

Gendered Assessment of Artisanal Fisherfolk in Bhavnagar and Amreli, Gujarat: Current Status, Climate Resilience, and Future Prospects



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and Amreli, Gujarat: Current Status, Climate Resilience, and
Future Prospects**

Final Report

Prepared in partnership by

**Kongunadu Arts and Science College Tamil
Nadu, India**

&

Utthan

**36, Chitrakut Twins, B/h Management Enclave,
Nehru Park, Vastrapur, Ahmedabad Gujarat 380015**

Cover page design by

Dr. Selvakumar Vellingiri

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Dr. Selvakumar Vellingiri

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Authorship Contribution Statement

- **Dr. Selvaraju Raja**
Responsible for tools development, data analysis, and report writing.
- **Dr. Mariadass Samynathan**
Coordinated logistics and financial aspects of the project.
- **Dr. Selvakumar Vellingiri**
Research conceptualisation, report editing and finalisation, on behalf of Utthan.

ISBN: 978-81-685316-3-5

Publication date

July 2026

This report is based solely on the opinions and responses of the survey participants. The findings do not represent the opinions of the authors or the organisations. Neither the authors nor the organization assume any responsibility or liability for any inaccuracies, errors, or issues arising from the use of this report.

Authors:

Raja, S., & Samynathan, M. Vellingiri, S. (2025). Gendered assessment of artisanal fisherfolk in Bhavnagar and Amreli, Gujarat: Status, climate resilience, and future prospects. Utthan & Kongunadu Arts and Science College, Tamil Nadu, India.

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Contact: selva@utthangujarat.org

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Research Coordinator

Dr. Selvakumar Vellingiri

*Lead – Knowledge Management and partnerships
Utthan*

Principal Investigators

Dr. Selvaraju Raja, Assistant Professor

Dr. Mariadass Samynathan, Assistant Professor

Kongunadu Arts and Science College

List of Tables	5
List of Figures.....	7
Utthan's Work with Fisherfolk Communities	9
Executive Summary	10
Glossary	12
Chapter 1: Introduction	13
India's Coastal and Fisherfolk scenario state wise.....	13
Gujarat fisheries	16
Districtwide and species wise marine fish production	17
Fish Production and Value (Marine & Inland)	21
Artisanal fisherfolk of Gujarat.....	23
Women and their contribution in fishing of Gujarat	27
The challenges faced by the fishing communities of Gujarat.....	27
1. Declining Fish Stocks and Overfishing.....	28
2. Climate Change and Environmental Stress.....	28
3. Gender Inequality and Marginalization of Women Fisherfolk	28
4. Limited Access to Resources and Technology	29
5. Poor Livelihood Security and Economic Vulnerability	29
6. Challenges in accessing Government Support	30
7. Violations of Fishing Regulations	30
Purpose of the Study	30
Research Objectives:	31
Chapter 2: Methodology	32
Research Design.....	32
Population and Sampling	32
Chapter 3: Demographic Profile	37
Chapter 4: Fishers' Infrastructure and Fishing Experience	60
Chapter 5: Fishers' Life.....	67
Chapter 6: Participation in Fisherfolk Associations	74
Chapter 7: Awareness on Fisheries Institutes and Knowledge-Seeking Behaviour.....	76
Chapter 8: Market and Selling Practices	78
Chapter 9: Climate Change, Disasters, and Migration	80
Chapter 10: Women Fisherfolk and Their Life	91
Chapter 11: Discussion and Conclusion.....	101
Key Results	101

Discussion.....	110
Chapter 12: Recommendations	119
Chapter 13: From Evidence to Implementation: Utthan's Post-Research Field Interventions.....	124
Bibliography.....	132
Field Interviews and Focus Group Discussions Cited	137
Photos from research process.....	138

List of Tables

Table 1 India's Coastal area and Fisherfolk state wise	14
Table 2 Fishers population of Gujarat -district wise distribution.....	16
Table 3 Districtwide and Species wise Marine Fish Production and Value in Gujarat State, 2023-24 (Production in M.T.)	19
Table 4 Fish Production and export of Gujarat in 2023m-2024.....	22
Table 5 Pagadiya Fishermen of Gujarat	25
Table 6 Total Data Collected.....	34
Table 7 Sample Distribution of Household Survey Across Blocks and Villages in Bhavnagar and Amreli Districts.....	35
Table 8 Gender and Occupation of household survey participants.....	36
Table 9 Age Distribution of the respondents by block.....	37
Table 10 Marital status of the respondents	38
Table 11 Social category of the respondents	39
Table 12 Respondents by religion	40
Table 13 Respondents by family size	41
Table 14 Respondents by Family type	42
Table 15 Educational status	43
Table 16 Income from the primary occupation per year	44
Table 17 Secondary Occupation among the respondents	46
Table 18 Average household expense based the primary occupation of the respondent	47
Table 19 Type of house.....	48

Table 20 Household material ownership	49
Table 21 Owning government issued Identity /beneficiary cards	50
Table 22 Disability status of the respondents	51
Table 23 Access to basic facilities	52
Table 24 Ownership of Phone	53
Table 25 Agricultural land ownership by the household.....	54
Table 26 Annual income of the family.....	55
Table 27 Choice of loan source.....	58
Table 28 Current loans and sources	59
Table 29 Fishing experience (In years)	60
Table 30 Infrastructure availability	60
Table 31 Licence ownership	61
Table 32 Fishing area	63
Table 33 Peak season for fishing.....	63
Table 34 Fish Catch by Pagadiya fishers using net fishing method	64
Table 35 Fish Catch by small boat owners.....	65
Table 36 Average fish catch per day (KG)	66
Table 37 Constraints faced by the artisanal fishing households	67
Table 38 Constraints across all blocks.....	67
Table 39 Conflict related issues across the blocks.....	68
Table 40 Perceptions of Artisanal fishers on the reliability of traditional fishing as a source of regular income.....	69
Table 41 Desire for Grandchildren to Continue Traditional fishing practices	70
Table 42 Perception of the need to Improve fisheries extension services	71
Table 43 Perception of work-life balance: time spent with family by fisherfolk in traditional fishing	72
Table 44 Alcohol consumption prevalence among the fisherfolk	72
Table 45 Prevalence of health issues among fisherfolk communities.....	73
Table 46 Presence of fisherfolk organisations at the Village level.....	74
Table 47 Membership in fisherfolk Association at Village level	74
Table 48 Fisher's Awareness on fisheries institutes.....	76
Table 49 Fisher's source of Information	77

Table 50 Place of selling the fish	78
Table 51 Practice of segregating and selling of fish catch	79
Table 52 Decline in fish diversity and population in the coast.....	80
Table 53 Awareness of Bycatch Impacts on fish stocks among fisherfolk.....	81
Table 54 Natural calamities that impacting the fisherfolk.....	82
Table 55 Impact of Natural Calamities, Including Cyclones, on Families in the Last 5 Years	83
Table 56 Awareness of Climate change	85
Table 57 Headship trends across gender	91
Table 58 Livelihood and skill development preferences for family members.....	99

List of Figures

Figure 1 India's Seafood Production and Exports	15
Figure 2 Age distribution of the respondents by district	37
Figure 3 Earnings per day by Gender.....	45
Figure 4 Daily earnings distribution by class interval and primary occupation	46
Figure 5 Percentage of contribution of Income by activity and the block.....	56
Figure 6 Mean income per year by activity and block	57
Figure 7 Mean income per year by Gender across activities.....	57
Figure 8 Conflict related issues.....	68
Figure 9 Impact of natural calamities on study participants and their families in coastal areas	85
Figure 10 Awareness of Climate change by block.....	86
Figure 11 Anticipated Climate Change Impacts.....	86
Figure 12 Weather prediction capability based on climatic or oceanographic conditions.....	87
Figure 13 Vulnerability to weather-related problems by priority level.....	88
Figure 14 Impact of coastal ecosystem degradation on traditional fisherfolk and migration.....	89
Figure 15 Awareness of negative consequences of household plastic usage on marine ecosystems...	90
Figure 16 Awareness of prohibition on Gill net with mesh size under 150 mm by occupation	90
Figure 17 Educational qualifications by Gender	92
Figure 18 Marital status by Gender	92

Figure 19 Age distribution across genders.....	93
Figure 20 Primary and secondary occupation by gender	93
Figure 21 Gendered perspectives on challenges faced by women fisherfolk	94
Figure 22 Major health issues faced by the traditional fisherfolk	95
Figure 23 Distance travelled for fishing by gender	96
Figure 24 Participation of women in SHGs.....	96
Figure 25 Membership in Utthan promoted federation.....	97
Figure 26 Climate change awareness by gender	97
Figure 27 Impacts of climate change observed by gender	98

Utthan's Work with Fisherfolk Communities

Utthan's journey began in 1981, when a small team of women started working alongside marginalised communities in Gujarat's Bhal region — then known locally as *napaani*, or waterless — on water scarcity, landlessness, and exclusion from decision-making. That founding conviction, that lasting change has to be led by the communities it affects, and by women within them, has carried through every stage of Utthan's growth since.

Utthan's work on the coast began as this experience extended into the coastal districts of Saurashtra, including Bhavnagar and Amreli, alongside its continuing work in tribal East Gujarat. Here, artisanal and Pagadiya (foot-fishing) communities faced a distinct set of pressures: livelihoods governed by tide and season rather than the clock, minimal recognition of women's contribution to fishing and fish-selling, and limited access to licences, credit, and social protection compared to other rural livelihoods.

Utthan's early efforts in villages such as Katpar and Bandar focused on organising fisherwomen into collectives, including the Mahila Dariyakhedut (women fish-farmers) group, so their labour in catching, processing, and selling fish would be recognised in its own right rather than an unpaid extension of household work. Through a dedicated capacity-building programme (2014–2016), this deepened into an effort reaching over 500 women farmers and fisherwomen in Bhavnagar, building the documentation, technical knowledge, and confidence to engage fisheries officials directly.

This institutional experience with fishing-dependent households grew further through a coastal livelihoods partnership (2017–2018) that supported gender-sensitive aquaculture options on the Kachchh coast, part of a wider coastal programme spanning Gujarat's coastline from Kachchh to Bhavnagar and Amreli.

When COVID-19 disrupted both fishing and the seasonal migration many households relied on, Utthan helped Pagadiya women in Katpar set up their own rope-making enterprises — an income source independent of the tides that kept women closer to their homes and children, and in several cases replaced months of migration to distant cotton and onion farms altogether. As one of these women, Gangaben, explained: fishing “closes through the rainy season and is dull during the winter season”; livelihoods like ropemaking exist precisely to fill that gap.

This report continues that same commitment. Conducted with Kongunadu Arts and Science College across Bhavnagar and Amreli, it is the most systematic assessment Utthan has undertaken of artisanal fisherfolk to date, combining survey data from over a thousand households with the voices of the women and men who shared their time and experiences with us. We believe that this report would allow stakeholders to understand the situation and act to build resilient fishing communities in Gujarat. Utthan is deeply grateful to The GROW Fund for making this assessment possible. Their trust and commitment to investing in hyperlocal data has been critical in bringing out the voices of fisherfolk and shaping context-specific action plans based on the aspirations of fisherfolk communities.

Executive Summary

This report presents a Gendered Assessment of Artisanal Fisherfolk in Bhavnagar and Amreli districts, Gujarat, undertaken by Kongunadu Arts and Science College on behalf of Utthan. The study examines the current socio-economic status, climate resilience, and future prospects of artisanal fisherfolk, with a particular focus on the experiences of women, in order to inform more inclusive and climate-responsive interventions.

The study followed a mixed-methods design. A structured household survey, administered through KoboCollect, reached 1,003 respondents (734 men and 269 women) across four blocks — Talaja, Ghogha, and Mahuva in Bhavnagar, and Rajula in Amreli. This was complemented by seven focus group discussions and individual interviews with Pagadiya fisherfolk, small-boat owners, crew members, and fisherwomen across both districts, whose voices are woven throughout this report to capture qualitative depth alongside the quantitative findings.

On demographic and socio-economic profile, fishing communities in both districts are overwhelmingly from Other Backward Classes (over 99%) and predominantly Hindu, with a notable Muslim minority in Ghogha. Family structures diverge sharply between districts: joint families dominate in Bhavnagar (79.55%), while nuclear families are more common in Amreli (72.66%). Incomes remain modest across both districts, housing is largely kaccha outside Talaja, and households rely heavily on informal loans from family members rather than banks or SHGs.

The findings reveal significant gender disparities. Women are concentrated in Pagadiya (foot) fishing and fish vending and are almost entirely absent from boat ownership and crew work. Across all activities, women earn substantially less than men, and fewer than one in five women hold recognised household headship, even though many carry the dual burden of income generation and childcare. Participation in Self-Help Groups stands at only 32.5%, and widowhood emerges as a particular source of vulnerability, especially in Amreli.

Climate change awareness remains low overall — reported by roughly 17% of women and 23% of men — despite widespread first-hand exposure to cyclones and other natural calamities, which fishers associate with declining catch, damaged assets, and economic loss. Women report proportionally higher emotional distress following such events, pointing to gendered impacts that extend beyond material loss.

Institutionally, fisherfolk associations, cooperatives, and SHGs exist across the study villages but vary widely in strength and inclusiveness, and awareness of national fisheries research and training institutions (such as CMFRI, CIFT, and MSSRF) remains limited. Fishing licences and boat documentation are overwhelmingly registered in men's names, which restricts women's direct access to state schemes, insurance, and compensation even where they contribute substantially to the sector.

Building on these findings, the report puts forward recommendations organised by stakeholder — the State Fisheries Department, local governments, Utthan and other civil society organisations, fisherfolk cooperatives and SHGs, and research institutions. These centre on formally recognising women as fish workers, simplifying and gender-equalising licence and permit systems, regularising land tenure for informally settled Pagadiya communities, introducing fast-tracked documentation support after disasters, strengthening infrastructure and social protection, fostering more democratic and inclusive

fisherfolk organisations, and generating better ecological and social data through participatory research.

Taken together, the evidence presented in this report is intended to help Utthan and its partners design livelihood and climate resilience interventions that are grounded in the lived realities of artisanal fisherfolk in Bhavnagar and Amreli, and that advance gender equity as a central, rather than secondary, goal of coastal development.

Glossary

Artisanal fisherfolk: Small-scale, traditional fishers who use low-technology, largely non-mechanised craft and gear, as distinct from large mechanised commercial fishing fleets.

BPL: Below Poverty Line.

CIFNET: Central Institute of Fisheries, Nautical and Engineering Training.

CIFT: Central Institute of Fisheries Technology.

CMFRI: Central Marine Fisheries Research Institute.

CPUE: Catch Per Unit Effort, a measure of fishing productivity.

EEZ: Exclusive Economic Zone, the maritime area over which a country has special rights to marine resources.

FAO: Food and Agriculture Organization of the United Nations.

FGD: Focus Group Discussion.

GIS: Geographic Information Systems.

GPS: Global Positioning System.

ICAR: Indian Council of Agricultural Research.

IMD: India Meteorological Department.

IPCC: Intergovernmental Panel on Climate Change.

IUCN: International Union for Conservation of Nature.

Kharwa, Koli, Machhi (Machhiyara), Bhoi: Other Backward Class (OBC) community groups traditionally engaged in fishing and seafaring occupations along the Gujarat coast.

MNREGA: Mahatma Gandhi National Rural Employment Guarantee Act, a rural employment scheme; the associated job card is also used as an identity/beneficiary document.

MPEDA: Marine Products Export Development Authority.

MSSRF: M. S. Swaminathan Research Foundation.

NCAER: National Council of Applied Economic Research.

OBC: Other Backward Classes, a social category recognised under Indian affirmative-action policy.

Pagadiya fishing: A traditional Gujarati foot-fishing method, practised for about 400 years, in which fishers set bag nets in shallow water at low tide and collect the catch after the following high tide, typically for 20–22 days each lunar month.

PMJJBY: Pradhan Mantri Jeevan Jyoti Bima Yojana, a government-backed life insurance scheme.

PMSBY: Pradhan Mantri Suraksha Bima Yojana, a government-backed accident insurance scheme.

SHG: Self-Help Group.

ST: Scheduled Tribe.

Chapter 1: Introduction

Oceans are the world's largest ecosystem, covering nearly three-fourths of the Earth's surface, creating a vast space for complex and interconnected development challenges, including livelihoods, climate change, commerce, and security. The Indian Ocean plays a crucial role in the economies, security, and livelihoods of its coastal states. With a coastline of 8,162 km, India spans 9 maritime states and 4 Union Territories including Gujarat, Tamil Nadu, Kerala, West Bengal, Maharashtra, Odisha, Andhra Pradesh, Karnataka, and Goa and four maritime Union Territories: Daman & Diu, Puducherry, Lakshadweep Islands, and the Andaman & Nicobar Islands, providing livelihood support to millions of coastal fisherfolk.¹ This extensive coast supports a 0.53 million km² continental shelf and an Exclusive Economic Zone (EEZ) of 2.02 million km², with an estimated annual fish yield potential of 3.93 million tonnes according to Standing Committee on Agriculture (2019–2020).

Marine fisheries play a vital role in India's fisheries sector, with significant catches from Gujarat, Tamil Nadu, Kerala, West Bengal, and Maharashtra. India ranks as the world's third-largest fish producer and the second-largest aquaculture fish producer, contributing about 7% of global fish production.² As one of 17 mega-biodiversity countries, India is home to over 10% of global fish biodiversity, supporting diverse aquatic ecosystems.

As the 2nd largest fish producer, 2nd largest aquaculture nation in the world after China and the largest producer of shrimp, India contributes significantly to both domestic food security and the global seafood market.

India's Coastal and Fisherfolk scenario state wise

According to the marine census ,2016 India's expansive coastline stretches over 8,162 kilometres, hosting a thriving ecosystem of 1,363 landing centres and 3,477 fishing villages across 13 coastal states and union territories. This vast coastal belt is home to a diverse and vibrant fisherfolk community, with a total population of 37,74,577 individuals, including 6,00,890 families living below the poverty line. These numbers reflect the socio-economic importance of fisheries while also highlighting the challenges faced by coastal communities.

