includes environmental parameters, catch per species (head), and number of catches (head), weight per species (kg), and the total weight of catch (kg). The data analysis used is the descriptive analysis of an independent sample t-test. The results showed that the 3.5-inch mesh treatment was significantly higher than the 4-inch mesh treatment ($p<0.05$) in terms of the number and weight of bottom gillnet catches. In the 3.5-inch mesh size, the catch was 3,067 individuals with a weight of 248.40 kg, and the number of catches in the 4-inch mesh size was 2,820 individuals with a weight of 234.60 kg. The highest number of catches was leaftail croaker found in a 3.5-inch mesh size of 1,393 individuals, and mantis shrimp was the heaviest catch in a 3.5-inch mesh size weighing 69 kg. Pomfret is the lowest catch in terms of quantity and weight. The conclusion of this study in terms of the number and weight of catches with a 3.5-inch mesh size is higher than the 4-inch mesh size.

Keywords: Bottom Gillnet, Mesh size, Sungai Jambat village waters

Abstrak

Kecamatan Sadu terletak di Kabupaten Tanjung Jabung Timur yang terdiri dari 9 desa, salah satunya adalah Desa Sungai Jambat yang memiliki ciri perairan keruh, bergelombang, berlumpur dan berpasir. Mayoritas nelayan di Desa Sungai Jambat menggunakan alat tangkap bottom gillnet dengan ukuran mata jaring 3,5 inci dan 4 inci. Tujuan dari penelitian ini adalah membandingkan hasil tangkapan bottom gillnet dengan ukuran mata jaring 3,5 inci dan 4 inci di perairan Desa Sungai Jambat. Metode yang digunakan dalam penelitian ini adalah metode *experimental fishing*. Data yang dihimpun meliputi parameter lingkungan, hasil tangkapan per jenis (ekor), jumlah hasil tangkapan (ekor), berat per jenis (kg) dan berat total hasil tangkapan (kg). Analisis data yang digunakan adalah analisis deskriptif *independent sample* t-test. Hasil penelitian menunjukkan bahwa perlakuan mata jaring 3,5 inci nyata lebih tinggi dibandingkan perlakuan mata jaring 4 inci ($p<0,05$) terhadap jumlah dan berat hasil tangkapan bottom gillnet. Pada ukuran

mata jaring 3,5 inci hasil tangkapannya adalah 3.067 ekor dengan berat 248,40 kg, dan jumlah hasil tangkapan ukuran mata jaring 4 inci sebanyak 2.820 ekor dengan berat 234,60 kg. Jumlah hasil tangkapan tertinggi adalah ikan gulama terdapat pada ukuran mata jaring 3,5 inci sebanyak 1.393 ekor, dan udang mantis merupakan hasil tangkapan terberat pada ukuran mata jaring 3,5 inci dengan berat 69 kg. Ikan bawal merupakan tangkapan terendah dalam segi jumlah dan berat. Kesimpulan dari penelitian ini dalam segi jumlah dan berat hasil tangkapan ukuran mata jaring 3,5 inci mendapatkan hasil yang lebih tinggi dibandingkan dengan mata jaring 4 inci.

Kata kunci: *Bottom Gillnet*, Mata Jaring, Perairan Desa Sungai Jambat

1. Introduction

Tanjung Jabung Timur Regency has quite a large natural resource potential in the marine and fisheries sector, with a coastline of 191 km that stretches from the border of Tanjung Jabung Barat Regency to the border of Sumatra Selatan Province which has marine capture fisheries with an area of 77,752 hectares. Based on fish production according to the Tanjung Jabung Timur Regency Fisheries Service sub-sector, the production of capture fisheries consisting of marine fisheries reached 23,491.54 tons, public waters reached 130.86 tons, and aquaculture products reached 120.4 tons. Of the various types of waters in East Tanjung Jabung Regency, the largest production of marine waters is in Mendahara District, Nipah Panjang District, Muara Sabak Timur District, Sadu District, and Kuala Jambi District (DKP Tanjung Jabung Timur, 2020).

