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Examining Fishermen's Attitudes and Practices Regarding Managing and Conserving Fishery Resources in Balochistan

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ABSTRACT

The study highlights the fishermen's perception and attitude regarding the management of fishery resources in Balochistan. Balochistan's coastline extends to 770 km, comprising two districts, namely Lasbela District and Gwadar District. The lack of proper policy and institutional arrangements poses a serious threat to the management of fishery resources in the region. This study adopted a quantitative methodology using a closed-ended questionnaire to examine the fishermen's attitudes and practices that are affecting their livelihood opportunities. The results of the study reveal that most of the fishermen are aware of the depletion of the fishery stock and environmental concerns and are willing to adopt more sustainable management measures for the protection and conservation of the fishery resources. However, they also raise concerns about institutional support in enforcing fishery laws to control or limit the fishing activity of foreign fishing vessels in their territory. The respondents also reveal that there are inadequate alternative livelihood and community development opportunities. Notably, all respondents disagreed with the statement that they do not want their next generation to pursue fishing as a profession, raising concern about the long-term viability and attractiveness of fishing livelihoods. Overall, the findings indicate that there is a need for more improvement in fishery governance, sustainable resource management, and more diversified livelihood opportunities.

Introduction

The increase in the global population has resulted in greater consumption of animal protein; however, seafood derived from fisheries plays a crucial role in meeting human nutritional needs [1]. A country's economic performance and human development

are significantly influenced by fishery resources, which are also an important source of animal protein and contribute to employment, production, and trade. More than 85% of people engaged in the fisheries sector are in Asia, where fisheries-related employment has increased rapidly. Fishery resources are renewable and have the capacity for self-renewal [2]. The current approach to fisheries management acknowledges that fisheries are a crucial component of their surrounding environment and cannot be managed independently. Therefore, they depend on the processes and framework of the surrounding ecosystem (Laugen et al., 2014). Variations in fish populations are essential considerations in fisheries resource management. These management objectives are beneficial for the conservation of fish stocks and their sustainable management. At present, such approaches make it easier to regulate the level of fishing and harvesting activities, which in turn affects the abundance of major fish species [3]. Policy analysis is necessary to facilitate the selection of practical policies aimed at improving fisheries management. Policy assessment may also support the development of an effective management system while addressing existing management limitations [4]. Fishermen work aboard fishing vessels in both inland and marine environments. Employment opportunities related to the fisheries sector also include work on fishing boats, at fish-curing yards, fish farms, and fish-processing plants. In Pakistan, according to the FAO 2017 report, approximately 400,000 people are directly and indirectly linked to the fisheries sector, which could be classified as full-time and part-time workers [1].

Fish is an important source of amino acids and is consumed globally. In Pakistan, per capita consumption of fishery products is less than two kilograms, indicating limited preferences for seafood such as crabs, lobsters, oysters, and mussels [5]. The unavailability of fresh seafood products in the markets could also limit consumption in the country. On the other hand, the depletion of fishery stocks also limits the availability of seafood products in the markets. Limited alternative opportunities in the coastal regions of Balochistan increase the dependency of the local community on fishery resources, which has adversely affected the standing stock of fish. According to [6] and [7], the lack of proper management measures in Pakistan has resulted in unresolved issues such as weak resource governance mechanisms, a lack of human resources to enforce fishery laws, limited alternative opportunities, a lack of institutional settings, and overlapping policies related to the management of coastal and marine resources.

Local dwellers' total dependence on fisheries and ineffective resource management measures have depleted marine fishery stocks. Therefore, the Government of Balochistan needs to implement sustainable efforts using modern technologies, enforce fishery laws, and encourage robust coordination among organizations to oversee and monitor the socio-economic and ecological potential of the coast and surrounding areas. In Balochistan, the fishery resources are also threatened by illegal, unregulated, and unreported fishing. Compliance with strict regulations would hamper or limit illegal activities in the maritime waters of the Balochistan coast.

The present study aims to examine the fishermen's existing practices and attitudes towards the sustainable management and conservation of fishery resources in Balochistan. According to [8], understanding fishermen's attitudes enhances the effectiveness of management strategies. Inclusion of fishermen in the decision-making process provides them with benefits of resource ownership, providing incentive-based management measures that encourage their participation for a short period of time [9]. Furthermore, the study has three main objectives in the context of Balochistan fishermen's perceptions: Firstly, it highlights to what extent fishermen are accepting or complying with regulations related to fishery resources management; Secondly, it determines the fishermen's attitude and behavior to the extent to which they are ready to adopt effective management measures introduced by the concerned organization for fishery resources management; Thirdly, it provides an inclusive policy framework regarding the role of the fishery organization for the effective management of fishery sources.

