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KNOWLEDGE, ATTITUDES, AND ADOPTION READINESS FOR RESPONSIBLE FISHING AMONG FISHERS IN THE BANDA ISLANDS, MALUKU

PENGETAHUAN, SIKAP, DAN KESIAPAN ADOPSI PENANGKAPAN BERTANGGUNG JAWAB PADA NELAYAN KEPULAUAN BANDA, MALUKU

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ABSTRACT

Environmentally responsible fishing requires gear and operational practices that maintain selectivity, reduce unwanted catch and habitat impacts, comply with management rules, and remain feasible for fishers. This study aimed to describe self-reported knowledge, attitudes, and perceived adoption readiness for environmentally responsible fishing practices among the surveyed tuna handline and mini purse seine fishers in the Banda Islands and to compare scores between the two groups. A cross-sectional quantitative survey was conducted in June–July 2025 using purposive sampling. The sample comprised 51 fishers, including 18 tuna handline fishers and 33 mini purse seine fishers. Sixteen of 20 questionnaire items met the item-validity criterion ($r > 0.33$), and each retained variable had Cronbach's alpha above 0.70. Item responses were summarized descriptively, and the two independent groups were compared using Mann–Whitney U tests. Knowledge did not differ significantly between tuna handline and mini purse seine fishers ($U = 313.0$, $p = 0.757$, rank-biserial $r = 0.054$). Mini purse seine fishers had higher attitude scores ($U = 191.0$, $p = 0.037$, $r = 0.357$ and perceived-adoption-readiness scores ($U = 179.0$, $p = 0.020$, $r = 0.397$. Combined item means nevertheless remained modest: knowledge ranged from 1.96 to 2.59, attitudes from 1.98 to 3.38, and perceived adoption readiness from 2.25 to 2.80. The findings indicate group differences in perceptions and enabling conditions, not verified differences in actual adoption or environmental performance. Fleet-specific demonstrations and technical support are recommended, accompanied by direct operational monitoring.

Keywords: adoption readiness, fishers, responsible fishing, technology perception, tuna handline

ABSTRAK

Penangkapan ikan bertanggung jawab memerlukan alat dan praktik operasi yang menjaga selektivitas, mengurangi tangkapan yang tidak diinginkan dan dampak terhadap habitat, mematuhi aturan pengelolaan, serta layak diterapkan oleh nelayan. Penelitian ini bertujuan mendeskripsikan pengetahuan yang dilaporkan sendiri, sikap, dan persepsi kesiapan adopsi praktik penangkapan ikan bertanggung jawab pada nelayan pancing ulur tuna dan *mini purse seine* yang disurvei di Kepulauan Banda serta membandingkan skor kedua kelompok. Survei kuantitatif potong lintang dilaksanakan pada Juni–Juli 2025 dengan penarikan sampel secara purposif. Sampel terdiri atas 51 nelayan, yaitu 18 nelayan pancing ulur tuna dan 33 nelayan *mini purse seine*. Sebanyak 16 dari 20 butir memenuhi kriteria validitas butir ($r > 0,33$), dan setiap variabel yang dipertahankan memiliki nilai Cronbach's alpha di atas 0,70. Jawaban diringkas secara deskriptif dan kedua kelompok dibandingkan menggunakan uji Mann–Whitney U. Pengetahuan tidak berbeda signifikan antara nelayan pancing ulur tuna dan *mini purse seine* ($U = 313,0$; $p = 0,757$; r rank-biserial = 0,054). Nelayan *mini purse seine* memiliki skor sikap lebih tinggi ($U = 191,0$; $p = 0,037$; $r = -0,357$) dan skor persepsi kesiapan adopsi lebih tinggi ($U = 179,0$; $p = 0,020$; $r = -0,397$). Meskipun demikian, rata-rata butir gabungan menunjukkan pola yang perlu ditafsirkan secara hati-hati: pengetahuan 1,96–2,59, sikap 1,98–3,38, dan kesiapan adopsi 2,25–2,80. Temuan ini menunjukkan perbedaan persepsi dan kondisi pendukung, bukan bukti perbedaan adopsi aktual atau kinerja lingkungan. Demonstrasi dan dukungan teknis perlu disesuaikan menurut armada serta disertai pemantauan operasi secara langsung.

