

Shellfish Fishers' Local Livelihoods and Ecological Sustainability in Tanjungbalai-Asahan

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ABSTRACT

Shellfish fishers in Tanjungbalai-Asahan represent a coastal community whose livelihood is closely connected to ecological change, local knowledge, and social resilience. This article examines how shellfish-based livelihoods are shaped by environmental pressure, declining catches, shifting shellfish grounds, and community adaptation around Teluk Nibung and the pontoon area. Using a qualitative coastal socio-cultural case study, data were collected through limited participant observation, semi-structured interviews, field notes, and visual documentation. The findings show that shellfish fishing is not merely an economic activity, but a social-ecological practice involving collective labor, family participation, local ecological knowledge, and informal coastal networks. Fishers interpret changes in water conditions, mud texture, seasons, and shellfish habitats through everyday experience. However, their knowledge is increasingly challenged by sedimentation, pollution, seasonal uncertainty, and fishing intensity. The study argues that ecological sustainability must include livelihood security, community participation, and recognition of small fishers' voices in coastal governance. Therefore, protecting shellfish resources also means protecting local knowledge, social solidarity, and the cultural continuity of coastal communities in Tanjungbalai-Asahan.

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1. Introduction

The climate crisis has increasingly affected coastal communities whose livelihoods depend on fragile marine ecosystems. Small-scale fishers are among the most vulnerable groups because their income, food security, and social stability are closely connected to seasonal patterns, coastal resources, and market access (Islam & Chuenpagdee, 2022; March & Failler, 2022). Climate variability, ecological degradation, and declining fishery resources may reshape the everyday survival strategies of fishing households. In this context, coastal livelihoods should not be understood only as economic activities. They are also embedded in social relations, ecological knowledge, cultural practices, and community resilience (Huynh et al., 2021; Silas et al., 2020).

Recent studies emphasize that small-scale fisheries operate within complex social-ecological systems. These systems connect marine resources, household economies, local institutions, and environmental change. When coastal ecosystems experience pressure, fishing communities often face multiple vulnerabilities at once. They may experience declining catches, unstable income, changing labor arrangements, and reduced livelihood security (Drakopoulos & Poe, 2023; Islam et

al., 2020; Sarkar et al., 2024). Therefore, the study of coastal livelihoods requires an interdisciplinary perspective that connects ecological sustainability with social justice, cultural meaning, and local adaptation.

Tanjungbalai-Asahan in North Sumatra represents an important coastal setting for examining these issues. The area has long been associated with fisheries, coastal trade, and shellfish-based livelihoods. Teluk Nibung and nearby pontoon areas function not only as landing points, but also as social and economic spaces where shellfish are caught, lifted, cleaned, sorted, and prepared for sale. These activities show how coastal space becomes a place of work, exchange, cooperation, and cultural memory. Previous research also shows that fisheries remain significant for the local economy and labor structure of Tanjungbalai-Asahan (Matondang et al., 2017; Pane et al., 2021; Ramlan, 2022).

Shellfish fishers in Tanjungbalai-Asahan should not be viewed merely as producers of marine commodities. They are also bearers of coastal knowledge, work discipline, and community-based ecological understanding. Through everyday practices, they read tides, muddy grounds, currents, seasons, and shellfish habitats. Their work involves cooperation among boat crews, family members, collectors, and local buyers. Such practices reveal that shellfish fishing is simultaneously economic, ecological, social, and cultural. Studies on declining shellfish production in Bagan Asahan Pekan indicate that changes in shellfish availability can affect income, education, household interaction, and social relations among traditional fishing families (Sari et al., 2016).

However, existing studies on shellfish and fisheries in Tanjungbalai-Asahan have generally emphasized production decline, fishing gear, fishermen's compliance, and sustainable capture fisheries. While these studies have contributed to understanding resource conditions and fisheries management, an empirical gap remains concerning how shellfish fishers construct local ecological knowledge, experience ecological and seasonal changes, organize collective labor, and adapt their livelihoods in everyday coastal settings. A conceptual gap also remains because these dimensions have rarely been examined together as an interconnected social-ecological livelihood system. Addressing these gaps is important because the sustainability of shellfish livelihoods depends not only on the availability of marine resources but also on how fishing communities interpret environmental change, maintain social solidarity, and sustain household livelihoods through local knowledge and cooperative practices (Ahmad et al., 2024; Ahmadin et al., 2025; Mustapa et al., 2022; Nasution et al., 2017).

