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ESTIMATION OF THE STOCK OF INDIAN SCAD FISH (*Decapterus russeli*) LANDED AT THE SIBOLGA ARCHIPELAGO FISHERY PORT, NORTH SUMATRA

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ABSTRACT

Indian Scad Fish (*Decapterus russeli*) are the most dominant small pelagic fish resources landed in the Sibolga Archipelago Fisheries Port. The production of Indian Scad Fish catches that are landed in PPN Sibolga on average fluctuates every year. Therefore, it is necessary to analyze the catch of Indian Scad Fish to control the level of exploitation and create effective fishing operations so that the utilization of Indian scad fish resources can run optimally and sustainably. This study aims to determine the percentage level of utilization of Indian scad fish (*Depterrus russeli*) that landed at the Sibolga Nusantara Fisheries Port, North Sumatra. This research was conducted in March – April 2022. The method used in this research is the survey method. The type of data collected is secondary data. The data analysis used includes standardization of Indian scad fish fishing gear, sustainable potential and optimum effort, total allowable catch (TAC), utilization rate, and effort. From the research results, it was found that the highest production of Indian scad fish catches in 2019 was 6,392 tons. Based on the calculation of MSY and the optimum effort in 2017-2021 of 5,934.97 tons/year, meaning that the maximum catch of Indian scad fish that can be caught is 5,934.97 tons/year and the number of allowable catches is 4,747.98 tons/year or 80% of the maximum catch and utilization rate of Indian scad fish for 5 years is 81.41%.

Keywords: Indian Scad Fish, Stock Estimation, North Sumatera

1. INTRODUCTION

Sibolga City is one of the cities in North Sumatra Province which is located on the West Coast of Sumatra which is directly facing the Indian Ocean and is a fishing ground for fishermen in Sibolga. A fishing port is a mixed area between land and sea that is used as a base for fishing activities and is equipped with various facilities for landed fish[1].

Marine and fishery resources are one of the leading potentials in the context of economic development. With a variety of marine and fishery resources, Indonesia has great potential to develop and involve many parties. Therefore the need for support from all parties to advance the development of Indonesian marine and fisheries.

Estimation of fish potential is intended to produce information about the abundance of fish stocks in water, recommendations for the optimum amount of fishing effort, and the number of fish catches that are allowed. Based on Sibolga Archipelago Fishing Port (PPN) operational data, the Indian scad fish is one of the small pelagic fish that is dominantly caught and has increased production every week. Based on PPN Sibolga's daily operational data on March 22, 2022, the total production of Indian scad fish is 6000 kg.

Based on the North Sumatra BPS census report[2], North Sumatra Province is one of the provinces that have significant fishery potential. In 2019 the production of capture fisheries products, based on the

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catch of fishermen from North Sumatra, reached 1,203,191 tons. The potential for capture fisheries is quite large, proving that North Sumatra can properly manage the available fishery products. North Sumatra Province has 33 urban districts, and four of them are areas that have considerable fishery potential and one of them is the city of Sibolga.

In fishing activities, the fishing gear used at PPN Sibolga to catch Indian Scad fish are purse seine, lift net, gill net, and fishing rod. According to Najamuddin[3] small Indian scad fish are generally caught using a chart, while medium to large sizes are caught using purse seines, gill nets, and fishing lines.

This study aims to estimate the stock of Indian Indian scad fish at the Sibolga Archipelago Fishing Port, to determine the level of utilization of Indian scad fish landed at the Sibolga Archipelago Fishing Port.

2. RESEARCH METHOD

Time and Place

This research was conducted at the Sibolga Archipelago Fishing Port, North Sumatra. This research was conducted for one month, from March 16 to April 16, 2022.

Method

The data collection method uses a survey method to get an overview that can represent the potential and level of utilization of Indian scad fish at the Sibolga Archipelago Fishing Port. The approach is taken by analyzing data on the catch (production) of Indian scad fish from various fishing gear units landed at the Sibolga Archipelago Fishing Port. The research procedure begins with heading to the Sibolga Archipelago Fisheries Port office by giving a permit to carry out research at the port. Then go to the PPN Sibolga office to obtain information about the general condition of the port and fulfill secondary data, namely the fishing area and the number of vessels catching Indian scad fish. Then the data is processed using Microsoft Excel.

