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UTILIZATION RATE OF CORAL TROUT (PLECTROPOMUSLEOPARDUS) USING BOTTOM TRAPS (BUBU)IN BELITUNG, BANGKA BELITUNG PROVINCE

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KeyWords
Bangka Belitung, bubu,coral trout, sustainable yield

ABSTRACT

One of the most commonly usedfising gear in PPN Tanjungpandan is a trap. Bubu is a passive fishing gear. Bubu catches generally demersal fish and reef fish. Coral trout is a type of common consumption fish. Coral trout is an economically important demersal fish caught by fishermen in Belitung. This can be seen from the amount of production of coral trout from 2012 to 2016 is quite high with the highest production value in 2013 reaching 89,516 kg. This research aims to estimate the sustainable potential and level of utilization of coral trout in Belitung waters. This research was conducted in April - May 2019 at the Tanjungpandan Archipelago Fisheries Port (PPN), Belitung , Bangka Belitung Islands. The method used in this research is a survey method and analyzed descriptively quantitative. The sustainable potential of catching coral trout in Belitung waters shows that it is still below the MSY value graph because the effort of catching and producing fish to the CPUE value gives a positive value on the b (slope) value. The highest CPUE value is 1879.48 kg / trip in 2018 and in December it becomes the highest average each year which is 81.88 kg / trip. The value of utilization level is not obtained because the sustainable potential is still below the MSY graph so it is still said to be underfishing or in other words the lack of production value for the effort to catch Coral trout in Belitung waters.

INTRODUCTION

Belitung Island is part of the Bangka Belitung Province which is also an archipelago which has a land area of 4,800 km^2, with the sea area of 29,606 km^2, coastal area of 1,900 km^2, coastline length of 195 km with 189 small islands.. Belitung is an archipelago that is geographically surrounded by sea and strait with the condition of the coastal area in the form of white sand, granite rocks with beautiful mosaics and clear sea water with coral reefs and small islands[1]. Belitung island are surrounded by sea waters. By this fact, of course has implications for the large potential of marine and fisheries owned by this region. The magnitude of this potential must be followed by the ability to manage resources that can provide added value to the level of community welfare. The great potential of fisheries and marine affairs makes most of the population work as fishermen, which of course requires full support from the central, provincial and local government in all of need aspects. Seen from the total production in 2017 amounted to 68,709.3 tons higher than the livestock sector which amounted to 2,771,599 tons[2].

One factor supporting the potential of fisheries resources is the existence of coral reefs. Coral reefs are one of the main communities making up tropical marine ecosystems has that high productivity. The diversity of types of coral reefs in waters is

strongly influenced by biotic and abiotic factors. Bangka Belitung Islands Province has 2 large islands and 251 small islands with alength of coastline 1,200 Km. The coral area is estimated at 20% of the territorial sea area of 65,301 km2[3].

The fishing gear that commonly used in PPN Tanjung Pandan is trap called “bubu”. Bubu is a passive fishing gear, which makes it easy for fish to enter but is difficult to escape[4]. Fish catches by traps have several advantages, including fish caught in living conditions (fresh) and do not experience physical damage due to the relatively large chamber of the traps which allows fish to move freely in them because the fish entering the traps will have resistance activities (struggle) more minimal so that damage to body parts and death can be reduced[5].

Bubu catches generally demersal fish and reef fish. Coral trout is a type of consumption fish. Coral trout is an economically important demersal fish caught by fishermen in Belitung . This can be seen from the amount of production of coral trout from 2012 to 2016 is quite high with the highest production value in 2013 reaching 89,516 kg[6].The condition of coral trout which provides high selling value is the tiger coral troutgroup in a living and complete condition. The coral trouthas a comparative advantage because of the large potential of local resources, market demand and high prices.

Fish resources need to be managed well because they are biological resources that can be renewed (renewable), but it can be overfishing, depletion or extinction. Thus, managing a fish resource correctly and appropriately becomes a necessity. In the utilization of fish resources at sea, one of the main problems is how many fish can be caught without disturbing the availability of stock, or how fish biomass harvest can be maximized without disrupting the prospect of future exploitation. One approach to managing fish resources is through modeling[7]. Based on this, there needs a research that can contribute to maintaining the preservation of coral trout fish. One of them is by knowing the level of utilization of coral trout fish at the Tanjungpandan Archipelago Fisheries Port.

