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Establishing livelihood resilience among fishing communities: The case of tuna (*Thunnus albacares*) fisheries in Occidental Mindoro, Philippines

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ABSTRACT

In Occidental Mindoro, catching yellowfin tuna isn't just an occupation—it's deeply embedded in the culture. However, recent times have seen a decline in their fortunes. Older fishers remember when the seas were abundant with tuna, but now many voyages yield nothing. The changing temperature of the oceans affects tuna quality, leading to decreased market prices. Coupled with high fishing expenses, many fishermen find themselves struggling financially. This research delves into these pressing issues, seeking to understand the lived experiences and resilience strategies of these fishers. This study investigates these challenges and aims to better understand the experiences in sustaining their livelihood and coping strategies to overcome the economic, environmental, and social challenges of the small-scale tuna fishers. The study was a qualitative type of research utilizing a phenomenological approach and analyzed the data using thematic analysis. Furthermore, the study proposed adaptive measures employed by small-scale tuna fishing communities in Occidental Mindoro to effectively steer the intricate web of economic, environmental, and social obstacles that beset them. By implementing strategies like income diversification, credit availability, strengthening market connections and advocacy, these communities demonstrate a proactive approach to securing their livelihoods and stimulating their resilience in the face of complex challenges. This research underlines the significance of local-level strategies in fostering community well-being and emphasizes the potential for informed decision-making in supporting the sustainable development of such communities.

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1. INTRODUCTION

The Republic of the Philippines, made up of 7,600 islands and islets, stands as the world's second most expansive island nation. With a rich abundance of marine assets, its coastline extends for 36,289 km and it possesses an exclusive economic zone (EEZ) covering 2.2 million km (Castro & Magnaye, 2023). The nation's continental shelf spans 184,600 km, plunging to depths of 200 m, and features a vast coral reef region measuring 27,000 km (Panga et a., 2021). Tuna emerges as the premier seafood export, with varieties like yellowfin, skipjack, and frigate tuna constituting close to half of the country's marine product exports. In 2020 alone, the nation exported an impressive aggregate of 134,412 metric tons across diverse tuna categories—ranging from fresh, chilled, and frozen to smoked, dried, and canned. These exports culminated in a substantial revenue generation of USD 481 million (Tahiluddin & Sarri, 2022).

Yellowfin tuna serves as the lifeblood of countless local fishermen. In Occidental Mindoro, pursuing tuna is not just a profession; it is deeply woven into the cultural fabric. The bounteous marine treasures of the Mindoro Strait support over a thousand fishing vessels. Several veteran fishers, with more than four decades of experience, have been witness to the stark decline in tuna availability in their local waters. They reminisce about the early 2000s when a mere few hours of fishing would guarantee a rewarding haul. Today, capturing even a single tuna requires an immense stroke of luck. As a seasoned fisherman from Mamburao lamented, "Out of 100 tuna boats out in the deep, barely 30 might return with a catch" (Juan-Jordá, et al., 2015).

Furthermore, as highlighted by Chan (2023), every voyage is an economic challenge for those in the tuna fishing industry. Investing heavily to embark on a trip, fishers face the stark reality that they might not even recover their expenses. Beyond the unpredictability of securing a catch, the warming seas harm the quality of the tuna (Heidrich et. al., 2022). As observed by numerous fishermen, tuna from these warmer waters tend to be of inferior grade and thus command a lesser price. Faced with increasing operational costs, the unpredictability of a successful haul, and declining tuna values, the earnings from each journey often prove inadequate. This has driven the tuna fishermen of Occidental Mindoro into a relentless spiral of financial hardship and escalating debts.

The small-scale tuna fishing industry is facing financial stressors and the quality and quantity of tuna are being impacted by global warming. These issues raise important questions about the sustainability of tuna fishing in the province as well as the broader socio-economic implications for the community and local economy. Despite the significance of these issues, there has been a notable absence of dedicated studies on the livelihoods of small-scale tuna fishers in the province.

