Cantrang Fisheries Performance in Brondong, Lamongan Regency, East Java, Indonesia

by Cek Turnitin

Cantrang Fisheries Performance in Brondong, Lamongan Regency, East Java, Indonesia

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---ABSTRACT---

Trawling fishing equipment that has been banned from operating under Presidential Decree 85 of 1982 chose to use cantrang which is a modification of trawling as an alternative which was then banned from being used by the government so that the minister of maritime affairs and fisheries was issued to extend the use of cantrang fishing gear. The purpose of this study is to determine the performance and productivity of the ship along with profit and loss during the operating period. Catching method using trawling with 0-21 up GT ships. Sales results use a profit sharing system. The most caught fish species are common ponyfish (Leiognathus sp) of 1,200 kg and golden-threadfin bream (Upeneus vittatus) 867 kg. The gross profit earned is divided into 25 parts. The 21 up GT ship has greater productivity with an average yield of 63,453 kg.

KEYWORDS: *Fishing Gear, Profit, Productivity*

I. BACKGROUND

Presidential Decree No. 39 of 1980 which prohibits the use of *trawls*, and Presidential Decree 85 of 1982 the government restricts trawl fishing gear operations in Eastern Indonesia. *Trawl* fishermen try to find alternative fishing gear to obtain a large and efficient catch of fish. Cantrang known as one of the most popular fishing gear among fishermen in the north coast of Java since 1960 and is a traditional fishing gear that has long been operating in the Java Sea (Ernawati *et al*, 2011). The National Standardization Agency issued a standard for construction of various types of fishing gear, one of which was the standard form of the construction of drag cantrang *trawl* which was issued in 2006 with SNI 01-7236-2006. According to the National Standardization Agency (2006) it is a *trawler* that operates using a single ship, which is operated by strings in the bottom of the waters by circling schooling *demersal* fish, hauling and lifting nets from the ship. This fishing gear has now become phenomenal because even though it was banned by the government after the issuance of the Regulations Ministry of Maritime and Fisheries Affairs No. 2 of 2015, but with the existence of a government statement so that the reality in the field is still many small or medium fishermen still using cantrang.

Archipelago Fishing Port (AFP) Brondong in Lamongan Regency, type B port which is determined based on technical criteria, namely serving fishing vessels carrying out fishing activities in the territorial sea and the Zone Economic Exclusive Indonesian (Sinaga *et al*. 2013). There are 689 cantrang vessels that have fishing bases at Brondong AFP with details of 670 weekly cantrang vessels and 19 daily cantrang ships (Annual Report of Brondong AFP in 2016). Hakim and Nurhasanah (2016) group of cantrang catches, namely common ponyfish, deepwater goatfish, largefin croaker, groupers, stingrays, blacktip reef shark, octopus, greater lizardfish, and kinds of shrimp. According to Leo (2010) the dominant catches are landed at Brondong AFP, among others, golden-threadfin bream *(Upeneus vittatus)*, whipfin silverbiddy *(Gerres kapas)*, groupers *(Cephalopholis boenack)*, red sea goatfish *(Parupeneus sp)*, largefin croaker *(Argyrosomus amoyensis)*, purple-spotted bigeye *(Priacanthus tayenus)*, squid *(Loligo spp)*, pufferfish *(Tetraodon sp)*, and red snapper *(Lutjanus sp)*.

The purpose of this study was to determine the performance of cantrang catches, find out profit and loss and determine the productivity of ships based on Gross Tonage.

II. METHODOLOGY

The analytical method used by the author in displaying the data obtained is as follows:

Catch of Performance

The catches in the form of fish species caught using cantrang are collected and tabulated and displayed in the form of graph and shown as a percentage, so that conclusions can be drawn that what types of fish are dominated by cantrang catches, and can be proved by the percentage of each type catch fish.

Profit Sharing of Fishing

Interviews with cantrang ship owners, by calculating the value of profit and loss by calculating the operational costs and ship income.

