The International Journal of Engineering and Science (IJES)
|| Volume || 7 || Issue || 12 Ver.II || Pages || PP 52-57|| 2018 ||
ISSN (e): 2319 – 1813 ISSN (p): 23-19 – 1805

Analysis of Catch per Unit Effort *Red Snapper* Resources in Brondong Archipelagic Fishing Port Lamongan Districk East Java Province Indonesia

[1]Yaser Krisnafi, [1]Syarif Syamsudin, [1]Yusrizal, [1]Erick Nugraha, [2]Zein Rokhman Fadly

[1] *Fishing Technology, Jakarta Fisheries University, Indonesia*
[2]*Department of Marine Affairs and Fisheries East Kutai, East Borneo, Indonesia*
Corresponding Author: Yaser Krisnafi

----------*ABSTRACT*----------
Red Snapper (Lutjanus sp.*) is one of the leading commodities in Brondong archipelagic fishing port. This study aims to analyze the catch per effort of catching Red Snapper resources at Brondong archipelagic fishing port. The data analysis method used to find out the catch per capture effort is CPUE analysis and standardization of fishing gear. The results show the value of catch per effort or CPUE (Catch Per Unit Effort) resources Red snapper landed at Brondong archipelagic fishing port in 2012-2016 fluctuated and tended to experience an increase with an average CPUE value of 549 kg/unit/year. Based on optimum fishing effort (f_{opt}) value of 954 units/year and MSY value of 650.091 kg.*

KEYWORDS: *Red snapper (Lutjanus* sp.*), Brondong archipelagic fishing port, Catch per catch effort, Optimum fishing effort, MSY*

Date of Submission: 28-12-2018 Date of acceptance: 12-01-2019

I. BACKGROUND

Lamongan is a district that contributes to the fisheries sector of 15-25% of the total fish production in East Java. Brondong archipelagic fishing port has a very strategic role in the business of developing capture fisheries, namely as the center or center of marine fisheries activities, especially in Lamongan Regency (Apriliani et. Al., 2015). Based on Brondong AFP data (2013), one of the dominant resource commodities in Brondong AFP is Red Snapper Fish. Most of the catches of Red Snapper fish are exported and entered into processing plants. Red Snapper fish landed at Brondong AFP has the highest average price compared to other fish species, which is Rp. 44,494 / kg. The Red Snapper fish landed at Brondong AFP was caught with long line, payang, and cantrang.

According to Marzuki and Djamal (1992) in Wahyuningsih *et al*. (2013), Red Snapper *(Lutjanus sp.)* Is a type of demersal fish from the family of *Lutjanidae* which has high economic value in Indonesia. Red Snapper is one of the export commodities from the fisheries sub-sector whose demand continues to increase. Red Snapper Fish *(Lutjanus spp)* is one of the economically important demersal fish species which is quite widely caught around Indonesian waters (Rikza, 2013). According to Sriati (2011), Red Snapper fish have relatively low motion activities, forming a cluster that is relatively not too large, migration is not too far away and has a stable life cycle because the habitat on the seabed is stable. These fish resources have a narrow distribution and are near the bottom of the water, so fish resources are less resistant to the effects of exploitation.

According to Widodo and Suadi (2006), management efforts increasingly felt their needs increased. This is driven by the fact that the intensity of fish resource utilization is increasing (intensively), which has caused a considerable loss of diversity of fish resources and their habitat. One form of fisheries management is stock assessment. Stock assessments include an estimate of the amount or abundance of resources. Stock assessments make it possible to find out the level of utilization of fish resources that have been carried out. In addition, one of the other fisheries management techniques is by controlling the fishing season (opened or closed season).

The purpose of this study was to analyze the catch per unit effort (CPUE) resources of Red Snapper fish landed at Brondong AFP, optimum fishing efforts and MSY.

This research was conducted in February-May 2018 at the Brondong Archipelagic Fishing Port (AFP), Lamongan Regency, East Java Province.

II. METHODOLOGY

The material used in this study was capture trip data and catches of Red Snapper *(Lutjanus sp.)* In the 2012-2016 period landed by fishermen in Brondong AFP, Lamongan. While the research method used is the survey method and descriptive. According to Sugiyono (2013), survey methods are used to obtain data from certain natural places (not artificial), but researchers treat them in data collection, for example by distributing questionnaires, interviews, and so on. According to Suryabrata (2003), literally, descriptive research is research that intends to make a description (description) of situations or events.

The data needed in this study are primary data and secondary data. Primary data was obtained through interviews and direct observations covering the specifications of the Red Snapper Catching Unit, catching methods, catches of several trips, fishing grounds. Secondary data was obtained from the statistical data of Brondong AFP, Lamongan.

