

Analysis of Ornamental Fish (*Pomacanthus navarchus*) for the Sustainability of Small and Medium Enterprises (UKM) in South Sulawesi, Indonesia

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Abstract

Pomacanthidae is a marine ornamental fish species that has become a favourite for both domestic and global markets. Ornamental fish enthusiasts have now spread across all walks of life. Although the purchasing power of people varies (depending on the class), this is enough to prove that all circles of society are fond of ornamental fish as a business field. The purpose of this study is to analyse the various factors affecting the export of angel pyama angel fish in South Sulawesi and to analyse the various factors affecting the supply of angel pyama fish. The types and sources of data needed in this study consist of Primary Data and Secondary Data. Local price and cost of production of angel pyama and batman fish have a significant positive effect on the amount of production/supply of angel pyama fish and the local price of angel batman fish has a significant negative effect on the amount of angel pyama fish production. The export price of angel pyama fish has a significant negative effect on the amount of export demand for angel pyama fish while the export price of angel batman fish has a significant positive effect on the amount of export demand for angel pyama fish. The exchange rate of the rupiah against the US dollar has no significant effect on the amount of export demand for angel pyama fish while the export price of angel pyama fish and the exchange rate of the rupiah against the US dollar has a significant effect on the amount of export demand for angel pyama fish.

Keywords: Analysis, Export, Angel Pyama, Sustainability, Business.

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INTRODUCTION

Indonesia is located in the world's coral reef triangle, which is the centre of the highest diversity of marine life, especially coral species and ornamental fishes (Ilyas et al., 2020; Kasmi, 2014; Kasmi et al., 2023). More than 500 coral species have been recorded in an area of approximately 51,000 km² and 2,057 fish species from 113 families have been identified, an estimated 4,234 species (Kasmi, Kumalasari, et al., 2022; Natsir et al., 2023; Sulkifli et al., 2023). Fishery products are one of Indonesia's main exports (Kasmi, Amir, Aman, et al., 2022; Kasmi, Sulkifli, et al., 2022; Zam et al., 2023). Given Indonesia's marine area of approximately 3.1 million km² (0.3 million km² of territorial sea waters and 2.8 million km² of archipelagic waters) and has important economic value (Asriany et al., 2023; Kasmi, Amir, Andryanto, et al., 2022; Mastuti et al., 2022). The marketing of fishery products in Indonesia's Exclusive Economic Zone directed to the export market has a mainstay product of ornamental coral and angel fish (Kasmi et al., 2017; Kasmi & Karma, 2016; Paharuddin et al., 2022). Angelfish as the second fisheries export commodity contributed to foreign exchange in 1998 (Abdullah et al., 2021; Mauli et al., 2022).

This condition is empirically experienced by marine ornamental fish agribusiness actors in Indonesia. They still experience classic constraints such as aspects of capital, low production quality, institutions (organisations), agribusiness management, technology, agribusiness networks, and market information (Mauli et al., 2022). These constraints are often exploited by other economic actors both from within and outside the community in building production and marketing networks that always put marine ornamental fish agribusiness actors in an unfavourable situation (Mastuti et al., 2022).

The potential of fisheries in South Sulawesi waters has a major contribution to increasing the role of South Sulawesi's economic development (Kasmi, 2014). In addition, the human resources engaged in the fisheries sector along the coastal areas have prospects to be developed to support the welfare of the community. The potential of fisheries is so promising and supported by large natural resources, but the production of the fisheries sector still receives less attention, especially the subsector of marine ornamental fish utilization (Kasmi, Sulkifli, et al., 2022). The ornamental fisheries business has a very large opportunity seen from the shift in the need for consumed fish to ornamental fish as a hobby from developed countries to be used as an aquarium decoration commodity (Kasmi, Amir, Andryanto, et al., 2022).

Ornamental fish enthusiasts have now spread to all levels of society. Although the purchasing power of the community varies (depending on the class), this is enough to prove that

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all circles of society are fond of ornamental fish as business land. The potential resources, diversity of fish species, and ease of cultivation will provide opportunities for anyone to enter this field. Armed with willingness and a little capital, coupled with tenacity and perseverance, this business may become a source of livelihood for some people if seen from its bright market prospects because it is not only to meet the needs of the local market (Asriany et al., 2023; Kasmi et al., 2020).

