Analysis of Shark Fisheries Typology in TPI Pangandaran, Pangandaran Regency, Indonesia

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

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ABSTRACT

Knowledge of the shark fisheries typology for manager or related stakeholder is a supporting factor for the success of the basic fisheries management program, especially shark fisheries. This study aims to analyze the technical, social and cultural typology of shark fisheries in TPI Pangandaran, Pangandaran Regency. This research was conducted using the case study method and the method of sampling (purposive sampling) and the data were analyzed descriptively qualitatively and quantitatively, the qualitative method is carried out by interpreting data, facts and information that have been collected through an understanding that is built based on empirical experience, quantitative method is done by using a measurement scale, measurement scale based on data obtained from the questionnaire. The benefits of the results of this study are expected to be input for managers and related stakeholders in formulating policies for the development of fisheries activities, especially shark fisheries so that shark fisheries in Indonesia can be sustainable. The results showed that the commercial status of fishermen is the main occupation, including labor fishermen, the average fisherman goes to sea in a day. In general, fishermen are aged between 44-54 years with primary education level with 10-20 years of work experience. Catching sharks is carried out using a 3 GT motorized boat, with trips (years) of 210 times on the 3 GT vessel size and the type of fishing gear used is Gill net. The shark catching areas were obtained from Pangandaran Beach, Pananjung Bay, Nusakambangan Waters and Cilacap waters. There are two

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types of sharks that are landed in TPI Pangandaran namely Lonjor Sharks (*Carcharhinus amblyrhynchos*) and Martil Sharks (*Sphyrnalewini*). The largest production output in 2019 is 5887 kg. The results of the feasibility analysis of shark fishery business in TPI Pangandaran are with a profit value of Rp. 10.200.000 and the value of the Benefit Cost Ratio (BCR) which is 1.2 means that the business is feasible and sustainable.

Keywords: Typology; shark fisheries; Pangandaran.

1. INTRODUCTION

The geological history in Indonesian territory is very complex, this causes the country to have the highest level of diversity in the world. The level of diversity of marine biota species such as true bony fish and cartilaginous fish *(Elasmobranchii)* in Indonesia is very high [1]. However, this high diversity is not followed by good management so it is not maintained. Increasing number of people, the population causes high *demand* for marine products, so that many communities that have high economic value experience *over fishing* and depletion.

One of the targeted fish is the shark. In the beginning, this can be found in almost all parts of Indonesia waters both in territorial waters, ocean waters and Indonesia's Exclusive Economic Zone (EEZ). The types of sharks found are also diverse. But because of the high increase in *demand* so that most of the shark species that have been entered into endangered species. Based on IUCN (International Union for Conservation of Nature) data, there are four types of sharks in Indonesia that have been categorized as critically endangered [2]. Five species are endangered, 23 are vulnerable, and 35 are classified as near threatened [3].The status is given to animals that have the potential for extinction in the near future or in a certain time.

Indonesia is recorded as a country that utilizes the largest shark resources in the world. Total shark fisheries production in Indonesia in the last three decades shows a significant upward trend. Even Indonesia is known for the largest catch of sharks in the world with a range of catches above 100 tons annually [4].

According to [4] the level of shark utilization in Indonesia has yet to be ascertained due to the lack of available data at several fish landing locations. Therefore, in order to develop policies on sustainable management of shark populations, it is necessary to have shark fisheries typology research related to social data including the profile of fishermen, the status of fishermen, and the fishermen's perception on the prohibition rules and knowledge of sharks, technical data include profiles ships, shark fishing ground, shark species caught and other types of fish, economic data covering shark production, price, cost and percentage of fishing, and legal protection data regarding shark fishing prohibitions. This is intended so that the data obtained can later be used as material information for managers or relevant stakeholders to further be used as a basis for fisheries management, especially shark fisheries, so that their sustainability in nature can be maintained.

2. METHODOLOGY

The research method used is using survey methods through descriptive analysis with case studies in TPI Pangandaran, Pangandaran regency, The sampling technique for fulfilling primary data is to use accidental sampling. The criteria of respondents determined were fishermen who caught sharks and were willing to be interviewed. The questions raised in this study amounted to 47 questions and the number of respondents was 100 respondents.

2.1 Research Location

The research took place in in TPI Pangandaran, which is located at Jln. Babakan sub-district Pangandaran, Pangandaran Regency. This study was conducted in August 2019 – September 2019.

2.2 Data Analysis Method

The analysis used in this research is qualitative and quantitative descriptive analysis. Descriptive analysis is a statistical analysis used to describe or analyze the results of research. The pictures obtained are fishermen's perception of sharks. The qualitative method is carried out by interpreting data, facts and information that have been collected through an understanding that is

built based on empirical experience. Quantitative method is done by using a measurement scale, based on data obtained from the questionnaire. In the data obtained, data processing and data analysis were performed using Microsoft Office Excel 2013 software.