Tamil Nadu emerges as a leader with 349 landing centres and 575 fishing villages, supporting the largest fisherfolk population of 7,95,708. The state also has one of the highest numbers of traditional fishermen families, totalling 1,96,784. Andhra Pradesh follows closely, with 1,52,062 traditional fishermen families, signifying its crucial role in India's fisheries sector.

Kerala stands out with a rich fishing heritage, housing 1,16,598 traditional fishermen families and supporting a fisherfolk population of 5,63,903. Gujarat, despite having the longest coastline of 1,600 kilometres, sustains 67,610 fishermen families, showcasing the diversity in the distribution of fisheries resources across states.

Among the union territories, the Lakshadweep Islands and Andaman & Nicobar Islands contribute significantly to the artisanal fisheries sector despite their smaller population sizes. These islands, with their unique coastal ecosystems, play a critical role in sustaining the livelihoods of their fisherfolk communities (Table 1).

¹ <https://pib.gov.in/PressReleaseDetailm.aspx?PRID=1802384®=3&lang=1>

² <https://dof.gov.in/inland-fisheries>

Table 1 India's Coastal area and Fisherfolk state wise

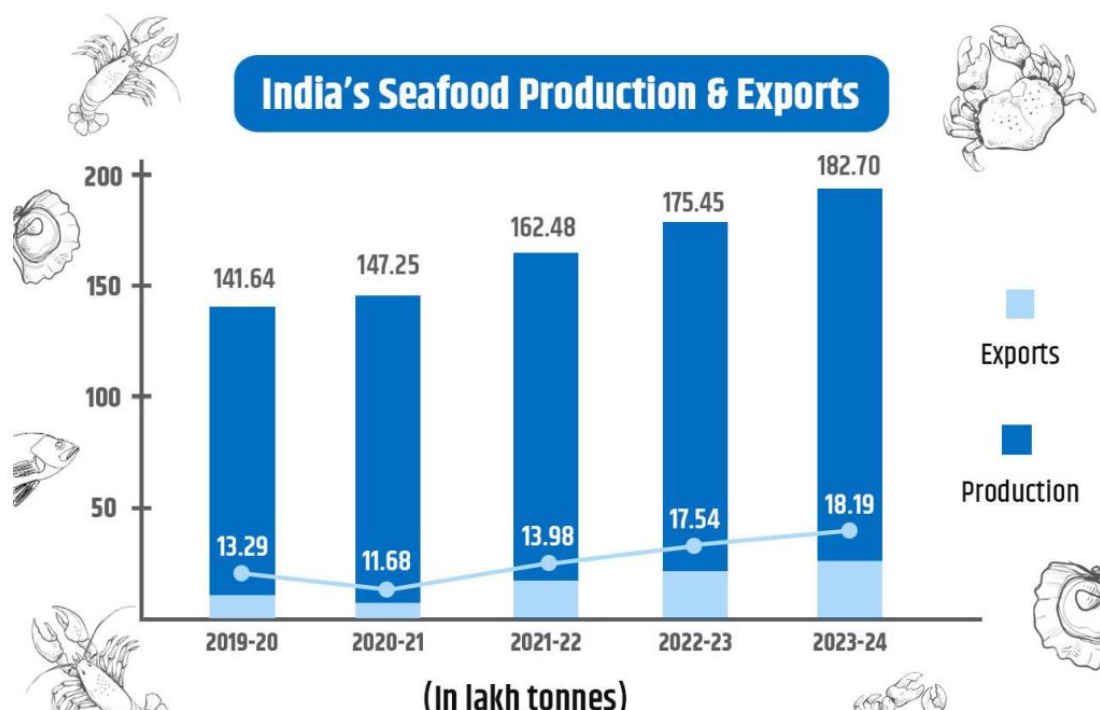
State	Coastal length (km)	Landing centres	Fishing villages	Fisherfolk families	Traditional fishermen families	BPL families	Fisherfolk population
West Bengal*	158	49	171*	81,067	56,447	55,301	3,68,816
Odisha	480	55	739	1,15,228	92,569	48,601	5,17,623
Andhra Pradesh	974	234	533	1,55,062	1,52,062	1,50,669	5,17,435
Tamil Nadu	1,076	349	575	2,01,855	1,96,784	1,83,683	7,95,708
Puducherry	45	22	39	14,347	14,328	12,968	50,270
Kerala	590	174	220	1,21,637	1,16,598	72,507	5,63,903
Karnataka	300	84	162	32,479	30,897	27,312	1,57,989
Goa	104	32	41	2,986	2,922	650	12,651
Maharashtra	720	155	526	87,717	80,906	27,400	3,64,899
Gujarat	1,600	107	280	67,610	64,395	19,123	3,54,992
Daman & Diu	21	8	12	3,163	3,094	20	15,836
Lakshadweep**	132	37	10	4,163	3,003	1,170	27,934
Andaman & Nicobar***	1,962	57	169	5,944	4,486	1,486	26,521
Total	8,162	1,363	3,477	8,93,258	8,18,491	6,00,890	37,74,577
* Subsequent reference to villages means Gram Panchayat in West Bengal. ** Fishing islands. ***Landing centres/Landing points (Source: Marine fisheries Census 2016 India)							

The Indian fisheries sector not only supports the livelihoods of around 30 million people, especially in coastal and rural communities, but it also holds immense potential for growth, job creation, and rural development (Ministry of Fisheries, Animal Husbandry & Dairying, 2024).

The statistics released by the Ministry of Commerce & Industry (2024) shows that India has significantly increased in seafood exports over the past few years, achieving a growth of 30.81% from 2019-20 to 2023-24. Further it was noted that over the past five years, India's marine product production and exports have steadily increased. From 141.64 lakh tonnes in production and 13.29 lakh tonnes in exports in 2019-20, production rose to 147.25 lakh tonnes while exports dipped in 2020-21 primarily due to the global COVID-19 pandemic. By 2021-22, production reached 162.48 lakh

tonnes and exports 13.98 lakh tonnes. This trend continued with production at 175.45 lakh tonnes and exports at 17.54 lakh tonnes in 2022-23. For 2023-24, production is projected to be 182.70 lakh tonnes, with exports expected to reach 18.19 lakh tonnes.³

Figure 1 India's Seafood Production and Exports



India's seafood export value has experienced a significant upward trend over the past five years. In 2019-20, exports were valued at ₹46,662.85 crore, followed by a slight dip to ₹43,720.98 crore in 2020-21. The sector rebounded strongly in 2021-22, with exports reaching ₹57,586.48 crore, and further increased to ₹63,969.14 crore in 2022-23. For 2023-24, the export value is projected at ₹61,043.68 crore.

India stands as a mega-diverse nation, boasting a remarkable wealth of fish species. This biodiversity is a cornerstone of the country's ecological and economic fabric, underpinning its fisheries and aquaculture sectors. With a staggering 3,231 fish species, comprising approximately 9.7% of the global total, India harbours a significant portion of the world's ichthyofauna (Gopi & Mishra, 2015). This diverse assemblage is a testament to the country's varied marine and freshwater ecosystems, ranging from the vast oceans to the intricate riverine networks and serene lakes.

Marine Dominance: Marine ecosystems dominate India's fish diversity, accounting for 75.6% of all species, with 2,443 species distributed across 927 genera and 230 families. The Andaman and Nicobar Islands, a unique archipelago, stand out as a hotspot of marine biodiversity, harbouring a remarkable 1,431 fish species (Gopi & Mishra, 2015).

Freshwater Riches: India's freshwater ecosystems, including rivers, lakes, and reservoirs, are home to a diverse array of fish species, with significant concentrations in the Western Ghats and the Northeast.

³ <https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=151994&ModuleId=3®=3&lang=1>

Endemic Treasures and Conservation Concerns: India boasts a remarkable number of endemic fish species, with 223 unique species representing 8.75% of the total fish species found within its borders (Kumar, 2012). However, this invaluable biodiversity faces significant threats. Approximately 50 marine fish species are listed as threatened on the IUCN Red List, while another 45 are categorized as near-threatened (Gopi & Mishra, 2015).

Historical Perspective: The appreciation for India's fish biodiversity has deep historical roots. References to fisheries and conservation practices can be traced back to ancient times, evident in Kautilya's Artha Sastra and Emperor Ashoka's edicts (Joshi et al., 2017). Systematic scientific exploration of Indian fish fauna began in the late 18th century, with pioneering contributions from renowned naturalists like Francis Day and Alcock, who meticulously documented numerous species (Nair and Kumar, 2018; Joshi et al., 2017).

Gujarat fisheries

Gujarat, located along India's western coast, has a wealth of natural resources that support a robust fisheries industry. With nearly 20% of India's total marine fish catch, the state's fisheries are critical to the local economy, supporting over 300,000 fisherfolk (Gujarat Fisheries Statistics, 2020).

Fishing has long been a primary livelihood for the coastal communities of Gujarat, with its 1,600 km coastline covering 15 maritime districts, including Valsad, Navsari, Surat, Bharuch, and Bhavnagar.

The data of Marine Fisheries Census 2016 of Gujarat state highlights the distribution and socio-economic profile of fisherfolk across Gujarat's districts. With a total fisherfolk population of 3,54,992, the state comprises 107 landing centres and 280 fishing villages. Gir Somnath emerges as the most significant district, with the highest fisherfolk population (83,538), traditional fishermen families (12,905), and fishermen families (14,515), making it a key hub for marine fisheries in the state. Valsad, with 48,091 fisherfolk, stands out as the second-largest district in terms of population, followed by Jamnagar (30,839) and Porbandar (25,073).

In contrast, districts like Anand and Bhavnagar report minimal engagement in marine fisheries, with only six and 20 fishing villages respectively, and the lowest fisherfolk populations (2,375 and 6,464). Interestingly, despite Kutch having the highest number of fishing villages (70), its fisherfolk population (22,835) is moderate, indicating possible variations in fishing intensity or family size. Furthermore, Devbhumi Dwarka records the lowest number of Below Poverty Line (BPL) families (238), while Valsad and Gir Somnath exhibit significant poverty levels among fisherfolk, with 3,384 and 2,570 BPL families respectively (Table 2).

Table 2 Fishers population of Gujarat -district wise distribution

District	Landing centres	Fishing villages	Fishermen families	Traditional fishermen families	BPL families	Fisherfolk population
Valsad	25	26	9,690	9,237	3,384	48,091
Navsari	16	18	5,318	5,310	1,738	25,645
Surat	9	21	3,442	3,389	1,422	15,256
Bharuch	3	27	2,413	2,379	1,146	13,943
Anand	0	6	377	336	374	2,375

District	Landing centres	Fishing villages	Fishermen families	Traditional fishermen families	BPL families	Fisherfolk population
Ahmedabad	0	19	1,948	1,943	1,244	7,713
Bhavnagar	0	20	1,324	1,302	576	6,464
Amreli	2	8	3,936	3,848	1,242	19,036
Gir Somnath	11	28	14,515	12,905	2,570	83,538
Junagadh	4	4	2,852	2,776	687	13,617
Porbandar	4	4	5,733	5,237	1,267	25,073
Devbhumi Dwarka	8	15	5,139	5,120	238	25,725
Jamnagar	7	10	4,562	4,535	823	30,839
Morbi	0	4	2,070	1,974	700	14,842
Kutch	18	70	4,291	4,104	1,712	22,835
Total	107	280	67,610	64,395	19,123	3,54,992
(Source: Marine fisheries Census 2016 Gujarat)						

Districtwide and species wise marine fish production

The marine fish production across the districts in the state of Gujarat varies across the district as reflected in the statistics published by the Commissioner of Fisheries, Agriculture, Farmers Welfare and Co-operation Department, Government of Gujarat. The data on marine fish production for the year 2023-2024 clearly exhibits this trend (Table 3).

Species like Ribbonfish and Small Sciaenids emerge as dominant contributors, with Ribbonfish alone accounting for 70,441 metric tonnes valued at ₹96,074.94 lakhs. Similarly, Small Sciaenids, which constitute 1,03,510 metric tonnes, bring in ₹1,09,613.85 lakhs, reflecting their economic importance across several districts, particularly Gir Somnath and Junagadh. High-value species such as White Pomfret (₹1,02,155.79 lakhs), Bomba Duck (₹95,941.56 lakhs), and Lobster (₹33,743.35 lakhs), although lower in volume, underline their premium market status and the potential for revenue generation through selective fishing.

A district-wise analysis reveals regional specializations. Valsad and Navsari predominantly contribute to the catch of Bomba Duck and Shrimp, while districts like Kachchh and Jamnagar significantly rely on Small Sciaenids. Gir Somnath and Junagadh stand out for their diversity, with notable contributions across Ribbonfish, Shrimp, and Threadfin. Meanwhile, Bhavnagar's reliance on Catfish (1,456 metric tonnes) and miscellaneous species (6,599 metric tonnes) highlights the district's focus on a variety of fisheries. Similarly, Amreli specializes in Threadfin (277 metric tonnes) and Squid/Cuttlefish (453 metric tonnes), which are commercially valuable species.

Crustaceans and cephalopods, such as Shrimp, Prawns, Lobsters, and Squid/Cuttlefish, significantly bolster the overall value of the state's fisheries. Notably, Shrimp alone contributes ₹75,535.19 lakhs, while Squid/Cuttlefish accounts for ₹62,195.26 lakhs, emphasizing their pivotal role in the marine economy. The data also shows that miscellaneous species make up a substantial portion of the total

catch, with 1,08,491 metric tonnes valued at ₹92,526.42 lakhs, underscoring the biodiversity of Gujarat's coastal waters.

Overall, districts like Gir Somnath, Junagadh, and Porbandar stand out as the most economically significant, collectively accounting for the largest share of both fish quantity and value.

Table 3 Districtwide and Species wise Marine Fish Production and Value in Gujarat State, 2023-24 (Production in M.T.)

Sr No	Name of Fish	Valsad	Navsari	Surat	Bharuch	Anand	Morbi	Kachchh	Jamnagar	Devbhumi Dwar	Porbandar	Junagadh	Gir Somnath	Amreli	Bhavnagar	Total	Value in Rs (In Lakhs)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	White Pomfret	1113	328	19	0	0	7	1371	403	1983	3605	425	3517	1806	6	14583	102155.79
2	Black Pomfret	0	0	15	0	33	0	103	113	1393	3139	539	3126	2083	10	10554	45460.33
3	Bomba duck	21886	6728	1497	575	70	17	3084	376	4867	0	0	758	15153	78	55090	95941.56
4	Thread fin	0	0	0	0	0	2	264	0	1760	1757	931	2627	277	1	7619	13267.45
5	Jewfish	0	0	0	0	0	27	773	0	2646	1530	0	2217	435	0	7627	68238.89
6	Hilsa	2581	393	87	0	0	0	57	47	886	2607	0	1179	230	17	8084	23410.61
7	Clupeids	314	468	0	0	0	34	2674	300	979	2822	1467	4671	382	76	14187	18205.09
8	Coilia	4431	2067	0	0	0	0	1451	39	595	0	0	619	686	18	9905	12840.6
9	Shark	0	1207	0	0	17	17	292	227	1956	4555	220	4829	330	70	13719	13097.13
10	Mullet	1678	2809	428	252	0	0	611	759	854	316	0	30	363	51	8151	12351.48
11	Catfish	2104	3047	381	197	41	39	2226	356	4962	3416	5288	6756	1456	32	30299	25836.75
12	Eel	0	0	0	168	0	0	125	43	899	2300	116	1538	743	9	5941	5585.17
13	Leather Jacket	0	0	0	0	0	0	74	0	4388	1646	0	2845	227	0	9180	12439.05
14	Seerfish	68	276	0	0	34	0	1641	64	3182	2204	3954	3707	518	0	15650	46974.92
15	Indian Salmon	67	1550	0	0	47	0	862	115	1581	2720	0	22	181	0	7144	16275.28

Sr No	Name of Fish	Valsad	Navsar i	Surat	Bharuc h	Anand	Morbi	Kachch h	Jamna gar	Dev bhumi Dwara	Porba ndar	Junaga dh	Gir Somna th	Amreli	Bhavn agar	Total	Value in Rs (In Lakhs)
16	Ribbonfish	81	2593	97	0	0	23	863	98	3600	5922	4975	50552	1636	0	70441	96074.94
17	Silver Bar	0	0	0	0	0	11	385	413	1107	1141	611	3237	1140	1	8045	10859.99
18	Perches	0	0	0	0	0	0	348	5	740	1633	1819	7741	1155	2	13442	15487.48
19	Small Sciaenids	0	818	0	0	19	76	4042	211	4051	1743	9048	82376	1053	73	103510	109613.85
20	Shrimp	18809	5157	0	413	34	94	2224	174	1365	1911	291	2998	977	63	34513	75535.19
21	Prawns Medium	7	2650	453	281	0	30	1467	291	1743	2583	165	1767	602	47	12088	35367.86
22	Prawns [Jembo]	0	798	0	238	0	0	446	78	1935	2346	3	1292	672	9	7817	30252.45
23	Lobster	98	0	0	0	0	0	1169	80	280	1672	5	240	343	5	3892	33743.35
24	Crab	1435	1795	98	377	783	4	1637	729	1042	2242	144	1202	339	29	11858	10425.97
25	Levta	1544	1344	484	413	108	0	1	14	233	414	0	0	105	28	4689	8450.21
26	Squid/Cuttlefish	5	1493	0	0	0	0	76	0	1661	3910	3109	17171	453	10	27888	62195.26
27	Tuna	0	0	0	0	0	0	38	0	2993	1783	0	10961	592	0	16366	16630.58
28	Carangids/Mackerel	0	0	0	0	0	0	529	0	675	3355	4827	10494	623	0	20502	18357.81
29	Ranifish	0	2640	0	0	0	0	45	0	102	4401	6503	21284	61	0	35035	22827.84
30	Solefish	0	0	0	0	0	0	375	0	93	3789	598	1718	1869	76	8517	17019.56
31	Miscellaneous	27264	11936	884	356	37	102	29959	473	9212	16623	1416	3303	6599	326	108491	92526.42

Sr No	Name of Fish	Valsad	Navsar	Surat	Bharuch	Anand	Morbi	Kachchh	Jamnagar	Devbhumi Dwara	Porbandar	Junagadh	Gir Somnath	Amreli	Bhavnagar	Total	Value in Rs (In Lakhs)
	Total	83487	50097	4445	3271	1222	483	59213	5407	63762	88084	46453	254778	43090	1036	704828	1167448.87

Source: <https://cof.gujarat.gov.in/>

Fish Production and Value (Marine & Inland)

In the past two decades, Gujarat has witnessed a significant growth in its fish production and export sector, which has contributed to the state's economic landscape. The trends in fish production and the export of fish products reflect both an increase in output and an enhancement in value, highlighting the strength of Gujarat's fisheries industry.