Data Analysis

Data analysis to obtain the level of utilization of Indian scad fish is by standardizing Indian scad fish fishing gear, estimating sustainable potential and optimum effort, total allowable catch (TAC), and estimating the level of utilization and effort. For more details, it can be described below.

Standardization of Indian Scad Fish Equipment

The fishing gear that has the highest value of catch per unit effort (CPUE) is declared as standard gear[4]. To find this value using the equation according to Noija et al.[5] as follows:

$$\mathbf{CPUE} = \frac{\mathbf{C}}{\mathbf{E}}$$

Description:
CPUE = Catch per unit effort (Kg/Trip)
C = Catch (Kg)
F = Effort (Trip)

Calculating the value of standardized fishing gear effort (standard effort) for each fishing gear using the equation[6]:

$$\mathbf{FS} = \mathbf{FPli} \times \mathbf{Fi}$$

Description:
Fs = Standard Arrest Attempt
Fpli = Fishing power fishing gear index
Fi = Number of arrest attempts

Maximum Sustainable Yield (MSY) and Effort Optimum

Then the management of potential maximum sustainable yield (MSY) which is the result of regression using the Schaefer model on CPUE and effort data, shows the optimum estimated effort value that is allowed in fishing effort[7].

The relationship between C (catch) and f (catching effort) is:

$$\mathbf{C} = \boldsymbol{af} + \boldsymbol{b}(\boldsymbol{f})^2$$

CPUE relationship with f (capture effort) is:

$$\mathbf{CPUE} = \boldsymbol{a} + \boldsymbol{b}(\boldsymbol{f})$$

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The optimum Effort Value (f optimum) is:

$$f\ opt = \frac{-a}{2b}$$

Maximum Sustainable Yield (MSY) value is:

$$MSY = \frac{-a^2}{4b}$$

C = Catch per Unit Effort (ton/trip)
A = Intercept
B = Slope
f = Catching effort (unit) in i-th period
$f_{op\ t}$ = Optimum catching effort (unit)
MSY = Maximum Sustainable Yield (Ton/year)

Total Allowable Catch (TAC)

Total allowable catch (TAC) is used as the basis for determining how big the catch is allowed. The formula for the number of catches allowed[8] is:

$$TAC = 80\% \times MSY$$

Description:
TAC = Total Allowable Cath (Ton/year)
MSY = Maximum Sustainable Yield (Ton)

Level of Utilization and Empowerment

Estimation of the utilization rate is carried out to find out how big the level of utilization of the Indian scad fish resources landed at the Archipelago Fisheries Port (PPN) Sibolga. The formula of utilization rate is Pauly *in* Astuti[9]:

$$TPc = \frac{Ci}{MSY} \times 100\%$$

Description:
TP_c = Utilization rate in the i-th year (%)
C_i = Fish catches in the i-th year (Ton)
MSY = Maximum sustainable yield (Ton)

Estimation of the level of effort is carried out to determine the level of effort to catch the Indian scad fish resources landed at PPN Sibolga. Estimation is done by presenting the standard effort in a certain year with the optimal effort value. According to Wahyudi[10], the formula for the level of effort is:

$$TPf = \frac{fs}{f\ opt} \times 100\%$$

Description:
TP_f = Ability level in the i-th year (%)
f_s = Arrest effort (standard effort) in the i-th year (Unit)
f_{opt} = Optimum capture effort (Unit)

3. RESULT AND DISCUSSION

General Conditions of Research Locations

This research was conducted at the Sibolga Archipelago Fishing Port. Sibolga is located on the West coast of North Sumatra, 344 km from Medan City, to the south. The city of Sibolga is located on the coast of Tapian Nauli Bay facing the Indian Ocean. The research location can be seen in Figure 1.

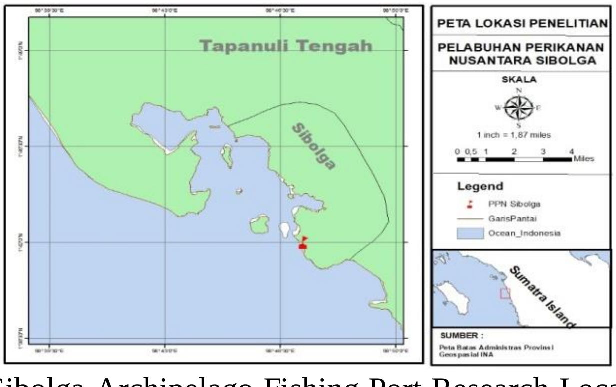

Figure 1. Map of the Sibolga Archipelago Fishing Port Research Location, Central Tapanuli Regency