This study aimed to explore the resilience of small-scale tuna fishers in Occidental Mindoro. It focused on their perspectives and experiences in sustaining their livelihood despite economic, environmental, and social challenges. The research also intended o inform government and non-government organizations about the current livelihood conditions of the tuna fishers in the province

2. MATERIALS AND METHOD

2.1. Study Design

This study utilized a phenomenological approach in its qualitative research, delving deep into the resilience of tuna fishing communities. This method is apt for exploring intricate phenomena comprehensively, shedding light on the experience of sustaining livelihood and coping strategies to overcome economic, environmental, and social challenges undertaken by the tuna fishers.

2.2. Setting

The research was conducted in Occidental Mindoro, Philippines, particularly in the municipality of Rizal, Calintaan, Sablayan, Sta. Cruz, Mamburao, and Paluan where small-scale tuna fishers were prevalent with a total population of registered fishers of 1, 961 (Mindoro Straight Management Plan, 2018).

2.3. Sample

The research centered around small-scale tuna fishers in Occidental Mindoro. After interviewing 15 participants, data saturation was achieved. The study targeted registered small-scale tuna fishers with a minimum of one year of fishing experience. Those not keen on participating or reluctant to share insights were excluded. Participants feeling uneasy or distressed during discussions were assured they could opt out at any time.

2.4. Research Instrument

Semi-structured interviews served as the primary research instrument. The interview guide was developed based on existing literature and expert consultations, ensuring it covers the challenges that the tuna fishers face in sustaining their livelihoods and their coping strategies to overcome the economic, environmental, and social challenges.

2.5. Data Collection

Data were collected through face-to-face interviews, allowing participants to express their experiences and strategies openly. These interviews were audio-recorded and transcribed verbatim to capture nuances in participants' narratives. Furthermore, an understanding was established that solely the researchers would possess the privilege of accessing the audio-recorded information.

2.6. Ethical Considerations

In the modern era, the landscape of research, its methodologies, and contexts are everevolving, and so are the ethical issues associated with them. Consequently, topics such as privacy and confidentiality have garnered significant attention, going beyond mere legal mandates (Harris & Atkinson, 2015). Adhering to the Code of Ethics, the researcher ensured that all data collected from participants was given voluntarily and with informed consent. The researcher also prioritized treating participants with respect and integrity during interactions, aiming to obtain the most genuine feedback. By valuing and recording the perspectives and feedback of the respondents, the study's credibility and success are reinforced.

2.6. Data Analysis

The data was analyzed using thematic analysis. The interview transcripts were examined and coded to pinpoint common themes and patterns. The analytical procedure involved stages like getting acquainted with the data, formulating preliminary codes, seeking out themes, assessing these themes, characterizing and labeling themes, and compiling the conclusive report.

3. RESULTS

3.1. Challenges in livelihood sustainability

The discussion on the perceptions and experiences of tuna fishing communities about the difficulties they encounter in maintaining their livelihoods reveals three common themes: 1) climate change, 2) economic instability, and 3) overfishing.

Theme 1: Climate change

The availability of tuna, a vital marine resource, is subject to seasonal variations that significantly impact local fishing communities. The small-scale tuna fishers noted that there are periods characterized by a consistent presence of tuna throughout the entire year, albeit in a gradual manner. This observation underscores the resilience of tuna populations to certain conditions, allowing for their sustained presence despite fluctuating factors.

Conversely, they have mentioned a specific timeframe for tuna catch, primarily from September to March, which suggests a temporal aspect of the fishing season. However, they have highlighted a scenario where tuna scarcity becomes pronounced during specific times, notably during the hot weather. This situation forces the community to adapt their fishing strategies, targeting alternative fish species to compensate for the absence of tuna. This stresses the vulnerability of tuna to environmental changes, particularly temperature variations, which can disrupt their distribution and behavior. The participants shared the following observations:

> *"There are times when there is tuna throughout the whole year, even if it's just gradually like now, but there are times like last year when there is no tuna from June to September."*

