Welfare status of coastal small-scale fishermen in Banten Bay, Northwest Java, Indonesia

[1,3]Subhechanis Saptanto, [2]Mennofatria Boer, [2]Sulistiono, [2]Taryono

[1] Study Program for Coastal and Marine Resources Management, Graduate Program, Bogor Agricultural University, Darmaga Bogor, 16680, Indonesia; [2] Department of Aquatic Resources Management, Bogor Agricultural University, Darmaga Bogor, 16680, Indonesia; [3] Research Centre for Marine and Fisheries Socio-Economic, Ministry of Marine Affairs and Fisheries, Jakarta, Indonesia. Corresponding author: S. Saptanto, anis_saptanto@yahoo.com

Abstract. Banten Bay, northwest Java, Indonesia supports the livelihood for coastal communities, including small-scale fishermen. This study seeks to evaluate the welfare of small-scale fishermen in the Banten Bay area. The research included 336 participants from three districts in the western (Bojonegara), central (Kasemen), and eastern (Pontang) regions. The methodology employed scoring and index-based characteristics, and an economic dimension approach. Results from the characteristic-based welfare index indicate that 63.39% of Banten Bay fishermen have a moderate welfare level, 28.57% are at a high level, and 8.04% are at a low level. According to fishermen's perceptions, the economic dimension-based welfare level reveals that 92.86% of fishermen fall into the moderate welfare category, with 4.76% at a low level and 2.38% at a high level. Both methods yield the same result, indicating that the well-being of fishermen is at a moderate level. This result suggests that the livelihoods of fishermen in the Banten Bay area are still reliable in meeting their living needs.
Key Words: coastal region, economic dimension indicators, livelihood.

Introduction. Indonesia is one of the maritime nations endowed with abundant fisheries resources. One significant community heavily reliant on marine resources is represented by the small-scale fishermen. Small-scale fishermen dominate the capture fisheries in developing countries (Pauly & Zeller 2016; Sari et al 2019; Malik et al 2019). Banten Bay coastal area in Indonesia, located in the northern coastal area of Java, is a notable fishing ground where many small-scale fishermen operate vessels under 10 GT (gross tonnage). Small-scale fishermen in the coastal regions of Banten Bay play a crucial role in the local economy and provide sustenance for the community.

As a recurring issue in the Sustainable Development Goals (SDGs) program (Barbier & Burgess 2017), the welfare of small-scale fishermen often remains low due to challenges related to poverty and environmental degradation (Nayak et al 2014; Stacey et al 2021; Zulkipli et al 2021). Banten Bay's small-scale fishermen face difficulties because the fishing industry must keep up with other industries and tourism (Cadith 2019; Noviani et al 2020). Welfare is a crucial factor for fishermen because, with sustainable welfare, their livelihoods in the fishing sector can continue to meet their daily needs. Thus, the welfare of small-scale fishermen in the coastal areas of Banten Bay deserves further investigation, considering government policies, sustainable marine practices, and the needs of fishermen to preserve their livelihoods.

This research aims to assess the welfare of small-scale fishermen in the coastal area of Banten Bay and the influencing factors. The findings of this study are expected to provide better insights into the welfare conditions of small-scale fishermen in the area. The results can be a foundation for the government, non-governmental organizations, and relevant stakeholders to develop better policies supporting the welfare of small-scale fishermen.

Material and Method

Description of the study site. The study area of this research is Banten Bay, in the northern coastal region of Serang Regency, in the northwest part of Java Island, facing the Java Sea. Geographically, Banten Bay is precisely located between 05°54'30" and 06°04'00" latitude south and 106°04'00" to 106°15'00" longitude east (Saraswati & Abubakar 2020).

Data and data collection. The study used both primary and secondary data. Secondary data are sourced from literature provided by relevant institutions and agencies regarding the research topic. On the other hand, preliminary data are collected through field surveys, utilizing a questionnaire as the primary tool. The survey questionnaire addresses 12 welfare indices, focusing on the socio-economic aspects of small-scale fishermen households. Furthermore, data on fishermen's perceptions of welfare were collected, encompassing 19 indicators within the economic dimension. The data collection phase spanned five months, from June to October 2021.

