

Resilience and Adaptive Responses in Small-scale Coastal Fisheries: Lessons from Ban Khlong Tob, Krabi Province, Thailand

Rattana Tiaye, Thanyalak Suasi, Jariya Sornkliang, Saruttaya Jaronpongswat, Kongpathai Saraphaivanich, Anusorn Chanyim, and Pornpimol Kuakakorn

Keywords: small-scale fisheries, fisheries productivity, resilience, livelihood diversification, digital marketing

Small-scale fisheries are crucial in ensuring the food security, nutrition, livelihoods, economic stability, and cultural identity of millions across Southeast Asia (FAO, 2015; FAO, 2022). In Thailand, many coastal communities depend on healthy marine ecosystems and open-access fishing grounds. However, these traditional fisheries systems are increasingly under pressure from multiple sources, including climate change, coastal erosion, marine pollution, IUU fishing, urban development, and global market disruptions, such as those experienced during the COVID-19 pandemic, all of which have heightened the vulnerability of small-scale fishers (SEAFDEC, 2023).

To cope with these pressures, small-scale fishing communities must continuously adapt. Adaptive strategies, such as livelihood diversification, the use of digital marketing, and participation in conservation initiatives, are critical for strengthening resilience and supporting long-term sustainability (Pomeroy & Rivera-Guieb, 2006; Berkes *et al.*, 2001). In the context of small-scale fisheries, resilience refers to the capacity of a social-ecological system to

absorb disturbances, adapt to change, and reorganize while maintaining its core functions, livelihood structures, and cultural identity. It encompasses not only ecological stability but also social, economic, and institutional dimensions that enable communities to respond effectively to external shocks and long-term environmental change.

This article examines the adaptive responses and resilience-building strategies of the Ban Khlong Tob fishing community in Krabi Province, Thailand. Data were collected through key informant interviews and focus group discussions with 17 community members during the “Training Workshop on Fisheries Resilience to Fisheries Management in Small-scale Fisheries and Field Trip to Conduct an Impact Assessment Study in Selecting Sites,” conducted from 18 to 25 June 2024 (SEAFDEC, 2024). The results show changes in fisheries productivity, livelihood structures, and ecosystem conditions, and analyze how local responses interact with governance and environmental constraints. This article also provides practical lessons for strengthening resilience in small-scale fisheries facing multiple overlapping shocks.

Introduction

Background of Ban Khlong Tob Fishing Community

Ban Khlong Tob is a small coastal village located in the Koh Lanta Yai Sub-district, Ko Lanta District, Krabi Province, in southern Thailand (**Figure 1**). The community comprises 432 households with a total population of 715 people. Fishing has long been the cultural and economic backbone of the village, although households also engage in rubber cultivation, small-scale trade, and tourism. Like many coastal communities in Southeast Asia, Ban Khlong Tob exemplifies a mixed rural economy rooted in natural resource use and informal employment (FAO, 2022).

The village benefits from access to rich coastal and marine ecosystems, including coral reefs, seagrass beds, and mangrove forests. These ecosystems are not only ecologically valuable but also provide essential habitats for commercially important fish species, supporting local livelihoods (Berkes *et al.*, 2001). However, despite this natural wealth, only about 30 households now engage in year-round fishing, reflecting both demographic shifts and increasing livelihood diversification.



Figure 1. Ban Khlong Tob, Koh Lanta Yai Sub-district, Ko Lanta District, Krabi Province, Thailand

Traditional fishing gear used in the area include crab gillnets, shrimp trammel nets, squid cast nets, fish gillnets, and squid light-luring gear. The village has one small community port located on the beach, which serves as a hub for fish landings, trade, and social interaction. While modest in scale, this infrastructure is critical for supporting both the fishing economy and community cohesion.

In recent years, Ban Khlong Tob has become increasingly connected to external markets and tourism circuits due to improved road access and digital connectivity. These changes present both opportunities and challenges for local fishers, prompting the need for adaptive strategies to sustain livelihoods and preserve cultural identity in a rapidly evolving coastal context.

