Relationship of the Amount of Living Bait with Results of Catch on the *Pole and Line* in MV. Venio 07 Sari Usaha Mandiri, Ltd North Sulawesi Bitung

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---*ABSTRACT*--
Skipjack tuna (Katsuwonus pelamis) is a superior economic activity in the North Sulawesi fisheries sector, which is usually captured by pole and line. To increase the efficiency of fishing with pole and line, it is necessary to know the number of relationships between the number of live bait distributed with the catch MV. Venio 07 belongs to Sari Usaha Mandiri. Ltd Bitung North Sulawesi for 8 times sailed dividing the fishing operation area into two fishing ground (fishing ground), that is Maluku Sea and Sulawesi Sea. The composition of fish catches Pole and Line is Skipjack tuna (Katsuwonus pelamis) 63,050 kg and Yellowfin (Thunnus albacares) 19,900 kg. Fishing done as much as 87 times with a total fishing duration of 2.856 minutes (47.6) using live bait type Sardine (Sardinella) and Anchovy (Engraulidae) of 12.078 kg. The relation of live bait to the catch obtained an average of 1 kg of live bait yielded 6.8 kg of fish catch. Average per minute is 28.9 kg of fish catch and average per fishing 7,768.7 kg of catch fish.
KEYWORDS: Pole and line, living bait

I. BACKGROUND

Indonesia is a tropical country that has extra-biodiversity and is ranked second highest after Brazil (Haerunnisa *et al*., 2013; Herawati *et al*., 2015; Hutama *et al*., 2016). The high biodiversity is supported by the condition of Indonesia as an archipelago (17,508 islands, 9 million km^2) with a coastline of 85,151 km (Kusmana & Hikmat, 2015) and 13.85 million ha of public waters. Bitung is one of the centers for *skipjack tuna* fishing in Indonesia.

Pole and line is a fishing method specifically used to catch s*kipjack tuna*, this type of fishery is widely applied by fishermen in Eastern Indonesian waters. The uniqueness of huhate is the shape of a ship that has a platform as a fishing spot, the use of spray pipes to trick fish, and the use of live bait and imitation to catch fish.

The purpose of this study directly fishing with *pole and line* fishing gear. To test the relationship between live bait and catch by factors of the number of live bait, fishing hours, number of trips, number of fishing and fishing times.

II. METHODOLOGY

According to Sungkawa (2013), to study the form of functional relationships between two variables or two factors commonly used regression analysis. In regression analysis, it is known that there are two types of variables, namely response variables or also called dependent variables, namely variables whose existence is influenced by other variables and usually denoted by Y. Predictor variables and also called independent variables, namely variables that are not affects other variables and is usually denoted by X.

The equation that will be used in finding the relationship of the number of bait with the catch, uses the equation $\gamma = \alpha \pm "bx"$, and for the analysis process the calculation is done with the help of *Microsoft Office Excel*. According to Bustami *et al*., (2014), to look for values b and α obtained by the formula:

$$b = \frac{n.\sum xy - \sum x.\sum y}{n.\sum x^2 - (\sum x)^2}$$ ....(1)

$$a = \bar{y} - b\bar{x} \quad ....(2)$$

The first thing that is sought is the value of b (coefficient regression/*slope*) by the number of fisherman (n) multiplied by the number of live bait used (x) multiplied by the number of catches (y) then minus the number of live bait (x) multiplied by the number the catch (y) is then divided by the number of fisherman (n) multiplied by the number of live bait (x) squared at less the number of live bait (x) squared. The results are the value of b or the regression/*slope* coefficient.

Then the value of b is processed by the formula $\quad \alpha = \bar{y} - b\bar{x}$ where looking for the value of α (constant/*intercept*) by means of the average number of catches (ȳ) minus the value of b (regeresi/*slope* coefficient) and multiplied by the average value of the number of bait life used (x̄).

Wherein :
n   : amount of fisherman
α   : *intercept*
b   : *slope*
x   : amount of bait
y   : amount of catch

To get the total catch data is calculated using assumptions per basket, where 1 basket has 40 fish and weighs 50 kg / basket.