Kata kunci: kesiapan adopsi, nelayan, pancing ulur tuna, penangkapan bertanggung jawab, persepsi teknologi

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INTRODUCTION

Ecosystem-based fisheries management seeks to maintain fisheries production while protecting ecosystem structure and function (Latour *et al*. 2003; Zhou *et al*. 2010; Bundy *et al*. 2016; Townsend *et al*. 2019). Strong management and governance can improve ecosystem status, while risk-based frameworks help translate ecosystem objectives into operational fisheries decisions (Bundy *et al*. 2016; Kenny *et al*. 2018). Within this approach, responsible fishing does not refer to a single device. It encompasses the design and operation of fishing gear, selectivity for target species and sizes, reduction of bycatch and discards, avoidance of habitat damage, compliance with spatial and temporal rules, safety, and efficient use of inputs. These criteria are consistent with the FAO Code of Conduct for Responsible Fisheries (FAO 1995) and with research on fishing-technology innovation (Lucchetti *et al*. 2023).

The relevance of these criteria differs by fishery. Tuna handlines generally target individual fish with hooks, while mini purse seines encircle schooling pelagic fish and involve collective vessel operations. Handlines often have limited seabed interaction and low discard rates, whereas purse seines can achieve high species selectivity but may retain juveniles or non-target species when school identification and mesh or operational choices are inadequate (Cochrane 2002; Kelleher 2005). Each fishery therefore requires a specific assessment of hook or mesh selectivity, catch composition, size at capture, bycatch, interactions with sensitive species or habitats, fuel use, and compliance with management measures. Neither gear can be classified as environmentally responsible on the basis of its name alone. The present survey did not technically audit gear performance. Instead, it examined fishers' self-reported understanding and evaluations of responsible practices associated with their operations.

The theory of planned behavior distinguishes attitudes, subjective norms, perceived behavioral control, behavioral intention, and actual behavior (Ajzen 1991). This distinction is important because favorable attitudes do not demonstrate that a practice has been adopted. Knowledge can support evaluation, while affordability, skills, access to training, and institutional support may shape perceived control. Measuring actual adoption requires behavioral data, such as the practice used, start date, frequency, consistency, and direct observation. The questionnaire in this study measured knowledge, attitudes, and perceived enabling conditions. It did not verify actual adoption. The third dimension is therefore interpreted as perceived adoption readiness rather than implementation.

Previous Indonesian studies report uneven understanding of responsible fishing criteria and highlight the importance of outreach and practical support (Hakim *et al*. 2021; Brewon *et al*. 2022; Saiful *et al*. 2023). Research on small-scale fisheries also shows that sustainable alternatives must account for local livelihoods, fishing practices, and institutional conditions (De Juan *et al*. 2024). However, evidence from the Banda Islands remains limited, particularly for tuna handline and mini purse seine fishers. The two fisheries differ in target species, crew organization, investment, and technical options. These differences justify a direct comparison of their perceptions, although such a comparison should not assume that a higher perception score proves better environmental performance.

This study aimed to describe self-reported knowledge, attitudes, and perceived adoption readiness for environmentally responsible fishing practices among the surveyed tuna handline and mini purse seine fishers in the Banda Islands and to compare scores between the two groups. The study compares perceptions between the two groups. It does not estimate an actual adoption rate, test causal effects of respondent characteristics, or determine the environmental superiority of either fishing gear.

METHODS

Time and location

A cross-sectional quantitative survey design was used to describe current distributions and compare independent fishing-gear groups without manipulating study conditions (Setia 2016). The survey was conducted in selected fishing communities in the Banda Islands, Maluku, during June and July 2025 (Figure 1). The period coincided with accessible field conditions and active fishing operations. Because data were collected during only two months, the responses may reflect the operational and weather conditions of that period and should not be interpreted as representing all fishing seasons. A complete village-level distribution of respondents was unavailable; this limits geographic generalization.