The large biodiversity, diverse ecosystems and large area with a large number of islands pose difficulties in optimal management, including in the utilisation of ornamental marine biota. This can be shown by the lack of interest in ornamental marine biota entrepreneurs. Most tend to have a freshwater ornamental aquarium business that has a low business risk compared to the high-risk marine ornamental aquarium business. The world community's interest in marine ornamental aquariums is increasing while the interest of entrepreneurs in the same field is still lacking and the market share is increasingly open, so the development of marine ornamental aquarium biota business needs to be improved (Abdullah et al., 2021).

The increasing demand for marine ornamental fish for several export destination countries will in turn increase the demand for marine ornamental fish itself. The stock availability factor is still an obstacle in the nursery business for marine ornamental fish exports. The fulfilment of ornamental fish needs in export destination countries still relies on natural catches but is only able to supply approximately 50% of the total demand for marine ornamental fish. In addition, from year to year, the number of stocks of marine ornamental fish available in nature tends to decrease, resulting in a gap between the increasing export demand and the availability of stocks that have not been maintained sustainably (Diawati et al., 2023).

The purpose of this study is to analyse the various factors affecting the export of angel pyama fish in South Sulawesi and to analyse the various factors affecting the supply of angel pyama fish in South Sulawesi.

METHODS

The research was conducted from March to June 2022 in ornamental fish SMEs in the South Sulawesi region. Data collection and analysis consisted of 1). Primary data, namely data obtained directly in the field by observation and interviews with respondents. The data in question are time series data and pyama angel fish production data. 2). Secondary data, namely data obtained from offices or companies (SMEs) that are closely related to the data needed to

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complement primary data.

The analytical tool used in this study is multiple linear regression analysis of the log-log model / double logarithm model or commonly referred to as constant elasticity. In this study, the supply model and demand model were used. The analysis model using SPSS software version 18 (Nerlova & William, 1958; Yudiarso, 2009; Kasmi, 2013) is as follows:

Supply Model

$$\text{Log } Q^s = \text{Log } \beta_0 + \beta_1 \text{ Log } P_p + \beta_2 \text{ Log } P_b + \beta_3 \text{ Log } B_n$$

Where:

Log Q^s = Total production of ornamental fish angel pyama

Log β_0 = intercept

Log P_p = Local price of ornamental fish angel pyama

Log P_b = Local price of ornamental fish angel Batman

Log B_p = Cost of production of ornamental fish angel pyama

$\beta_1, \beta_2, \beta_3$, = regression coefficients

Demand Model

$$\text{Log } Q^{de} = \text{Log } \alpha_0 + \alpha_1 \text{ Log } P_{Ep} + \alpha_2 \text{ Log } P_{Eb} + \alpha_3 \text{ Log } N_t$$

Where:

Log Q^{de} = Total export demand of ornamental fish angel pyama

Log α_0 = intercept

Log P_{Ep} = Export price of ornamental fish angel pyama

Log P_{Eb} = Export price of ornamental fish angel Batman

Log N_t = Exchange rate of rupiah against US dollar

$\alpha_1, \alpha_2, \alpha_3$ = regression coefficients

RESULTS AND DISCUSSION

The supply function obtained that the local price of ornamental fish angel pyama has a significant positive effect on the amount of production or supply of ornamental fish angel pyama, meaning that when the local price of ornamental fish angel pyama increases, the amount of production or supply of ornamental fish angel pyama also increases. The results obtained are by the theory that the amount of production or supply of a commodity is influenced by the price of

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the commodity concerned. However, empirically the results obtained in this study are different from those obtained previously by (Kasmi, 2014), who found an insignificant effect between the price of angel pyama fish and the amount of production of angel pyama fish. Although there are empirical differences in previous studies, the current study is more consistent theoretically. (LeGrand et al., 2020) explain that for fishery products the time factor is very important to consider in supply because fishery products are seasonal in general so an increase in market prices cannot be immediately followed by an increase in supply because usually, supply occurs when the fishing season takes place.