Discussion of the feed on each trip, to get the number of kilograms of live bait used, is obtained by calculating how many frequencies of live bait are taken from the live bait tub into the live bait spreader. Based on MV fishing journal Venio 07 the average weight of live bait taken with a large spoon into the feed spreader is equal to 3 kg, while to obtain the number of live bait in the unit of bucket used, besides being obtained during loading, the number of live bait buckets in the bucket is drained, weighed heavily live bait. In addition, based on interviews with bait masters in MV. Venio 07, the weight of live bait in the bucket is 8-9 kg. According to Sutrisno (2017), buckets to move live bait from the chart to the bait tub, with a top size of 40 cm, for the bottom measuring 25 cm with a capacity of 25 liters.

III. RESULTS AND DISCUSSION

Catch

The types of fish caught using *pole and line* in general are *skipjack tuna*, but there are also other types of fish caught. This is because the fish swim in groups together with *skipjack tuna* to find food. The catch in Motor Ships with 80 Gross Tonage is 82,950 kg with the composition of *skipjack tuna* 63,050 kg (76%) and *yellowfin* 19,900 kg (24%). This catch is obtained for 8 *pole and line* operation trips, where as many as 34 people angrate and use 12,078 kg of live bait. Operations are carried out in the Maluku Sea and Sulawesi Sea.

Analyze The Relationship Of Live Bait With The Catch

Analysis of catches is done by summing the number of catches obtained on each trip, and divided by the number of fishing on each trip. The composition of catches trip 1 to trip 8 is 76% *skipjack tuna (Katsuwonus pelamis)* and 24% *yellowfin (Thunnus albacares)*. This result is not much different from the research of Rahmat & Yahya (2015), the catch is dominated by *skipjack tuna (Katsuwonus pelamis)* of 69%, fish production of *pole and line* caught during 2014 landed in Oceanic Fishing Port Bitung reaching 12,227 tons consisting of *skipjack tuna*, *tuna*, *salmon* and *mackarel tuna* are dominated by *skipjack tuna*. Table 1 shows the number of live bait used and the number of catches for 8 trips.

| No	Trip	Amount Of Fisherman	Life Bait (Kg)	The Amount Of Fish Caught					
				Skipjack Tuna		Yellow Fin Tuna		Total	
				Fish	Kg	Fish	Kg	Fish	Kg
1	1	40	2.061	11.92	14.9	1.6	2	13.52	16.9
2	2	40	1.206	6.24	7.8	1.96	2.45	8.2	10.25
3	3	34	2.034	8.08	10.1	3	3.75	11.08	13.85
4	4	38	1.62	2.6	3.25	1.8	2.25	4.4	5.5
5	5	25	666	2.52	3.15	8.4	1.05	3.36	4.2
6	6	28	1.17	4.12	5.15	1.76	2.2	5.88	7.35
7	7	34	1.944	8.6	10.75	2.48	3.1	11.08	13.85
8	8	39	1.62	6.36	7.95	2.48	3.1	8.84	11.05
	Total		12.321	50.44	63.05	15.92	19.9	66.36	82.95

Tabel 1. Average Catch per Trip
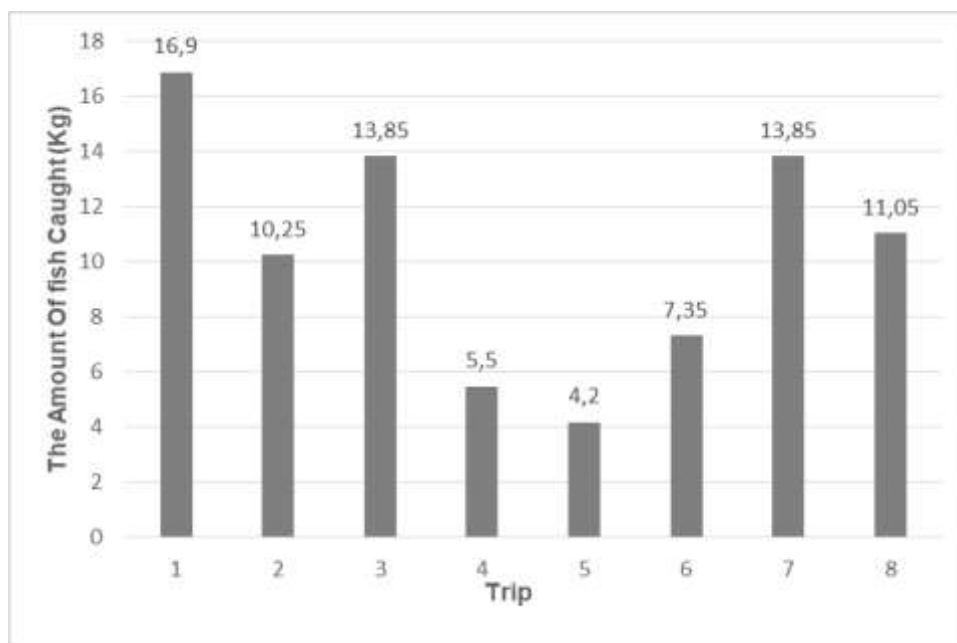
Figure 1. Catches per Trip