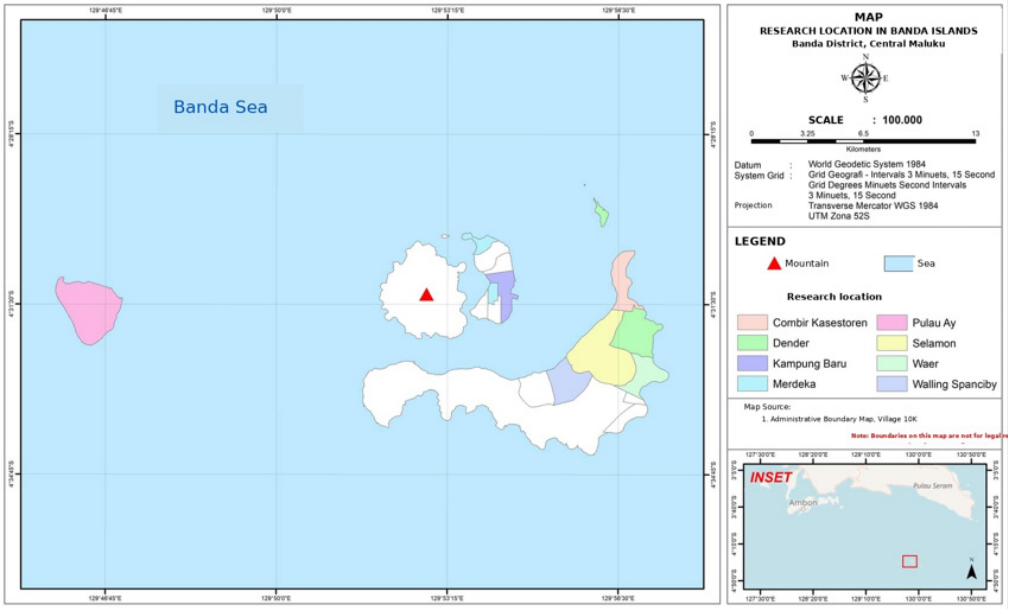


Figure 1. Research location in the Banda Islands, Maluku.

Target population and sampling

The target population was restricted to active tuna handline and mini purse seine fishers who were accessible at the selected survey sites. Purposive sampling was used to include respondents from the two fisheries and different age and experience categories. Inclusion required current participation in one of the two fisheries and willingness to complete the interview. The final sample comprised 51 respondents: 18 tuna handline fishers (35.3%) and 33 mini purse seine fishers (64.7%). The sample was not designed as a probability sample of all active fishers in the Banda Islands. Consequently, the results describe and compare the surveyed groups but do not estimate island-wide population parameters.

Concept and measurement

For the interview, environmentally responsible fishing practices were defined as gear characteristics and operational actions intended to improve selectivity, reduce unwanted catch and habitat effects, comply with applicable rules, and maintain feasible and safe operations. This operational definition provided a common frame for the questionnaire. Nevertheless, the instrument did not present a standardized list of specific gear modifications or record observed use. The results therefore concern general perceptions of responsible practices, not the performance of a named technology.

The structured questionnaire used a five-point Likert response scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. Five response categories were retained because the number of response options can affect reliability, validity, and response bias in Likert-type instruments (Kusmaryono *et al.* 2022). Equal-width descriptive intervals were set before interpretation (Table 1): 1.00–1.80 strongly disagree, 1.81–2.60 disagree, 2.61–3.40 neutral, 3.41–4.20 agree, and 4.21–5.00 strongly agree. Item means were also interpreted relative to the neutral point of 3.00. These categories summarize response tendency and do not convert ordinal responses into objective measures of knowledge or behavior.

Table 1. Interpretation of mean scores for five-point Likert-scale items.

Mean Interval	Response Tendency
1.00–1.80	Strongly disagree
1.81–2.60	Disagree
2.61–3.40	Neutral
3.41–4.20	Agree
4.21–5.00	Strongly agree

Instrument quality and data analysis

Item validity was assessed using Pearson product-moment item-total correlations. Sixteen of 20 statements met the retention criterion ($r > 0.33$), and each retained variable met the internal-consistency criterion of Cronbach's alpha > 0.70. Cronbach's alpha is widely used to assess the reliability of attitude scales, but it does not by itself establish validity (Wadkar *et al.* 2016). These procedures assess item performance and internal consistency but do not establish predictive validity (Boateng *et al.* 2018). Knowledge scores were calculated from items 1–5, attitude scores from items 6–10, and perceived adoption readiness scores from items 11–16. Descriptive analysis reported item means and group means, standard deviations, medians, and interquartile ranges. Tuna handline and mini purse seine fishers were compared as independent groups. Because the measures originated from ordinal Likert responses, group sizes were unequal, and attitude and readiness scores in the mini purse seine group departed from normality, the Mann–Whitney U test was applied. U denotes the Mann–Whitney test statistic, and p denotes the two-sided probability, under the null hypothesis of equal score distributions, of obtaining a test statistic at least as extreme as the observed value. Statistical significance was evaluated at alpha = 0.05. Rank-biserial correlations describe the direction and magnitude of group differences. SD denotes standard deviation, and IQR denotes the interquartile range, reported as the first to third quartiles. A negative rank-biserial value indicates higher scores in the mini purse seine group because tuna handline fishers were entered first. No correlation, regression, or causal analysis of education and fishing experience was performed.