2.3 Benefit Cost Analysis

Benefit cost analysis is used to calculate the cost and revenue components resulting from shark fishing efforts by conducting interviews. The cost components used are investment costs and operational costs. The revenue component is the value of sales of products. If a project shows positive net benefit, then the project plan can be continued. If the opposite is negative, then the project plan is terminated [5].

2.4 Business Analysis

Business analysis is usually used to see the level of success of a business activity. According to [6], business analysis aims to find out the magnitude of the benefits derived from the business carried out, with the formula:

$$\Pi = TR\text{-}TC$$

Information:

Π: Benefits
TR: Total Revenue
TC: Total Cost

2.5 Benefit Cost Ratio

Benefit Cost Ratio (BCR) is a way of evaluating business by comparing the present value of all results obtained by a business with the present value of all business costs.

The BCR formula can be written as follows for the reduction in the formula used [7].

$$BCR = \frac{TR}{TC}$$

Information :

TR: Total Revenue
TC: Total Cost

3. RESULTS AND DISCUSSION

This research was conducted at TPI Pangandaran, located in Pangandaran sub-district, Pangandaran Regency. According to

fisheries production data in Pangandaran Regency, the largest shark production is in Pangandaran TPI and Pangandaran TPI is the largest fish landing base in Pangandaran Regency. Several types of fishing equipment such as gill nets, trammel nets, dogol nets, longline fishing, beach trawlers and charts are operated in the area.

3.1 Technical Data of Fishermen

The fishermen's technical data used are covering the fishing fleet, shark fishing area, types and proportion of sharks that are landed in Pangandaran TPI and the number of trips:

3.1.1 Capture fleet

3.1.1.1 Ship profile

From the results of interviews with fishermen that the boat used by the fishermen in TPI Pangandaran dominantly uses a 3 GT motor boat using gasoline fuel. It can be seen in Fig. 1 above that using 3 GT vessels that are 80%, while the least using 20 GT vessels at 5%, this is because fishermen in Pangandaran TPI dominantly catch fish by using vessels that can operate with The distance traveled by fishermen from fishing base to fishing ground ranges from 1-5 miles with the travel time between 1-3 hours by doing one *trip* / day and also the fishermen at TPI Pangandaran are mostly small fishermen.

3.1.1.2 Catching tool

There are six types of fishing gear operated by fishermen in Pangandaran Regency, namely Dogol, Arad Net, Gillnet, Tramell net, Bagan and Longline fishing line. The fishing gear that is often operated in Pangandaran Regency is a fishing net tool. The following are fishing gear data in Pangandaran Regency in 2006-2011.

3.1.2 Shark fishing areas

In Fig. 2, there are 3 shark fishing areas for fishermen in Pangandaran TPI, including around South Java, who are in the 573 Fisheries Management Area, which includes Pangandaran Beach, Pananjung Bay, Nusakambangan waters to a portion of Cilacap waters, 0-5 miles from fishing base, takes about 1-3 hours. The relatively close fishing ground was due to the small size of the ship and the strength of the engine used and the oceanographic conditions of the waters especially the high waves. The location of the fishing area is about 1-5 miles from the coast.
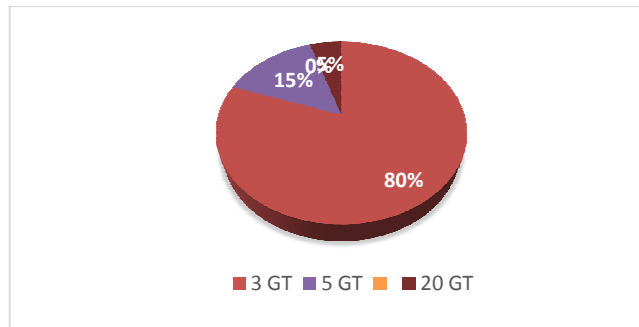
Fig. 1. Level of GT fishing boat size in TPI Pangandaran

Table 1. Data of fishing equipment in Pangandaran regency in 2006-2011

No.	Type of fishing gear	Years					
		2006	**2007**	**2008**	**2009**	**2010**	**2011**
1	Arad Nets	32	43	27	27	27	27
2	*Gill Net*	926	2806	2395	2395	2395	2395
3	*Tramel Net*	144	276	303	303	303	303
4	Longline Fishing Line	153	205	469	469	469	469
5	Dogol	97	110	201	201	201	201
6	Chart	16	20	20	20	20	20
	Total	1368	3460	3415	3415	3415	3415