MATERIAL AND METHODS

Research on the level of utilization of coral trout using basic trap fishing gear in Belitung , Bangka Belitung Islands was conducted in April - December 2019 at the Tanjungpandan Archipelago Fishery Port (PPN), Belitung , Bangka Belitung. The method that used in this research is the survey method. According to[8].a method that can be used to determine the estimated maximum sustainable yield (MSY) is through a surplus production model approach. The model relates to an overall stock, total effort and total catches obtained from stock.

Figure 1. Research Location

RESEARCH PARAMETERS

The parameters measured in this research are the catches, and the catch effort including the composition of the catch, validation of the production of coral trout fish, CPUE, standardization of the catch effort, sustainable potential and the level of utilization.

1. Catch Per Unit Effort (CPUE)

The calculation of the value of CPUE is obtained by dividing the catch data with the capture effort. Catching efforts can be in the form of fishing trips, number of fleets carrying out fishing operations, or number of fishing gear. According to Sulistiyawati (2011) the formula used to determine the value of the catch per unit capture effort (CPUE) is as follows[9]:

$$CPUE_i = \frac{Catch_i}{Effort_i}$$

Note:
$CPUE_i$:catches per unit of arrest attempt in the i year
$Catch_i$: catches in the i year i
$Effort_i$: capture effort in the i year

2. Estimation of Maximum Sustainable Yield (MSY)

Estimation of sustainable potential catch (MSY) from catch data and efforts to catch coral trout fish is done using the Schaefer and Fox models[10]. Before analyzing the two models, the intercept (a) and slope (b) values must be known. The magnitude of parameters a and b can be mathematically searched using Microsoft Excel 2013 with a simple regression equation with the formula Y = a-bx. The parameters a and b can be determined by:

$$a = \frac{\sum y_i - b \times \sum x_i}{n}$$

$$b = \frac{n \times \sum(x_i \times y_i) - \sum y_i}{n \times (\sum x_i^2) - (\sum x_i)^2}$$

Note:
a : intercept (the intersection point of the regression line and the y-axis)
b : slope (slope) of the regression line
n : time frame (year)
y_i : catch per unit effort in year i
x_i : effort capture (effort) in the i year

The choice of one model that is considered reasonable or one of the models that is in accordance with the data in the PPN Tan-jungpandan[10].. This can be shown by the coefficient of determination or R2. The model which has the largest R^2 value is a suitable model to be used in analyzing the data obtained. Determination of the value of sustainable potential (MSY) and optimum effort (opt) by using the Schaefer and Fox models[9]are as follows (Table 1):

Tabel 1. Formula to Find the Value of Maximum Sustainable Yield and Optimum Effort

	Schaefer Model (Linier Model)	**Fox Model (Exponensial Model)**
Equation Model	$CPUE = a - bf$	$\ln CPUE = a + bf$
C and f relations	$C = af - b(f)^2$	$C = f \times \exp(a + bf)$
Sustainable yield	$MSY = \frac{a^2}{4b}$	$MSY = -\left(\frac{1}{b}\right) \times \exp(a - 1)$
Optimum effort	$f_{opt} = \frac{a}{2b}$	$f_{opt} = -\left(\frac{1}{b}\right)$

Note:
MSY : sustainable potential (tons)
Fopt : optimum capture effort (trip)
a : intercept
b : slope
C : catch (ton)
E : capture effort (trip)

RESULTS

1. Coral Trout Fisheries in Belitung

1.1Fishing Gears

Fisheries activities in Belitung are supported by the existence of fishing gear that is used in the operation of catching coral trout in the area, namely bubu. The number of bubu fishing gear from year to year can be seen in Figure 5. According to Sudirman and Mallawa (2004), bubu is a fishing gear that is set permanently in water for a certain period of time which makes it easy for fish to enter and find it difficult to get out[11]. Martasuganda (2003) states the method of operation of bubu is generally almost the same for all types of bubu[12]. Before setting the trap, it is necessary to determine the fishing ground first, especially the area that has been estimated to have a lot of target fish.