Average Catch per Fish

Table 2 explains that the most catches are trip-1, reaching 16,900 kg. The number of catches on trip-1 is because the number of fishing reaches 11 times with 40 fisherman, thus the number of catches per trip is also influenced by the number of fisherman.

Trip	Fsihing (Times)	Total			Average Fish Catch		
		Duration Of Fishing	Live Bait (Kg)	Fish Catch (Kg)	Per 1 Kg Of Bait (Kg)	Per Minute (Kg)	Per Fishing (Kg)
1	11	411	2.061	16.9	8,2	41,1	1536,4
2	7	184	1.206	10.25	8,5	55,7	1464,3
3	15	519	1.791	13.85	7,6	26,1	903,3
4	10	260	1.62	5.5	3,4	21,2	550
5	7	196	666	4.2	6,3	21,4	600
6	7	281	1.17	7.35	6,3	26,2	1050
7	17	555	1.944	13.85	7,1	25,0	814,7
8	13	450	1.62	11.05	6,8	24,6	850
Total	87	2.856	12.078	82.95	6,8	28,9	7768,7

Table 2. Average Catch Results per Fishing

Then the catch from trip 1 to trip 8 with a total catch of 82,950 kg was made on average per 1 kg of bait where many of the bait used from trip 1 to trip 8 were 12,078 kg with a yield of 7.02 kg, meaning that every 1 kg of bait was stocked get the catch as much as 7.02 kg. According to Sutrisno (2017) that there is a tendency for more and more operating trips, more catches are also made. Then the relationship between the two variable trip numbers and catches is quite significant, or the catch is determined by the number of fishing trips. Furthermore, the catch is also divided by the average per minute of fishing, where the duration of fishing minutes from trip 1 to trip 8 is 2856 minutes (47.6 hours) with an average yield per minute of 28.9 kg. The following can be seen an average graph per 1 kg of bait and average per minute. This is still below the average arrest rate. According to Lumi *et al*., (2013), the number of *skipjack tuna* has decreased in 2009 to 2011. This is due to changes in the weather and changing fish culture so that the production of *skipjack tuna* is unstable. Furthermore, according to Sutrisno (2017) said that the catch of each vessel in the period January to November 2016 ranged from 867,852 to 1,428,093 kg, with an average production per ship of 91,254 kg per month. There are 5 ships that get below average catches, namely MV. Baku Sayang-02 (795,898 kg), MV. Bitung Raya-01 (814,448 kg), MV. Baku Sayang-03 (867,852 kg), MV Sinar-02 (911,927 kg) and MV. Sari Usaha-09 (927,721 kg). There are 3 ships with above average catches namely MV. Bitung Raya-03 (1,038,540 kg), MV. Wahyu (1,145,5099 kg) and MV. Berkat Karunia (1,428,093 kg).
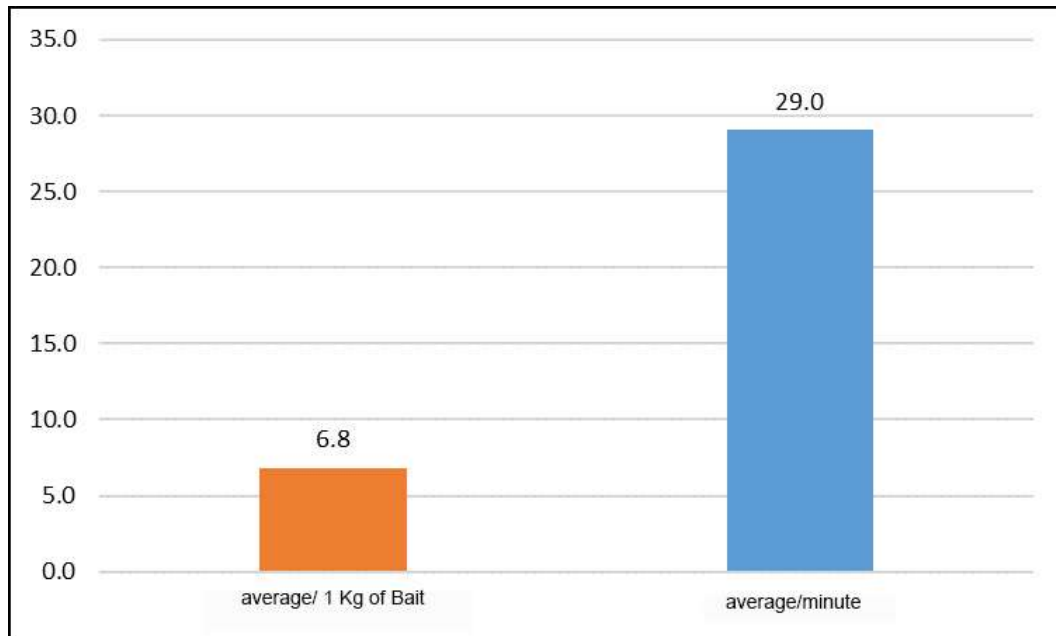
Figure 2. Average Catch Results in Fishing Hours for 8 Trips