Source: Fisheries and Maritime Affairs Office of Pangandaran Regency
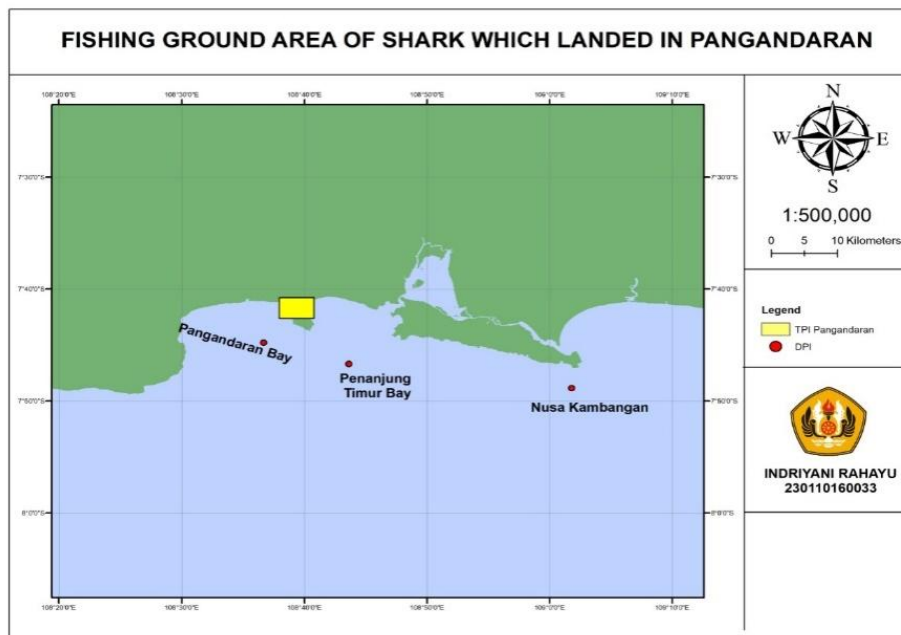
Fig. 2. Map of shark fishing location

3.1.3 Types and proportions of shark species landed at TPI Pangandaran

There are 2 types of sharks landed at TPI Pangandara during the study:

3.1.3.1 Lonjor sharks (Carcharhinus amblyrhynchos)

Lonjor or *Gray Reef Shark* (*Carcharhinus amblyrhynchos*) is a type of shark that has many

names, Indonesian people know it as a longitudinal shark, Peacock feather (Lombok), shark Lanjaman, or cone Lanjaman (Java). Longitudinal sharks are often seen in areas of coral reefs, near the reefs, or ato reef boundaries. This shark has special features, such as the edge of the tail fin of the back widens black, the tip of the lower pectoral fin is black, there are prominent ridges between the dorsal fins that are not very clear. This shark can grow to the size of 70-230 cm. The types of sharks that live in coral waters can still often be encountered. However, IUCN has put it on the yellow list which means it is almost endangered [8].

3.1.3.2 Martil sharks (Sphyrna lewini)

The Martil shark (*Sphyrnalewini* Griffith & Smith 1834) belonging to the *Sphyrnidae*family is a type of shark that is often caught in Indonesian waters [9]. Martilhave small mouths and seem to do a lot of bottom-hunting. Martil have two fins on their backs. The first dorsal fin is high, slightly curved and for the second dorsal fin short, with a long back end and a slightly concave edge. The caudal fin is shaped like the letter "V" and has a pair of pectoral fins. Conservation status on the [9], this type of shark is declared endangered and includes protected sharks [10].

3.1.3.3 Proportion of shark capture results at TPI Pangandaran

From the results of observations in the field for 2 months, sharks landed at TPI Pangandaran, there are 2 types of sharks namely the Lonjor shark *(Carcharhinus amblyrhynchos)* and Martil shark (*Sphyrnalewini).* The dominant shark caught by fishermen at TPI Pangandaran is Lonjor (*Carcharhinus amblyrhynchos*) with a percentage of 83%. The fishermen at TPI Pangandaran said that usually in one trip if they get a shark, it can reach 50-100 kg. whereas for Martil sharks can only get 1-3 and rarely get it, this is because the conservation status of the shark Martil is included in the [8], this type of shark is declared endangered and is included as a protected shark based on the Republic of the Ministry of Maritime Affairs and Fisheries Indonesia Number 34/PERMEN.the percentage can be seen in the Fig. 5.

3.1.4 Number of Trips/Year

Based on the identification results it can be seen in Fig. 6 that the largest number of trips/year on a 3 GT vessel size is 210 trips/year, while for the smallest number of trips with a 20 GT ship size of 20 trips/year, trips made by fishermen with a ship size of 3 GT is in the form of in a day fishing that trip is done in a day. Fishermen conduct fishing activities starting from early morning until morning. Whereas trips that are carried out with a boat measuring 5-20 GT are trips more than in a day, and fishermen usually catch further from the fishing base. Consideration of the number of fishing trips in operation, among others, 1) weather conditions; 2) catches; and 3) operational costs incurred. Small or large trips do not affect fishermen's income. Fishermen's income will significantly influence the catch.

