Bioeconomic Analysis of White Pomfret Resources Landed at Fish Landing Base Cikidang (PPI Cikidang) Pangandaran

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ABSTRACT

The research was conducted at the Cikidang Fish Landing Base, Pangandaran Regency from June 2019 to August 2020. The purpose of this study was to see the condition of the white resources landed at PPI Cikidang, Pangandaran Regency. The analytical approach used is the bioeconomic model analysis of the Gordon-Schaefer production surplus in one species, namely white pomfret. The results showed that the increase in catch effort rate had decreased the catch per effort (CPUE). The maximum sustainable effort (Emsy) is 14,167 trips / year with a maximum sustainable production value (hmsy) of 60.21 tons / year and economic rent of IDR 5,177,053,078. Efforts in the MEY (Emey) condition amounted to 11,849 trips / year with production (hmey) of 58.60 tons / year and the largest economic rent among other conditions, namely Rp. 5,383,111,051. The open fishing effort (EOA) is 23,697 trips / year with a production (hOA) of 32.96 tons / year and an economic rent of Rp. 52.44 tonnes / year (97% of MSY) with the actual average effort per year of 15. 189 trips / year exceeded MSY conditions but this did not occur in economic activities because fishing activities still had advantages.

Keyword : *Utilization Rate, Gordon-Schaefer, Fisheries Management, Single Species*

1. INTRODUCTION

Fish Landing Base (PPI) Cikidang is located in Babakan Village, Pangandaran District, Pangandaran Regency. There are 108 fishermen-based collective business groups (KUB) registered at PPI (DKP 2018). The large number of fishermen who carry out fishing operations and dock at PPI Cikidang makes PPI Cikidang a center for capture fisheries activities in Pangandaran District [1].

PPI Cikidang has thirteen types of fishing gear with five fishing gears that are commonly used, namely drift net, trammel net, vessel seine, handline and gill nets. (liong bun). The highest fishing gear used at PPI Cikidang is drift gillnet. The number of fishing gear has implications for the production of fish landed at PPI Cikidang, namely layur fish and pomfret which are the main target fish for the drift gillnet. The status of layur fish and white pomfret is economically important, so the price of these fish is relatively high, so that the drift gillnet business activity at PPI Cikidang has a fairly high profit [1].

White pomfret is one of the types of fish landed at PPI Cikidang. Data of white pomfret from 2011 to 2016 in Pangandaran Regency has increased with the highest production obtained in 2016 of 1,406.2 tons (Department of Fisheries and Food Security Pangandaran Regency). This increase in production is a positive thing that can be achieved in capture fisheries activities. But continuous capture fisheries activities can cause overfishing if they exceed the set limits.

The fundamental thing in fishery resource management is how the activities of utilizing these resources produce high economic benefits for users, but their sustainability is maintained [2]. One of the approaches that can be taken to solve this problem is the bioeconomic approach. The bioeconomic approach used is surplus production. This

research consists of three conditions, namely Maximum Sustainable Yield (MSY), Maximum Economic Yield (MEY), and Open Access (OA). This research will examine the bioeconomic analysis of white pomfret with the Gordon-Schaefer model bioeconomic approach in order to know the description of the condition of the white pomfret fish and to know the management that must be carried out.

2. METHODOLOGY

The method used for this research is the case study method. The case study method is carried out through interviews with questionnaires and direct observation to determine conditions in the field and facts about the object to be studied at the research location. The types of data used in this research are primary data and secondary data. Primary data includes catch data, white pomfret fish price (Rp) and data on operational costs of fishing for white pomfret. The data is obtained by the direct survey through interviews with gill net fishermen. The data used are time series data (2014-2019) which consists of white pomfret production data, the number of vessels using gill nets, production value of white pomfret and general conditions of the research area. Secondary data is obtained from agencies related to research, namely the Ministry of Marine Affairs and Fisheries (KKP), the Department of Marine, Fisheries and Food Security (DKPKP) Pangandaran Regency and literature sources. The data obtained will be tabulated, processed and further analyzed to determine the production value, utilization effort and actual utilization rate of white pomfret landed at PPI Cikidang.