PPN Sibolga is located in Sarudik District, Sibolga City, and North Sumatra Province. Geographically, the PPN Sibolga is at coordinates 01º02'015" S 100º23'034"E. The geographical location of PPN Sibolga is very strategic because it is located on the west coast of the island of Sumatra, close to fishing grounds. The condition of the PPN Sibolga waters is very calm because it is in the Tapian Nauli Bay area and there are many clusters of islands around the bay as natural protection. PPN Sibolga is the Technical Implementation Unit of the Ministry of Maritime Affairs and Fisheries which is directly responsible to the Director General of Capture Fisheries[11].

Fishing Area

WPP-572, namely the waters of the Indian Ocean in the western region of Sumatra has considerable fishery potential. Based on the 2014 data on the Potential and Level of Utilization of Fish Resources in the Fisheries Management Area of the Republic of Indonesia (WPP RI). The average utilization of fish resources in WPP-572 has experienced a fairly high level.

Fishinggroundis an area of water where the fish that are the target of fishing are caught in the maximum number and the fishing gear can be operated economically. An area of seawater can be said to be a "fishing area" if there is an interaction between the fish resources that are the target of fishing and the fishing technology used to catch fish. Purse seines are operated near the surface of the water, so sufficient water depth is required to operate them. The fishing area is in the WPP-NRI 572 area (West Sumatra), to be precise in the South Nias-Teluk Dalam area. The PPN Sibolga capture area can be seen in Figure 2.

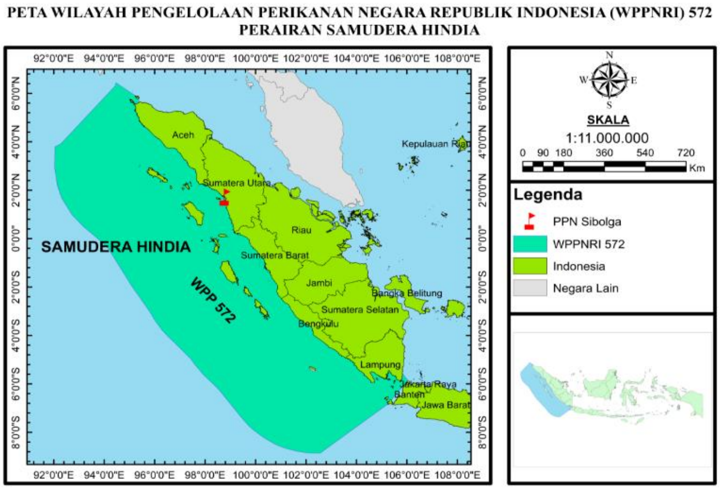

Figure 2. Indian scad fish catching area

In conserving fish resources for maximum utilization and increasing the welfare and prosperity of the Indonesian people, it is necessary to supervise and regulate the fishing gear used to support responsible and sustainable fisheries. Law Number 45 of 2009 concerning Amendments to Law Number 31 of 2004 concerning Fisheries Article 9 Everyone is prohibited from owning, controlling, carrying, and/or using fishing gear and/or fishing aids that disturb and damage the sustainability of natural resources fish on fishing vessels in the fishery management area of the Republic of Indonesia. Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 71/Permen-KP/2016 Concerning Fishing Routes and Placement of Fishing Equipment in the Fisheries Management Area of the Republic of Indonesia[11].

Indian Scad Fish Catch Results 2017-2021 (Ton)

Data on the catch of Indian scad fish landed at PPN Sibolga in 2017-2021 can be seen in Figures 3, 4, 5, and 6.