Fig. 3. *Carcharhinus amblyrhynchos*
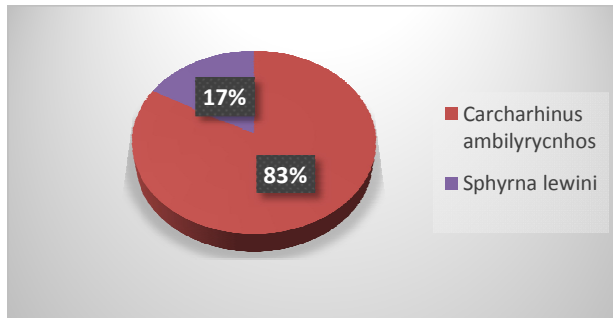
Fig. 4. Sphyrnalewini

Fig. 5. Proportion of Sharks' Catches

3.2 Fishermen Social Data

Fishermen social data used include Fisherman's Sociodemographic including respondent age, b. Level of Education of Respondents and Level of Work Experience, and for typology of fishermen, among others, based on background, based on type of fishing business, based on ship ownership, and based on fishing time:

3.2.1 Sociodemograpic of fishermen

3.2.1.1 Age of respondents

From the results of the study it can be seen in the Fig. 7, that the majority of fishermen in TPI Pangandaran are in the age group of 44-54 years (45%). This shows that the age group of 44-54 years is classified as productive age in fishing business in TPI Pangandaran. In accordance with the statement of [11], the age group considered productive is age 15-55 years. Age level affects a person's ability to do activities and concepts. This is seen from the strong physical condition and more experience compared to the young age [12].

3.2.1.2 Level of education

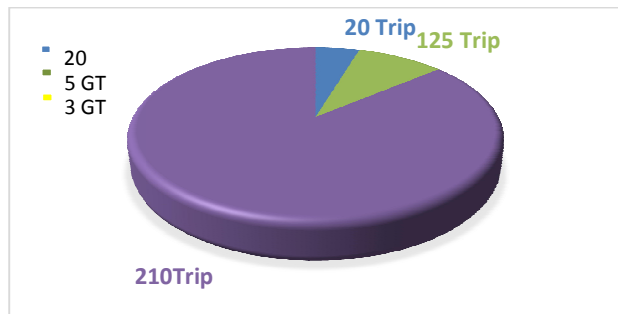TPI education level of fishermen in Pangandaran can be seen in Fig. 8.
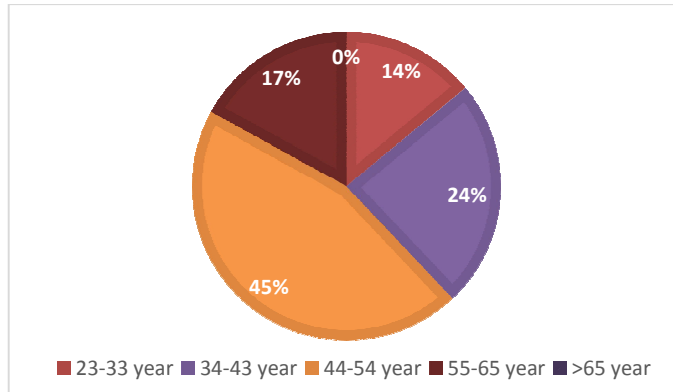

Fig. 6. Number of trips/year at TPI Pangandaran

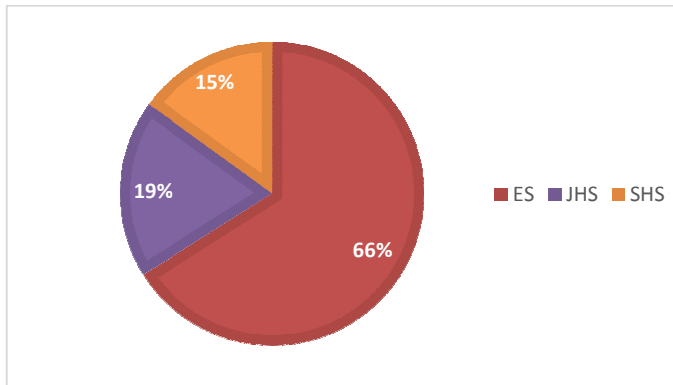**Fig. 7. Characteristics of respondents by age**

Fig. 8. Characteristics of respondents by education level

From Fig. 8 it can be seen that the majority of fishermen in TPI Pangandaran majority of their education level is only up to elementary school (SD) with a percentage of 66%, while the least is SMA with a percentage of 15%. The low level of fishermen's education is caused by difficult economic conditions and the thought of fishermen who think that being a fisherman is

hereditary and formal education is not the main thing in conducting fishing activities.