Research Methodology

The study adopted a quantitative approach to examine public perceptions in Balochistan using a population-based framework. The main purpose of the study was to assess fishermen’s attitudes, understanding, and implementation of sustainable marine fisheries management practices along the coastal areas of Balochistan. The study also aimed to explore and identify the institutional, behavioral, and policy mechanisms influencing the effective conservation and governance of the province’s marine fishery resources.

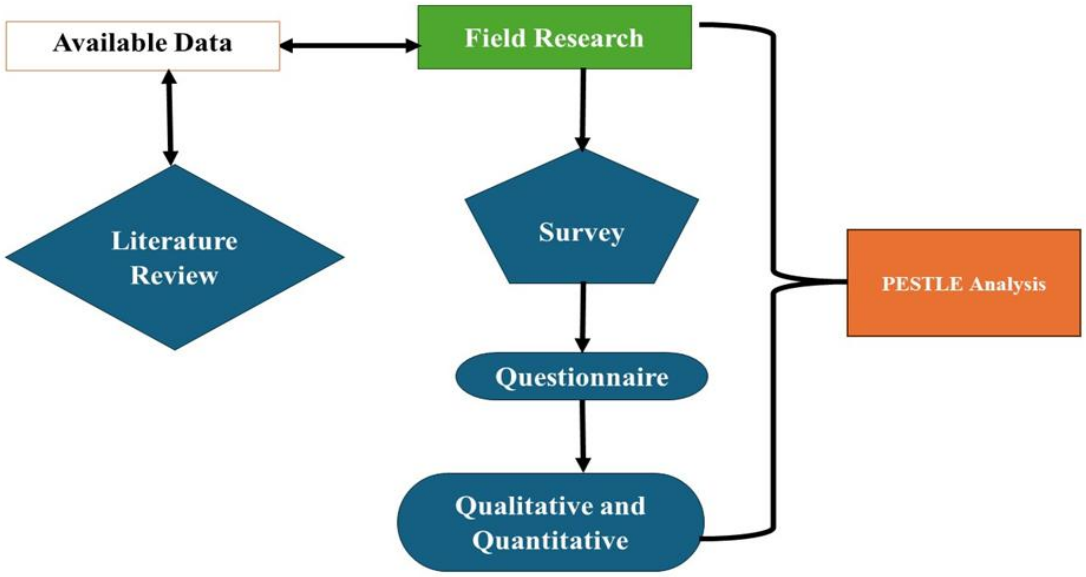


Figure 1: Research Methodology Flow Chart

Study Area and Research Population

The research was conducted along the coast of Balochistan in nine coastal communities: Gaddani, Sonmiani, Kund Malir, Ormara, Pasni, Sur Bandar, Gwadar, Pushkin, and Jiwani. The closed-ended questionnaire was adapted [10] and modified to get basic information from the fishermen and their perception and attitude regarding the conservation and management of the fishery resources

Result And Discussion

Catch Yields and Financial Performance of Fishing Households

The data in Figure 2 report fishermen's catch volume, consumption, income generation, and fluctuation in fish prices from the last few years. The survey results reveal that 56.7% of fishermen's daily catch reaches 201 to 250 kg; 36% reported 100 to 150 kg; while a small proportion (5.3%) reported their catch between 151 and 200 kg, and only 2% reported high catch ranges from 251 to 300 kg. The trend in catch depends on fishermen's fishing capacity, such as the type of gear used for fishing, availability of fish during the fishing season, and the type of the targeted species. In addition, 58.70% of respondents claimed that their daily earnings from captured fish range from PKR 16,000 to 30,000. Approximately 30% reported their daily income between PKR 5,000 and 15,000, whereas 9.3% earned from PKR 31,000 to 45,000, and only 2% reported high daily income from captured fisheries ranging from PKR 46,000 to 55,000. The daily income of the fishermen reveals that most of the respondents are in the lower- to middle-income category. The difference in their daily income reflects fishermen's daily catch composition, market prices, operational costs, and fishing efforts.