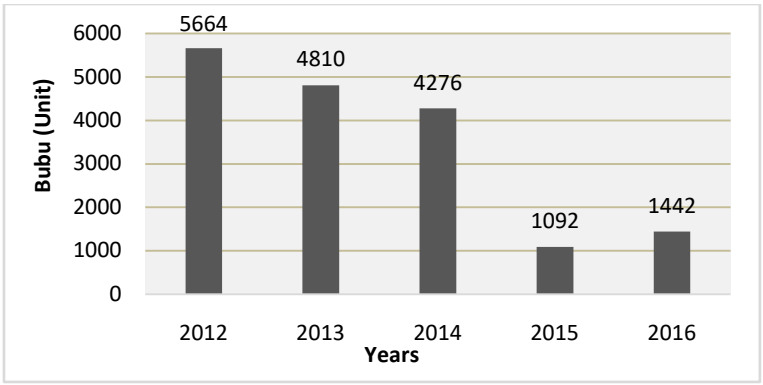

Figure 2. Total of *bubu* fishing gears in Belitung

Slack and Smith (2001) state that the trap consists of the frame, body, mouth, bait place, door, pass and gap ballast[13].The bubu framework functions to give shape to the bubu. The frame is made of strong material and can maintain the shape of the trap when operated. Bubu frames can be made of wood, iron, steel or even plastic.

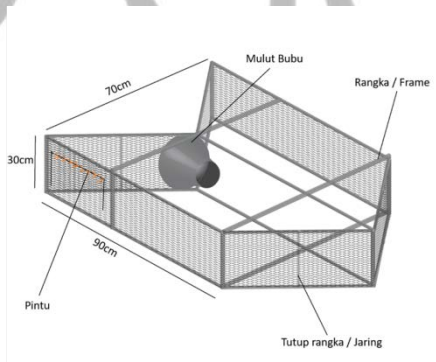

Figure3. Bubu Constructions

The type of bubu used in Belitung has a different shape from the bubu in Indonesia generally. Can be seen in the figure 3. This bubu has a size of 90cm long, 70cm wide and 30 cm height. Bubu used in Belitung is made of wood as a base frame and then coated with wire as a frame cover. It has one mouth on the back and one door on the side of the trap.

1.2Fishing Ground

Fishing is influenced by weather, wind and. season in the area. In the east season, it is the peak season for fishermen to get as many catches as possible. This is because in that season the sea is not choppy, making it easier for fishermen to operate at sea. Small scale bubu fisheries are operated in shallow water, while medium and large scale fish are usually in offshore waters at depths between 20 m to 700 m[2].The fishing phase search stage is generally based on the habits and experience of fishermen in carrying out fishing operations. In general, the location of traps setting is in the waters around the open coast which are affected by waves, the

speed of the current is not too large, the bottom of the water is sand sediment, muddy sand, and mud. The basic trap how to operate it is by placing it on an area of coral reef that is suspected to be the area where fish nest[14].

Based on the results of a survey conducted, several points became fishing grounds for coral troutcatch by the bubu fishing gear by several fishermen shown in Figure 4.

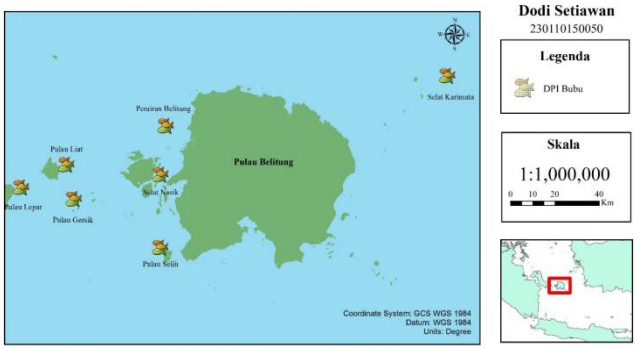

Figure 4. Bubu Fishing Ground

Knowing the potential fishing grounds and supported by a good fishing unit will increase the production of any fishin[15]. Coral trout generally inhabit areas of coral waters to tidal areas in the estuary, and even some species tend to penetrate into fresh waters. Areas for catching coral trout in the Bangka Belitung Islands include the waters of TanjungPandan and the Gaspar Strait[16].

2. Coral trout Fish Production

Based on the data obtained during the 10 years obtained as the graph below (Figure 4) shows that the highest amount of catch production in 2017 was 198,734.17 kg while the lowest catch production in 2009 was 15,519.22 kg.

