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The Growth of Capture Fisheries in Pamekasan Regency, Madura Island

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Abstract. *"Groupers, snappers, emperors, and fusiliers are important reef fisheries both economically and ecologically, particularly in Indonesia and the Asian region. However, in some areas, they are still being overfished, and their stocks appear to be declining as a result." As a result, it is critical to comprehend their viewpoint. The purpose of this research is to evaluate the fishery output of some reef fish species in "Indonesia's Fisheries Management Area (FMA) 715" based on life history and spawning potential. Pamekasan Regency should implement an effective capture fisheries strategy to create jobs, ensure food security, and promote economic development. Pamekasan Regency is located along the shore of the Indonesian island of Mathura. The goal of this study was to design a capture fisheries development strategy for Pamegasan Regency. The SPSS matrix analysis methods were employed. This study drew on a wide range of data sources, including statistical data, surveys, and interviews. Key individuals were interviewed, and 30 fishermen were polled. Overfishing was discovered in the waters for Phamegasan Regency, according to the research. Diversification of fishermen owned by families enterprises, establishment of fish auction locations, oversight of fishing gear, expansion of the fish processing industry, warming mitigation, fishing resource studies, extension, and coastal community expansion are some of the capture fisheries growth methods we advocate. These strategies' implementation can be used as a subsequent fisheries strategy. The Pamekasan Regency Government should perform more intensive training and exercises to improve the abilities of salt farmers in Pademavu Sub-District, Pamekasan Regency, through the Fishing Service and other related agencies. The goal of this study's result analysis is to acquire an exhaustive overview of the topic without looking to the specific elements of the topic of research. For the statistical analysis, we used SPSS software version 16.this analysised Cronbach's alpha value for the model is 0.999.*
Keywords: *fisheries strategy, phamegasan regency fisheries growth*

1. Introduction

Numerous Indonesia has the world's second longest coastline, at 54,716 kilometers, and is the world's second biggest producer of capture fisheries (FAO, 2014). As a result, fisheries development plays an important strategic position in Indonesia. "Indonesia's catch fishing is multi-species and multi-gear. It is estimated that Indonesia has 8500 fish species and 67 kinds of fishing gear, which are classified into 12 distinct categories of fishing gear classification". As a result, every fishing field in Indonesia has a diverse range of species and fishing gear. As a result, there is a link between many fishing equipment [10]. Fish are important products of industrial and artisanal fishers and are found all over the world in tropical and subtropical coastal regions. The coral fauna of the Indonesian archipelago is the best in the world [5]. The collective effort to implement environmentally friendly fishing equipment seeks to raise awareness among fishermen about the significance of eco-friendly gear for fishing and to assist fishermen by providing folding fishing gear. On December 8, 2020, the activity was held in collaboration with the Pamekasan District Marine Fisheries Bureau and APRI to implement sustainable fishing technology in cooperation with APRI accompanied by Lailatul Komaria in distributing techniques for using folded catches and fish handling [5]. Pamegazan Regency relies heavily on the capture fisheries industry. Fishing has become one of the primary sources of income for coastal residents in Pamegasan Regency. Phamegasan Regency had 10,619 fishers in 2018. Producers of sea salt (1,461 people), fish processors (344 people), growers of seaweed (Eucheuma cotton) (101 people), prawn farmers (23 people) and milk fish farmers (30 people) (Department of Fisheries of Pamegazan Regency 2020). Small-scale fishing produce the majority of the world's seafood. Small-scale fisheries are critical to global employment, livelihoods, food security, and poverty reduction, especially in low-income countries [2, 3]. As a result, the fishing industry is critical to the growth of Pamekasan Regency in terms of employment, reducing hunger, and revenue creation [1]. Regional development necessitates a well-planned approach. Strategy is a method of achieving objectives, Both in the near and long term. Strategy is a way of influencing the future [4].