Figure 2 also highlights the fishermen's fish consumption from their catch, whereas 54.7% of respondents reported that they consume 5-8 kg, while 40.7% reported 1- 4 kg. A small proportion (4%) reported 9-12 kg and only 0.7% reported 13-16 kg. No respondent reported sustenance catch within 17-20 kg. The results indicate that fish retention or consumption among fishermen ranges, on average, from 1-8 kg. The findings also indicate that fishermen not only catch fish for income but also use it as a source of food for themselves. Therefore, the present study does not quantify the fish consumption frequency of the fishermen and their dietary patterns as well. During the survey, we also asked about fish price trends: 68.7% of respondents reported that fish prices are increasing, 16.7% reported no change, and 14.7% reported a decrease. In the survey, most of the fishermen reported increased fish prices. These perceptions of changes in fish prices could reflect market demand, transportation costs, seasonal availability of fish, and broader market conditions. The market prices in the survey only reflect the respondents' perceptions rather than independently verified fish market price fluctuations. In addition, increasing fish prices do not explain the higher net income for fishermen because operating costs for fishing, crewmember daily wages, and market arrangements could influence financial returns of the fishermen.

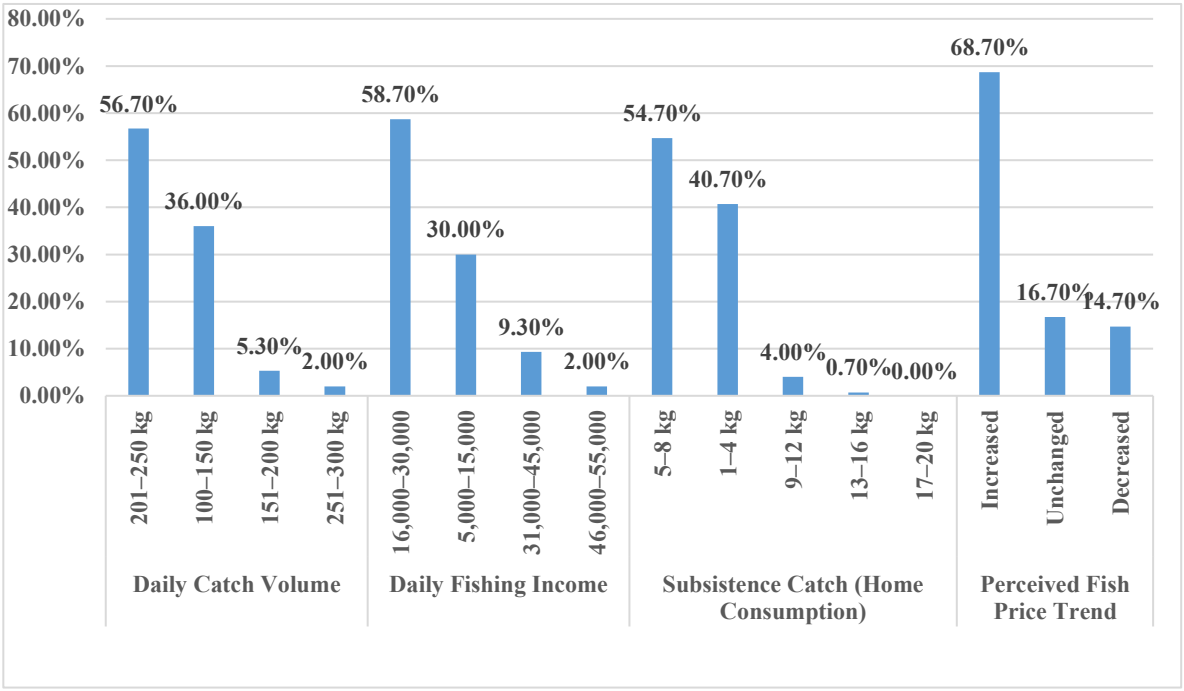


Figure 2: Percentage distribution of respondents according to daily fish catch volume (kg), daily fishing income (PKR), subsistence fish catch retained for household consumption (kg), and perceived changes in fish prices among surveyed fishing households.

Fishing Landings Data Reporting and Collection (UN) Reported Fisheries

Figure 3 reports respondents' experiences and practices regarding their fish catch record, including catch documentation, previous data collection activities by the fishery officers, and on-site catch documentation. The findings of the survey reveal that 100% of fishermen do not need to report their catch to fishery officials or any other government entities. They further highlighted that no formal catch record mechanism exists in the fishery department. None of the respondents reported that they have ever been asked to participate in catch reporting activities during the previous 5–10, 11–15, 16–20, or 21–25 years. The findings of the survey indicate that the absence of capture fish record-keeping limits the ability of the fishery officials to measure, estimate, and evaluate the pressure on fishery resources, which could also hamper the fisheries department from developing evidence-based fishery management strategies. Regarding previous on-site fishery data collection, 46% of respondents reported that they are not aware that fishery data collection has taken place previously, while 54% of respondents reported that no data had been collected yet.