Ship Productivity based on Gross Tonage

Productivity data is based on Gross Tonage from Brondong AFP in the form of loading and unloading data. Then the data is analyzed using *Anova Single Factor*. Tabulated using an *Microsoft Excel* program on a computer. After tabulation and grouping based on Gross Tonage then analyzed using *Anova Single Factor* analysis program in *Microsoft Excel*. The formula used in Maimun, *et al* (2013) is:

$$JKK = \sum_{i-1}^{k} \frac{T_i^2}{n_i} - \frac{T^2}{N} \quad \dots\dots\dots(1)$$

$$db\,JKK = k - 1 \quad \dots\dots\dots(2)$$

$$KTK = \frac{JKK}{db\,JKK} \quad \dots\dots\dots(3)$$

$$\frac{KTK}{KTB} \quad \dots\dots\dots(4)$$

$$JKG = JKT - JKK \quad \dots\dots\dots(5)$$

$$db\,JKG = N - k \quad \dots\dots\dots(6)$$

$$KTG = \frac{JKG}{db\,JKG} \quad \dots\dots\dots(7)$$

$$JKT = \sum_{i-i}^{k} \sum_{j-1}^{n1} x_v^2 - \frac{T^2}{N} \quad \dots\dots\dots(8)$$

$$db\,JKT = N - 1 \quad \dots\dots\dots(9)$$

$$KTG = \frac{JKG}{db\,JKG} \quad \dots\dots\dots(10)$$

III. RESULTS AND DISCUSSION

Catch

The yield of cantrang is a demersal fish resource. All cantrang catches at Brondong AFP are the main catches because all fish caught can be used for factory needs and for animal feed.

No	Name of Fish	Scientific Name	Catch (Kg)	Price/Kg (IDR)	Total (IDR)
1	Golden-threadfin bream	*Upeneus vittatus*	867	6.000	5.202.000
2	Whipfin silverbiddy	*Gerres kapas*	213	11.500	2.449.500
3	Red sea goat fish	*Parupeneus sp*	37	13.500	499.500
4	Grouper	*Cephalopholis boenack*	6,5	50.000	325.000
5	Largefin croaker	*Argyrosomus amoyensis*	179	8.000	1.432.000
6	Purple-spotted bigeye	*Priacanthus tayenus*	232	5.000	1.160.000
7	Red snapper	*Lutjanus spp*	16,5	45.000	742.500
8	Squid	*Loligo spp*	92	60.000	5.520.000
9	Pufferfish	*Tetraodon sp*	49	5.000	245.000
10	Deepwater goatfish	*Upeneus mullocensin*	15	9.500	142.500
11	Greater lizardfish	*Saurida spp*	147	8.000	1.176.000
12	Barracuda	*Sphyraena barracuda*	25	15.000	375.000
13	Yellowspotted sweetlips	*Lethrinidae*	14	13.000	182.000
14	Indian halibut	*Pleuronectiformes*	41	14.500	594.500
15	Spotted coastal trevally	*Caranxsexfasciatus*	7	14.500	101.500
16	Common pike conger	*Muraenesox cinereus*	25	19.000	475.000
17	Forktail large-eye bream	*Terapon jarbua*	5	12.000	60.000
18	Blue spotted stingray	*Neotrygon kuhlii*	5	11.000	55.000
19	Red cornetfish	*Fistularia petimba*	14	5.000	70.000
20	Blacktip reef shark	*Carcharhinus amblyrhynchoides*	8	13.000	104.000
21	Cuttlefish	*Sepiida*	5	55.000	275.000
22	Common ponyfish	*Leiognathus sp.*	1.200	2.000	2.400.000
	Total		**3.203**		**23.586.000**

