Journal of Socioeconomics and Development

https://publishing-widyagama.ac.id/ejournal-v2/index.php/jsed

Are social conditions important to increase household income? The case of coastal fishers in Makassar City, Indonesia

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ARTICLE INFO

►**Research Article**

Article History
Received 6 July 2022
Accepted 30 August 2022
Published 3 October 2022

Keywords
coastal fishers; household income; small-scale fishery; woman empowerment

JEL Classification
D10; Q22; Z10

ABSTRACT

Social conditions strongly influence changes in household income because they play a critical role in improving the household welfare of coastal fishing communities. The purpose of the study is to analyze the influence of social conditions on the growth of fisherman's household income in Makassar City, Indonesia. Quantitative research method using survey instrument was addressed to 46 fishers' households by applying the purposive sampling technique. The analytical method used was multiple regression with the exponential function model. This study found that social factors such as the age of the head of the family and the number of working family members contributed to changes in the increase in household income because they had a significant positive effect. On the other hand, the number of dependent household members did not contribute anything because it had a negative effect on changes in the income level of fishers' households. Likewise, the wife's level of formal education did not affect the household income. Related to social factors as a determinant of improving the fishers' household economy, efforts to increase it can be made through on-fishing and off-fishing. On-fishing is carried out with the support of a gross tonnage boat. Household members do off-fishing in postharvest handling, handling, processing, and marketing marine products.

To cite this article: Rahim, A., Hastuti, D. R. D., Bado, B., & Astuty, S. (2022). Are social conditions important to increase household income? The case of coastal fishers in Makassar City, Indonesia. Journal of Socioeconomics and Development, 5(2), 188-198. https://doi.org/10.31328/jsed.v5i2.3832

ISSN 2615-6075 online; ISSN 2615-6946 print

INTRODUCTION

Marine fisheries have an essential role in social development (Nguyen et al., 2022) to achieve sustainable development goals (Eriksson et al., 2017; FAO, 2020). The marine fisheries sector is still a mainstay for most coastal communities whose livelihoods are fishers. Fishing communities living in coastal areas can take advantage of the natural resources found in the ocean. The potential of capturing fisheries resources can be used to increase income which is expected to improve the welfare of fishers' households. However, the reality is that many fishers still have not been able to increase their catch (Lein & Setiawina, 2018). Fishers' poverty rate (Teh et al., 2020) and their welfare generally occupy the lowest stratum compared to other communities on land. Revenue from marine products is a source from the sea, while other income comes from land (Parashar et al., 2016). Both are referred to as fishers' household income. The size of household income will affect household consumption expenditure. Household income and consumption expenditure are part of the household economy (Hastuti et al., 2021; Michael et al., 2010)

Most of the coastal fishing households in Makassar City still rely on work as fishers to fulfill their household needs. Meanwhile, the rest rely on family members who are fishers' wives with low education. This phenomenon is a social condition that can affect changes in household income. In another case, economic conditions such as fishing business and non-catch income are parts of household income, so they are not factors in fishers' household income. Social conditions or social factors play a critical role in alleviating poverty in coastal fishing communities (Islam et al., 2011). The poverty experienced by fishing communities will cause the community's ability to weaken in developing their neighborhood and improve their social welfare. Social, economic, and cultural factors can influence fishers' decisions (Bisack & Clay, 2020; Marín-Monroy & Ojeda-Ruiz de la Peña, 2016) in improving their household economy locally and nationally (Ng'onga et al., 2019) and globally. The global fisheries sector is critical to the world's most vulnerable communities' socio-economic well-being and food security (Bose et al., 2020). The phenomenon of social conditions will provide opportunities to improve conservation policies (Boubekri et al., 2022) for the welfare of coastal fishing communities.