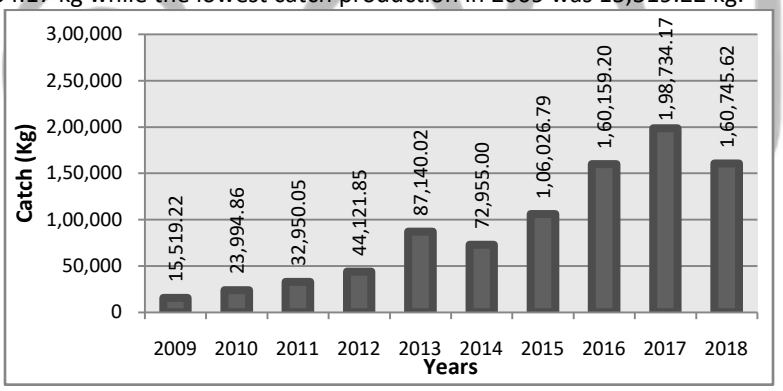

Figure 4. Coral trout catches with bubu by years

The results of coral trout production in Belitung have experienced an increase in the last 10 years, presumably due to an increase in fishing efforts from 2009-2018, meanwhile, during the 2012-2016 coral trout production in Indonesia has shown positive performance[17]. The high and low catches of coral trout fish in each period of catch are influenced by the presence of fishing effort fluctuations caused by unfavorable environmental factors such as wind, currents, and waves [18].The factor of fluctuation in the value of Coral trout fish production is due to the increasing number of fleets and fishing gear units that are increasing every year.

Based on the average monthly data for 10 years obtained in (Figure 5), it shows that the highest average amount of catch production in April was 11,449.08 kg while the lowest catch production in February was 3,603.33 kg.

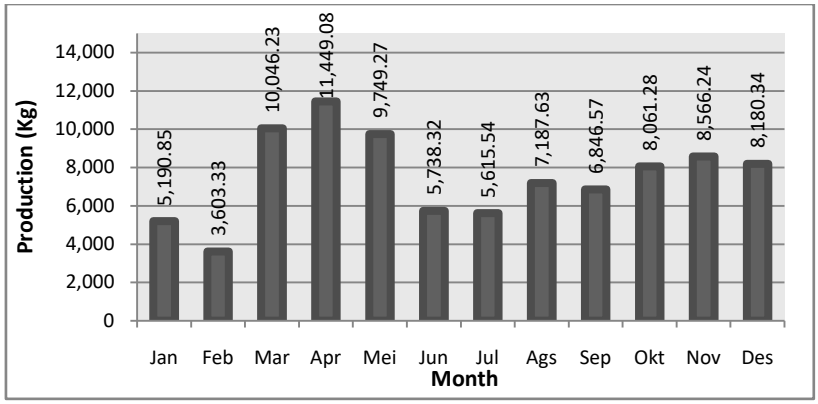

Figure 5. The average production of coral trout by month from in last 1 years.

The two graphs comparing the annual period and the average monthly production show that the contribution of production value every month is not the same even though the annual graph has increased every year. Production in March to May is the highest contributor every year, this is influenced by the season, where the peak season for coral troutspawning[19].The peak season for coral trout fishing occurs in March to May because in March low rainfall makes it easier for fishermen to go to sea, allegedly high chlorophyll-a caused by the up welling process that causes abundance from phytoplankton which results in coral troutgatherin[20]. So that arrest efforts in March, April, and May can be seen in Figure 5.

3. Fishing Effort

Based on 10-year data obtained from the PPN Tanjungpandan, as (Figure 6) shows that the highest number of arrest attempts in 2017 was 1,839 while the lowest fishing effort in 2009 was 575 trips.

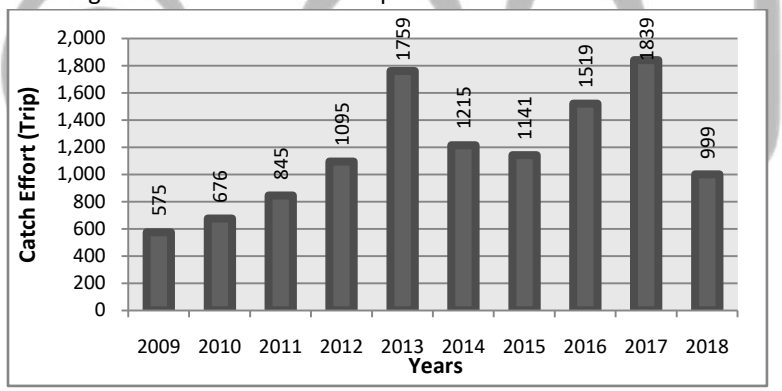

Figure 6. Fishing trip for last 10 years

The number of trips carried out in 2009 increased until 2013 then decreased until 2015 then rose again until 2017 and finally decreased in 2018. The use of the number of fishing units is adjusted to the available coral trout resources. In addition, the increase or decrease in fishing effort in Belitung is allegedly due to economic, fishing season and environmental factors[21].