Sadu District is one of the Subdistrict in Tanjung Jabung Timur Regency which consists of 9 villages, namely Sungai Benuh, Labuhan Pering, Sungai Cemara, Air Hitam Laut, Remau Baku Tuo, Sungai Sayang, Sungai Jambat, Sungai Lokan, and Sungai Itik. Sadu District is the District that has the longest coastline in Tanjung Jabung Timur Regency, namely and directly borders the South China Sea. Based on survey results Sadu District has a total of 355 fishermen using gill net fishing gear, splints, longlines, trawls, bag nets, and others come from Sungai Jambat Village. Sungai Jambat Village has 20 fishermen who use longline fishing gear, splints, and basic gill nets (bottom gillnets).

The catch tool that is widely used in Sungai Jambat Village is the bottom gill net as many as 10 fishermen with net size (mesh size) 3.5 inches 5 fishermen and 4 inches 5 fishermen, with the main catch mantis shrimps (*Harpiosquila rhapidae*) where the operation of this fishing gear is by the main catch habitat which is at the bottom of the waters and technically this fishing gear is easy to operate. Fishing business using gill nets is no longer a new technology for fishermen, this is because the materials are easier to obtain, technically easy to operate, and economically affordable for fishermen. According to Rustandar (2005) states that basic gill nets are operated at the bottom of the waters with the target of catching demersal fish.

The size of the mesh in a gill net greatly affects catch results. This is because nets are a vital part of the fishing process. The meshes in gill nets have different shapes and sizes, where differences in meshes affect the weight and quantity of each type of catch (Pratama, 2012). Mesh size is the size of the hole in the fishing net, the size of the gill net mesh has a significant influence on the efficiency and composition of the catch. The smaller the mesh size used, the smaller the fish that will be caught. This research aims to determine the comparison of catches of bottom gillnet with finger sizes of 3.5 inches and 4 inches in the waters of Sungai Jambat Village, Sadu District.

2. Material and Method

2.1. Time and Place

This research was carried out in the waters of Sungai Jambat Village, Sadu District from June 25 2022 to July 25, 2022

2.2. Methods

This research was conducted using the method of experimental fishing. According tosrigandon (1981) Method experimental fishing is a planned method to obtain new facts or strengthen or refute existing facts. The data taken in this research was obtained directly through research in the field. The sample in this study was determined using the Simple Random Sampling method, namely 20% of the total of 10 3.5-inch and 4-inch Gillnet fishermen. This research was carried out using direct fishing operations with 2 (two) local fishermen using 2 units of basic gill net fishing gear (bottom gillnet) with a mesh size of 3.5 inches and 4 inches with a net length of ±900 meters and 2 vessels (pompong) measuring 3 GT with 16 repetitions.

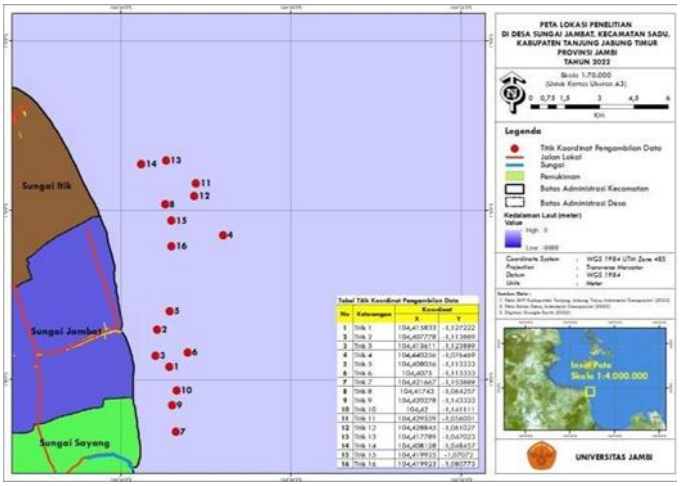

Figure 1. Map of research locations

2.3. Procedure

Working procedures in basic gillnet fishing gear research (bottom gillnet) are as follows:

2.3.1. Preparation

Preparations are made as follows, make the following preparations, first prepare BBM (fuel oil), boats (pompong), cut leaftail croaker bait weighing ±20g 300 pieces with a total weight of 6 kg and prepare the fishing gear that will be used, namely basic gill net fishing gear (bottom gillnet) the mesh size 3.5 inches and 4 inches and others needed for supplies while at sea. Bottom gillnets which have a length of ±900m and width of 1.5m, the body of the net is divided into several parts having sign buoys; the distance between the sign buoys and the other sign buoys is ±30m with the mesh sizenamely 3.5 inches and 4 inches. Determining the fishing location is done using the experience of fishermen because it is still traditional and requires time to get to the fishing ground ±1 hour.

