Maximum Economic Yield Analysis Of Crab Utilization In Saugi Island Waters, North Tupabirring District, Pangkep Regency

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Abstract- The purpose of this study is to determine the level of utilization of crab management resources on Saugi Island, Pangkep Regency and analyze the Maximum Economic Yield (MEY) value of crab crabs on Saugi Island, Pangkep Regency. The method used is Descriptive Quantitative using questionnaire tools. The sampling method used is the Random Sampling method where the respondents or samples selected during the interview are fishermen whose entire working time is used to carry out crab fishing operations using fixed gill nets and bubu fishing gear with a set percentage of samples.

The results showed that the utilization rate of crab crabs in general in bubu fishing gear and gill nets still has a fluctuating or up-and-down value, indicating that there has been underfishing in the crab crab population with a management regime, MEY of 213.05 tons.

Index Terms-Underfishinhg, Utilization Rate, Maximum Economic Yield, Fluctuations

I. INTRODUCTION

Pangkep Regency has abundant biological resources both in coastal areas, seas and small islands. This huge wealth is a great capital to develop the area and to improve the welfare of fishing communities whose lives are highly dependent on fishery biological resources. Fisheries biological resources are very important for the development of resource-based fisheries (Resource Based Development), without fisheries biological resources fisheries development would not exist. Everything that is done in relation to the construction of fisheries, if you do not consider the existence of resources, then the development will stop halfway.

Crabs are a very potential fishery product. In addition to having a delicious meat flavor, its nutritional value is also quite high so that the demand for this commodity both from the local market and the export market is increasing. Crab is a fishery commodity that is exported mainly to the United States, which reaches 60% of the total crab catch. Until now, crab commodities are ranked third or fourth in the total export value of Indonesian fishery products after shrimp, tuna and seaweed. The fulfillment of crab raw materials still depends on catches in nature (Hermanto, 2015).

Some of the problems that occur due to the intensive use of crabs (P. pelagicus) include the decreasing catch of fishermen so that operational costs are not covered, there are symptoms of the size of the crab (Portunus pelagicus) getting smaller, the fishing time is getting longer, the crab fishing area tends to move further away from the coast, and fishermen no longer choose the ideal catch (adult crab), but the crab (Portunuspelagicus) that lays eggs as well was caught on the grounds that if they released into the sea the other fishermen would catch them, although he knew that the crab (Portunus pelagicus) laying eggs should not be caught.

Facts on the ground show that fishermen as business actors and resource users are oriented towards economic principles by prioritizing the maximum profit to meet individual needs without paying attention to their sustainability.

This research focuses on cases of crab crab fishing that have decreased catches and exploitation, causing resource draining and decreasing income and even fishermen's losses. This study aims to analyze the optimal utilization rate of the economic aspects of crab crabs (Portunus pelagicus) in Pangkep Regency.

II. RESEARCH METHODOLOGY

A. Time and Place

The location of this study is on Saugi Island, Pangkep Regency, South Sulawesi Province. This location was chosen deliberately (purposive) with the consideration that the location is a coastal area that has the potential of crab crabs that are quite potential.

B. Type of Research

This research uses quantitative methods. Quantitative is the process of finding knowledge that uses data in the form of numbers as a tool to find information about what is the research problem. This research was conducted by a survey method, namely by making observations in the field and interviewing directly with respondents, as well as using questionnaires as a data collection tool. Then the data that have been obtained are analyzed quantitatively.

C. Sampling Method

Research methods are a way used by researchers to obtain data and information on various matters related to the problem to be studied. A population is a collection of all elements in a population where a sample is taken while a sample is a portion of the population (Welhelmus, 2007).

This study used the Random Sampling method where the respondents or samples selected during the interview were fishermen whose entire working time was used to carry out crab crab fishing operations using fixed gill nets and bubu fishing gear.

The sampling of fishermen or respondents is guided by the principle of representation according to the opinion of Black and Dean (2001) which states that the percentage of the sample designated as respondents is 10% - 15% of the fisherman population per type of fishing gear in each region.

No.	Nama Desa	Jaring Insang Tetap		Bubu		Persentase
		Populasi	Sampel	Populasi	Sampel	
1	Desa Bombang	150	15	50	5	10%
2	Desa Mattiro Baji	150	15	300	30	10%

Table 1. Number of Research Samples

D. Data Analysis

The data analysis carried out is mostly quantitative analysis in accordance with the Maximum Economic Yield analysis is with the following steps

1) Compiling production and effort data (input and effort) in the form of time series (time order), the data used in this study is data for 2009-2017.

2) Standardization of fishing gear.

3) Estimating economic parameters in the form of price per kg and production cost per trip.

4) Perform optimal value calculations based on a predetermined formula. This step can be done using the help of excell software to facilitate analysis, as well as for the purposes of creating charts.

