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WHAT'S NEXT FOR FISHERMEN? EXAMINING FUTURE MARITIME TRENDS AND INDUSTRY SUSTAINABILITY

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ABSTRACT

The fishing industry faces mounting challenges due to economic instability, technological advancements, and environmental changes, raising concerns about its long-term sustainability. This study, What's Next for Fishermen? Examining Future Maritime Trends and Industry Sustainability, explores the evolving maritime trends and future outlook of the fishing community in La Libertad, Negros Oriental, Philippines. It aims to assess fishermen's socio-economic conditions, identify their technological aspirations, and determine key factors shaping marine capture fisheries. A descriptive research design was employed, involving 254 respondents from six coastal barangays: Pisong, Martilo, North Poblacion, South Poblacion, Cantupa, and San Jose. Data were collected through structured surveys and analyzed using statistical tools. Results indicate that most fishermen are male, aged 46-60, married, and supporting households of 1-5 members, with monthly earnings below ₱9,520 and low educational attainment. Technological preferences highlight a shift toward modernization, with Fiber Glass Boats, Spin Cast Fishing Reels, and Fish Finders emerging as the most sought-after equipment. Fishermen anticipate improvements in fishery management systems and resource recovery but recognize the necessity of investing in new fishing grounds due to shifting fish populations. The study underscores the critical role of government support in providing access to modern fishing technologies, enhancing management systems, and ensuring economic stability. Findings offer valuable insights for policymakers in developing targeted interventions that address industry challenges, promote sustainable fishing practices, and enhance the resilience of coastal communities. Strengthening collaboration between fishermen, local authorities, and stakeholders is vital in navigating future maritime trends and securing the long-term viability of marine capture fisheries.

Keywords: *Fisheries, Fisherman, Industry Sustainability, Maritime Trends, Technological Preferences*

INTRODUCTION

The maritime industry plays a crucial role in economic stability, food security, and global trade, particularly in archipelagic nations like the Philippines. Within this industry, marine capture fisheries provide essential livelihood opportunities for coastal communities. However, fishermen face mounting challenges due to climate change, resource depletion, economic instability, and rapid technological advancements. Traditional fishing methods are becoming less sustainable, necessitating a shift toward modernized equipment and improved fisheries management to ensure long-term viability. In La Libertad, Negros Oriental, where many residents rely on marine resources for survival, understanding the future of maritime trends and their impact on fishermen is essential.

Improving the performance of fishing gear, particularly towed gear, has become a global priority, both from an environmental perspective—reducing seabed impacts—and a socio-economic one, considering rising fuel costs (Sala et al., 2023). While numerous studies have examined the socio-economic conditions of fishermen and the sustainability of marine capture fisheries, gaps remain in localized perspectives. For instance, Allison and Ellis (2001) emphasize that small-scale fisheries are especially vulnerable to climate-related changes and economic shocks due to limited access to capital and adaptive strategies. Similarly, Pauly et al. (2001) highlight the global decline of fish stocks, underscoring the need for improved fisheries governance and technological innovations. In the Philippine context, Muallil et al. (2014) reveal that overfishing and habitat destruction severely threaten local fishery resources, calling for sustainable management initiatives. Despite these studies, limited research explores how fishermen in specific communities, such as La Libertad, perceive and adapt to evolving maritime trends.

Emerging global shifts in ocean conditions further complicate fisheries management. As climate change warms the oceans, fish migrate to new areas, forcing fisheries to adapt by increasing fuel consumption and adjusting fishing treaties between nations (Rogers et al., 2019). These transformations align with broader maritime trends, including shifting shipping routes, heightened geopolitical tensions over marine resources, and the growing need for improved ocean governance. While technological advancements offer potential solutions, achieving sustainability requires context-specific strategies that align with both ecological and socio-economic realities (Hilborn et al., 2023).

This study aims to bridge this research gap by examining the maritime trends that fishermen in La Libertad aspire to adopt, their socio-economic conditions, and their expectations for the future of marine capture fisheries. By analyzing fishermen's demographic profiles, technological preferences, and perspectives on industry

sustainability, this research provides valuable insights into how they can transition toward more sustainable and economically viable fishing practices. The findings will help policymakers, local government units, and stakeholders design targeted interventions that support fishermen's adaptation to emerging maritime trends, ensuring the long-term resilience of coastal communities.

Research Questions

This study aimed to determine the following:

1. The demographic profile of the respondents in terms of their age, sex, civil status, membership status, family members, educational attainment and monthly income.
2. What are the fishing equipment respondents aspire to acquire, reflecting current trends in maritime equipment?
3. What was the valuable insights into the future perspectives of marine capture fisheries?
4. What were the insights of the fishermen into what will happen to fishermen in the future?