Hypothesis Testing of the supply function

Table 1. Partial test results

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-5.615	2.103		-2.669	.011
Log.Pb	-1.391	.519	-.451	-2.678	.010
Log.Bp	.730	.334	.356	2.187	.034
Log.Pp	1.734	.373	.637	4.643	.000

Source: Data processed 2022

From the partial test results in the table above, the following results are obtained:

1. The significant value of the price of angel pyama (Pp) = $0.000 < \alpha (0.05)$ and the coefficient is positive so the decision to accept the hypothesis means that the price of angel pyama has a significant positive effect on the amount of production or supply of angel pyama fish.
2. The significant value of the price of angel Batman (Pb) = $0.010 < \alpha (0.05)$, and the coefficient is negative so the decision to accept the hypothesis means that the price of angel Batman fish has a significant effect on the amount of production or supply of angel pyama fish.

3. The significant value of angel pyama fish production costs (B_p) = $0.034 < \alpha$ (0.05) and the coefficient is positive so the decision to accept the hypothesis means that the cost of angel pyama fish production has a significant positive effect on the amount of production or supply of angel pyama fish.

Based on the results obtained in the table above, the supply regression model is as follows:

$$\text{Log } Q^s = -5.615 + 1.734 \text{ Log } P_p - 1.391 \text{ Log } P_b + 0.730 \text{ Log } B_p$$

The regression results above give the following meanings:

1. The constant value is -5.615. This means that if the price of angel pyama fish, the price of angel batman fish, and the cost of producing angel pyama fish does not change, there is a relative decrease in the amount of production or supply of angel pyama by 5.615 per cent.
2. The coefficient value of angel pyama fish price (P_p) of 1.734 means that every 1 per cent increase in the price of angel pyama will increase the amount of production or supply of angel pyama fish by 1.734 per cent.
3. The coefficient value of the price of angel batman fish (P_b) of -1.391 means that every 1 per cent increase in the price of angel batman fish will reduce the amount of angel pyama fish production by 1.391 per cent.
4. The coefficient value of angel pyama fish production costs (B_p) of 0.730 means that every 1 per cent increase in angel pyama production costs will increase the amount of angel pyama fish production by 0.730 per cent.

Table 2. Simultaneous testing

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.727	3	.242	10.666	.000 ^a
Residual	.978	43	.023		
Total	1.705	46			

a. Predictors: (Constant), Log. P_p , Log. B_p , Log. P_b

b. Dependent Variable: Log. Q_s

Source: data processed 2022



Table 2 shows a significant value of $0.000 < \alpha$ (0.05) so the decision to accept the hypothesis means that the price of angel pyama fish, the price of injel batman fish, the cost of production of angel pyama fish have a significant effect on the amount of production or supply of angel pyama fish. This means that the regression model is feasible to use to predict the amount of production/supply of ornamental fish angel pyama.

To explain the ability of the model to explain the dependent variable, it can be seen in the determination test table below:

Table 3. Determination Test Results

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.653 ^a	.427	.387	.1507782

a. Predictors: (Constant), Log.Pp, Log.Bp, Log.Pb

b. Dependent Variable: Log.Qs

Source: data processed, 2022

In Table 3. the value of R is 0.653 that if the value of R or $(0.40 \leq R \leq 0.70)$ then the degree of relationship/correlation between the variables studied is moderate or adequate. The results obtained show that the correlation or relationship between the amount of production and the three independent variables is moderate or adequate. The R square (R^2) number or the coefficient of determination is 0.427. The R^2 value explains the independent variables in explaining the dependent variable. A value close to one means that the independent variables provide almost all the information needed to predict variations in the dependent variable. The R square (R^2) value of 0.427 explains that the price of angel pyama fish, the price of angel batman fish, and the cost of angel fish production can explain 42.7% of the variation that occurs in the amount of production. While the remaining 57.3% is explained by other factors not studied.

From the results obtained that the local price of angel batman fish has a significant negative effect on the amount of production or supply of angel pyama fish, meaning that when the local price of angel batman fish rises, the amount of angel pyama fish production will decrease. The results obtained are by the theory which states that the amount of a commodity



offered or produced is influenced by the price of other related commodities. The negative relationship between the price of angel pyama ornamental fish and the amount of supply or production of angel pyama fish reflects that angel batman ornamental fish is a complement to angel pyama ornamental fish. This means that producers, in this case, fishermen in catching angel pyama ornamental fish see that the catch they get is optimal so they tend to reduce the time to catch angel pyama fish and switch to catching angel batman fish.