Analysis of the data used in this study was analysis of catch per unit effort (CPUE), standardization of fishing gear, optimum fishing efforts, MSY, and utilization rates.

Calculation of CPUE (catch per unit effort) aims to determine the rate of catch rate of fishing efforts based on the division of catch (catch) against effort (effort), (Gunawan, 2004).
The formula used is as follows:

$$CPUEi = \frac{Ci}{fi} \quad \text{.....(1)}$$

Information :
Ci : catch to-i (tons)
Fi : efforts to-i (trips)
CPUEi : amount of catch cought to-i (tons/trips)

According to Rahmawati *et al* (2013), the number of fishing gear in an area requires the calculation of standardization of fishing gear which aims to find the value of FPI (Fishing Power Index) using the following formula:

$$CPUE_S = \frac{C_s}{f_s} \quad \text{.....(2)}$$

$$FPI_S = \frac{CPUE_s}{CPUE_s} \quad \text{.....(3)}$$

$$CPUE_i = \frac{C_i}{f_i} \quad \text{.....(4)}$$

$$FPI_i = \frac{CPUE_i}{CPUE_s} \quad \text{.....(5)}$$

Information :
$CPUE_s$: catch per effort (fishing gear standart)
$CPUE_i$: catch per effort fishing gear
C_s : amount of catches type of fishing gear standart
C_i : amount of catches
f_s : amount of effort catches standart
f_i : amount of effort
FPI_s : catch power factor type of fishing gear standart
FPI_i : catch power factor type of fishing gear

According to Schaefer in Kurniawan (2001), effort and catch relationships produce a symmetrical parabolic curve. The formula presented is :

1. Relationship between Catch per Unit Effort (CPUE) and catch effort (f)

$$CPUE = a - bf \quad \text{.....(6)}$$

Information :
CPUE : catch per unit effort
a : *intercept*
b : *slope*
f : effort

2. Relationship between catch (c) and fishing effort (f)

$$Catch\ (c) = af - bf^2$$ .....(7)

3. The optimum effort obtained from the derivative of equation (2) = 0, namely:

$$c = af - bf^2$$
$$c' = a - 2bf = 0$$
$$a = 2b\ x\ f$$
$$f = \frac{a}{2b}$$ .....(8)

4. The maximum sustainable yield (MSY) is obtained by substituting the maximum Effort value in equation (2), namely:

$$c = af - bf^2$$
$$MSY = a\left(\frac{a}{2b}\right) - b\ (a^2 - 4b^2)$$

Then :

$$MSY = \frac{a^2}{4b}$$ .....(9)

The step to calculate the CPUE formula using the schaefer method formula as follows :

1. Make a catch data table (c) and capture effort (f) and calculate CPUE
2. Plot the CPUE value against the corresponding f and calculate Intercept (a) and Gradient (b) using linear techniques
3. Calculates f optimum
4. Calculating Maximum Sustainable Yield (MSY)

The magnitude of a and b can be searched using the equation:

$$b = \frac{n.\sum xy - \sum x.\sum y}{n.\sum x^2 - (\sum x)^2}$$ .....(10)

$$a = \bar{y} - b\bar{x}$$ .....(11)

Wherein :
x : Effoet
y : CPUE

Determining the utilization rate of the catch is calculated using a formula (Simanungkalit, 2007 in Cahyani, *et al*, 2013), as follows:

$$Tingkat\ Pemanfaatan = \frac{C}{MSY}\ x\ 100\%$$ .....(12)

III. RESULTS AND DISCUSSION

General Conditions of Research Location

Lamongan Regency is one of the areas in East Java that has considerable fisheries resource potential, namely aquaculture and capture fisheries. Lamongan Regency which has a 47 km coast starting from Weru Paciran to Lohgung Village, has 5 fish landing sites, namely Weru, Brondong, Kranji, Labuhan and Lohgung Complex with the largest landing center in Brondong AFP.

Brondong Archipelago Fisheries Port is located in Brondong Village, Brondong District, Lamongan Regency. Brondong Subdistrict is a Lamongan Regency region located in the northern hemisphere, approximately 50 km from the capital of Lamongan Regency, located at the coordinate point between 06° 53' 30"- 07° 23' 6" South Latitude and 112° 17' 01"-112° 33' 12" East Longitude, with regional boundaries as follows:

North side : Java Sea
East side: Blimbing Village

South side : Sumber Agung Village
West side : Sedayu Lawas Village

Production of Red Snapper Fish *(Lutjanus sp.)* At Brondong AFP

Red Snapper Fish is a type of fish in Brondong AFP which has the highest average price compared to other types of fish and one of the export commodities. Red Snapper fish landed at Brondong AFP was caught with fishing gear, payang, long line and cantrang.