METHODOLOGY

Research Design

This study employed a descriptive research design to systematically analyze and interpret data gathered from fishermen in La Libertad, Negros Oriental. The research utilized tables to present findings, including preferred fishing equipment, anticipated challenges in the fisheries sector, and investment needs for adapting to new fishing sites. This structured approach allowed for a clear comparison of emerging trends and patterns, offering insights into fishermen's socio-economic conditions and technological aspirations. Additionally, the use of tables facilitated the analysis of concerns regarding fish scarcity, environmental changes, and the sustainability of marine capture fisheries. The comprehensive data presentation enabled researchers to formulate relevant recommendations for local government units and stakeholders in the fishing industry.

Research Locale

The study was conducted in six (6) coastal barangays of La Libertad, Negros Oriental: Pisong, Martilo, North Poblacion, South Poblacion, Cantupa, and San Jose. These barangays were chosen due to their significant reliance on marine capture fisheries, making them ideal locations for assessing fishermen's perspectives on maritime trends and sustainability.

Research Participants

The respondents were residents of the coastal barangays, particularly fishermen and individuals directly engaged in marine capture fisheries. To ensure representation, participants were selected from each barangay, reducing bias and enhancing the reliability of the study.

Research Instrument

Data collection was conducted using a structured questionnaire, which was modified to suit the study's objectives. The questionnaire was divided into sections: (1) demographic profile, (2) maritime trends and preferred fishing equipment, and (3) future perspectives on marine capture fisheries and the fishing industry.

Data Gathering Procedure

A formal request for research approval was submitted to the Municipal Mayor of La Libertad, Negros Oriental. Once granted permission, the researchers personally administered the questionnaires to respondents, providing instructions and ensuring clarity. After completion, the responses were collected, verified for accuracy, and systematically tabulated for analysis.

Data Analysis

To determine the current maritime trends and fishermen's future perspectives, the study employed a ranking method. Responses were ranked from highest to lowest based on the most preferred fishing technologies and anticipated challenges. This approach provided a clear picture of the fishermen's priorities and industry expectations. By organizing the data in this manner, policymakers and stakeholders can easily identify which technological advancements and sectoral concerns require immediate attention. This structured analysis ensures that interventions are aligned with the actual needs of fishermen, making it easier to formulate targeted policies that enhance sustainability and economic resilience in the fisheries sector.

RESULTS AND DISCUSSION

Table 1 shows the demographic profile of the respondents in terms of their age, sex, civil status, membership status, family members, educational attainment and monthly income.

Table 1. Demographic Profile

Variable	Description	Frequency *(f)*	Percentage *(%)*
Age	15-30	42	17
	31-45	89	35

	46-60	103	40
	Others	20	8
Sex	Male	150	59
	Female	104	41
Civil Status	Single	47	19
	Married	194	76
	Widowed	13	5
Membership Status	Fishermen	148	58
	Fish Gleaner	82	32
	Fish Vendor	22	9
	Others	2	1
Family Members	1-5	168	68
	6-10	81	32
	11-15	41	2
Educational Attainment	Elementary Level	78	31
	Elementary Graduate	30	12
	High School Level	61	24
	High School Graduate	38	15
	College Level	29	11
	College Graduate	18	7
Monthly Income	Less than ₱9,520	190	75
	Between ₱9,520 - ₱19, 040	46	18
	Between ₱19, 040 - ₱38,080	18	7

The demographic profile of the respondents, as shown in Table 1, reveals significant trends regarding age, gender, marital status, occupation, household size, education level, and income. Among the 254 respondents, 40% were between the ages of 46-60, followed by 35% aged 31-45, 17% aged 15-30, and only 8% aged above 60. This finding contrasts with the study by Kwen et al. (2013), which identified the most active age group in fisheries as 30-39 years. The gender distribution shows that 59% of the respondents were male, while 41% were female, indicating that while men dominate the fishing sector, women also contribute significantly. Kwen et al. (2013) also observed female participation in fisheries, highlighting that fishing activities are not exclusively male-dominated.

Marital status data shows that 76% of the respondents were married, 19% were single, and 5% were widowed, aligning with findings from Bornales et al. (2021), Molina et al. (2018), and Kwen et al. (2013), all of which reported a high percentage of married participants in fisheries studies. In terms of occupation, 58% of respondents identified as fishermen, 32% as shellfish gleaners, 9% as fish vendors, and 1% held other roles, including co-founders and employees of the agriculture office. This distribution indicates that fishermen form the majority, serving as the backbone of their local fisheries association, a trend also observed by Bornales et al. (2021).

