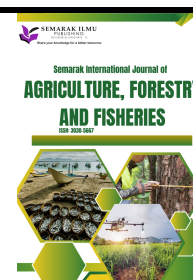




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Aging Population: A Threat to the Sustainability of Fisheries in Terengganu

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ABSTRACT

Fisheries have long played a central role in shaping the economic, cultural, and social landscape of coastal communities in Terengganu. However, beyond the well-documented environmental challenges, the sector is now facing a growing threat from demographic changes, particularly the aging of the fishing population. While many studies in Malaysia have examined issues such as overfishing and marine resource depletion, limited attention has been given to the demographic factors that influence the long-term viability of the fisheries sector. This conceptual article explores how the aging workforce threatens fisheries sustainability in Terengganu by contributing to labor shortages, the erosion of traditional knowledge, weak knowledge transfer between generations, and reduced innovation. Relying on secondary data, demographic reports, and existing literature, the study presents a conceptual framework that illustrates how these factors interact to weaken the continuity and resilience of the fisheries sector. The findings suggest that aging is not only a demographic trend but a structural challenge that must be addressed through proactive policy measures. Ensuring the future of fisheries in Terengganu requires strategies that support youth participation, preserve traditional knowledge, and strengthen the capacity of fishing communities to adapt to generational change.

1. Introduction

Fisheries have long been the backbone of Terengganu's coastal economy, playing a central role in shaping the state's economic development, cultural identity, and community well-being. Situated along the South China Sea, Terengganu is endowed with rich marine biodiversity and fertile fishing grounds that have sustained generations of coastal communities [1]. The state is consistently ranked among Malaysia's leading contributors to marine capture fisheries, with landings that include a diverse range of species such as mackerel, anchovies, squid, and prawns. These resources not only generate income for thousands of local households but also supply vital raw materials for

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downstream industries such as seafood processing, fish-based products, and tourism-related gastronomy [2].

Economically, the fisheries sector provides livelihoods for both small-scale artisanal fishers and commercial operators, reinforcing its role as a key pillar of coastal development [3]. Many households in Terengganu remain highly dependent on fishing activities, either directly through catching fish or indirectly through related occupations such as boat building, net mending, fish trading, and fish processing. For rural coastal populations with limited access to alternative employment, fisheries serve as a critical safety net, ensuring both household income stability and food availability. The sector also contributes significantly to Malaysia's broader food security agenda by meeting domestic demand for fresh fish, a staple protein source in the Malaysian diet.

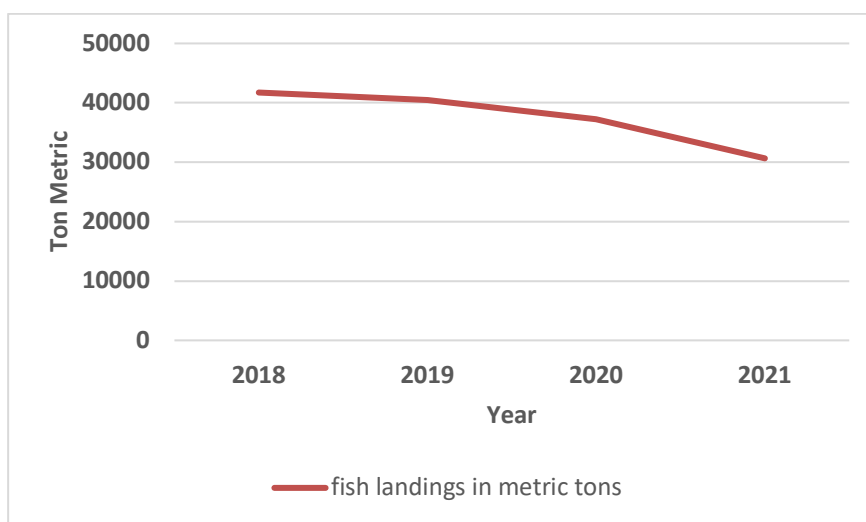


Fig. 1. Fish landings in Terengganu (2018-2021)