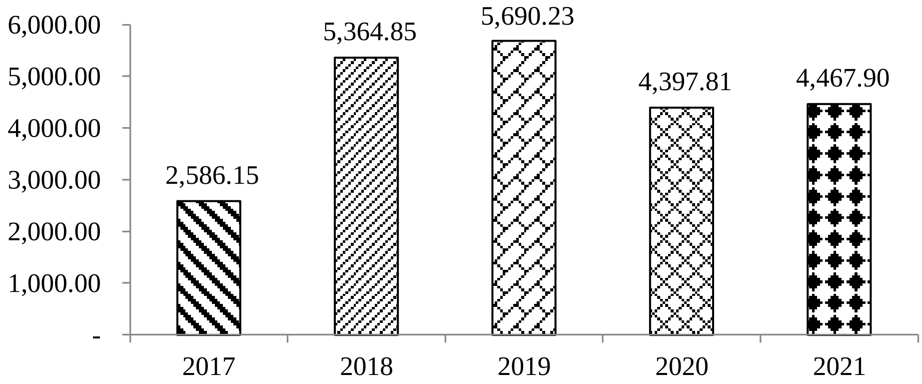

Figure 3. Catches of Indian scad fish using purse seine 2018-2021

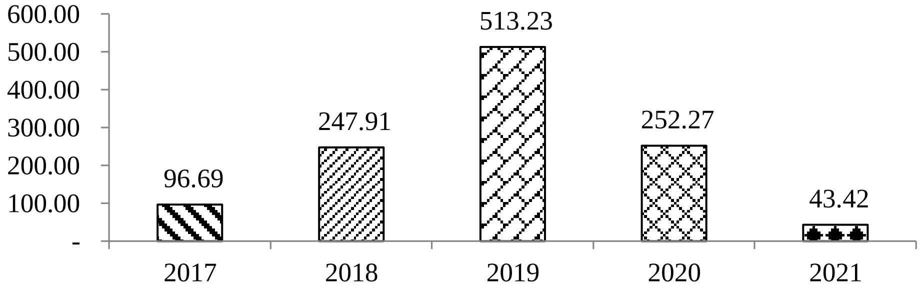

Figure 4. Catches of Indian scad fish using boat net 2018-2021

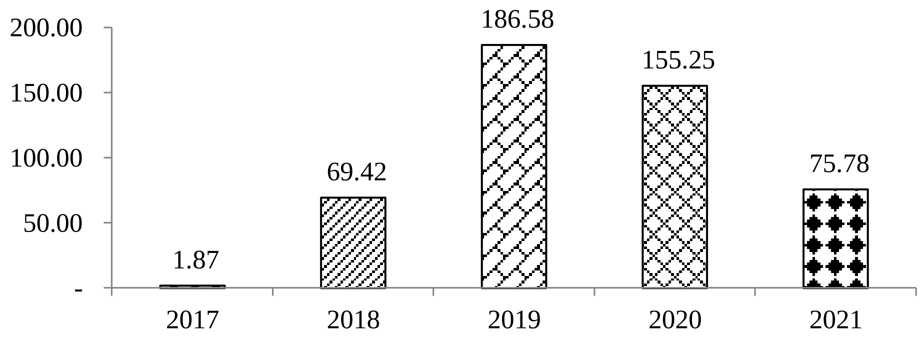

Figure 5. Catches of Indian scad fish using fishing rods 2018-2021

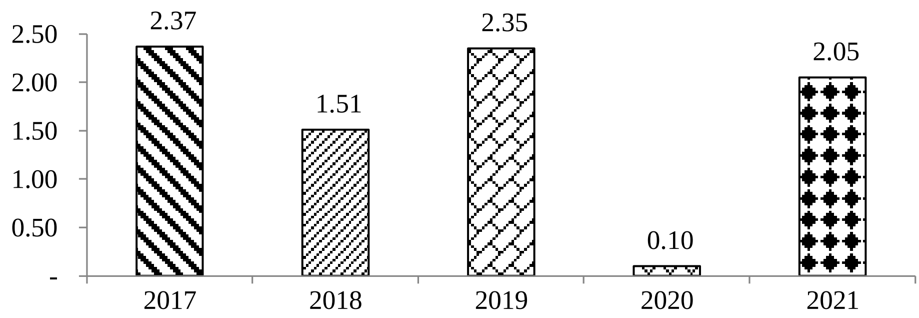

Figure 6. Catches of Indian scad fish using gillnet 2017-2021

Based on the catch data of Indian scad fish, the catch of Indian scad fish based on fishing gear unit which dominated the most in 5 years is the purse seine. Ring seine fishing gear is a type of fishing gear used to catch various types of small pelagic fish, one of which is the Indian scad fish. This is due to the large number of fishing units for purse seines compared to other fishing gear in PPN Sibolga. Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 71 of 2016 Article 23 is a regulation regarding the use of Purse Seine fishing gear on fishing lines in the Indonesian fishery management area. This Ministerial Regulation is intended as a reference for the regulation of fishing lines and placement of API and ABPI in WPPNRI. The purpose of establishing this Permen-KP is to realize responsible, optimal, and sustainable utilization of fish resources and reduce conflicts over the use of fish resources based on the principles of fish resource management[11].