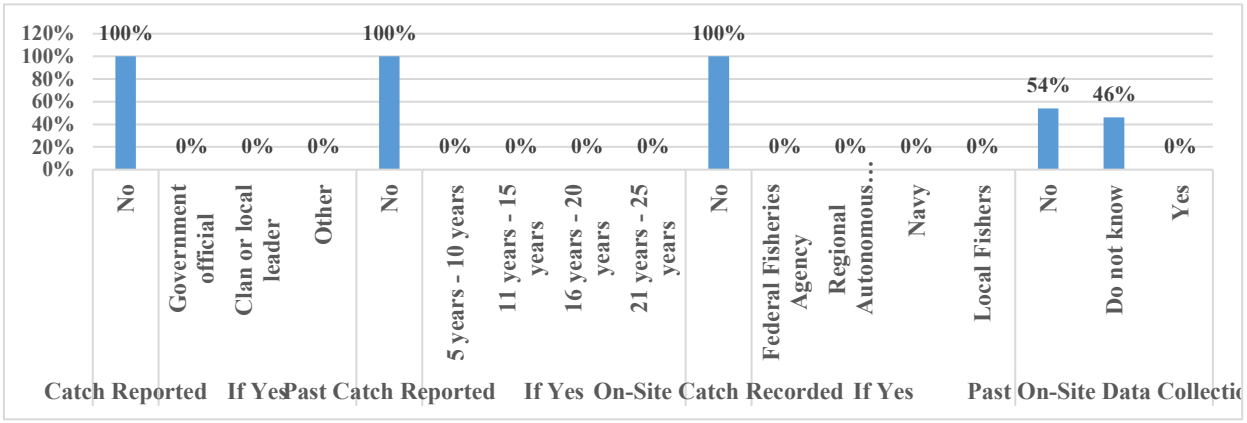


Figure 3: Fishing Landing Data Reporting and Collection: Assessment of Unreported Fisheries in Balochistan:

Fishing Regulations, Compliance, and Enforcement

Figure 4 of the survey reveals the fishermen's perceptions and experiences regarding the enforcement of fishery laws and associated penalties for violating fishery laws. Many respondents (59.3%) indicated that penalties related to violating fishery laws were not imposed, whereas a small proportion of the respondents (33.3%) acknowledged the enforcement of such penalties. While 6.7% were not sure regarding the enforcement of regulatory penalties. These findings reflect that respondents' perceptions of law enforcement vary among fishery communities, where a substantial proportion of respondents reported that the enforcement of law is limited or missing. The responses regarding the enforcement of the fishery laws may reflect organizational weakness in regulatory implementation, lack of human resources availability, or limited exposure of the fishermen to the regulatory authorities. However, the results solely represent respondents' perceptions or experiences and do not indicate the reflection of organizational effectiveness of enforcement activities. In addition, 46% of respondents reported that the use of prohibited fishing gear is punished by the fisheries department, while 0.4% reported the seizure of a boat.