Source: Perangkaan Perikanan 2021

The fisheries sector in Terengganu has shown signs of fragility, with fish landings dropping from over 41,000 to just above 30,000 metric tons between 2018 and 2021. This decline highlights growing pressure on marine resources and the sector's vulnerability, driven by overfishing, environmental changes, and a shrinking workforce. This situation underscores the urgent need for sustainable management. Malaysia is undergoing a demographic shift toward an aging society, with 15% of its population projected to be over 60 by 2030 [4]. This trend is especially visible in rural and coastal areas like Terengganu, where youth migrate to cities for education and jobs, leaving behind an older fishing workforce [5]. As younger generations leave, fishing villages rely on elderly fishers, creating challenges for labor supply, economic stability, cultural continuity, and sustainability. While numerous studies in Malaysia have examined declining fish stocks, overfishing, and environmental pressures on the fisheries sector such as the studies by Zainuddin *et al.*, [6], Yamin *et al.*, [7], Zakaria *et al.*, [8] and Rahman [9] hence, there is limited research that explicitly links demographic aging with the sustainability of fisheries, particularly in Terengganu. Previous authors focused on collecting demographic data but did not relate it to the issue of fish landings within the context of fisheries sustainability. Therefore, impacts of an aging fishing workforce and declining youth participation, remains underexplored. This gap makes it difficult to fully understand how demographic transitions intersect with ecological sustainability and long-term sectoral resilience. Hence, the objective of this article is to conceptually explore the implications of an aging fishing population on the sustainability

of fisheries in Terengganu. It seeks to highlight the intersection between demographic transition, labor force dynamics, and ecological challenges, while examining how reduced youth participation and reliance on elderly fishers may affect food security, cultural continuity, and the resilience of coastal communities. The article also aims to stimulate discussion on the need for adaptive strategies and policy interventions to ensure the long-term viability of Terengganu's fisheries sector. This study is significant because it brings attention to the underexplored relationship between demographic aging and the sustainability of fisheries in Terengganu. By conceptually examining how the dependence on an aging fishing workforce and the lack of youth participation intersect with ecological and economic challenges, the article contributes to a more holistic understanding of the sector's vulnerabilities. The discussion provides valuable insights for policymakers, researchers, and coastal stakeholders in identifying strategies that not only safeguard food security and cultural continuity but also strengthen the resilience of fishing communities. Ultimately, this study emphasizes the urgency of adopting adaptive policies and innovative approaches to ensure the long-term viability of Terengganu's fisheries.

1.1 Problem Statement

Fisheries in Terengganu are under severe strain from both resource decline and demographic shifts. Fish landings have dropped sharply, with *The Malaysian Insight* (20 May 2023) reporting reduced catches and *Utusan Malaysia* (5 Dec 2022) noting nearly 50 percent declines at local jetties, driving price surges. At the same time, the number of active fishers, particularly in deep-sea sectors, continues to shrink as highlighted by the National Food Security Conference (PKMK 2025). The Fisheries Statistics of Malaysia 2021 confirms persistent labor shortages, while the LKIM Socioeconomic Census (2017/2018) shows that more than half of fishers are aged 50 and above and only one quarter are between 20 and 39 years old. This aging and declining workforce undermines labor supply, knowledge transfer, and resilience, placing Terengganu's fisheries and national food security at critical risk without urgent reforms.

2. Literature Review

2.1 Fisheries and Coastal Economy in Malaysia

Fisheries are a cornerstone of Malaysia's coastal economy, supporting livelihoods, generating income, and securing food for millions [10]. Terengganu, situated along the South China Sea [11], is a leading contributor due to its rich marine biodiversity and high landings of commercially valuable species such as mackerel, anchovies, squid, and prawns. Among the coastal Malay communities, the primary economic activities traditionally included fishing, fish drying, netting, boat handling, and small-scale trade. However, the more lucrative sectors of the local economy have historically been dominated by elite groups, resulting in a monopolization of wealth and opportunities within these communities [12]. Yet, the sector is under growing strain. Fish landings in Terengganu declined sharply from over 41,000 metric tons in 2018 to just above 30,000 metric tons in 2021, signaling resource depletion and ecological stress. Overfishing, environmental degradation, and declining stocks now threaten not only household livelihoods but also the sustainability of fisheries as a whole. These challenges underscore the urgency of safeguarding the sector, which remains integral to economic well-being, cultural identity, and national food security.

