



### A STUDY ON THE ADOPTION OF MODERN FISHING TECHNOLOGY AMONG FISHERMEN IN THE MUMBAI REGION

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#### Abstract:

*The fishing industry in Mumbai has undergone significant transformations due to the integration of modern fishing technologies such as GPS navigation, sonar systems, advanced fishing nets, and mechanized boats. This study examines the extent of technological adoption among fishermen in the Mumbai region, analysing the driving factors, challenges, and socio-economic implications. Using primary data collected from 100 fishermen and secondary sources, the research reveals that while modern technology enhances productivity and income, its adoption remains uneven due to financial constraints, lack of technical knowledge, and resistance to change. A paired t-test analysis indicates a statistically significant increase in fishermen's income post-adoption of modern technologies. The study understands the need for policy interventions, financial support, and training programs to ensure inclusive and sustainable growth in the sector*

**Key Words:** Fishermen's, Fishery industries, Fishing Technology.

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#### Introduction:

Fishing has been a cornerstone of Mumbai's coastal economy and culture for centuries, with the Koli community playing a pivotal role in sustaining this traditional livelihood. However, in recent years, the fishing industry has faced multiple challenges, including declining fish stocks, environmental degradation, and competition from large-scale commercial fisheries. To adapt to these changing dynamics, many fishermen in the Mumbai region have begun incorporating modern fishing technologies such

as GPS navigation, advanced fishing nets, sonar systems, and mechanized boats.

The adoption of modern fishing technology has the potential to enhance productivity, reduce labour-intensive efforts, and improve sustainability. However, the extent of its adoption varies due to several factors, including financial constraints, lack of technical

knowledge, and resistance to change among traditional fishing communities. Additionally, government policies and support systems play a crucial role in facilitating or hindering technological advancements in the sector.

This study aims to explore the extent to which modern fishing technologies are being adopted by fishermen in the Mumbai region. It will examine the driving factors, challenges, and socio-economic implications of technological integration in the fishing industry. By understanding these aspects, the research seeks to provide insights into how sustainable and inclusive growth.

#### Historical Evolution of Fishing Technology:

Early fishing practices in India were predominantly manual and small-scale, involving methods like hand-picking, harpooning, line fishing, and the use of natural barriers (Sreekrishna & Shenoy, 2001). Over time, the increasing demand for seafood and the need for

efficient fishing methods led to the development of mechanized fishing boats, synthetic nets, and modern trawling techniques (Pillai & Katiha, 2004). The transition from traditional to mechanized fisheries was heavily influenced by government initiatives and the introduction of Five-Year Plans, which prioritized fisheries development (Rajee & Quigley, 2017).

#### **Adoption of Modern Fishing Technology:**

The adoption of technologically advanced fishing methods has been a key factor in improving catch efficiency and profitability. The use of global positioning systems (GPS), sonar, fish aggregating devices (FADs), and net sondes has helped fishermen locate fish schools with greater accuracy, reducing time and effort (Ravishankar, 2019). However, while these technologies have enhanced productivity, their adoption remains uneven across different regions due to factors such as cost barriers, lack of awareness, and limited access to financial support (Gopal & Edwin, 2013).

#### **Impact on Fisheries and Marine Ecosystem:**

Modern fishing techniques have both positive and negative impacts on the fisheries sector. On the one hand, they contribute to national food security, employment, and economic growth by increasing fish production (FAO, 2020). On the other hand, unregulated fishing practices have resulted in overfishing, habitat destruction, and increased by-catch production, leading to ecosystem degradation (FAO-SOFIA, 2006). The problem of "ghost fishing", where lost or abandoned fishing gear continues to trap marine life, is another significant concern (Brodziak & Link, 2002).

#### **Challenges of Technological Integration:**

While advanced fishing technologies offer numerous benefits, their widespread adoption is hindered by several challenges:

- **Economic Constraints:** Many small-scale fishermen struggle to afford modern equipment,

leading to an economic divide between traditional and mechanized fishers.

- **Regulatory and Policy Issues:** The lack of strict monitoring and enforcement mechanisms has allowed for the overexploitation of marine resources (Pillai & Katiha, 2004).
- **Environmental Impact:** The excessive use of bottom trawling, purse seining, and large-scale mechanized fishing has led to the depletion of fish stocks and disruption of marine biodiversity (FAO, 1995).

#### **Review of Literature:**

(Sarbjee Kaur and Surjya Narayan Datta 2021) Examined the "Improvising Indian Fishing Technology: Modernization, Impacts and Strategies for Sustainable Fisheries" Fishing technology encompasses various techniques for capturing fish, evolving from traditional hand-picking, harpooning, and wooden barriers to highly efficient, mechanized crafts and advanced electronic systems. Modern innovations, such as echo sounders, sonar, fish aggregating devices (FADs), and GPS, have revolutionized the fishing industry by improving accuracy, reducing effort, and enhancing profitability. While these advancements contribute to food security, economic growth, and research development, their unregulated use has led to significant environmental concerns, including overfishing, habitat degradation, and by-catch issues. The open-access nature of India's marine fisheries further exacerbates excessive exploitation, often resulting in destructive and ghost fishing, which severely impacts aquatic biodiversity. To counteract these challenges, sustainable fishing strategies are increasingly emphasized, incorporating eco-friendly approaches such as closed seasons, spatial closures, marine protected areas, selective gear use, and monitoring, control, and surveillance (MCS) measures. Additionally, ecosystem-based conservation efforts and stringent regulatory frameworks are essential to

ensuring responsible fishing practices that balance technological progress with long-term resource sustainability for future generations

