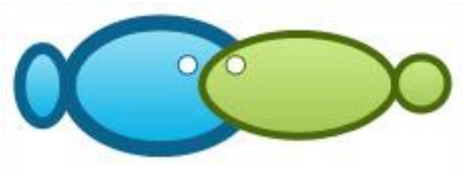

The small-scale fisher's welfare in Semayang Lake, Indonesia: an analysis based on fisher terms of trade index

[1]Qoriah Saleha, [2]Erwiantono, [3]Jailani, [2]Freddy Maryanto, [4]Heru Susilo

[1] Laboratory of Fisheries Agribusiness, Faculty of Fisheries and Marine Sciences, Mulawarman University, Indonesia; [2] Laboratory of Coastal Community Development, Faculty of Fisheries and Marine Sciences, Mulawarman University, Indonesia; [3] Department of Water Resources Management, Faculty of Fisheries and Marine Sciences, Mulawarman University, Indonesia; [4] Laboratory of Fisheries Resource Economics, Faculty of Fisheries and Marine Sciences, Mulawarman University, Indonesia.
Corresponding author: Q. Saleha, qoriah.saleha@fpik.unmul.ac.id

Abstract. The present study was developed to evaluate small-scale fisher's welfare and determine the factors influencing it. Fisher terms of trade (FTT) index and the Tobit model were involved. Data was collected from 100 small-scale fishers using the cross-sectional technique. Results revealed that the FTT index value was 1.21, implying small-scale fishers were in adequate prosperity. Moreover, results also showed that education, experience, operational costs, revenue, and fisher group variables are statistically significant on the FTT index. The fisher's welfare can be increased by providing an infrastructure for education, improving technology, supplying incentives or subsidies for improving fishing activities and providing low-interest loans and credit facilities as financial support.
Key Words: gill nets, Mahakam Cascade Lake, Tobit model, poverty.

Introduction. Worldwide, fisheries are a crucial sector since they contribute to poverty alleviation, food security, and the suggested daily intake of omega-3 fatty acids (Belton & Thilsted 2014; Belhabib et al 2015; Susilo et al 2022; FAO 2022a). The world's fish production in 2020 reached 177.8 million tons, where almost 54% or 90.3 million tons come from capture fisheries. Of this, more than 37.88 million workers were engaged in capture fisheries (FAO 2020). Of overall capture fisheries, about 40% comes from small-scale fisheries (SSF), and at least 12.74% or about 11.5 million tons was estimated to originate from inland fisheries (FAO 2022a; FAO 2022b). Furthermore, Indonesia is one of the leading fish-producing countries in global inland water capture production, ranking sixth after India, China, India, Bangladesh, Myanmar, and Uganda (FAO 2020). Moreover, Ministry of Marine Affairs and Fisheries Republic of Indonesia (IMMAF 2022) reported that the absolute value of Indonesia's inland water capture production in 2022 was calculated at 0.58 million tons, accounting for 7.20% of Indonesia's capture fisheries.

Although fisheries play an important role in livelihood, it is one of the most impoverished sectors. World Bank (2020) documented that globally, about 689 million people were in extreme poverty in 2017, with 48% coming from rural and coastal areas. Moreover, almost 62.2% of people work in agriculture, and fisheries are among the world's poorest. On the other hand, poverty rate reduction in Indonesia is progressing slowly. The decrease in poverty in 2019 compared to the previous year only reached 2.06%, with 25.14 million poor people (BPS 2020; Susilo et al 2021).

Many factors have indicated that SSF engaged in poverty. Béné (2003) explained that poverty among fishers was caused by the disruption of their livelihoods due to resource degradation or depletion. Lack of national government attention to the SSF compared to industrial fisheries, particularly subsidies and improving fishery

management systems (Villasante et al 2016; Schuhbauer et al 2017; Outeiro et al 2018). Also, Primyastanto et al (2013) proved that age and experience of fishers at sea influenced poverty. On the other hand, SSF's poverty in Indonesia is mainly caused by overfishing, impairment of marine resources and a fisher's debt patronage connection with traders (Adhuri et al 2016), and diminished fisheries productivity and conflict (Muawanah et al 2012).

