SQUID PRODUCTION ON INCOME AND POVERTY LEVEL OF FISHERMEN'S HOUSEHOLDS IN PESAWARAN REGENCY, LAMPUNG PROVINCE

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ABSTRACT

Squid (*Loligo* spp.) contains a high nutritional value and is a fishery resource that can be used as an economic source so that the catch fishery products can be utilized by fishermen to support their household needs and economic. The aim of this study was to determine the relationship between squid fishing and the income and poverty level of fishermen's households. This study was conducted in Sukajaya Lempasing Village, Teluk Pandan District, Pesawaran Regency, Lampung. This study used questionnaires and interviews with 20 respondents of squid fishermen. The results showed that fishermen's education was 75% at the elementary level, and fishermen became the main occupation by 55%. The income of squid fishermen had differences in the catch period, namely the catch of season 1 (2,148,092 IDR) and season 2 (1,352,992 IDR). Based on the BPS category 80% of fishing families are classified as poor, according to the World Bank 90 % during squid season and 100% during the non-squid season are in the category of poor, and according to ADB 50% is classified as poor and 90% is poor during the squid season and not the squid season. Because of these differences, it is necessary to manage local resources to reduce poverty by increasing the awareness of squid fishermen in financial management, supported by increasing local government capacity, and revitalizing local institutions.

INTRODUCTION

The potential of marine fisheries in Pesawaran Regency is spread out in Teluk Pandan District, Marga Punduh District, Punduh Pidada District, and Padang Cermin District. The number of households engaged in marine fisheries is quite high, this is supported by the production level of marine capture fisheries which reached 14,880.92 tons in 2019. In general, squid is known to contain various compounds including bioactive compounds (Jeyasanta and Patterson, 2019), Luminescent Bacteria (Jaelani and Pringgenies, 2019), antioxidants (Nisha and Suja, 2018), and collagen (Raman and Mathew, 2014). In addition, squid is also used as an income source for household economy. Squid are caught by fishermen using squid nets or *bouke ami*, squid fishing rods, ring seines, gill nets, bottom *lampara* and fishing trawls. Squid (*Loligo* sp.) in Indonesian waters are generally caught with 100% squid jigging, 85% cast net and 80% *bouke ami* (KKP, 2010).

Coastal areas are identical with slum and poor areas, even though they are supported by marine fishery production as an economic source. Poverty in coastal areas is caused by several factors, including land changes and food scarcity (Adnan et al., 2020), income management plans (Lawson *et al.,* 2012), climate change (Barbier, 2015), rising sea levels (Handwerger *et al.,* 2012), and distribution of royalties (Aloise de Seabra *et al.,* 2015). The coastal area of Lampung which is vulnerable to the effects of the tsunami also affects the economic condition of the community (Riantini *et al.,* 2021). In general, the income of fishermen in the capture fisheries business is filled with uncertainty and is speculative as well as fluctuational. Therefore, efforts are needed to reduce the poverty level. These efforts can be done by improving and introducing new technologies (Lee and Wie, 2015), presenting

special skills that support long-term sources of income (Autor *et al.,* 2008), and implementing activities related to natural resources that influence the community to change the demand for labor. (Marchand & Weber, 2018).

The characteristics of fishermen can be formed from the influence of available natural resources (Liao *et al.,* 2019). Squid fishermen can get maximum catch by making shifting catches (Alexander *et al.,* 2015). On the other hand, there is a high risk of business with the owners of capital and catching squid that live in a nature full of uncertainty in running a business (Alves *et al.*, 2020). The purpose of this study was to determine the relationship between squid fishing and the income and poverty level of fishermen's households.

RESEARCH METHODS

Time and Research Site

This research was conducted in Sukajaya Lempasing Village, Teluk Pandan District, Pesawaran Regency, Lampung. This study used a saturated sampling method or census with a total of 20 respondents (squid fishermen). The fisherman used fishing gear to collect data. The type of data used in this study were primary and secondary data. Primary data were obtained from interview with fishermen, while secondary data were collected from literatures related to this study, such as books, journals, government documents, etc. Method of data analysis applied was quantitative and qualitative. Quantitative method is used to investigate fishermen condition based on the number obtained from the interview, while qualitative method is applied by observing the real situation in research location (Hardani, 2020).