RESULTS AND DISCUSSION

Respondent characteristics

Mini purse seine fishers comprised 64.7% of respondents and tuna handline fishers 35.3%. This composition describes the purposive sample and should not be treated as an estimate of the fleet structure of the entire Banda Islands. Most respondents had secondary education (Figure 2): 39.2% had completed junior high school and 51.0% senior high school, while 9.8% had completed elementary school. Education was described but was not tested as a determinant of any perception score.

The largest age class was 52–58 years (25.5%), followed by 45–51 years (19.6%) and 31–37 years (17.6%; Figure 3). The distribution indicates that the sample included many middle-aged and older fishers. It does not, by itself, demonstrate weak generational renewal because the sampling design was not intended to estimate the age structure of all fishers.

Fishing experience was concentrated in the 28–33-year class (29.4%), followed by 16–21 and 34–39 years (21.6% each; Figure 4). Long experience may shape familiarity with established fishing routines, but this study did not test whether experience increased or reduced knowledge, attitudes, or readiness scores.

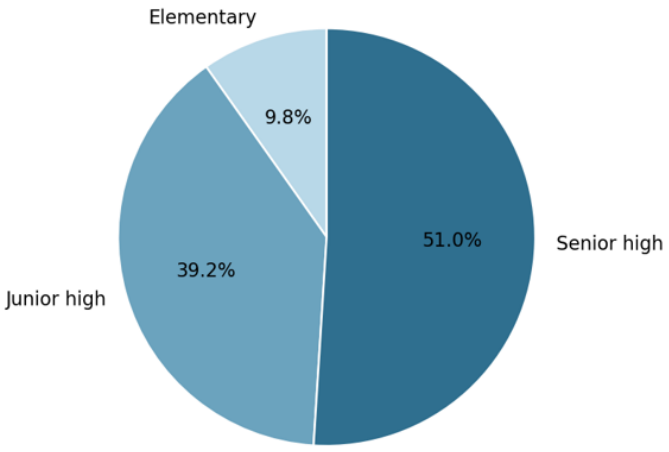


Figure 2. Educational attainment of respondents in the Banda Islands, Maluku (n = 51).

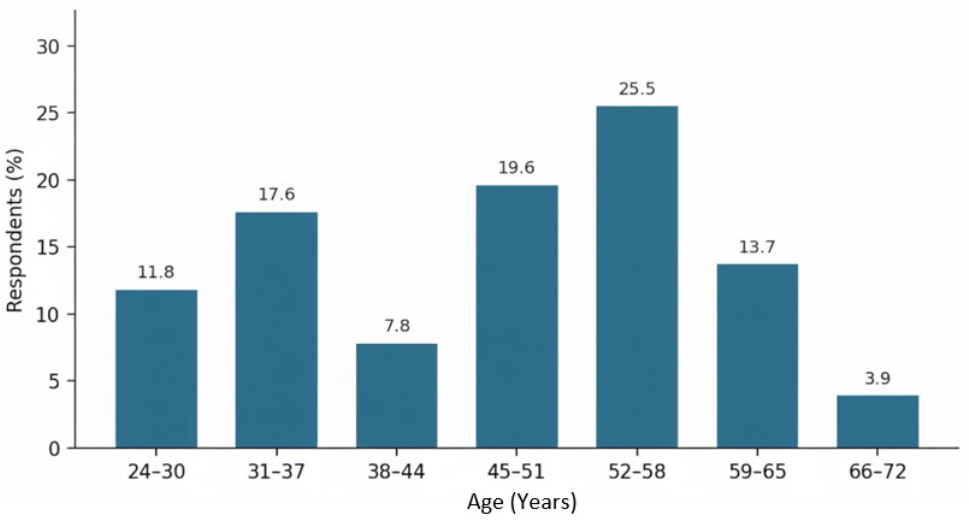


Figure 3. Age distribution of respondents in the Banda Islands, Maluku (n = 51).