Study Method

Study Site and Data Collection

The study was conducted in Ban Khlong Tob, Koh Lanta Yai Sub-district, Ko Lanta District, Krabi Province, Thailand. The primary data were collected during a one-day field exercise conducted as part of the “Training Workshop on Fisheries Resilience to Fisheries Management in Small-scale Fisheries and a Field Trip to Conduct an Impact Assessment Study in Selecting Sites,” organized by SEAFDEC and partners from 18 to 25 June 2024. The data collection methods included key informant interviews and focus group discussions (FGDs). A purposive sampling approach was applied to ensure representation of key stakeholder groups, including community leaders, religious leaders, committee members, and active small-scale fishers (both men and women). A total

of 17 interviewees were involved (**Figure 2**). As data were collected during a one-day field exercise, findings represent a snapshot of community perceptions and may not fully capture seasonal variation or long-term trends. However, triangulation with secondary ecological data strengthens the reliability of the findings.

Data Types and Analysis

The discussions followed semi-structured interview guides covering: 1) livelihoods and fishing practices, 2) environmental conditions, 3) perceived changes in fisheries, and 4) adaptive strategies and challenges. Additionally, secondary data were obtained from government sources, particularly the Department of Marine and Coastal Resources. Data were analyzed using descriptive qualitative analysis as well as quantitative summaries (e.g. counts and percentages).

Key Findings

Socioeconomic and Livelihood Characteristics

Although the livelihoods of Ban Khlong Tob community are increasingly diversified, around 30 households (about 7 percent) continue to rely on full-time small-scale fishing. Most of the residents are between 25 and 50 years old, with education levels generally reaching upper secondary school. The community is socially cohesive and predominantly Muslim (98 percent), with a small Buddhist minority. Women make up roughly 60 percent of the population.

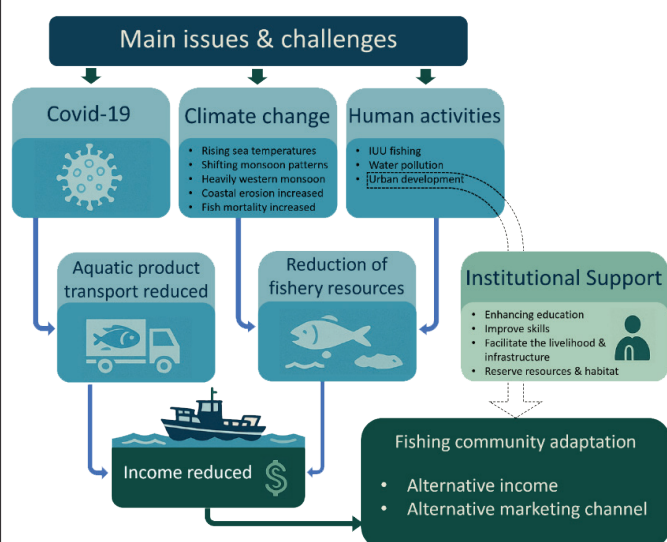
Livelihoods combine small-scale fisheries with agriculture, tourism-related services, trade, and public-sector employment. Fishing activities are conducted within three nautical miles from shore using traditional gear such as crab gillnets, shrimp trammel nets, traps, and squid cast nets with or without luring lights. The monsoon season occurs between April and November. Fish catches have declined substantially over time, with historical catches of 40–100 kg per trip now reduced to an average catch of around 10 kg per trip, and occasional minimum catches of 0–3 kg per trip.

In response to declining fisheries productivity, households are increasingly diversifying their income sources. Tourism-related activities, including island tours and recreational fishing, are undertaken 8–10 days per month and generate approximately THB 1,200–1,500 per trip, while trap fishing provides an additional income of around THB 1,000 per trip. Strong community organizations—such as fisher groups, farmer groups, savings groups, and village funds—along with access to formal and informal financial services, reflect the community’s relatively strong human and social capital and its capacity to adapt.



Figure 2. Key informant interviews and focus group discussions

Box 1. Main issues, challenges, and adaptive responses in Ban Khlong Tob's small-scale fisheries



This conceptual diagram summarizes the interlinked drivers of vulnerability, impacts, and adaptive responses in the Ban Khlong Tob fishing community. External shocks, such as the COVID-19 pandemic, disrupted aquatic product transportation and market access. At the same time, climate change and human pressures—including IUU fishing, marine pollution, and unplanned coastal development—have contributed to ecosystem degradation and declining fishery resources, leading to reduced fishing income and increased livelihood vulnerability.