3.2.1.3 Level of work experience

The results of identifying the characteristics of respondents based on work experience can be seen in Fig. 9 as follows:
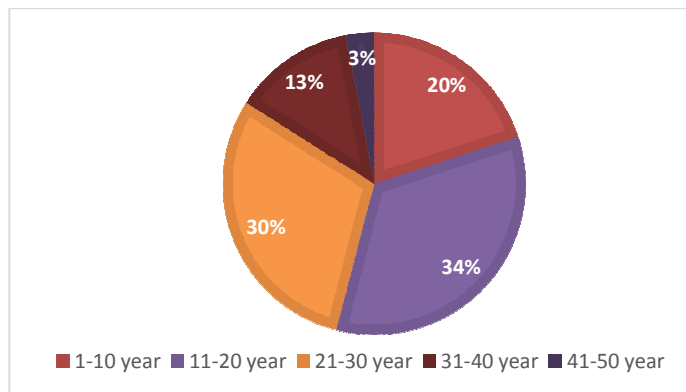

Fig. 9. Characteristics of respondents based on work experience

Based on the identification results it can be seen that the majority of fishermen who catch Pangandaran TPI sharks have a sea experience of 21-30 years with a percentage of 34%, while the lowest is at 41-50 vulnerable with a percentage of 3%. According to [13] one factor for fishermen to develop their business in catching fish is work experience. The longer experience owned by fishermen in fishing, the greater the ability for the fishermen to know fishing techniques, the use of skilled fishing [14].

3.2.2 Typology of fishermen

Typology can be interpreted as the division of society into groups according to certain criteriain the typology of fishing communities can be seen based on four perspectives, namely based on background, fishing effort, ownership of fishing gear and time to sea, the following is an analysis of the typology of fishermen at TPI Pangandaran, Pangandaran Regency:

3.2.2.1 Based on background

Based on the results of field interviews during the research, the majority of fishermen have a commercial fishing background with a percentage of 92%. While the lowest is the background of fishing in a recreational manner with a percentage of 0%, so it can be concluded that fishermen who are in TPI Pangandaran have no results for daily food consumption and also do not engage in fishing activities just for fun or sports, but the catch will be sold then the money raised will be allocated to buy food and daily necessities (Fig. 10).

3.2.2.2 Based on the type of fishing business

From the analysis, it can be seen that the majority of fishermen in TPI Pangandaran do fishing as the main occupation with a percentage of 96% and there are fishermen who do fishing as a type of side and additional business with a
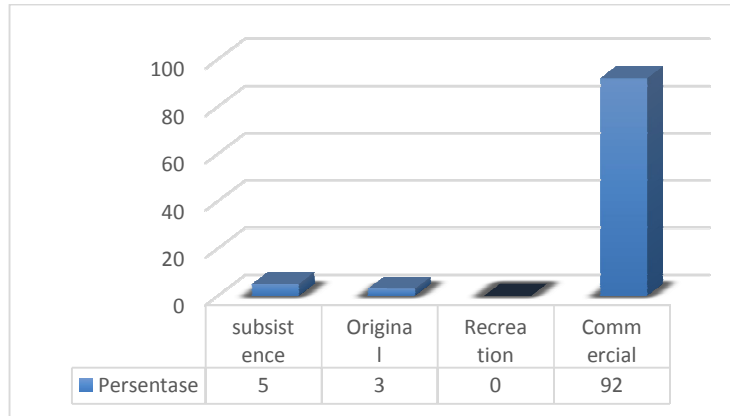

	subsistence	Original	Recreation	Commercial
Persentase	5	3	0	92

Fig. 10. Typology of fishermen based on background

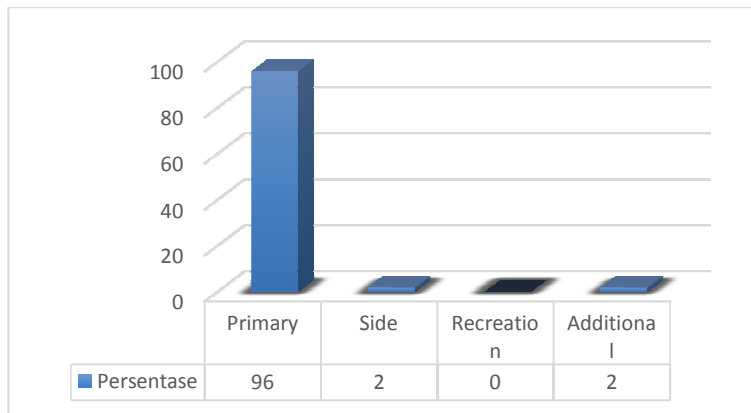|	Primary	Side	Recreation	Additional
Persentase	96	2	0	2

Fig. 11. Typology of fishermen's types of fishing business

percentage of 2% each. The high percentage of fishermen as a main occupation is because they only depend on their profession as fishermen and do not have jobs and expertise other than being a fisherman (Fig. 11).