The data of Fish Production and export of Gujarat state 2023-2024⁴ indicates a consistent rise in both marine and inland fish production, with marine fish dominating the total output. In 2001-02, the total fish production stood at 701,603 metric tons, which has steadily grown to 899,828 metric tons in 2023-24. This represents a 28% increase over this period, signalling the sector's expansion. Marine fish production has seen significant increases over the years, peaking in 2023-24 with a record of 704,828 metric tons. In contrast, inland fish production, although comparatively smaller in volume, has also shown growth, reaching 195,000 metric tons in 2023-24.

The value of fish production has mirrored this growth in volume, with the total value of production reaching ₹1,571,034.47 lakhs in 2023-24. This is a significant rise from ₹571,763.71 lakhs in 2001-02, driven largely by marine production, which contributed ₹1,167,448.87 lakhs to the total value. Inland fish, though smaller in volume, accounted for ₹403,585.60 lakhs in 2023-24. This increase in the value of production suggests not only an increase in the quantity of fish produced but also improved prices, possibly due to better market conditions or the introduction of value-added products.

Gujarat's fish export market has similarly expanded. In 2001-02, the state exported 132,175 metric tons of fish products, a figure that surged to 336,991 metric tons by 2023-24. This growth in export quantity is reflective of Gujarat's increasing prominence in the global fish export market. The export value has followed a similar trajectory, growing from ₹625.72 crores in 2001-02 to an impressive ₹6,087 crores in 2023-24, despite a slight fluctuation in the per-ton export value. The highest value of exports occurred in 2012-13 at ₹2,929.61 crores, although the export value has now surpassed this peak, further reinforcing

Gujarat's growing export footprint in the global market. The following table provides a detailed view of the annual fish production and export statistics, further illustrating the growth trajectory over the years (Table 4).

Table 4 Fish Production and export of Gujarat in 2023m-2024

FISH PRODUCTION & VALUE [MARINE & INLAND] OF GUJARAT STATE								FISH AND FISH PRODUCT EXPORT OF GUJARAT STATE			
SR.NO	YEAR	FISH PRODUCTION IN M.T.			VALUE IN RS. LAKHS			SR. NO	YEAR	QUANTITY IN M. T	VALUE IN Rs. CRORES
		MARINE	INLAND	TOTAL	MARINE	INLAND	TOTAL				
1	2001-02	650829	50774	701603	142127.48	26207.36	168334.84	1	2001-02	132175	625.72
2	2002-03	743638	34267	777905	169681.52	19254.95	188936.47	2	2002-03	134047	760.36
3	2003-04	609136	45436	654572	138667.15	30148.13	168815.28	3	2003-04	108386	614.41
4	2004-05	584951	50628	635579	136495.64	33613.52	170109.16	4	2004-05	119951	704.59
5	2005-06	663884	69936	733820	201544.12	42002.28	243546.4	5	2005-06	136485	934.88
6	2006-07	676762	76821	753583	227061.74	43472.07	270533.81	6	2006-07	188166	1264.61
7	2007-08	680848	78780	759628	239314.68	45087.15	284401.83	7	2007-08	150727	1141.97
8	2008-09	683855	82047	765902	254224.78	52099.19	306323.97	8	2008-09	164725	1485.72
9	2009-10	687445	84071	771516	294223.9	55150.44	349374.34	9	2009-10	183870	1838.75
10	2010-11	688930	85972	774902	356419.96	58684.73	415104.69	10	2010-11	198297	2156.2
11	2011-12	692488	91231	783719	394488.87	65990.71	460479.58	11	2011-12	196850	2533.99
12	2012-13	693560	94930	788490	434603.63	78463.92	513067.55	12	2012-13	242057	2929.61
13	2013-14	695580	102913	798493	446214.36	94015.48	540229.84	13	2013-14	251920	3658.57
14	2014-15	698450	111482	809932	473488.45	126133.65	599622.1	14	2014-15	245434	3645.23

FISH PRODUCTION & VALUE [MARINE & INLAND] OF GUJARAT STATE								FISH AND FISH PRODUCT EXPORT OF GUJARAT STATE			
SR.NO	YEAR	FISH PRODUCTION IN M.T.			VALUE IN RS. LAKHS			SR. NO	YEAR	QUANTITY IN M. T	VALUE IN Rs. CRORES
15	2015-16	697328	112232	809560	480877.37	128225.24	609102.61	15	2015-16	208624	3567.24
16	2016-17	698832	116725	815557	484201.19	139188.03	623389.22	16	2016-17	237442	4417.4
17	2017-18	700743	137685	838428	495088.22	181285.35	676373.57	17	2017-18	312568	5071.05
18	2018-19	699230	142880	842110	506510.16	194004.23	700514.39	18	2018-19	305326	5202.3
19	2019-20	700809	157463	858272	532915.45	228351.88	761267.33	19	2019-20	279751	5019.48
20	2020-21	619720	124705	744425	632875.64	244456.34	877331.98	20	2020-21	228072	4254.21
21	2021-22	688272	185689	873961	765950.07	356176.52	1122126.6	21	2021-22	232619	5232.88
22	2022-23	703000	194422	897422	789923.3	384475.39	1174398.7	22	2022-23	284850	5864.3
23	2023-24	704828	195000	899828	1167448.87	403585.6	1571034.5	23	2023-24	336991	6087

Artisanal fisherfolk of Gujarat

The term "small-scale fishery" is multifaceted and has been interpreted in various ways across different regions of the world. It is also referred to as artisanal, traditional, native, subsistence, or inshore fisheries (Johnson, 2006). There is no single, universally accepted definition for small-scale fisheries due to their inherent diversity and complexity (Alfaro-Shigueto et al., 2010). Nonetheless, many researchers have defined small-scale fisheries based on factors such as the scale of operations, technology level, employment generation, and the degree of capital investment (Carvalho, 2011). For example, Alfaro-Shigueto et al. (2010) define small-scale fisheries based on vessel size, specifying vessels that are up to 15 meters in length and are typically operated manually within 5 nautical miles of the coast. It is important to note, however, that in Gujarat, many fishing vessels that are under 15 meters in length often operate beyond 5 nautical miles. These fisheries are primarily labour-intensive, with fishers utilizing low-capital gear to harvest smaller catches compared to industrial fisheries (Hauck, 2008).

Small-scale fisheries in many countries are primarily defined by a combination of local biological, social, economic, and political factors (Carvalho, 2011). Johnson's (2006) extensive research further categorizes small-scale fisheries into two subtypes: subsistence fisheries and domestic commodity production

. These two categories are distinguished by various criteria, including social-institutional organization, knowledge and technology, and spatial and temporal considerations.

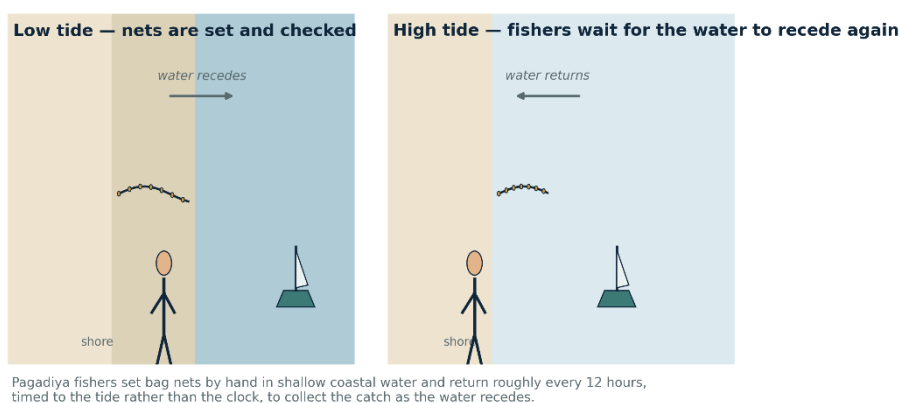
Johnson (2006) explains that small-scale fisheries are not just limited to catching fish for personal or family use. When used for domestic commodity production, they usually operate on a larger scale, covering more areas, involving more activities, and reaching bigger markets compared to subsistence⁵ fisheries.

Further, more than 90% of the global fishing population are small-scale fishers, the majority of whom reside in developing countries.(Hauck, 2008). These fisheries play a crucial role not only in food security but also as a primary source of animal protein for over a billion people(Alfaro-Shigueto et al., 2010). In addition to their economic importance, small-scale fisheries contribute to employment generation and poverty alleviation (Sowman, 2006). They also play a key role in promoting social justice and ecological sustainability (Reed et al., 2013). Furthermore, small-scale fisheries are characterized by significant cultural diversity, particularly when contrasted with the homogeneity of industrial fisheries(McGoodwin, 1995).

The definitions of artisanal and mechanized boats in the Indian context are complex and often unclear, with significant variations. Pillai et al. (2000) from the Central Marine Fisheries Research Institute of India identify bag net fishing as an artisanal practice along the Gujarat coast. However, based on factors such as the distance travelled by bag netters, the number of days spent at sea per trip, and the type of technology used, bag net fishing can also be classified as small- or medium-scale and semi-mechanized fishing.(Pillai et al., 2000).

The pagadiya are the part of artisanal fisherfolk of Gujarat and they use the foot for fishing. For approximately 400 years, the fishing community of Gujarat practices the traditional 'Pagadiya' method of fishing on foot. This cost-effective technique involves setting nets in the water during low tide and collecting the catch after high tide. The moon's phases and resulting tidal variations significantly influence catch rates. Pagadiya fishers typically engage in bag net fishing for 20 to 22 days each month. According to the lunar calendar, fishing is most productive on 20 days, while the remaining 8 days yield scant catches. This traditional knowledge allows fishers to plan their activities efficiently. Seasonal analysis reveals that catches are highest during the winter, followed by the monsoon and summer months. As per the study conducted by Anjani Jignesh and Prajith, K.K. (2017) in the Kutch region, the average daily catch per unit is approximately 6 kg in the monsoon, 10.3 kg in winter, and 4 kg in summer. The catch composition indicates that Acetes and other low-value non-penaeid shrimp account for 24% of the total catch, followed by penaeid shrimp and Bombay duck. Seasonal variations in species composition are evident, with Bombay duck dominating during the monsoon, Acetes in winter, and penaeid shrimp in summer. However, only 10% of the catch is of high value. The study identified poaching and operational difficulties as major challenges faced by Pagadiya fishers.

Figure B. The Pagadiya (Foot-Fishing) Method: A Tide-Governed Daily Cycle



⁵ small-scale fishing practices where fish are caught for personal consumption or for the consumption of dependents

Additionally, the coastal population has a deep understanding of lunar periodicity and its correlation with fishing activities.

Table 5 Pagadiya Fishermen of Gujarat

Sr. No.	Name of the District	No. of Pagadiya Fishermen
1	Valsad	24
2	Navsari	55
3	The Dangs	0
4	Surat	103
5	Tapi	0
6	Bharuch	768
7	Narmada	11
8	Vadodara	2
9	Panchmahal	0
10	Dahod	0
11	Anand	115
12	Kheda	20
13	Ahmedabad	234
14	Gandhinagar	0
15	Mehsana	25
16	Patan	75
17	Sabarkantha	20
18	Banaskantha	0
19	Surendranagar	130
20	Rajkot	502
21	Bhavnagar	228
22	Kachchh	489
23	Jamnagar	110
24	Porbandar	49
25	Junagadh	267
26	Amreli	144
	Total	3,371

The pagadiya fishermen data of Government of Gujarat (2012-2013) shows the distribution of Pagadiya fishermen across Gujarat's districts, with a total of 3,371 individuals practicing this method. Bharuch reports the highest number, with 768 Pagadiya fishermen, followed by Rajkot with 502 and Kachchh with 489. Ahmedabad also has a significant number, with 234 fishermen.

Several districts, including The Dangs, Tapi, Panchmahal, Dahod, Gandhinagar, and Banaskantha, report no Pagadiya fishermen. Other districts, such as Vadodara (2 fishermen), Mahesana (25 fishermen), and Valsad (24 fishermen), have comparatively low numbers. Moderate numbers are recorded in districts like Anand (115 fishermen), Navsari (55 fishermen), and Junagadh (267 fishermen). The data highlights the concentration of Pagadiya fishermen in specific districts, with Bharuch, Rajkot, and Kachchh having the highest representation, while some districts report no activity.

Women and their contribution in fishing of Gujarat

Women are key contributors in Gujarat's fisheries sector, participating in pre- and post-harvest activities, managing family networks, and supporting household income through diverse roles within and beyond fishing. With 57% of fish seed collectors being women, their involvement underscores the need for gender-focused policies that recognize their economic contributions and enhance sector-wide resilience.

Research on fisherwomen in India highlights their significant role in the fisheries sector, alongside the socio-economic challenges they face. Early observations by Krishna Srinath (1987) indicated that women involved in inland fisheries are generally optimistic about improving their livelihoods and show a strong willingness to acquire new skills through training. However, their progress has been constrained by poverty and limited awareness.

Subsequent studies have further explored the changing roles and constraints faced by fisherwomen. Ashalatha et al. (2002) examined the evolving roles of fisherwomen in India and identified key challenges in the value addition sector, particularly low product prices and the lack of reliable markets. Similarly, Swathilakshmi (2011) reported that socio-economic factors such as annual income, scientific orientation, expenditure patterns, debt, and savings have a significant and positive influence on the livelihood index of fisherwomen.

In terms of participation, Vijaya Khader and Sathiadhas (2005) reported that nearly 60% of fisherwomen are engaged in post-harvest activities, which serve as a major source of income. Notably, about 60.68% of their earnings are spent on food, indicating the subsistence nature of their livelihoods. Beyond their traditional roles as household managers, fisherwomen contribute substantially to fisheries through post-harvest handling, preservation, processing, and seafood marketing.

At a broader level, women constitute nearly half of India's population and play a crucial role in sustaining fisheries, an important component of the agricultural economy. Due to the irregular income patterns of male fishers, many women diversify their livelihood activities within the fisheries sector to ensure economic stability. The Marine Fisheries Census (2010) further underscores their dominant role in post-harvest operations, reporting that women account for 81.8% of fish marketing, 88.1% of curing and processing, and 89.6% of peeling activities.

Overall, these studies highlight that while fisherwomen are central to the functioning and sustainability of the fisheries sector, issues related to empowerment, gender equality, and economic security remain critical in the context of a globalized economy.

The challenges faced by the fishing communities of Gujarat

The fisherfolk community in Gujarat, particularly artisanal and small-scale fishers, faces a wide range of challenges that constrain both their socio-economic development and the sustainability of their livelihoods (Food and Agriculture Organization, 2022; Kelleher, 2012). These challenges are further intensified among women fisherfolk, who play a critical yet often under-recognized role across pre- and post-harvest activities, including fish processing, marketing, and net mending (International

Collective in Support of Fishworkers, 2020). Despite their substantial contributions, women frequently encounter systemic gender-based inequalities, limited decision-making power, and restricted access to productive resources, institutional support, and financial services.

The issues confronting these communities are complex and interrelated, encompassing environmental pressures such as coastal degradation, climate variability, and declining fish stocks; economic constraints including market volatility and indebtedness; as well as social and institutional barriers such as inadequate policy recognition, weak governance structures, and exclusion from formal fisheries management frameworks (Government of India Ministry of Fisheries Animal Husbandry and Dairying, 2020). Addressing these multifaceted challenges requires a holistic and gender-sensitive approach that integrates ecological sustainability with social equity and inclusive development.

1. Declining Fish Stocks and Overfishing

One of the primary challenges faced by fisherfolk in Gujarat is the declining fish stocks due to overfishing, environmental degradation, and habitat loss. Overfishing, driven in part by industrial fishing and unsustainable practices, has resulted in reduced catch per unit effort (CPUE) in coastal areas. highlight the declining marine biodiversity and over-exploitation of fish stocks, which severely impacts the artisanal fishing communities that rely on these resources for their livelihoods.

2. Climate Change and Environmental Stress

Climate change has emerged as a major challenge to the fisheries sector, exerting both ecological and socio-economic impacts. Rising sea surface temperatures, ocean acidification, and changing oceanographic conditions are altering marine ecosystems and influencing fish distribution and productivity (FAO, 2020; IPCC, 2022). In addition, shifts in monsoon patterns and the increasing frequency and intensity of extreme weather events such as cyclones and storms have adversely affected fishing operations, reducing fishing days and increasing risks to life and infrastructure (Allison et al., 2009). Temperature fluctuations and unseasonal rainfall further disrupt fish migration and breeding cycles, leading to a decline in the availability of several commercially important species (Brander, 2007).

At the regional level, studies conducted in Bhavnagar along the Gujarat coast indicate that changing tidal patterns and unpredictable weather conditions have increased uncertainty in fishing activities, thereby affecting catch efficiency and income stability of fisherfolk (Sathiadhas et al., 2014). These environmental and climatic stressors have significant implications for coastal communities, as they directly impact livelihood security, food availability, and overall socio-economic well-being. Consequently, climate change not only threatens marine biodiversity but also undermines the resilience and sustainability of fisheries-dependent communities.

