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ORIGINAL ARTICLE

Comparison of the Catching Results of Mini One-Boat and Two-Boat Purse Seine in Bali Strait, Muncar, East Java Province

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Abstract

Mini purse seine has a major contribution in increasing production of small pelagic catches in Pelabuhan Perikanan Pantai (PPP) Muncar. This research aimed to investigate the effectiveness and efficiency of mini one-boat and two-boat purse seine in Bali Strait, Indonesia. This research was conducted in Mei 2018 in Muncar, East Java, Indonesia. In this study, survey was used to get the data by distributed the questioners to the fisherman. The primary data are total catch composition, fork length, individual weight of total catch and operation time of both fishing gears. Data were analysed by main catch and bycatch proportion, legal size proportion and catch rate. The results showed that the mini two-boat purse seine had a greater catch volume compared to the mini one-boat purse seine. The bycatch composition dominates in both fishing gear. The proportion of legal-size catching is 67% of the total. The fork length is not significantly different and for the total catches is significantly different. The catching rate of the mini purse seine one boat catch rate is lower at 4,048.67 kg/hour, compared to the mini two-boat purse seine which is 9,189.18 kg/hour.

Keywords: Catch rate, Catches composition, Mini one-boat purse seine, Mini two-boat purse seine

Introduction

The Banyuwangi Regency is located on the edge of East Java Province which relies on the fisheries sector, especially capture fisheries as one of the sources of regional income. Muncar Beach Fisheries Port gives the largest contribution in the capture fisheries sector in Banyuwangi with a total of 21,141,772 kg of the marine capture fisheries production in 2014 which was dominated by pelagic fish species.

There is various fishing gear used by the local fishermen, one of which is purse seine. According to Wiyono (2012), since its introduction in 1972, purse seine has become the main catching tool and has replaced other fishing gear in capturing small pelagic fish in the Bali Strait. There are two types of purse seine fishing equipment used in PPP Muncar, specifically mini purse seine *gardan* (one-boat) and purse seine *slerek* (two-boat). Mini purse seine two boats are operated with two ships, while the mini one-boat purse seine is operated using one ship and is equipped with axle aids (*gardan*).

Based on data from the Muncar Beach Fisheries Port coastal fishing technical implementation unit (UPT), the number of trawl traps in 2014 were 220 units. This number has increased from 190 units (2001) to 220 units (2014). The increased capacity of the fishing fleet has caused problems related to overcapacity and a reduction in the excess amount of fishing efforts (Berkes et al., 2001).

Although it has been declared overexploited, fishing with mini purse seines is still ongoing with the tendency to keep increasing in usage. As a result, the productivity of fishing has decreased and the poverty of fishermen increased. In order to ensure the sustainability of fishing activities and the supply of raw materials for the fish processing industry, a fishing venture needs to be studied to analyze its productivity (Perkasa et al., 2016).

According to Perkasa et al. (2016), the type of mini purse seine that dominates the Muncar Beach Fishery Port is the mini two-boat purse seine, but in recent years the fishing form that is becoming more popular is the mini one-boat purse seine. Hermawan (2016) stated that the difference in the method of operation of one-boat and two-boat purse seine affects the timing of net meshing and the closing of the rope which will affect the mini purse seine catch both in terms of quantity, size and type of fish. The time of meshing and pulling of the rope is an important factor in the success of the catch because it affects the escape of fish (Muntaha, 2012).

Based on this, a research to determine the effectiveness and efficiency of the catch by comparing one-boat and two-boat purse seine is needed. The purpose of this study was to learn the effectiveness and efficiency in order to compare the catch composition and catch rate in mini one-boat and two-boat purse seine operations, at Muncar for sustainable fisheries management.

Materials and Methods

This research was conducted in May 2018. The research location was in the Beach Fisheries Port of Muncar (PPP Muncar), Banyuwangi, East Java.

Figure 1: Map of Research Location

Experimental Design

This research was conducted using survey methods by distributed the questioners to the fisherman and field observations. The parameters observed were the composition of the catch, the proportion of the type of caught fish, the legal size for the main catch, and the catch rate of mini one-boat and two-boat purse seine.