Years	Fishing Gear			Total (Kg)
	Payang (Kg)	Cantrang (Kg)	Long Line (Kg)	
2012	229	367.743	60.028	428.000
2013	463	492.491	93.046	585.000
2014	776	492.584	121.640	615.000
2015	3.147	518.339	182.514	704.000
2016	2.817	488.599	162.584	654.000

Table 1. Production of Red Snapper at Brondong AFP

Catcht per Unit Effort (CPUE)

According to Susanto (2006), the CPUE value is obtained from periodic data (time series) from production and fishing efforts to estimate biological parameters and technological parameters of the bioeconomic model. After standardization of fishing gears, the standard fishing gear is cantrang. The standard CPUE value can be seen in Table 2.

Years	Production (Kg)	Effort Standart (Unit)	CPUE Standart (Kg/Unit)
2012	428.000	1.228	349
2013	585.000	1.456	402
2014	615.000	1.156	532
2015	704.000	936	752
2016	654.000	922	709
Total	2.986.000	5.698	2.744
Average	597.200	1.140	549

Table 2. CPUE Values

The highest catch per unit effort (CPUE) occurred in 2015 amounting to 752 kg / unit, this was because in 2015 the catch obtained was 704,000 kg with fishing effort of 936 units, while the catch per unit of effort was catching (CPUE) the lowest occurred in 2012 amounting to 349 kg / unit, this happened because in 2012 the catch was 428,000 kg with an fishing effort of 1,228 units. The catch value per effort of CPUE red snapper resources *(Lutjanus spp.)* Landed at Brondong AFP within 5 years (2012-2016) has increased fluctuations.

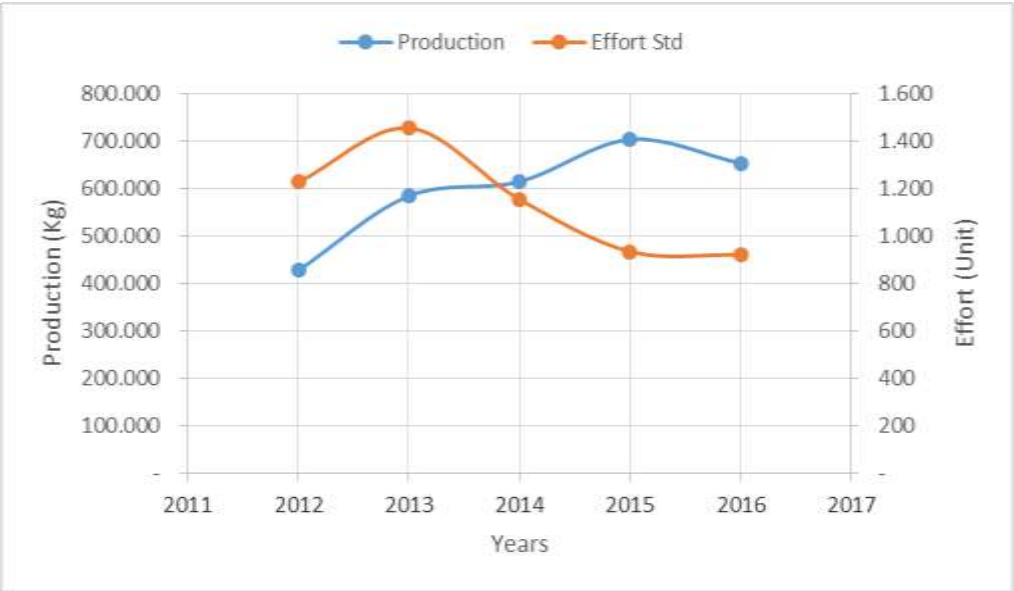

Figure 1. Graph of Production Relations with Effort

Based on the regression analysis between effort and CPUE the intersept value (a) = 1.363 and the slope value (b) = -0.71486 are obtained. From these results the optimum effort value (fopt) and maximum potential (MSY) can be obtained.

Figure 2. Graph CPUE relationship with Effort

Maximum fishing effort (fopt) is the amount of fishing effort carried out by the arresting unit, in order to obtain maximum catch without damaging the sustainability of fishery resources in the waters. After calculation, the optimum capture effort (fopt) value is 954 units / year.