In the catch diagram, it can be seen that Indian scad fish at the Sibolga Archipelago Fishery Port are caught using 4 fishing gears, namely purse seine, boat lift net, fishing line, and gill nets. Based on the production of Indian scad fish for each fishing gear, within five years it is known that the highest production of Indian scad fish is the purse seine, and the lowest production is gill nets each year. The fishing gear that catches Indian scad fish can be seen in Table 1.

Table 1. The number of fishing gear that caught Indian scad fish in 2017-2021 at PPN Sibolga

No	Fishing Gear	2017	2018	2019	2020	2021
1	Purse Seine	210	209	204	213	199
2	Boat Net	73	79	68	66	62
3	Fishing Rod	9	63	86	79	55
4	Gillnet	4	7	2	1	9
	Total	296	358	360	359	325

Source: PPN Sibolga, 2017-2021

Table 2. Productivity of Indian scad fish fishing gear unit in 2017-2021 at PPN Sibolga (ton/unit)

No	Fishing Gear	2017	2018	2019	2020	2021	Average	FPI
1	Purse Seine	12,32	25,67	27,89	20,65	22,45	21,80	1,00
2	Boat Net	1,32	3,14	7,55	3,82	0,70	3,31	0,152
3	Fishing Rod	0,21	1,10	2,17	1,97	1,38	1,36	0,063
4	Gillnet	0,59	0,22	1,18	0,10	0,23	0,46	0,021
Total		14,44	30,12	38,79	26,53	24,76	26,93	

Based on the data on the number of fishing gear that caught Indian scad fish in Table 1, it can be seen that the vessels that caught Indian scad fish in 2017 were 296 units, in 2018 there was an increase of 358 units, in 2019 there was an increase of 360 units, in 2020 experienced a decrease of 359, in 2021 it has decreased by 325. This is due to very strong winds and bad weather for carrying out fishing operations. Strong winds can cause high sea waves, which can endanger fishermen who are looking for fish. The weather determines whether the catch is good or not because the influence of the wind that is too big usually scares the fishermen when fishing, so the fishermen's work is not optimal [12].

Standardization of Fishing Gear

Indian scad fish at the Nusantara Sibolga Fishery Port are caught using 4 fishing gears, namely purse seines, boat charts, fishing rods, and gill nets. The ability of each fishing gear is different in producing catches, so it is necessary to equalize efforts before carrying out further analysis. Fishing gear is considered standard if it has the highest average fishing productivity. The fishing power index (FPI) value is needed when looking for the conversion of fishing gear. To find the FPI value, the average value of productivity per fishing gear is needed. Productivity per catch is obtained from the calculation of production per fishing gear in tons divided by fishing effort (unit) (Table 2).

Based on the productivity table of fishing gear units, purse seine gear is the fishing gear that plays the most important role in Indian scad fish resources and experiences an increase and decrease in the number of efforts each year. The productivity of fishing gear units was the highest in 2019. The increase in fishing productivity is allegedly due to the abundance of Indian scad fish stocks in large fishing areas which are still large enough to carry out fishing operations. However, this is not the only determining factor for the amount of catch, but there are several factors such as environmental changes that can affect the abundance of fish[13].

The fishing gear used as standard is fishing gear that has high productivity (dominant) and produces an FPI value of 1. Ring seine is a fishing gear with the highest productivity and produces an FPI value of 1. It can be concluded that purse seine is a standard fishing gear with a significant catch ratio in one unit of purse seine fishing gear that is capable of producing more fish production compared to other fishing gear based on the magnitude of the productivity value of each fishing gear. This FPI value is then used to find the standard effort by multiplying the FPI value by the number of fishing gear[14]. The results of calculating the standard effort can be seen in Table 3.

Table 3. Total effort calculation results from standard fishing gear

No.	Year	Standard total effort
1	2017	221,723
2	2018	225,077
3	2019	219,742
4	2020	227,980
5	2021	212,040

From the table above it can be seen that the effort of fishing gear that has been standardized is the highest, namely in 2019 with a total of 227,980 units, in 2017 namely 221,723 units, in 2018 namely 225,077 units, and 2019 namely 219,742 units and the lowest in 2021, namely 212,040 units. Capture fisheries activities in Indonesia tend to be oriented towards catches with the hope that catches will increase from time to time. This condition causes fishermen to continue to increase effort when catches are low to get profits, as well as when catches are high, fishermen will continue to increase effort because these conditions are profitable. Even though the increased effort does not always increase the catch. The decrease in effort that occurs can be caused by weather factors such as high waves and rain. The majority of fishermen will not go out to sea in that season because it endangers safety[15].