Urban development plays a dual role in this process. While coastal infrastructure expansion and tourism-related activities can place additional pressure on marine ecosystems, improved roads, services, and digital connectivity have also enhanced accessibility, facilitated tourism and trade, and enabled new livelihood opportunities for community members. In response to these interacting challenges and opportunities, the community—supported by institutional efforts in education, skills development, and infrastructure—has adopted adaptive strategies, such as livelihood diversification and alternative marketing channels, to strengthen resilience and support long-term sustainability. The relationships illustrated in this diagram are further examined in the Discussion section.

Environmental Conditions and Fishery Resources

According to the Department of Marine and Coastal Resources (DMCR, 2022), coral reef conditions in Krabi vary significantly by location; while reefs within Mu Ko Lanta National Park—such as Ko Rok, Ko Ha, and Ko Ngai—remain in ‘Good’ condition, the western coast of Koh Lanta Yai, including Ban Khlong Tob, is currently categorized as ‘Damaged’ due to marine debris and seasonal bleaching. This ecological degradation is further compounded by a declining trend in water quality observed in 2022, characterized by elevated levels of fecal coliform bacteria and phosphates linked to community wastewater and the resurgence of tourism.

Despite 93 percent of the province’s seawater being rated as good overall, the combination of these water quality issues and stressors, like sedimentation from coastal development, has severely impacted the marine ecosystem. Consequently, local communities have reported a sharp decline in the diversity and abundance of economically important fish species. To address these challenges, management measures, such as relocating mooring buoys away from vulnerable reef sites, have been implemented to mitigate the ongoing pressures from maritime and tourism activities (DMCR, 2022).

Vulnerability and Adaptive Capacity

The community is exposed to multiple stressors, including climate change (e.g. more intense and less predictable monsoon patterns), tourism development, and external market shocks. Adaptive capacity varies among households and is strongly influenced by access to alternative skills, social networks, and financial capital. While social cohesion and community organizations are strong, governance gaps and weak enforcement limit long-term resilience.

Discussion

Interaction of Vulnerability Drivers

The findings demonstrate that the decline in fisheries productivity in Ban Khlong Tob is not attributable to a single stressor but rather to the interaction of multiple environmental, climatic, and socioeconomic drivers. Environmental degradation, particularly the deterioration of coral reef habitats, has reduced the availability of fish resources and undermined the ecosystem services that support small-scale fisheries. These ecological changes are closely linked to climate variability, including rising sea temperatures, stronger and less predictable monsoon patterns, and increased storm frequency, all of which have reduced fishing reliability and increased operational risks for fishers.

The COVID-19 pandemic further exposed structural vulnerabilities within the local fisheries system, especially the community’s dependence on external markets and middlepersons. Disruptions to transportation and market access led to sharp income losses, revealing the limited buffering capacity of households reliant on a single livelihood source. At the same time, human pressures, such as IUU fishing, marine pollution, and coastal and urban development, have intensified stress on marine ecosystems. While urban development has contributed to habitat modification and increased pollution in some areas, it has also accelerated social and economic change by improving infrastructure, accessibility, and connectivity to tourism and markets. Together, these factors have increased livelihood insecurity, pushed some people to shift away from fishing, and in some cases led remaining fishers to fish more intensively.

These interacting effects create feedback loops that threaten both environmental sustainability and community well-being, highlighting the complex and interconnected nature of vulnerability in small-scale fisheries. Similar patterns of interacting stressors have been documented in small-scale fisheries across Southeast Asia, reinforcing the regional relevance of this case.

Adaptive Responses and Their Implications

In response to these interacting stressors, the Ban Khlong Tob community has adopted a range of adaptive strategies aimed at stabilizing livelihoods and reducing dependence on declining fishery resources. Livelihood diversification has emerged as a central response, with households engaging in tourism-related services, small businesses, and supplementary fishing activities. The expansion of digital marketing and direct seafood sales through social media has further enabled fishers to maintain income during periods of market disruption and to capture greater value by reducing reliance on middleperson.