Sampling. A total of 336 fishermen from three districts in Banten Bay participated in the interviews, with these districts situated in the western (Bojonegara), central (Kasemen), and eastern (Pontang) regions of the bay. The fishermen sampled in this study are small-scale fishermen who operate fleets with less than ten gross tons (Ministry of Marine Affairs and Fisheries of the Republic of Indonesia 2016).

Data analysis. The study estimates the welfare level through two approaches, i.e., the 10-indicator method from data from the Central Statistics Agency of the Republic of Indonesia (2015) that has been modified into 12 indicators, and the welfare index based on economic perception. The 12-indicator method delves into various socio-economic aspects, presenting a detailed view of fishermen's welfare and allowing for a comprehensive analysis of factors shaping their welfare. The welfare index based on economic perception focuses on how fishermen subjectively perceive and experience economic risks, enriching quantitative data with qualitative insights into their financial challenges.

The first approach employs 12 indicators: education level, the proportion of family members working, age, work experience, ownership of fishermen's insurance, living conditions, electricity availability, sanitation facilities, road conditions, healthcare accessibility, clean water availability, and the number of assets owned. Scores with higher categories are assigned higher values compared to others. Table 1 shows the welfare indicators based on respondent characteristics, and the scores are defined according to categories. Then, validation is undertaken using the Pearson correlation applied to those twelve indicators to identify variables that should be omitted from the analysis of the welfare index (Chan & Idris 2017; Anggraini et al 2020). The scoring method was applied to calculate the level of welfare (Cahyadinata et al 2019) by finding the difference between the highest and lowest scores among the 12 indicators and then dividing by the number of classifications used. Three classifications are used in this case, i.e., low, moderate, and high. The welfare score was set at ranges from 0-100, calculated with the following equations (1, 2):

$$Vc = \sum_{i=1}^{n} X_i \qquad \text{equation 1}$$

$$IK = \frac{Sc}{SM} x\ 100 \qquad \text{equation 2}$$

Where Sc is the number of welfare score, n is the number of variables (n = 1, 2, …, 12), X = indicator score and SM is the maximum score. After the index is obtained, respondents are grouped into 3 categories using the next equation (3):

$$RK = \frac{IK_{max} - IK_{min}}{JK} \qquad \text{equation 3}$$

Where RK is the range of index class, IK_{max} is maximum value and IK_{min} is minimum value of welfare index and JK is the number of classes or welfare categories.

Table 1

Welfare indicators of small-scale fishermen based on respondents characteristics

No	*Indicator*	*Categories*	*Score*
1	Level of education	High school	3
		Elementary to junior high school	2
		Unfinished elementary school	1
2	The percentage of family members working	High (68 - 100%)	3
		Medium (34 - 67%)	2
		Low (0 - 33%)	1
3	Age	Productive (15-64)	2
		Nonproductive (others)	1
4	Work experience	High (> = 10 years)	3
		Medium (5-10 years)	2
		Low (< 5 years)	1
5	Fisherman's insurance	Possess	3
		In process of acquiring	2
		Does not possess	1
6	House condition	Permanent	3
		Semi-permanent	2
		Not permanent	1
7	Electricity access	Easy	3
		Quite easy	2
		Difficult	1
8	Sanitation facilities	Inside the house	3
		Sharing washroom	2
		Riverbank	1
9	Road condition	Good	3
		Medium	2
		Bad	1
10	Healthcare access	Easy	3
		Quite easy	2
		Difficult	1
11	Clean waters access	Easy	3
		Quite easy	2
		Difficult	1
12	Number of assets owned	Many (6-8 unit)	3
		Moderate (4-5 unit)	2
		Few (0-3 unit)	1

The second approach (Table 2) utilizes the perception-based economic welfare index to measure the extent to which fishermen are vulnerable to economic factors affecting their livelihoods. This index can be employed to assess the welfare levels of fishermen in the research location. Factors considered for the perception-based economic vulnerability index include: 1) labor force; 2) income comparison; 3) marketing; 4) alternative employment; 5) sales targets; 6) selling locations; 7) price determination; 8) fish sales profit; 9) economically high-yield captures; 10) ownership of fishing equipment; 11) catch meets needs; 12) shared losses; 13) impact of fish sales patterns; 14) ease of purchasing fuel; 15) ease of engine repairs; 16) ease of buying fishing gear; 17) ease of boat repairs; 18) seasonal job shift strategy; 19) changes in the number of workers.