Primary data were obtained from interviews and questionnaires on squid fishermen in Sukajaya Lempasing

Village, Teluk Pandan District, Pesawaran Regency. Secondary data were obtained from the Central Statistics Agency bureau of Lampung Province, the Department of Fisheries of Pesawaran Regency, and other institutions related to this study.

Data Analysis

Net Income

Fishermen's net income is the difference between income and the total costs incurred by fishermen and can be calculated using the following formula (Rahim and Hastuti 2016).

$$\pi = TR - TC \text{ or } \pi = TVP - TFC \quad\text{............................... (1)}$$

Description: π = Net income, TR = Total revenue, TC = Total cost, TVP = Total value of product, TFC = Total factor cost

The income from the squid fishing business is divided into two, namely income on cash costs and income on total costs. Income on cash costs is squid fishing business income obtained from the reduction between the total revenue and the total cash costs incurred. Revenue, production costs, and income from the squid fishing business per month per squid season, namely cash costs (fuel (gasoline), drinks, food consumption + cigarettes and boat maintenance + engine. Costs calculated include family labor), depreciation expense (boat, engine, squid bait, string, and FAD).

Total Cost

Total cost (TC) is the sum of fixed costs and variable costs which is formulated as follows.

$$TC = TFC + TVC \quad\text{... (2)}$$

Description: TC = total cost (IDR), TFC = Total of fixed costs (IDR), TVC= Total of variable costs (IDR).

Income on total costs, namely the squid fishing business income obtained from the reduction between the total revenue and the total costs incurred, both cash costs and costs are calculated. Cash costs are costs that are paid in cash (physically) incurred by squid fishermen, while calculated costs are costs that are not incurred by squid fishermen but are calculated economically, such as family labor costs and depreciation costs.

Squid Season

The squid fishing season pattern was calculated using time series analysis of the landed squid catch. According to Dajan (1983) as modified by Wiyono (2001), the steps for calculating the method are as follows:

(1) Compile the CPUE series over a period of 5 years:

$$CPUEi = ni \quad\text{... (3)}$$

Description: $i = 1,2,3,.......n$; ni = i-order

(2) Compile a CPUE moving average for 12-month (RG):

$$RG_i = \frac{1}{12}\left[\sum_{i=i-6}^{i+5} CPUE_i\right] \quad\text{.. (4)}$$

Description: RG_i = 12-month moving average ofI i-order, $CPUEi$ = i-order CPUE, i = 7,8,........,n-5

(3) Compile a centralized CPUE moving average (RGP):

$$RG_i = \frac{1}{2}\left[\sum_{i=1}^{i=1} RG\, i\right] \quad\text{.. (5)}$$

Description: RGP_i = i-centralized moving average of CPUE, RGi = 12-month moving average ofI i-order, $i = 7,8,.......,n-5$

(4) Compile the average ratio per month (Rb):

$$Rb_i = \frac{CPUEi}{RGPi} \quad\text{... (6)}$$

Description: Rbi = the average ratio of the i-order months $CPUEi$ = i-order CPUE, $RGPi$ = i-order centralized CPUE moving average.

The Poverty Rate

The criteria used in measuring poverty in this study are the poverty line of the Central Statistics Bureau of the Republic of Indonesia(BPS), the World Bank, and the Asian Development Bank (ADB). The Central Statistics Bureau of the Republic of Indonesia((BPS) used the concept of the ability to meet basic needs (basic needs approach) in measuring poverty. According to BPS (2020), poverty is the inability of a person economically to meet basic food and non-food needs in terms of expenditure.