3. Gender Inequality and Marginalization of Women Fisherfolk

Women fisherfolk play a crucial role in the fisheries sector, particularly in post-harvest activities such as fish processing, preservation, and marketing. Despite their significant contributions, they face multiple socio-cultural and economic constraints that limit their empowerment and participation. Studies have shown that women in fishing communities often have limited access to training, institutional support, financial resources, and credit facilities, and are frequently excluded from decision-making processes within the fisheries sector (FAO, 2018; Weeratunge et al., 2010). These

structural inequalities not only undermine their economic potential but also reinforce gender disparities in coastal livelihoods.

At the regional level, evidence from coastal districts such as Bhavnagar and Amreli in Gujarat indicates that women are predominantly engaged in activities like fish drying, curing, and local marketing, which are often considered supplementary rather than primary economic roles (Sathiadhas et al., 2014; Gopal et al., 2015). Consequently, their contributions remain undervalued, and they are rarely recognized as key stakeholders in fisheries governance and resource management. Addressing these disparities through inclusive policies, capacity building, and improved access to resources is essential for enhancing the socio-economic status and empowerment of women in fisheries.

4. Limited Access to Resources and Technology

Artisanal fisherfolk in Gujarat, particularly those residing in remote coastal villages, face significant constraints due to limited access to modern fishing technologies, infrastructure, and financial resources. This technological gap restricts their productivity and operational efficiency when compared to mechanized and commercial fishing sectors (Kurien, 1998; Bavinck et al., 2013). Many small-scale fishers continue to depend on traditional and labour-intensive practices, such as the *Pagadiya* fishing technique, which involves manually setting nets during low tide. While these indigenous methods are adapted to local ecological conditions, the lack of capital investment and technological support limits their capacity to enhance catch yields and income levels (Sathiadhas et al., 2014).

In addition, inadequate access to essential post-harvest infrastructure such as cold storage facilities, efficient transportation systems, and organized market linkages further constrains their profitability and market competitiveness (FAO, 2020; Salagrama, 2012). These limitations not only lead to higher post-harvest loss

es but also reduce bargaining power in fish markets. Consequently, the continued reliance on traditional methods, coupled with infrastructural and institutional gaps, places artisanal fisherfolk at a distinct disadvantage in competing with technologically advanced and capital-intensive fisheries, thereby affecting their long-term livelihood sustainability.

5. Poor Livelihood Security and Economic Vulnerability

Artisanal and small-scale fishers are highly vulnerable to economic shocks, as a large proportion of them live under conditions of poverty with limited financial security and minimal access to formal safety nets. Their livelihoods are often characterized by income instability, seasonal variability, and dependence on natural resources, making them particularly susceptible to external stressors such as market fluctuations and environmental changes (Allison & Ellis, 2001; Bene, 2006). Within this context, women in fishing communities are predominantly engaged in the informal sector, including fish processing, vending, and small-scale marketing, where employment is largely unregulated and lacks social protection mechanisms (Weeratunge et al., 2010; FAO, 2018). The absence of livelihood diversification opportunities further heightens their economic vulnerability and limits resilience during periods of crisis.

Moreover, the heavy reliance of fishing communities on the health and productivity of marine ecosystems intensifies their exposure to ecological disturbances. Changes in fish stock availability, driven by climate variability and environmental degradation, directly affect income and food security,

thereby compounding existing socio-economic challenges (Badjeck et al., 2010; FAO, 2020). Consequently, the combined effects of economic marginalization, gender disparities, and environmental dependency place artisanal and small-scale fishers among the most vulnerable groups, underscoring the need for inclusive policies, social protection measures, and sustainable resource management strategies.

6. Challenges in accessing Government Support

Despite the critical role that artisanal and small-scale fisheries play in sustaining coastal economies and livelihoods, they often receive inadequate institutional support and suffer from weak policy implementation. Although several government schemes exist to support the fisheries sector, access to these benefits remains limited for small-scale fishers due to bureaucratic barriers, lack of awareness, and institutional inefficiencies (Béné et al., 2007; FAO, 2015). As a result, many artisanal fishers are unable to fully benefit from welfare measures, subsidies, and development programs intended to enhance their productivity and socio-economic conditions.

This challenge is even more pronounced for women in fisheries, who are frequently marginalized within formal governance structures and overlooked in policy design and implementation (Harper et al., 2013; Weeratunge et al., 2010). Despite their substantial contributions, particularly in post-harvest and value chain activities, women fishers often lack recognition as primary stakeholders and face barriers in accessing credit, training, and institutional support. The absence of gender-sensitive policies and inclusive frameworks further exacerbates their exclusion, highlighting the need for targeted interventions to ensure equitable access to government schemes and strengthen the resilience of artisanal fishing communities.

7. Violations of Fishing Regulations

Another significant challenge confronting artisanal fisherfolk in Gujarat is the prevalence of unsustainable and illegal fishing practices, which undermine the long-term sustainability of marine resources. Activities such as unregulated trawling, overfishing, and the use of destructive fishing gear have contributed to the depletion of fish stocks and degradation of marine habitats (Pauly et al., 2002; FAO, 2020). These practices often intensify competition for dwindling resources, disproportionately affecting small-scale and traditional fishers who depend on nearshore fisheries for their livelihoods.

In particular, mechanized trawling in coastal waters has been widely reported to disrupt benthic ecosystems and reduce the availability of commercially important species for artisanal fishers (Bavinck et al., 2013; Salagrama, 2012). The lack of effective regulation and enforcement further exacerbates the problem, allowing unsustainable practices to persist. Consequently, these ecological pressures not only threaten biodiversity but also weaken the economic stability and livelihood security of traditional fishing communities, highlighting the urgent need for sustainable fisheries management and stricter regulatory frameworks.

Purpose of the Study

Utthan has extensive experience working with fisherfolk communities, particularly in the coastal regions of Gujarat. Building on this foundation, the present study aims to deepen the understanding of the challenges and opportunities faced by artisanal fisherfolk across four blocks in the Bhavnagar and Amreli districts, where Utthan has been actively engaged. The study focuses on small boat owners

(both motorized and non-motorized), labourers involved in fishing operations, and women fisherfolk who participate in both harvesting and post-harvest activities, including fish marketing.

By examining the socio-economic, ecological, and gender dimensions within these communities, the study seeks to generate critical insights that can inform more effective interventions and strengthen the resilience of fisherfolk in the face of evolving challenges. It also aims to enhance understanding of ongoing transformations within the fisheries sector, particularly in relation to livelihood patterns, gender roles, and climate resilience.

Through this research, Utthan intends to guide the design of future programmes that are inclusive, gender-sensitive, and responsive to the specific needs of artisanal fishing communities. Ultimately, the study aspires to contribute to the development of more sustainable, equitable, and resilient fisheries-based livelihoods in Bhavnagar and Amreli, thereby supporting the broader goal of improving the well-being of artisanal fisherfolk in Gujarat.

Research Objectives:

- i. Assess the socioeconomic status of artisanal fisherfolk in the Bhavnagar and Amreli districts.
- ii. Identify and document the ecological challenges faced by the community, such as overfishing, habitat degradation, and the impacts of climate change.
- iii. Understand the status of artisanal fisherfolk in accessing government schemes and support services.
- iv. Analyse the impacts and study variables from a gender perspective to identify any gender-specific challenges or opportunities.
- v. Highlight actionable measures that Utthan and other stakeholders can undertake to improve the quality of life for the artisanal fisherfolk community, considering aspects such as skill development, access to credit and markets, rights realisation, and social welfare initiatives.

Chapter Summary: Structure of the Study

This study delves into the socioeconomic status, climate change impacts, policy gaps, and effectiveness of interventions for artisanal fisherfolk in Gujarat. The research aims to provide actionable recommendations for improving their livelihoods and resilience.

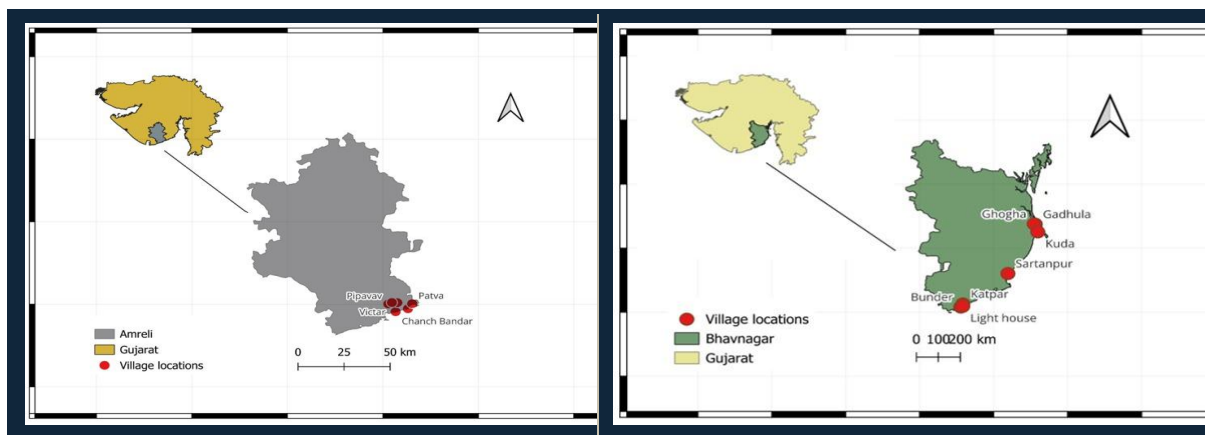
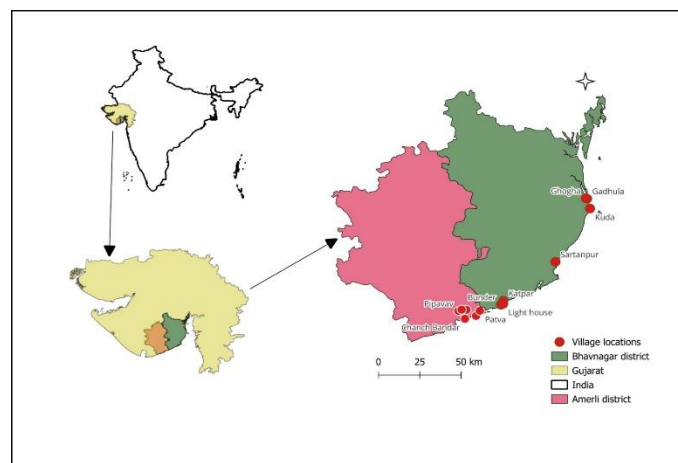
Chapter 2: Methodology

This chapter outlines the methodological approach adopted for the study including the research design, population and sampling strategies, questionnaire development, data collection procedures, data analysis techniques, and ethical considerations.

Research Design

The study adopted a mixed-methods approach, integrating both quantitative and qualitative elements to achieve a comprehensive understanding of the lives of artisanal fisherfolk in the study area. The primary emphasis was placed on the quantitative survey component, which was designed to collect statistically significant data on key aspects such as demographic profiles, socio-economic status, climate resilience strategies, and perceptions of prospects. This quantitative data was complemented by qualitative insights gathered through focus group discussions and stakeholder meetings, enabling the study to capture nuanced, gender-specific experiences and challenges.

Population and Sampling



The study was undertaken to assess the socio-economic status of artisanal fisherfolk in two districts of Gujarat, namely Bhavnagar and Amreli. Before developing the research instruments, the research team conducted a stakeholder consultation involving key participants, including officials from the Department of Fisheries, Government of Gujarat, small-scale fishing boat owners, fisherwomen, and labourers engaged in fishing activities. The consultation provided valuable insights that helped refine the study objectives, focus areas, and methodological approach.

Based on the understanding gained from these stakeholder consultations and data from the Marine Census 2016 of Gujarat, villages were selected for the study. The selection criteria considered the presence of fishing families and Utthan or women's federations promoted by Utthan's on-ground presence. The study aimed to include three specific groups:

1. Small fishing boat owners (motorized and non-motorized).
2. Fisherwomen involved in fishing and ancillary activities.
3. Laborers working on fishing boats.

Household Survey

Participants for the household-level survey were selected using convenience sampling. The purpose of the research was explained to potential participants, and those who consented to take part were included. The survey encompassed both men and women engaged in small-scale fishing activities, fish processing, and related ancillary services.

The survey tool was developed in English, translated into Gujarati, and piloted to ensure its suitability. Necessary adjustments were made based on the pilot feedback. Data collection was conducted using **Kobo Collect**, an Android-based application, to enhance data quality and enable real-time monitoring. Enumerators recruited from study regions to ensure cultural competence and rapport with respondents. Comprehensive training provided, covering ethical considerations, questionnaire administration techniques, and strategies to minimize biases.

The survey covered the following key areas:

- **Demographic Information:** Age, gender, education, household size, income levels, etc.
- **Current Status:** Types of fishing activities, duration of involvement, ownership of fishing assets, access to resources, etc.
- **Climate Resilience:** Awareness of climate change, perceived impacts, adaptation strategies, and access to support systems.
- **Prospects:** Aspirations, perceived barriers, desired support, and views on sustainability.

This structured approach provided a robust framework for capturing comprehensive data, enabling a deeper understanding of the fisherfolk's challenges, opportunities, and aspirations.

Focus group discussions: The Focus Group Discussions (FGDs) were conducted with men and women engaged in fishing and allied activities in the selected villages. The primary purpose of these FGDs was to gather qualitative data on community perceptions, shared experiences, and traditional knowledge related to climate change and other anthropogenic impacts.

Table 6 Total Data Collected

No.	District	Block	Village	Household survey
	Bhavnagar	Talaja	Gadhula	37
	Bhavnagar	Talaja	Sartanpur	210
	Bhavnagar	Ghogha	Ghogha	227
	Bhavnagar	Ghogha	Kuda	7
	Bhavnagar	Mahuva	Bunder (Mahuva Bandar)	67
	Bhavnagar	Mahuva	Katpar	160
	Bhavnagar	Mahuva	Light house (Mahuva Light house)	17
	Amreli	Rajula	Chanch Bandar	39
	Amreli	Rajula	Kathivadar	24
	Amreli	Rajula	Khera	111
	Amreli	Rajula	Patva	32
	Amreli	Rajula	Pipavav	11
	Amreli	Rajula	Victar	61

Focus Group Discussions Conducted

In total, seven FGDs were conducted across the study villages in Bhavnagar and Amreli, each bringing together Pagadiya fishers, small-boat owners, crew members, and fisherwomen from the same village or village cluster. Discussions were held in Gujarati with the help of local Utthan field staff acting as translators, audio-recorded with participants' consent, and covered fishing practices and ecological change, livelihood constraints, access to licences and government schemes, climate-related risks, and gender roles within fishing households. The FGDs conducted are listed below.

Village	Block	District	Date
Kuda	Bhavnagar	Bhavnagar	4th November 2023
Mithivirdi	Bhavnagar	Bhavnagar	4th November 2023
Katpar-Bandar	Mahuva	Bhavnagar	5th November 2023
Ucha Kotda	Mahuva	Bhavnagar	5th November 2023
Khera	Rajula	Amreli	6th November 2023
Chanch	Rajula	Amreli	6th November 2023
Katpar / Bandar / Lighthouse cluster	Mahuva	Bhavnagar	5th November 2023

This survey methodology provides a comprehensive framework for studying the impacts of climate change on livelihoods. By incorporating both quantitative and qualitative methods, it enables a detailed understanding of how communities perceive and respond to climate change. The findings from such surveys can support evidence-based policymaking and the development of targeted interventions to enhance resilience and adaptive capacity.

Table 7 Sample Distribution of Household Survey Across Blocks and Villages in Bhavnagar and Amreli Districts

Block	Village	Sex		Total
		Female	Male	
Talaja	Gadhula	16	21	37
	Sartanpur	83	127	210
	Total	99	148	247
Ghogha	Ghogha	13	214	227
	Kuda	7	0	7
	Total	20	214	234
Mahuva	Bunder	30	37	67
	Katpar	77	83	160
	Light house	6	11	17
	Total	113	131	244
Rajula	Chanch Bandar	1	38	39
	Kathivadar	0	24	24
	Khera	24	87	111
	Patva	1	31	32
	Pipavav	3	8	11
	Victar	8	53	61
	Total	37	241	278
Grant total		269	734	1003

The above table represents the sample distribution of the household survey conducted across selected blocks and villages in the Bhavnagar and Amreli districts of Gujarat. A total of 1,003 individuals (734 males and 269 females) participated in the survey, ensuring a comprehensive representation of the fishing communities. The villages were purposively selected based on their dependency on fishing and allied activities.

Table 8 Gender and Occupation of household survey participants

Sex	Primary occupation	Block				Total
		Talaja	Ghogha	Mahuva	Rajula	
Female	Fisherfolk - Owns small boat	0	0	0	0	0
	Labour in the fishing boat	0	0	0	0	0
	Pagadiya fisherfolk	29	6	87	15	137
	Selling of fish	70	14	26	22	132
	Total	99	20	113	37	269
Male	Fisherfolk - Owns small boat	18	14	10	7	49
	Labour in the fishing boat	8	24	19	80	131
	Pagadiya fisherfolk	113	141	93	140	487
	Selling of fish	9	35	9	14	67
	Total	148	214	131	241	734
Overall (Male & Female)	Fisherfolk - Owns small boat	18	14	10	7	49
	Labour in the fishing boat	8	24	19	80	131
	Pagadiya fisherfolk	142	147	180	155	624
	Selling of fish	79	49	35	36	199
	Total	247	234	244	278	1003

The study focused on four groups: Pagadiya fisherfolk, fisherfolk who own small boats, labourers on fishing boats, and individuals selling fish. While the study aimed to understand gender dynamics, the participation of women in owning small boats or working as labourers on boats was negligible. Therefore, women from fish-selling and Pagadiya fishing were included in the study. On the other hand, male participation in Pagadiya fishing, as labourers, and as boat owners significantly increased the proportion of males in the study.