3.2.2.3 Based on ship ownership

Based on the results of the analysis it is known that the majority of capture fisheries fishermen are only workers not the owners of facilities and fishing equipment and only a small portion have their own boats and fishing gear. This condition illustrates their nature as workers as Ship Crews (ABK) whose income portion is also low after being issued for the portion of income for capital owners and operational costs of fishing activities (Fig. 12).

3.2.2.4 Based on the old sea

Based on the Fig. 13, it is known that the majority of fishermen who sailed to TPI Pangandaran for a long time is 67% for one day, because the majority of fishermen who are in Pangandaran

TPI use a boat with a size of 3 GT so that fishermen can only sail with a distance of 3 miles. Whereas for fishermen who go to sea more than one day with a value of 27% because the fishermen use a boat measuring 5-20 GT so that the distance to the fishing area is longer. The fishing time is very influential on the catch of the fish.

3.3 Economic Data of Shark Fishermen

Fishermen economic data used include the production of sharks at Pangandaran TPI, the percentage of fishing at TPI Pangandara, business analysis including investment costs and production costs, revenue, business analysis including profits and Benefit Cost Ratio:

3.3.1 Shark production at TPI Pangandaran

Sharks production data in the period of 5 years (2015-2019) at the landing of TPI Pangandaran can be seen from the following graph in the Fig. 14.
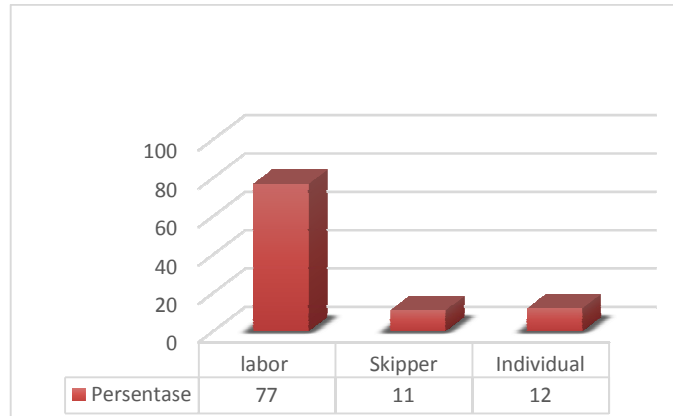

	labor	Skipper	Individual
Persentase	77	11	12

Fig. 12. Typology of fishermen based on ship ownership

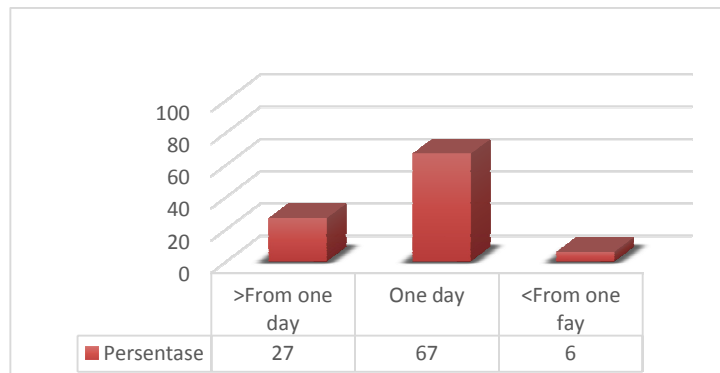|	>From one day	One day	<From one fay
Persentase	27	67	6

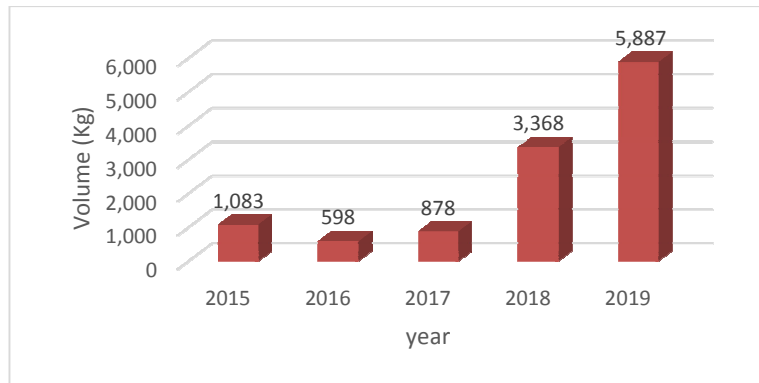**Fig. 13. Typology of fishermen based on sea time**

Fig. 14. Production of sharks (Kg) TPI Pangandaran in 2015-2019
Source: (Fisheries and Maritime Affairs Office of Pangandaran Regency