2.3.2. Installation Operation

The arrest operation is divided into two stages, namely the setting, and hauling. The setting process begins with lowering the sign buoy, main buoy, and net body followed by installing the bait where the bait of the cut grass weed weighing ±20 g is attached with the help of a safety pin to the mesh size with a distance between other baits, namely ±3 m and the installation of the baits linked in a straight line to the body of the net with a distance between the baits and the weights ±50 cm. until everything is lowered or stretched perfectly, then lower the float to the second mark, then measurements of environmental parameters such as temperature, pH, salinity and current speed are carried out during the setting process. The time required to lower the net is ± 1 hour and this research carried out two treatments with mesh size differences, namely 3.5 inches and 4 inches. After the setting process is complete, the next step is Immersion for ± 2 hours then the lifting process is hauling where the catch caught in the net is collected in a container or basket. Then the catch is observed and the weight, quantity, and composition of the catch are recorded on the fishing gear bottom gillnet.

2.3.3. Collected Data

The data used is primary and supporting data. Primary data obtained in this study include catch per species (fish), the total number of catch (fish), weight per type of catch (kg), and the total weight of catch (kg) as well as supporting data obtained in this research including the degree of acidity (pH), current speed, temperature, and salinity.

2.4. Data Analysis

To determine the differences in catch results from fishing gear bottom gillnet with the mesh size different a T-test is carried out, the t-test used is the Independent sample t-test. This t-test aims to compare the means of two groups that are not paired or related. The data analyzed is the catch from each mesh size different quantity/type, total quantity, weight/type, and total weight. The data obtained were processed using the t-test formula Sudjana (2005) by using the following formula:

$$\text{t hitung} = \frac{X1-X2}{\sqrt{(n1-1)s,2+(n2-1)s,2\frac{1}{n1}\frac{1}{n2}}}{n1+n2-2}$$

Information:

t = Calculated t value
X1 = Average catch on mesh size 4 inches (fish)
X2 = Average catch on mesh size 3.5 inches (fish)

n1 = Number of samples mesh size 4 inches
n2 = Number of samples mesh size 3.5 inches
n = Sum of n1+ n2
s,2 = Variance of group values

3. Result and Discussion

3.1. General Description of Research Location

Tanjab Timur Regency is a division area in Jambi Province. The location of the district which has an area of 5.330 km^2, is very strategic because it is close to the regional economic growth center of Singapore-Batam-Johor (SIBAJO) or Indonesia-Singapore-Malaysia (IMS). In this area on the east coast of Sumatra, the northern and eastern parts directly border the Natuna Sea, while the southern part borders Muara Jambi Regency, and the western part borders West Tanjab Regency (Sutrisno, 2012).

Sadu District area, to the north borders the South China Sea, to the east borders the South China Sea, to the south borders Sumatra Selatan Province, and to the west borders Nipah Panjang District and Berbak National Park. The area of Sadu District is 1,821 km^2 consisting of 9 villages including Sungai Jambat Village with an area of 139.7 km^2 or equal to 7.67% of the total area of Sadu District (BPS, 2021).

3.2. Composition Result Bottom Gillnet

Based on the research results, there were 7 types of catch in total in this fishing effort with Mantis Shrimp as the main catch. Composition data on the number and weight of catches using bottom gillnet using 3.5-inch and 4-inch meshes can be seen in Table 1.