Currently, the Ministry of Marine Affairs and Fisheries Republic of Indonesia focuses on improving SSF's welfare to reduce the poverty rate, particularly post-pandemic COVID-19, which caused a decline in fish prices and hampered the distribution of fishing (Campbell et al 2021). An instrument to measure the welfare of SSF is required to identify an accurate description of changes in small-scale fisher's welfare. The indicator of farmer income changes has been employed in recent years to identify the SSF's welfare. However, it is still not accurate to calculate the SSF's welfare since the consumption needs as an expenditure instrument are ignored. IMMAF introduced the new concept of measuring the fisher's welfare by publishing the general and technical guidelines in 2001 through the Directorate General of Coasts and Small Islands (Basuki et al 2001). This concept was the fisher terms of trade (FTT) that considered the revenue and expenditure of the fisher's family (Basuki et al 2001). In addition, FTT identifies fisher's purchasing power in meeting their daily needs (Bidarkota & Crucini 2000; Anna et al 2019; Susilo et al 2021).

Kutai Kartanegara Regency (KKR) is one of the regions in East Kalimantan province, Indonesia. The distribution of poor people in this regency was almost 56.99 thousand in 2015, the region's most extensive distribution of poor people in the province. Of this, nearly 67.40% of poor people live in coastal and rural areas (BPS 2016; Erwiantono et al 2020). Moreover, KKR's capture fisheries reached 77.8 thousand tons, with 43.8% originating from inland waters, including Semayang Lake. This lake is connected to the Mahakam Watershed, with an area of 13 thousand hectares. Fishing in this lake is mainly conducted by small-scale fishers using gill nets (BPS 2022). Previous studies have been conducted in Semayang Lake (Mustakim et al 2019; Samuel et al 2021; Mislan 2022; Sudarmo et al 2023). However, studies on employing the FFT for small-scale fisher's welfare and identifying factors influencing small-scale fisher's welfare in this area are scarce. Following these findings, this study analyzes the small-scale fisher's welfare as a representative of poverty and defines factors influencing the small-scale fisher's welfare in Semayang Lake, Indonesia.

Material and Method

Study area and data collection. This study was carried out in the Semayang Lake, which is located on the Kutai Kartanegara Regency between 0°13'24.48" S and 116°27'-117.55" E (Figure 1). This lake has an area of 13,000 hectares and is included in the Mahakam Cascade Lake along with two other large lakes, including Jempang and Melintang Lakes. In addition, Mahakam Cascade Lake is a lake that the Indonesian government has designated as one of 15 national priorities. Semayang Lake is one of the largest freshwater fisheries centers on the island of Kalimantan. Most of Kutai Kartanegara's freshwater fisheries production originates from this lake. In this lake, most small-scale fishers use gill nets. The samples of small-scale fishers were randomly chosen by applying questionnaire and face-to-face interviews. The sample size was selected employing the Slovin formula, as seen below, with a 10% margin of error (Tejada & Punzalan 2012):

$$n = \frac{N}{1 + Ne^2}$$

Where N represents the population, referring to the total number of fishers in 2021, n is the calculated sample size, and e is the desired margin of error.

The total number of small-scale fishers in the study area was 11,634 in 2021 (BPS 2022). By applying Slovin's formula with a 10% margin of error, a minimum sample size

of 99 small-scale fishers was calculated. However, 100 small-scale fishers were randomly selected to enhance the reliability of the results. One hundred small-scale fishers were selected and interviewed from August to October 2023 in four SSF villages in Semayang Lake, including Kota Bangun, Liang, Semayang, and Jantur villages.