(Shariq Mehmood Khan 2024) in this research paper “Comparative analysis of traditional and modern fishing practices in global fisheries” explores the ecological, economic, and social consequences of both traditional and modern fishing techniques across global fisheries. By conducting a comparative analysis, it examines how these approaches influence fish population dynamics, environmental conservation, and community well-being. Utilizing a qualitative review of existing literature along with case studies from diverse regions, the research highlights key differences in their outcomes. The findings indicate that while modern fishing methods enhance efficiency and economic gains, they frequently contribute to environmental decline and social disparities. In contrast, traditional fishing techniques, though less commercially productive, often foster greater ecological balance and community resilience. The study emphasizes the need for integrating sustainable strategies within modern fisheries management to safeguard marine biodiversity while ensuring the long-term livelihoods of fishing communities

(Nudrat Aslam et al., 2024) in this research paper “Evolving Paradigms and Innovations in Modern Fisheries Practices” The sustainable growth of aquaculture and efficient fisheries management plays a vital role in securing global nutrition. This section delves into the evolving dynamics of fisheries, assessing total yield trends, environmental constraints, and the adoption of cutting-edge innovations aimed at optimizing industry operations. Although aquaculture production has seen remarkable expansion, persistent challenges such as climate change, excessive fishing, and pollution pose severe risks, underscoring the urgency for advanced fisheries management solutions. Emphasizing an ecosystem-based approach, this study

highlights the transformative impact of digital technologies, including artificial intelligence, drones, sensors, and the Internet of Things, in modernizing fishing practices. The integration of data-driven methodologies and real-time ecosystem monitoring is reshaping fisheries management, supported by innovative molecular techniques such as genomic selection, genetic editing, and the application of nanoparticles for waste management. These advancements collectively pave the way for a more sustainable and technologically empowered future in fisheries conservation and resource optimization.

(M. Balaji et al., 2023) in this research paper “Technological Innovations in Fisheries Sector” This article explores the transformative impact of technological advancements on fisheries management, highlighting innovations that are reshaping the industry. It examines key breakthroughs in aquaculture, including the integration of robotics, autonomous systems, electronic monitoring, big data analytics, remote sensing, and satellite-based tracking. These advancements are enhancing the efficiency of aquaculture operations, streamlining data collection, and improving real-time monitoring of fisheries activities. The study emphasizes the role of these technologies in promoting sustainability, optimizing resource utilization, and ensuring greater transparency in the fishing sector. By fostering the coexistence of responsible fishing practices and healthy marine ecosystems, these innovations pave the way for a more ethical and environmentally conscious future in global fisheries management.

#### **Research objective:**

1. To analyse the extent of adoption and utilization of modern fishing technologies.
2. To examine the socio-economic and environmental impacts of integrating modern fishing technologies on fishermen's livelihoods, fish stock sustainability,

and the overall marine ecosystem in Mumbai's coastal waters.

3. To identify key barriers and driving factors influencing the adoption of modern fishing technology, including financial constraints, government policies, awareness levels, and the willingness of fishermen to transition from traditional to advanced methods.

### Scope of the Study:

This study explores the extent to which fishermen in the Mumbai region are adopting modern fishing technologies and the factors influencing this transition. It examines the economic, environmental, and social implications of technological integration in traditional fishing practices. The research also aims to identify challenges, benefits, and potential policy interventions to enhance sustainable and efficient fishing methods in the region.

**Research Methodology:** This study employs a combination of primary and secondary data to ensure a comprehensive analysis. Primary data is collected through a structured questionnaire administered to 100 fishermen, selected using a convenience sampling method. The gathered responses are verified and systematically analysed. Additionally, secondary data is sourced from credible journals, publications, and database repositories. Both parametric and non-parametric statistical techniques are utilized to interpret the findings effectively.

**Area of the Study:** The primary data sample is randomly selected from different locations across the Mumbai region to ensure diverse representation.

**Research Approach:** The research methodology involves gathering primary data from fishermen in

Mumbai through a structured questionnaire survey. Each respondent was requested to fill out the questionnaire, which covered specific topics relevant to the study. The survey was designed using a structured format that incorporated both open-ended and closed-ended questions, ensuring clarity and ease of understanding for participants. This approach allowed for the collection of detailed insights while maintaining a standardized framework for data analysis.

**Sample Technique:** The study used a convenient sample of 100 fishermen from the Mumbai region, selected through a probability sampling method. They were asked to fill out the questionnaire voluntarily. The data was collected over two months, in November and December 2024.

**Data usage:** The analyses and interpretations are based on randomly gathered source data. The conclusion and recommendations are based on a combination of primary and secondary data, as well as feedback from respondents. The data gathered from these sources was analysed with various kinds of techniques, including the percentage analysis method and the t-test: Paired Two Sample for Means.