Estimation of Economic Parameters

Economic parameters include the estimated input costs,the estimated price of capture output and the cut ratesof resources.The cost of catching or estimating the cost of input isobtained from primary data, which is then made theyearly real fishing cost data series using the formula :

(Najamuddin, 2014)

$$\mathbf{c = \sum c_i / n_1}$$

Where:

c = Average fishing costs (IDR) per year

ci = Catching cost per capture attempt of respondent i

n1 = Number of respondents

The output price estimate is obtained from primary data,which is then made a data series of real sales prices in the year using the formula: (Clark *et al*., 1992)

$$\mathbf{p = \sum p_i / n_2}$$

Where:

p = Average catch price per kg

pi = Average price during the i season

n2 = Number of seasons (peak, regular, famine)

The cut-off rate parameter (d) uses the equation (Clark, 1985) :

$$\mathbf{d = \ln (1+i)}$$

Where :

i = investment interest rate – inflation rate

d = resource cut rate

Assuming that the demand curve is perfectly elastic, then the rentier of fishery resources based on the Maximum Economic Yield (MEY) value is obtained using the following equation:

$$\mathbf{E_{MEY} = \frac{r}{2q}\ \left(1 - \frac{c}{pqK}\right)}$$

$$\mathbf{Y_{MEY} = \frac{rK}{4}\ \left(1 + \frac{c}{pqK}\right)\left(1 - \frac{c}{pqK}\right)}$$

$$\mathbf{X_{MEY} = \frac{K}{2}\left(1 + \frac{c}{pqK}\right)}$$

Dimana :

E_{MEY} : Attempted arrest of MEY condition

Y_{MEY} : Catch of MEY condition

X_{MEY} : Optimal stock estimation of MEY conditions

III. RESULTS AND DISCUSSION

1. Crab Crab Fishing Tool

The crab net is one of the fishing gear that is rectangular in shape and is used to catch crabs (Portunnus pelagicus) in coastal waters. Crab nets are fishing gear that are also called single-sheet gill nets or in foreign languages they are called "Gillnets".

Gill nets in Indonesia consist of single-sheet or single gillnet gill nets, two-sheet gill nets or double gillnets and three-sheet gill nets or trammel nets.

This net consists of net units. In capture operations usually consist of several tintings combined into one so that it is one long device (unit) (300-500 m), depending on the amount of tinting to be operated. Gill nets include selective fishing gear, the size of the mesh can be adjusted to the size of the crab to be caught.

Figure 3.1 Buoys on Fixed Gill Nets

The fishing trip used in this study was carried out once a day, namely leaving in the afternoon and returning in the morning or at noon the next day and leaving in the morning and returning at noon (one day fishing). Fishermen generally use boats commonly referred to by the community, namely katinting and sometimes fishing is carried out only alone.

Figure 3.2 Fixed Gill Webs

For the operation technique of fixed gill net fishing gear, namely:

For the installation of nets, fishermen will leave at 05.30 WITA. The journey from the fishing base to the fishing ground is approximately 30 minutes. Once at the fishing ground, fishermen will immediately lower their nets.

The withdrawal of the net is carried out after the net is in the water for approximately 8 hours from the time of its installation. The withdrawal of this net is usually done in the afternoon, namely at 16.00 WITA. The length of the crab net withdrawl process ranges approximately 2 hours.

Based on the classification of fishing gear, crab nets are classified into a group of fixed gill nets, namely basic nets. In general, gill nets are still included in the gill net or gillnet. The kejer net used by fishermen to catch crabs is included in the puntal net or tangle net group because the crab, which is the main target of its fishing, is caught by twisting or entangled its body parts on the net body.

2. Bubu Fishing Gear

Bubu is a common tagkap tool known among fishermen, which is in the form of traps, and is passive. Bubu are often also called traps "traps" and blockers "guiding barriers". This tool is in the form of confinement like a closed room so that the fish cannot get out. The basic principle of Bubu is to trap the vision of the fish so that the fish is trapped in it

The shape of the bubu varies, namely folds, cages, cylinders, drums, elongated triangles (cubes), multifaceted, round and half-linkaran and others. Broadly speaking, bubu consists of a body, mouth (funnel) and door. Bubu's body is in the form of a cavity, a place where fish are confined.

Bubu is operated for 12 hours using a ship that is commonly referred to by the community, namely katinting. Before heading to the fishing ground, what is prepared is to check the condition of the ship, the necessary equipment such as fuel, bubu fishing gear, ropes, bait and so on.

Figure 3.3 Bamboo as bait holder

For the operating technique, namely: after the preparation is complete, the fisherman will start the boat engine and start to set off. Bubu fishing gear is installed about 2 miles from the waters of saugi island. Usually fishermen leave at 15.00 WITA, the journey takes about 30 minutes from the fishing base to the fishing ground. After arriving at the fishing ground area, fishermen immediately unloaded their fishing gear.