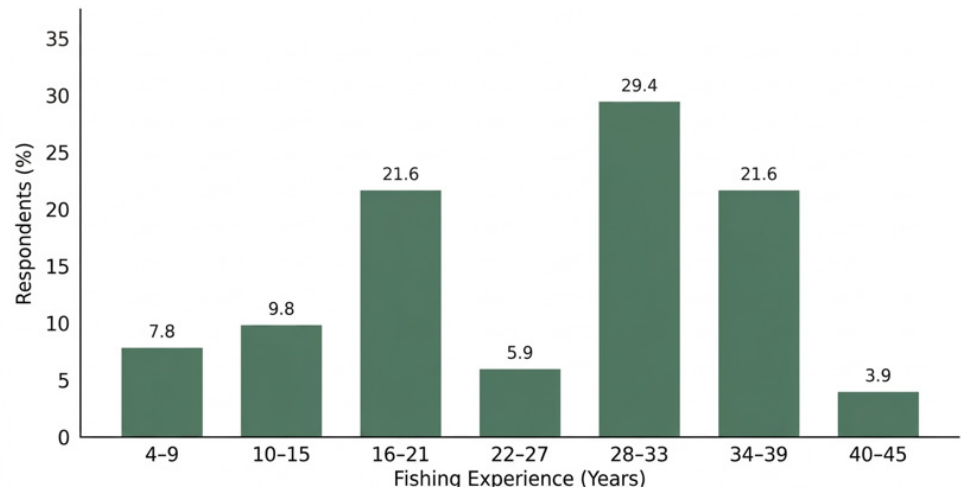


Figure 4. Distribution of respondents by fishing experience in the Banda Islands, Maluku (n = 51).

Knowledge of environmentally responsible fishing practices

All five knowledge-item means were below the neutral point of 3.00 (Table 2). The highest mean was for knowing the general meaning of environmentally responsible fishing (2.59), while the lowest was for understanding its benefits (1.96). Under the predetermined intervals, the first item fell at the upper boundary of the disagree interval, and the other items indicated disagreement. The result is best interpreted as limited self-assessed knowledge, not as an objective test of technical competence.

At the variable level, tuna handline fishers recorded a mean knowledge score of 2.23 ± 0.40 and a median of 2.20 (IQR 2.00–2.60), while mini purse seine fishers recorded a mean of 2.19 ± 0.44 and a median of 2.20 (IQR 1.80–2.40). The difference was not significant ($U = 313.0$, $p = 0.757$), and the effect size was negligible (rank-biserial $r = 0.054$; Table 5). Both groups therefore showed a comparable knowledge gap. The gap between general recognition (2.59) and understanding of benefits (1.96) suggests that respondents may have heard the terminology without receiving enough operational explanation. Small-scale fishing communities in Indonesia have also reported similar limitations in access to policy and technical information (Brewon *et al.* 2022; Mulyasari *et al.* 2023; Saiful *et al.* 2023). Extension programs should translate broad environmental language into gear-specific actions, such as choosing appropriate hooks or mesh, handling non-target catch, avoiding sensitive areas, and complying with seasonal or spatial measures.

Attitudes toward environmentally responsible fishing practices

Attitude responses were mixed (Table 3). Support for government training and equipment assistance had the highest mean (3.38), but it remained within the neutral interval. Beliefs that responsible practices could sustain catches (3.06) and conserve resources (3.10) were only slightly above the neutral point. Readiness and planning to use such practices scored slightly below neutral (2.96). The lowest score concerned the statement that most local fishers already supported and used responsible technology (1.98). Thus, the results do not justify a broad claim that fishers held uniformly positive attitudes.

Tuna handline fishers had a mean attitude score of 2.69 ± 0.70 and a median of 2.80 (IQR 2.20–3.15), whereas mini purse seine fishers had a mean of 3.11 ± 0.71 and a median of 3.20 (IQR 2.80–3.60). Mini purse seine fishers recorded higher attitude scores ($U = 191.0$, $p = 0.037$), with a small-to-moderate effect (rank-biserial $r = 0.357$; Table 5). This association may reflect the collective organization of purse seine operations and greater exposure to owners, skippers, port services, and assistance programs, but the cross-sectional design does not establish those factors as causes. The pattern is consistent with the theory of planned behavior, which distinguishes attitudes, social norms, perceived control, intention, and behavior (Ajzen 1991; Booth *et al.* 2023). General approval of conservation goals can coexist with uncertainty about feasibility and costs. Programs should therefore test practical options separately for each fleet and evaluate ecological and economic outcomes before scaling them.

Perceived adoption readiness

The third dimension describes perceived adoption readiness (Table 4). Its items concern awareness of assistance, perceived affordability and applicability, perceived usefulness of training, expected ecosystem benefits, and optimism. None records actual use, frequency, consistency, or observed behavior. The scores therefore indicate perceived readiness and enabling conditions rather than verified implementation.