The figure above explains that from trip 1 to trip 8 the catch is obtained on average from the number of fisherman as many as 34 people and the average from live bait where 1 kg of live bait produces 6.8 kg of fish caught. Then also obtained an average of the duration of fishing with the results of 28.9 kg every 1 minute fishing. According to Puspito (2010), the rate of *skipjack tuna* describes the number of fish caught every minute. Based on the fisherman position, the position in front of the ship gives the highest average catch rate, which is 0.77 unit / minute. Then followed by the left position of the ship 0.52 unit / minute and the right of the vessel 0.43 unit / minute.
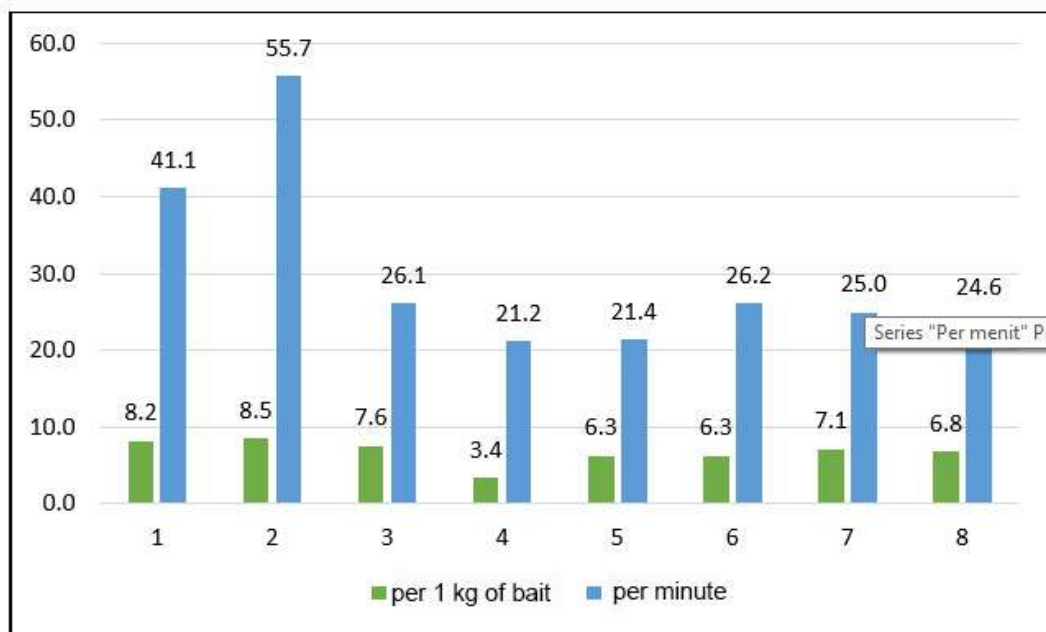