Based on this background, this article examines shellfish fishers' local livelihoods and ecological sustainability in Tanjungbalai-Asahan. Specifically, it addresses the following research questions: (1) How is shellfish fishing constructed as a local livelihood system in Tanjungbalai-Asahan? (2) How do ecological pressures and local ecological knowledge shape the livelihood practices of shellfish fishers? and (3) How do social solidarity and everyday livelihood practices contribute to ecological sustainability? The study focuses on shellfish fishing as a local livelihood system shaped by ecological pressures, local ecological knowledge, social solidarity, and everyday livelihood practices. The findings demonstrate that shellfish fishers play an important role as local actors whose knowledge, labor relations, and adaptive practices contribute to ecological sustainability. Therefore, this study contributes to the social sciences and humanities by positioning shellfish fishing as a social-ecological livelihood practice that integrates environmental, social, and cultural dimensions rather than merely an extractive economic activity.

2. Research Method

This study employs a qualitative approach using a coastal socio-cultural case study design. This design was selected because the study examines shellfish fishing as a local livelihood system, with particular attention to ecological pressures, local ecological knowledge, social solidarity, and ecological sustainability in Tanjungbalai-Asahan. A case study is appropriate when a social phenomenon is investigated within its real-life context, particularly when the interaction between community practices and ecological settings cannot be separated (Yin, 2018). The research was

conducted in the coastal area of Tanjungbalai-Asahan, especially Teluk Nibung and the surrounding pontoon areas where shellfish fishers harvest, lift, clean, sort, and prepare shellfish before selling them. Primary data were obtained from shellfish fishers, local workers, and other community members involved in shellfish-related activities. Secondary data consisted of journal articles, government reports, previous studies, and visual documentation related to shellfish livelihoods, coastal ecology, and small-scale fisheries.

Data were collected through limited participant observation, semi-structured interviews, field notes, and visual documentation. Observation focused on fishing activities, shellfish harvesting, post-harvest handling, labor division, and interactions among fishers, family members, and local buyers. Semi-structured interviews explored participants' experiences regarding shellfish livelihood practices, ecological pressures, seasonal changes, local ecological knowledge, social solidarity, and livelihood adaptation. This interview approach enabled the researcher to follow a prepared interview guide while remaining open to emerging issues and participants' narratives during fieldwork (Patton, 2015).

Informants were selected using purposive sampling because they had direct experience in shellfish fishing activities. The selection criteria included (1) actively working as shellfish fishers for at least five years, (2) regularly participating in harvesting and post-harvest activities, and (3) willingness to participate voluntarily in the interviews. Eight key informants representing different roles within the shellfish livelihood system—including boat owners, boat crews, shellfish cleaners, and local traders—were purposively selected. Interviews continued until data saturation was achieved, indicated by the absence of substantially new codes or themes in the final interviews (Guest et al., 2020). Each interview lasted approximately 45–90 minutes and was conducted in Indonesian and the local Malay dialect at locations convenient for the participants, including their homes, boats, and pontoon working areas. Visual documentation, including photographs of fishing activities, shellfish handling, and pontoon-based work, was collected as supporting field evidence and treated as research data rather than merely illustrative materials.

The data were analyzed through transcription, coding, thematic categorization, interpretation, and verification. Interview recordings and field notes were first transcribed into written text. Initial open coding was conducted to identify meaningful statements from the interview transcripts. Similar codes were subsequently grouped into broader analytical categories corresponding to the focus of the study, namely shellfish livelihood systems, ecological pressures, local ecological knowledge, social solidarity, and ecological sustainability. These categories were then refined into overarching themes through iterative comparison across interviews, observations, and field documentation following Braun and Clarke's (2021) thematic analysis framework. The analysis also followed the qualitative data analysis procedures of data condensation, data display, and conclusion drawing proposed by Miles et al. (2014). The findings are presented through narrative descriptions, selected interview excerpts, an informant profile table, and field documentation to ensure consistency between the analytical procedures and the reported findings.

To enhance the credibility of the findings, this study employed methodological triangulation across interviews, participant observation, field documentation, and relevant literature. Interview findings related to shellfish livelihood practices, ecological pressures, local ecological knowledge, social solidarity, and ecological sustainability were compared with direct field observations, visual documentation collected during fieldwork, and previous studies on shellfish fisheries in Tanjungbalai-Asahan. Consistency among these data sources strengthened the credibility and trustworthiness of the findings (Creswell & Poth, 2018).