> *"When the weather becomes excessively hot, tuna are very scarce, so we often bring home different types of fish instead. Most of the time, our catch of tuna is only from September to March."*

Theme 2: Overfishing

The overfishing of the tuna population poses a serious threat, say the small-scale tuna fishing communities. It lessens the amount of tuna in the ocean, making it harder for them to find tuna and possibly resulting in lower catches. Furthermore, young tuna has less time to develop and reproduce than older tuna. The size of the tuna population may decrease as a result. Overfishing may result in higher tuna mortality rates. This is because tuna caught using fishing techniques may sustain wounds that make them more vulnerable to disease or attack by predators. With that being mentioned, the fishermen reached a consensus on the following:

> *"Overfishing is even more dangerous than climate change, so commercial fishing bears a significant responsibility because they catch without discrimination and control, even capturing small fish."*

Theme 3. Economic instability

The tuna fishing communities also struggle with economic instability. The individual or community involved in fishing recognizes the need to use the proceeds from their catch to address financial obligations, particularly debts. The statement implies that they view this practice as appropriate or necessary. The fact that the proceeds might sometimes be insufficient indicates a certain level of financial strain. This could be due to various factors such as fluctuating fish prices, rising costs of equipment and resources, and potentially overexploitation of fish stocks, leading to lower yields. The insufficiency of funds to cover debts can perpetuate a cycle of economic difficulty, where debt repayment becomes a significant burden.

They also highlighted the rising costs of living and the lack of control over market prices for their catch. The increasing cost of goods can erode the purchasing power of the income earned from fishing. Furthermore, the lack of control over market prices, specifically in this case, tuna prices, can make it challenging for fishermen to predict their income accurately. This uncertainty can make it difficult to plan for the future or budget effectively. The statement also implies that the traditional livelihood of fishing might no longer be able to adequately support the needs of a family due to external economic factors that are beyond the fishermen's control. Respondents clamor on the issue of economic stability:

> *"It's just right that the proceeds from our catch are used to pay off debts when we return home; sometimes, it's even insufficient."*

> *"With the soaring cost of goods and the lack of control over tuna prices, there's nothing we can do. The income from fishing is no longer sufficient to support the family."*

3.2. Coping strategies to overcome the economic, environmental, and social challenges

Three (3) themes emerged as coping strategies employed by tuna fishing communities to overcome the economic, environmental, and social challenges they encounter which are: 1) diversifying income sources, 2) adopting sustainable fishing methods, and 3) building social capital.

Theme 1: Diversifying income sources

The small-scale tuna fishers emphasize the importance of finding alternative ways to support their family when tuna, their primary source of income, becomes scarce. This shows a responsible attitude towards their family's well-being and their determination to meet their needs. By working as a laborer in construction, they can earn income from a different field. Additionally, they mentioned "peddling" their caught fish, indicating that they are using their fishing skills to directly sell the fish they catch, likely to a local market or to neighbors. This showcases their ability to diversify their income streams by combining their fishing skills with other forms of work.

Moreover, most of them put up a sari-sari store as an alternative source. This move demonstrates their entrepreneurial spirit and willingness to explore new avenues for income generation highlight the resourcefulness and adaptability of an individual when faced with challenges in their livelihood, specifically in the context of fishing and providing for their family.

Their responses illustrate the importance of adaptability and innovation when facing fluctuations in the availability of resources while also emphasizing the individual's commitment to their family's well-being and their readiness to explore different options for sustaining their livelihood. All participants undoubtedly asserted the following claims:

> "*During times when tuna is scarce, I need to earn money through other means to meet the needs of my family. I work as a laborer in construction and, at the same time peddle my caught fish."*

> *"When I'm unable to fish because tuna isn't available, my partner and I established a sari-sari store. Also, I engaged in carpentry to supplement my income."*

Theme 2: Adopting sustainable fishing methods

The small-scale tuna fishers who exclusively employ handline fishing. Handline fishing involves using a single fishing line with hooks, often managed manually. This method tends to be more selective, targeting specific fish species and reducing bycatch which is the unintended capture of non-target species. Handline fishing is often associated with smaller-scale and more localized operations.