2.2 Global and Regional Perspectives on Aging Populations

Demographic transition is reshaping global and regional populations, with declining fertility and rising life expectancy driving rapid aging. Southeast Asia is no exception, as countries such as Thailand, Vietnam, and Singapore face shrinking youth cohorts alongside growing elderly populations. Malaysia is projected to become an aged nation by 2030, demographic shift that corresponds with national life expectancy data from 2010 to 2020 as found by Halim *et al.*, [13]. The shift toward an aging society carries major economic and social implications. For labor-intensive sectors like agriculture and fisheries, an older workforce means reduced physical capacity, limited adaptability to new technologies, and eventual labor shortages as younger generations turn to urban opportunities that is parallel to the finding for a study conducted in Pulau Duyong, Terengganu by Abdullah [14]. A study conducted in United States of America by Garcia [15] found that the productivity of work is closely linked to the age of a person. Comparative cases reinforce these concerns. In Japan, South Korea, and parts of Southern Europe, fisheries-dependent communities face severe workforce aging, rural depopulation, and declining youth participation as presented by Lee *et al.*, [16], An *et al.*, [17] and Clements [18]. These experiences show that without proactive strategies to attract younger workers and modernize the sector, demographic aging can accelerate the decline of fisheries, weaken food security, and erode cultural heritage.

2.3 Demographic Trends in Malaysian Fisheries

The demographic profile of Malaysia's fishing communities shows growing dependence on an aging workforce. The LKIM Socioeconomic Census (2017/2018) reported that more than half of fishers are aged 50 and above, while only one quarter are between 20 and 39. This imbalance reflects limited youth entry into the sector, a trend reinforced by the Fisheries Statistics of Malaysia (2021), which documented a steady decline in active local fishers. A study conducted by Zainudin [6], using a survey among fishermen in Terengganu, specifically in Kuala Marang and Seberang Takir, found that the majority of fishermen are over 50 years old, with the oldest being 77. Youth participation remains low as fishing is seen as labor-intensive, risky, and offering unstable income compared to urban opportunities in education and employment. Rural-to-urban migration further compounds the issue, with younger generations leaving coastal villages in Terengganu for cities such as Kuala Lumpur and Johor Bahru. This outflow reduces the availability of young labor, accelerates community aging, and disrupts intergenerational knowledge transfer. As a result, many fishing villages now rely on elderly fishers, raising concerns about long-term sustainability and cultural continuity.

2.4 Labor Force Dynamics in Fisheries

Fishers are central to sustaining marine capture fisheries, providing labor, skills, and ecological knowledge that support both artisanal and commercial operations. In Terengganu, their work not only secures household livelihoods and national food supply but also sustains related industries such as seafood processing, boat building, and trading. The resilience of the fisheries sector is therefore closely tied to the availability and adaptability of its workforce as confirmed by a study in the case for Japan by Takahashi [19] that the performance of fisheries in Japan is shrinking due to the dropping numbers of new fisherman and the remain numbers of elderly fisherman. Fishing is widely perceived as unstable, physically demanding, and less rewarding compared to urban-based opportunities, leading many youth to pursue alternative careers. This generational shift has left the sector dependent on older fishers, creating a widening age gap and weakening prospects for renewal. The

reliance on an aging workforce poses challenges for productivity, knowledge transfer, and resilience [20]. Older fishers face physical limitations and often struggle to adapt to modern technologies, while declining youth participation erodes intergenerational knowledge transmission [21]. These dynamics threaten the sustainability of fisheries by reducing the sector's capacity to adapt to ecological, economic, and demographic change.

2.5 Sustainability Challenges in Fisheries

The sustainability of fisheries in Malaysia is increasingly threatened by ecological, economic, and demographic pressures. Overfishing and destructive practices have depleted many commercially important species, while habitat loss, coastal pollution, and climate change further undermine marine ecosystems [22]. A case study in Egypt by Mehanna [23] found that rising sea temperatures, ocean acidification, and erratic weather patterns disrupt fish distribution and reduce the productivity of traditional fishing grounds, thereby affecting the long-term availability of resources for coastal communities, and this situation is no exception in Terengganu. Economic vulnerability compounds these pressures, as most fishers operate at a small scale with limited capital, technology, and livelihood alternatives. Declining landings directly reduce household incomes, increase reliance on subsidies, and expose fishing families to financial instability [24]. Demographic stress intensifies these challenges. An aging workforce with limited adaptability and declining youth participation weakens innovation, knowledge transfer, and community resilience [25]. Without generational renewal, fisheries face reduced capacity to adopt sustainable practices and respond to environmental change, threatening both ecological balance and economic viability [26].