The bioeconomic analysis in this study uses the Gordon-Schaefer surplus production model. According to [3], this model is used to determine the condition management conditions of MSY (Maximum Sustainable Yield), MEY (Maximum Economic Yield) and OA (Open Access). The formula used to obtain these conditions is as follows.

Table -1: Gordon-Schaefer Bioeconomics

Variables	MEY	MSY	OA
Production (h)	$(ap - c)/2\beta p$	$a/2\beta$	$(ap - c)/\beta p$
Efforts to arrest / Fishing effort (E)	*EMEY (ap+c/2p)*	$aEMSY - \beta EMSY2$	*EOA (c/p)*
Economic Rent (π)	(P.hMSY) -(c.EMSY)	(P.hMEY) -(c.EMEY)	(P.hOA) -(c.EOA)

Source : Nurhalimah (2018)

3. RESULT AND DISCUSSION

3.1 White Pomfret Capture Fisheries at PPI Cikidang

White pomfret fishing activities landed at PPI Cikidang are carried out by drift gillnet fishing gear fishermen. The boat used is a boat made of fiber using a 15 PK engine. Drift gillnet used to catch white pomfret with a mesh size of 4.5-5.5 inches. The nets used are made of monofilament polyamide (PA).

Based on interviews with white pomfret fishermen, one day fishing takes place with a departure time of 2-3 in the morning and returns at 9-11 in the afternoon. Trips are carried out every day except Friday and public holidays. In bad weather fishermen usually reduce the number of trips because they often do not get fish.

3.2 Biological Aspects

he catch from the gillnet drift fishing gear that lands at PPI Cikidang consist of the main catch in the form of white pomfret and the by-catch is pepetek and gulamah. The production of white pomfret from 2014 to 2019 has fluctuated. The production of white pomfret can be seen in chart 1.

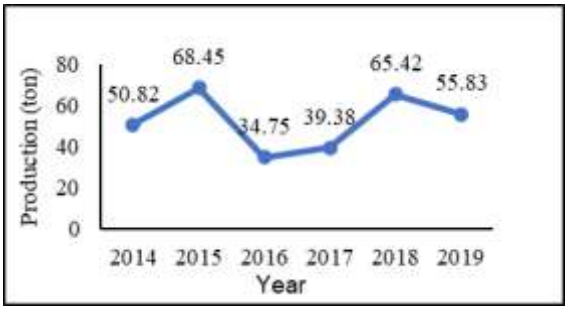

Chart -1: Production of White Pomfret Landed at PPI Cikidang in 2014-2019

The production of pomfret landed at PPI Cikidang which has a fluctuating value with an average annual rate of 52.44 tons. The highest production was in 2015 amounting to 68,448 tons. The increase in production in 2015 was also supported by the number of trips made. The lowest production data occurred in 2016, amounting to 34,748 tons. The decrease in the amount of production lasted until 2017 and again increased in 2018 by 65.42 tons. The decrease is directly proportional to the effort made. The number of trips in 2016 was smaller than in the previous year, namely 15,734 trips in 2016 and 17,127 trips in 2015. This is supported by the statement by [4] stated that fish catch fluctuations are very useful by many factors, including the presence of fish, the number of fishing efforts and the increase in fishing operations. To see the level condition of the white pomfret catcher, it can be seen from chart 2 which shows the graph of the relationship between CPUE and effort.