Table 2

Measurement of welfare indicators for small-scale fishermen in Banten Bay

No	*Indicator*	*Categories (score)*
1	Labor force	Very difficult (3) – Difficult (2) – Easy (1)
2	Income comparison	Lower (3) - Same (2) – Higher (1)
3	Marketing	Middleman (3)- Auction (2) - Direct Selling (1)
4	Alternative occupation	None (3) - Few (2) - Many Jobs (1)
5	Sales targets	Local Banten (3) - Outside Banten (2) – Export (1)
6	Selling locations	Always (3) - Rarely (2) – Never (1)
7	Price determination	Never (3) - Rarely (2) – Always (1)
8	Fish sales profit	Never (3) - Rarely (2) – Always (1)
9	High-economic catches	Never (3) – Rarely (2) – Always (1)
10	Ownership of fishing gear	Rent (3) - Shared (2) – Own (1)
11	Catch meets needs	Never (3) - Rarely (2) – Always (1)
12	Shared losses	Never (3) - Rarely (2) – Always (1)
13	Fish sales patterns impact	Many (3) - Some impact (2) - No impact (1)
14	Ease of purchasing fuel	Difficult (3) - Somewhat difficult (2) – Easy (1)
15	Ease of engine repairs	Difficult (3) - Somewhat difficult (2) – Easy (1)
16	Ease of buying fishing gear	Difficult (3) - Somewhat difficult (2) – Easy (1)
17	Ease of boat repairs	Difficult (3) - Somewhat difficult (2) – Easy (1)
18	Seasonal job shift strategy	None (3) - Few (2) – Many (1)
19	Changes in workers number	Decrease (3) - Same (2) – Increase (1)

Results And Discussion

Welfare indicator selected. Following the validation of the 12 indicators in this study, it was noted that the variables related to the percentage of employed family members and age are deemed invalid due to their Pearson correlation values falling below the critical threshold. Consequently, these variables must be excluded from the computation of the welfare index. The utilized indicators results are presented in Table 3.

Table 3

Validity test of welfare indicators for small-scale fishermen in Banten Bay

Indicator		*Sig (Pearson correlation)*	*r table (0.01)*	*Description*
Working family members proportion	PRO	0.0113	0.8368	Not Valid
Educational level	EDU	0.3249	0.0000	Valid
Age	AGE	0.0475	0.3852	Not Valid
Experience	EXC	0.2696	0.0000	Valid
Fishermen's insurance	INS	0.5056	0.0000	Valid
Housing conditions	LIV	0.4698	0.0000	Valid
Water accessibility	WAT	0.6015	0.0000	Valid
Electricity accessibility	ELC	0.3799	0.0000	Valid
Sanitation facilities	SAN	0.4766	0.0000	Valid
Road conditions	ACC	0.5228	0.0000	Valid
Healthcare accessibility	HEA	0.4017	0.0000	Valid
Owned assets	JMA	0.3043	0.0000	Valid

After the validation process, the assessment of welfare status among small-scale fishermen based on the number of respondents and percentages is presented in Table 4. The welfare index is measured using 10 indicators with a minimum score of 12 and a maximum score of 35. With three categorical classes, the boundaries for the three welfare categories are low, if ranging from 14 to 19.33; moderate, at the level of 19.34 to 24.67; and high, at the level of 24.68 to 30.

Table 4

Measurement of welfare indicators based on respondent characteristics

No	*Indicator*	*Categories*	*Number*	*Percentage*
1	Level of education	High School	19	2.79
		Elementary to junior high school	170	89.47
		Unfinished elementary school	147	43.75
2	Work experience	High (> = 10 years)	254	75.60
		Medium (5-10 years)	68	20.24
		Low (< 5 years)	14	4.17
3	Fisherman's insurance	Possess	82	24.40
		In process of acquiring	20	5.95
		Does not possess	234	69.64
4	House condition	Permanent	231	68.75
		Semi-permanent	85	25.30
		Not permanent	20	5.95
5	Electricity access	Easy	279	83.04
		Quite easy	56	16.67
		Difficult	1	0.30
6	Sanitation facilities	Inside the house	303	90.18
		Sharing washroom	5	1.49
		Riverbank	28	8.33
7	Road condition	Good	129	38.39
		Medium	160	47.62
		Bad	47	13.99
8	Healthcare access	Easy	191	56.85
		Quite easy	122	36.31
		Difficult	23	6.85
9	Clean waters access	Easy	172	51.19
		Quite easy	126	37.50
		Difficult	38	11.31
10	Number of assets owned	Many (6-8 unit)	25	7.44
		Moderate (4-5 unit)	177	52.68
		Few (0-3 unit)	134	39.88