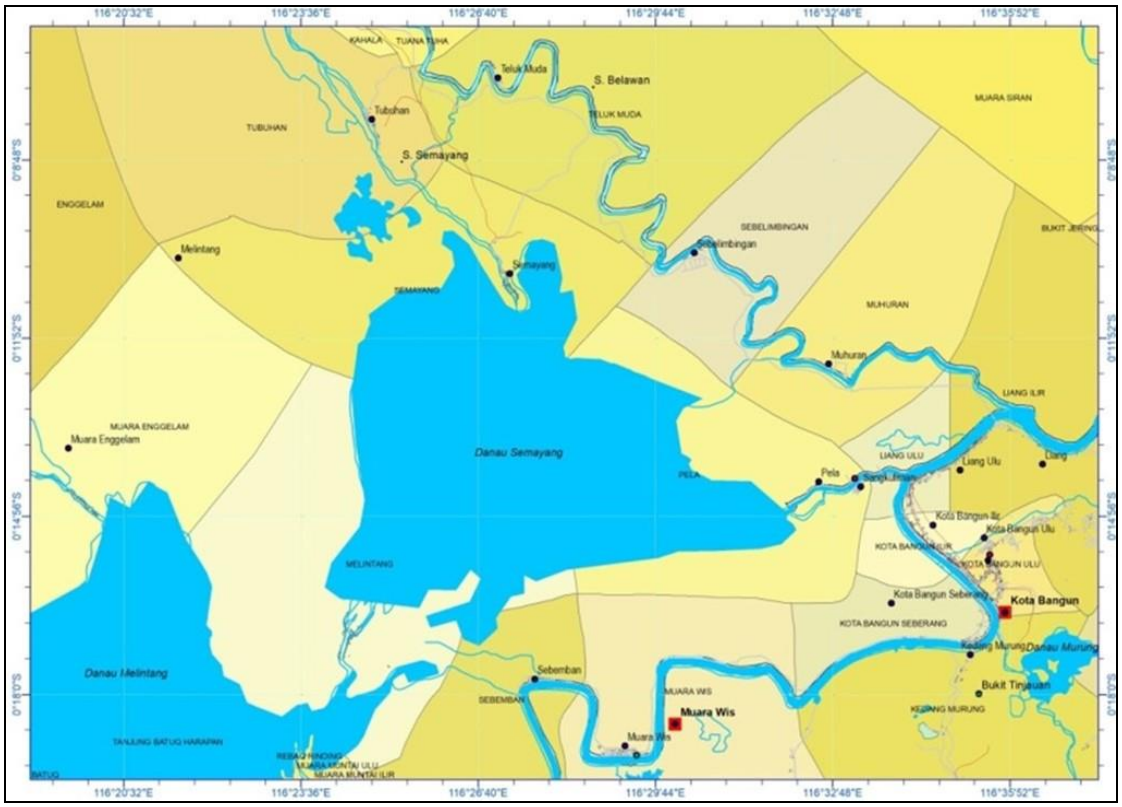

Figure 1. Map displays the location of the study area, Semayang Lake, Indonesia (map generated using Arc Map 10.1).

Small-scale fisher's welfare analysis. FTT is an indicator to estimate small-scale fisher's welfare according to the fisher's capacity to meet their subsistence needs. FTT is also known as subsistence terms of trade, where this indicator employs income and expense variables simultaneously (Bidarkota & Crucini 2000). FTT denotes the ratio of the revenue obtained from fish catch and other sources to the expenditure, consisting of the operational cost and the consumption needs (Basuki et al 2001). According to FTT interpretation, fishers are prosperous if FTT is greater than or equal to one and vice versa. FTT is formulated as follows (Susilo et al 2021):

$$FTT = \sum_{i=1}^{n} P_{x_i} Q_{x_i} + \sum_{i=1}^{n} R_i \Big/ \sum_{i=1}^{n} P_{y_i} Q_{y_i} + \sum_{i=1}^{n} C_i$$

Where: FTT – fisher terms of trade index; P_{xi} - fish price from catches using gill nets; Q_{xi} - fish quantity of catches; P_{yi} - input price from gill nets operation; Q_{yi} - the input quantity of gill nets operation; R_i - income from other sources; and C_i - fishers household expenditures.