They also highlighted the tension between sustainable and localized fishing practices, represented by handline fishing, and more industrialized and less selective practices carried out by commercial fishing vessels. This contrast underscores the need for balanced and responsible fishing practices that consider both environmental conservation and the well-being of local communities that depend on fishing for their livelihoods. Fishermen provided the subsequent feedback:

> *"We, tuna fishermen, only use handlines while commercial fishing vessels enter municipal waters and indiscriminately catch even small fish using bag net 'basnigan'."*

Theme 3: Building social capital

The participants point out the development of new groups or associations among fishermen. This is significant as it indicates a growing recognition of the benefits of coming together for a common purpose. In contrast to the past where individuals may have struggled to make their voices heard, by forming organized

groups, fishermen can pool their resources, share knowledge, and collaborate on issues that affect their livelihoods. It also provides a platform for fishermen to express their concerns and opinions more effectively. This implies that the collective action has empowered fishermen to engage in advocacy and seek redress for any injustices they might be facing. It is a demonstration of how organized efforts can lead to tangible changes and improvements in their working and living conditions. Consequently, the tuna fishers reached a consensus on the following:

> *"Now there are emerging groups or associations of fishermen, which is better because our voices are now being heard, unlike before it was our own. We are now able to fight for our rights and hear our grievances."*

4. DISCUSSION

Establishing Livelihood Resilience Among Fishing Communities holds significant importance given the significant role of fishing communities in global food security, the vulnerability of such communities to various challenges, and the need for sustainable approaches to safeguard their livelihoods.

Climate change introduces a range of challenges and uncertainties that collectively affect small-scale tuna fishers (Cinner et al., n.d; Daw et al., 2012). Shifts in climatic conditions impose restrictions on the fishing activities of the fishermen. The impact of climate change on the output of small-scale fishers is jeopardizing their food security and poses a significant obstacle to meeting their livelihood requirements (Clarke et al., 2022). The pivotal factor for success lies in guaranteeing sufficient and efficient adaptation strategies. Effective adaptive practices hold the potential to significantly mitigate threats posed by climate change (Ali & Erenstein, 2017). According to Israel and Sierra (2023), adaptation to climate change can be either premeditated or spontaneous. In the context of capture fisheries, strategies of adaptation encompass adjustments in fishing objectives, shifts in timing, and changes in fishing locations.

This study also underlines a significant concern regarding the overfishing of tuna which poses a grave risk to the livelihoods of tuna fishers. In the work of Digal (2017), it is evident that despite the looming possibility of the entire industry collapsing because the adoption of sustainable tuna fishing methods among local fishers remains disappointingly low. Tahiluddin and Sarri (2022) draw attention to the alarming rate of overfishing in the commercial marine fisheries sector of the Philippines. This reckless overfishing could potentially trigger the complete breakdown of the fisheries sector.

Navigating and addressing the multifaceted challenges posed by economic, environmental, and social factors requires the development and implementation of effective coping strategies. This objective delves into the diverse approaches and solutions that small-scale tuna fishers employ to overcome these complex challenges and strive for sustainable progress.

Broadening the range of income avenues could serve as a strategy for tuna fishers in the Philippines to cope with economic, environmental, and social hurdles. Tolentino-Zondervan (2016) revealed that private incentive mechanisms play a role in enhancing the capabilities of fishers to meet sustainability standards, potentially resulting in economic advancement. Lomboy (2019) crafted an economic resilience strategy focused on bolstering household assets to minimize risks and vulnerabilities, stressing the linkage between household interventions and sustainable fishing practices. Collectively, these papers highlight the viability of income diversification and the adoption of sustainable methods as avenues for tuna fishers to surmount economic, environmental, and social challenges.