Tabel 1. Catch of MV. Citra Buana 1

From the data above, it can be analyzed that the total catch is 3,203 kg. The most common types of fish while following the cantrang ship are common ponyfish *(Leiognathus sp)* 1,200 kg, golden-threadfin bream *(Upeneus vittatus)* 867 kg, purple-spotted bigeye *(Priacanthus tayenus)* 232 kg, whipfin silverbiddy *(Gerres kapas)* 213 kg, largefin croaker *(Argyrosomus amoyensis)* 179 kg, and greater lizardfish *(Saurida tumbil)* 147 kg. Even though common ponyfish is the most in terms of quantity, the largest total income is from the sale of squid with a value of Rp. 5,520,000. If it is made in graphical form, it will be seen in the figure 1.
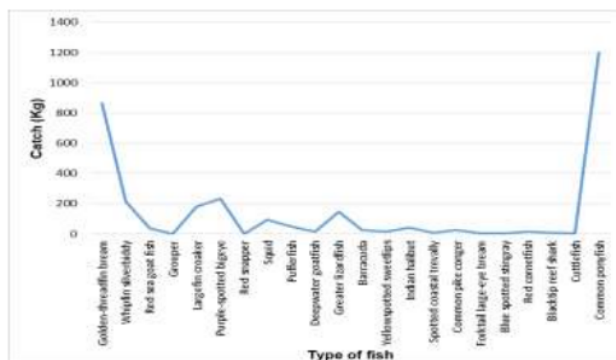

Figure 1. Catch MV. Citra Buana 1

Analysis Using *Anova Single Factor*

The relationship between the Gross Tonage group of cantrang vessels and the catches landed at AFP Brondong in the period January to February 2018 and the relationship between the length of the vessel and the grouping of cantrang vessel Gross Tonage.

1. Relationship between GT ship group and catch

Analysis of GT vessels with cantrang catches was to find out which group of vessels had the best productivity among the three groups of cantrang vessels. The vessel GT grouping is divided into 10 (three) groups including 0 - 9 GT, 10-20 GT, and 21 Up GT. In analyzing the author's data using the following hypothesis:

- $H_0 : \mu 1 = \mu 2 = \mu 3$, There is no difference in the catch of the cantrang vessel GT.
- $H_1 : \mu 1 \neq \mu 2 \neq \mu 3$, There are differences in catches of the cantrang vessel GT.

If : $\quad F_{Count} > F_{Table} (F_{Crit})$, tolak H_0

$F_{Count} \leq F_{Table}$ (F $_{Crit}$), terima H_0

From these data can be presented the following results:

Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
0-9 GT	53	153201	2890,58491	3709177,3		
10 - 20 GT	44	341580	7763,18182	598707,7		
21 Up	53	3363058	63453,9245	2,752E+09		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1,17E+11	2	5,8637E+10	59,085863	1,47E-19	3,057621
Within Groups	1,46E+11	147	992406079			
Total	2,63E+11	149				

Table 2. Relationship between GT vessels and catches

From the results of the above analysis it can be concluded that:

a. *Count*, in this case is the number of loading and unloading operations carried out by each group of vessels located at Brondong AFP. The number of ship loading and unloading activities with 0 - 9 GT and 21 Up as many as 53 times while for ships with 10-20 GT as many as 44 times.

b. *Sum*, the total amount of the total catch obtained by each group of cantrang vessels. The highest number of catches of cantrang vessels is on ships with 21 Up GT with a total catch of 3,363,058 Kg. Furthermore, the vessels are 10-20 GT with a catch of 341,580 Kg, and the least vessels with 0-9 GT with 153,201 Kg.

c. *Avarage*, the average value of each variable, in this case the average value of catches of the cantrang vessel GT group are: 2890,58491 Kg for ships with 0-9 GT, 7763,18182 for ships 10-20 GT, and 63453,9245 for ships with 21 Up GT.

d. *Variance* is a quadrant value of a standard deviation that can be used to see how far the data distribution value of each variable. From the above data it can be concluded that the smallest variance value is for the size of the vessel with 0-9 GT, which is 3709177.3, this indicates that the catch data tends to be more stable because it is close to the mean value.