Factors influencing small-scale fisher's welfare. The Tobit model is applied to examine the factors influencing small-scale fisher's welfare. The Tobit regression model estimates relationships between variables when the dependent variable is censored within a restricted range (Tobin 1958), as follows:

$$FTT_i^{Tobit} = \boldsymbol{X_i'\beta} + e_i, \;\; e_i \sim N(0, \sigma^2)$$

Where: FTT_i^{Tobit} - an unobserved continuous dependent variable; X_i' - a vector of independent variables; β - a coefficients vector; e_i - an independently distributed error term expected to be normal with a zero mean and constant variance σ^2; and i - individual in the sample;

The observed FTT_i^{Tobit} variable can be developed as follows:

$$FTT_i^{Tobit} = \begin{cases} \boldsymbol{X_i'\beta} + e_i & if\ FTT_i^{Tobit} > 0, \\ 0 & if\ FTT_i^{Tobit} \leq 0. \end{cases}$$

The likelihood function for Tobit model as follows:

$$L = \prod_{y_i=0} \left[1 - \Phi\left(\frac{x'_i\beta}{\sigma}\right)\right] \cdot \prod_{y_i>0} \frac{1}{\sigma} \emptyset\left(\frac{y_i - x'_i\beta}{\sigma}\right)$$

Where Φ and $\emptyset$ define the distribution and density function of the standard normal variable, respectively. β is a vector of Tobit maximum vector likelihood estimates; and σ defines the standard error of the error term.

Table 1 describes the definition and measurement of variables applied for analysis. Age, education, experience, fishing effort, operational costs, revenue, and extension were continuous variables. The fisher's group was entered into the model as a dummy variable.

Table 1

Definition and measurement of variables included in the Tobit model

Variables	*Type*	*Definition and measurement*
Dependent variable		
FTT index	Continuous	Fishers' welfare indicator
Independent variables		
Demographic attributes		
Age	Continuous	Actual age of fishers in years
Education	Continuous	Formal education level of fishers in years
Experience	Continuous	Number of years in fisher experience
Economics attributes		
Fishing effort	Continuous	The time used fishing using gill nets
Operational costs	Continuous	The expenses required to acquire fish through fishing activities
Revenue	Continuous	The money earned from fishing activities
Social capital attributes		
Fisher's group	Dummy	Member of a fisher's group, 1; otherwise, 0
Extension	Continuous	Number of visits of extension agent each year

Results and Discussion

Descriptive statistics. Table 2 displays a descriptive analysis of all variables. On average, small-scale fisher's welfare was adequately prosperous, as indicated by the FTT index of 1.21. For demographic attributes, the mean actual age was 42.34 years, implying that small-scale fishers were within the productive life phase. Working as a fisherman does not necessitate any educational background, a fact revealed by the mean actual education level of 7.53 years or junior high school. Most small-scale fishers had

experience carrying out their work, characterized by the mean actual small-scale fisher's experience of 11.04 years. In terms of economic attributes, small-scale fishers' average yearly fishing effort was arranged between 180 and 288 trips. Operational cost per trip ranged between 5.18 and 8.29 USD, with a mean of 6.36 USD. Meanwhile, revenue per trip was 19.19 USD, ranging between 15.04 and 24.07 USD. Regarding the social capital attributes, the table also shows that 70% of small-scale fishers were involved in the fisher group, while 30% were not. Lastly, the majority of the small-scale fishers opinionated that, on average, extension agents provided counseling between 6 and 12 times in one year.

Table 2

Descriptive statistic of fishers

Variables	*Mean*	*Std. dev.*	*Min.*	*Max.*
Dependent variable				
FTT index	1.21	0.08	1.06	1.43
Independent variables				
Demographic attributes				
Age	42.34	8.46	21	57
Education	7.53	2.07	6	12
Experience	11.04	2.92	3	20
Economics attributes				
Fishing effort	230.16	43.73	180	288
Operational costs	6.36	1.15	5.18	8.29
Revenue	19.19	3.64	15.04	24.07
Social capital attributes				
Fisher’s group	0.7	0.46	0	1
Extension	10	2.59	6	12