Moreover, the results recommend that adopting sustainable fishing methods can be a coping strategy for the economic, environmental, and social challenges faced by tuna fishers in the Philippines. Handline fishers have lower catch rates than purse seine and ring net fisher but they have the advantage of being able to roam freely between Fish Aggregating Device (FAD) areas (Macusi, 2020). Tolentino-Zondervan (2016) compared different private incentive mechanisms for improving sustainability in Filipino tuna fisheries and found that the success of these mechanisms depends on the extent to which they support the development of fisher capabilities to comply with sustainability requirements. Overall, the papers suggest that adopting sustainable fishing methods can be a viable coping strategy for the challenges faced by tuna fishers but various factors affect the adoption of these practices and the success of incentive mechanisms.

This study also proposes that fostering social capital can serve as an effective strategy for small-scale tuna fishers to address economic, environmental, and social challenges. Mialhe et al., 2018) discovered that greater levels of linking and bridging social capital correlated with enhanced co-management performance among fishers. The significance of social capital to small-scale tuna fishers becomes apparent as it grants them access to vital information about fishing conditions, facilitates collaborative problem-solving, facilitates resource pooling, and empowers collective advocacy for their rights and interests. Ultimately, this foundation of social capital contributes to their resilience, improved livelihoods, and the promotion of sustainable fishing practices.

Utilizing the key themes that highlight the environmental, economic, and social challenges faced by tuna fishermen, the researchers have systematically compiled a livelihood resilience plan for tuna fishing communities as detailed in Table 1. This plan provides a comprehensive approach to address their challenges and strengthen their resilience.

Table 1. Proposed livelihood resilience plan.

Key Challenges	Objectives	Actions/ Measures
Seasonal variation and tuna availability	Enhance seasonal resilience	• Consider strictly implementing seasonal fishing regulations that are based on the availability patterns of tuna. • Provide training on diversification of fishing targets during off-peak seasons.
Overfishing and ecological imbalance	Improve fishing practices to address overfishing and ecological imbalance	• Advocate for stricter fishing quotas and the use of selective fishing gear to ensure sustainable fishing practices and protect marine life. • Collaborate with authorities to implement marine protected areas.
Economic challenges	Strengthen Supportive Government Policies	• Lobby for policies stabilizing fish prices and provide financial assistance to those in need. • Promote and enforce sustainable fishing practices through strict government regulations.
Dependency on the single income stream	Empower small-scale tuna fishers with skills for alternative income sources	• Conduct training programs for alternative income sources. • Support entrepreneurship initiatives related to fishing.
Sustainable fishing practices and conservation	Establish Sustainable Fishing Practices	• Raise awareness about handline fishing and sustainable practices. • Engage in collaborative efforts for effective regulations and conservation measures.
Lack of collective action	Foster collective action	• Facilitate the formation of fishing associations. • Encourage knowledge-sharing and collaboration among fishing groups.

5. CONCLUSION

The study's findings indicate that small-scale tuna fishers is threatened by various challenges such as climate change, overfishing, and economic instability have emerged as prominent factors undermining their efforts. Addressing these multifaceted challenges demands a comprehensive and coordinated approach. To ensure the long-term viability of small-scale tuna fishing communities, the government must take the lead in addressing their challenges. This can be achieved by strengthening the regulatory framework for seasonal fishing, promoting the diversification of fishing targets, and instilling responsible fishing practices through continuous training on sustainable fishing methods. These essential measures will contribute to the sustainable management of tuna resources.

This study sheds light on how small-scale tuna fishing communities in Occidental Mindoro adapt to the economic, environmental, and social obstacles they face. It is recommended to implement strategies in income diversification, credit availability, strengthening market connections, and advocacy to secure their livelihoods and fortify their resilience. Local level strategies are crucial for community development and informed decision-making supports sustainable development. Moreover, the active involvement of local institutions is crucial in alleviating the obstacles that threaten the viability of small-scale tuna fishing in the province. This collective effort, grounded in understanding, collaboration, and support, is crucial to enable fishing communities to navigate their challenges while ensuring the sustainability of their livelihoods and tuna conservation.

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