Based on the 10-year data obtained as shown below (Figure 6) through the monthly period, it shows that the highest number of fishing attempts in April was 131.13 trips while the lowest average fishing effort in January was 68.9 trip. Based on Alamsyah's research (2012), the average Coral trout fish found in February to March has entered the spawning season with the discovery of many Coral trout fish with gonad ripe conditions indicating that the increasing number of coral trout is so that fishermen increase the number of their fleets to add value to the production of catches[18].

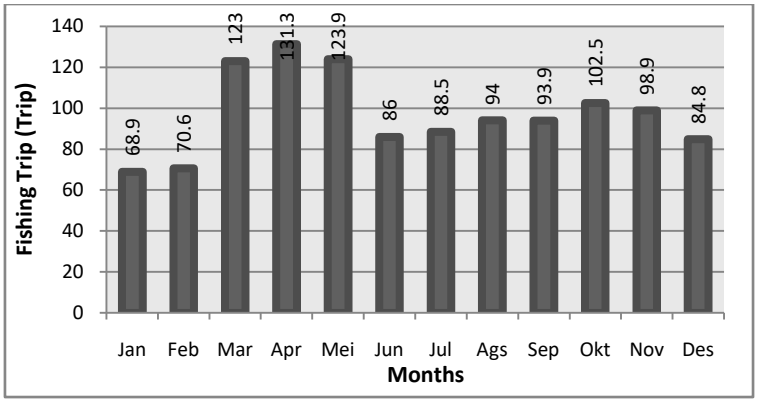

Figure 7. Average fishing trip by months in last 10 year

Seeing the comparison of the average value of Coral trout production (Figure 5) and the average trip each month (Figure 7) fluctuations in the graph can be said to be similar because it shows an increase but experienced ups and downs in April which then rose again in June, so that the number of trips adjusted to the value of production from the previous month.

Fluctuations in productivity of Coral trout Fish catches can be explained that the large volume of productivity is influenced by the size of the fishing effort that is done. The higher the capture effort (trip), the reduced productivity volume. The decline in productivity was influenced by a decrease in production volume, due to the greater fishing activity compared to the ability to recruit Coral trout stocks in the fishing area that year. Recruiting of fish stocks can occur if there are fish that are allowed to become adults, on the contrary the recruitment of fish stocks in the waters cannot occur if there are no fish that are allowed to mature and spawn [22].

4. CPUE

CPUE is the average catch of each business unit. CPUE value every year will be able to see a picture of fishing activities in a fishing area. Based on data on the capture and production efforts of Coral trout in Belitung Waters obtained in the last 10 years, the CPUE values obtained annually are shown in the following graph (Figure 8).

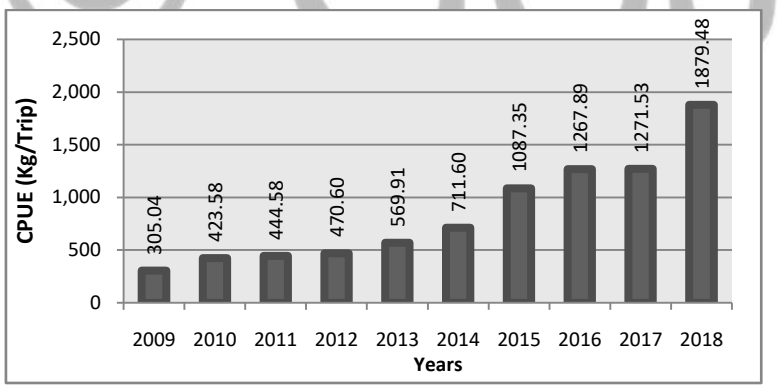

Figure 8.CPUE's value in last 10 years

Figure 8 shows the highest average CPUE value in 2018 which is 1879.48 kg / trip and the lowest average CPUE value is in 2009 which is 305.04 kg / trip. The high CPUE value is influenced by the increasing number of fleets each year. On each fleet on average, based on survey results that approximately every year fishermen add bubu units each year which will affect the catch of each fleet. Therefore the increase in fleet units and bubu units in each fleet will affect the amount of production each year, it will affect the CPUE value of coral trout.