All six means were below 3.00, although four fell within the equal-width neutral interval. The lowest mean concerned affordability (2.25), followed by optimism (2.55). Awareness of government programs was the highest (2.80), but it did not reach agreement. Tuna handline fishers had a mean readiness score of 2.44 ± 0.40 and a median of 2.50 (IQR 2.21–2.63). Mini purse seine fishers had a mean of 2.70 ± 0.42 and a median of 2.83 (IQR 2.50–3.00). The mini purse seine group scored higher ($U = 179.0$, $p = 0.020$), with a small-to-moderate effect (rank-biserial $r = 0.397$; Table 5). The difference indicates unequal perceived access, feasibility, or practical exposure. It does not verify actual adoption. Technologies with observable operational and economic benefits may receive stronger acceptance when supported by finance and training (Nhat *et al.* 2023; Yulisti *et al.* 2024). Interventions should begin with participatory diagnosis and small-scale trials, followed by measurements of catch composition, size selectivity, bycatch, operating costs, safety, and consistency of use.

Comparison between tuna handline and mini purse seine fishers

Knowledge scores were nearly identical, indicating that both fleets shared limited access to formal information and training. By contrast, mini purse seine fishers had higher attitude and readiness scores. Collective crew organization and more frequent interaction with assistance programs may make responsible-fishing messages and supporting technologies more visible in mini purse seine operations (Arkham *et al.* 2023; Booth *et al.* 2023). This interpretation remains provisional because the design tests associations, not causal mechanisms.

Table 2. Mean scores for self-assessed knowledge of environmentally responsible fishing practices among surveyed fishers.

No.	Assessed aspect	Mean	Tendency
1	Knowing the meaning of environmentally responsible fishing practices	2.59	Disagree
2	Understanding the benefits of environmentally responsible practices	1.96	Disagree
3	Recognizing different types of responsible fishing technology or practice	2.16	Disagree
4	Having participated in official training on responsible fishing practices	2.20	Disagree
5	Having access to information on responsible fishing practices	2.33	Disagree

Table 3. Mean scores for attitudes toward environmentally responsible fishing practices among surveyed fishers.

No.	Assessed aspect	Mean	Tendency
1	Responsible practices can improve catches sustainably	3.06	Neutral
2	Responsible practices are important for conserving fish resources	3.10	Neutral
3	Ready and planning to use responsible practices in fishing operations	2.96	Neutral
4	Government should provide training and equipment assistance	3.38	Neutral
5	Most local fishers already support and use responsible technology	1.98	Disagree

Table 4. Mean scores for perceived adoption readiness for environmentally responsible fishing practices among surveyed fishers.

No.	Assessed aspect	Mean	Tendency
1	Aware of government incentive or assistance programs	2.80	Neutral
2	Cost of adopting responsible practices is affordable	2.25	Disagree
3	Responsible practices can be applied in fishing operations	2.71	Neutral
4	Available training helps understanding and application	2.63	Neutral
5	Responsible practices can reduce negative ecosystem impacts	2.61	Neutral
6	Optimistic about the future of responsible fishing locally	2.55	Disagree

Table 5. Comparison of knowledge, attitude, and perceived adoption readiness scores between tuna handline and mini purse seine fishers.

Variable	Tuna Handline Mean ± SD Median (IQR)	Mini Purse Seine Mean ± SD Median (IQR)	U	p	Rank-biserial r	Interpretation
Knowledge	2.23 ± 0.40 2.20 (2.00–2.60)	2.19 ± 0.44 2.20 (1.80–2.40)	313.0	0.757	0.054	Not significant, negligible effect
Attitude	2.69 ± 0.70 2.80 (2.20–3.15)	3.11 ± 0.71 3.20 (2.80–3.60)	191.0	0.037	0.357	Higher in mini purse seine, small-to-moderate effect
Adoption readiness	2.44 ± 0.40 2.50 (2.21–2.63)	2.70 ± 0.42 2.83 (2.50–3.00)	179.0	0.020	0.397	Higher in mini purse seine, small-to-moderate effect

Note: Values are mean ± SD and median (Q1–Q3). SD = standard deviation; IQR = interquartile range (Q1–Q3); U = Mann–Whitney U statistic for the tuna handline group; p = two-sided p-value. The significance threshold is 0.05. Rank-biserial r = 2U/(18 × 33) − 1; negative values indicate higher scores in the mini purse seine group.

Management should respond to the observed pattern without treating either gear as automatically responsible. Both groups require knowledge-oriented extension. Tuna handline fishers may benefit from individual-scale demonstrations, affordable equipment options, and direct information access. Mini purse seine fishers require continued technical support combined with monitoring of school selection, fish size, bycatch, energy use, light or fish-aggregating-device practices, and compliance. Higher perception scores do not prove superior environmental performance.