e. *Anova table*, can see a comparison between F_{Count} and F_{Table}. From the table above F_{Count} is the output of the F value while F_{Table} is the output of F_{Crit} value. From the ANOVA table above, it can be concluded that the calculated F value is 59,085863> from F_{Crit} of 3,057621, so the decision is toll H_0 (reject there is no difference in catch of GT ship cantrang) or in other words there are differences in catches between the three groups of cantrang vessels separated based on GT ship. Ships with GT 21 Up have the best productivity among other groups of ships. This is based on the GT Ship 21 Up having a large capacity so that it can load a lot of catches. This is confirmed by the statement of Ernawati *et al* (2011) that cantrang ships with GT 0 - 9 operate around the north coast which is a densely captured area, with relatively few resources. The beach is densely caught with high exploitation pressures compared to the off shore. Whereas for ships with GT 21 Up have the ability to operate in the middle of the sea (off shore), with relatively large fish resources. In the area of the off shore the exploiting fleet is still limited. Therefore, fish resources in the off shore waters are relatively abundant compared to coastal areas. Whereas according to Aji, *et al* (2013) the small size of the ship GT has no significant effect. In the process of fishing the ship is in a stationary position so that it does not affect fishing operations. Ships with small GT can also get more results from ships with larger GT. Which affects the catch include: fishing gear, length of rope, and setting. The influence of fishing gear on the catch is because the larger the fishing gear, the sweeping during the capture operation will be wider so that more fish will be obtained. Selambar rope influences because the longer the rope is drawn, the longer the hauling will be. If the hauling process is faster than fish swimming, it can affect the catch. The setting is very influential on the catch, because the determination of fishing ground is very important. Currents will affect the movement of fish and fishing gear. Fish usually fight currents so the mouth of the net must oppose the movement of the current.

2. Relationship between ship GT groups and ship dimensions

The data to be analyzed using ANOVA between the ship's GT group and the length of the ship is 142 (one hundred and forty-two) ships which is a sample of all the cantrang vessels based at Brondong AFP. The purpose that can be taken for this analysis is to find the average dimensions of cantrang vessels in accordance with the vessel GT grouping. There are two groupings of GT vessels used for 10-20 GT and 21 GT Up. The hypothesis that I use in this analysis is as follows:

- $H_0 : \mu 1 = \mu 2 = \mu 3$, There is no difference in the average dimensions of the ship, the GT cantrang vessel.
- $H_1 : \mu 1 \neq \mu 2 \neq \mu 3$, There are differences in the dimensions of the ship's average, cantrang ship GT.

If : $F_{Count} > F_{Table}$ (F $_{Crit}$), tolak H_0

$F_{Count} \leq F_{Table}$ (F $_{Crit}$), terima H_0

The data and analysis used are:
- Ships between 0 and 9 GT.
  For ship samples in this group none.
- Ships between 10 and 20 GT.
  For groups of vessels between 10-20 GT, there are 12 (twelve) cantrang vessels that have a fishing base at Brondong AFP. From these data can be presented the following results:

SUMMARY							
Groups	*Count*	*Sum*	*Average*	*Variance*			
Length	12	131,25	10,9375	1,389602			
Breadth	12	55,6	4,633333	0,189697			
4-pth	12	21,95	1,829167	0,08839			
ANOVA							
Source of Variation	SS	Df	MS	F		P-value	F crit
Between Groups	522,2704	2	261,1352	469,7551		5,69E-25	3,284918
Within Groups	18,34458	33	0,555896				
Total	540,615	35					

Table 3. The Relationship between GT and the Dimensions of the Ship 10-20 GT

From the results of the above analysis it can be concluded that:
a. *Count*, in this case is the number of ships sampled at Brondong AFP. In this case the number of samples is 12 ships.
b. *Sum*, the total dimensions of the cantrang vessel that are the object of research include the length, width and inside of the ship. The overall length of the ship is 131.25 m, the width is 55.6 m, and in total it is 21.95 m.
c. *Average*, the average value of each variable, in this case the average value of the length of the vessel is 10.9375 m, the average width of the vessel is 4,633 m, and the average in the vessel is 1,829 m.
d. *Variance* is a quadrant value of a standard deviation that can be used to see how far the data distribution value of each variable. From the above data it can be concluded that the smallest variance value is in ships with a value of 0.08839 m, this indicates that ships tend to be more stable because they are close to the mean value.
e. *Anova table*, can see a comparison between F_{Count} and F_{Table}. From the table above F_{Count} is the output of the F value while F_{Table} is the output of F_{Crit} value. From the ANOVA table above it can be concluded that the calculated F value is 469.7551> from F_{Crit} of 3.28492 then the decision is toll H_0 (reject no difference in average) or in other words there is a difference in average dimensions of ships between three groups of ships cantrang which is separated based on GT ship. According to Putri, *et al* (2013) the catch did not significantly affect the dimensions of the ship used.