Based on Fig. 14, the data shows that the production of sharks in 2015-2019 experienced fluctuations up and down, significant fluctuations in shark production occurred in 2016-2019. The highest shark production occurred in 2019 of 5,887 kg / year, and the lowest occurred in 2016 of 598 kg / year. The amount of shark production in TPI Pangandaran is the catch of fishermen using *gill net* or commonly called fishing net. Fluctuations in production are inseparable from factors that influence catches such as natural factors [13]. The fishing season in the last few years in Pangandaran waters has changed in patterns and is difficult to predict so that it has an impact on shark production. The fishing season in Pangandaran Regency is influenced by two seasons, namely the peak season and the famine season. The peak season occurs in certain months in the eastern season which lasts from May to October, while the dry season occurs in certain months which occur in the west season which lasts November - April [15].

3.3.2 Percentage of fishing in Pangadaran TPI

The biggest percentage of fish catch landed at TPI Pangandaran within 5 years (2015-2019), including Bawal (*Pampus argenteus*) (48%), Layur (*Trichiurus spp*) (9%), Mackerel (Rastrelliger spp) (14%), Mackerel (*Scromberomorus spp*) (23%), Tuna (*Katsuwonus pelamis*) (5%) and sharks (1%). The following is the percentage of fish catch in TPI Pangandaran presented in the Fig. 15.

Based on the results of the Fig. 15, it is known that the highest percentage of fish caught landed at TPI Pangandaran is in Bawal fish. Then for the catch of sharks is lower than the 5 other types of fish, this is due to the results of interviews during the study, fishermen mentioned that shark fishing is not the main catch but shark is a catch of fishermen outside the target catch (by catch). Fishermen do not usually catch sharks, but if the shark is accidentally trapped in a net then the
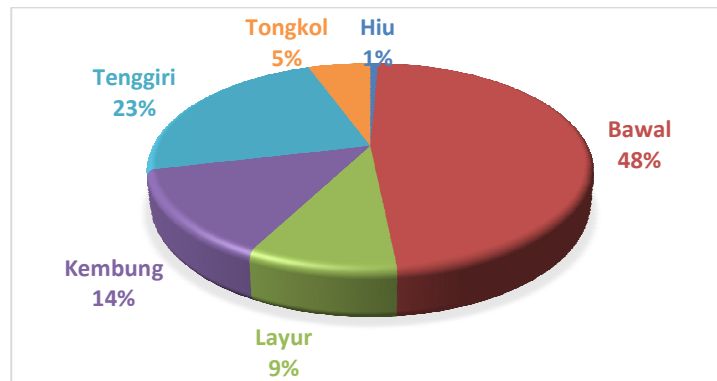

Fig. 15. Percentage of fish catches at TPI Pangandaran
Source: (fisheries and maritime affairs office of Pangandaran regency)

fisherman will catch it because if it has been caught the shark is dead and the shark can make additional income for the fisherman. The number of sharks landed at TPI Pangandaran is unstable every month, but in a day it can reach 1-10 kg/ one trip. Unstable production every month indicates that there is no catch season pattern for sharks in Pangandaran waters and sharks can be caught throughout the year.

3.3.3 Cost analysis

3.3.3.1 Investment costs

Investment costs are the initial costs incurred when running a business that is in the first year of business, where the amount is relatively large and cannot be used up in one production period. The following is the equipment needed to do shark fishing in Table 2.

Can be seen in Table 2 that the investment costs required in the business of catching sharks are Rp. 21,000,000 consisting of ships (<5 GT), engines and fishing gear. The investment cost component is the average price for vessels with size <5 GT of Rp. 15,000,000 with an average technical life of around 7 years, for machines with an average price of Rp. 4,000,000 with a technical life of around 3 years, and for fishing gear with an average price of 2,000,000 with a technical life of around 1 year. Equipment and investment are the initial capital used during fishing production. Each equipment has its own function that cannot be replaced with other tools,

besides the technical age and number of tools depends on the usage requirements.

3.3.3.2 Production costs

The following is the average production cost in shark fishing activities in TPI Pangandaran which is presented in Table 3.

Supplies and fuel costs are incurred each time an operational (trip) fishing is usually done with the pattern of one day fishing. The total costs incurred reached Rp. 80,000 for supplies and Rp. 150,000 for fuel consisting of 20 liters at a price of Rp. 6500/liter and Rp. 30,000 for 1 can of oil in each trip,as for maintenance costs, fishermen usually spend an average of Rp 4,500,000 a year. From interviews discovered that the average fishing year to do 2 1 0 trip, the average cost of production which should cost Rp. 52,800.00/year.

3.3.4 Revenue

Revenue is the product of the number of catches (kilograms) and the price per kilogram (rupiah) from the sale of catches. The details of catch revenue for 1 year can be seen in Table 4.