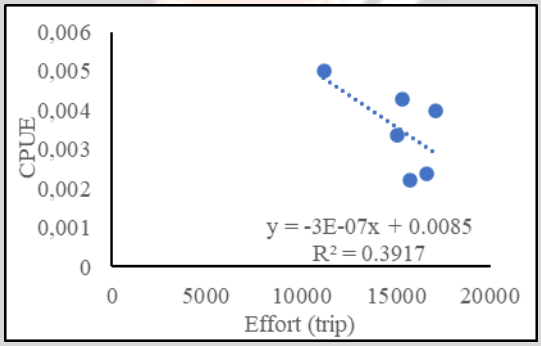

Chart -2: Graph of the relationship between CPUE and Effort

In Figure 2, the linear equation is obtained, namely y = -3E-07x + 0.0085, indicating that the coefficient a is 0.0085 and the b value is -0.0000003E. The coefficient still states that if there is no effort, the potential available in nature is 85 kg/trip. The persuasion regression coefficient has a negative relationship between production and effort, that once every day the business will increase the CPUE increase by 0.0003 kg/trip and vice versa. Judging from this function, it can be seen that the higher the fishing effort of white pomfret, the smaller the number of CPUE. The CPUE value is found that the relationship between CPUE and capture method (E) is inversely proportional. This condition can be seen from the results of the negative value function, where the increase in fishing effort, the smaller the value of CPUE obtained. The coefficient of determination (R^2) of 0.3917 or 39.17% states that the increase or decrease in CPUE of 39.17% is measured by the value of effort, while the remaining 60.83% is influenced by other factors not discussed in this study.

3.3 Economic Aspects

The Gordon-Schaefer statistical model assumes several assumptions which include price per unit of output (Rp / kg) assumed to be constant or demand curve assumed to be perfectly elastic, cost per unit of effort (cost) is considered constant, market structure is competitive and only capture factors are taken into account so that costs arrest can be defined as variable costs per day of operation and capture costs are considered constant [5]. Catching costs are obtained through interviews with gillnet drift fishermen in PPI Cikidang. The results of interviews with fishermen showed that the cost of catching a white pomfret attempt by using a 0-5 GT gillnet drift was Rp. 177,778.00 per trip.

The price of white pomfret used is the price of white pomfret from 2014-2019, the average price of white pomfret throughout the year is used in bioeconomic calculations. The price of white pomfret caught by the gillnet drift fisherman is obtained from the value of the production of white pomfret divided by the amount of white pomfret production at PPI Cikidang. Based on these calculations, the average price of white pomfret is Rp. 127,815,722 / ton or Rp. 127,816 / kg.

3.4 Bioeconomic Analysis

According to Fauzi and Anna, the basis in managing fish resources is how to utilize the resources so as to produce high economic benefits for users but their sustainability is maintained. There are two meanings of the statement, namely economic meaning and biological meaning. The fisheries sector is one of the sectors that use the most bio-economics [6]. Bioeconomic estimation in this study uses the calculation of the management of white pomfret with the Gordon-Schaefer model approach. Economic balance is estimated by knowing the condition of white pomfret resources landed at PPI Cikidang on the condition of MSY, MEY and OA. The values for MSY, MEY and OA can be seen in Table 2.

Table -2: Results of Bioeconomic Analysis of White Pomfret at PPI Cikidang with Various Management Conditions for 2014-2019.

	Open Access	**MEY**	**MSY**
f (trips/year)	23,697	11,849	14,167
Y (ton)	32.96	58.60	60.21
TR (Rp)	Rp 4,212,805,146	Rp 7,.489,513,624	Rp 7,695,571,597
TC (Rp)	Rp 4,212,805,146	Rp 2,106,402,573	Rp 2,518,518,519
TR-TC (Rp)	Rp 0	Rp 5,383,111,051	Rp 5,177,053,078

Source: Results of data analysis (2020)

Utilization of white pomfret resources at maximum sustainable yield (MSY) conditions produces a total production of 60.21 tons per year with an effort of catching 14,167 trips. Catch production in the MSY condition is the largest production compared to the condition of other white pomfret resource utilization. High production compared to other conditions does not mean that MSY has a high profit.