Catch per Unit effort

The catch per fishing effort aims to determine the abundance and level of utilization of Indian scad fish resources landed at PPN Sibolga as well as to show the productivity of the fishing gear used by fishermen to catch Indian scad fish. According to Yusrizal et al.[16], stated that the CPUE which tends to decrease is an indication that the level of exploitation of fish resources leads to overfishing.

The catch per unit effort (Catch per Unit effort CPUE) is an indicator of the status of fish resources which is a measure of relative abundance. In obtaining CPUE, it is necessary to know the fishing effort that has been standardized based on the catch (tons) and fishing gear units (units)[4].

CPUE can be considered as an index of fish abundance and as an indicator of whether fish abundance is still good, or how far it has been depleted. It can be seen from the calculation results of the 2017-2021 CPUE Indian scad fish in Table 4.

The data in Table 4 shows that the CPUE value has fluctuated increases and decreases. In 2017 the CPUE value was 12.12 tons/unit, in 2018 the CPUE value increased to 25.25 tons/unit In 2019 the CPUE value increased to 29.09, and in 2020 it decreased to 21.08 tons/unit, and in 2021 the CPUE value is 21.64 tons/unit.

Table 4. Indian scad fish CPUE Calculation 2017-2021

No.	Year	Production (Ton)	Total Effort (UNIT)	CPUE (Standard)
1	2017	2.687	221,723	12,12
2	2018	5.684	225,077	25,25
3	2019	6.392	219,742	29,09
4	2020	4.805	227,980	21,08
5	2021	4.589	212,040	21,64
Total		24.158	1106,562	109,18

A decrease in the CPUE value indicates a reciprocal relationship with fishing efforts in that year. This is consistent with the results of the linear regression obtained between the effort and the CPUE Indian scad fish Schafer's model, namely for every 1% increase in effort, the CPUE value will decrease by 0.039 tons.

Based on the calculation results of linear regression analysis between effort (effort) and catch per fishing effort (CPUE), the estimated value of intercept parameter (a) and slope (b) is obtained using the Schaefer method. Estimation of sustainable potential using the production surplus method consisting of the Schafer. The constant (a) is 30.52 and the regression coefficient (b) is -0.039.

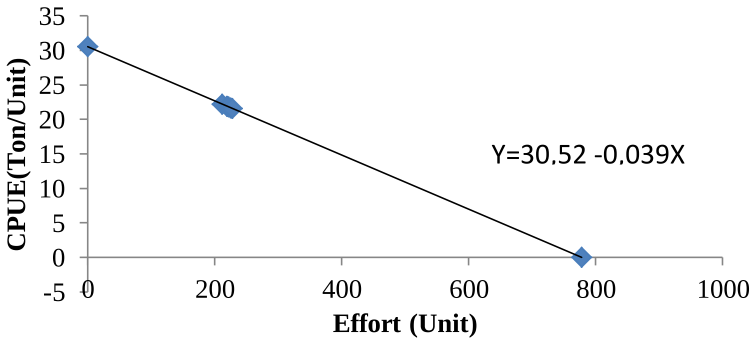

Figure 7. CPUE relationship and effort Indian scad fish

The tendency (trend) of the CPUE value of Indian scad fish can decrease due to increased fishing effort, so it is suspected that the abundance of fish resources in these waters is decreasing. These conditions can cause the catch obtained by fishermen to be small. a condition where fishing effort increases every year, but the CPUE value decreases every year because the existing resources continue to decrease, this shows an indication that there has been overfishing of existing resources or better known as overfishing[17].

The relationship between catch (C) and catch effort (f) for Indian scad fish resources is shown using the Schafer in the equation C = 102.04 -0.359 f^2. The relationship between CPUE and effort from the linear regression equation of the Schafer model is y = 102.04 (-0.359)x. In the

Schaefer model, it only applies if the value of the parameter (b) is negative, meaning that each additional fishing effort will cause a decrease in the CPUE value. If the calculation results in a positive coefficient (b), then the calculation of potential and optimum fishing effort does not need to be continued, because this indicates that the addition of fishing effort is still possible to increase catches[10].