Many studies on the social and economic conditions of fishers' households have been conducted in various countries, such as social information on the risk behavior of small-scale fishers in Africa (Dannenberg et al., 2022). However, studies of social conditions specifically as an essential factor in increasing fishers' household income have never been carried out. In Bangladesh, the main determinants of fishers' resilience are social capital of fishers' household income (Islam et al., 2011) and social capital (Hossain & Banik, 2022). Furthermore, social capital and participation play an essential role in the small-scale fisheries governance system in the Gulf of California, Mexico (Nenadovic & Epstein, 2016). Other studies include the factors affecting the socio-economic and welfare of artisanal sea cucumber fishery in the Pacific Islands (Purcell et al., 2016), the effect of household socio-economic factors on seagrass beds (household income, number of adults, number of children) and adaptive capacity (alternative livelihoods, ownership of fishery assets) in the Indo-Pacific (Jones et al., 2022), and the social conditions for fishers provide opportunities to improve conservation policies in Algeria (Boubekri et al., 2022). In Indonesia, Vibriyanti (2019) conducted a descriptive study of socio-economic factors that affect the household income of captured fishers in Kendari City. However, studies of social conditions specifically as an essential factor in increasing fishers' household income have never been carried out.

Although social conditions or social factors cannot directly affect fishers' household incomes, such as catches, they have a crucial role in the economic contribution of the household. Those factors include the number of working family members (Manyungwa et al., 2019; Rahim et al., 2021), the wife's education level (Fesanrey et al., 2020; Hao, 2012; Rahim & Hastuti, 2018), the age of the head of the family (Lein & Setiawina, 2018), and the number of family members (Hao, 2012). The social conditions of coastal fishing communities play a vital role in alleviating poverty in coastal communities. Poverty will make the community's bargaining position in developing the region and improving social welfare to be weak. Social factors can be regarded as social information (de Oliveira Estevo et al., 2021; Manyungwa et al., 2019) because they relate to a person's behavior in making risky decisions in the life of fishers. In addition, the opportunity to improve conservation policies is also related to the social conditions of fishing communities. Based on this description, this paper aims to analyze the influence of social conditions as a determining factor of changes in the household income of fishers in coastal areas. The results of this study can be used as a material for policymakers to improve the welfare of coastal fishers.

RESEARCH METHOD

The research was conducted in the coastal area of Cambaya Village, Ujung Tanah District, Makassar City, Indonesia. The research method used was quantitative with a survey instrument to estimate the household income of small coastal fishers. Cross-section data were used from a survey of fishers' households. Questionnaires were given to 46 respondents by applying the purposive sampling technique. The analysis method used was multiple regression with the exponential function model (equation 1). This model analyzes the estimated household income of small-scale fishers with variables (age of the head of the family, wife's education, dependent family members, and working family members) which are considered essential.

$$FsHIc = \beta_0\, AgHH^{\beta_1} WfEd^{\beta_2} NFDp^{\beta_3} NWFMbr^{\beta_4}\, \mu \quad (1)$$

Furthermore, to facilitate the calculation of the regression, the double log method or natural logarithm was used as follows:

$$FsHIc = \beta_0 + \beta_1\, LnAgHH + \beta_2\, LnWfEd + \beta_3 LnNFDp + \beta_4\, LnNWFMbr + \mu \quad (2)$$

Where $FsHIc$: fishers' household income (IDR, rupiah); β_0 and β_6 are intercepts; $\beta_1, \ldots, \beta_4$ are regression coefficients of the independent variable; $AgHH$ is age of head of household (years); $WfEd$ is wife's education (years); $NFDp$ is the number of family dependents (people); $NWFMbr$ is the number of working family members (people); and μ is an error term.

Equation (2) was supported by measuring the model's accuracy (adjusted R^2). It was also supported by hypothesis testing (F-test and t-test) and testing the classical assumptions, such as multicollinearity and heteroscedasticity (Gujarati & Porter, 2009). The goodness of fit model was calculated by using

$$Adjusted\ R^2 = 1 - (1 - R^2)\frac{(n-1)}{(k-1)} \quad (3)$$

where $Adjusted\ R^2$ is adjusted determination coefficient, *k* is the number of variables (not including the intercept), and *n* is sampling numbers. The hypothesis testing of the regression coefficients used *F-test* with a certain confidence level:

$$F\ test = \frac{ESS/(k-1)}{RSS/(n-k)} \quad (4)$$

$$F\ table\ [(k-1):(n-k);\alpha] \quad (5)$$

For testing on the partial regression coefficients, t-test was used with a certain level of confidence:

$$t\ test = \frac{\beta i}{S\beta i} \quad (6)$$

$$t\ table\ [(n-k);\alpha/2] \quad (7)$$

where β_i is the regression coefficient of *i*. $S\beta_i$ is the standard error of the regression coefficient of *i*. Furthermore, the multicollinearity test used the Variance Inflation Factor (VIF) method :