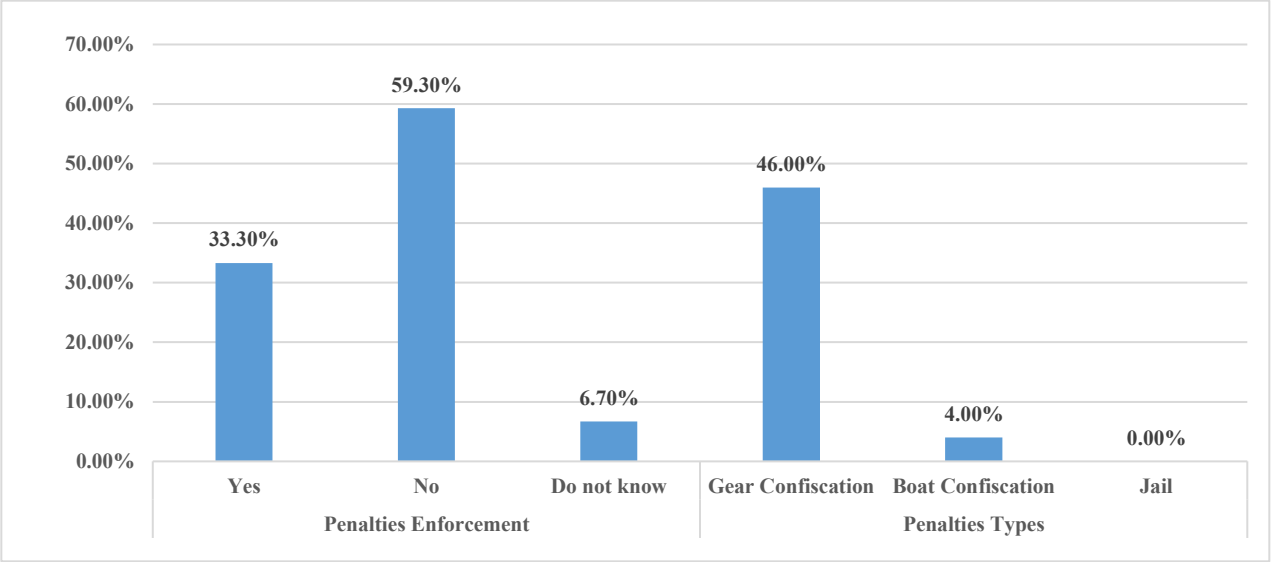


Figure 4: Compliance with Fisheries Regulations and Enforcement Penalties Among Fishermen in Balochistan

Sighting and Perception of Foreign Fishing Vessels (Illegal Fishing)

Figure 5 presents respondents' insights into illegal fishing activities along the Balochistan coast. The respondents (100%) reported that they observe foreign fishing vessels in Pakistan's maritime waters. The fishermen's responses reflect that they observe foreign fishing vessels daily. However, 82% of respondents report the presence of foreign fishing vessels all the time, while 15% report frequently sighting vessels. Moreover, 80% of respondents report that the foreign fishing vessels hold fishing permits, while a small proportion claim that they do not hold permits for fishing. Regarding the presence of foreign fishing vessels in Balochistan's maritime waters, 80% of local fishermen claim the presence of fishing vessels from the Sindh province, while 20% report the presence of both Sindh and foreign fishing vessels. No respondent claimed that the foreign fishing vessel was alone responsible for illegal fishing activities along the Balochistan coastal waters. Regarding the nationality of fishing vessels, approximately 82% reported that they observed Chinese fishing vessels, while 18% said that they were unable to identify the nationality. The survey also asked respondents about the foreign fishing vessels' fishing proximity area; 87% of them claimed that the foreign fishing vessels fish in offshore areas, while 13% of them reported that the foreign fishing vessels are found in very far offshore areas. No respondent claimed that foreign fishing vessels are near the shore areas.

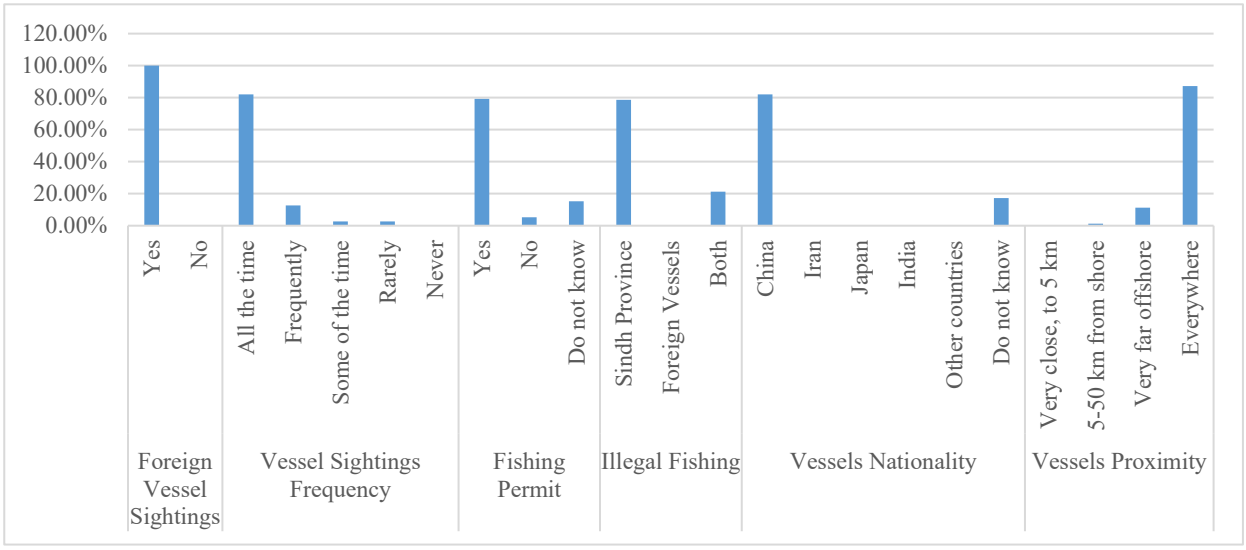


Figure 5: Fishermen Sighting on IUU Activity

Enforcement and Confiscation of Fishing Vessels (Fine)