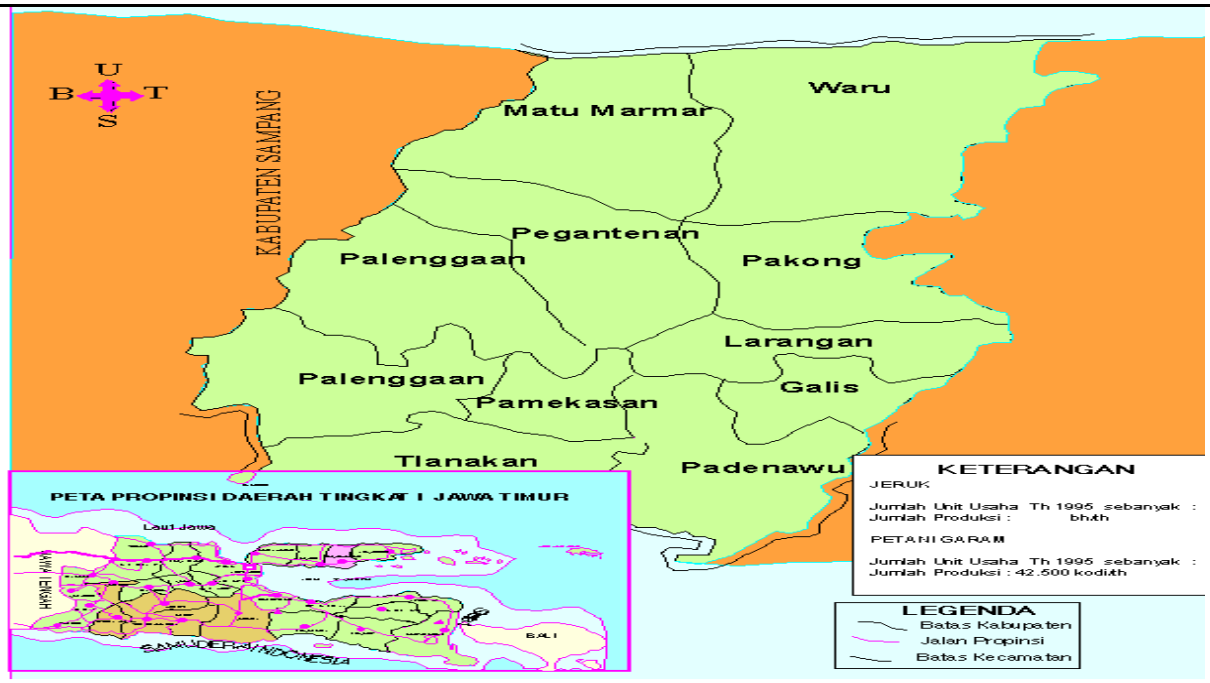

FIGURE 1. Potential Map of Pamekasan Regency

"Pamekasan is a district (kabupaten) located on Madura Island in East Java, Indonesia. It is bordered by Sumenep to the east, the Java Sea to the north, and Sampang to the south (west), with the Madura Strait to the south. Pamekasan is located approximately 120 kilometers east of Surabaya and has a diverse population consisting of Madurese, Javanese, and Chinese Indonesians. One of the area's well-known products is Batik Pamekasan." "Pamekasan Regency's medium-term development plan (based on Regency Regulation No. 9 of 2019) establishes a development vision, namely "Pamekasan Province is developed, prosperous, and highly competitive regency based on environmentally friendly farming and fisheries". As a result, the Phamegasan Regency Capture Fisheries Growth Strategy plays an essential part in realising the Phamegasan Regency's development vision and mission. The study goal was to create a comprehensive capture fisheries development plan for Pamegasan Regency with an envisioned strategic value. Management should consider the exterior and internal environments, including governmental, regulatory, Resources include economic, social, technical, and natural resources. The characteristics of fishing resources and the economic status of fishermen in Pamegasan Regency's waters should be central to developing capture fisheries development plans [1].