Participation in conservation and community-based initiatives, including habitat restoration and pollution management activities, has also contributed to strengthening social cohesion and reinforcing stewardship of marine resources. Collectively, these responses have enhanced short-term resilience by spreading risk, improving income stability, and fostering innovation at the community level.

However, households with greater access to education, digital skills, financial capital, and social networks are better positioned to diversify livelihoods and adopt new technologies. In contrast, more vulnerable households face barriers to participation and remain highly dependent on fishing. Moreover, without effective fisheries governance, environmental enforcement, and institutional coordination, there is a risk that some adaptive strategies function primarily as short-term coping mechanisms rather than pathways to long-term sustainability. These findings underscore the importance of aligning community-level adaptation with supportive policy frameworks and governance reforms.

Lessons Learned and Transferability to Other Coastal Communities

This case study offers several contributions that extend existing knowledge on resilience in small-scale fisheries. First, it integrates ecological assessment data with household-level livelihood analysis, indicating that ecosystem degradation—such as declining coral reef conditions and reduced catch volumes—directly influences livelihood decisions and adaptive behavior. This integrated perspective strengthens the understanding of the socio-ecological linkages that shape resilience outcomes.

Second, the post-COVID digital adaptation in a small-scale fishing context, specifically the use of social media for direct seafood marketing, represents a low-cost, scalable innovation that enhances market access, improves profit margins, and engages younger community members. This approach demonstrates how digital tools can serve as effective resilience mechanisms for small-scale fisheries, particularly in contexts with growing connectivity.

Third, the Ban Khlong Tob case provides evidence of partial resilience under governance constraints. Strong social capital, community organization, and local initiatives have enabled adaptation despite limited enforcement capacity and fragmented institutional support. At the same time, the case highlights the limits of community-driven responses in the absence of effective fisheries management, environmental regulation, and cross-sectoral coordination. These insights emphasize that resilience in small-scale fisheries is not solely a function of local capacity but also depends on enabling governance conditions.

Taken together, the lessons from Ban Khlong Tob are highly relevant for coastal communities across Southeast Asia facing similar combinations of environmental change, economic uncertainty, and development pressure. The case illustrates that resilience emerges through the interaction of local innovation, ecosystem stewardship, and supportive institutions, offering transferable insights for policy and practice in small-scale fisheries management.

Conclusion and Recommendations

Ban Khlong Tob illustrates how small-scale fishing communities can respond to compounded environmental and socioeconomic challenges through locally driven adaptation. While livelihood diversification, digital innovation, and strong community cohesion have enhanced resilience in the short term, achieving long-term sustainability will require strengthened fisheries governance, targeted infrastructure investments, and continued ecosystem restoration. The lessons from this case offer practical guidance for policymakers and practitioners seeking to enhance resilience in small-scale fisheries across Southeast Asia. This study provides practical recommendations to serve as a guideline for other areas with similar characteristics, allowing them to adapt these insights for effective implementation, as summarized in **Box 2**. However, without strengthened fisheries governance and sustained ecosystem restoration, current adaptive strategies may mitigate vulnerability in the short term but will not ensure the long-term sustainability of the social-ecological system.

Box 2. Recommendations for strengthening resilience in Ban Khlong Tob's small-scale fisheries

Recommendations	Key actions	Responsible agencies	Timeline	Indicators of success
Strengthen skills and adaptive capacity	Implement annual training programs on climate literacy, digital marketing, and alternative livelihoods	Department of Fisheries, Local NGOs, SEAFDEC	Short-term (0-2 years)	At least 50 % of fishing households participate; increased income from non-fishing sources
Improve coastal and community infrastructure	Upgrade boat hauling facilities, cold storage, waste management systems, and internet connectivity	Local government authorities, Department of Fisheries, Ministry of Transport, Ministry of Digital Economy and Society	Medium-term (2-5 years)	Reduced post-harvest losses; improved market access
Enhance fisheries governance and enforcement	Strengthen enforcement against IUU fishing and establish participatory monitoring involving the community	Community committees, Department of Fisheries, Marine Police	Medium-term (2-5 years)	Reduced illegal fishing incidents; improved regulatory compliance
Restore ecosystems and reduce marine pollution	Conduct quarterly beach clean-ups, install artificial reefs, and implement waste-sorting campaigns	Community groups, Local schools, Department of Fisheries, Department of Marine and Coastal Resources	Ongoing (0 to 10 years)	Improved reef conditions; reduced marine debris