Ethical principles were observed throughout the research process. Before each interview, participants were informed about the purpose of the study, the voluntary nature of their

participation, and their right to decline or withdraw from the interview at any stage. Verbal informed consent was obtained from all participants prior to data collection. To protect participants' privacy, all interview quotations are presented using anonymous informant codes (e.g., SF-01 to SF-08), and no personally identifiable information is disclosed.

This study has several methodological limitations. As a qualitative case study conducted in a single coastal area with eight purposively selected informants, the findings are intended to provide an in-depth understanding of shellfish fishers' livelihood practices rather than statistical generalization. Future studies may expand the geographical coverage, involve a larger number of participants, and employ mixed-method approaches to strengthen comparative analyses of shellfish livelihoods and ecological sustainability across different coastal communities.

3. Results and Discussion

3.1. Shellfish Fishing as a Local Livelihood System

Shellfish fishing in Tanjungbalai-Asahan operates as a local livelihood system shaped by marine resources, labor relations, and coastal economic networks. It is not merely an activity of collecting shellfish from the sea, but a chain of work involving departure by boat, searching for shellfish grounds, lifting the catch, transporting it to the pontoon area, cleaning, sorting, and preparing it for sale. Around Teluk Nibung and nearby pontoon spaces, these activities form a daily rhythm of coastal labor. The boat becomes a production space, while the pontoon becomes a transition space between the sea and the market. This pattern shows that shellfish fishing is embedded in a broader social-ecological setting, where household income depends on access to coastal resources, collective labor, and local trading relations (Manurung et al., 2025).

The livelihood system also reflects a clear division of roles among fishers, boat crews, family members, collectors, and buyers. Some actors are directly involved in catching and lifting shellfish, while others assist in cleaning, sorting, weighing, and selling. This division of labor indicates that shellfish fishing supports more than individual income; it sustains a wider coastal economy involving families and informal workers.

The organization of shellfish fishing activities is further reflected in the experiences shared by the informants. The following excerpts illustrate how labor is distributed from harvesting at sea to post-harvest handling around the pontoon area.

"Kalau kami turun ka laut, bukan cuma mencari korang ajo, Pak. Ado yang narik, ado yang milah, ado yang mangangkat. Sampai ka panton pun masih banyak karjo." (When we go to sea, we do not only search for shellfish. Some pull, some sort, and some carry them. Even after reaching the pontoon, there is still much work to do.) — SF-01, personal interview, June 2026

"Korang ni sampai ka pembeli panjang prosesnyo, Pak. Dari laut dibawak, dicuci, dipilah, baru bisa dijual. Jadi banyak tangan yang ikut makan dari karjo ni." (Shellfish go through a long process before reaching buyers. They are brought from the sea, washed, sorted, and then sold. Many people depend on this work.) — SF-08, personal interview, June 2026

These interview excerpts show that shellfish fishing is not a single activity but a local livelihood system involving interconnected forms of labor from harvesting to post-harvest handling. The fishers' narratives demonstrate that boats, pontoon spaces, family members, and local buyers are connected within the same livelihood network. This finding indicates that shellfish fishing in Tanjungbalai-Asahan functions as a collective, labor-intensive, and socially embedded livelihood system that supports the sustainability of coastal livelihoods.

Table 1. Profile of Shellfish Fisher Informants in Tanjungbalai-Asahan

No.	Informant Code	Age	Years of Work	Main Location	Activity	Role in Shellfish Livelihood
1	SF-01	48	22	Teluk Nibung waters		Boat owner and shellfish catcher
2	SF-02	41	18	Panton area		Shellfish catcher and sorter
3	SF-03	36	12	Tanjungbalai-Asahan coast		Boat crew member
4	SF-04	52	27	Teluk Nibung pontoon		Shellfish cleaner and local seller
5	SF-05	44	20	Bagan Asahan waters		Shellfish catcher
6	SF-06	39	15	Panton and landing area		Shellfish lifter and cleaner
7	SF-07	55	30	Teluk Nibung coast		Senior fisher and local knowledge holder
8	SF-08	33	9	Pontoon market area		Sorter and small-scale trader

Note. SF = shellfish fisher.