Maximum Sustainable Yield (MSY) and Effort Optimum

MSY is a reference in the management of fishery resources which is still possible to be exploited without reducing the population; this is intended so that the stock of fishery resources is still at a safe level. This is following Telussa[18], which states that the maximum sustainable catch is a large number of fish (tons) that can be caught sustainably from a resource without affecting the sustainability of the fish stock. While the optimum fishing effort (fopt) is the amount of fishing effort carried out by the fishing unit to get maximum results without destroying the sustainability of existing resources.

Graphs of the maximum sustainable yield and Effort of Indian scad fish can be seen in Figure 8.

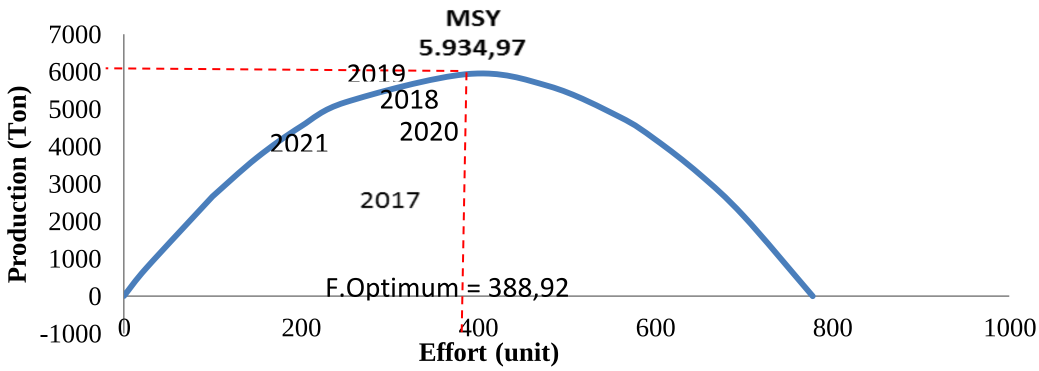

Figure 8. Maximum sustainable yield and effort optimum Indian scad fish

The sustainable potential (MSY) of Indian scad fish resources in Sibolga waters in the last 5 years was 5,934.97 with an optimum effort of 388.92, which means that if the effort is made to exceed the optimum effort, it will reduce the production value. When viewed based on the maximum sustainable catch value, the number of catches produced from 2017, 2018, 2020, and 2021 has not yet reached the maximum catch value, but in 2019 it experienced a maximum catch (MSY).

MSY is the largest catch that a fishery can produce year after year. The MSY concept is based on a very simple model of a fish population which is considered a single unit[19]. Based on the sustainable potential of Indian scad fish, the allowable number of catches of Indian scad fish is 5.78.43 tons. This value is obtained from 80% of the maximum sustainable potential.

Total Allowable Catch (TAC)

Results of the TAC are obtained by multiplying the 80% value with the MSY value can be seen in Table 6.

The calculation of the results of the total allowable catch is equal to 5,787.43 tons. The fish potential that is allowed to be caught (total allowable catch/TAC) is 80% of the sustainable potential (MSY). If the potential utilization of fish resources is more than 80%, it shows an indication of overfishing. Marine capture fisheries production activities based on Sibolga VAT data in 2017, 2018, 2020, and 2021 have not exceeded the allowable catch, while in 2019 it has exceeded the allowable catch.

The selectivity of fishing gear needs to be applied by fishermen so that fish that are not yet fit for consumption can develop so that fishing can be carried out continuously. In addition to protecting young fish in Sibolga Waters, the selectivity of fishing gear is also useful for protecting small fishermen whose fishing gear is still simple. According to Supardan[20], the policy of fishing gear selectivity is aimed at protecting fish resources from the use of destructive fishing gear. Besides that, this policy can also be carried out for socio-political reasons to protect fishermen who use less or inefficient fishing gear.

Table 6. Total allowable catch Indian scad fish (*Decapterus ruselli*)

No.	Tahun	Produksi (ton)	MSY	tac
1	2017	2.687	5.934,97	4.747,98
2	2018	5.684		
3	2019	6.392		
4	2020	4.805		
5	2021	4.589		

The use of environmentally friendly fishing gear also needs to be done by fishermen so as not to damage the resources in Sibolga waters. According to Saputro et al.[21], the use of environmentally friendly fishing gear directly has a positive impact on sustainable fisheries while taking into account the sustainable potential of existing fish resources. The CCRF (Code of Conduct for Responsible Fisheries) also regulates the use of fish resources where only 80% of their sustainable potential can be utilized optimally for efforts to realize sustainable fisheries.