Acknowledgments

The authors sincerely thank the Ban Khlong Tob fishing community for generously sharing their knowledge. We also deeply thank the U.S. Department of the Interior (DOI) for their financial support. Our appreciation extends to the fisheries officers of Ko Lanta District and all involved personnel for their vital roles in the successful data collection process. We acknowledge the SEAFDEC team for their unwavering support and collaboration throughout the project. Lastly, we offer our heartfelt thanks to our instructors, especially *Prof. Dr. Suvaluck Satumanatpan* and *Dr. Jawanit Kittitornkool*, for their expert guidance, mentorship, and invaluable insights.

References

- Berkes, F., Mahon, R., McConney, P., Pollnac, R., & Pomeroy, R. S. (2001). *Managing Small-Scale Fisheries: Alternative Directions and Methods*. International Development Research Centre (IDRC). <https://www.idrc.ca/en/book/managing-small-scale-fisheries-alternative-directions-and-methods>
- Department of Marine and Coastal Resources. (2022). *Report on the Situation of Marine and Coastal Resources and Coastal Erosion in Krabi Province*. Bangkok: Ministry of Natural Resources and Environment.
- FAO. (2015). *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Food and Agriculture Organization of the United Nations. <https://www.fao.org/3/i4356en/i4356en.pdf>
- FAO. (2022). *The State of World Fisheries and Aquaculture 2022: Towards Blue Transformation*. Food and Agriculture Organization of the United Nations.
- Pomeroy, R. S., & Rivera-Guieb, R. (2006). *Fishery Co-management: A Practical Handbook*. CABI Publishing.
- SEAFDEC. (2024). *Training Workshop Report: Fisheries Resilience and Impact Assessment in Small-scale Fisheries* (TD/RP/245).

About the Authors

Ms. Rattana Tiaye (rattana@seafdec.org), is a Fisheries Management Researcher at SEAFDEC/TD. She specializes in small-scale fisheries co-management, community-based fisheries management (CBFM), and the Ecosystem Approach to Fisheries Management (EAFM).

Ms. Thanyalak Suasi (thanyalak@seafdec.org) is the Fisheries Management Section Head at SEAFDEC/TD. As a fisheries socioeconomic specialist, her expertise includes small-scale fisheries, CBFM, EAFM, fisheries co-management, and livelihood improvement.

Ms. Jariya Sornkliang (jariya@seafdec.org) works as a Fisheries Management Researcher at SEAFDEC/TD. Her research focuses on fisheries management, small-scale fisheries, gender equality and social inclusion (GESI), and CBFM.

Ms. Saruttaya Jaroonsawat (saruttaya@seafdec.org) is a Fishing Technology Researcher at SEAFDEC/TD. She works on acoustic methods for fisheries resource assessment, target strength estimation, ecological impact assessment, and fishing technology, focusing on integrating biological and ecological data with acoustic data.

Mr. Kongpathai Saraphaivanich (kongpathai@seafdec.org) is a Training and Research Supporting Division Head at Training and Research Supporting Division, SEAFDEC Training Department, Samut Prakan, Thailand.

Acting Sub. Lt. Anusorn Chanyim (anusorn@seafdec.org) is a former Marine Engineer at Marine Engineering Section, Training and Research Supporting Division, SEAFDEC Training Department, Samut Prakan, Thailand. His areas of expertise include marine engineering, fishing vessel technology, and technical support for fishing operations.

Ms. Pornpimol Kuakakorn (pronphimon.pk@hotmail.com) is a Fishery Officer, Senior Level, Khlong Thom Fisheries District Office, Bangkok, Thailand. Her areas of expertise include fisheries management, small-scale fisheries, and fisheries extension and community engagement.