Chapter 3: Demographic Profile

Figure 1 Age distribution of the respondents by district

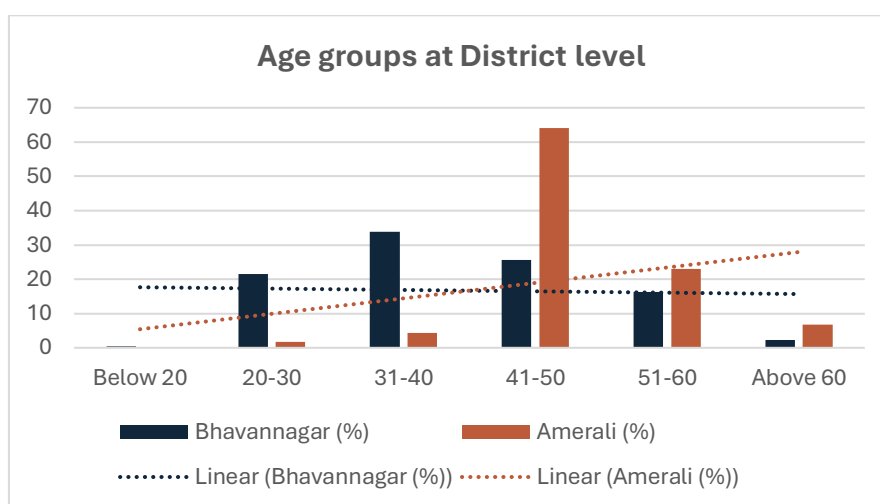


Table 9 Age Distribution of the respondents by block

Age Distribution	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Below 20	1	0.4	1	0.43	1	0.41	0	0.00
21-30	61	24.7	38	16.24	57	23.36	5	1.80
31-40	98	39.68	65	27.78	83	34.02	12	4.32
41-50	60	24.29	65	27.78	61	25.00	178	64.03
51-60	23	9.31	59	25.21	35	14.34	64	23.02
Above 60	4	1.62	6	2.56	7	2.87	19	6.83
Total	247	100	234	100	244	100	278	100

The age distribution of fishers shows notable differences between Bhavnagar and Amreli districts. Bhavnagar has a more balanced spread across age groups, while Amreli (Rajula) is heavily dominated by the 41-50 age group (64.03%).

Within Bhavnagar, Talaja has the highest proportion of fishers aged 31-40 (39.68%), followed by Mahuva (34.02%) and Ghogha (27.78%). Ghogha also shows significant representation in the 51-60 group (25.21%), indicating a slightly older workforce. In contrast, Rajula in Amreli stands out for its reliance on middle-aged fishers, with minimal participation from younger groups (below 20 and 21-30) and a relatively higher share of elderly fishers (6.83%). This inter- and intra-district comparison highlights the generational variations in fisher demographics.

Table 8 Marital status of the respondents

Marital status	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Never married	4	1.62	21	8.97	19	7.79	4	1.44
Married	237	95.95	209	89.32	210	86.07	254	91.37
Widowed	6	2.43	1	0.43	14	5.74	18	6.47
Divorced	0	0	2	0.85	0	0	0	0
Separated (mutually)	0	0	1	0.43	0	0	0	0
Woman has left	0	0	0	0	1	0.41	2	0.72
Total	247	100	234	100	244	100	278	100

Across districts, Bhavnagar has a slightly higher proportion of widowed individuals (3.03%) compared to Amreli (6.47%), while Amreli exhibits a marginally greater share of married individuals (91.37%). The proportion of never-married individuals is similar across both districts, remaining minimal.

Within Bhavnagar, the Ghogha block has the highest percentage of never-married individuals (8.97%) compared to Talaja (1.62%) and Mahuva (7.79%). Mahuva also has a notable share of widowed individuals (5.74%), significantly higher than Talaja (2.43%) and Ghogha (0.43%). In Amreli, the Rajula block displays a higher percentage of widowed individuals (6.47%) and cases where the woman has left (0.72%) than the blocks in Bhavnagar. Across blocks, the proportion of married individuals remains consistently dominant, ranging between 86.07% (Mahuva) and 95.95% (Talaja).

Table 9 Social category of the respondents

Social Category	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
General	2	0.81	1	0.43	0	0	1	0.36
OBC	245	99.19	233	99.57	244	100	276	99.28
ST	0	0	0	0.00	0	0	1	0.36
Total	247	100	234	100	244	100	278	100

Across districts, Bhavnagar exhibits an overwhelming majority of individuals from the OBC category (99.43%), with a marginal presence of the general category (0.55%). Similarly, Amreli shows a comparable dominance of the OBC category (99.28%) with minimal representation from the general category (0.36%) and a negligible presence of individuals from the ST category (0.36%).

Within Bhavnagar, all three blocks—Talaja, Ghogha, and Mahuva—show near-universal representation of OBC individuals, with percentages ranging from 99.19% (Talaja) to 100.00% (Mahuva). The general category is represented only in Talaja (0.81%) and Ghogha (0.43%). In Amreli, Rajula has a similar OBC dominance (99.28%), with a small presence of the general category (0.36%) and ST category (0.36%).

Table 10 Respondents by religion

Fisher's religion	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Hindu	246	99.6	202	86.32479	244	100	278	100
Muslim	1	0.4	31	13.24786	0	0	0	0
Buddhist	0	0	1	0.42735	0	0	0	0
Total	247	100	234	100	244	100	278	100

The religious composition of fisher communities in Bhavnagar and Amreli districts varies significantly across different regions. In Talaja, Mahuva, and Rajula, Hinduism is the overwhelmingly dominant religion, with 99.6% of fishers in Talaja (246 out of 247), 100% in Mahuva (244 out of 244), and 100% in Rajula (278 out of 278) identifying as Hindu. This strong adherence to Hinduism reflects the cultural homogeneity within these communities.

Ghogha, however, stands out with a more diverse religious landscape. While 86.32% of fishers in Ghogha (202 out of 234) identify as Hindu, 13.25% (31 out of 234) are Muslim. Additionally, there is a minimal presence of Buddhists (0.43%) in Ghogha, marking it as a region with more religious diversity compared to the other areas.

The rest of the regions, including Bhavnagar and Amreli, show similar trends, with Bhavnagar having 99.6% of fishers identifying as Hindu and a small Muslim minority of 0.4%. Amreli is entirely Hindu, with 100% of fishers identifying as such. The religious composition across these regions reflects varying degrees of religious homogeneity, with Ghogha being the most diverse.

Table 11 Respondents by family size

Avg. Number of members in fisher's family	Bhavnagar (N= 725)			Amreli (N=278)
	Talaja (N=247)	Ghogha (N=234)	Mahuva (N=244)	Rajula (N=278)
Mean	5.57	4.39	5.07	4.41
Std. Deviation	2	3	1.83	3.73
Minimum	1.00	1.00	1.00	1.00
Maximum	13.00	18.00	14.00	24.00

The analysis of family sizes among fishers in Bhavnagar and Amreli districts reveals several distinct differences. In Bhavnagar district, the average family size is 5.01 members, which is notably larger than Amreli's district average of 4.41 members, indicating that fishers in Bhavnagar district generally have larger families.

The average number of members in fisher families varies across the different regions of Bhavnagar and Amreli districts. In Talaja, the average family size is 5.57, with a standard deviation of 2, indicating moderate variation. Family sizes in Talaja range from as few as 1 member to a maximum of 13, suggesting that while most families are of a moderate size, there are some with significantly fewer or more members.

In Ghogha, the average family size is slightly smaller at 4.39, with a higher standard deviation of 3, indicating greater variability. Family sizes in Ghogha range from 1 to 18 members, showing a broader diversity in family structures compared to Talaja. Mahuva, on the other hand, has an average family size of 5.07, with a standard deviation of 1.83, which reflects less variation than Ghogha. The family sizes in Mahuva range from 1 to 14 members.

Rajula shows an average family size of 4.41, with the highest standard deviation of 3.73, suggesting substantial variability in family sizes. In Rajula, the family sizes range from 1 to 24 members, marking the region with the largest family size range. These variations across regions reflect the differences in family structures within the fisher communities, with Talaja and Mahuva having moderately sized families, while Ghogha and Rajula demonstrate a wider range of family sizes.

Table 12 Respondents by Family type

Fisher's gender	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Nuclear family	7	2.83	135	57.69	2	0.82	202	72.66
Joint family	240	97.17	99	42.31	242	99.18	76	27.34
Total	247	100	234	100	244	100	278	100

In Bhavnagar district, a significant majority of fishers, 79.55%, live in joint families and in contrast, Amreli district shows a strikingly different pattern, with 72.66% of fishers belonging to nuclear families.

The block wise data presented in the table on family structure across the four regions Talaja, Ghogha, Mahuva, and Rajula reveals notable differences in the prevalence of nuclear and joint families within the fisher communities. In Talaja, joint families dominate, comprising 97.17% of households, while only 2.83% of families are nuclear. This suggests a strong cultural preference for extended family living in the region. Ghogha, in contrast, shows a more balanced distribution between nuclear and joint families, with 57.69% of households being nuclear and 42.31% joint families. This indicates a shift toward nuclear family arrangements compared to Talaja.

In Mahuva, the family structure is overwhelmingly joint, with 99.18% of families living in extended households, and only 0.82% of families identified as nuclear. This pattern reflects a similar trend to Talaja, where joint families are the norm. However, Rajula stands out with a significant preference for nuclear families, where 72.66% of households are nuclear, and only 27.34% are joint families. This indicates a transition towards more independent family units, contrasting with the extended family models observed in Talaja and Mahuva.

Overall, the data suggests that the fisher communities in Talaja and Mahuva have a strong tradition of joint family living, while Ghogha and Rajula exhibit more diverse family structures, with a higher proportion of nuclear families in Rajula and a more balanced mix in Ghogha.

Table 13 Educational status

Educational status	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Non literate	62	25.1	67	28.63	96	39.34	35	12.59
Primary schooling	184	74.5	101	43.16	14	5.74	141	50.72
Secondary Schooling	1	0.4	12	5.13	6	2.46	86	30.94
Higher secondary	0	0	6	2.56	1	0.41	3	1.08
Graduate	0	0	0	0	1	0.41	6	2.16
Ability to read and write	0	0	48	20.52	126	51.64	7	2.52
Total	247	100	234	100	244	100	278	100

The educational status of the respondents across the regions of Talaja, Ghogha, Mahuva, and Rajula presents varying levels of formal education and literacy. In Talaja, the majority of fishers (74.5%) have completed primary schooling, although 25.1% are non-literate. Secondary schooling is minimal (0.4%), and no fishers reported having higher secondary or graduate education. This suggests that while many fishers in Talaja have basic education, there is a significant lack of access to higher educational opportunities.

In Ghogha, the educational distribution shows a strong focus on primary schooling, with 43.16% of fishers having attained this level of education. However, 28.63% of fishers remain non-literate. Secondary schooling is reported by 5.13% of fishers, while 2.56% have completed higher secondary education. Interestingly, a notable proportion (20.52%) of fishers in Ghogha have the ability to read and write, indicating a level of informal literacy. There are no graduates in this region, highlighting the challenges in accessing higher education.

In Mahuva, a larger portion of fishers (39.34%) are non-literate, with only 5.74% having completed primary schooling. Secondary schooling is more common in Mahuva, with 2.46% of fishers reaching that level, and 0.41% attaining graduate education. Additionally, 51.64% of fishers in Mahuva are able to read and write, showing that informal literacy plays a significant role in this region. Rajula has a higher percentage of secondary schooling, with 30.94% of fishers completing it, and 2.16% holding a graduate degree. Non-literacy is relatively low (12.59%), and the number of fishers with primary schooling is missing from the data.

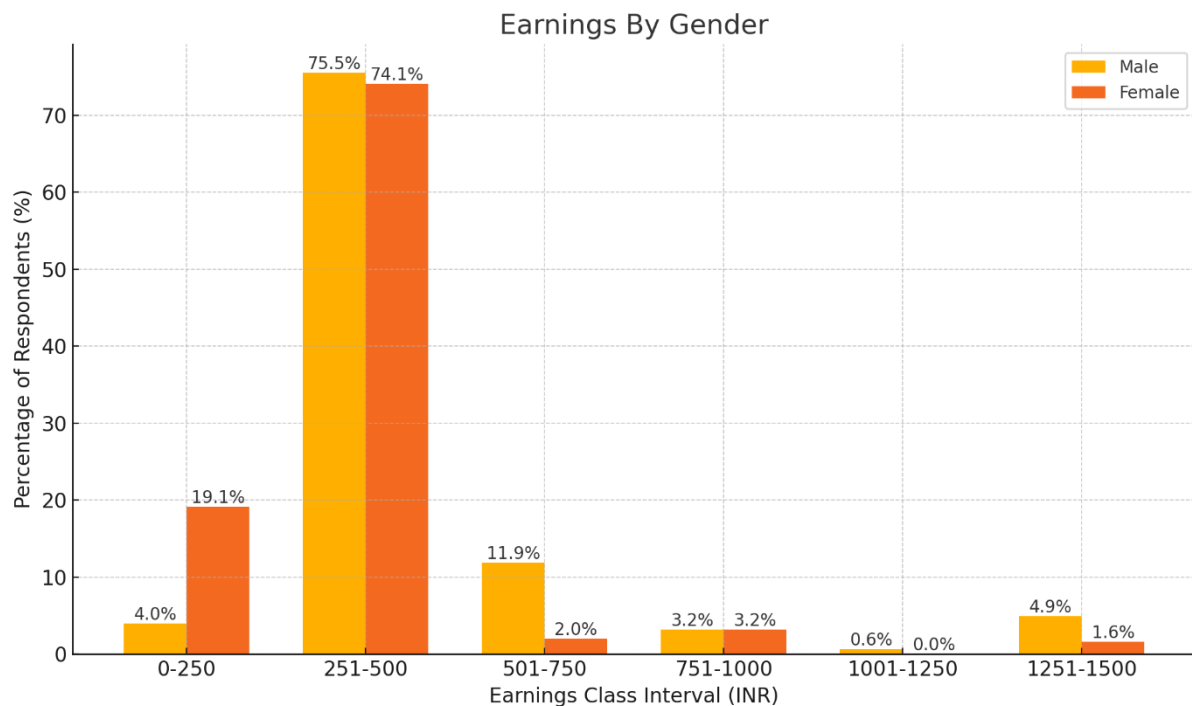
In summary, while primary education dominates in most regions, Talaja stands out with the highest percentage of primary schooling. However, there is a marked disparity in secondary and higher education across the regions. Non-literacy rates are high in Mahuva and Ghogha, indicating a need for focused literacy programs, while Rajula shows greater access to higher levels of schooling.

Table 14 Income from the primary occupation per year

Fisher's income from the primary occupation	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Less than 1 lakh	90	36.44	206	88.03	210	86.07	181	65.11
Between 1 to 2 lakhs	157	63.56	22	9.4	34	13.93	73	26.26
Between 2 to 3 lakhs	0	0	1	0.43	0	0	20	7.19
Between 3 to 4 lakhs	0	0	2	0.85	0	0	3	1.08
More than 4 lakhs	0	0	3	1.28	0	0	1	0.36
Total	247	100	234	99.99	244	100	278	100

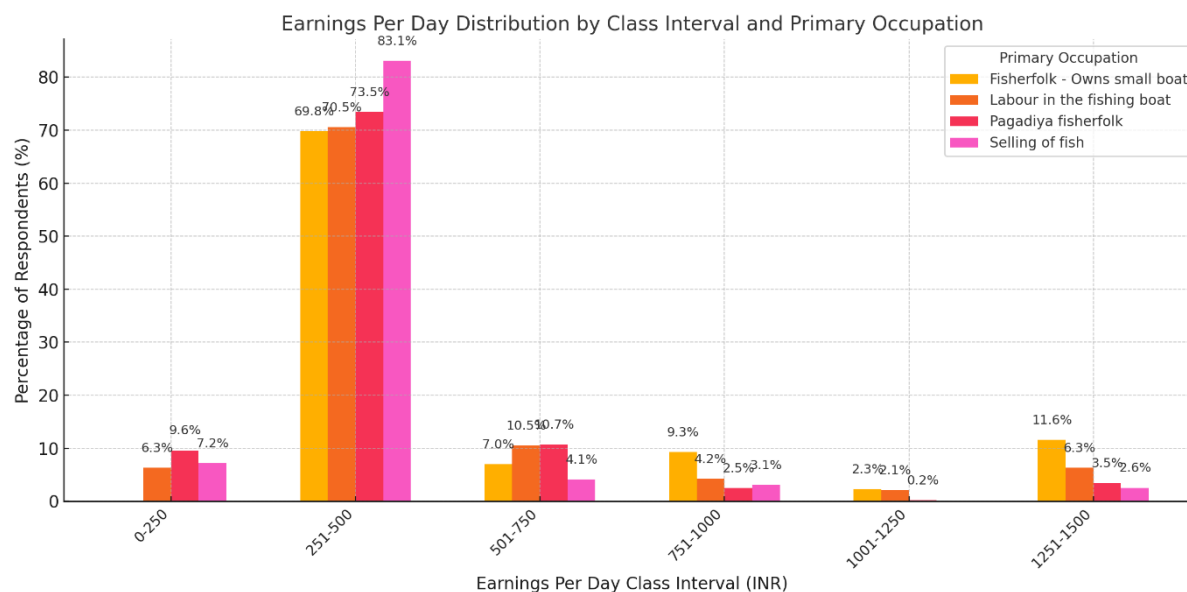
The income distribution of fishers from their primary occupation reveals distinct patterns and regional disparities across Talaja, Ghogha, Mahuva, and Rajula. A significant proportion of fishers in all regions earn less than ₹1 lakh annually, with Ghogha (88.03%) and Talaja (86.07%) exhibiting the highest concentration in this category, followed by Mahuva (65.11%). In contrast, Rajula stands out with only 36.44% of fishers in this low-income bracket, indicating relatively better earning levels. The middle-income range of ₹1–2 lakhs show a contrasting trend, with Rajula having the highest representation at 63.56%, followed by Mahuva at 26.26%. Ghogha (13.93%) and Talaja (9.4%) have significantly fewer fishers in this category, reflecting a limited shift toward moderate earnings. Fishers earning above ₹2 lakhs are nearly absent in Talaja and Ghogha, while Rajula shows a small but notable presence in higher-income brackets, including 1.43% earning above ₹3 lakhs. This highlights Rajula's potential for better economic opportunities or practices that support higher incomes. Overall, Rajula demonstrates the most balanced income distribution, while Ghogha and Talaja are heavily skewed toward low earnings, reflecting economic vulnerabilities. Mahuva shows a transitional pattern, with a gradual shift from low to middle-income levels.