$$VIF = \frac{1}{1-R_j^2} \quad (8)$$

R_j^2 was received from auxiliary regression between the independent variables and dependent variables, where if VIF < 10, there is no multicollinearity. Another case is the heteroscedasticity test using the *Glejser* method with regression of the absolute value with independent variables. *Glejser* suggests performing the following residual functions : (Gujarati & Porter, 2009)

$$\hat{e}_i = \beta_0 + \beta_1 X_i + v_i \quad (9)$$

$$\hat{e}_i = \beta_0 + \beta_1 \sqrt{X_i} + v_i \quad (10)$$

$$\hat{e}_i = \beta_0 + \beta_1 \frac{1}{X_i} + v_i \quad (11)$$

$$\hat{e}_i = \beta_0 + \beta_1 \frac{1}{\sqrt{X_i}} + v_i \quad (12)$$

If the coefficient of β is not significant through the t-test, there is no heteroscedasticity. Instead, if β is significant, the model contains heteroscedasticity.

RESULT AND DISCUSSION

Socioeconomic and Budgetary Background

The fishers' household income in the coastal area of Cambaya Village, Ujung Tanah District, Makassar City came from income from fishing and non-catching businesses. The income from the fishing business came from revenues (catch production and fish prices) minus operational costs per trip. Non-catch income came from other businesses (salted fish processing business). Income from the fishing business was certainly not enough to be used for household needs, so non-fishing activities (other livelihoods) were needed.

Most of the fishing households in the coastal area of Cambaya Village, Ujung Tanah District, Makassar City still relied on work as fishermen to meet their household needs. Fishers did fish activities every day (except Friday) in the afternoon and returned home at dawn or in the morning. The rest of the time was used to rest. On Friday, it was customary or cultural for the people in Cambaya Village to worship Friday prayers while resting and repairing fishing gear equipment (fishing nets and boats/boats).

Table 1. Household Income of Coastal Fishers

Household Income	Frequency	Percentage
		%
≤1,000,000 rupiah	0	0.00
1,000,000–2,999,999 rupiah	32	78.26
≥3,000,000 rupiah	14	11.74
Total	46	100.00
Fishing business income (rupiah)		2,551,560.87
Non-catch income (rupiah)		205,434.78
Fishers' household income (rupiah)		2,756,995.65

Note: US$1 = 15,000 rupiah (IDR15,000)

The average household income of fishers in the sample area was 2.7 million rupiah per month. The income came from the contribution of fishing (IDR2.5 million) and non-catch income from fishers' wives (IDR205 thousand). The distribution of household income was dominated by 32 fishing households (78.26%) between IDR1 million – IDR2.9 million. In comparison, IDR3 million were 14 households (11.74%). In Vietnam, fishers' household income from fishing and aquaculture is VND 100,000 – 150,000, and fish processing is VND 150,000 – 250,000, with the contribution of women fishers each being 20% (Hao, 2012). According to Islam et al. (2011), various livelihood assets outside the fishing business contribute to fishers' household income. It is different from the West coast of USA, in that the source of income for fishing is lower than non-fishing sources (Norman et al., 2022). In general, fishers' household incomes are highly dependent on sea fishing businesses such as seagrass beds (Jones et al., 2022). In addition, marine resources such as coral reefs as food providers (Cordeiro et al., 2021) and mangrove forests as a place to live for various kinds of biodiversity (Chamberland-Fontaine et al., 2022) can have an impact on improving the economy and welfare of fishers' households.

The results of the multicollinearity test do not show multicollinearity because the VIF was less than ten. Furthermore, the heteroscedasticity test shows that the Glejser test coefficient (β) was insignificant, so it is concluded that there was no heteroscedasticity. The measurement of the model with Adjusted R2 shows that the independent variable contributed as many as 67.2%, while other variables not included in the model contributed 32.8%. Testing of the calculated F-test hypothesis shows that all independent variables simultaneously affected household income. Furthermore, the individual (partial) effect was shown by testing of the t-test hypothesis (Table 3). The social condition variable in this study was used as a variable affecting the fishers' household income, the age of the fisherman, the education of the fisherman's wife, the number of family members borne, and the number of working family members (Table 2).