3.2. Ecological Pressures and Declining Shellfish Resources

The interviews revealed that shellfish fishers perceive significant ecological changes in the coastal waters of Tanjungbalai-Asahan. Most informants reported that shellfish catches have declined compared to previous years. According to their observations, changes in water conditions, increasing sediment accumulation, seasonal irregularities, and waste pollution have affected shellfish habitats. Several fishers explained that areas previously known for abundant shellfish now require longer fishing trips and greater operational costs. These experiences indicate that ecological pressures are increasingly influencing the sustainability of shellfish-based livelihoods. The issue is not only environmental but also socioeconomic, as declining catches directly affect household income, work opportunities, and economic security among fishing families (Manurung et al., 2025; Mustapa et al., 2022).

Another concern expressed by informants relates to the growing uncertainty surrounding fishing seasons and resource availability. Fishers reported that traditional indicators used to predict productive harvesting periods have become less reliable than in the past. Some participants also associated declining catches with increasing fishing intensity and competition among fishers in productive areas. Although these observations require further ecological verification, they remain important because they represent local experiences and environmental knowledge developed through long-term interaction with coastal ecosystems. The findings suggest that ecological sustainability and livelihood sustainability are closely interconnected. When shellfish resources decline, the resilience of coastal communities becomes increasingly vulnerable, making adaptive strategies and sustainable resource management essential for the future of shellfish fishing in Tanjungbalai-Asahan (Matondang et al., 2017; Ramlan, 2022).

The perceptions of ecological change described above are further illustrated through the narratives of shellfish fishers. The following interview excerpts demonstrate how declining catches, changing water conditions, and seasonal uncertainty are experienced in everyday fishing activities.

“Dulu, waktu turun ka laut, korang tu banyak kali, Pak. Sakarang agak susah, kadang kami jauh-jauh pun hasilnya tak sabarapo.” (In the past, one fishing trip could bring abundant shellfish. Now it is more difficult, and even longer trips often produce limited catches.) - SF-03, personal interview, June 2026

“Kalo aer koruh samo lumpur naek, korang susah nampak. Kami tengok musim pun sakarang tak manantu macam dulu lagi.” (When the water becomes turbid and the mud rises, shellfish are

difficult to find. We also observe that the seasons are no longer as predictable as before.) - SF-06, personal interview, June 2026

The interview excerpts demonstrate that ecological change is understood through everyday fishing experience rather than formal environmental measurements. These statements show that ecological change is experienced through daily labor, not only through statistical indicators. The fishers describe declining catches, muddy waters, and seasonal uncertainty as practical problems that directly affect work duration, income stability, and livelihood security. Their narratives also indicate that local ecological knowledge remains important, although it is increasingly challenged by changing coastal conditions. Therefore, the decline of shellfish resources should be read as both an environmental concern and a social problem for coastal households in Tanjungbalai-Asahan.

3.3. Local Knowledge and Adaptive Practices among Shellfish Fishers

Local knowledge plays an important role in the way shellfish fishers understand coastal change in Tanjungbalai-Asahan. The fishers do not rely only on formal information about weather or tides. They also observe water color, mud texture, wind direction, wave patterns, and the movement of productive shellfish grounds. Through repeated experience, they develop practical knowledge about when to depart, where to search, and how to estimate the possibility of obtaining a sufficient catch. This knowledge is transmitted through daily work, family experience, and interaction among boat crews.

However, the interviews indicate that this local knowledge is increasingly tested by ecological uncertainty. Fishers explained that seasonal patterns have become less predictable, while shellfish locations often shift from familiar grounds to more distant areas. When catches decline, they adapt by extending fishing time, moving to alternative locations, reducing daily expenses, or combining shellfish fishing with other informal work. These adaptive practices demonstrate that shellfish fishers actively respond to environmental uncertainty by relying on accumulated experience and locally developed knowledge.

The importance of local ecological knowledge and adaptive practices is further illustrated through the following interview excerpts. The narratives show how shellfish fishers interpret changes in water conditions, mud characteristics, wind patterns, and shifting shellfish grounds to guide their fishing activities and adapt their livelihood practices.

