

Enhancing social resilience and addressing economic uncertainty in small-scale fishing households along the west coast of West Sumatra

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Abstract: This study examined the significance of small-scale fishing within the west coastal communities in Sumatra. It aimed to investigate the impact of various factors, such as the COVID-19 outbreak, overfishing, and changes in marine ecosystems, on the decline of natural resources. These factors created insecurity in the livelihoods of small-scale fishing and had severe social and economic impacts on coastal communities. To better understand the coping mechanisms used by small-scale fishing in response to external shocks, a qualitative study was conducted in Ampiang Parak Village, Sutera sub-District, South Pesisir District. Data were collected using observation, interviews, literature review, and photo documentation. The results showed that small-scale fishing and the associated households used various livelihood strategies to respond to these challenges. Furthermore, this study examined the social resilience built by fishing households to overcome economic insecurity. The result showed that the resilience-building measures included income diversification, temporal and seasonal migration, women group empowerment, the development of labor division, and the exploration of non-fish resources.

1 Introduction

Unlike various coastal and rural activities, fishing is characterized by a high degree of uncertainty due to several factors, including occupational hazards, natural disasters, and macroeconomic variables such as fluctuations in gasoline prices and other input costs [1, 2]. These factors lead to financial instability for fishing households, as their income can fluctuate

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daily or seasonal [3]. The tensions may also affect other fishing-related activities while impacting coastal community members [4]. Berkes [5] argues that the complexities arising from uncertainties make the management of fisheries more challenging. If the sources of uncertainties in fishing cannot be accurately identified, it can result in the failure of effective management and an inaccurate approach to addressing the actual underlying causes of poverty within fishing communities [3] [6], [7].

Small-scale fishing is especially vulnerable to uncertainties in fishing communities because they are more prevalent in this sector [8]–[10]. As reported by Allison & Ellis [11] and Béné [4], small-scale fishermen stand out among the socio-economic groups in developing nations as one of the most vulnerable. The increase in vulnerability occurs when the capacity of both institutional and human capabilities to address uncertainties in fishing is generally weaker compared to developed nations [12], [13]. Béné [4] also reported a vulnerability linked to gender within the context of small-scale fishing. Coastal women often face higher vulnerability, given that their social standing tends to be relatively lower in developing nations [14]–[17]. Gender distinctions within coastal fishing communities exhibit intricacies, and the relative positions within social hierarchies can differ [18].

The western coast of West Sumatra is inhabited by many fishermen whose livelihoods are dependent on fishing [19]. Fishing activities on the western coast of West Sumatra are predominantly carried out by small-scale fishermen (60%), although several larger vessels, such as purse seiners, significantly contribute to the overall catch in the Sumatra Sea [20]. The term small-scale is used with differing interpretations among various fishing countries [21]. Therefore, it is crucial to clarify within the context of Indonesia, as it typically refers to fishing carried out using small boats, including non-motorized and outboard motor-equipped vessels, with a gross tonnage of less than ten [4, 11, 12]. The City of Padang and Pariaman, District of South Pesisir, Agam, West Pasaman, and Padang Pariaman are coastal urban centers serving as the primary hubs within the fishing network of West Sumatra [20] (*Figure 1*). For instance, the District of South Pesisir plays a crucial role in receiving and distributing small pelagic fish throughout the country. In addition to the craft of Songket (ornamented clothing), fishing continues to be a dominant economic activity. Around the year 2016, the western coastline of West Sumatra became a significant fishing region in Indonesia, making a substantial contribution to the total catch volume.



Source: <https://www.vectorstock.com/royalty-free-vector/administrative-map-west-sumatra-indonesia-vector-34452693>

Fig. 1. Map of the West Coast of West Sumatra

There is a widely held belief that the susceptibility of small-scale fishers to uncertainty could further weaken the local economy and exacerbate poverty in coastal communities [23], [24]. However, this belief often overlooks the capacity of fishing households to navigate uncertainties through various mechanisms [15], [24], [25]. Coastal communities in developing countries, for instance, have demonstrated that social resilience rooted in their culture can be an effective means of coping with unforeseen shocks [26] [3], [27], [28]. These mechanisms are sometimes underestimated or overlooked by authorities, leading to the failure of government-initiated poverty-alleviation programs due to a lack of recognition of local initiatives [15], [18], [29]. The significance of these mechanisms is often not fully appreciated until after government programs have already proven unsuccessful. Hence, we must enhance our comprehension of the diverse coping and livelihood strategies employed by small-scale fishers and their families to mitigate the adverse effects of uncertainties. This paper seeks to promote and enhance this understanding. It will investigate how small-scale fishing households respond to uncertainties arising from fluctuations in resources and other sources of uncertainty, including social and market fluctuations. The authors will begin by offering a concise overview of coastal fisheries on the west coast of Sumatra, with a specific focus on small-scale or artisanal fishing activities. Subsequently, the authors will examine various adaptation strategies implemented by both fishermen and their families, aiming to identify key lessons learned from these observations that can inform fishery management efforts