Figure 6 shows that the primary survey emphasizes the application of fishery laws and the strict managerial measures authorities are taking to curb illegal fishing along the Balochistan coast. The survey also highlights the responsible authorities responsible for enforcing fishery laws and regulations in the coastal waters of Balochistan. Approximately 72% of respondents stated that regional agencies enforce fishery-related laws, while 27% identified the Navy as a law enforcement agency in the area. The survey also asked respondents about the payment of fines, monetary penalties, and the return of vessels after confiscation during illegal fishing activity. None of the respondents reported fines, penalties, or the return of vessels. Regarding the frequency of patrolling, 53% of respondents said they observed patrols sometimes, 28% rarely, and 19% frequently. The findings regarding the surveillance of fishing activities in the Balochistan coastal waters were perceived as intermittent rather than consistently implemented across the surveyed fishing communities. In addition, the findings of the survey show the absence of continuous surveillance of fishing activities, no reports of vessel confiscation or fines, and variations in the frequency of patrolling, indicating limited enforcement action.

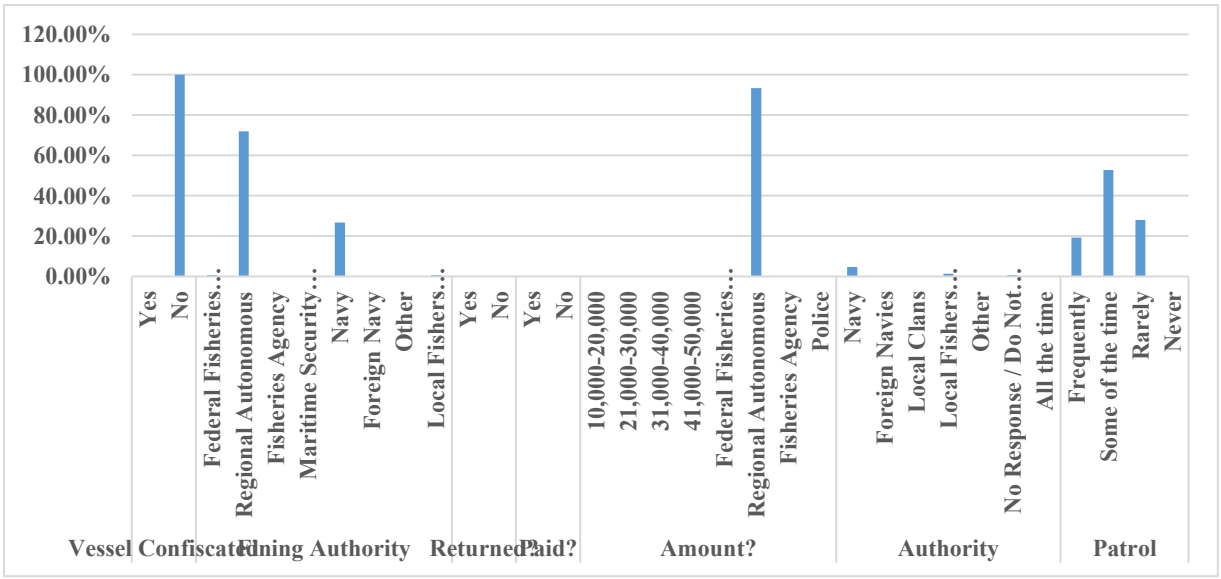


Figure 6: Fishermen's Experiences and Perceptions Regarding Vessel Confiscation, Fines, and Fisheries Law Enforcement in Balochistan

Fishermen's Perceptions of Changes in Fish Catch, Income, Community Peace, and Development in Balochistan

Figure 7 shows respondents' agreement and disagreement with environmental protection measures, challenges in fishery resource management, and improvements in their livelihoods. The findings of the respondents reflect that 98% of the fishermen have inadequate equipment, while 57% reported spoilage of the harvest as the major concern. We also asked the respondents regarding the depletion of fishery stocks, where 97% agreed that foreign fishing vessels are responsible for fish stock depletion, whereas about 47% alleged that foreign fishing vessels discarded their waste into the marine environment, posing a major environmental risk. Regarding the governance of fishery resources, 68% of respondents agreed that inadequate management measures are being taken by the authorities, while 46% expressed that the existing law enforcement agencies are ineffective. In addition, 78% of the respondents reported that alternative opportunities are available that need to be highlighted and supported by the government. Notably, all respondents (100%) disagreed with the statement that they do not want their next generation to pursue fishing as a profession, raising concern about the long-term viability and attractiveness of fishing livelihoods. Overall, the findings indicate that there is a need for more improvement in fishery governance, sustainable resource management, and more diversified livelihood opportunities.