Figure 2 Earnings per day by Gender



The chart illustrates the percentage distribution of daily earnings among respondents, categorized by gender. A significant proportion of female respondents are concentrated in the lowest earnings bracket (₹0–₹250), while males dominate the higher income ranges (₹751–₹1500). The moderate earnings range (₹251–₹500) has a balanced representation, though females slightly outnumber males, indicating that women's incomes tend to cluster around mid-level brackets. These findings highlight a gendered disparity in earnings within the fishing community, with women facing barriers to higher-income opportunities.

Figure 3 Daily earnings distribution by class interval and primary occupation



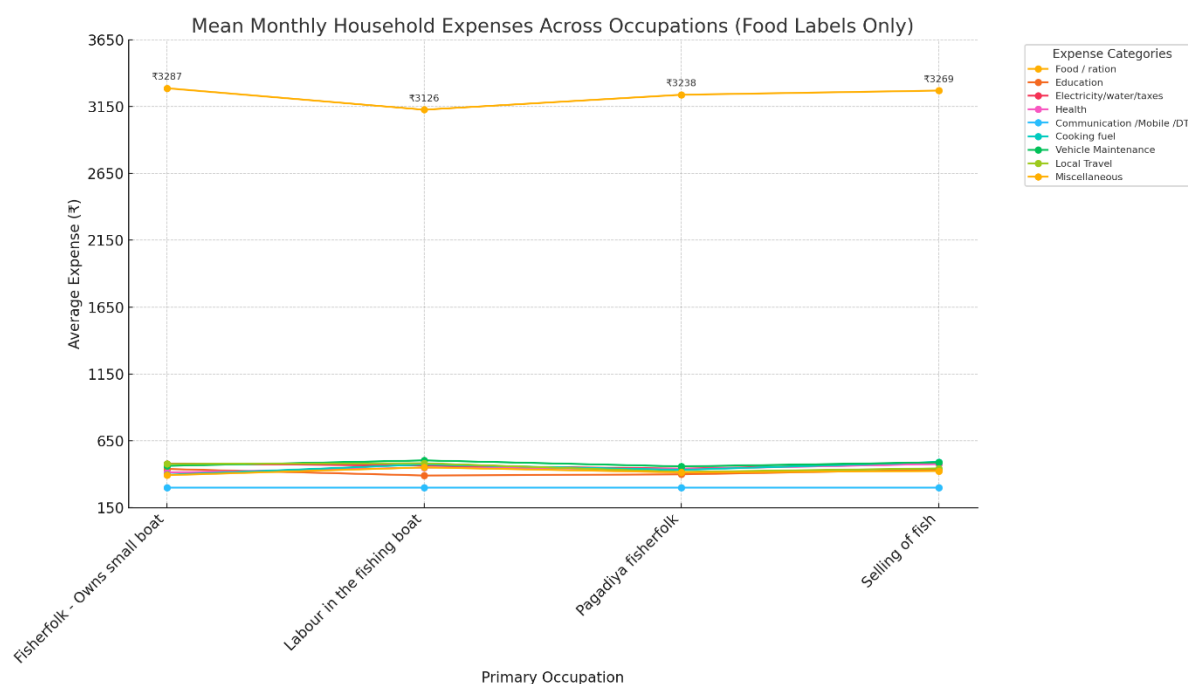
The chart illustrates the distribution of daily earnings across different class intervals for various primary occupations. The majority of respondents in all occupations fall within the ₹251–₹500 class interval. Notably, Pagadiya fisherfolk have the highest concentration in this range, with 83.1% earning between ₹251 and ₹500 per day, indicating a narrow income range for this group. In contrast, occupations like Fisherfolk - Owns small boat and Labour in the fishing boat show a broader spread of earnings, with notable representations in higher income brackets.

At the upper end of the earnings spectrum, Fisherfolk - Owns small boat stands out, with 11.6% of respondents earning ₹1251–₹1500 daily, highlighting the potential benefits of asset ownership. Meanwhile, selling of fish and Pagadiya fisherfolk show minimal representation in higher-income intervals, reflecting the economic constraints faced by these groups.

Table 15 Secondary Occupation among the respondents

Category	Key Summary
Dominant & Gender-Based Trends	Agricultural Daily Labourer is the most common secondary occupation, with men dominating labour-intensive roles like fishing and salt work, while women focus on unpaid work and agriculture.
Diversity in Occupations	Pagadiya Fisherfolk engage in diverse secondary occupations, including fishing, salt work, and supplementary roles like transport and animal husbandry, reflecting regional adaptations.
Key Observations	Secondary occupations align closely with local industries (fishing, agriculture), and there is a clear gender-based division of labor in these communities.

Table 16 Average household expense based the primary occupation of the respondent



The analysis of monthly household expenses reveals significant patterns and variations across occupational groups, providing insights into economic priorities and vulnerabilities.

Food expenses, ranging from ₹3,000 to ₹3,300, consistently dominate household budgets across all groups, emphasizing their essential nature. Selling of Fish households report the highest average expenditure at ₹3,269, followed closely by Pagadiya Fisherfolk at ₹3,237, reflecting the centrality of food in household spending.

Utility expenses, such as Electricity, Water, and Taxes, show moderate variation, with averages between ₹300 and ₹600. Fisherfolk - Owns Small Boat report slightly higher utility costs (₹480), indicating increased demands tied to resource-intensive activities.

Health-related expenses, ranging from ₹50 to ₹600, demonstrate significant variability, with Labour in Fishing Boats averaging ₹450. This highlights disparities in healthcare access and expenditure, possibly reflecting occupational health risks or differences in healthcare priorities.

Education expenses show a broad range (₹0–₹600), with Selling of Fish households reporting an average of ₹434. This suggests differing levels of access to educational opportunities or varying household priorities for education spending.

Cooking fuel costs are relatively consistent, with averages between ₹50 and ₹600. Pagadiya Fisherfolk households spend an average of ₹433, reflecting reliance on locally accessible resources. Finally, Miscellaneous expenses, ranging from ₹200 to ₹600, show consistent patterns across occupations. Labour in Fishing Boats report the highest average of ₹451, indicating some flexibility for discretionary spending.

Table 17 Type of house

Type of home	Block				Total
	Talaja	Ghogha	Mahuva	Rajula	
Kaccha	40	155	162	231	588
	16.194 %	66.239 %	66.393 %	83.094 %	58.624 %
Pucca	207	79	82	47	415
	83.806 %	33.761 %	33.607 %	16.906 %	41.376 %
Total	247	234	244	278	1003
	100.000 %	100.000 %	100.000 %	100.000 %	100.000 %

The table illustrates the distribution of housing types kaccha and pucca across the four study regions: Talaja, Ghogha, Mahuva, and Rajula. According to the Census of India, kaccha houses are constructed from materials such as mud, thatch, or other low-durability substances, while pucca houses are built with more durable materials like bricks, concrete, and stone. The analysis reveals notable regional disparities in housing conditions. Rajula stands out with the highest proportion of kaccha houses, as 83.09% of households live in such structures. Similarly, Ghogha (66.24%) and Mahuva (66.39%) also show a significant predominance of kaccha houses. In contrast, Talaja exhibits much better housing conditions, with 83.81% of households residing in pucca houses. In total, kaccha houses account for 58.62% of all homes across the four regions, while pucca houses represent 41.38%.

Table 18 Household material ownership

Fisher's Household Materials Ownership	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No. of fisher	Percent	No. of fisher	Percent	No. of fisher	Percent	No. of fisher	Percent
Motorcycle	209	84.62	96	41.03	7	2.87	204	73.38
Tractor	6	2.43	4	1.71	0	0	10	3.6
Television	26	10.53	31	13.25	1	0.41	45	16.19
Refrigerator	39	15.79	7	2.99	1	0.41	24	8.63

The table provides an overview of household material ownership among fisherfolk in Talaja, Ghogha, Mahuva, and Rajula, highlighting notable regional differences in ownership of key household items. Motorcycle ownership is most common in Talaja, where 84.62% of fisher households own one. Rajula follows with 73.38%, while Ghogha and Mahuva show lower ownership rates of 41.03% and 2.87%, respectively. Tractor ownership is minimal across all regions, with Rajula having the highest percentage at 3.6%. Talaja (2.43%) and Ghogha (1.71%) show similarly low levels of tractor ownership. Television ownership is highest in Rajula at 16.19%, with Mahuva having the lowest at 0.41%. Refrigerator ownership is most common in Talaja (15.79%), followed by Rajula (8.63%). Ghogha and Mahuva have lower ownership rates, at 2.99% and 0.41%, respectively.

Table 19 Owning government issued Identity /beneficiary cards

Assessing Beneficiary Card	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Ration card	246	99.6	226	96.58	243	99.59	216	77.7
Aadhar card	244	98.79	226	96.58	241	98.77	267	96.04
Ayushman Card	204	82.59	150	64.1	116	47.54	185	66.55
MNREGA card	61	24.7	32	13.68	54	22.13	117	42.09
Bank account	240	97.17	206	88.03	241	98.77	160	57.55

The analysis of beneficiary card ownership among fishers in Talaja, Ghogha, Mahuva, and Rajula reveals significant regional disparities, reflecting varying levels of access to government schemes and financial inclusion. Ration card ownership is nearly universal in Talaja (99.60%) and Mahuva (99.59%), followed closely by Ghogha (96.58%). However, Rajula lags significantly, with only 77.70% of fishers possessing ration cards, indicating gaps in access to this critical entitlement.

Aadhar card ownership is consistently high across all regions, with Talaja (98.79%), Mahuva (98.77%), Ghogha (96.58%), and Rajula (96.04%) reporting near-total coverage, reflecting the widespread implementation of this foundational identification document. In contrast, Ayushman card ownership, which facilitates access to health insurance, shows significant variation. Talaja leads with 82.59% of fishers possessing the card, while Ghogha (64.10%) and Rajula (66.55%) report moderate levels. Mahuva falls behind, with only 47.54% of fishers owning Ayushman cards, highlighting limited healthcare access in this region.

MNREGA card ownership, linked to rural employment schemes, also displays disparities. Rajula reports the highest ownership rate at 42.09%, followed by Talaja (24.70%) and Mahuva (22.13%). Ghogha records the lowest rate at 13.68%, indicating uneven utilisation of rural employment benefits. Similarly, bank account ownership, an indicator of financial inclusion, is high in Talaja (97.17%), Mahuva (98.77%), and Ghogha (88.03%). However, Rajula again shows a significant deficit, with only 57.55% of fishers reporting bank accounts, reflecting barriers to financial accessibility in the region.

Overall, Talaja demonstrates strong ownership of beneficiary cards and bank accounts, suggesting effective access to government schemes and financial services. Mahuva performs well in most categories but lags in Ayushman card ownership. Rajula shows mixed results, with low ownership rates of ration cards, MNREGA cards, and bank accounts, indicating the need for targeted interventions. Ghogha exhibits moderate levels of ownership but requires attention to improve access to MNREGA and Ayushman cards.

Table 20 Disability status of the respondents

Fisher's Types of Disabilities	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Blindness /Low vision	2	0.81	0	0	0	0	2	0.72
Hearing Impairment	0	0	1	0.43	1	0.41	3	1.08
Locomotor Disability	0	0	0	0	0	0	4	1.44
Mental health disability	0	0	1	0.43	1	0.41	1	0.36
Any other ailment	0	0	2	0.85	0	0	1	0.36

The prevalence of disabilities among fishers in Talaja, Ghogha, Mahuva, and Rajula is relatively low, with noticeable differences across regions. Blindness or low vision is reported in Talaja (0.81%) and Rajula (0.72%), while this type of disability is absent in Ghogha and Mahuva. Hearing impairment is minimally reported, with one fisher each in Ghogha (0.43%) and Mahuva (0.41%) and three in Rajula (1.08%). Talaja does not report any cases of hearing impairment.

Locomotor disability is exclusively reported in Rajula, where 1.44% of fishers experience this condition, while it is absent in the other regions. Mental health-related disabilities are infrequent, with one case each in Ghogha (0.43%), Mahuva (0.41%), and Rajula (0.36%), and none in Talaja. Disabilities categorised under "any other ailment" are sparsely reported, with Ghogha showing the highest prevalence at 0.85%, followed by Rajula (0.36%).

Overall, the data indicate a low incidence of disabilities among fishers across the regions. However, Rajula stands out with a slightly higher prevalence of locomotor disabilities and hearing impairments, while the other regions show minimal cases in all categories.

Table 21 Access to basic facilities

Fisher's Household Access	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Functional Toilet	147	59.51	92	39.32	137	56.15	229	82.37
Drinking water tap	143	57.89	94	40.17	230	94.26	226	81.29
Legal electricity connection	76	30.77	79	33.76	137	56.15	218	78.42
Gas connection (Cylinder)	41	16.6	62	26.5	130	53.28	9	3.24

The data on household access to essential amenities among fishers in Talaja, Ghogha, Mahuva, and Rajula reveals significant regional variations, reflecting differing levels of infrastructure and resource availability.

In terms of functional toilets, Rajula stands out with 82.37% of fishers having access, followed by Talaja at 59.51% and Mahuva at 56.15%. Ghogha has the lowest access rate at 39.32%, highlighting a notable gap in sanitation facilities in this region.

Access to drinking water taps is highest in Mahuva (94.26%) and Talaja (81.29%), indicating strong water supply infrastructure in these regions. In contrast, Ghogha reports the lowest access rate at 40.17%, suggesting challenges in providing reliable water sources.

Legal electricity connections are most prevalent in Rajula (78.42%) and Mahuva (56.15%), but Talaja (30.77%) and Ghogha (33.76%) have considerably lower access, indicating a need for improvements in electrification in these areas.

When it comes to gas connections, Mahuva leads with 53.28%, showing good access to clean cooking fuel. Talaja follows with 26.5%, while Ghogha (16.6%) and Rajula (3.24%) report significantly lower access, pointing to critical gaps in cooking energy access in these regions.

Overall, Rajula has relatively better access to sanitation, water, and electricity, but its low rate of gas connections is a concern. Mahuva excels in water and gas connections but faces challenges in electricity access. Both Talaja and Ghogha experience significant deficiencies in sanitation, water, and electricity, particularly in Ghogha, where the lowest access rates are observed.

Table 22 Ownership of Phone

Ownership of phone	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No Phone	79	20	18	56	173
	33.76 %	8.20 %	7.29 %	20.14 %	17.25 %
Simple phone	58	215	103	145	521
	24.79 %	88.11 %	41.70 %	52.16 %	51.94 %
Smart phone	97	9	126	77	309
	41.45 %	3.69 %	51.01 %	27.70 %	30.81 %
Total	234	244	247	278	1003
	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

The data on phone ownership across both geographic and gender dimensions reveals varying trends in access to mobile technology, with notable differences between blocks and between males and females. Starting with the geographic breakdown, the total number of respondents across the four blocks (Ghogha, Mahuva, Talaja, and Rajula) is 1003. In Ghogha, 41.45% of respondents own smartphones, which is the highest rate among the blocks. In contrast, Mahuva shows a stark difference, with 88.11% of respondents using simple phones and only 3.69% owning smartphones. Talaja and Rajula show more balanced distributions, with Talaja having 51.01% smartphone ownership and Rajula at 27.70%.

When the data is analyzed by gender, distinct trends emerge. Of the total 1003 respondents, 269 are female and 734 are male. For females, 66.17% own simple phones, while only 22.68% own smartphones, and 11.15% do not own any phone. Conversely, males show a more divided ownership pattern: 46.73% own simple phones, 33.79% own smartphones, and 19.48% have no phone.

Interestingly, although females own a higher percentage of simple phones, males tend to have a higher rate of smartphone ownership. Males also make up a larger portion of those without any phone, especially in blocks like Ghogha and Rajula. This indicates that while females in the survey are more likely to own simple phones, males are more inclined to own smartphones, suggesting a digital divide not only between blocks but also within gender groups.

Overall, the data reveals a complex landscape where simple phone ownership is most prevalent, especially among females, but smartphone adoption is growing, particularly among males in certain areas.

Table 23 Agricultural land ownership by the household

Does the family own any agricultural land?	Block				Total
	Talaja	Ghogha	Mahuva	Rajula	
No	161	231	244	227	863
	65.182 %	98.718 %	100.000 %	81.655 %	86.042 %
Yes	86	3	0	51	140
	34.818 %	1.282 %	0.000 %	18.345 %	13.958 %
Total	247	234	244	278	1003
	100.000 %	100.000 %	100.000 %	100.000 %	100.000 %

The table highlights the ownership of agricultural land among fisherfolk families in Talaja, Ghogha, Mahuva, and Rajula.

In **Talaja**, 34.82% of households own agricultural land, while 65.18% do not. **Ghogha** shows a very low percentage of agricultural land ownership, with only 1.28% of households owning land, compared to 98.72% that do not. **Mahuva** shows no agricultural land ownership among households, with 100% reporting no land ownership. In **Rajula**, 18.35% of households own agricultural land, while 81.66% do not.

Overall, 13.96% of households across the four regions own agricultural land, while the majority, 86.04%, do not.