The maximum catch (MSY) is the amount of fish that can be captured continuously from a resource without affecting the sustainability of the fish stock. MSY is used to find out the fish resources used, to determine the level of utilization of these resources by estimating the fluctuations in the abundance of a type of fish and describing fish biomass in a waters. The MSY value was obtained at 650,091 kg. This value is a boundary where fish resources can still be utilized without disturbing their sustainability and guarding their offspring. By knowing the optimum capture effort value and MSY value, the average utilization rate from 2012 to 2016 is 92%. This means that fishing efforts have exceeded the sustainable potential that should be allowed to be captured, which according to Cahyani, *et al*. (2013), states that the utilization of fisheries resources above 80% does not support the sustainability of these resources.

IV. CONCLUSION

The level of CPUE of red snapper resources *(Lutjanus sp.)* In 2012 to 2016 seen from CPUE analysis was 349 kg / unit in 2012, 402 kg / unit in 2013, 532 kg / unit in 2014, 752 kg / unit in 2015, 709 kg / unit in 2016. The potential of red snapper catch *(Lutjanus sp.)* in Brondong AFP using the Schaefer Method obtained the optimum fishing effort (fopt) value of 954 units / year and MSY value of 650,091 kg.

REFERENCE

[1]. Apriliani, Rizki Astri, Beta Suryokusumo, and Sigmawan Tri P. 2015. Fish Market with the Concept of Climate Response Local Architecture at AFP Brondong, Lamongan. Student Journal of the Architecture Engineering Department. Faculty of Engineering, Brawijaya University. 3 (1) : 1-14.
[2]. Brondong Archipelagic Fishing Port. 2012. Statistics Report Brondong Archipelagic Fishing Port. Lamongan
[3]. Brondong Archipelagic Fishing Port. 2013. Statistics Report Brondong Archipelagic Fishing Port. Lamongan
[4]. Brondong Archipelagic Fishing Port. 2014. Statistics Report Brondong Archipelagic Fishing Port. Lamongan
[5]. Brondong Archipelagic Fishing Port. 2015. Statistics Report Brondong Archipelagic Fishing Port. Lamongan
[6]. Brondong Archipelagic Fishing Port. 2016. Statistics Report Brondong Archipelagic Fishing Port. Lamongan
[7]. Cahyani, R.T., Anggoro, S and Yulianto, B. 2013. Sustainable Potential of Demersal Fish Resources. Proceedings of the National Seminar on Natural Resource and Environmental Management.
[8]. Gunawan, A. 2004. Analysis of Catching Patterns and Utilization of Anchovy in Tuban Regency, East Java.
[9]. Kurniawan, B.A, 2001. Application of the Schaefer Method Against the Catch and Patterns of the Catching Season for Red Snapper *(Lutjanus. Spp)* Landed in AFP Pekalongan, Central Java, Agricultural Institute Bogor, Bogor.
[10]. Rahmawati, M., Fitri, A.D.P, Wijayanto, D. 2013. Analysis of Catches per Effort for Catching and Patterns of Catching Season of Anchovy *(Stolephorus spp.)* In Pemalang Waters. Journal of Fisheries. Vol. 2. Page 213-222.
[11]. Rikza, Choirul. 2013. Effect of Differences in Bait and Time of Line Fishing Operation *(Set Bottom Longline)* on the Catch of Red Snapper Fish *(Lutjanus spp)* Around Jepara Waters. Journal of Fisheries Resources Utilization Management and Technology. 2(3): 152-161.

[12]. Sriati, 2011. Study of Bioeconomics of Red Snapper Fish Resources landed on the South Coast of Tasikmalaya, West Java. Faculty of Fisheries and Marine Sciences, Padjadjaran University, Bandung. Journal Aquatic ISSN 0853-2523. II (2) : 79-90.
[13]. Sugiyono. 2013. Quantitative and Qualitative Research Methods and R & D. Alfabeta Publisher, Bandung.
[14]. Suryabrata, Sumadi. 2003. Research Methodology. Raja Grafindo Persada, Jakarta
[15]. Susanto. 2006. Bioeconomics Study of Crab Resources *(Portunus pelagicus L)* in Waters of Maros Regency, South Sulawesi. Journal Agrisystem ISSN 1858-4330. 2(2) : 55- 67.
[16]. Wahyuningsih, Prihatiningsih, and Tri Ernawati. 2013. Parameter of Population of Red Snapper Fish *(Lutjanus malabaricus)* in the Waters of the East Java Sea. Marine Fisheries Research Center, Jakarta, Bawal, 5(3): 175-179.
[17]. Widodo, Johanes and Suadi. 2006. Marine Fisheries Resource Management. Gadjah Mada University Press, Yogyakarta.

Yaser Krisnafi " Analysis of Catch per Unit Effort Red Snapper Resources in Brondong Archipelagic Fishing Port Lamongan Districk East Java Province Indonesia. " The International Journal of Engineering and Science (IJES), 7.12 (2018): 52-57