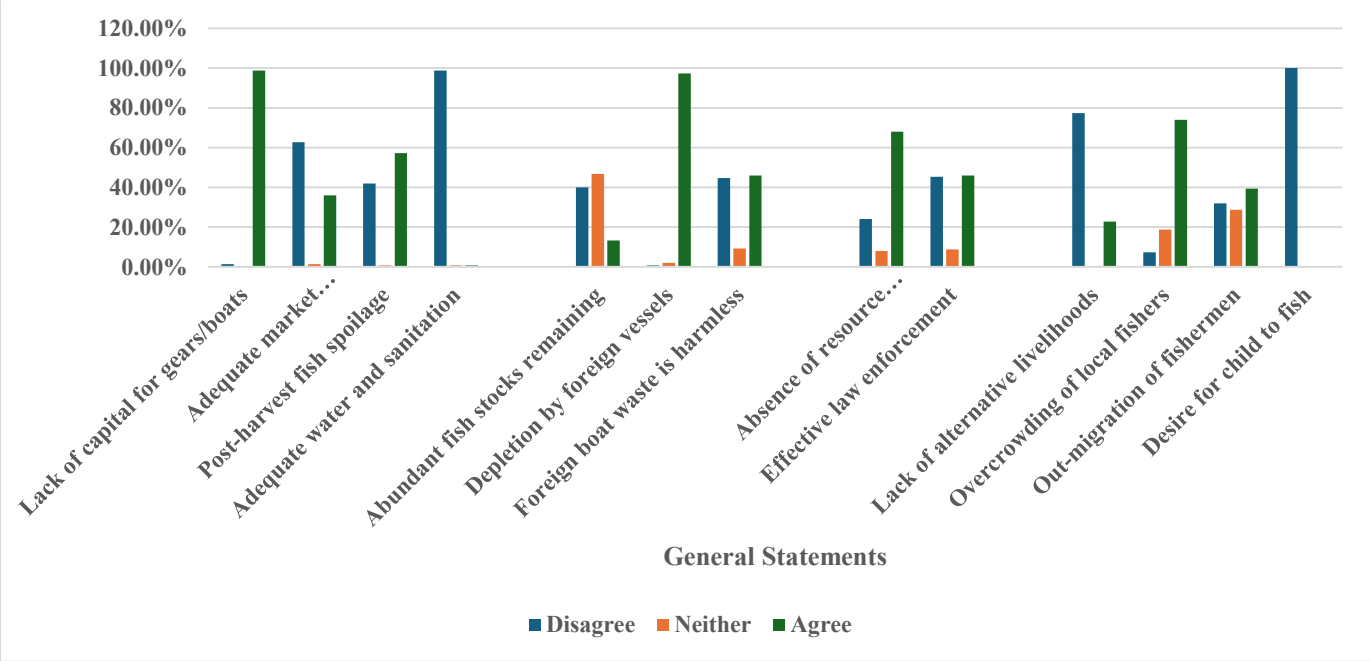


Figure 7: Fishermen's Perceptions of Socioeconomic Challenges, Fisheries Resource Management, and Conservation Issues in Balochistan

Discussion

The present study examines the socio-economic potential of marine fisheries for local coastal communities in Balochistan while documenting the depletion of fishery stocks that affects the livelihoods of fishermen. Among the respondents surveyed, daily catches and fishing income play a significant role in their economic activity. During the survey, we also found that many fishermen retain fish for household consumption in addition to generating monetary income. Despite daily catches and financial returns, most fishermen express concern about the decline in catch and daily income over the last five years. Based on the respondent's response current trend of fish catch depleting. The availability of fish, daily operational cost, and use of gears may influence the fishermen daily catch and income.