Household size data reveals that 66% of respondents had 1-5 members, 32% had 6-10 members, and 2% had 11-15 members. This closely aligns with Molina et al. (2018),

which reported that most fishing households had 5-6 individuals. The education level of respondents highlights a significant concern: 31% had some elementary education but did not complete it, while only 12% graduated elementary school. Additionally, 24% had some high school experience, 15% graduated high school, 11% had some college education, and only 7% completed college. Compared to Bornales et al. (2021) and Molina et al. (2018), whose respondents generally completed at least elementary or secondary education, this study found that most fishermen had not completed elementary education.

Income levels further underscore the economic challenges faced by the respondents. A striking 75% earned less than ₱9,520 per month, 18% earned between ₱9,520 - ₱19,040, and only 7% earned between ₱19,040 - ₱38,080. This is consistent with Samonte et al. (1992), which found that the majority of fishermen earned below ₱9,520. The correlation between low educational attainment and low income is evident, as limited formal education restricts access to better employment opportunities and higher earnings. If respondents had attained higher education, their economic status could have improved, potentially increasing their monthly income.

These findings provide valuable insights into the socio-economic conditions of La Libertad's fishing community. The data suggest that addressing educational gaps and promoting sustainable fisheries management can help uplift fishermen's livelihoods. Furthermore, the recognition of female participation and diversification of roles beyond fishing indicate opportunities for expanding economic activities within the maritime sector. By understanding these demographic and economic patterns, policymakers and stakeholders can develop targeted interventions that enhance the resilience and sustainability of local fisheries.

Table 2 highlights the fishing equipment respondents aspire to acquire, reflecting current trends in maritime equipment.

Table 2. Maritime Trends

Fishing Equipment	Frequency	Maritime Trends
Fiber Glass Boats	116	1
Spin Cast Fishing Reels	67	2
Fish Finder Using Technology	32	3
Modern Big Boats	20	4
Gill Nets	13	5
Others	6	6
Total	254	

The data on maritime trends highlights the respondents' preferences for upgrading their fishing equipment to enhance productivity and efficiency. The most desired item was Fiber Glass Boats, prioritized by 116 respondents. This preference indicates a shift toward more durable, efficient, and modernized fishing vessels, likely due to their advantages in maneuverability and reduced maintenance compared to traditional wooden

boats. This finding aligns with previous studies that emphasize the increasing adoption of fiber glass boats due to their cost-effectiveness and longevity.

The second most sought-after equipment was Spin Cast Fishing Reels, chosen by 67 respondents. This trend suggests a growing interest in more efficient fishing methods that improve catch rates, supporting earlier research that highlights the role of advanced fishing gear in boosting productivity. Similarly, the adoption of Technology-Aided Fish Finders by 32 respondents reflects the increasing reliance on technology to locate fish more efficiently and minimize effort. This finding is consistent with prior studies that underscore the role of modern fish-finding technology in optimizing fishing operations.

Other preferences included Modern Big Boats (20 respondents), Gill Nets (13 respondents), and miscellaneous options such as Pump Boats (6 respondents). The lower rankings of these items suggest that while demand for various fishing tools exists, the majority of respondents prioritize equipment that directly enhances efficiency and ease of operation. Furthermore, the data reveals a critical gap in access to motorized or advanced boats among many fishermen, highlighting financial constraints and limited access to modern fishing technology as key barriers to adoption. These challenges resonate with findings from previous research, which emphasize the economic limitations that hinder fisherfolk from transitioning to more advanced maritime equipment.

Overall, the findings suggest the need for targeted interventions, such as subsidies, equipment grants, or financing programs, to enable fishermen to acquire the necessary tools. Additionally, training programs on the use and maintenance of advanced fishing equipment could maximize benefits and ensure sustainable practices. Addressing these needs can enhance the productivity and economic well-being of the fishing community while promoting sustainable fisheries management. These recommendations align with existing studies advocating for policy support to modernize the fishing sector and improve the livelihoods of fisherfolk.

Table 3 provides valuable insights into the future perspectives of marine capture fisheries.