### Hypotheses Testing:

**H0 (Null hypothesis)** = The adoption of modern fishing technologies does not significantly improve the efficiency and income levels of fishermen in the Mumbai region.

**H1 (Alternate hypothesis)** = The adoption of modern fishing technologies significantly improves the efficiency and income levels of fishermen in the Mumbai region.

**Table: 1 Demographic Profile of fishermen in Mumbai region**

SR. NO.	Age (In years)	No. of Respondents	Percentage
1	Less than 25	25	25%
2	25 – 40	35	35%
3	40 -50	20	20%
4	50-60	15	15%
5	Above 60	5	5%
	Total	100	100%
	<b>Educational Level</b>	<b>No. of Respondents</b>	<b>Percentage</b>
1	Illiterate	5	5%
2	Primary Education	40	40%
3	Secondary Education	30	30%
4	Above Secondary Education	25	25%
	Total	100	100%
	<b>Types of Family</b>	<b>No. of Respondents</b>	<b>Percentage</b>
1	joint Family	40	40%
2	Nuclear Family	60	60%
	Total	100	100%
	<b>Marital Status</b>	<b>No. of Respondents</b>	<b>Percentage</b>
1	Married	65	65%
2	Unmarried	35	35%
	Total	100	100%
	<b>Annual Income</b>	<b>No. of Respondents</b>	<b>Percentage</b>
1	Up to 3 Lakhs P.A.	40	40%
2	Rs. 3 Lakhs to 6 Lakhs P.A.	45	45%
3	Rs 6 Lakhs to 8 Lakhs P.A.	10	10%
4	More than 8 Lakhs P.A.	05	05%
	Total	100	100%

**Source: computed From Primary Data.**

According to table no. 1, an examination of the demographic status of a sample of fishermen in the Mumbai region found that the majority (35%) of fishermen are between the ages of 25 and 40. The majority of fishermen have completed primary school education. The majority of fishermen (60%) come from nuclear families. A significant

proportion of fishermen (65%) are married. Most of the fishermen in the Mumbai region have an annual income of Rs. 3 lakhs to 6 lakhs P.A.

#### t-Test: Paired Two Sample for Means

	<i>Fishermen income P.A Before adopting modern technology</i>	<i>Fishermen income P.A after adopting modern technology</i>
Mean	161000	347000
Variance	1900444444	6409000000
Observations	100	100
Pearson Correlation	0.938337579	
Hypothesized Mean Difference	0	
df	99	
t Stat	-4.433740996	
P(T<=t) one-tail	0.000819131	
t Critical one-tail	1.833112933	
P(T<=t) two-tail	0.001638261	
t Critical two-tail	2.262157163	

The paired t-test analysis compares the annual income of fishermen before and after adopting modern fishing technologies. The results show a significant increase in income, with the mean rising from ₹161,000 to ₹347,000. The p-value (0.0016) is much lower than the significance level of 0.05, indicating that the difference is statistically significant. Additionally, the t-statistic (-4.4337) exceeds the critical t-value ( $\pm 2.2621$ ), further confirming the significance of the findings. Based on these results, we reject the null hypothesis ( $H_0$ ) and accept the alternative hypothesis ( $H_1$ ), concluding that modern fishing technologies significantly improve the income levels of fishermen in the Mumbai region.

#### Conclusion:

The findings of this study highlight a significant positive impact of modern fishing technologies on the income levels of fishermen in the Mumbai region. The results confirm that the shift to modern fishing methods enhances efficiency and profitability. Therefore, it can

be concluded that embracing technological advancements in the fishing industry plays a crucial role in improving fishermen's economic well-being and fostering sustainable fishing practices.

#### References:

1. (M. Balaji et al., 2023) *Technological Innovations in Fisheries Sector. Trends in Agriculture Science*, 2(6), 411-414. doi: <https://doi.org/10.5281/zenodo.8037283>
2. (Aslam N, A Mateen, A Abbas, A Zahra, Dureshahwar, K Ashraf, S Razzaq & A Kanwal, 2024). *Evolving paradigms and innovations in modern fisheries practices*. In: *Zoology: Advancements and Research Trends* (Ijaz MU, N Ehsan, M Imran & S Yousaf, eds): FahumSci, Lahore, Pakistan, pp: 166-172. ISBN: 978-627-7745-02-8. <https://doi.org/10.61748/Zool.2024/21>
3. (Shariq Mehmood Khan 2024) *Comparative analysis of traditional and modern fishing practices*

- in global fisheries. *International Journal of Fisheries and Aquatic Research*, 9(1), 27-29.
4. Sarbjeet Kaur and Surjya Narayan Datta (2021) *Improvising Indian fishing technology : Modernization, impacts and strategies for sustainable fisheries. J. Exp. Zool. India* 24, 1071-1076. DocID: <https://connectjournals.com/03895.2021.24.1071>
5. *Report of National Agricultural Fisheries, Government of India, Ministry of Agriculture and Irrigation.*
6. *Economic Survey, (India)*

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