2 Materials and method of research

2.1 Study Location

This study was conducted at Ampiang Parak Village, Sutera Sub-district, District of South Pesisir, West Sumatra Province, Indonesia, from May 2023 to July 2023. Unless otherwise indicated, all the data presented were considered accurate as of January 2023. Most of the interviews were carried out in an informal and unorganized manner. During visits to the houses of villagers, fixed questions were intentionally minimal, and conversations on daily things were pursued without trying to pre-determine their directions. When a noteworthy aspect emerged, attempts were made to delve deeper into the subject. This approach was aimed to both record and elucidate the intricate perceptions of the fishermen in the surroundings. Simultaneously, there was proactive involvement with these perceptions as they naturally surfaced in a manner closely intertwined with their everyday experiences.

Concurrently with these informal interviews, a methodical survey was carried out involving family members. This survey was essential to elucidate sporadic migration inquiries about individual lineage, familial ties, and marriage traditions within their clans. In addition to interviews and surveys, it was crucial to highlight the villagers' eagerness to open up about their daily routines.

The ethnographic direction brings together the images of the government, the Ampiang Parak people's involvement, and their adoptions and engagements. As a result of this involvement, individuals residing along the Ampiang Parak coast have conceptualized and begun to reshape their identity, practices, classifications, and originality within their local knowledge. Hence, this study investigated the adoption of the Ampiang Parak variant of the Minangkabau, evaluated its ensuing consequences, and analyzed the behaviors emerging in connection with these circumstances.

2.2 Interview, focus group discussion, and field survey

This study employed qualitative methods, which involve describing variables through definitions, conceptual explanations, notes, or other means of recording field conditions [15–18]. Various criteria were used to pick the analysis, namely 1) it must be related to a socio-economic aspect, 2) the potential social and cultural in this village, such as tradition, habit, and interaction between the communities, and 3) the basic range of entrepreneurship in their culture. This study consisted of 25 semi-structured interviews, with 20 males and five females, consisting of fishermen and local stakeholders. Besides, a snowball sampling technique was used to select the respondent. The interview guidelines consisted of inquiries related to the occupations within fishing communities, the socio-economic status, the information and knowledge dissemination concerning environmental legislation implementation, and economic endeavors. The questions were posed to ascertain the informant's level of expertise, and Table 1 showed the occupation of the fishing communities. Subsequently, the interview was coded, and the results were recorded and written.

Table 1. The Fishing Communities Occupation

Study Location	Occupation	Number of Informants
Ampiang Parak Village, Sutera District, South Pesisir Regency	Head of village	2
	Fishermen	13
	Wife of Fishermen	5
	Fish Trader	5
Total		25

Source: *Primary Data, 2023*

3 Results

Since late 2019, fishery on the west coast of West Sumatra has experienced a decline in fish production (*Figure 2*) because of the combination of intense fishing pressure alongside additional elements like environmental deterioration, natural risks, and the outbreak of Covid-19. Frequent occurrences of coastal area flooding have become more common, and there is a notable decline in the size of mangrove forests. These elements have led to a decrease in fish production and increased economic instability. The decrease in fish landings leads to a reduction in the pace of economic activity stemming from fishing. The fecundity has experienced a continuous decline, as evident in the number of fish caught per gear unit. Over the past four years, there has been a significant decrease in the productivity of three primary fishing tools commonly employed in small-scale fishing: the scoop net (*payang*), drift gill net, and set gill net (*Figure 3*). Furthermore, the productivity of *payang* decreased from approximately 20 tons/gear/year in 2018 to merely 2 tons/gear/year in 2022, dropping over 80%. The trend resembles the set gill net, which saw its productivity drop from 2.52 tons per gear per year to 0.45 tons per year, marking a decrease of more than 80% in the past four years.

The gross earnings derived from fishing have experienced a notable decline, dropping from its peak of roughly 3,000 US dollars per gear in 2022 to approximately 2,000 US dollars in 2021, indicating a decrease of approximately 50%. The drop has ripple impacts on various socio-economic facets, including purchasing ability, household earnings, as well as expenditures on healthcare and education, among other factors. According to Husen [34], the family earnings of small-scale fishermen along the western coastline of West Sumatra range

from 20.50 US dollars per person for those using scoop nets to 42.50 US dollars for those using gill nets.