Table 3. Marine Capture Fisheries in the Future

Statements	Frequency *(f)*	Rank
1. Demonstrate progress in some fishery management systems, and recovery of depleted resources.	116	1
2. Marine Capture Fisheries sector will face its most critical challenges.	85	2
3. Fisheries will expand as technology improves and harvesting becomes more cost-effective.	41	3

4. Marine Fisheries will be conditioned by sectoral and social, economic, and environmental governance.	12	4
Total	**254**	

A significant portion of respondents (116, ranked first) foresee progress in fishery management systems and the recovery of depleted resources. This reflects growing confidence in sustainable fisheries initiatives, such as improved stock assessment techniques, habitat restoration, and stricter fishing regulations. Similar trends have been reported in studies by Cochrane et al. (2009) and Hilborn et al. (2018), which highlight the positive effects of well-implemented fishery management policies in restoring fish populations and maintaining ecological balance.

Conversely, 85 respondents (ranked second) predict that the marine capture fisheries sector will face critical challenges. This aligns with global concerns about overfishing, climate change, and policy inefficiencies (FAO, 2020). Such concerns are consistent with the findings of García et al. (2010) and Pomeroy & Suh (2020), who emphasize that dwindling fish stocks, habitat degradation, and socio-economic pressures continue to threaten marine fisheries worldwide. These factors could undermine sustainability efforts, necessitating adaptive strategies to mitigate risks.

Meanwhile, 41 respondents (ranked third) believe that technological advancements will drive expansion and cost-effective harvesting. The adoption of modern fishing technologies—such as GPS-based fish finders, improved fishing gear, and sustainable aquaculture practices—has been shown to increase efficiency and reduce waste (Pauly & Zeller, 2016). While technology presents promising solutions, its accessibility remains a challenge for small-scale fishers, who may lack the financial resources to adopt these innovations.

Only 12 respondents (ranked fourth) recognize the importance of governance in shaping the future of marine fisheries. This suggests that governance structures, including legal frameworks and socio-economic policies, are not yet fully prioritized by local fishermen. However, research by Cinner et al. (2022) underscores that effective governance, community involvement, and enforcement mechanisms are crucial for long-term sustainability. The low ranking of governance in this study may indicate a gap in awareness or engagement in policy-making processes.

Overall, the findings suggest that the future of marine capture fisheries hinges on balancing progress and challenges. While fishermen recognize the potential benefits of improved management and technology, they also anticipate significant hurdles. Effective governance, adaptive policies, and continued investment in sustainable practices will be essential in ensuring the long-term viability of the sector.

Table 4. Fishermen in the Future presents insights into what will happen to fishermen in the future.

Table 4. Fishermen in the Future

Statements	Frequency *(f)*	Rank
1. Fishermen will have to invest more time and resources in locating and acclimating to the new sites of fish.	201	1
2. Coastal fishermen had long warned that fish will become scarcer.	35	2
3. Coastal fishermen lost their livelihoods.	18	3
Total	**254**	

A strong majority of respondents (201 out of 254) expressed the view that fishermen will need to invest more time and resources in locating and adapting to new fishing sites. This reflects an increasing awareness of the environmental pressures facing marine resources. Such concerns are consistent with recent research, such as Mossler's (2021) study, which documents the migration of fish populations toward cooler waters due to climate change. These shifting migration patterns are likely to impact the accessibility and abundance of fish in traditional fishing grounds, thereby increasing the need for fishermen to explore new areas. This trend underscores the growing challenge of environmental adaptation in the fisheries sector, especially for small-scale and coastal fishermen.

The second most common response (35 respondents) suggests that coastal fishermen have long warned of the impending scarcity of fish. This recognition of the dwindling fish stocks aligns with findings from studies like those by Hilborn et al. (2018) and Pomeroy & Suh (2020), which highlight the increasing threat of overfishing and climate change to global fish populations. The respondents' concerns underscore the pressing need for sustainable fisheries management and conservation efforts to address the depletion of marine resources.

In contrast, only 18 respondents (ranked third) believed that fishermen would lose their livelihoods. This relatively small number of responses could reflect either a sense of optimism or a belief in the adaptability and resilience of the fishing community. While the risks of livelihood loss due to environmental change are real, as emphasized in various studies (e.g., FAO, 2020), the fishing community's resilience may suggest that they are preparing to overcome these challenges through adaptation, innovation, and collaboration. This contrasts with the findings of Bornales et al. (2021), where some respondents expressed concerns about the potential collapse of their livelihoods in the face of increasing environmental and economic challenges.

In conclusion, the results of this study suggest that fishermen are facing an uncertain future shaped by environmental change, but they remain largely optimistic about their ability to adapt. The findings highlight the need for investment in new technologies, sustainable fishing practices, and alternative livelihoods, while emphasizing the resilience

of the fishing community despite the challenges they anticipate. The combination of adaptation to shifting fish stocks and proactive resource management will be key to ensuring the long-term sustainability of the fishing industry.