Poverty rate according to of the Central Statistics Bureau of the Republic of Indonesia (BPS) (2020) was formulated as follows.

$$GK = GKM + GKBM \quad\text{.. (3)}$$

Description: GK = poverty line, GKM = poverty line of food, GKBM = poverty line of non-food

In addition to measuring poverty using an approach to meeting basic needs, also by looking at the percentage of poor people, poverty depth index, and poverty severity index to see the poverty level in society. The percentage of the poor population is the percentage of the population below the Poverty Line (GK). The percentage of poor people is formulated:

$$P_a = \frac{1}{n}\sum_{i-1}^{q}\left[\frac{z-y_i}{z}\right]^a \quad\text{... (4)}$$

Description: a = 0, z = Poverty line, yi = Average expenditure per capita of the population below the poverty line, poverty (i=1,2,3,.....q); yi<z, q= The number of people below the poverty line, n = Total population

Poverty Gap Index-P_1 is a measure of the average expenditure gap of each poor population towards the poverty line. The higher the index value, the farther the average population expenditure is from the poverty line.

$$P_a = \frac{1}{n}\sum_{i-1}^{q}\left[\frac{z-y_1}{z}\right]^a \quad\text{...}\quad (5)$$

Dscription : a = 1, z = Poverty line, yi = Average expenditure per capita of the population below the poverty line (i=1,2,3,.....q); yi<z, q = The number of people below the poverty line, n = Total population

The Poverty Severity Index-P_2 provides an overview of the distribution of expenditure among the poor. The higher the index value, the higher the disparity in expenditure among the poor.

$$P_a = \frac{1}{n}\sum_{i-1}^{q}\left[\frac{z-y_1}{z}\right]^a \quad\text{.................................}\quad (6)$$

Description: a = 2, z = Poverty line, yi = Average expenditure per capita of the population below the poverty line, poverty (i=1,2,3,.....q); yi<z, q = The number of people below the poverty line;n = Total population,

World Bank (2015). The International Poverty line is USD 1.9. According to the World Bank, a population is said to be poor if it has a minimum per capita income per day below USD 1.9. Per capita income is obtained from household income divided by the number of family dependents.

Asian Development Bank (ADB). The level of poverty is also measured based on the criteria of the Asian Development Bank (ADB) in 2014 which refers to this criteria, a population is said to be poor if it has a per capita income per day below USD 1.25

RESULT AND DISCUSSION

Squid Production

The catch of marine fisheries in Pesawaran Regency by type of fish consists of squid (Figure 1). Teluk Pandan has the highest catches annually, from 2017, 2018, and 2019. The catches of Puduh Pidada and Padang Cermin is increasing every year from 2017 to 2019, but the highest catch is in the Punduh Pidada area. Based on the total production, the catches have increased every year from 2017 to 2019 which are 14,598.80 tons/year, 14,748.80 tons/year, and 14,880.92 tons/year, respectively.
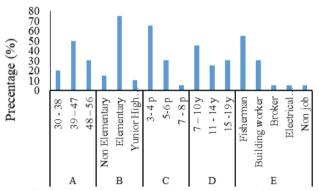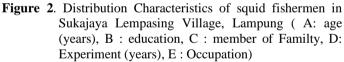

Figure 1. Squid Catches in 2017-2019 in Pesawaran Regency, Lampung Province

The fishing season is a certain period of time in which there are catches in the fishing process. The fishing season is closely related to seasonal fishing activities (Alves et al.,

2020); thus, the season can affect the number of catches. By knowing the fishing season, the timing of fishing can be done more effectively and efficiently. Then it increases again in October-December which coincides with the start of the rainy season. During the rainy season, many squids emerge to the sea surface, making it easier for fishermen to catch. The other research showed that monthly catches peak during the recruitment period (October–January) and spawning period (April– June) (Arkhipkin *et al,* 2015)and night time, and daily catches tend to increase around the full moon, rainy days being the exception (Ueta, 2000). This also is in line with previous studies which found that the highest catch is in June while the lowest production is in January-February and the squid fishing season in Rembang occurs from March to May, and November (Triharyuni and Puspasari, 2012), November and December is the peak of squid fishing in South Bangka Regency (Febrianto *et al.,* 2017)

Characteristics of Squid Fishermen

There are different characteristics of each respondent (Figure 2). These characteristics include age, education level, number of household members, experience as a squid fisherman, and side jobs.