"Biasanyo kami tengok warno aer samo angin dulu, Pak. Kalau airnya elok, lumpurnyo pas, baru kami turun mencari korang." (Usually, we first observe the water color and wind conditions. If the water is good and the mud condition is suitable, then we go out to search for shellfish.) - SF-02, personal interview, June 2026

"Sakarang tompat korang tu soring bapindah, tak macam dulu. Kadang kami tapaksa mamutar jauh, minyak abis, hasilnya pun bolum tontu banyak." (Now the shellfish grounds often shift, unlike in the past. Sometimes we must travel farther, spend more fuel, and still cannot be sure of getting a good catch.) - SF-05, personal interview, June 2026

The interview excerpts indicate that local ecological knowledge is developed through long-term interaction with the coastal environment. Fishers interpret changes in water conditions, mud characteristics, wind patterns, and shifting shellfish grounds to guide everyday fishing decisions and adapt their livelihood practices. This knowledge is both ecological and economic, enabling fishers to adjust their work routines, protect household livelihoods, and respond to ecological pressures. These findings suggest that local ecological knowledge forms an integral part of shellfish livelihood practices and contributes to ecological sustainability in Tanjungbalai-Asahan (Ahmadin et al., 2025; Nasution et al., 2017).

3.4. Social Solidarity, Labor Relations, and Coastal Community Resilience

Shellfish fishing in Tanjungbalai-Asahan is sustained through collective labor and everyday social cooperation. The work rarely depends on one individual alone, because catching, lifting,

cleaning, sorting, and preparing shellfish require coordinated roles among boat crews, family members, and local workers. On the boat, cooperation appears through shared tasks during departure, harvesting, and unloading. Around the pontoon area, cooperation continues when shellfish are carried, washed, separated, and prepared for buyers. These activities show that shellfish livelihood is not only an economic practice, but also a social process that depends on trust, mutual assistance, and practical coordination.

Labor relations among shellfish fishers also reveal the importance of family and community networks in maintaining livelihood resilience. When catches decline or operational costs increase, fishers often rely on social ties to share information, adjust work schedules, borrow equipment, or support household needs. Family members may participate in cleaning, sorting, selling, or managing small earnings from shellfish trade. This informal support system helps reduce vulnerability, although it does not fully eliminate economic insecurity. Therefore, coastal community resilience in Tanjungbalai-Asahan should be understood as a collective capacity shaped by labor cooperation, kinship relations, and shared dependence on coastal resources.

The collective character of shellfish fishing is further reflected in the experiences shared by the informants. The following interview excerpts illustrate how cooperation and family participation become essential components of everyday shellfish livelihood activities.

"Kalau karjo korang ni tak bisa sorang-sorang, Pak. Di kapal kami saling bantu. Yang angkat ado, yang milah ado. Sampai ka darat pun keluarga ikut nolong." (Shellfish fishing cannot be done alone. On the boat, everyone helps each other. Some lift the shellfish, some sort them, and after landing, family members also help.)- **SF-04, personal interview, June 2026**

"Kalau hasil kurang, kami tetap sama-sama turun. Yang penting karjo jalan. Kadang tetangga pun saling pinjam alat atau bantu angkat korang." (Even when catches are low, we still work together. The important thing is to keep working. Sometimes neighbors lend equipment or help carry the shellfish.)- **SF-01**

These interview excerpts demonstrate that social solidarity is embedded in everyday shellfish fishing practices rather than being expressed only during times of crisis. Cooperation among boat crews, family members, and neighboring fishers enables the continuity of livelihood activities despite ecological and economic uncertainty. The findings suggest that community resilience is built through reciprocal labor relations, trust, and shared responsibility within coastal households.



Figure 1. Field documentation of shellfish livelihood activities in Tanjungbalai-Asahan.

Figure 1 provides visual evidence of the collective nature of shellfish-based livelihoods in Tanjungbalai-Asahan. The photographs show fishers working together during harvesting, transporting, sorting, and handling shellfish aboard fishing boats and coastal working spaces. These activities demonstrate that shellfish fishing depends not only on marine resources but also on cooperation, shared labor, and social coordination among community members. The images further illustrate how livelihood practices are embedded within everyday interactions between people, coastal environments, and local economic networks. As such, shellfish fishers should be understood as participants in a living social-ecological system in which ecological sustainability, community resilience, and local livelihoods are closely interconnected.

3.5. Toward Ecological Sustainability of Shellfish Livelihoods

The findings indicate that ecological sustainability in shellfish livelihoods cannot be separated from the everyday realities of small-scale fishers. Declining catches, shifting shellfish grounds, increasing operational costs, and uncertain seasons show that resource management should address both ecological and social dimensions. Sustainable shellfish livelihoods require locally grounded catch management, protection of coastal habitats, and stronger attention to pollution, sedimentation, and fishing intensity. In this context, sustainability should not be reduced to conservation alone. It must also include livelihood security, fair access to coastal resources, and the recognition of fishers' knowledge in environmental decision-making. This perspective is consistent with social-ecological fisheries studies, which emphasize that small-scale fisheries depend on the interaction between ecosystems, institutions, and community practices (Ahmad et al., 2024; Islam et al., 2020; Pane et al., 2021).