Open access is a condition of a person or group of fisheries actors who exploit fish resources uncontrollably [7]. Bioeconomic balance is achieved in conditions of management that are open (open access). Revenue under OA conditions is lower than MEY and MSY conditions. This is influenced by the value of total revenue and total cost which are equal in size, causing the value of economic rent received to reach point 0. The value of economic rent will increasingly show a negative value. If catching efforts continue to be made that are not accompanied by increased catch production. This is influenced by the increasing costs incurred (total cost).

Management in MEY conditions gives the highest value economically. The MEY condition requires a small capture effort compared to the MSY and OA conditions to produce a maximum level of profit, whereas in the open access condition there is an economic mismatch due to a large enough fishing effort but smaller production so that it does not benefit ($\pi = 0$). Utilization of fish resources is said to have undergone biological overfishing, it can be seen in the actual utilization that has exceeded sustainable catches and sustainable fishing efforts, but if fishing activities can no longer provide a favorable revenue value will result in economic overfishing [8]. Management in MEY conditions gives the highest value economically. The MEY condition requires a small capture effort compared to the MSY and OA conditions to produce a maximum level of profit, whereas in the open access condition there is an economic mismatch due to a large enough fishing effort but smaller production so that it does not benefit ($\pi = 0$). Utilization of fish resources is said to have undergone biological overfishing, it can be seen in the actual utilization that has exceeded sustainable catches and sustainable fishing efforts, but if fishing activities can no longer provide a favorable revenue value will result in economic overfishing[8].

4. CONCLUSIONS

The Based on the bioeconomic model, an optimum effort (Emsy) of 14,167 trips was obtained with a maximum catch (hmsy) of 60.21 tons. In the MEY conditions obtained optimum effort (Emey) 11,849 trips and catches (hmey) 58.60 tons. The current condition of open access was obtained by an effort (EOA) of 23,697 trips with a catch (hOA) of 32.96 tons. The condition of white pomfret fishery shows the level of overexploited biologically and does not experience overfishing economically.

5. REFERENCES

[1]. Syauqi, I. 2019. Analisis Usaha Penangkapan Ikan Drift Gillnet Di Pangkalan Pendaratan Ikan Cikidang Pangandaran. Skripsi. Departemen Pemanfaatan Sumber daya dan Lingkungan. Institut Pertanian Bogor.

[2]. Fauzi, A. dan S. Anna. 2002. Penilaian Depresiasi Sumber daya Perikanan Sebagai Bahan Pertimbangan Penentuan Kebijakan Pembangunan Perikanan. Jurnal Akuatika, 4 (2): 36-49.

[3]. Nurhayati, A. 2013. Analisis Potensi Lestari Perikanan tangkap di Kawasan Pangandaran. Journal Akuatika I: 195-209.

[4]. Nugraha, E. Koswara, B dan Yuniarti. 2012. Potensi Lestari dan Tingkat Pemanfaatan Ikan Kurisi (Nemipterus japonicus) di Perairan Teluk Banten. Jurnal Perikanan dan Kelautan. 3(1):91-98.

[5]. Fauzi, A. 2004. Ekonomi Sumber Daya Alam dan Lingkungan. Teori dan Aplikasi. PT Gramedia Pustaka Utama, Jakarta 259 hal.

[6]. Dewi, D A N N. 2010. Analisis Bioekonomi untuk Pengelolaan Kerang Simping (Amusium pleuronectes) di Kabupaten Batang Jawa Tengah. Tesis. Universitas Diponegoro.

[7]. Susilo, H. 2010. Analisis Bioekonomi pada Pemanfaatan Sumber Daya Ikan Pelagis Besar di Perairan Bontang. Jurnal Ekonomi Pertanian dan Pembangunan. 7(1):25-30

[8]. Hakim, L. L., Z. Anna dan Junianto. 2014. Analisis Bioekonomi Sumber daya Ikan Tenggiri (Scomberomous commerson) di Perairan Kabupaten Indramayu Jawa Barat. Jurnal Kebijakan Sosial Ekonomi Kelautan dan Perikanan, 117-127.