Figure 2. Distribution Characteristics of squid fishermen in Sukajaya Lempasing Village, Lampung (A: age (years), B : education, C : member of Familty, D: Experiment (years), E : Occupation)

The highest characteristics of squid fishermen are influenced by education level. Wekke and Cahaya (2015) also revealed that education level affects fishermen's income; the higher the level of education, the greater the capabiliy to have more skills and not apathetic to the environment. The level of education affects the ability of fishermen to absorb information, the process of adopting new technologies and innovations, as well as influencing the behavior and mindset of fishermen in managing and carrying out business activities. The level and capacity of education also affect the level of ability in financial management (Noviyanti *et al.,* 2015). Most of the squid fishermen in Sukajaya Lempasing Village are in the 39-47 year age group with a percentage of 50%. According to BPS (2020), the productive age group is 15-64 years old. Squid fishermen have a productive age to carry out business activities and indicate that they are still able to work optimally. The higher the number of family dependents, the negative effect on family welfare (Rahmawati *et al.,* 2021; Andriadi *et al.,* 2021)

Production Cost of Squid Fishing Business

Production costs are costs incurred by squid fishermen in catching squid, consisting of variable costs and fixed costs. The production cost of squid fishing business is calculated in units of rupiah per month. Details of the production costs of squid fishing business in Sukajaya Lempasing Village can be seen in Table 2. Revenue from squid fishing business is obtained from the multiplication of the amount of squid production/catch with the selling price of squid.

Table 2. Production, Selling Price, and Revenue from Squid Fishing Business Per Month Per Squid Season

Description	Unit	Squid season 1	Squid season 2
Production	Kg	159,5	112,5
Selling price	Rp/Kg	32.000	35.000
Revenue	Rp	5.104.000	3.937.500

Table 2 shows that there are differences in revenue in each squid season. The difference in revenue is caused by the different production and selling prices in each season. The catch in squid season 2 is lower than squid season 1 due to differences in wind seasons and abundance of squid in the sea. In squid season 2, there was a west monsoon which caused the rainy season, thus hampering the activities of fishermen to catch squid. In addition, the selling price received by fishermen is also different; the price in season 1 was lower because it coincided with the onset of the covid outbreak in Indonesia which made it difficult for middlemen to sell squid outside Lampung and only sold it to local consumers. Squid fishing business also requires institutions or organizations to monitor and control the stability of prices and weather conditions. (Riantini *et al.,* 2017) indicated that institutions play essential role in reducing vulnerability to poverty levels through fishing groups, and market availability.

Revenue from Squid Fishing Business

The income from the squid fishing business comes from the revenue earned by the squid fishermen which has been deducted by the total costs incurred. Revenue from the squid fishing effort is obtained from the multiplication of the squid production/catch with the squid selling price. The squid fishing effort in Sukajaya Lempasing Village in a year has two squid seasons, namely squid season 1 (March-May) and squid season 2 (October-December). The income from the squid fishing business in Squid seasons 1 and 2 are presented in Table 3.

Table 3. Revenue, production costs, and squid fishing business income per month per squid season

Description	Squid season 1 (IDR/mounth)	Squid season 2 (IDR/mounth)
1. Revenue	5.104.000	3.937.500
2. Production Cost		
Total cash cost	997.608	866.208
Total Cost Calculated	1.958.299	1.718.299
3. Income		
Income on cash costs	4.106.392	3.071.292
Income on total cost	2.148.092	1.352.992

The difference in net income is caused by differences in revenue and total costs in each squid season. The income in Squid Season 1 is greater than in Squid Season 2 due to higher revenue. The average catch in squid season 1 was 159.5 kg per month with a selling price of 32,000 IDR while in squid season 2 the catch of squid decreased from 112.5 kg with a selling price of Rp. 35,000 IDR. Therefore a large difference in the net income of squid fishermen in each squid season may occur. If the income and expenditure of the daily needs of fishermen's households are not balanced, then the vulnerability to poverty increases (Riantini *et al.,* 2019).