The analysis of welfare status using 19 economic indicators indicates that both the marketing variable (EKON3) and the impact of the sales pattern of captured fish (EKON13) are deemed invalid, leading to their exclusion from the overall calculation. The results of the validity tests for the economic dimension indicators of small-scale fishermen can be found in Table 5.

Table 5

Validity test of economic dimension indicators

Factors		*Sig (Pearson correlation)*	*r table (0.01)*	*Description*
Labor force	EKON1	0.3068	0.0000	Valid
Income comparison	EKON2	0.3476	0.0000	Valid
Marketing	EKON3	0.0626	0.2528	Not Valid
Alternative occupation	EKON4	0.3905	0.0000	Valid
Sales targets	EKON5	-0.0923	0.0911	Valid
Selling locations	EKON6	0.1904	0.0005	Valid
Price determination	EKON7	0.1821	0.0008	Valid
Fish sales profit	EKON8	0.4857	0.0000	Valid
High-economic catches	EKON9	0.4824	0.0000	Valid
Ownership of fishing gear	EKON10	0.1374	0.0117	Valid

Catch meets needs	EKON11	0.4376	0.0000	Valid
Shared losses	EKON12	-0.1756	0.0012	Valid
Fish sales patterns impact	EKON13	-0.0275	0.6150	Not Valid
Ease of purchasing fuel	EKON14	0.5306	0.0000	Valid
Ease of engine repairs	EKON15	0.5239	0.0000	Valid
Ease of buying fishing gear	EKON16	0.4959	0.0000	Valid
Ease of boat repairs	EKON17	0.4136	0.0000	Valid
Seasonal job shift strategy	EKON18	0.3777	0.0000	Valid
Changes in workers number	EKON19	0.1221	0.0252	Valid

Assessment of welfare index. The assessment of fishermen's welfare, considering respondent characteristics, generated scores and indices ranging from 14 to 30, with an average of 22. Generally, welfare is categorized as moderate (63.39%), high (28.57%), and low (8.04%). Overall, small-scale fishermen in Banten Bay tend to experience low welfare, aligning with previous studies that such fishermen often face poverty and hunger (Arthur et al 2021). The welfare index with an economic dimension mainly falls into the moderate level with 92.86%, high level with 2.38% and low level with 4.76%. These results suggest that welfare assessments based on characteristics and economic dimensions are comparable, placing welfare in the moderate category.

Conclusions. The welfare of small-scale fishermen in the Banten Bay based on characteristics falls into the moderate welfare category, accounting for 63.39% of total responses, while the high level is at 28.57%, and the low level is at 8.04%. The welfare assessment using an economic dimension approach indicates that fishermen are in the moderate welfare category at 92.86%, low welfare at 4.76%, and high welfare at 2.38%.

Acknowledgements. We appreciate the support and thank the Research Centre for Marine and Fisheries Socio-Economic (RCMFSE), Ministry of Marine Affairs and Fisheries, Republic of Indonesia, and the Conservation Strategy Fund (CSF) Jakarta, Indonesia. This paper is part of the result of research conducted by authors which funded and organized CSF in 2021.

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

References

Anggraini D., Khumaedi M., Widowati T., 2020 Validity and reliability contents of independence assessment instruments of basic beauty students for class X SMK. Journal of Educational Research and Evaluation JERE 9(1):40-46.

Arthur R. I., Skerritt D. J., Schuhbauer A., Ebrahim N., Friend R. M., Sumaila U. R., 2021 Small-scale fisheries and local food systems: transformations, threats and opportunities. Fish and Fisheries 23(1):109-124.

Barbier E. B., Burgess J. C., 2017 The sustainable development goals and the systems approach to sustainability. Economics 11(1):1-22.

Cadith J., 2019 [Conflict in Resource Utilization on the Coast of Banten Bay]. Jurnal Administrasi Publik Vol 10(2):280-299 [In Indonesian].