3. Methodology

This study uses a conceptual and qualitative approach to explore how an aging population affects fisheries sustainability in Terengganu. Based on secondary sources such as academic literature, policy reports, and demographic data, the analysis identifies five key challenges: labor shortages, loss of traditional knowledge, weak knowledge transfer, decreased innovation, and weakened sustainability. These themes, drawn through thematic analysis, form the basis of a conceptual framework that guides understanding and supports future research and policy efforts.

4. Discussion

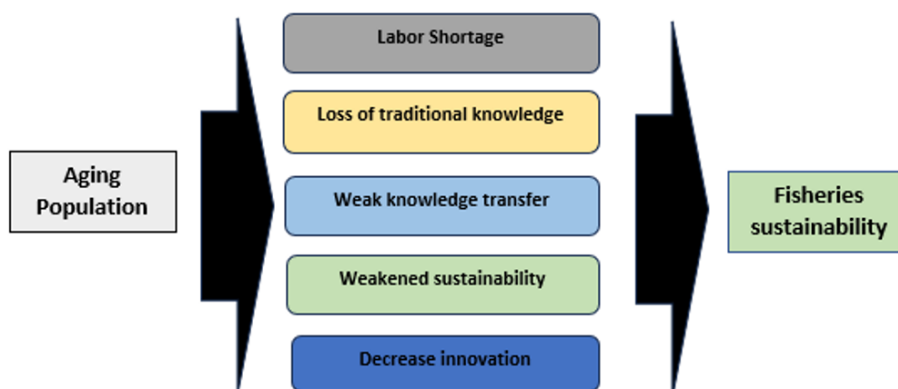


Fig. 2. Conceptual framework

The sustainability of fisheries in Terengganu is increasingly threatened by an aging fishing population. As shown in Figure 2, this shift leads to a shrinking workforce, loss of traditional knowledge, and reduced innovation, all of which undermine the sector's long-term ecological, economic, and social sustainability.

An aging workforce is causing a labor shortage in Terengganu's fisheries sector. With younger generations opting for urban or white-collar jobs, few are replacing retiring fishers. This has reduced fishing activity, especially among small-scale fishers, increasing the vulnerability of coastal communities dependent on fishing for income and food security.

Another key impact of an aging fishing population is the loss of traditional knowledge. Experienced fishers hold valuable insights into sustainable practices, but with fewer young people entering the industry, this knowledge risks being lost. This weakens cultural heritage and future fishers' ability to manage resources and adapt to change.

The problem is worsened by declining knowledge transfer, as fewer young people join the sector and mentorship opportunities fade. Without structured ways to pass on skills and values, responsible fishing practices and community-based management are at risk.

Weakened sustainability is a likely result as experienced fishers retire without successors. With fewer active fishers, the social structures that support collaborative resource management break down, making it harder to monitor, manage, and enforce sustainable practices.

An aging workforce can reduce innovation in fisheries, as older fishers may be less willing or able to adopt new technologies like digital monitoring and modern gear. This slows progress in tackling challenges like climate change and resource scarcity. In Terengganu, this threatens both the economic viability of fishing and the resilience of coastal communities. Addressing this requires coordinated efforts from government, education, and local leaders.

5. Policy Implications

The aging population in Terengganu's fisheries sector presents significant challenges that require immediate policy attention. Key strategies include engaging youth through vocational training, financial incentives, and rebranding fisheries as a modern profession; preserving traditional knowledge through mentorship programs and digital documentation; and enhancing human capital through continuous training in sustainable practices and the use of modern technology. Social protection for older fishers, including pensions and healthcare, is also essential to ensure a dignified retirement and to support generational transition in the sector. Community participation must underpin all policy efforts to ensure relevance, cultural appropriateness, and long-term sustainability.

6. Conclusion

This conceptual article highlights the growing threat of an aging population to the sustainability of fisheries in Terengganu, leading to labor shortages, loss of traditional knowledge, and reduced innovation. These interconnected issues weaken the ecological, economic, and social resilience of fishing communities. Ensuring the sector's future requires engaging youth through education, training, and economic opportunities, while preserving traditional knowledge and supporting aging fishers. Inclusive and community-based policies are essential to maintain generational continuity and safeguard the long-term sustainability of Terengganu's fisheries.

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