Following the poverty indicator set by the World Bank, which is 2 US dollars per person per day, these income levels are significantly below the norm, as they translate to only 0.67 and 1.40 US dollars for scoop net and gill net fishermen, respectively. The national poverty rate saw an increase from 16% to nearly 18% of the overall population from 2005 to 2006. This rise can be attributed in part to the government's issuance of President Decree No 55/2005 in 2005, which sought to raise the prices of fuel, encompassing both diesel and gasoline. The cost of petrol and diesel rose by 87.5 and 105 %, respectively. Although there was a subsequent decrease in fuel prices in 2008, the high price of diesel during 2005-2006 profoundly impacted fishermen because it is a fundamental component of their engines. This was significant because fuel constituted approximately 60% of the total fishing expenses.

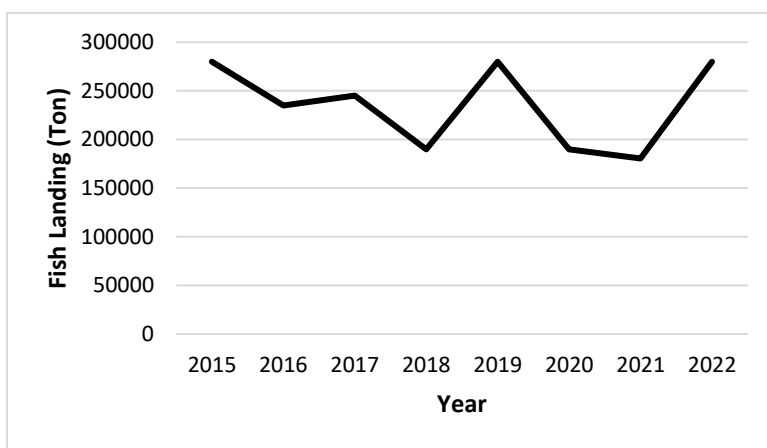


Figure 2: Small pelagic fish landing on the west coast of West Sumatra

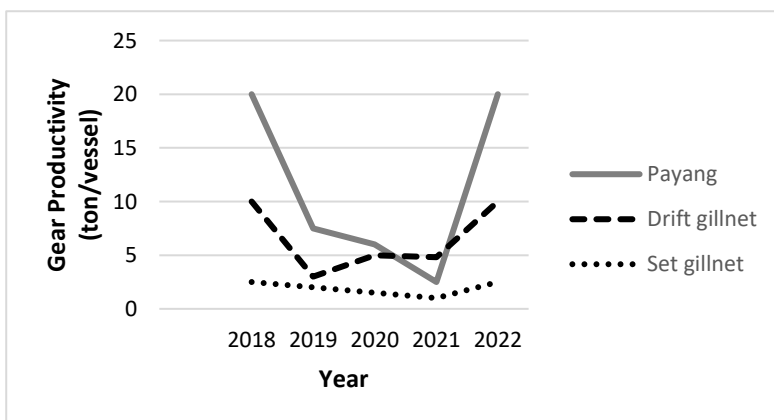


Figure 3: Fishing gear productivity on the west coast of West Sumatra

Fishermen faced a dual challenge, experiencing both the serendipity of resource availability and an economic shock triggered by the rise in fuel prices. The consequences of the fuel price hike are significantly more pronounced, as it led to inflation and diminished

the buying power of individuals. There is limited potential to enhance the well-being of fishermen operating at this income level. There is limited capacity to improve the well-being of fishermen at this income level. The entire income is allocated towards acquiring food, making saving unattainable, resulting in minimal healthcare and education expenditures. High levels of malnutrition and other health issues were prevalent in these coastal regions, underscoring the unfavorable state of livelihood for both fishermen and coastal communities.

It used Focus Group Discussions and field surveys conducted in the District of South Pesisir to examine the social stability and perceptions of fishermen. Overall, the findings validate the hypothesis that fishermen possess the ability to adjust and formulate strategies to manage uncertainties. For instance, fishing is commonly described as 'the last-resort employment,' indicating that fishermen generally persist in their profession despite its inherent risks and uncertainties. This perspective is encapsulated when fishermen were questioned, 'How would you respond if the uncertainty in fishing continues?'. Most of them, accounting for 83%, indicated that they would continue to work as fishermen, while 17% were doubtful, and no one responded with a desire to switch their occupations. They viewed the emergence of uncertainties during unfavorable seasons as simply a result of 'bad luck,' rather than identifying it as the core problem. One of them even said, "*The existing uncertainty and unfavorable fishing season are merely attributed to being the wrong time of the year; it's something we don't even pay much attention to*". Similarly, Masri et al. [35] reported the attitudes of fishermen toward fishing, showing that 74% *would stay as a fisherman all their life*.