The most prominent threat that fishermen highlighted during survey was depletion in fishery stock over last five years. The depletion in fishery stock may affect the fishermen livelihood and long-term productivity of the fishery stocks in Balochistan maritime waters. However, the present study cannot provide biological evidence regarding the depletion of fishery stock, it only reflects the fishermen perception based on their daily catch. Therefore, the perception fishermen on the depletion of fishery stock cannot be neglected as it need scientific investigation to identify the causes. In addition, environmental variability, sustained fishing pressure, changes in fish species abundance, and the destruction of ecological niches may also affect the decline in fish catch. However, these effects cannot be predicated solely on fishermen's perceptions; they require scientific evidence, including daily catch

data, catch per unit effort records, and temporal and spatial information on ecologically important areas. Therefore, this study also suggests that integrating fishermen's experiential knowledge into scientific assessment would help to understand current and historical resource trends in fishery catch and strengthen resource-based management along the Balochistan coast. This study also highlights major issues related to the record of fish catch; none of the respondents agreed that they need to report their catch, nor have they experienced on-site catch documentation. Keeping a daily catch record is essential to estimate fishing pressure, support stock assessment, identify production trends, and evaluate management interventions. Without systematic fishing and catch records, the fishery authorities could face difficulties in determining stock exploitation levels and providing appropriate management measures. The findings from the survey raised serious concerns over the competence of the fisheries department regarding information on fish catch in their territorial regions.

During survey the fishermen's also shows strong disagreement regarding the enforcement of fishery laws or punitive measures enforced by the fishery department. They also reveal the frequent patrolling of the fishery department in the territory of the Balochistan maritime waters. For the governance of fishery resources, the Government of Balochistan needs to adopt educational initiatives and robust community participation rather than solely relying on punitive measures. Fisheries regulations should be established through transparent consultation and accepted by local communities.

During survey the fishermen also highlighted the presence of foreign fishing vessels in the territory of the Balochistan maritime waters. According to the respondents the availability of foreign fishing vessels in their fishing territory has adversely affected their daily catch. This raises a high concern over the performance of the organizations involve in the management and conservation biological resources of the Pakistan sea waters. Therefore, the Government of Pakistan with the collaboration of provincial entities to implement robust management measures to limit the influence of foreign fishing vessel in the respective regions of the provincial territorial. License for fishing permits could be permitted to the foreign fishing vessels and limit their fishing activities beyond the provincial territorial boundary (12nm). The lack of effective management measures and unavailability of alternative activities on the coastal regions of Balochistan could pose challenges on the practical implementation of law enforcement in the future.

In addition, the most prominent threat that fishermen raise to adopt a fishing as their profession for their future generations, all respondents strongly disagree to allow their future generation to be fishermen. Such strongly disagreement shows that there is strong depletion on stock, market price uncertainty, ineffective measures and support from the fishery departments, lack of facility such harbors, jetties, cold storage units, and limited access to the market.

Conclusion

The investigation helped better understand the perceptions of local fishermen towards the sustainable management measures for the conservation of marine fishery resources. The research aimed to examine the attitudes and practices of fishermen in Balochistan regarding the value and sustainable management of the marine environment. It assessed their knowledge, practices, and willingness to participate in conservation activities aimed at protecting threatened fish stocks and maintaining coastal biodiversity. Primary data were collected from major coastal settlements of Balochistan, including Gaddani, Sonmiani, Kund Malir, Ormara, Pasni, Sur Bandar, Gwadar, Pishukan, and Jiwani.

The study revealed that, despite having limited formal education in many cases, fishermen possess considerable knowledge of the marine environment, and many have extensive experience at sea. Financial difficulties limited institutional support, and a lack of alternative livelihood opportunities were among the major factors contributing to the continued use of unsustainable fishing practices. Notably, 100% of the fishermen expressed that they did not want their children to continue in the fishing profession, mainly because of the risks to life, limited income growth, lack of job security, and poor prospects for improvement within the sector. Instead, they preferred their children to pursue education and seek alternative professions, which they considered more promising for the future.

Despite these challenges, fishermen are becoming increasingly concerned about the depletion of fishery resources and the degradation of the marine environment. The study highlights the need to strengthen communication and coordination among local communities, government institutions, and conservation organizations. It recommends greater support for community-based management systems, community awareness, and capacity-building initiatives to promote sustainable fishing practices. Traditional Ecological Knowledge (TEK), when combined with appropriate scientific approaches, can contribute to the effective management of marine resources. The present study therefore suggests that, in addition to regulatory measures, the active participation of fishermen in marine conservation is essential for the future sustainability of fisheries in Balochistan. In conclusion, a holistic approach that integrates scientific knowledge, traditional practices, and community participation could help safeguard Balochistan's marine resources while supporting sustainable livelihoods for coastal communities.

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