Based on Table 5, the total revenue obtained in the fishing business sharks in TPI Pangandaran, Pangandaran Regency per year is Rp. 63.000.000. Shark fishing revenue is based on shark catches production for one year. Shark catch production consists of two seasons, the dry season (east) and the rainy season (west).

Table 2. Investment costs investment costs in the shark fishing business at TPI Pangandaran for 1 year

No	Type of invesment	Nomber(Unit)	Unit price (Rp)	Total	Technical age (year)
1	Ship (< 5 GT)	1	15.000.000	15,000,000	7
2	machine	1	4.000.000	4,000,000	3
3	Capture equipment	1	2.000.000	2,000,000	1
	Total			21,000,000	

Source. Primary Data processed (2019)

Table 3. Production costs in the shark fishing business at TPI Pangandaran for 1 year

No	Types of production costs	Value (Rp)/Trip	Value (Rp)/year
1	Fuel costs (*trip /* year)	150,000	31,500 ,000
2	Supplies (*trip /* year)	80,000	16,800 ,000
3	Boat and fishing gear maintenance costs (Package / year)	-	4,500,000
	Total	230,000	52 ,800 ,000

Source. Primary Data processed (2019)

Table 4. Acceptance of shark fishing business at TPI Pangandaran for 1 year

Acceptance Period (*Profit*)	Price of Fish (Rp / kg)	Catches (kg)	Total (Rp)
East Season	18,000	2,180	39240000
Western Season	20,000	1,188	23760000
Total		3368	63000000

Source. Primary Data processed (2019)

3.3.5 Business analysis

3.3.5.1 Profit

The following are the benefits of shark fishing business at TPI Pangandaran:

Table 5. Benefits of sharks catching business at TPI Pangandaran for 1 year

No	Cost component	Total (Rp / year)
1	Total Revenue (TR)	63,000.000
2	Total Cost (TC)	52,800. 000
	Benefits (Π)	10,200. 000

Source: Primary data processed (2019)

The profit value is obtained by reducing total revenue (TR) and total cost of production (TC). The total revenue from shark fishing business in TPI Pangandaran per year is Rp.63.000,000 with the total cost of the boat being Rp.52,800,000. Resulting in a profit of Rp. 10,200,000. This means that these benefits are positive, which means that shark fishing business at TPI is profitable. According to [16] large profits can be obtained by reducing operational costs incurred.

3.3.5.2 Benefit cost ratio

The following analysis of Benefit Cost Ratio (BCR) on shark fishing business in TPI Pangandaran:

Table 6. Benefit cost ratio of shark catching business in TPI Pangandaran for 1 year

No	Cost component	Total (Rp / year)
1	Total Revenue (TR)	63,000,000
2	Total Cost (TC)	52,800. 000

Source: Primary data processed (2019)

$$BCR = \frac{63.000.000}{52.800.000} = 1{,}2$$

So, BCR shark fishing = 1.2

The B / C Ratio value obtained from the above data of 1.2. That means that every 1 rupiah spent will result in a receipt of 1 rupiah 2 cents. In the research results the B / C value is greater because the annual revenue can be greater. This shows that the B / C ratio in shark fishing business more than 1 means that the business is feasible to run and sustainable.

4. CONCLUSION

Based on the research results, conclusions can be drawn:

1. Typology technical of fishermen fishing sharks in TPI Pangandaran based kategoi: fishing fleet were used that the majority of vessels measuring 3 GT with fishing gear such as *gill net,* daerah shark fishing obtained from Pangandaran beach, Gulf Pananjung Bodies Nusakambangan wishful to partially Cilacap waters . There are two types of sharks that are landed in TPI Pangandaran namely Lonjor Sharks (*Carcharhinus amblyrhynchos*) this type of shark IUCN has put it on the yellow list which means it is almost endangered.and Martil Sharks (*Sphyrna lewini*) and this type of shark Conservation status on the IUCN red list, this type of shark is declared endangered and includes protected sharks. Therefore there needs to be a role from the government to create a socialization program on the prohibition of shark fishing carried out at TPI Pangandaran and also further monitoring is needed related to shark landing at TPI Pangandaran by the local government.
2. The social typology of the shark capture fishermen in TPI Pangandaran based on the category of commercial status fishermen, is the main occupation, including labor fishermen, the average fisherman goes to sea one day. In general, fishermen are aged between 44-54 years with elementary school level with 10-20 years of work experience.
3. The economic typology of shark fishing fishermen in TPI Pangandara by category: The biggest production result in 2019 is 5887 kg with a production value of

Rp. 110,219,200. The results of the feasibility analysis of the shark fisheries business in Pangandaran TPI are with a profit value of Rp. 10,200,000 and the value of the *Benefit Cost Ratio* (BCR) which is 1.2 means that the business is feasible and sustainable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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