Small-scale fishermen operating on the western coast of West Sumatra have established a range of strategies, both related to fishing and non-fishing activities, in order to manage the instabilities in production and [4], [11], [36] revenue that impacts their way of life. These strategies are partially influenced by what is often referred to as 'social memory' [20], where diverse mechanisms are constructed to manage external shocks by utilizing the reservoirs of social values, practices, and knowledge. Subsequently, they also implemented tactics that encompass altering fishing methods and adapting to changes in seasons and locations. While this study found that fishermen maintain their existing gear in response to a decline in catch, the overall data suggest a gradual evolution in the practice of adjusting gear over an extended period. During the early 2000s, Béné [4] documented significant shifts in the array of fishing equipment employed along the western coastline of West Sumatra over the past three decades. Different variants of scoop nets have been employed to supplement primary gear like scoop nets. Additionally, in the absence of government regulation, fishermen adapt their equipment to resemble trawling gear, resulting in conflicts among local fishermen due to its indiscriminate catch and ecosystem damage. Unlike the situation during the trawl controversy in the 1980s, the local government opts not to impose a ban on this gear. During the period, the government worked swiftly by denying the gear in the Java Sea.

New strategies, such as early fishing trips, are formulated to monitor shifts in fish stocks' spatial and seasonal distribution. According to Allison & Ellis [11], these strategies can be adopted by fishermen on the west coast of West Sumatra through following long-shore and inter-island fish stock migration. This can be a driving factor in refusing to change professions. The traditional fishermen from the western coast of West Sumatra are renowned for their mobility and adeptness in monitoring fish movements. A few even partake in fishing endeavors extending to the northern regions of the Sumatran Sea utilizing basic equipment, while others concentrate on the western sections of the island, tracing the seasonal fish migration. During the early 2000s, Indonesia initiated a fresh political framework through

the implementation of Act number 32/2004, which involved adopting a decentralized government system encompassing the management of natural resources, including fishing. This change in resource management has triggered disputes among fishermen in neighboring regions., such as a disagreement emerged between West Sumatra and Bengkulu Provinces, with each side accusing the other of exploiting fish resources unlawfully.

The dropping fish stock availability has compelled fishermen to adapt their focus and equipment, such as fishing in closer proximity to the shore or at river mouths and chasing various fish species. Some of these smaller fish might not hold much market value but are consumed by the fishermen to cut down on food expenses. Another tactic involves utilizing coastal land to construct freshwater and brackish ponds, which facilitates a shift from fishing to milkfish farming.

Coastal communities and small-scale fishermen exhibit high flexibility in responding to uncertainties by making adjustments to their way of life [4, 7], including 'wage-earning pluractivity' and 'industrial pluractivity.' Wage-earning pluractivity involves engaging in extra work for supplementary income, while industrial pluractivity entails diversifying into other business ventures to mitigate the effects of instabilities in the primary business. On the western coast of West Sumatra, diversified livelihoods are prevalent, with fishermen and their families participating in various economic undertakings to mitigate the impact of changes in household incomes. These encompass activities like setting up small shops to sell essential items like cigarettes, snacks, beverages, rice, and noodles. They also involve involving other family members in part-time jobs such as gear and boat repairs or working as domestic help.

One of the strategies fishermen and coastal communities developed to cope with uncertainty is exploiting the terrestrial environment. Lucky Zamzami [19] has documented the presence of this approach in the context of small-scale fishing in West Sumatra. Fishermen in Amping Parak have increased their efforts in cultivating jasmine flowers on coastal land, fetching approximately IDR 10,000 per kilogram, where the harvest can reach 5 kg per month, providing extra family revenue.

Creating plans to handle uncertainties is not solely the task of fishermen; fisherwomen or fishermen's wives can also perform it. The two primary methods exerted by women include dealing with the internal family livelihood and the external forces. Women frequently take on the role of 'financial managers,' overseeing the sustainability of the family's livelihood. Furthermore, they invest in community-saving groups known as 'arisan' to cope with the fluctuation in family income. Within the community savings group, each woman contributes a pre-determined sum of money, usually falling between 1 to 2 US dollars and around 1.5 US dollars per rotation. An arisan involving ten women in a group will have ten rotations conducted weekly or monthly in one period. The winner determination is performed randomly and is awarded the entire sum of money amassed by the group.