Figure 3. Catches in Fishing Hours for 8 Trips

Figure 3 shows a graph that the best average is found in the second trip where the use of 1 kg of bait can produce 8.5 kg of fish caught and 1 minute of fishing to produce 55.7 kg of fish caught. Furthermore, trip 1 also has an average catch that is not much different from the second trip, which is 1 kg of live bait used can produce 8.2 kg of fish caught and on average per minute yields 41.1 kg of fish caught.
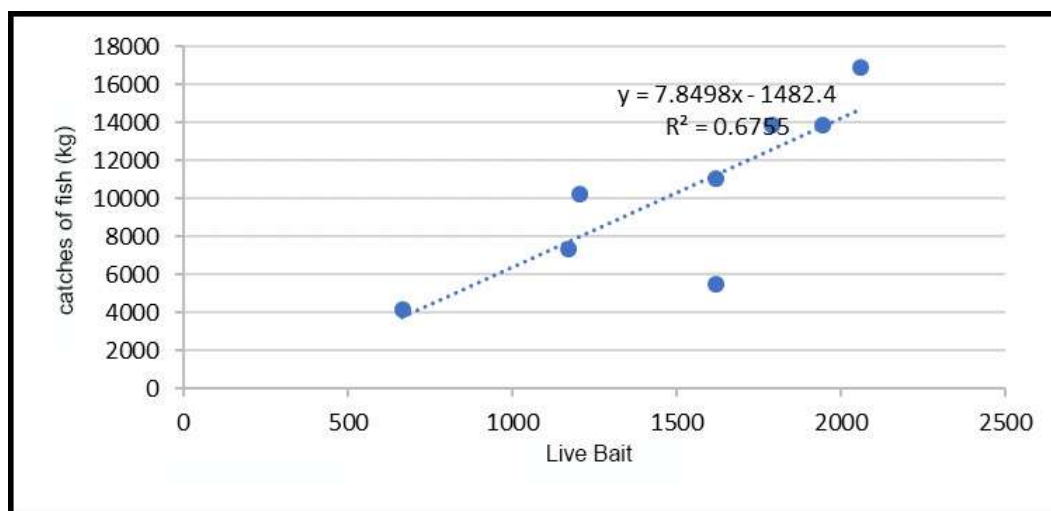
Figure 4. Regression of the Relationship of Using Live Bait with the Results of Catches for 8 Trips.

Figure 4 can be concluded that the more live bait that is spread more and more catches obtained by the regression equation the relationship of the use of live bait with the catch is y = 7.7941x - 1435.9 with r square = 0.6758 and the correlation of determination = 67.58% %, the meaning of the equation above is that every addition of 1 kg of live bait will affect 7.79 kg of fish caught, where live bait has an effect on the catch of 67.58%, while the remaining 32.42% is influenced by other variables outside the regression model this or e (error). This is according to Sutrisno (2017) that there is a tendency for the increasing number of baits to be used, the more catches are also obtained. Means that there is a positive relationship between the amount of bait and the catch.

Presentation of tables and graphs above can be seen that the fishing hours are carried out to find out the average catch, analysis of the fishing hours is done to determine the average catch per 1 kg of bait and the average catch per minute of fishing. Based on table 15, the best average of the second trip is 7 times fishing with the use of bait 1 kg of live bait produces 8.5 kg of fish and one minute fishing produces 55.7 kg of fish.

The analysis of the catch above shows that the average catch per fishing is mostly in trip 1 and trip 2, as well as the average catch in fishing hours with the use of live bait and duration per minute. The location of this equation is assumed that on trips 1 and 2 the fish obtained at FAD in the Maluku sea (*fishing ground*) has a fairly high level of abundance because the following trip is still being carried out at the same locations, but this not according to Kekenusa (2006), in December the catch decreased, generally due to the occurrence of a large wavy west wind season so that the number of fishing trips decreased. While trip 1 and trip 2 were held in December. Then explain that the catch is on MV. Venio 07 is obtained by utilizing the behavior of *skipjack tuna* actively seeking food in the morning and evening. But not all live bait use can be done at each fishing ground, because there are limiting factors, one of which is sea surface temperature which at a certain level determines the existence of *skipjack tuna* in a waters or FAD. This is due to the length of direct sunlight irradiating the surface of the earth.

IV. CONCLUSION

The relationship between the number of passes that are stocked with the catch on pole and line in MV. Venio 07 has a r square value = 0.6758 and the determination correlation = 67.58% with the equation y = 7.7941x - 1435.9 means that every addition of 1 kg of live bait will affect 7.7941 kg of fish caught. In addition to the influence of live bait as the lure of *skipjack*, the duration of fishing, fishing hours are the limiting factors that affect the catch in this discussion.

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