Estimation of Level of Utilization and Effort

The calculation of the utilization rate aims to determine the percentage of fish resources in the waters that are utilized. The level of utilization that exceeds sustainable potential (MSY) can threaten the sustainability of fish resources, the availability and sustainability of their life cycle will be disrupted and the impact on fish stocks will decrease. The level of utilization can be caused by various factors; the decrease in catch may be due to a decrease in population size due to high previous fishing effort[22]. The level of utilization and effort of Indian scad fish can be seen in the following graph:

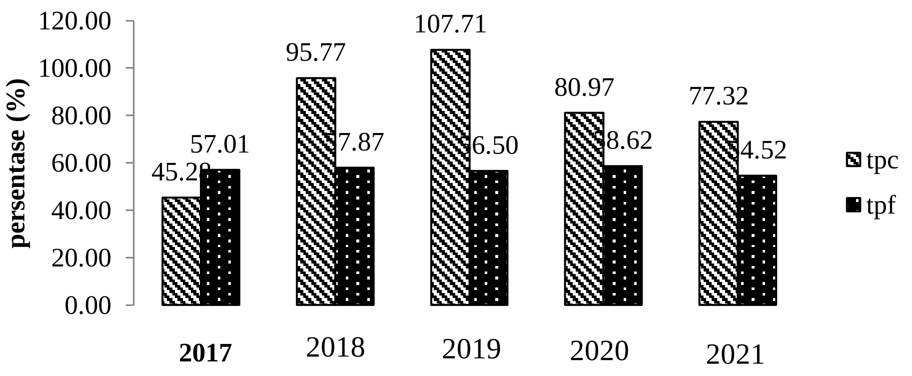

Figure 9. Level of utilization and capacity of Indian scad fish 2017-2021

From the graph above it can be seen that the results of the utilization rate of Indian scad fish in 2017 were 45.28% with an effort rate of 57.01%, in 2018 the utilization rate was 95.77% with an effort rate of 57.87%, in 2019 the utilization rate is 107.71% with an effort rate of 56.50%, In 2020 the utilization rate is 80.97% with an effort rate of 58.62%, in 2021 the utilization rate is 77.32% with an effort level of 54.52%.

The level of utilization of Indian scad fish in 2017 is in the range of developing stages, the level of utilization of Indian scad fish in 2020-2021 is in the dense catch stage, and the utilization rates for 2018 and 2019 are in the overfishing or overfishing stage. This is following the classification of the level of utilization of fishery resources used by the Commission on the Estimation of National Marine Fish Stocks consists of four levels, namely: 1) low level when the catch is still a small part of the potential sustainable yield (0-33.3%), where fishing efforts still need to be increased; 2) medium level when the catch has become a real part of the sustainable potential (33.3-66.6%) but additional effort is still possible to optimize yields; 3) optimum level when the catch has reached the part of the sustainable potential (66, 6-99.9%), additional effort can not improve results; 4) the level of excess or overfishing when the catch has exceeded the sustainable potential (>100%) and additional efforts can be dangerous to resource extinction.

Based on the results of calculating the percentage level of utilization of Indian scad fish in 2017-2021 at the Sibolga Nusantara Fishery Port, it has an average value of 81.41% with an average effort level of 56.90%. This shows that the level of utilization of Indian scad fish for 5 years (2017, 2018, 2019, 2020, 2021) is in the optimum range and not overfishing.

4. CONCLUSION

From the results of the study it can be concluded as follows: The highest catch per unit effort (CPUE) was in 2019 with a total of 6,392 tons/unit and the lowest was in 2017 with a total of 2,687 tons, the maximum sustainable catch (MSY) obtained in 2017-2021 was 5,934.97 tonnes with an optimum effort of 141.78 units, the number of catches allowed is smaller than the MSY value, so the number of fish catches allowed is still in the category of catches that can be increased but does not exceed the existing optimum sustainable catch limits, and the level of utilization of Indian scad fish is in the optimum range and not overfishing, so efforts can be increased as long as it does not exceed the MSY limit.

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