Fisher terms of trade index. Table 3 displays the FTT index estimation. As mentioned earlier, the FTT index is a fisher's welfare indicator directing to the ratio between the index of the price obtained by the fishers for their fishing activity's product and the index of the costs incurred. The table shows that the average fisher's revenue is valued at USD 5.850 year^{-1}, consisting of revenue from fishing activities (USD 4.400) and non-fishing activities (USD 1.450). The average fisher's expenditure is valued at USD 4.830 year^{-1}, consisting of costs of fishing activities (USD 1.580) and household expenditures (USD 3.250). Thus, fisher's welfare using the FTT index is valued at 1.21, greater than 1, meaning that most fishers are adequately prosperous.

Table 3

Fisher terms of trade (FTT) estimation

Description	*Average (USD year^{-1})*
Revenue from fishing activities	4400
Revenue from non-fishing activities	1450
Costs of fishing activities	1580
Household expenditures	3250
Fisher terms of trade	1.21

Factors influencing the small-scale fisher’s welfare. Table 4 shows the empirical estimation of the Tobit model. The FTT index is a dependent variable represented as a proxy of small-scale fisher's welfare. There are eight variables that have been identified as independent variables. The estimated Tobit model is a good fit for the model as the value of the Likelihood Ratio-Chi-Square test (94.88) is significant at a 1% significance level. Also, Pseudo R^2 is 0.4, indicating that the model is a good fit since the result was between 0.2 and 0.4 (McFadden 1978). Seven of the eight variables examined in the Tobit model affected the FTT index.

Based on the results obtained for demographic attributes, the education variable is statistically significant at 5% and has a positive coefficient. Meanwhile, the experience variable is considerable at 1% and has a positive coefficient. Regarding economic attributes, the estimated coefficient for operational costs has a negative coefficient with statistically significant influences on the FTT index at 1%. The revenue variable, meanwhile, is statistically significant at 1% and has a positive coefficient. Only fisher's group variable is statistically significant at 5% for social capital attributes and has a positive coefficient.

Education positively and significantly influenced the FTT index ($p<0.05$). It indicated that well-educated small-scale fishers had a higher chance of increasing their welfare. Well-education helps improve fishing techniques. Thus, it has an impact on fishing productivity and affects, then, their income. This result is in line with Dahlia et al (2022) who proved that education influenced fisher's welfare. However, a comparison with the results from Husni et al (2022) showed the contrary, where education did not influence fisher's welfare. Similarly, the other variable that had a positive and significant effect on the FTT index was experience with a *p*-value less than 0.01. It implies that more years applied in fishing activities bring more success to the fishers. Dahlia et al (2022) stated that fisher's experience could manage well-fishing operations by increasing production and reducing operational costs. On the contrary, Anna et al (2019) and Husni et al (2022) documented that experience did not statistically affect the FTT index since it did not guarantee that it could influence a fisher's professional success.

In terms of economic attributes, cost and revenue variables were statistically related to the small-scale fisher's welfare. The parameter estimate of the operational cost variable was negative and significant toward the FTT index with a p-value less than 0.01. It expressed that the small-scale fishers with a higher cost for fishing operations had the worst chance of improving welfare and vice versa. This finding is in line with Sukono et al (2021), and Dahlia et al (2022), who proved that operational costs in fishing activities related to small-scale fisher's welfare. Meanwhile, the revenue variable had a statistically significant positive coefficient with a p-value of less than 0.01. It indicates that small-scale fishers with higher revenue had better welfare improvement chances and vice versa. This finding aligns with Dahlia et al (2022), in which the revenue variable had a significantly positive relationship with the FTT index, implying that small-scale fishers with higher revenue had a high chance of improving welfare.

Regarding social capital attributes, fisher's group positively and significantly influenced the FTT index ($p<0.05$). It implied that small-scale fishers were more likely to increase welfare if they were a member of a fisher group. In fact, the low education of small-scale fishers in the study area highlighted the importance of fisher group memberships to obtain opportunities to gain access to information and exchange ideas on fishing activities. Therefore, it encourages them to enhance their experience and learning capability (Susilo et al 2017).