Data Collection Methods

Data collection was carried out by conducting surveys and observations on research objects, specifically mini purse seine one boat and two boats, also including mini purse seine fleet units at the base of fishing operations in the Bali Strait that arrive on PPP Muncar. The data obtained includes primary and secondary data. Primary data consists of the length of the fish body, fish weight, catch volume, setting time, and hauling and fishing area. Secondary data includes the ship data logbook and the Muncar PPP UPT statistical data which includes fishing gear specifications and mini purse seine vessels as supporting data.

Samples of vessels taken were 25-30 GT with Mini Purse Seine unit type, the main catches were small pelagic fish, fishing operations in the Bali Strait, fishing base for catches in PPP Muncar Banyuwangi, East Java, fishing trips which is one day fishing, and the size of the net mini purse seine used is 300 m. Referring to Ardianto (2009), the sample taken was as much as 10% of the total population studied, the number of vessels sampled was 5 for each type, with the total number of mini purse seine one boats were as many as 40 units and two boats as many as 35 units. Fish samples took for length and weight measurements were the main catches of 50 fish per trip.

Data Analysis

The measurement results of the sample fish in each catch trip are used to determine whether the fish is legal catching. Determination of whether the fish were legal to be caught or not was known after comparing the length of the fish caught with a literature study of length at first maturity (LM).

The analysis used to determine whether there are differences in catches between mini purse seine one boat and mini purse seine boat two was a variety analysis with T-test. As according to Sugiono and Wiratno (2007), the formula for the Independent Sample T test is:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{SDp\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad (1)$$

Information:

$\bar{X}_1$ = Average sample 1
$\bar{X}_2$ = Sample average 2
SDp = Combined standard deviation
n_1 = number of samples 1
n_2 = number of samples 2

Catch rate analysis uses the Shindo formulation interpretation in Sparre and Venema (1999) as follows:

$$\text{Catch rate, } cr = \frac{\text{Catch}}{\text{Effort}} \times 100 \quad (2)$$

with,

cr = catch rate (kg / hour)
catch = catch (kg)
effort = effort to catch (converted from per towing / hauling / trip in hours)

The proportion composition of the main and by-catches is known by using the following formula:

$$\text{Main catch proportion} = \frac{\text{Main catch}}{\text{Total catch}} \times 100\% \quad (3)$$

$$\text{Bycatch proportion} = \frac{\text{Bycatch}}{\text{Total catch}} \times 100\% \quad (4)$$

Results and Discussion

Composition of Catches

The total number of catches obtained by *mini purse seine one boat* and *mini purse seine two boat* which each operated as much as 5 fishing trips in the waters of the Bali Strait amounting to 13,040 kg with 7 species caught. Identification results of the *mini purse seine one boat* and *mini purse seine two boat* are represented on Table 1.

Table 1: Composition of Catches Mini One-Boat and Two-Boat Purse Seine

No	Species Name	Family	Volume	
			kg	%
Main Catch				
1	Layang (*Decapterus ruselli*) **(*Mini Purse Seine One Boat*)**	Clupeidae	2.703	20,79
2	Layang (*Decapterus ruselli*) **(*Mini Purse Seine Two Boat*)**	Clupeidae	3.484	26,80
Total Catch			**6.187**	**47,59**
Bycatch				
1	Tongkol (*Auxis thazard*)	Scombridae	6.591	50,70
2	Tembang (*Sardinella fimbrata*)	Clupeidae	142	1,09
3	Belanak (*Mugil* spp)	Mugilidae	10	0,08
4	Bangkok (*Thryssa mystax*)	Engraulidae	21	0,16
5	Layur (*Trichiurus lepturus*)	Trichiuridae	23	0,18
6	Teri (*Stolephorus sp*)	Clupeidae	26	0,20
Total Catch			**6.813**	**52.41**
Amout Catch			**13.000**	**100**

Based on the results in table 1, the catch on the mini purse seine one boat has a total weight of 5,573 kg with species composition specifically tongkol (*Auxis* sp.) 2,518 kg, layang (*Decapterus ruselli*) 2,903 kg, tembang (*Sardinella fimbriata*) 142 kg, and belanak (*Mugil* spp.) 10 kg.