From the results obtained that the cost of production of angel pyama fish has a significant positive effect on the amount of angel pyama fish production, meaning that when the cost of production of angel pyama fish increases, the amount of angel pyama fish production will increase. The results obtained are by the theory which states that the cost of production of a commodity affects the amount of production or supply of that commodity. The positive relationship reflects that an increase in production at any existing market price means that fishermen have made a profit. (Copes, 2019) explained that the maximum economic fisheries production is the socially optimal level of effort. If we compare the level of effort in the open access equilibrium with the socially optimal level of effort, then the open access condition causes a mismatch of resource location due to excess production factors (labour and capital) so open access fisheries lead to economic overfishing conditions.

The variables studied are only able to explain as much as 42% of the ups and downs of production while as much as 57.3% is influenced by factors not studied or outside this model, this indicates that the existing economic model does not reflect the conditions of angel fish production, angel fish production is more reflected by biological aspects. In addition, the negative intercept obtained also proves that pyama production has decreased. (Asriany et al., 2023) explained that the excess demand for fish and its price which tends to be high compared to other ornamental fish can result in increased activity of fishermen to continue catching angel pyama. The high interest in angel fish is also indicated by the use of this fish as a bargaining tool for fish suppliers to include the sale of other types of ornamental fish. This will result in the angel pyama population continuing to decline due to high exploitation pressure.

The export demand function of angel pyama fish, obtained that the export price of angel pyama has a significant negative effect on the amount of export demand for angel pyama fish, the results obtained are by the theory which states that the price of a commodity affects the amount of demand for a commodity. The negative relationship means that when the export price of angel pyama rises, the amount of export demand for angel pyama will decrease.

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Empirically, the results obtained are the same as the results of research conducted previously by (Kasmi, Sulkifli, et al., 2022) that the export price of angel pyama fish has a real and positive effect on Indonesian angel pyama fish exports at the level of $\alpha = 5\%$, with an elasticity value of 2.316. This means that a 1% increase in the export price of angel pyama fish will be followed by a 2.316% increase in exports.

Table 4. Partial test results of angel pyama fish export demand model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	5.092	3.477		1.465	.150		
Log.Nt	-.993	.725	-.202	-1.370	.178	.789	1.267
Log.PEp	-1.166	.536	-.335	-2.178	.035	.730	1.370
Log.PEb	2.148	.611	.489	3.517	.001	.891	1.122

a. Dependent Variable: Log.Qde

Source ata processed, 2022

From the partial test results in Table 4. above, the following results are obtained:

1. The significant value of the export price of angel pyama fish (PEp) = $0.000 < \alpha (0.05)$ and the coefficient is negative so the decision to accept the hypothesis means that the price of angel pyama fish has a significant negative effect on the amount of export demand for angel pyama fish.
2. The significant value of the export price of angel pyama fish (PEb) = $0.001 < \alpha (0.05)$ and the coefficient is positive so the decision to accept the hypothesis means that the price of angel pyama fish has a significant positive effect on the amount of export demand for angel pyama fish.
3. The significant value of the exchange rate of the rupiah against the dollar (Nt) = $0.178 > \alpha (0.05)$ and the coefficient is negative so the decision to reject the hypothesis means

that the exchange rate of the rupiah against the dollar has no significant effect on the amount of export demand for angel pyama fish.

Based on the results obtained in Table 4. above, the export demand regression model is as follows:

$$\text{Log } Q^{\text{de}} = 5.092 - 1.166 \text{ Log } \text{PEp} + 2.148 \text{ Log } \text{PEb} - 0.993 \text{ Log } \text{Nt}$$

The regression results above give the following meanings:

1. The constant value is -5.615. This means that if the export price of angel pyama fish, the export price of angel batman fish, the exchange rate of the rupiah against the dollar does not change, there will be an increase in the number of export requests for angel pyama fish by 5.092 per cent.
2. The coefficient value of the export price of angel pyama fish is -1.166, meaning that if the export price of angel pyama fish increases by 1 per cent, it will reduce the total export demand for angel pyama fish by 1.166 per cent.
3. The coefficient value of the export price of angel batman fish is 2.148, meaning that if the export price of angel batman fish increases by 1 per cent, it will increase the total export demand for angel pyama fish by 2.148 per cent.
4. The coefficient value of the rupiah exchange rate against the US dollar is -0.993, meaning that if the rupiah exchange rate against the US dollar increases by 1 per cent, it will reduce the amount of demand for angel pyama fish exports by 0.993 per cent.