Table 4

Tobit model estimates of the FTT index

Variables	*Coefficient*	*Std. error*	*t-value*
Demographic attributes			
Age	-0.0010	0.0007	-1.36
Education	0.0061**	0.0028	2.21
Experience	0.0123***	0.0023	5.28
Economics attributes			
Fishing effort	-0.0001	0.0001	-1.26
Operational costs	-0.0195***	0.0049	-3.99
Revenue	0.0067***	0.0016	4.25
Social capital attributes			
Fisher group	0.0280**	0.0126	2.22
Extension	0.0025	0.0022	1.15
Constant	1.0598***	0.0633	16.75
Model diagnosis			
Log–likelihood	153.56		
LR Chi Square	94.88		
Pseudo R^2	0.40		
Observations	100		

Note: ***, and ** indicate significance level at 1%, and 5%, respectively.

Conclusions. Some significant findings emerged from the study. Results reveal that most of the fishers are adequately prosperous. However, results also indicated that some factors determined the survival of small-scale fisher's welfare. Identifying and addressing these factors is crucial to ensure the continued welfare of small-scale fishers. Findings from the Tobit model show that demographic, economic, and social capital variables influence the likelihood of a fisher improving their welfare. Since education and experience variables significantly influence small-scale fisher's welfare, decision-makers can provide an infrastructure for education to improve the skills of the fishers, particularly for the fishers who have low education, by registering them into coastal learning organizations, including high school equivalency, vocational training, and adult literacy courses. Moreover, by encouraging studies and development concentrating on fisheries, the decision-makers can improve technology-capturing fisheries and other fishery activities.

Another finding reveals that operational costs and revenue influence the fisher's welfare. Decision-makers should provide incentives or subsidies for improving fishing activities, mainly small-scale fishers supporting improved fish productivity and reducing operational costs. In addition, low-interest loans and credit facilities can be delivered as financial support to fishers in fishery enterprises. The fisher group plays a crucial role in improving the welfare of fishers, as evidenced by the fisher group variable influencing the FTT index in this study. Therefore, policy interventions encouraging the fisher group membership could be applied to increase the fisher’s welfare.

Acknowledgements. The authors are grateful for the facilities and financial support from the Faculty of Fisheries and Marine Sciences, Mulawarman University. Also, the authors wish to express their appreciation to all the parties who engaged in this study.

Conflict of interest. The authors declare that there is no conflict of interest.

References

Adhuri D. S., Rachmawati L., Sofyanto H., Hamilton-Hart N., 2016 Green market for small people: markets and opportunities for upgrading in small-scale fisheries in Indonesia. Marine Policy 63:198-205.