Further, the total land size owned by fisherfolk families across Talaja, Ghogha, Mahuva, and Rajula shows that in **Talaja**, the average land owned is 0.967 acres, with a standard deviation of 0.731, indicating some variation in land ownership. The minimum land owned is 0.4 acres, while the maximum is 5.2 acres. In **Ghogha**, the mean land ownership is 1 acre. No agricultural land ownership reported in **Mahuva** and in **Rajula**, the mean land ownership is 0.592 acres, with a standard deviation of 0.388. The minimum land owned is 0.013 acres, while the maximum is 2 acres. This analysis shows notable differences in land ownership across the regions, with Ghogha exhibiting uniform land ownership, Talaja showing a wider range, and Rajula having moderate levels of land ownership.

Table 24 Annual income of the family

	Total annual income of the family			
	Ghogha	Mahuva	Talaja	Rajula
N	233	244	247	276
Mean	83527.9	54155.74	75405.26	144438.5
Std. Deviation	26158.01	18447.3	46824.38	90824.91
Minimum	35000	40000	19500	18000
Maximum	200000	130000	600000	550000

The analysis of total annual family income across blocks reveals notable variations in economic conditions. **Rajula** emerges as the block with the highest mean annual income of ₹144,438.52, reflecting significant earning opportunities. However, it also exhibits the greatest disparity, with incomes ranging from as low as ₹18,000 to as high as ₹550,000, and a high standard deviation of ₹90,824.91. This highlights substantial income inequality within the block, possibly due to uneven access to resources or varying types of livelihoods.

In contrast, **Ghogha** shows a mean income of ₹83,527.90 with a much narrower income range (₹35,000 to ₹200,000) and a standard deviation of ₹26,158.01, indicating a more uniform economic landscape. Similarly, **Mahuva**, with the lowest mean income of ₹54,155.74 and a narrow income range (₹40,000 to ₹130,000), reflects limited economic variation and relatively lower earnings.

Talaja, with a mean income of ₹75,405.26, stands out for having the highest maximum income of ₹600,000, suggesting the presence of high-income households, possibly engaged in specialized or diversified economic activities. However, the standard deviation of ₹46,824.38 points to considerable income inequality within the block.

These findings underline stark differences in economic opportunities and challenges across the blocks. While Rajula and Talaja exhibit potential for high earnings, the significant disparities warrant targeted interventions to address income inequality.

Voices from the Field — Fifteen Days of Fish

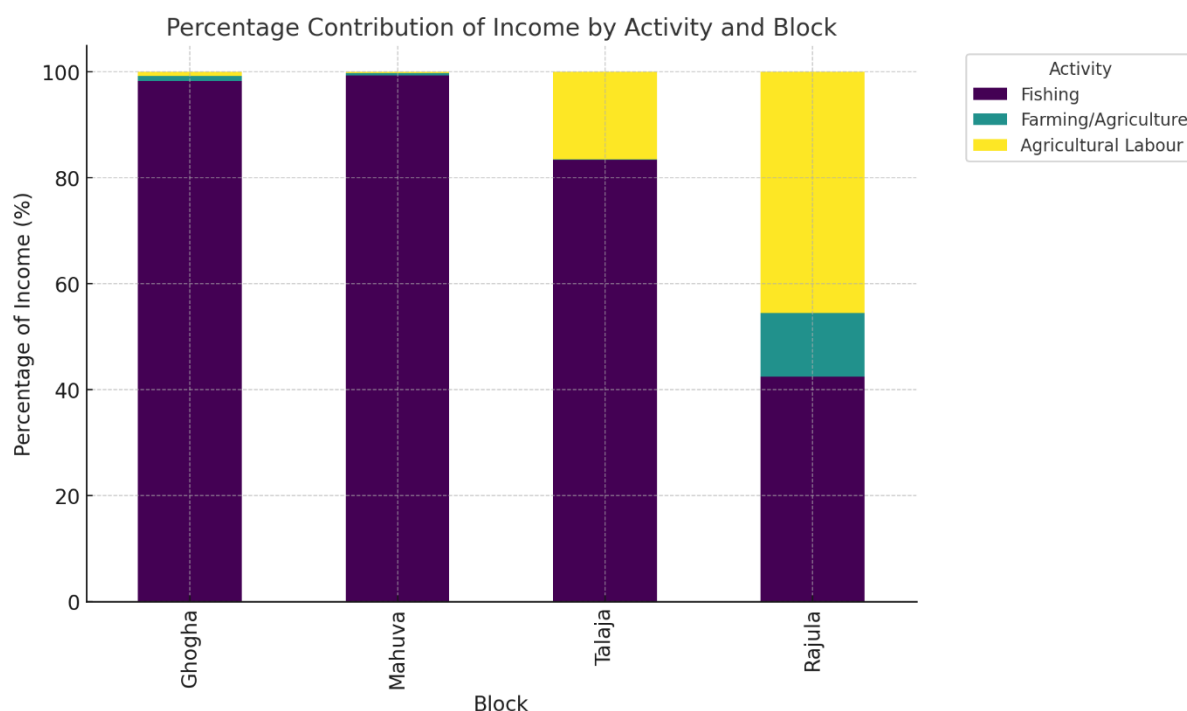
A Pagadiya household in Khera earns, in a good month, roughly ₹5,000–6,000 from fishing — but “good” depends entirely on the lunar calendar. Fishers here work only about half the month, following the tidal cycle that determines when low tide exposes enough shoreline to fish. “When we get water we do fishing, and when there is no water we cannot do fishing,” one fisherman explained. “That is a simple thing.”

To cover the shortfall, household members increasingly migrate 10–20 km to nearby villages for cotton-field labour, adding another ₹2,000–3,000 to monthly income. Even the fishing income is under pressure: as local catch has declined, traders now import fish from Jafrabad and Porbandar to meet local demand, competing directly with the fishers who once supplied the market themselves. Asked what one thing they would ask of the government, the answer

was immediate and unanimous — stop the discharge of industrial wastewater into the sea. “Company’s water waste,” one fisherman said. “Every company is doing that,” added another, describing a concern several households linked directly to the shrinking size and number of fish in their nets.

(Fisher interview, 6th Nov. 2023, Khera)

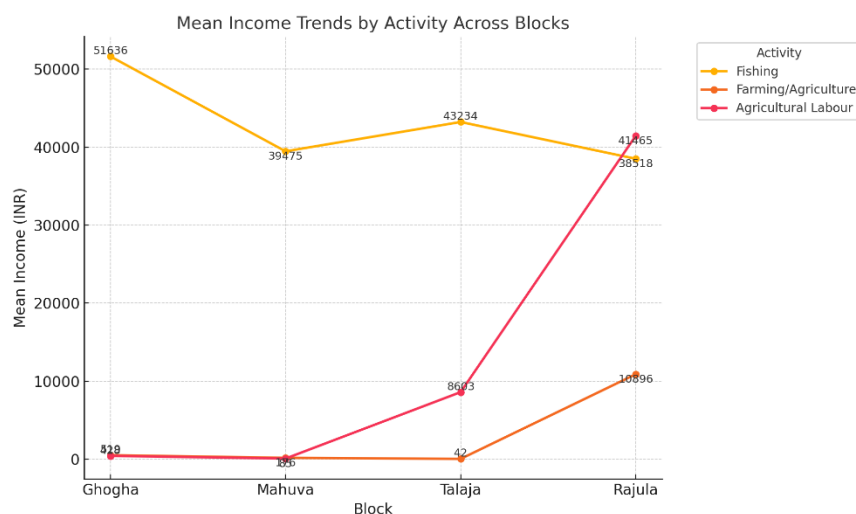
Figure 4 Percentage of contribution of Income by activity and the block



The chart highlights the percentage contribution of income from fishing, farming/agriculture, and agricultural labor across the blocks of Ghogha, Mahuva, Talaja, and Rajula. Fishing emerges as the predominant source of income in Ghogha, Mahuva, and Talaja, contributing nearly all household earnings in these blocks. This indicates a strong dependence on fishing-related activities as the primary livelihood. Conversely, farming/agriculture and agricultural labor make minimal contributions in these blocks, reflecting limited engagement with agricultural activities.

In Rajula, the income structure is more diversified, with fishing still being a significant contributor but complemented by notable shares from agricultural labor and farming/agriculture. This points to a mixed-livelihood model in Rajula, distinguishing it from the other blocks. The data underscores the importance of fishing in the region while highlighting Rajula’s potential for leveraging agricultural activities to further diversify income streams.

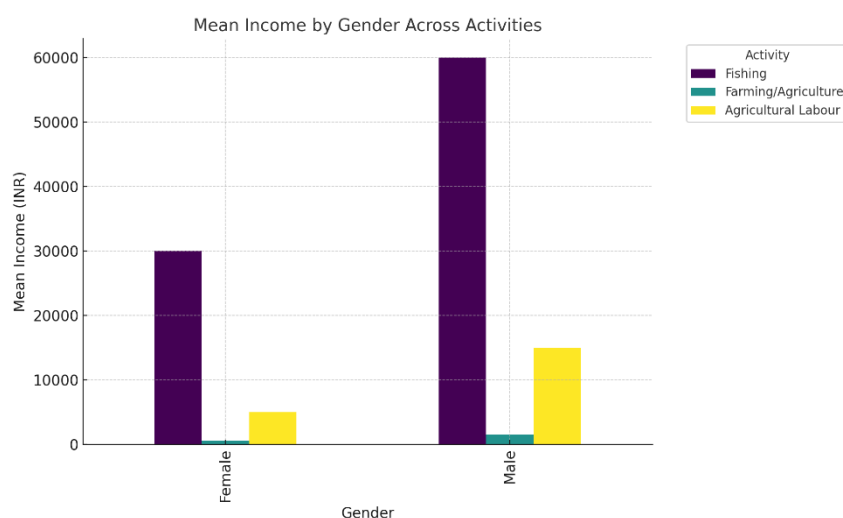
Figure 5 Mean income per year by activity and block



The income analysis highlights significant disparities across blocks and gender. Block-wise, fishing emerges as the primary income source, especially in **Ghogha** and **Talaja**, where it constitutes a major portion of earnings. **Rajula**, however, stands out for its higher income from **agricultural labour** (mean income of ₹41,465.28), reflecting its dependence on land-based

activities. Farming and agriculture contribute minimally to overall income across most blocks, with the exception of **Rajula**, where it has a moderate impact (₹10,895.56 mean income).

Figure 6 Mean income per year by Gender across activities



Men consistently report higher incomes across all activities and blocks, particularly in fishing and agricultural labour. For instance, male respondents dominate fishing income, with notable contributions in **Ghogha** (mean income of ₹51,635.53) and **Mahuva** (₹39,474.79), while women earn considerably less in comparison.

Table 25 Choice of loan source

Choice of Loan Source (1st Choice)	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Bank/ Credit Cooperative	15	6.07	5	2.14	13	5.33	37	13.31
Friends	2	0.81	11	4.7	2	0.82	51	18.35
Money lender	2	0.81	4	1.71	2	0.82	31	11.15
Relative (Family)	228	92.31	214	91.45	227	93.03	136	48.92
SHG	0	0	0	0	0	0	23	8.27

The table presents the fisherfolk's preferred sources of loans when asked whom they first approach for financial support across Talaja, Ghogha, Mahuva, and Rajula.

In **Talaja**, the overwhelming majority (92.31%) of fisherfolk first approach their relatives (family) for loans, followed by a small proportion seeking loans from banks/credit cooperatives (6.07%). Friends (0.81%) and money lenders (0.81%) are much less frequently approached, while no one mentioned SHGs as a first choice.

In **Ghogha**, a similar trend is observed, with 91.45% of fisherfolk turning to relatives (family) first. Friends (4.7%) and money lenders (1.71%) are the next most common sources, while a small proportion (2.14%) approach banks/credit cooperative. No one in Ghogha ranks SHGs as their first choice.

In **Mahuva**, 93.03% of fisherfolk prioritize family (relatives) for loans, followed by 5.33% turning to banks/credit cooperatives. Friends and money lenders are both less common choices (0.82% each), with no mention of SHGs as the first source.

In **Rajula**, family (relatives) remains the first choice for 48.92% of fisherfolk, followed by a significant proportion seeking loans from friends (18.35%) and money lenders (11.15%). Banks/credit cooperatives are also an option for 13.31%, while 8.27% of respondents in Rajula indicated SHGs as their first choice.

Overall, family remains the dominant source of loans across all regions, with variations in the importance of other sources such as friends, money lenders, and banks/credit cooperatives. SHGs play a more prominent role in Rajula, where a notable proportion of fisherfolk consider them a primary loan source.

Table 26 Current loans and sources

Current loan	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Fishing nets	0	0	32	13.68	9	3.69	128	46.04
Household consumption	16	6.48	21	8.97	7	2.87	34	12.23
Education	2	0.81	18	7.69	11	4.51	34	12.23
Health	1	0.4	8	3.42	7	2.87	36	12.95
Vehicle purchase	0	0	4	1.71	0	0	20	7.19
Business	0	0	3	1.28	0	0	8	2.88
Purchase of house/land	0	0	3	1.28	0	0	7	2.52
Marriage and other social functions	0	0	4	1.71	0	0	15	5.4

The table outlines the current loans taken by fisherfolk families in Talaja, Ghogha, Mahuva, and Rajula across various categories.

In Talaja, there is no recorded loan under the categories of fishing nets, vehicle purchase, business, or the purchase of house/land, while loans for household consumption, education, and health are minimal, with 6.48%, 0.81%, and 0.4% of households reporting loans in these categories, respectively.

In Ghogha, loans are more varied, with the highest percentage (13.68%) for fishing nets, followed by loans for household consumption (8.97%), education (7.69%), health (3.42%), and vehicle purchase (1.71%). Business and the purchase of house/land have relatively lower loan proportions, at 1.28%.

In Mahuva, loans for fishing nets are relatively low (3.69%), while loans for education, health, and household consumption are minimal, with 4.51%, 2.87%, and 2.87% of households reporting loans for these purposes, respectively.

In Rajula, loans for fishing nets dominate (46.04%), followed by loans for health (12.95%) and household consumption (12.23%). Loans for vehicle purchase, business, and social functions are also observed, though at much lower percentages (7.19%, 2.88%, and 5.4%, respectively).

Overall, fishing nets are the most common reason for taking loans in Ghogha and Rajula, while loans for household consumption and health are more prominent in Rajula.

Source of loan: While analysing the sources, relatives, credit cooperatives, and money lenders emerged as the top choices, with loan-taking respondents being comparatively higher in Rajula. Eighteen respondents from Ghogha and twelve from Rajula reported taking loans from fish traders. SHGs were not reported as a loan source among the study participants.

Chapter 4: Fishers' Infrastructure and Fishing Experience

Table 27 Fishing experience (In years)

Experience in fishing and related activities	Talaja (N=247)	Ghogha (N=234)	Mahuva (N=244)	Rajula (N=278)
Mean	13.5142	15.72	12.88	10.7194
Std. Deviation	6.02356	5.65	4.19	9.03505
Minimum	0	2	2	0
Maximum	40	40	35	52

The table summarises the experience in fishing and related activities across the four study blocks: Talaja, Ghogha, Mahuva, and Rajula. Ghogha recorded the highest average experience, with a mean of 15.72 years and a standard deviation of 5.65, indicating relatively consistent experience levels among the respondents. Talaja followed with a mean experience of 13.51 years and a slightly higher standard deviation of 6.02, suggesting some variation in respondents' fishing experience. Mahuva reported an average of 12.88 years of experience, with a lower standard deviation of 4.19, reflecting more uniformity within the group. Rajula had the lowest mean experience at 10.72 years but displayed the highest variability, as shown by a standard deviation of 9.04. Notably, the maximum experience reported was highest in Rajula (52 years) compared to Ghogha (40 years), Talaja (40 years), and Mahuva (35 years).

Table 28 Infrastructure availability

Fisher's Infrastructure	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Boat	19.00	7.69	19.00	8.12	34.00	13.93	34.00	12.23
Fishing Net	2.00	0.81	6.00	2.56	13.00	5.33	64.00	23.02
Insulated Icebox	0.00	0.00	1.00	0.43	0.00	0	17.00	6.12
Cold storage	0.00	0.00	4.00	1.71	0.00	0	16.00	5.76
Fish holding tank	0.00	0.00	5.00	2.14	2.00	0.82	27.00	9.71
GPS	0.00	0.00	0.00	0	1.00	0.41	5.00	1.80
Quality Testing lab	0.00	0.00	0.00	0	0.00	0	1.00	0.36

There is a notable disparity between Bhavnagar and Amreli in terms of fishing resources and infrastructure. Bhavnagar has a lower percentage of fishers with boats (9.92%) compared to Amreli, where 12.23% of fishers own boats. Similarly, Amreli shows a significantly higher rate of fishing net ownership at 23.02%, while Bhavnagar lags behind at just 2.90%. Fishers in Amreli are also better equipped with insulated iceboxes (6.12%) compared to their counterparts in Bhavnagar (0.14%). Cold storage facilities follow a similar trend, with Amreli leading at 5.76% versus Bhavnagar's 0.57%. Additionally, Amreli has a higher percentage of fishers with fish holding tanks (9.71%) compared to Bhavnagar (0.99%). GPS usage remains low in both regions, but Amreli is slightly ahead with 1.80% compared to Bhavnagar's 0.14%. Quality testing labs are almost non-existent in both regions, with Bhavnagar showing no presence (0.00%) and Amreli having a marginal presence (0.36%).

The data reveals a notable disparity in fishing infrastructure between Bhavnagar and Amreli. Amreli has superior equipment and facilities, including better availability of fishing nets, insulated iceboxes, and cold storage, which enhance the efficiency and profitability of fishing operations. In contrast, Bhavnagar's lower levels of these essential resources can hinder fishing operations, potentially increasing post-harvest losses and reducing overall productivity. Both regions exhibit limited adoption of GPS technology, highlighting a need for increased awareness and access to modern navigation tools, which are vital for efficient and safe fishing practices. Additionally, the near absence of quality testing labs in both regions points to a significant gap in quality control, affecting fish quality, safety, and marketability.