The productivity of the head of the family, mainly working in the capture fisheries sector, was influenced by his physical condition. Age generally influences physical conditions. The higher the age level, the more mature in terms of physical and maturity in thinking. In addition, at a certain level, it will cause a decrease in physical power and affect productivity in carrying out economic activities. The age of the head of the family as a social factor had a positive and significant effect on fishers' household income at an error rate of 5% or a 95% confidence level (Table 3). As the age of the head of the family, in this case, fishers, increases, household income will increase. It is proven by the fact that most of the head of household respondents were still in the productive age group in catching fish. Age 15-64 years (45 heads of household with a percentage of 97.78%) dominated the age of the head of household (Table 2).

Table 2. Social Condition of Coastal Fishers

Description	Frequency	Percentage %
Age of head of household		
15–64 years	45	97.78
≥65 years	1	2.22
Total	46	100.00
Wife's education		
No School	16	34.78
Elementary school	14	30.43
Junior high school	10	21.73
High school	6	13.06
Total	46	100.00
The number of family dependents		
3-5 people	27	58.69
≥6 people	19	41.31
Total	46	100.00
The number of working family members		
0 people	38	82.60
8 people	8	17.40
Total	46	100.00

The increasing age of fishers shows their work experience and increases in their work in catching fish (Kim et al., 2020). Likewise, in Taiwan, fishers who have reached the age of 40 are of productive age in producing catch production (Lu et al., 2020). In addition, fishers support their household economy in the research area by supporting their wives and children. According to the age group, the head of the family who was no longer productive in carrying out fishing activities was one person with a percentage of 2.22%. Working as a fisherman demands a good amount of physical fitness, so age is an essential factor in choosing a profession (Baruah & Hazarika, 2019), along with other social factors in this study such as the wife's education, the number of family members covered, and the number of working family members.

Table 3. Estimation of the Influence of Social Conditions on the Household Income of Coastal Fishermen

Independent Variable	E.S.	Coefficient (β_i)	t-test	Sig	VIF	Glejser Test
Age of head of household	+	0.248**	2.290	0.024	1.526	0.126
Wife's formal education	+	0.042	0.687	0.960	1.159	0.217
Number of family dependents	+	- 0.014**	- 2.401	0.035	1.033	0.145
Number of working family members	+	0.194***	2.114	0.010	1.357	0.167
Intercept						13.832
F-test						2.812
Adjusted R^2						0.672
Sample size (n)						46

Notes: *** and ** denote significant level at 1% and 5%; ES is an expectation sign. If the VIF value is less than 10, then there is no multicollinearity; otherwise, if VIF value is greater than 10, then multicollinearity occurs. If the Glejser test coefficient (β) value is not significant, then it is not available heteroscedasticity; otherwise, the Glejser test coefficient (β) value of β significant, then there is heteroscedasticity

The following social factor is that the formal education of the fisherman's wife did not affect her household income (Table 3). This finding is not in line with the research by Adili & Antonia (2017) where in Tanzania, the Indian Ocean, education affects fishermen's household income. This happens because of the low education of fishermen's wives. Coastal fishermen women in Cambaya Village, Ujung Tanah District, Makassar City still had a low level of formal education, especially fishermen's wives. The fisherman's wife's formal education level consisted of no primary school, elementary school, lower secondary school, and high school. Most coastal fishermen's wives, namely 16 people (34.78%), did not earn education in school. The highest education level was only high school, as many as six people (13.06%) (Table 2).

The low level of education of fishermen's wives in Indonesia causes a lack of wife contributions in providing information and knowledge about the marine sector (Rahim & Hastuti, 2018). Similarly, Hao (2012) found a low level of education for women in Vietnam's fishing households. In increasing the household income of fishermen, it was usually the wife who did other activities to bring in additional income. In the research area, the wife earned an additional income and helped sell her husband's catch (fishermen) in fresh or processed form, such as salted fish, although most of their household income comes from catches (Table 1). The role of the wife in looking for additional income was very prominent during the famine season when the husband (fisherman) could not go to sea. In addition, the wife managed more of her household finances and as well as her household members, such as preparing food and drink for her children and monitoring their schooling.

The education of fishermen's wives is related to creativity in decision-making in managing the household economy. Although generally, the husband as the head of the household has a higher education level than his wife. Women's education can be rational decision-makers in their households, especially in their family consumption expenditures (Rahim et al., 2021). Education as an indicator of human resources is the essential component in influencing the quality of human behavior and positively impacts a person's life behavior to improve the standard of living of his family (Ramadhan et al., 2017). Formal education will provide better knowledge, for example, family financial arrangements where Indonesian fishing households are known as wasteful people and find it difficult to save money and use it to increase household assets. According to Rahim et al. (2021) formal education can also be used as an indicator to measure productivity and the ability to manage business capture so that they dare to take risks in the business.