Based on catching and production data of Coral trout obtained in the last 10 years in each month, CPUE values obtained each month are shown in the graph below (Figure 9).

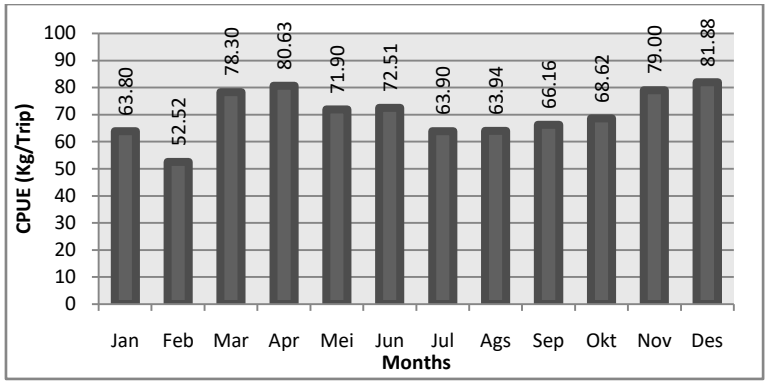

Figure 9. Average values of CPUE by months in last 10 years

The graph shows the highest average CPUE value in April at 80.63 kg / trip and the lowest average CPUE value in February at 52.52 kg / trip.

CPUE value is the value of the ratio between the amount of production and the number of capture attempts. According to Noija (2014), the CPUE value is calculated to determine the abundance and level of utilization of fisheries resources in certain waters[23]. The results of the analysis showed the highest CPUE value of Coral trout fish occurred in 2018 amounted to 1879.48 kg / trip, this was allegedly due to the highest production value and fishing effort in that year while the lowest CPUE value occurred in 2009 of 305.04 kg / trip this case because the value of production is lower than the capture effort. The decrease in CPUE is assumed to indicate an excess of capture effort, this is a consequence of the increased capture effort[21]. In accordance with the opinion of Simbolon (2011), that the higher the effort, the CPUE value shows symptoms of decline[24].The highest CPUE value of coral trout occurred in 2018, this was thought to be due to an abundance of demersal fish resource stocks despite low fishing efforts.

Based on the results of an economic analysis and income of fishermen conducted by Pratama (2012), that fishing business using basic bubu fishing gear is more feasible to run, because besides being safe it is also a higher business feasibility value and the economic potential of coral fisheries can be supported by government policies. Increasing the CPUE value will have a positive impact on the Belitung coastal community[14].

5. Sustainable Yield and Utilization Rate

Based on catching and production data of coral trout obtained and then processed using the Schaefer model and Fox model methods, the equation values of each variable are obtained (Table 2).

Tabel 2. Equation valuesof Schaefer dan Model Fox Models

	Schaefer	**Fox**
a (*intercept*)	26,7421868	3,2720739
b (*slope*)	0,0386925	0,0007249
R^2	**0,1472**	**0,2794**

Based on the table above the coefficient of determination (R^2) of the Schaefer model and Fox model, so the model used is the Fox model. If in the calculation a positive b value is obtained, then the calculation of potential and optimum catching efforts cannot be continued but it can only be concluded that the addition of capture effort is still possible to increase catches[25].

The condition of fish resource utilization in Belitung in Bangka Belitung Province in general can be classified as sustainable. This is based on the fact that the actual catch has not exceeded MSY. Based on the optimum value of catching effort on the production of tiger fish each month, that the level of utilization of the coral trout catch fisheries cannot be known. The overall value of the optimum fishing effort shows that it is below the value of sustainable potential (MSY), which means that catching coral trout fish is still relatively low.

CONCLUSIONS

1. Sustainable potential in the catching of coral trout in the Belitung waters shows that it is still below the graph of MSY value because the effort of catching and producing fish to the CPUE value gives a positive value on the value of b (slope). The highest CPUE value is 1879.48 kg / trip in 2018 and in December it becomes the highest average each year which is 81.88 kg / trip.

2. The value of utilization level is not obtained because the potential for sustainability is still below the MSY graph so that it is still said to be underfishing or in other words the lack of production value for the effort to catch coral trout in Belitung waters.

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