Study limitations

The purposive sample, unequal group sizes, incomplete village-level coverage information, and two-month survey period limit geographic and seasonal generalization. Responses were self-reported, and the questionnaire did not present a standardized catalogue of specific technologies or directly observe the start date, frequency, or consistency of adoption. The Mann–Whitney tests establish group differences in scores, not causal effects of gear type, education, experience,

or institutional exposure. Environmental performance must be assessed separately using catch composition, juvenile proportion, bycatch, habitat interaction, fuel use, and compliance data. The results therefore apply to the surveyed respondents and should not be generalized to all fishers in the Banda Islands.

CONCLUSION

Among the 51 surveyed tuna handline and mini purse seine fishers, knowledge-item means were below the neutral point, indicating limited self-assessed knowledge of environmentally responsible fishing practices. Knowledge scores did not differ significantly between the groups. Attitude responses were mixed at the item level, but mini purse seine fishers recorded higher attitude scores than tuna handline fishers. Mini purse seine fishers also had higher perceived-adoption-readiness scores, although the item means and group distributions did not demonstrate strong or complete adoption. These differences indicate unequal perceptions and enabling conditions, not proof that mini purse seine fishing is environmentally superior or that responsible practices have been adopted consistently. Both fleets require stronger knowledge-oriented extension. Tuna handline fishers require accessible demonstrations and affordable individual-scale options, while mini purse seine fishers require technical assistance combined with operational monitoring. The conclusions apply to the surveyed respondents and should not be generalized to all fishers in the Banda Islands.

REFERENCES

Ajzen I. 1991. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*. 50(2): 179–211. DOI: https://doi.org/10.1016/0749-5978(91)90020-T.

Arkham MN, Hutapea RYF, Andri, Mardiah RS, Djunaidi. 2023. Perceptions of Purse Seine Ship Fishermen toward Responsible Capture Fisheries at PT. Hasil Laut Sejati Batam City. *Coastal and Ocean Journal*. 7(2): 94–101. DOI: https://doi.org/10.29244/coj.v7i2.50031.

Boateng GO, Neilands TB, Frongillo EA, Melgar-Quinonez HR, Young SL. 2018. Best Practices for Developing and Validating Scales for Health, Social, and Behavioral Research: A Primer. *Frontiers in Public Health*. 6: 149. DOI: https://doi.org/10.3389/fpubh.2018.00149.

Booth H, Ichsan M, Hermansyah RF, Rohmah LN, Naira KB, Adrianto L, Milner-Gulland EJ. 2023. A Socio-psychological Approach for Understanding and Managing Bycatch in Small-Scale Fisheries. *People and Nature*. 5(3): 968–980. DOI: https://doi.org/10.1002/pan3.10463.

Brewon MO, Wiyono ES, Sudarmo AP. 2022. Kajian Persepsi Nelayan terhadap Kriteria Alat Penangkapan Ikan yang Ramah Lingkungan di Perairan Pantai Timur Sumatera Utara. *Torani: Journal of Fisheries and Marine Science*. 6(1): 44–65. DOI: https://doi.org/10.35911/torani.v6i1.21260.

Bundy A, Chuenpagdee R, Boldt JL, Borges MF, Camara ML, Coll M, Diallo I, Fox C, Fulton EA, Gazihan A, *et al*. 2016. Strong Fisheries Management and Governance Positively Impact Ecosystem Status. *Fish and Fisheries*. 18(3): 412–439. DOI: https://doi.org/10.1111/faf.12184.

Cochrane KL. 2002. A Fishery Manager's Guidebook: Management Measures and Their Application. FAO Fisheries Technical Paper No. 424. Rome (IT): Food and Agriculture Organization of the United Nations.

De Juan S, Ruiz-Frau A, Villasante S, Ospina-Alvarez A. 2024. A Threatened Heritage: Sustainable Alternatives for Mediterranean Small-Scale Fisheries. *Marine Policy*. 163: 106148. DOI: https://doi.org/10.1016/j.marpol.2024.106148.

FAO. 1995. Code of Conduct for Responsible Fisheries. Rome (IT): Food and Agriculture Organization of the United Nations.