The importance of ecological sustainability is also reflected in the perspectives of shellfish fishers. The following interview excerpts illustrate their expectations for protecting shellfish resources while sustaining coastal livelihoods.

The need for more sustainable coastal resource management is also reflected in the perspectives of the shellfish fishers. The following interview excerpts illustrate their expectations regarding the future of shellfish resources and coastal livelihoods.

"Kami baharap laut janganlah rusak lagi, Pak. Kalo tempat korang ni totap dijago, anak cucu kito masih bisa cari makan dari sini." (We hope the sea will no longer be damaged. If shellfish grounds are protected, our children and grandchildren will still be able to earn a living here.)- SF-07, personal interview, June 2026

"Kalo ado aturan nang elok, kami maunyo mangikut, Pak. Asal samuo nelayan ni dibuat samo dan laut totap ado hasilnyo." (If there are good management rules, we are willing to follow them, provided that all fishers are treated fairly and the sea continues to provide livelihoods.) - SF-05, personal interview, June 2026

These interview excerpts indicate that shellfish fishers understand ecological sustainability as the long-term continuity of both shellfish resources and local livelihoods. Rather than opposing conservation measures, the informants expressed support for fair and participatory management that protects shellfish habitats while sustaining household livelihoods. These findings suggest that ecological sustainability should be developed through collaboration with fishing communities by recognizing their local ecological knowledge and everyday livelihood practices.

For Tanjungbalai-Asahan, ecological sustainability should therefore be developed through participatory coastal governance. Shellfish fishers need to be involved in identifying productive grounds, monitoring ecological changes, discussing harvest limits, and designing locally acceptable management rules. Their participation is important because they understand daily changes in water conditions, shellfish habitats, and fishing risks. The FAO small-scale fisheries guidelines also emphasize that sustainable fisheries should place fishing communities, human rights, food security, and poverty reduction at the center of policy (Nations, 2015). Thus, the future of shellfish

livelihoods in Tanjungbalai-Asahan depends not only on the availability of shellfish resources, but also on inclusive policies that strengthen fishers' voices, protect coastal ecosystems, and support community resilience.

The findings indicate that shellfish fishers view ecological sustainability as closely linked to their participation in managing coastal resources. Across the interviews, informants emphasized the importance of protecting productive shellfish grounds, recognizing ecological changes, and maintaining collective responsibility for sustaining future livelihoods. These findings suggest that local ecological knowledge and social solidarity are integral components of ecological sustainability because they enable fishing communities to respond collectively to changing environmental conditions.

These findings are consistent with the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries, which emphasize that sustainable fisheries governance should actively involve fishing communities in decision-making while promoting human rights, food security, and poverty reduction (FAO, 2015). From this perspective, participatory coastal governance provides an appropriate framework for integrating fishers' local ecological knowledge into fisheries management. Therefore, ecological sustainability in Tanjungbalai-Asahan depends not only on the availability of shellfish resources but also on inclusive governance that recognizes fishers as key actors in protecting coastal ecosystems and sustaining local livelihoods.

4. Conclusion

This study concludes that shellfish fishers in Tanjungbalai-Asahan represent a close relationship between local livelihoods, ecological knowledge, and coastal sustainability. Shellfish fishing is not merely an economic activity, but a social-ecological practice shaped by labor cooperation, local experience, family participation, and community adaptation. The findings show that fishers experience ecological pressure through declining catches, shifting shellfish grounds, uncertain seasons, sedimentation, and changing water conditions. These pressures directly affect household income, work duration, operational costs, and livelihood security. Therefore, the sustainability of shellfish livelihoods cannot be understood only through biological resource availability, but must also consider the social and cultural realities of coastal communities.

The significance of this study lies in its effort to position shellfish fishers as important knowledge holders and social actors in coastal sustainability. Their narratives reveal how local communities interpret ecological change and develop adaptive practices within everyday work. Future coastal governance in Tanjungbalai-Asahan should involve shellfish fishers in resource monitoring, habitat protection, catch management, and local policy formulation. Ecological sustainability will be stronger when it is supported by social solidarity, fair access to coastal resources, and recognition of small fishers' voices. Thus, protecting shellfish resources also means protecting coastal communities, local knowledge, and the cultural continuity of Tanjungbalai-Asahan.

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