Whereas in the *mini purse seine two boat* the weight of the total catch is 7,467 kg with species composition specifically tongkol (*Auxis* sp.) 3,313 kg, layang (*Decapterus ruselli*) 4084 kg, bangkok (*Thryssa mystax*) 21 kg, layur (*Trichiurus lepturus*) 23 kg and teri (*Stolephorus* sp.) 26 kg.

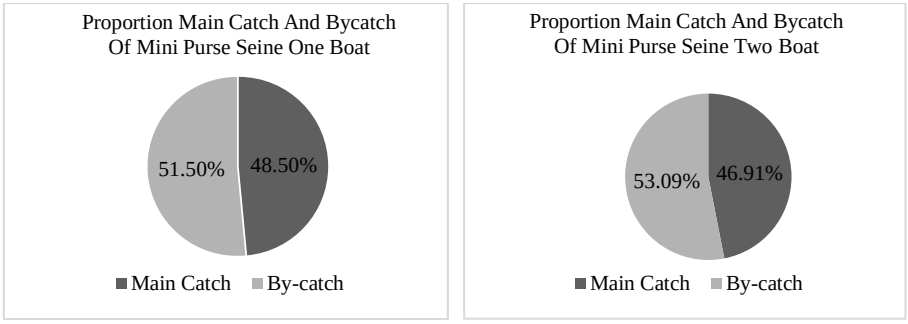
Reviewed from Hermawan's research (2016) it had been stated that the *mini purse seine* catches in PPP Muncar are generally small pelagic fish species, namely lemuru (*Sardinella* lemuru Bleeker, 1853), layang (*Decapterus* sp.), squid (*Loligo* sp.), tongkol (*Auxis* sp.), slengseng (*Scomber* sp.), kembung banyar (*Rastrelliger kanagurta*), yellow selar (*Selaroides leptolepis*), layur (*Trichiurus lepturus*), and pepetek (*Leiognathus equulus*).

Proportion of Main and Bycatch Results

On mini purse seine one boat, the proportion of main catch is 48.50% and the bycatch is 51.50%, while in the mini purse the two-boat proportion of main catch is 46.91% and bycatch is 53.09%.

The bycatch results of the two types of mini purse seine show that they are more dominant than the main catches. According to Suadela (2004), if the proportion of the main target catch is ≥60% then a fishing gear can be said to be environmentally friendly. Based on these criteria, the mini purse fishing gear is categorized as not environmentally friendly.

The bycatch results of the purse seine, is generally divided into two, namely the catch that is utilized and the catch that is discarded. None of the bycatch in this study were discarded, all bycatches were used by fishermen by selling to middlemen.

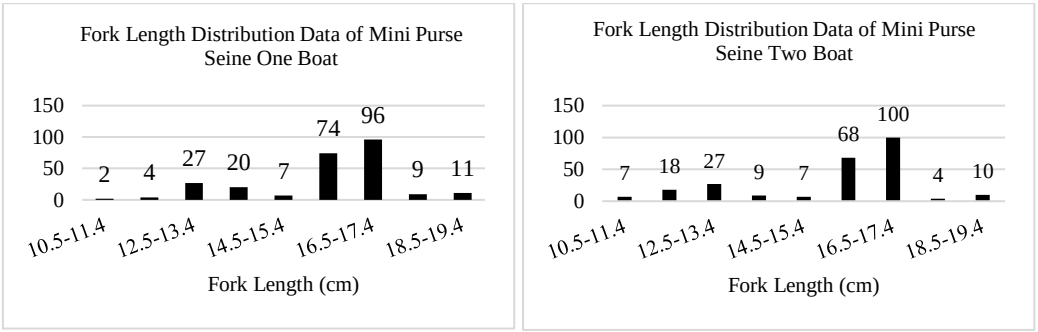


(a) (b)

Figure 2: Main catch and bycatch proportion of mini purse seine. (a) Mini Purse Seine One Boat (b) Mini Purse Seine Two Boat