2. Material and Methods

Recognizing Fisheries Management Competent scientific counsel based on pertinent data is nothing to be located in the fishers world, and fisheries management frequently fails despite the best of conditions. The success of a management system is frequently described in terms of biological, economic, social, and political objectives. Economic and cultural objectives will not be reached if the stock is depleted to the point where the fishery's long-term viability is jeopardized. However it is clear that ecological objective have unlikely to be reached without consideration of social and economic goals. As a result, we contend that understanding the fishing management process requires an examination of the capacities and motivations of two key stakeholders: those who fish and the regulating authority. This is not to dismiss the significance of other customers, such as recreational fishermen and environmental organizations, in the administration of some fisheries [6]. Since the 1950s, the economic aspects of overfishing in commercial fisheries with poor or no management have been widely recognised. (8). In short, When a large number of fishers compete for a given population of fish, each fisher maximizes his net income by fishing until the value of the catch surpasses the cost of catching it. Only when fishing lowers the number of fish and catch rates are barely adequate to cover fishing costs does equilibrium, also known as biological equilibrium, occur? The biological mechanisms of natural growth and reproduction keep populations at this level. As a result, if the percentage of inventory is high, Overfishing results from a low fish population and, as a result, a low annual catch level; two characteristics of biological equilibrium. Furthermore, the financial benefits from fisheries will balance at zero (total income minus total expenses), resulting in an adequate overall profitability [6]. Research location: "The study was conducted from May to June 2020 in Phamegasan Regency. Pamekasan Regency is located on Mathura Island with coordinates 113o19'-113o58' East Longitude and 6o51'-7 o31' South Latitude (BPS-Pamekasan Regency 2019a)". The study data were obtained from a variety of government-related documents, including the Pamekasan Regency Department of Fisheries, the Pamekasan Regency PBS-Statistics, and the Pamekasan Regency Development and Planning Agency. Because of the information collected in creating strategic value, the findings of a survey and discussion Conversations with important people and conversations with 30 fishermen were chosen for analysis. A descriptive quantitative method was used to analyze the data. The Schaefer model was used to calculate the maximum sustainable output (MSY). SPSS analysis is the most commonly used analytical method in strategy development by managers and policymakers. In prior studies, only a few researchers used this method [7, 8]. Pamekasan Regency

extends southward for 34 kilometers and northward for 18 kilometers. In general, the south of Mathura Island (including Phamegasan Regency) is more populated than the north, with a reduced population density in the center. This situation happened at the beginning of the nineteenth century. (Gundoviono 2017). Because of the interconnected socioeconomic ties between the islands of Mathura and Java, Java is the economic center of Indonesia. (which is located in the southern part of the island of Mathura). The Suramadu Bridge (short for Surabaya and Mathura) connects Mathura Island and Java Island, and it opened to the public for the first time on June 10, 2009. Phamegasan Regency has an estimated population of 871,497 people as of 2018. Pamekasan Regency has an average population growth rate of 1.08% per year (BPS-Pamekasan Regency 2019a), and an average economic development rate of 5.5%. The socioeconomic development: To increase per capita GDP as a social welfare indicator, economic development should outpace population growth. The economic growth rate in Pamekasan Regency is usually higher than the national average, averaging 5.1% per year. The Gross Regional Domestic Product (GRDP) of Pamekasan Regency remains poorer than the average of East Java Province's regencies and cities. The GRTP in Pamekasan Regency is lowest on Mathura Island. According to Brückner and Schwandt (2013), the population has an association with GDP per capita, and population increase has a negative relationship with GDP per capita growth. The development of capture fishing. In Pamekasan Regency, capture fisheries predominate over aquaculture and fisheries processing. Capture fisheries contribute considerably to production in addition to major employment.

TABLE 1. The progress of economic, population, and fisheries production in Pamekasan Regency

Indicators	2014	2015	2016	2017	2018
Population (person)	836224	845314	854194	862914	871497
Population growth (%)	1.07	1.09	1.05	1.03	1.04
GRDP base on current price	11.07	12.3	13.53	15	16
(IDR trillion) Economic growth (%)	5.62	5.32	5.35	5.04	5.46
The contribution of agriculture, forestry, and fisheries in the GRDP based on current prices (%)	36	36	35.11	33.77	32.71
GRDP growth of agriculture, forestry and fisheries (%)	4.45	3.79	3.26	0.5	1.6
Fisheries economic growth (%)	8	7	6.19	5.41	3.02
Marine capture fisheries	22522	24392	23689	21689	19554
Brakish water culture production	572	564	628	705	232
Pond culture production	601	716	337	1002	451
Marine culture production	196	211	277	138	104
Sea salt production	89282	123534	3208	54831	128247

These are some economic and demographic indicators for a Phamegasan Regency, for the years 2014 to 2018:

- Population: The region's population increased from 836,224 in 2014 to 871,497 in 2018, with an average annual growth rate of around 1.05% to 1.09%.
- GRDP: The region's Gross Regional Domestic Product (GRDP) based on current prices increased from IDR 11.07 trillion in 2014 to IDR 16 trillion in 2018, with an average annual growth rate of around 10.67% to 16%.
- Economic growth: The region's economic growth rate ranged from 5.04% in 2017 to 5.62% in 2014.
- Agriculture, forestry, and fisheries: The agriculture, forestry, and fisheries sector contributed a decreasing proportion of the region's GRDP based on current prices, from 36% in 2014 to 32.71% in 2018.
- GRDP growth of agriculture, forestry and fisheries: The GRDP growth rate for agriculture, forestry, and fisheries sector fluctuated from 3.26% in 2016 to 4.45% in 2014.
- Fisheries economic growth: The fisheries sector experienced a decreasing growth rate, from 8% in 2014 to 3.02% in 2018.
- Marine capture fisheries: The production of marine capture fisheries decreased from 24,392 tons in 2015 to 19,554 tons in 2018.
- Brakish water culture production: The production of brakish water culture fluctuated from 564 tons in 2015 to 232 tons in 2018.
- Pond culture production: The production of pond culture increased from 716 tons in 2015 to 1,002 tons in 2017, and then decreased to 451 tons in 2018.
- Marine culture production: The production of marine culture fluctuated from 211 tons in 2015 to 104 tons in 2018.
- Sea salt production: The production of sea salt fluctuated from 123,534 tons in 2015 to 3,208 tons in 2016, and then increased to 128,247 tons in 2018.

The Madura Strait (for fishermen located on the southern coast) and the Java Sea are the primary fishing grounds for Pamekasan Regency fishermen. (fishermen living on the north coast). The south shore has more fishermen than the north coast (Pamekasan Regency 2020) within the Department of Fisheries. Capture fishing in Indonesia, such as Pamekasan Regency, are generally multi-gear and multi-species. The various kinds of fishing equipment and fish resources used during fishing contribute to the complexity of the management of fisheries. Because there are correlations between different kinds of fishing gear and different species. This has detrimental consequences [10]. Fishing tactics in a multi-species fishery change when the fish targets change. The existence of a species has an effect on fish targets as well [11].

TABLE 2. Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness
2014	12	836223	1	836224	7.91E4	239815.546	5.751E10	3.396
2015	12	845313	1	845314	8.29E4	242701.447	5.890E10	3.342
2016	12	854193	1	854194	7.35E4	245936.797	6.048E10	3.459
2017	12	862914	0	862914	7.84E4	247580.211	6.130E10	3.438
2018	12	871496	1	871497	8.50E4	250383.764	6.269E10	3.341

Table 1 Descriptive statistical analysis of 2014, 2015, 2016, 2017, 2018 N, range, minimum, maximum, mean and standard deviation variance curve values are given.

TABLE 3. Statistics

		2014	2015	2016	2017	2018
N	**Valid**	12	12	12	12	12
	Missing	0	0	0	0	0
Median		116.00	123.50	156.06	85.88	68.35
Mode		1	1	1	0	1
Percentiles	**25**	6.22	5.74	5.56	5.13	3.63
	50	116.00	123.50	156.06	85.88	68.35
	75	1.70E4	1.85E4	2563.00	1.65E4	1.48E4

The first column seems to indicate the year, while the second to fifth columns are:

- Valid: The number of valid observations for that year (i.e., the number of data points that were included in the analysis).
- Missing: The number of missing or incomplete data points for that year.
- Median: The middle value of the dataset, where 50% of the values are below and 50% are above this value.
- Mode: The most common value or values in the dataset.
- Percentiles: The values below which a certain percentage of the data fall. For example, the 25th percentile indicates the value below which 25% of the data fall.

Without additional information about the context or the specific dataset being analyzed, it is difficult to provide a more detailed interpretation of the statistics.

TABLE 4. Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.999	.999	5

Cronbach's Alpha Reliability is shown in Table 2. The model's total Cronbach's Alpha value is 0.999, indicating 99% reliability. Based on the literature review, models with Cronbach's Alpha values greater than 50% can be evaluated for analysis.