Table 1. Composition of types of catch bottom gillnet by using mesh sizes of 3.5 inches and 4 inches

Hasil Tangkapan		Ukuran Mata Jaring								Ket
		3,5 inci				4 inci				
Nama Lokal	Nama Ilmiah	Jumlah (Ekor)	Komposisi (%)	Berat (Kg)	Komposisi (%)	Jumlah (Ekor)	Komposisi (%)	Berat (Kg)	Komposisi (%)	
Udang mantis	*Harpiosquilla raphidea*	455	14,84	69,00	27,78	393	13,94	62,10	26,47	HTU
Gulama	*Johnius trachycephalus*	1393	45,42	57,60	23,19	1347	47,77	57,20	24,38	HTS
Pari	*Dasyatis Sp*	319	10,40	45,30	18,24	266	9,43	42,90	18,29	HTS
Duri	*Hexanematichthys sagor*	341	11,12	44,20	17,79	312	11,06	42,90	18,29	HTS
Senangin	*Eleutheronema tetradactylum*	139	4,53	15,20	6,12	106	3,76	13,10	5,58	HTS
Bawal	*Pampus argenteus*	73	2,38	6,70	2,70	59	2,09	6,50	2,77	HTS
Rajungan	*liocarcinus holsatus*	347	11,31	10,40	4,19	337	11,95	9,90	4,22	HTS
Total		3067	100,00	248,40	100,00	2820	100,00	234,60	100,00	
Rata-rata/hari		191,69		15,53		176,25		14,66		

Note: HTU = main catch; HTS = bycatch.

The main catch when caught using fishing gear bottom gillnet in Sungai Jambat Village is mantis shrimp (*Harpiosquilla raphidea)*, while for leaftail croaker (*Johnius trachycephalus*), stingray (*Dasyatis* sp), sagor catfish (*Hexanematichthys sagor*), fourfinger threadfin (*Eleutheronema tetradactylum*), pomfret (*Pampus argenteus*) and crab (*Liocarcinus holsatus*) categorized as bycatch. According to Sarmintohadi (2002), the diversity of species caught is due to the similarity of habitat between target fish and non-target fish. According to the opinion of Mirnawati (2019), the main catch is the target catch and has high economic value, while the by-catch is the catch that has low economic value. Santoso et al. (2009), by-catch types of fish generally have little economic value and are often not brought to land.

leaftail croaker became the largest catch of both mesh sizes during research with 16 repetitions with mesh sizes3.5 inches resulting in a catch of 1393 fish (45.42%) in the mesh size 4 inches caught 1347 fish (47.77%) this is thought to be caused by the research location or fishing ground having a muddy substrate is still included in the habitat favored by the leaftail croaker which is a bottom fish (demersal) by fishing gear whose operation is at the bottom of the waters. This is the opinion of Saputra et al. (2008), which explains that the leaftail croaker is one of the demersal fish of the family Sciaenidae. Further, according to Robin et al. (1991); Sasaki (1995) leaftail croaker is a type of fish that lives in marine and brackish waters. According to Anggraeni et al. (2016), these fish live in groups. Meanwhile, the lowest catch was pomfret in both net mesh sizes, and catches mesh size 3.5 inches resulted in a catch of 73 fish (2.38%) at the mesh size 4 inches caught 59 fish (2.09%), this is thought to be because the abundance of white pomfret is still small and this research was conducted in June-July, which is the east season. This follows the opinion of Partosuwiryo (2002), who stated that white pomfret is abundant in the western season, and the peak of the pomfret season coincides with the peak of the rainy season. Supported by the opinion of Fadika et al. (2014) which states that the western season occurs in December, January, and

February while the east season occurs in June, July, and August. In the opinion of Setiawan et al. (2016) states that the fishing season is one of the determinants of production value in a body of water.