Numerous women extend their working hours to manage the reduced income accompanying fishing's low seasons, such as working as occasional domestic helpers for households belonging to the more affluent segment of the coastal region. This approach aids in covering the expenses for essential daily needs and lowering the family's food expenditure. Those engaged as domestic helpers also receive additional provisions for themselves and their families. In more severe situations, they frequently arrange for their daughters or other relatives to work as professional domestic helpers abroad, particularly in countries like Malaysia, Singapore, Hong Kong, and Taiwan. Individuals employed overseas often remit their earnings back to their families, playing a crucial role in aiding their families to endure challenging circumstances. Therefore, in response to uncertainty, the work of all members

within the family is maximized and combined, including instances where children contribute by working to assist their parents.

Fisherwomen formulate a variety of tactics to manage external influences, including uncertainties regarding their husbands' productivity, family fluctuation, and insufficient government support. Women are initially involved in the direct selling of fish products and typically emerge as the primary vendors of various fish products, including small shrimp intended for processing 'terasi' (fermented shrimp). When the husbands are unable to participate in fishing because of unfavorable weather or the off-season, the wives can still do economic endeavors to generate income for their families.

Moreover, fisherwomen have also participated in various approaches to address this issue, like making groups and establishing businesses such as the 'Kedai Pesisir' (Coastal Café). In this setup, members can acquire daily necessities at reduced prices and even borrow goods at 0% interest, based on trust and membership. The Café also acts as a safety net when their husbands return home with depleted resources. Family instability often leads to heightened uncertainty, prompting fisherwomen along the north Java coast to adapt to such challenging circumstances. While the dissolution of a marriage is avoided whenever possible, if it occurs, women tend to adjust to the new situation without treating divorce as a grave matter. Generally, fisherwomen on the north coast of Java adopt the mindset of 'life goes on'.

4 Conclusions

In conclusion, Coastal communities reliant on fishing along the western coast of West Sumatra continuously grapple with uncertainties stemming from fluctuations in natural resources and various socio-economic factors. The inconsistency in natural resources, evident through adverse seasons and fluctuations in fish catches, substantially affected the livelihoods of small-scale fishermen and coastal communities. A continuing fall in fish capture resulted in impoverishment and disturbances to human well-being, including decreased health and education, among other societal problems. On the other hand, Fishermen's homes have built-in mechanisms for dealing with uncertainty in the form of social resilience. This study revealed that traditional fisherman have a wealth of knowledge and tactics that may be improved and maintained to reduce government interference and resource waste caused by inadequate top-down policies. Furthermore, fishermen and coastal communities must be encouraged to use traditional social and ecological knowledge better.

Furthermore, women have a significant role in the sustenance of coastal communities, although their contribution has often been disregarded and undervalued. However, empowering fisherwomen could result in a more comprehensive approach to poverty alleviation. The program can directly address women-related issues in this area and target the correct groups, hence benefitting the entire coastal communities. In developing countries, including Indonesia, the majority of government initiatives aimed at fishermen through direct subsidies and economic programs like PEMP (Economic Program of Coastal Empowerment) have been unsuccessful because of mismanagement at the local level. Frequently, direct subsidies provided to fishermen are subject to misuse and misallocation, and economic empowerment programs often result in squandered resources due to inefficiencies in their implementation. In specific areas, it triggered additional conflicts instead of effectively compensating for the loss of welfare. Certain individuals conveyed a feeling of having their dignity as diligent fishermen undermined, leading to resentment towards the government and other societal groups.

A prevalent notion is that the susceptibility of small-scale fishing to uncertainty could result in a more subdued local economy and exacerbate poverty within coastal communities. However, that belief overlooked the ability of fishery households to overcome delays using various mechanisms. The coastal communities in developing countries have shown that social resilience embedded in their culture is an effective way to deal with unexpected shocks. The authorities sometimes overlooked these mechanisms, resulting in the failure of poverty-alleviation programs initiated by the government due to a lack of acknowledgment of local initiatives. Therefore, there is a need to improve comprehension of the various coping and livelihood strategies employed by fishermen and their families to overcome the negative impacts of uncertainties. This study attempted to foster this understanding by exploring the strategies used by small-scale fishing households to avoid delays caused by resource fluctuation and other source uncertainties, such as social and market fluctuations.

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