3. Ship 21 GT Up
For the group of vessels between 21 GT Up, there are 130 cantrang vessels. The data can be described as follows:

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Length	130	1653,89	12,72223077	1,263312039		
Breadth	130	760,85	5,852692308	0,162808974		
4-pth	130	257,31	1,979307692	0,043239052		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	7696,176076	2	3848,088038	7856,66113	0	3,019042106
Within Groups	189,5474485	387	0,489786689			
Total	7885,723524	389				

Table 4. Relationship between GT and Dimensions of 21 Up GT Vessels

From the results of the above analysis it can be concluded that:
a. *Count*, in this case is the number of ships sampled at Brondong AFP. In this case the number of samples is 130 cantrang vessels.
b. *Sum*, the total dimensions of the cantrang vessel that are the object of research include the length, width and inside of the ship. The total length of the ship is 1,653.89 m, the width is 760.85 m, and in total it is 257.31 m.

c. *Average*, the average value of each variable, in this case the average value of the length of the ship is 12.722 m, the average width of the vessel is 5.852 m, and the average in the vessel is 1.979 m.
d. *Variance* is a quadrant value of a standard deviation that can be used to see how far the data distribution value of each variable is. From the data above, it can be concluded that the smallest variance value on the ship with a value of 0.0432 m, this indicates that the ship tends to be more stable because it approaches the average value.
e. *Anova table*, can see a comparison between F_{Count} and F_{Table}. From the table above F_{Count} is the output of the F value while F_{Table} is the output of F_{Crit} value. From the ANOVA table above it can be concluded that the value of F Calculate is 7.856.66> from F_{Crit} of 3.0190 then the decision is toll H_0 (reject no difference on average) or in other words there are differences in average dimensions of ships for GT 21 group Up. According to Putri, *et al* (2013) the catch did not significantly affect the dimensions of the ship used.

Profit Sharing System

The profit sharing system applied in the Brondong fishing community is still traditional and a family system, there is no binding agreement or agreement between the ship crews and the ship owner. The profit sharing system in MV. Citra Buana 1 is as follows:
a. The total sales of all catches are reduced by the ship's operational costs plus the cost of cigarettes which will later be given to the crew so that gross profit can be obtained.
b. From the gross profit, the ship owner divides into 25 parts with the following details: 10 parts for the ship, 10 parts for the owner, and 5 parts After obtaining a number of shares, then the owner gives 10 parts plus the cost of cigarettes for all crew members.
c. For the captain the owner added 3 parts as a bonus and a trust crew of 2 parts.

The following is an analysis of profit sharing MV. Citra Buana 1 for 6 (six) days of operation:

Profit Sharing Analysis		
Profits From The Fish Auction		IDR. 23.586.000,-
Fish cathing operating cost		IDR. 8.466.000,-
Solar 600 liter @ IDR. 5.150,- (For 6 days @ 100 liter)	IDR. 3.090.000,-	
Oil 30 Liter @ IDR. 28.000,- (For 6 days @ 5 Liter/days)	IDR. 840.000,-	
Ice cube 30 pieces @ IDR. 25.000,- (For 6 days @ 5 ice cube/days)	IDR. 750.000,-	
Drinking water 6 galon @ IDR. 6.000,- (For 6 days @ 1 galon/days)	IDR. 36.000,-	
Cigarretes for crew per trip IDR.500.000,-	IDR. 3.000.000,-	
Gross Profit		IDR. 12.120.000,-
Gross profit is divided into 5 parts (5 crew, 10 Ship, 10 Owner) @ IDR.484.800,-		
Additional captain (3 part)	IDR. 1.454.400,-	
1 additional crew (2 part)	IDR. 969.600,-	
10 crew members (10 part)	IDR. 4.840.000,-	
Total expenditure on salaries of crew members		IDR. 7.264.000,-
Net profit (Owners)		IDR. 4.856.000,-

Table 5. Profit Sharing Analysis MV. Citra Buana 1

From table 5, it can be seen that the captain gets an additional 3 (three) parts out of the total distribution of all crew members. For every ordinary crew member gets IDR. 605,000, - for 6 days of operation. While the total income received by the captain is IDR. 2,059,400, - (additional captain added with the results of each crew member). And the trust crew is IDR 1,574,600, - (additional trust crew added with the results of each crew member).