In terms of weight, mantis shrimp, fourfinger threadfin have a higher mesh size of 3.5 inches compared to 4-inch mesh, and leaftail croaker, stingray, sagor catfish, pomfret, crab the mesh size is 4 inches higher than the 3.5-inch mesh. Mantis shrimp became the catch with the highest weight in both mesh sizes during the research with 16 repetitions with the mesh sizes the 3.5 inch caught a catch of 69 weight (27.78%) on mesh size 4 inches caught a catch weighing 62.1 kg (26.46%) due to the research location or fishing ground has sandy and muddy substrates and also borders the mantis shrimp distribution area namely the Natuna sea. This is the opinion of Syafrina and Raisa (2011), that the Java Sea and Natuna Sea are the distribution areas of the mantis shrimp family Harpiosquillidae and Squillidae. Mantis Shrimp It is also the main catch in fishing using bottom gillnet in Sungai Jambat Village, where the average weight of mantis shrimp caught during the research was 156 g. This is following the opinion of Moosa (2000) that the body size of mantis shrimp can reach 33.5 cm with a weight of 200 g/fish. The lowest catch weight during the research with 16 repetitions was pomfret namely the size of the mesh size 3.5 inches got a catch weighing 6.7 kg (2.70%) on the mesh size 4 inches got results weighing 6.5 kg (2.77%) because the number of pomfret caught was small. Gill nets with a mesh size 3.5 inches has a catch with an average weight per day of 0.42 kg and a gill net with a mesh size of 4 inches has a catch with an average weight per day of 0.41 kg.

3.3. Catch Result

Based on research that has been carried out, the number of catches using bottom gillnet by using mesh size 3.5 inches and mesh size 4 inches in Sungai Jambat Village for 16 repetitions can be seen in Table 2.

Table 2. T-test for number of catches bottom gillnet by using mesh sizes of 3.5 inches and 4 inches

Information	Mesh size (inches)	
	3.5	4.0
Number (fish)	3067	2820
Average (fish)	191,69[a]	176,25[b]
Stdev	16,94	18,66
T- Count	2,450	
T-table	2,131	

Note: Different superscripts on the same line indicate significant differences ($p<0.05$).

From Table 2, The t-test results show that the number of catches bottom gillnet with a mesh size of 3.5 inches showed significantly different results with the number of catches bottom gillnet with a net size of 4 inches ($p<0.05$), the t-count value obtained was 2.450 with a t-table of 2.131 so that it could be stated that there was a real difference in catch results, where the catch bottom gillnet with a net size of 3.5 inches with a total catch of 3067 fish with an average daily catch of 191.69 fish, higher than the catch bottom gillnet with a net size of 4 inches where the total catch was 2820 fish with an average daily catch of 176.25 fish. This is in line with the opinion of Bandi (2021), that fishing using a smaller mesh size produces more optimal catches. In this study, the mesh size is the most appropriate one for producing the most catches is 3.5 inches because it has a better value when compared to using mesh size 4th. This is thought to be because the fish and shrimp previously escaped the mesh size 4th pearl capable of getting entangled in 3.5 inches. After all, the body size corresponds to the size of the net mesh, and the shape of the mesh opening that does not match the body shape of the target fish can cause fish and shrimp to only hit the mesh size and then escape, thus affecting the total catch. According to Nomura (1985), the shape of the mesh opening that does not match the body shape of the target fish can cause the fish to simply hit the mesh and then escape.

The bottom gillnet with a mesh size of 4 inches has fewer catches compared to a mesh size of 3.5 inches. This is caused by the size of the mesh size 4 inches larger so fish and shrimp will be easy to escape. This is by the opinion of Syafriadi (2018) that the larger the mesh size, the smaller the number of catches, the fish caught will be limited to larger fish, while small fish are more likely to escape. Furthermore, Rahantan and Puspito (2012) stated that each mesh size influences the total catch. This is explained by the opinion of Pratama (2012) which states that different mesh sizes in gill nets have a significant effect on the total number of fish caught.

Table 3, the t-test results show that the weight of the catch using the bottom gillnet with the mesh size *of* 3.5 inches is significantly different from the weight caught using the bottom gillnet with the mesh size 4th ($p< 0.05$). The t-count value obtained is 2.556 with a t-table of 2.131 so it can be stated that there is a real difference in catch results, where the weight of the bottom gillnet with the mesh size of 3.5 inches gets a weight of 248.4 Kg with a average weight per15.53 kg/day, better than the weight of the bottom gillnet with mesh 4 inches weighs 234.6 kg with an average daily weight of 14.66. The high weight of the catch on the mesh size of 3.5 inches is thought to be because the number of catches in gill nets with a mesh size of 3.5 inches is also high. This is following the opinion of Rahmad (2019) who states that the greater the number of catches, the heavier the catch. Next according to opinion Iskandar et al. (2015) stated that different mesh sizes also cause differences in the total gross weight of the catch.