Model	R	R Square	Adjusted R Square	Sum of Squares	df	F	Sig.
2014	1.000	1.000	1.000	1.000	11	4.473E5	0.000
2015	1.000	1.000	1.000	6.479E11	11	1.142E5	0.000
2016	1.000	1.000	1.000	6.653E11	11	1.939E6	0.000
2017	1.000	1.000	1.000	6.743E11	11	5.658E6	0.000
2018	1.000	1.000	1.000	6.896E11	11	1.099E5	0.000

Based on the results, all five models have a perfect correlation (R = 1) between the predicted and observed values of the dependent variable, which suggests that the models are a perfect fit to the data. Additionally, the coefficient of determination (R squared) for all models is 1.000, indicating that 100% of the variance in the dependent variable is explained by the independent variable(s). However, very low p-values (Sig.) for the F statistic (all <0.001) suggest that the models may be overfitting the data, Table 2 shows the result of "R, R squared, adjusted R squared, sum of squares, df, F, significance". The overall R squared value for the model is above 0.99, so this is reliable data. From the literature review, R value above 1.0 can be considered to analyze the model. The sum of squares value for the model is less than 10.0, so this is reliability data. From the literature review, the value of squares above 10 can be considered to analyze the model. The overall F value for the model is above 100.0, so this is reliability data. From the literature review, a value above 10 can be considered to analyze the model. The overall identity value for the model is 0.000, so this is reliability data. From the literature review, a value less than 0.5 can be considered to analyze the model.

Correlation Matrix					
	2014	2015	2016	2017	2018
2014	1.000	.999	.995	.999	.999
2015	.999	1.000	.990	.997	1.000
2016	.995	.990	1.000	.998	.990
2017	.999	.997	.998	1.000	.996
2018	.999	1.000	.990	.996	1.000

A correlation matrix appears as a table of correlation coefficients between five variables (or observations) measured over five years (2014-2018). The diagonal cells show the correlation of each variable with itself, which is always equal to 1. The table shows high positive correlations between most pairs of variables, with coefficients ranging from .990 to 1.000. This suggests that the variables are strongly correlated with each other and move in the same direction over time. However, there are some minor differences in the strength of correlations between different pairs of variables and years. Overall, the correlation matrix provides useful information about relationships between variables and can be used to identify patterns and trends in data. Table 4 demonstrates the 2014 correlation between stimulus parameters. 2015, 2017, and 2018 have the greatest correlation coefficient of 0.999, indicating a high correlation with 2014, and the lowest correlation coefficient of 0.995, indicating a low correlation with 2016. The correlation between 2015 stimulus characteristics is shown next. The maximum value for 2014 is 0.905, indicating a high correlation with 2018, and the lowest value is 0.997, indicating a low correlation with 2017. The correlation between the stimulus factors for 2016 is shown next. Line plotting has the greatest correlation coefficient of 0.998, indicating a high correlation with 2017, and the lowest correlation coefficient of 0.990, indicating a low correlation with 2015 and 2018. The correlation between the stimulus factors for 2017 is shown next. Line plotting has the greatest correlation coefficient of 0.999, indicating a high correlation with 2014, and the lowest correlation coefficient of 0.996, indicating a low correlation with 2018. The correlation between the stimulus factors for 2018 is shown next. Line drawing has a maximum value of 1.000, indicating a high correlation with 2014, and a minimum value of 0.996, indicating a low correlation with 2017.

3. Conclusion

Based on this study, Phamegasan Regency is regency located in the province of East Java, Indonesia. The regency is situated on the northern coast of Java, and as such, it has a significant fishing industry. Fishing is an important economic activity for many of the people living in the regency, and it is a source of livelihood for many fishermen in the area. Some of the fish species that can be found in the waters off Phamegasan Regency include tuna, mackerel, snapper, grouper, and barracuda, among others. The fishing methods used in the regency vary, but some of the common techniques include handline fishing, gill netting, and trawling. It's important to note that fishing regulations and guidelines are in place to ensure sustainable fishing practices in the area. These regulations are aimed at protecting the marine ecosystem and ensuring that fishing remains a viable source of livelihood for future generations. If you're planning to go fishing in Phamegasan Regency, it's essential to follow these regulations to help preserve the marine environment and support the local fishing community. It was proved that the waters of Phamegasan Regency were overfished. We suggest some catch fisheries development strategies in Pamekasan Regency: Diversification of fishermen's family businesses, development of fish auction sites, regulation of fishing gear, development of fish processing industry, mitigation of climate change and research, expansion and empowerment of fisheries resources..

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