Table 5. Simultaneous test results of the export demand model

ANOVA^b

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.441	3	.147	5.022	.005 ^a
Residual	1.260	43	.029		
Total	1.701	46			

a. Predictors: (Constant), Log.PEb, Log.Nt, Log.PEp

b. Dependent Variable: Log.Qde

Source: data processed, 2022



From Table 5. above, a significant value of $0.000 < \alpha (0.05)$ is obtained so that the decision to accept the hypothesis means that the export price of angel pyama fish, the export price of angel batman fish, the exchange rate of the rupiah against the US dollar has a significant effect on the total export demand for angel pyama fish.

Table 6. Test results of the coefficient of determination of export demand

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.509 ^a	.259	.208	.17115

a. Predictors: (Constant), Log.Nt, Log.PEb, Log.PEp

Sumber: data diolah, 2015

In the table above, the R-value is 0.509 that if the R-value or $(0.40 \leq R \leq 0.70)$ then the degree of relationship/correlation between the variables studied is moderate or adequate. The results obtained show that the correlation or relationship between the total export demand and the three independent variables is moderate or adequate. The R square (R^2) number or the coefficient of determination is 0.259. The R^2 value explains the independent variables in explaining the dependent variable. A value close to one means that the independent variables provide almost all the information needed to predict the variation that occurs in the dependent variable. The R square (R^2) value of 0.259 explains that the export price of angel pyama fish, the export price of angel batman fish, and the exchange rate of the rupiah against the dollar can explain as much as 25.9% of the variation that occurs in the amount of export demand for angel pyama fish. While the remaining 74.1% is explained by other factors not studied.

From the research results obtained that the export price of angel batman has a significant positive effect on the amount of export demand for angel pyama, the results obtained are in accordance with the theory that the amount of demand for a commodity is influenced by the price of other related commodities. The positive relationship reflects that angel Batman fish is a complement to angel pyama fish kept by consumers. Empirically, the results obtained are similar to the results of research obtained previously by Yudiarso (2009), a significant positive relationship between crabs and shrimps as related commodities to the amount of export

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demand for angel pyama fish.

From the results of this study obtained the exchange rate of the rupiah against the dollar has no significant effect on the amount of export demand for angel pyama fish, empirically the results obtained in this study are different from those obtained previously empirically, research on factors affecting the export demand of a fishery commodity was conducted by Kasmi (2013), regarding the export demand for angel pyama fish in the European Union, Asia and America. The study used several factors such as export prices and domestic prices of ornamental fish and the exchange rate of the rupiah against the US dollar. From the results of the study it was found that the variables that affect exports are the exchange rate of the rupiah against the US dollar and domestic prices.

The variables studied were only able to explain as much as 25.9% of the ups and downs of export demand, while as much as 74.1% was influenced by factors not studied or outside of this model. This shows that this demand model does not reflect the condition of angel pyama fish export demand in South Sulawesi. There are still other factors that better reflect the conditions of angel pyama export demand in South Sulawesi.

CONCLUSION

Local price, cost of production of angel pyama and batman fish have a significant positive effect on the amount of production/supply of angel pyama fish and the local price of angel batman fish has a significant negative effect on the amount of production of angel pyama fish. The export price of angel pyama fish has a significant negative effect on the amount of export demand for angel pyama fish while the export price of angel batman fish has a significant positive effect on the amount of export demand for angel pyama ornamental fish. The exchange rate of the rupiah against the United States dollar has no significant effect on the amount of export demand for angel pyama fish while the export price of angel pyama fish and batman rupiah exchange rate against the dollar has a significant effect on the amount of export demand for angel pyama fish. Based on the results of this study only found a small part of the variables measured were able to explain the production model, so further research is recommended to use variables/aspects of biology, technology, and conservation policies in the production model. This study only uses local export data, further research adds national export data.



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