Brondong AFP Production

Brondong AFP production for 5 years has fluctuated depending on the weather and the rules set by the government. The production results from 2012 to 2016.
For 2012 to 2016 the total production of Brondong AFP is 318,524 tons. Details of catches from 2012 to 2016 can be seen in the following tables and figure.

No	Month	Production (tons)					Total
		2012	2013	2014	2015	2016	
1	January	2.975	1.764	2.730	2.592	5.518	15.579
2	February	3.875	3.837	4.972	3.960	4.338	20.982
3	March	3.322	5.303	8.086	6.566	5.952	29.229
4	April	4.378	5.893	6.353	6.562	5.433	28.619
5	May	4.607	4.013	5.964	4.450	4.605	23.639
6	June	3.485	4.253	4.694	3.813	3.846	20.091
7	July	5.550	4.096	4.515	2.674	2.714	19.549
8	August	3.847	2.730	4.399	6.330	6.224	23.530
9	September	6.445	6.235	6.588	6.880	6.631	32.779
10	October	6.572	5.655	6.909	6.316	8.410	33.862
11	November	6.338	7.453	8.456	7.813	7.754	37.814
12	December	6.368	6.913	7.960	6.856	4.754	32.851
	Total	57.762	58.145	71.626	64.812	66.179	318.524

Table 6. Production from 2012 to 2016

Figure 2. Production from 2012 to 2016

From the table and figure, the highest production occurred in 2014 with a production of 71,626 tons. Whereas the lowest production occurred in 2012 with a total production of 57,762 tons. Whereas for the month with the lowest production occurred in January 2013 with production of 1,764 tons and for the month with the highest production occurring in November 2014 with a production value of 8,456 tons. It can be seen that the month which has the lowest production is between December and January. This is caused by bad weather characterized by high intensity rain, strong winds so that the waves are large which causes fishermen to be reluctant to sea.

This is in accordance with Azkia (2015) who said that the western season in the north coast of Java was marked by the onset of the rainy season, which was sometimes accompanied by storms, which lasted quite a long time. This period runs from November to March. According to Azkia (2015) said that November is indicated as the peak of fishing production every year where November is the beginning of the western season in the year in which the previous month was in October which entered the transitional season. The weather in November was indicated to be still affected by the month of October where the speed of the flow was a bit weak so the sea looked calm so many fishermen went to sea.

Brondong AFP production always fluctuates every month and year due to the influence of the weather. This is in accordance with the statement of Ernawati and Sumiono (2009) who said that weather changes greatly influence the success of catches.

IV. CONCLUSION

1. The total amount of fish caught of MV. Citra Buana 1 during the operation was 3,203 Kg. And the most dominant species of common ponyfish are 1,200 Kg *(Leiognathus sp)*, 867 Kg of golden-threadfin bream *(Upeneus vittatus)*, 232 Kg of purple-spotted bigeye *(Priacanthus tayenus)*, 213 Kg of whipfin silverbiddy *(Gerres kapas)*, and greater lizardfish *(Saurida tumbil)* 147 Kg. Even though common ponyfish is the most in terms of quantity but for the largest total income is from the sale of squid with a value of IDR. 5,520,000, -.

2. Profit sharing system in MV. Citra Buana 1 is from the gross profit the ship owner divides into 25 (twenty five parts). For each crew member gets Rp. 605,000, - the captain gets Rp. 2,059,400, -, and crew trust amounting to Rp. 1,574,600, -.

3. The highest number of loading and unloading activities at Brondong AFP for grouping GT vessels is 53 times (days) for ships with 0 - 9 and 21 Up GT. Whereas for the largest total catch is for 21 Up GT vessels with a total catch of 3,363,058 Kg, with an average of 63,453,9245 Kg. From the results of the catch above it can be concluded that there are differences in the average catch between the three groups of cantrang vessels which are separated based on the GT of the ship. This is based on the GT Ship 21 Up having a large capacity so that it can load a lot of catches.

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