Hakim L, Wiyono ES, Wisudo SH. 2021. Persepsi Nelayan Muarareja terhadap Pelarangan Arad dan Program Bantuan Alat Tangkap Ramah Lingkungan. *Marine Fisheries: Jurnal Teknologi dan Manajemen Perikanan Laut*. 12(2): 161–171. DOI: https://doi.org/10.29244/jmf.v12i2.35913.

Kelleher K. 2005. Discards in the World's Marine Fisheries: An Update. FAO Fisheries Technical Paper No. 470. Rome (IT): Food and Agriculture Organization of the United Nations.

Kenny AJ, Campbell N, Koen-Alonso M, Pepin P, Diz D. 2018. Delivering Sustainable Fisheries through Adoption of a

Risk-Based Framework as Part of an Ecosystem Approach to Fisheries Management. *Marine Policy*. 93: 232–240. DOI: https://doi.org/10.1016/j.marpol.2017.05.018.

Kusmaryono I, Wijayanti D, Maharani HR. 2022. Number of Response Options, Reliability, Validity, and Potential Bias in the Use of the Likert Scale in Education and Social Science Research: A Literature Review. *International Journal of Educational Methodology*. 8(4): 625–637. DOI: https://doi.org/10.12973/ijem.8.4.625.

Latour RJ, Brush MJ, Bonzek CF. 2003. Toward Ecosystem-Based Fisheries Management: Strategies for Multispecies Modeling and Associated Data Requirements. *Fisheries*. 28(9): 10–22. DOI: https://doi.org/10.1577/1548-8446(2003)28[10:TEFM]2.0.CO;2.

Lucchetti A, Melli V, Brčić J. 2023. Editorial: Innovations in Fishing Technology Aimed at Achieving Sustainable Fishing. *Frontiers in Marine Science*. 10: 1310318. DOI: https://doi.org/10.3389/fmars.2023.1310318.

Mulyasari G, Trisusilo A, Windirah N, Djarot IN, Putra AS. 2023. Assessing Perceptions and Adaptation Responses to Climate Change among Small-Scale Fishery on the Northern Coastal of Bengkulu, Indonesia. *The Scientific World Journal*. 2023(1): 8770267. DOI: https://doi.org/10.1155/2023/8770267.

Nhat ND, Tien DT, Dan TV, Tram NDQ, Lich NQ, Phuc HD, Phuoc NN. 2023. The Effectiveness of Light-Emitting Diode (LED) Lamps in the Offshore Purse Seine Fishery in Vietnam. *Aquaculture and Fisheries*. 8(5): 551–557. DOI: https://doi.org/10.1016/j.aaf.2022.01.005.

Saiful, Saragih M, Attamimi GR. 2023. *Persepsi Masyarakat Perikanan Skala Kecil* (*Small-Scale Fisheries*) *terhadap Penangkapan Ikan Terukur di Kepulauan Aru* (*WPP 718*). Jakarta (ID): EcoNusa Foundation and Universitas Pattimura.

Setia MS. 2016. Methodology Series Module 3: Cross-sectional Studies. *Indian Journal of Dermatology*. 61(3): 261–264. DOI: https://doi.org/10.4103/0019-5154.182410.

Townsend H, Harvey CJ, deReynier Y, Davis D, Zador SG, Gaichas S, Weijerman M, Hazen EL, Kaplan IC. 2019. Progress on Implementing Ecosystem-based Fisheries Management in the United States Through the Use of Ecosystem Models and Analysis. *Frontiers in Marine Science*. 6: 641. DOI: https://doi.org/10.3389/fmars.2019.00641.

Wadkar SK, Singh K, Chakravarty R, Argade SD. 2016. Assessing the Reliability of Attitude Scale by Cronbach's Alpha. *Journal of Global Communication*. 9(2): 113–117. DOI: https://doi.org/10.5958/0976-2442.2016.00019.7.

Yulisti M, Hidayat AS, Firdausy CM, Mu'awanah U, Kurniasari N, Nurjati E. 2024. Effects of Eco-friendly Fishing Gears on Fishermen's Welfare and Sustainable Fisheries: Lessons Learned from Indonesia. *Marine Pollution Bulletin*. 198: 115888. DOI: https://doi.org/10.1016/j.marpolbul.2023.115888.

Zhou S, Smith ADM, Punt AE, Richardson AJ, Gibbs M, Fulton EA, Pascoe S, Bulman C, Bayliss P, Sainsbury K. 2010. Ecosystem-based Fisheries Management Requires a Change to the Selective Fishing Philosophy. *Proceedings of the National Academy of Sciences*. 107(21): 9485–9489. DOI: https://doi.org/10.1073/pnas.0912771107.