Cahyadinata I., Fahrudin A., Sulistiono, Kurnia R., 2019 Household welfare of mud crab fishermen in small outermost islands case study: Enggano Island Bengkulu Province, Indonesia. AACL Bioflux 12(2):564-574.

Chan L. L., Idris N., 2017 Validity and reliability of the instrument using exploratory factor analysis and Cronbach's alpha. International Journal of Academic Research in Business and Social Sciences 7(10):400-410.

Malik J., Fahrudin A., Bengen D.G., Taryono., 2019 Overfishing and overcapacity small scale fisheries in Semarang City. Jurnal Ilmu dan Teknologi Kelautan Tropis 11(2):427-435.

Nayak P. K., Oliveira L. E., Berkes F., 2014 Resource degradation, marginalization, and poverty in small-scale fisheries: threats to social-ecological resilience in India and Brazil. Ecology and Society 19(2):73. http://dx.doi.org/10.5751/ES-06656-190273
Noviani E., Sulistiono, Samosir A. M., 2020 Heavy metal (Pb, Hg) extent in mud crab (*Scylla serrata*) in Cengkok coastal waters, Banten Bay, Indonesia. Omni-Akuatika 16(2):108-115.
Pauly D., Zeller D., 2016 Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining. Nature Communications 7:10244. https://doi.org/10.1038/ncomms10244
Saraswati R., Abubakar R., 2020 [Changes in the coastline of the north coast of Java]. Departemen Geografi FMIPA Universitas Indonesia. 269 pp. [In Indonesian].
Sari I., Ichsan M., White A., Raup S. A., Wisudo S. H., 2019 Monitoring small-scale fisheries catches in Indonesia through a fishing logbook system: challenges and strategies. Marine Policy 134(5):104770. doi: 10.1016/j.marpol.2021.104770
Stacey N., Gibson E., Loneragan N. R., Warren C., Wiryawan B., Adhuri D. S., Steenbergen D. J., Fitriana R., 2021 Developing sustainable small-scale fisheries livelihoods in Indonesia: trends, enabling and constraining factors, and future opportunities. Marine Policy 132:104654. https://doi.org/10.1016/j.marpol.2021.104654
Zulkipli, Ujianto, Andjarwati T., 2021 The effect of fisheries productivity, socioeconomic factor, non-fisheries business opportunity on vulnerability and poverty: small-scale fisheries in Riau Islands, Indonesia. International Journal of Entrepreneurship and Business Development 4(1):7-18.
*** Central Statistics Agency of the Republic of Indonesia, 2015 [Indicator of People's Welfare 2015]. Jakarta. 196 pp. www.bps.go.id [Last accessed on 12 November 2023] [In Indonesian].
*** Ministry of Marine Affairs and Fisheries of the Republic of Indonesia, 2016 [Minister of Marine Affairs and Fisheries regulation of the Republic of Indonesia No. 18/Permen-KP/2016 concerning risk protection assurance for fishermen]. Fish Cultivators, and Salt Farmers. 15 pp. www.peraturan.bpk.go.id [Last accessed on 12 November 2023] [In Indonesian].

Received: 13 November 2023. Accepted: 24 November 2023. Published online: 28 December 2023.
Authors:
Subhechanis Saptanto, Study Program for Coastal and Marine Resources Management, Graduate Program, Bogor Agricultural University, Darmaga Bogor, 16680, Indonesia, e-mail: anis_saptanto@yahoo.com
Mennofatria Boer, Department of Aquatic Resources Management, Bogor Agricultural University, Darmaga Bogor, 16680, Indonesia, e-mail: mboer@ymail.com
Sulistiono, Department of Aquatic Resources Management, Bogor Agricultural University, Darmaga Bogor, 16680, Indonesia, e-mail: onosulistiono@gmail.com
Taryono, Department of Aquatic Resources Management, Bogor Agricultural University, Darmaga Bogor, 16680, Indonesia, e-mail: tkodiran@yahoo.com

How to cite this article:
Saptanto S., Boer M., Sulistiono, Taryono, 2023 Welfare status of coastal small-scale fishermen in Banten Bay, Northwest Java, Indonesia. AACL Bioflux 16(6):3390-3396.