Analysis of Poverty Level of Squid Fisherman's Household

Based on Table 4, food expenditure has the highest percentage of total household expenditure of squid fishermen with a percentage of 70.98%. Higher food expenditure indicates that fishermen prioritize food needs over other needs. The household expenditure of the squid fishermen is then compared with the poverty line to measure the level of poverty. The poor are people who have an average expenditure per capita per month below the poverty line, which is below 437,108 IDR /capita/month.

Table 4. Food and Non-Food Expenditure Per Month For Squid Fishermen in Sukajaya Lempasing Village

Type of expenditure	Average of expenditure (IDR/month)	Percentage (%)
Food expenditure		
Total food expenditure	1.078.550	70,98
Total non-food expenditure	441.029	29,02
Total household expenditure	1.519.579	100,00

Total food expenditure is higher than non-food expenditure. The income of squid fishermen is used to meet household needs compared to other expenses.

Category of Poverty

The distribution of the poverty level of squid fishermen based on the BPS poverty line criteria in Sukajaya Lempasing Village is presented in Table 5.

Table 5. The distribution of the poverty level of squid fishermen based on the BPS poverty line criteria in Sukajaya Lempasing Village

No.	Category	Number (people)	Percentage (%)
1.	Poor	16	80
2.	Not poor	4	20

Based on Table 5, squid fishermen are classified as poor because household expenditures are below the poverty line of Lampung Province. BPS (2020) in measuring poverty is further deepened by measuring the value of the poor (the poor percentage is the proportion of the population living below the poverty line), the poverty depth index (the Poverty Gap Index (P_1) is an average expenditure gap of each poor population towards the poverty line. The higher poverty gap index value, the farther average population expenditure from the poverty line), and the poverty severity index (The Poverty Severity Index (P_2) provides a distribution overview of poor people expenditure. The higher severity index value, the higher expenditure disparity among the poor people). The amount of

household expenditure of squid fishermen is also influenced by the size of the squid fisherman's household income. (Hakim, 2016) also added that the weak management system of the household economy also affects the level of poverty.

The World Bank in measuring household poverty uses the international poverty line. The World Bank sets the international poverty line at USD 1 per capita per day. The calculation of the poverty level based on World Bank criteria is obtained by comparing the per capita income per day obtained by squid fisherman's households with a standard of USD 1.9 or equivalent to the rupiah exchange rate of IDR 26,990. A comparison of the poverty level of squid fishermen during the squid season and non-squid season based on the World Bank criteria can be seen in Table 6.

Table 61. Comparison of The Poverty Level of Squid Fishermen During The Squid Season and Non-Squid Season Based on the World Bank Criteria in Sukajaya Lempasing village

Category	Category	Season		non-squid season	
		people	%	people	%
World Bank	Poor	18	90	20	100
	Not poor	2	10	0	0
ADB	Poor	10	50	18	90
	Not poor	10	50	2	10

Based on Table 6, during the squid season, fishing families are in the poor category with a percentage of 50%, while during the non-squid season, there is an increase in poverty in the poor category with a percentage of 90%. The Asian Development Bank (ADB) sets a per capita income per day at USD 1.25 or equivalent to the rupiah exchange rate of IDR 17,756 belongs to poverty criteria, while the poverty criteria set by the World Bank is USD 1.9 or equivalent to the rupiah exchange rate of IDR 26,990 per capita income per day.

CONCLUSION

The household income of squid fishermen is IDR 2,515,917 per month during the squid season and IDR 1,582,500 per month during the non-squid season. The poverty level of squid fishing households is high, both based on the poverty line criteria set by the Central Statistics Bureau, World Bank and Asian Development Bank (ADB). The management plan is to incorporate the priorities and needs of local resource users, reducing poverty while increasing resource users' awareness of more appropriate mechanisms for managing coastal resources. The relationship between income and poverty level of fishermen's households on squid production is influenced by seasons. In addition, the level of education affects the characteristics of income and poverty.

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