Anna Z., Rizal A., Anitaningrum M., 2019 Analysis fishermen term of trade in

Pangandaran subdistrict of Pangandaran Regency. World Scientific News 117(5):260-278.
Basuki R., Prayogo U. H., Pranaji T., Ilham N., Sugianto, Hendiarto, Bambang W., Daeng H., Iwan S., 2001 [General guidelines for fishermen exchange rates]. Directorate General of Coastal and Small Islands, DKP Jakarta. 37 pp. [In Indonesian].
Belhabib D., Sumaila U. R., Pauly D., 2015 Feeding the poor: contribution of West African fisheries to employment and food security. Ocean Coast. Manag. 111:72–81.
Belton B., Thilsted S. H., 2014 Fisheries in transition: food and nutrition security implications for the global South. Global Food Security 3(1):59–66.
Béné C., 2003 When fishery rhymes with poverty, a first step beyond the old paradigm on poverty in small-scale fisheries. World Development 31(6):949–975.
Bidarkota P., Crucini M. J., 2000 Commodity prices and the terms of trade. Review of International Economics 8(4):647-666.
Campbell S. J., Jakub R., Valdivia A., Setiawan H., Setiawan A., Cox C., Kiyo A., Darman, Djafar L. F., De La Rosa E., Suherfian W., Yuliani A., Kushardanto H., Muawanah U., Rukma A., Alimi T., Box S., 2021 Immediate impact of COVID-19 across tropical small-scale fishing communities. Ocean & Coastal Management 200:105485. doi: 10.1016/j.ocecoaman.2020.105485.
Dahlia, Anggoro S., Gunawan B. I., 2022 Factors affecting the small-scale fishermen welfare in Bontang, Indonesia. AACL Bioflux 15(2):893-899.
Erwiantono, Darmansyah O., Saleha Q., Zulkarnain, Sulistianto E., Fahrizal W., Maryanto F., Susilo H., 2020 Impact of shrimp-fish polyculture practices on small-scale farmers' income in Indonesia. AACL Bioflux 13(6):3407-3419.
Husni S., Yusuf M., Nursan M., Utama A. F., 2022 Study of household welfare level of crab fishermen using Fisherman Exchange Rate (FER) indicators in East Lombok. IOP Conf. Series: Earth and Environmental Science 1107:012112. doi: 10.1088/1755-1315/1107/1/012112.
McFadden D., 1978 Quantitative methods for analyzing travel behavior of individuals: Some recent developments. In: Behavioural travel modeling. Hensher D. A., Stopher P. R. (ed), Croom Helm, London, UK. 279-318 p.
Mislan L., 2022 Potential pollution of Mahakam Cascade Lake water pollution (Semayang Lake, Melintang Lake and Jempang Lake) from garbage and household waste. International Journal of Research and Innovation in Social Science (IJRISS) 6(7):376-382.
Muawanah U., Pomeroy R. S., Marlessy C., 2012 Revisiting fish wars: conflict and collaboration over fisheries in Indonesia. Coastal Management 40(3):279-288.
Mustakim M., Anggoro S., Purwanti F., Haeruddin, 2019 Length-weight relationships and condition factor of *Anabas testudineus* in the Semayang Lake, East Kalimantan, Indonesia. AACL Bioflux 12(1):327-337.
Outeiro L., Villasante S., Sumaila R., 2018 Estimating fishers' net income in small-scale fisheries: minimum wage or average wage?. Ocean and Coastal management 165:307-318.
Primyastanto M., Marno S., Efani A., Muhammad S., 2013 Economic of household analysis and influence on poverty Payang fisherman at Madura Straits. International Journal of Innovative Social Sciences & Humanities Research 1(1):43-51.
Samuel, Dwirastina M., Ditya Y. C., 2021 Sepat Siam fish community (*Trichopodus pectoralis Regan*, 1910) in Semayang Lake, East Kalimantan. IOP Conf. Series: Earth and Environmental Science 890:012069. doi: 10.1088/1755-1315/890/1/012069.
Schuhbauer A., Chuenpagdee R., Cheung W. W., Greer K., Sumaila U. R., 2017 How subsidies affect the economic viability of small-scale fisheries. Marine Policy 82:114–121.
Sudarmo A. P., Ali M., Anggraeini D. P., Dwirastina M., Ditya Y. C., Makri., Makmur S., Kaban S., Samuel, 2023 Assessing benthic community and water quality as the bioindicator of environment in Semayang Lake East Kalimantan, Indonesia. Polish Journal of Environmental Studies 32(5):4281-4290.
Sukono, Riaman, Herawati T., Saputra J., Hasbullah E. S., 2021 Determinant factors of