As the head of the family, fishermen in the coastal area of Cambaya Village, Ujung Tanah District, Makassar City had a small number of family members, namely six people or 41.31% (Table 2). The number of family dependents had a negative effect on household income at an error rate of 5% with a 95% confidence level (Table 3). Each increase in the number of family dependents will reduce household income. However, fishing households in the research area did not affect productivity in fishing activities. In addition, as heads of households, fishers have realized a great responsibility in providing for their wife and their many children. Coastal fishing communities have adopted the slogan in their regions (South Sulawesi

Province in particular Makassar City): "many children (means) much fortune".

The number of dependents as a household characteristic may include dependence on marine resources for livelihood (Muallil et al., 2013) and the household income of fishers (Jones et al., 2022). In addition, household dependents are also related to the amount of consumption expenditure in a household, both food and non-food. The consumption expenditure will be an impetus in increasing household income both from the catch and outside the catch. It affects work productivity and encourages work enthusiasm to increase income. It affects household spending (Rahim et al., 2021).

A large number of working family members has implications for additional sources of income. Furthermore, the number of working family members positively affected household income at an error rate of 1% or a confidence level of 99%—the purpose of increasing family members who work to increase household income opportunities. The working family member was fishers' wife, which was only eight people (17.40 %) from 46 fishing households. The wife's role as a household member in coastal areas was not only as a housewife but also in carrying out productive activities to increase household income, such as processing salted fish. The raw material for processed fish came from the husband's catch. Processed salted fish were made and directly sold to consumers. The business had no legal entity nor operating license, and used simple technology.

The average income of fishers' wife reached Rp. 205,000 per month from the total household income (Table 1). The income of fishers' wives as salted fish processors was very dependent on the catch from their husbands, while the husband's catches had low economic value. The uncertainty of income obtained by the head of the family as a fisherman encouraged other household members, such as wives, to work to meet the needs of household life. The results of this study differ from Ameyaw et al. (2020) in Ghana in that the role and contribution of women to the fisheries sector are under-recognized and under-documented. Even though the wages of women workers (fishers' wives) are lower than men (fishers as husbands), they can complement or meet their household needs.

The work carried out by the wife and head of the family in a fisherman's household had the same characteristics because it depended on the season. Working family members such as fishers' wives can reduce the burden on their husbands (fishers) as the head of the family and increase income in the family to meet their needs. When the income of the head of the family increases, the income tendency of fishers' wives also increases. Its contribution impacts changes in household income even though it is small. So, business development outside the capture fisheries sector is critical, considering the level of income from the fishery sector is still low because it is strongly influenced by the season.

Research Implication

Globally, the capture fisheries sub-sector, especially small-scale fishermen, has impacted economic and social development in developing countries, especially Indonesia. In addition, its contribution has supported the livelihoods and well-being of more than 500 million people worldwide and is an important source of income for the world's fishermen (Barnes-Mauthe et. al., 2013). Although it is part of economic development, the level of welfare is still below other sectors. Generally, it occupies the lowest stratum compared to other communities on land, even as a marginal group (Asiedu et al., 2013). Small-scale fishermen are also referred to as the poorest group in all countries with the attribute of the poorest of poor. According to Rahim et al. (2019), ironically, as many as 32.14% of the 16.42 million coastal community members in Indonesia still live below the poverty line with an income of US$1 per day or a monthly income per capita of US$7-10.

International fisheries policy through the Committee on Fisheries (COFI) has supported the sustainable development and protection of small-scale fisheries in the context of producing two-thirds of all catch targeted for direct human consumption and providing 90% of employment (FAO, 2016). The purpose of fisheries development in Indonesia is to improve the welfare of fishermen and other coastal communities through the development of economic activities, increasing the quality and quantity of human resources, strengthening socio-economic institutions, and optimal and sustainable use of marine and fishery resources (Rahim et al., 2019).