Conclusions

This study provides valuable insights into the demographic, socioeconomic, and technological aspirations of fishermen, as well as their perceptions of the future challenges and opportunities in marine capture fisheries. The demographic analysis reveals that most respondents (40%) were aged 46-60 years, followed by 35% aged 31-45 years, indicating the active participation of middle-aged individuals in livelihood activities. The majority (59%) were male, and 76% were married, a trend consistent with previous studies on fisheries-dependent communities. Socioeconomic findings highlight that fishermen (58%) form the backbone of the association, with 66% of respondents belonging to households with 1-5 members, aligning with similar demographic patterns observed in other research. Additionally, low educational attainment (31% with incomplete elementary education) correlates with low income levels, as most respondents earned less than ₱9,520 per month.

The study also identifies a strong inclination among fishermen toward technological advancements. The most preferred equipment was Fiber Glass Boats, selected by 116 respondents, followed by Spin Cast Fishing Reels and Fish Finder technology. This preference underscores a shift toward modernizing traditional fishing practices to enhance efficiency and productivity. However, limited access to advanced tools, such as motorized boats, highlights the need for external support to equip fishermen with the necessary resources to navigate economic and environmental challenges.

Looking ahead, the respondents foresee significant transformations in marine capture fisheries. A majority (201 respondents) anticipate the necessity of investing more time and resources in locating new fishing sites, reflecting concerns over fish migration driven by environmental changes. While 85 respondents predict critical challenges in the fisheries sector, 41 express optimism about technological advancements as a means to improve cost-effectiveness and expand the industry. These findings emphasize the importance of sustainable resource management, effective governance, and innovation in ensuring the resilience of fisheries and the livelihoods of coastal communities.

To address the identified challenges and aspirations, the Local Government Unit (LGU) can play a crucial role in fostering a resilient and adaptive fishing community. Targeted interventions—such as financial assistance for modern fishing equipment, training programs on sustainable fishing practices, and educational support—can significantly improve the productivity and income of fishermen. Moreover, integrating alternative livelihood programs can help break the cycle of low educational attainment and economic vulnerability. Collaborative efforts between the LGU, stakeholders, and

fisherfolk associations can drive sustainable development, ensuring that the fisheries sector remains viable amid evolving environmental and economic conditions.

Future research may explore the long-term impacts of climate change on local fish populations and assess the effectiveness of emerging fishing technologies in improving livelihoods. Additionally, further studies on policy frameworks and governance strategies can help develop more comprehensive approaches to support sustainable fisheries management.

Recommendations

Based on the findings, several recommendations can be made to improve the livelihoods of fishermen and promote sustainable fisheries management. First, economic and livelihood support should be enhanced by providing subsidies or financing programs for modern fishing equipment, such as Fiber Glass Boats, Spin Cast Fishing Reels, and Fish Finders. Additionally, alternative livelihood programs, including aquaculture, fish processing, and community-based tourism, should be introduced to supplement fishing income and reduce economic vulnerability.

Improving educational attainment and capacity building is also crucial, as the data shows a significant portion of fishermen have low levels of formal education. Implementing skill development programs on sustainable fishing practices, financial management, and alternative income-generating activities can help fishermen increase their earning potential. Moreover, scholarships and vocational training tailored to fisherfolk and their families can break the cycle of poverty and open opportunities beyond fishing.

To ensure the long-term sustainability of marine resources, strengthening fisheries management and environmental conservation efforts is essential. The local government should promote sustainable fishing practices by regulating overfishing and encouraging responsible resource use. Establishing marine protected areas and implementing fish stock monitoring programs can help preserve fish populations and restore depleted habitats.

Furthermore, enhancing governance and community involvement will improve fisheries management. Strengthening policy frameworks and actively involving fisherfolk in decision-making processes can lead to more effective and inclusive regulations. Empowering local fishing organizations to participate in governance and conservation initiatives will also foster a sense of ownership and responsibility within the community.

Lastly, adapting to climate change and resource scarcity should be a priority. Conducting research on shifting fish populations and changing marine conditions will help fishermen adjust to new fishing sites. Additionally, providing training on climate adaptation strategies and offering financial assistance during environmental disruptions can improve the resilience of fishing communities. By implementing these recommendations, the local government and stakeholders can support fishermen in

overcoming economic challenges, ensuring sustainable resource management, and securing the long-term viability of the fishing sector.

Compliance with Ethical Standards

The study adhered to strict ethical standards. Participants received an informed consent letter explaining the research objectives, methodology, and their voluntary participation. Confidentiality was maintained throughout the study, with respondents' identities kept anonymous. Participants had the right to refuse participation without any consequences.

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