Mini Purse Seine Catch Size

The total sampling for 5 trips, both on mini purse seine one boat and two boats, was obtained by layang fish, each consisting of 250 tails. Based on Hariati (2005), Length at first maturity (LM) of a layang fish was 16 cm. The size of the layang fish that is worth catching on the mini purse seine one boat is as many as 171 tails and that is not worth catching as much as 79 tails. The majority of the layang fish sizes were in the class with lengths from 16.5 - 17.4 cm and the least is the length class of 10.5 - 11.4 cm. While in the *mini purse seine two boats* that were most caught were in the length class of 16.5 - 17.4 cm and the least were in the length class of 17.5 - 18.4 cm. The size of the layang fish that were legal catching was 165 tails and the layang fish that were not yet legal catching was 85. Based on Suadela (2004), fishing units are categorized as environmentally friendly if the proportion of catches is worth catching ≥60%, then it can be concluded that the *mini purse seine* in this research is categorized as an environmentally friendly fishing gear.



(a) (b)

Figure 3: Fork Length Distribution Data of Mini Purse Seine. (a) Mini Purse Seine One Boat (b) Mini Purse Seine Two Boat

Catch Rate

Catch rate illustrates the capture capability of a fishing gear per fishing effort. The catching effort that is part of the catch rate analysis in this study is the time of catching operation, including the setting time and hauling that is converted in hours.

Table 2: Catch Rate of Mini Purse Seine One Boat dan Two Boat

No	Fishing Gear Unit	Average Operating Time (hour)	Ampunt of Catches (kg)	Catch rate (kg/hour)
1	*One Boat*	1,38	5.573	4048,67
2	*Two Boat*	0,81	7.427	9189,18

The value of the mini purse seine two boat is greater, specifically by 9189.18 kg/hour with an average duration of hauling time of 0.81 hours /trip compared to mini purse seine one boat of 4048.67 kg /hour with an average duration of hauling time of 1.38 hours/ trip. The difference in the ability to capture both types is caused by the technique of net looping and the withdrawal of the wrinkle used so that it causes a time difference, where the difference in the timing of the mesh and the withdrawal of the rope will affect the catch.

Rajab (2017) states that the speed of rope withdrawal (pursing speed) affects the number of catches where the greater the time of withdrawal of the wrinkle rope, the number of catches will decrease, and the more minimal the time, it will increase the number of catches. Kefi et al (2013) stated that the wrinkle pull factor has a large influence on the catch because it can prevent the escape of fish through the bottom of the net.

According to Fridman (1986), there are 3 ways to get rid of fish in a purse seine fishing device, namely through a gap between the two ends of the fishing gear, under the ballast rope when the net has spread, and under the ballast rope when the wrinkle is being pulled. Most of the ways to get rid of fish through the bottom of the fishing gear, if the wrinkle is not immediately pulled, the likelihood of catching will be reduced. Another factor that is considered sufficient to determine the success of fishing in the two-boat mini purse is the skills and expertise of the crew.

Average Two-Sided T Test

This test is used to determine the effect of the mini purse seine type one boat and the type of two boat on the main catch namely the layang fish (*Decapterus ruselli*). The value between the mini purse seine one boat with the mini purse seine two boat for the length of the layang fish, obtained by the value of T count of 1.41 and T table of 2.31. From the value data, it can be seen t count <t table, so it can be concluded that H0 is accepted, meaning that the length of the flying fish catching on the *mini purse seine one boat* and *two boat* is not significantly different. For the flying fish total weight parameter, it was obtained a Tcount value of 54 ,30 and t tables of 2.31.

From this data value, it can be seen t count> t table, which means it can be concluded that H_0 is rejected, meaning that the total weight of the flying fish catch in the mini purse seine one boat and two boat is significantly different. This condition is due to the size of the mesh used, specifically 1 inch wing nets and 0.5 inch body nets.

Conclusion

This study showed that two-boat purse seine was proofed to be more effective in catch, and be more efficient in remain the sustainability, thus in line with the preservation from over fishing.

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