Table 3. T-test weight (kg) of catch results in *bottom gillnet* by using mesh sizes of 3.5 inches and 4 inches.

Information	Mesh size		
	3.5		4
Weight (Kg)	248,4		234,6
Installment-installment (Kg)	15,53[a]		14,66[b]
Stdev	0,9		1,00
T- Count		2,556	
T-table		2,131	

Note: Different superscripts on the same line indicate significant differences ($p<0.05$).

3.4. Environmental Parameters

Environmental parameters influence the catch that is the target of fishing, both fish and other types of organisms. This is related to the presence of fish or organisms that are targets for fishing at sea because each species has a certain tolerance for aquatic environmental conditions. The results of measuring environmental parameters which include these factors include temperature, salinity, degree of acidity (pH), and current. The results of measuring environmental parameters in the waters of Sungai Jambat Village can be seen in Table 4.

Table 4. Environmental parameters in Sungai Jambat Village Waters

Parameter	Range	Average
Temperature (˚C)	26 - 30	28,4
Salinity (ppt)	17 - 21	18,6
Current (m/s)	0,33 - 0,50	0,44
pH	7,1 - 7,9	7,4

Based on the results of environmental parameter measurements in Table 4, which consist of temperature, salinity, current speed, and degree of acidity (pH). The water temperature conditions in Sungai Jambat Village at the time of conducting the research were around 26–30˚C with an average temperature of 28.4˚C. From the results of observations then in get a temperature that is still good for the activities of organisms in the water. This follows the opinion of Urbasa et al. (2015) state that fish can grow well at temperatures around 25 – 30˚C. The opinion of Rahantan and Puspito, (2012) stated the composition of fish species in a habitat is greatly influenced by various complex parameters including physical, chemical, and biological factors.

Salinity is the level of dissolved salts in water. The salinity obtained in observations during research ranged from 17 – 21 ppt with an average of 18.6 ppt, still included in the brackish water category. This follows the opinion of Fardiansyah (2011), who states that the water salinity value for fresh waters ranges from 0-5 ppt, brackish waters usually range between 6-29 ppt, and marine waters range between 30-40 ppt.

Current is a factor that fishermen can exploit in fishing, such as bottom gillnet which is used in Sungai Jambat Village for fishing, the main catch of which is mantis shrimp. The current speed obtained during the research ranged from 0.33–0.50 m/s by rate 0.44 m/secThis is still a medium current speed. This is following the opinion of Ihsan (2009) who states that water flow speed can be divided into 3 categories, including current speed which ranges between 0-0.25 m/s, including the slow flow category, and current speed which ranges between 0.26 m/s. -0.50 m/s is included in the moderate current category, and current speed ranges between 0.51-1 m/s, including in the very fast current category.

The degree of acidity (pH) is one of the indicators obtained during the research ranging from 7.1 to 7.9 with an average of 7.4. Where the degree of acidity (pH) is an indicator that influences the fertility level of water. In the opinion of Elvince (2021) states that the degree of acidity (pH) of pure water has a pH value = 7, and is declared neutral, while normal brackish water ranges from 7-9. If the pH number is below 7.0 then the water is in an acidic condition. In a body of water, biota can live in it with a pH value ranging from weak acid tolerance to weak wetness. The results of the research showed that the numbers were still relatively normal. This is in line with opinion. According to Rosadi et al. (2022) which states that the pH value for marine biota ranges from 7-8.5. This is explained by the opinion of Barus (2004) who states that the ideal pH value for the life of aquatic organisms is generally between 7 and 8.5.

4. Conclusions

Based on the results of research conducted using fishing gear bottom gillnet with mesh sizes of 3.5 inches and 4 inches, the obtained are mantis shrimps, leaftail croakers, stingrays, sagor catfish, fourfinger threadfin, pomfret, and crabs. In terms of the amount and weight of the catch, the 3.5-inch mesh gets a higher result compared to the 4-inch mesh.

5. Suggestion

It is hoped that fishermen in Sungai Jambat Village will continue to preserve the use of gill nets, especially using 3.5 inch meshes in order to get more optimal catches.

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