The poreasian of bubu fishing gear is bait inserted in bamboo, first one by one the bubu is lowered and takes about 30 minutes. Furthermore, after the bubu is lowered, then the second bubu is lowered with a distance of the first bubu of about 4 meters and so on until all the bubu are lowered.

Figure 3.4 Fixed Gill Webs

3. Estimation of Economic Parameters

1. Estimated Input Cost

The cost of efforts to utilize crab crabs in the waters of Saugi Island, Pangkep Regency consists of fixed costs and variable costs. Fixed costs are costs that are not used up in a single arrest operation (trip). Fixed costs consist of depreciation costs for fishing equipment such as boats, fixed gill net fishing gear, bubu, machinery and other supporting fishing gear. While variable costs are costs that are used up for one arrest (Trip).

The economic theory of fisheries states that in open access fisheries where the cost of fishing is assumed to be comparable to the business of fishing the business will continue to increase even though the income per unit of business decreases and in the end the income will decrease until it is equal to the costs incurred (Gordon in Kar and Chakraborty, 2011).

The cost of capture or estimated input costs is obtained from primary data which is then made a data series of annual real capture costs with the equation:

$$\mathbf{c} = \sum \boldsymbol{c_i}/\boldsymbol{n_1}$$

Where:

c = Average cost of capture (Rp) per year

ci = Cost of arrest per attempted arrest of i-th respondent

n1 = Number of respondents

The results of the overall estimation of the input cost of crab crabs in the study

Based on Table 12 seen in the appendix above, it can be concluded that the value of the cost of rii latau value c = 4,335,889 is the total value c of fixed gill net costs and bubu costs. The total cost (TC) of efforts to utilize crab crab resources in the waters of Saugi Island, Pangkep Regency, namely: TC = 4,034,541E

2. Estimated Output Price

In addition to the components of the cost of capture required in this analysis, price commissioner data is also needed. The price component that will be used in the analysis is the average price obtained from primary data or through direct interviews with fishermen and also secondary data from the District Fisheries Service.

One of the problems in pricing is the abnormal price movement due to the monetary crisis and the rate of inflation. To overcome the abnormality of the movement, adjustments were made by converting the nominal price obtained into a real price (Nababan and Sari, 2007). To convert the nominal price into a real price, the consumer price index (CPI) of Pangkep Regency with the base year = 34,000 obtained from the Pangkep Regency Fisheries Service of South Sulawesi Province.

The estimated output price is obtained from primary data which is then made a data series of annual real sales prices with the formula:

$$\mathbf{p} = \sum \boldsymbol{p_i}/\boldsymbol{n_2}$$

Where:

p = Average catch price per kg

pi = Average price on season -i

n2 = Number of seasons (peak, ordinary, famine)

Table 2. Average Real Price of Crab Crab in the Waters of Saugi Island, Pangkep Regency, South Sulawesi Province (Rp/kg)

No.	Musim	Harga (Rp)
1.	Musim Puncak Bulan November - Februari	34,000
2.	Musim Biasa Bulan Maret - Mei	30,000
3.	Musim Paceklik Bulan Juni - Oktober	32,000
	Total	96,000
	p	32000

Based on Table 2, it can be estimated the real price value or p value = Rp 32,000; per kg or 32,000.

3. Estimated Discount Rate (Resource Deduction)

The parameters of the discount rate or resource deduction rate refer to the investment interest rate and inflation rate. The prevailing interest rate is 11.75 and the inflation rate is 5.01%. To obtain the value of the resource cut rate is estimated by the equation

d = ln(1+i) where i= investment interest rate minus the rate of inflation, so that the value of the resource deduction rate of d = ln(1+ (11.75 % - 5.01 %)) = 2.0464 is obtained. The value of d = 2.0464.

4. Maximum Economic Yield Analysis of Crab Crab Utilization

The analysis of crab utilization in this study is estimated in the management regime model, namely the Maximum Economic Yield (MEY) management regime. Such management regime models can be determined by using analytical solving tools through the Excell program. The results of the bioeconomic optimization analysis of each crab management regime in this study are succinctly presented

Table 3. Results of Bioeconomic Optimization Analysis of Crab Crab Utilization.

No	Model Pengelolaan SDI Kepiting Rajungan	Effort (E)	Produksi (Y)	Biomass (X)
		(Unit)	(ton)	(ton)
1	Maximum Economic Yield (MEY)	130.16	213.05	449.92

2	Aktual	195.60	193.53	

Based on the table above, the MEY (Maximum Economic Yield) balance is obtained at 213.05 tons / year

IV. Conclusion

The utilization rate of crab crabs in general in bubu fishing gear and gill nets still has a value that fluctuates or rises and falls, indicating that there has been underfishing in the crab population and the MEY (Maximum Economic Yield) management regime of 213.05 tons

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