In relation to household income earned by fishermen, it is strongly influenced by social, economic, and technological conditions. In this study, social factors can be considered social information (de Oliveira Estevo et al., 2021) because they are related

to a person's behavior in making risky decisions in the life of fishers. It has an essential role in alleviating poverty in coastal communities (Manyungwa et al., 2019). Social conditions or factors in the form of fisher's age, wife's education, number of working family members, and number of family dependents are important factors in increasing fisher's household income as an economic factor. Household income is income from fishing business and non-catch income.

Social conditions such as age level affect the productivity of fishers based on their physical strength so that they determine their attitude in deciding to fish at sea. The fisher's age is more important than the fishing experience. According to Liao et al. (2019), the age of fishers influences attitudes and perceptions of fisheries management. This can impact economic development, especially capture fisheries in coastal areas. With the age of fishers still productive, it will have implications for increasing income through knowledge, skills, collaboration, and learning in terms of fishing in the sea. This is in line with the findings of Muallil et al. (2013) in the coastal areas of the Philippines, that younger fishers catch fish more often than older ones.

Increased knowledge and skills are related to the education of fishermen's wife through empowerment. Empowerment is related to the ability of individuals or communities with social awareness to gain greater independence in building balance in community relations (Wiber et al., 2009). About fisheries management, empowerment is a mechanism to provide change to influence the future of fishermen in their communities (Kabir et al., 2011). Empowerment of fisher's wives can be done through skill-based literacy education programs such as reading, writing, arithmetic, and learning skills. Skills education in coastal areas is very necessary, because women are not only required to accompany their husbands but also increase household income through mastering more productive skills such as making salted fish which they have been working on so far. The empowerment of women fishermen is a form of participation and decision-making process to diversify, innovate, develop new markets, and maintain sustainability and the future (Freeman & Svels, 2022). Based on this, it can further improve the household economy so that it also has an impact on the economic development of coastal areas. Sustainable management of small-scale fisheries requires a balance in achieving socio-economic goals (Ninef et al., 2019). Sustainable fisheries development in several coastal areas (Peng et al., 2021). Efforts to improve the socio-economic aspects of small-scale fishers are to increase household income which can be carried out gradually and involve various interested parties.

In addition to social factors as a determinant of increasing fishers' household income, efforts to increase it can be made by on-fishing. Fishing can be carried out by the head of the household, namely fishers, through fishing businesses with the support of boats with a strength of 50-100 gross tonnage (Boesono et al., 2016) with in-board machines used by modern or large-scale fishermen. Outboard motor boats with a power of 3-10 gross tonnage (Amron et al., 2021) or power knots with outboard engines are used by traditional or small-scale fishermen (Rahim et al., 2020). The power of fishing boats/boats to reach the fishing ground as fishing grounds in the territorial sea (Pho Hoang Han, 2007) or the Exclusive Economic Zone of 200 nautical miles (Rowlands et al., 2019) for motorboats and 6 to 12 miles for motorboats paste. In addition, it is also equipped with modern, environmentally-friendly fishing gear in the form of fishing rods and nets. So, social conditions or factors on household income (catch and non-capture income) will have profound implications for fisheries management, poverty alleviation policies, and fisheries economic development worldwide.

CONCLUSION AND SUGGESTION

The findings of this study indicate that social factors such as the age of the head of the family and the number of working family members make the most significant contribution to increasing household income because they have a significant positive effect. It happens because the age group is classified as productive, and there are many family members, so fishers work diligently to catch fish. In contrast, the number of dependent family members has not provided the most significant contribution because it has a negative effect on changes in the income level of fishers' households. However, the husband's responsibility as the head of the family is still carried out towards his wife and children. Furthermore, the wife's variable level of formal education does not affect household income. It happens because the level of formal education is still deficient, so it affects decision-making in the household.

Based on the findings, social factors such as the formal education of fishers' wife need to be considered. Increased education of the wife as a working family member will impact increasing household income. In addition, the wife can manage finances in household consumption expenditures, earn additional income, help sell her husband's catch (fishers) in fresh or processed form, and manage household members (children). So, the education of fishers' wife is related to creativity in decision-making in managing the household economy. For this reason, learning programs are needed to increase knowledge, skills, and creative attitudes, such as empowerment in the form of knowledge, technology, and family management. The empowerment of women fishers is crucial to providing knowledge and skills relevant to the marine potential in coastal areas. The women are involved in marketing marine products after processing fish whose fresh raw materials are obtained by fishers.

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