fishermen income and decision-making for providing welfare insurance: an application of multinomial logistic regression. Decision Science Letters 10:175–184.
Susilo H., Darmansyah O., Erwiantono., Saleha Q., Gunawan B. I., Haqiqiansyah G., Abdusysyahid S., Purnamasari E., Syafril M., Sugiharto E., Fahrizal W., Maryanto F., 2022 Technical, economic, and allocative efficiencies of small-scale brackish water pond culture in Mahakam Delta, Indonesia. AACL Bioflux 15(2):662-670.
Susilo H., Saleha Q., Darmansyah O., Oktawati N. O., Maryanto F., Zulkarnain, Erwiantono, 2021 Determinants of fish farmers' welfare in brackishwater pond culture in Indonesia: fish farmer terms of trade index. AACL Bioflux 14(2):754-761.
Susilo H., Takahashi Y., Yabe M., 2017 The opportunity cost of labor for valuing mangrove restoration in Mahakam Delta, Indonesia. Sustainability 9(12):2169. doi: 10.3390/su9122169.
Tejada J. J., Punzalan J. R. B., 2012 On the misuse of Slovin's Formula. Philipp. Stat. 61, 129–136 p.
Tobin J., 1958 Estimation of relationships for limited dependent variables. Econometrica 26(1):24-36.
Villasante S., Pierce G. J., Pita C., Guimeráns C. P., Rodrigues J. G., Antelo M., Da Rocha J. M., Cutrín J. G., Hastie L. C., Veiga P., Sumaila U. R., Coll M., 2016 Fishers' perceptions about the EU discards policy and its economic impact on small-scale fisheries in Galicia (North West Spain). Ecological Economics 130:130–138.
*** Central Bureau of Statistics (BPS), 2022 [Kutai Kartanegara in figures]. https://kukarkab.bps.go.id. [In Indonesian]. [Last accessed on 2 November 2023].
*** Central Bureau of Statistics (BPS), 2020 [Monthly report of socio-economic data, January 2020]. https://www.bps.go.id. [In Indonesian]. [Last accessed on 4 November 2023].
*** Central Bureau of Statistics (BPS), 2016 [Kutai Kartanegara in figures]. https://kukarkab.bps.go.id. [In Indonesian]. [Last accessed on 8 November 2023].
*** Food and Agriculture Organization (FAO), 2022a The state of food security and nutrition in the world 2022. Repurposing food and agricultural policies to make healthy diets more affordable. Rome, FAO. 260 p. doi: 10.4060/cc0639en.
*** Food and Agriculture Organization (FAO), 2022b The state of world fisheries and aquaculture 2022. Towards blue transformation. Rome, FAO. 266 pp. doi: 10.4060/cc0461en.
*** Food and Agriculture Organization (FAO), 2020 The state of world fisheries and aquaculture – sustainability in action. Rome, FAO. 244 pp. doi: 10.4060/ca9229en.
*** Ministry of Marine Affairs and Fisheries Republic of Indonesia (IMMAF), 2022 [Release of marine and fisheries data for Quarter IV in 2022. Center for statistical data and information]. https://sosek.info. [In Indonesian]. [Last accessed on 3 November 2023].
*** World Bank, 2020 Reversals of fortune. Washington DC. www.openknowledge.worldbank.org. [Last accessed on 6 November 2023].

Received: 29 December 2023. Accepted: 11 March 2023. Published online: 29 October 2024.
Authors:
Qoriah Saleha, Mulawarman University, Faculty of Fisheries and Marine Sciences, Laboratory of Fisheries Agribusiness, 75119 Samarinda, Indonesia, e-mail: qoriah.saleha@fpik.unmul.ac.id
Erwiantono, Mulawarman University, Faculty of Fisheries and Marine Sciences, Laboratory of Coastal Community Development, 75119 Samarinda, Indonesia, e-mail: erwiantono@fpik.unmul.ac.id
Jailani, Mulawarman University, Faculty of Fisheries and Marine Sciences, Department of Water Resources management, 75119 Samarinda, Indonesia, e-mail: jailani1401960@gmail.com
Freddy Maryanto, Mulawarman University, Faculty of Fisheries and Marine Sciences, Laboratory of Coastal Community Development, 75119 Samarinda, Indonesia, e-mail: freddymaryanto@fpik.ummul.ac.id
Heru Susilo, Mulawarman University, Faculty of Fisheries and Marine Sciences, Laboratory of Fisheries Resource Economics, 75119 Samarinda, Indonesia, e-mail: herususilo@fpik.unmul.ac.id

How to cite this article:
Saleha Q., Erwiantono., Jailani, Susilo H., 2024 The small-scale fisher's welfare in Semayang Lake, Indonesia: an analysis based on fisher terms of trade index. AACL Bioflux 17(5):2219-2227.