Insurance Trends:

- The majority of the fisherfolk do not have insurance for their infrastructure, including nets and iceboxes.
- Boat owners, however, reported owning licenses, indicating a level of formal registration or recognition for their boats.

Table 29 Licence ownership

Licence ownership	No. of fisherfolk own licence	Total fisherfolk in the category	Percent
Fisherfolk - Owns small boat licence	49	49	100
Pagadiya fisherfolk	361	624	57.85
Selling of fish	87	199	43.72

Voices from the Field — A Hundred Kilometres for a Stamp

In Katpar-Bandar, holding a legal fishing licence means an annual trip to Bhavnagar, roughly 100 km away, since “whatever licence work we have to do for Pagadiya fishing, we have to go to Bhavnagar only. We can’t do anything here,” as one woman put it. The Pagadiya fishing licence must be renewed every year, and the separate licence required to sell the catch every three years; both are processed entirely at the district level, with no local alternative.

The trip does not guarantee results. One woman described travelling for a scheduled renewal only to have the officer leave before seeing her group, despite being told they had come specifically for that purpose: “the officer was about to leave... but still he left.” Recognising the imbalance in the arrangement — as one member of the research team put it, “instead of 100 local people going to the office, 4 people can come here and finish the work” — the team proposed to a state fisheries official that periodic documentation camps be held locally, so households would not have to repeat the journey to Bhavnagar every time a licence needs renewing.

(Fisher interview, 5th Nov. 2023, Katpar-Bandar)

Voices from the Field — Two Licences, No Land

In Kuda, a Pagadiya fishing settlement of eight to nine families living and fishing on the same stretch of coast for an estimated three to four generations, legal recognition comes at a cost disproportionate to the size of the operation. Fishers here must renew a Pagadiya fishing licence every year and hold a separate licence to sell their catch, renewed every three years — each requiring supporting paperwork and sign-off from local officials. “Even if we want to issue or renew our licence, we need to give proof from the Minister, the Sarpanch and other officials,” one fisherman explained.

The burden compounds a deeper insecurity: because the settlement sits on land the community does not legally own, it has no paved roads and no reliable drinking water supply, and floods every monsoon. As a member of the household explained through the research team’s translator, they cannot ask the government for these facilities “because legally this land is not owned by them.” For a community whose relationship to this coastline predates the licences it must now renew each year, formal recognition — of both livelihood and land — remains just out of reach.

(Fisher interview, 4th Nov. 2023, Kuda)

The table summarises licence ownership among different categories of fisherfolk. All fisherfolk owning small boats (49 out of 49) reported 100% licence ownership. Among *Pagadiya* fisherfolk, 361 out of 624 possess licences, representing 57.85%. In the category of fisherfolk engaged in selling fish, 87 out of 199 own licences, which accounts for 43.72%. This indicates full licence coverage among small boat owners, while *Pagadiya* fisherfolk and fish sellers show relatively lower licence ownership rates.

Table 30 Fishing area

Fishing Areas Utilized	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
Banthara	65	26.32	15	6.41	7	2.87	33	11.87
Creek	58	23.48	57	24.36	125	51.23	187	67.27
Open sea	124	50.2	162	69.23	112	45.90	58	20.86

The table presents the fishing areas utilized by artisanal fishers in the villages of Talaja, Ghogha, Mahuva, and Rajula in Bhavnagar and Amreli. The areas are categorized into Banthara, Creek, and Open Sea.

In Talaja, 50.2% of fishers primarily use the Open Sea, while 26.32% fish in Banthara and 23.48% in the Creek. In Ghogha, the Open Sea is the most commonly used area, with 69.23% of fishers fishing there, followed by 24.36% in the Creek and 6.41% in Banthara. In Mahuva, the Creek is the dominant fishing area, used by 51.23% of fishers, with 45.90% using the Open Sea and only 2.87% fishing in Banthara. Finally, in Rajula, the Creek is the most widely used fishing area, with 67.27% of fishers utilizing it. 20.86% of fishers use the Open Sea, and 11.87% fish in Banthara.

Overall, the Creek is the most widely utilized fishing area across all regions, particularly in Rajula and Mahuva. The Open Sea is most commonly used in Ghogha and Talaja, while Banthara is utilized by a smaller proportion of fishers in Talaja and Rajula.

Table 31 Peak season for fishing

Peak fishing season	Bhavnagar (N= 725)						Amreli (N=278)	
	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent	No of fisher	Percent
August to October	8	3.24	23	9.83	36	14.75	120	43.17
November to February	237	95.95	67	28.63	208	85.25	53	19.06
March and April	2	0.81	19	8.12	0	0	37	13.31
May to July	0	0	4	1.71	0	0	1	0.36
	247	100	113	48.29	244	100	211	75.9

In Talaja, the overwhelming majority (95.95%) of fishers operate between November to February, making this the dominant fishing season. Only a small number of fishers (3.24%) fish from August to October, and a very few (0.81%) fish during March and April. Interestingly, there is no fishing reported from May to July, which could indicate unfavorable conditions for fishing during that time.

In Ghogha, the fishing season is more spread out. A significant proportion of fishers (43.17%) fish from August to October, while November to February is also a prominent period (28.63%). The fishing activity decreases after that, with a smaller number of fishers (8.12%) fishing in March and April and 1.71% during May to July.

For Mahuva, November to February is the peak fishing season (85.25%), with a smaller portion (14.75%) fishing between August to October. No fishers report fishing in March and April, and similarly, there is very little activity in May to July.

In Rajula, August to October emerges as the most active fishing period, with 43.17% of fishers working during these months. However, November to February sees considerably less activity, with only 19.06% of fishers fishing during that time. A moderate number of fishers (13.31%) operate in March and April, and a small proportion fish in May to July.

Voices from the Field — Fishing by the Moon

For Pagadiya families in Mithivirdi, the fishing day is set not by the clock but by the tide, and the tide follows the lunar calendar. Nets are checked roughly twice every 24 hours, with the exact hour shifting by about an hour each day; fishers often go out at midnight, torch in hand, to catch the water as it recedes. “There is nothing like that, there is no fix,” one fisherman said of trying to predict a good catch. “It depends on the water level.”

Because the lunar cycle also determines which stretch of the month yields any catch at all, only one or two members of each household still fish full time; the rest have moved into construction work in April, May and July and farm labour from September to November — precisely the months fishing is banned or unproductive. “Nowadays we are not getting enough fish from the sea, so children go out for other work,” one field worker observed, describing a household whose youngest member had left fishing altogether for a government job. With two high schools nearby and steady exposure to the neighbouring industrial area, Mithivirdi’s children are visibly being educated toward an exit from Pagadiya fishing.

(Fisher interview, 4th Nov. 2023, Mithivirdi)

Overall, the November to February season is the most dominant across the villages in Talaja and Mahuva, while August to October stands out in Rajula and Ghogha.

Table 32 Fish Catch by Pagadiya fishers using net fishing method

SNo	Gujarati Name	English Name	Scientific Name	Number of times reported)	Rank
1.	Masli	General small fish	Various species	287	1
2.	Dhudiya	Bombay Duck	<i>Harpadon nehereus</i>	280	2
3.	Titan	Lobster	<i>Panulirus</i> spp.	264	3
4.	Lepta	Ribbonfish	<i>Trichiurus lepturus</i>	250	4
5.	Karchala	Crab	<i>Scylla serrata</i>	143	5
6.	Bumla	Lizardfish	<i>Saurida tumbil</i>	106	6

7.	Khagi	Sole Fish	<i>Cynoglossus spp.</i>	75	7
8.	Kati	Threadfin	<i>Polynemus indicus</i>	62	8
9.	Kut	Flatfish	<i>Psettodes erumei</i>	22	9

Pagadiya fishers employing net fishing methods predominantly catch a diverse range of species, with Masli (general small fish) emerging as the most frequently reported, reflecting its abundance in the fishing zones. Following closely is Dhudiya (Bombay Duck), a species integral to local fisheries, known for its significant presence. Titan (Lobster), a high-value catch, ranks third, highlighting its importance in the fishers' economic activities.

Other notable species include Lepta (Ribbonfish) and Karchala (Crab), which rank fourth and fifth, respectively, further emphasizing the rich biodiversity of the region. Lower down the ranks, Bumla (Lizardfish) and Khagi (Sole Fish) continue to contribute meaningfully to the fishers' catch, albeit in smaller quantities. Rounding off the list are Kati (Threadfin) and Kut (Flatfish), which are less commonly caught but add to the diversity of the harvest.

Table 33 Fish Catch by small boat owners

SNo	Gujarati Name	English Name	Scientific Name	Rank
1.	Palva	Pomfret	<i>Pampus argenteus</i>	1
2.	Bumla	Lizardfish	<i>Saurida tumbil</i>	2
3.	Paplet	Pomfret	<i>Pampus argenteus</i>	3
4.	Surmai	Seer Fish	<i>Scomberomorus guttatus</i>	4
5.	Khagi	Sole Fish	<i>Cynoglossus spp.</i>	5
6.	Maghara	Shark	Various species	6
7.	Kut	Flatfish	<i>Psettodes erumei</i>	7

The data on fish catch by small boat owners reveals significant variations in species composition and fisher engagement across different blocks. In Bhavnagar, species like Palva, Bumla, and Paplet dominate the catch, with each involving 20 fishers (8.1% of the total). These are followed by Khagi and Kati, which engage 19 fishers each (7.69%), while Surmai is slightly less prominent at 6.48%.

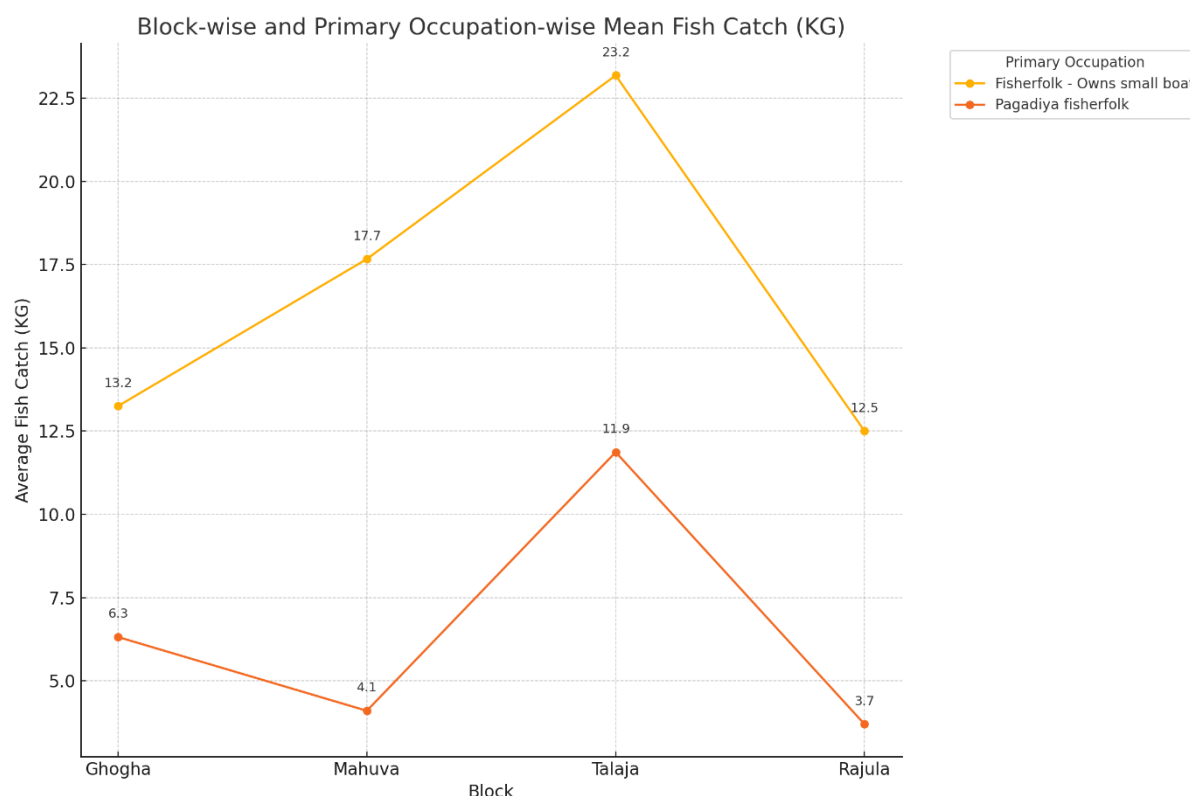
In Amreli, the highest engagement is seen with Jhinga, involving 25 fishers (10.68%), reflecting the abundance of this estuarine species. Other significant catches include Karchala (9.4%) and Lepta (9.83%), emphasizing the prevalence of nearshore and benthic species in this region.

Talaja emerges as a dominant block with the highest engagement for several species, including Dhudiya, Masli, and Maghara, each involving 160 fishers (65.57%). Other notable species include Titan (63.52%) and Lepta (59.02%), showcasing the ecological richness of the block.

In contrast, Ghogha exhibits a more balanced distribution of fish catches, with Palva (2.52%) and Surmai (2.88%) being the most commonly caught species. However, species like Lepta, Tīṭan, and Maghara are less prevalent, engaging fewer than 1% of fishers.

Overall, the analysis highlights Talaja as the most productive block in terms of diversity and fisher engagement, while Amreli shows a strong focus on estuarine species like Jhinga and Karchala. Bhavnagar demonstrates a balanced focus on midwater species, and Ghogha exhibits moderate engagement with no single dominant species.

Table 34 Average fish catch per day (KG)



The analysis reveals distinct variations in the average daily fish catch across blocks for Pagadiya fisherfolk and small boat owners:

1. Talaja reports the highest average fish catch for both groups, with small boat owners achieving 23.2 KG and Pagadiya fisherfolk reaching 12.4 KG, highlighting Talaja as the most productive block.
2. Mahuva has the lowest average for Pagadiya fisherfolk at 4.1 KG, reflecting lower productivity or access to fish resources in this block. Small boat owners in Mahuva also report relatively lower averages at 11.2 KG.
3. Rajula, placed last on the x-axis, demonstrates moderate averages of 10.5 KG for small boat owners and 6.7 KG for Pagadiya fisherfolk, indicating steady but less remarkable fishing outcomes.
4. Ghogha shows averages of 15.4 KG for small boat owners and 8.9 KG for Pagadiya fisherfolk, positioning it as a balanced block in terms of productivity.

The overall range of fish catch spans from a minimum of 4.1 KG (Mahuva, Pagadiya fisherfolk) to a maximum of 23.2 KG (Talaja, small boat owners), with an overall average across all blocks and occupations of 11.6 KG.

Chapter 5: Fishers' Life

Table 35 Constraints faced by the artisanal fishing households

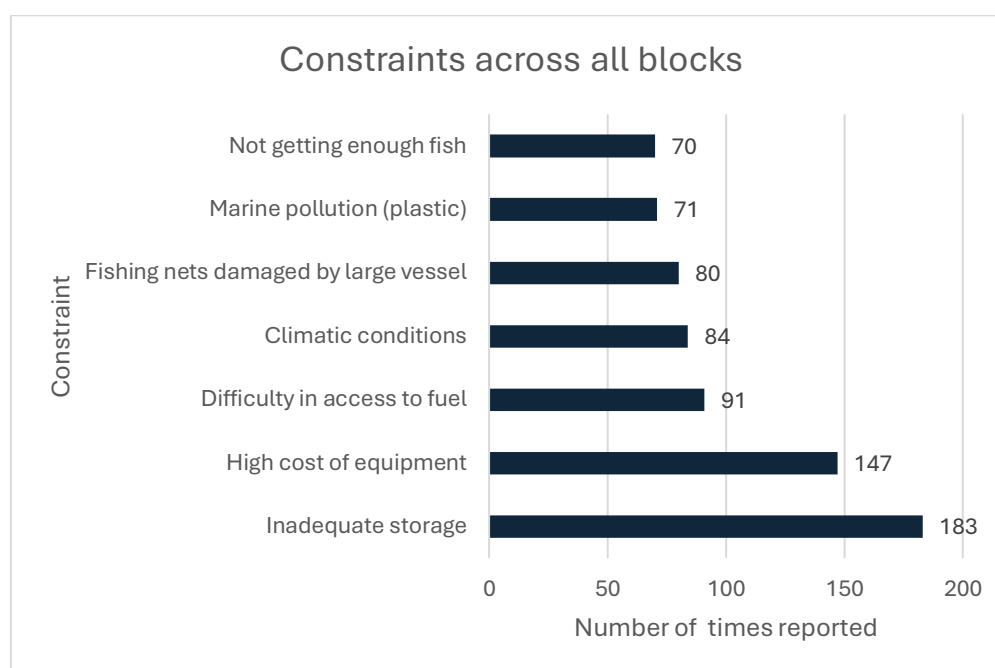


Table 36 Constraints across all blocks

Rank	Constraint	Frequency	Dominant Blocks
1	Inadequate storage	183	Mahuva (108), Rajula (28), Talaja (25)
2	High cost of equipment	147	Talaja (88), Ghogha (28), Mahuva (24)
3	Difficulty in access to fuel	91	Rajula (48), Mahuva (22), Talaja (14)
4	Climatic conditions	84	Talaja (38), Mahuva (20), Ghogha (15)
5	Fishing nets damaged by large vessel	80	Rajula (65), Mahuva (10), Talaja (4)
6	Marine pollution (plastic)	71	Ghogha (68), Rajula (2), Mahuva (1)
7	Not getting enough fish	70	Ghogha (38), Rajula (19), Mahuva (12)

Inadequate storage facilities are the most significant constraint, particularly in Mahuva where 108 cases were reported. High costs associated with equipment pose a major challenge in Talaja, with 88 cases highlighting this issue. Difficulty in accessing fuel is a prominent concern in Rajula, with 48 cases reported. Marine pollution is a critical issue in Ghogha, while Talaja reported no such concerns. Additionally, damage to fishing nets caused by large vessels is a significant problem in Rajula.

Figure 7 Conflict related issues

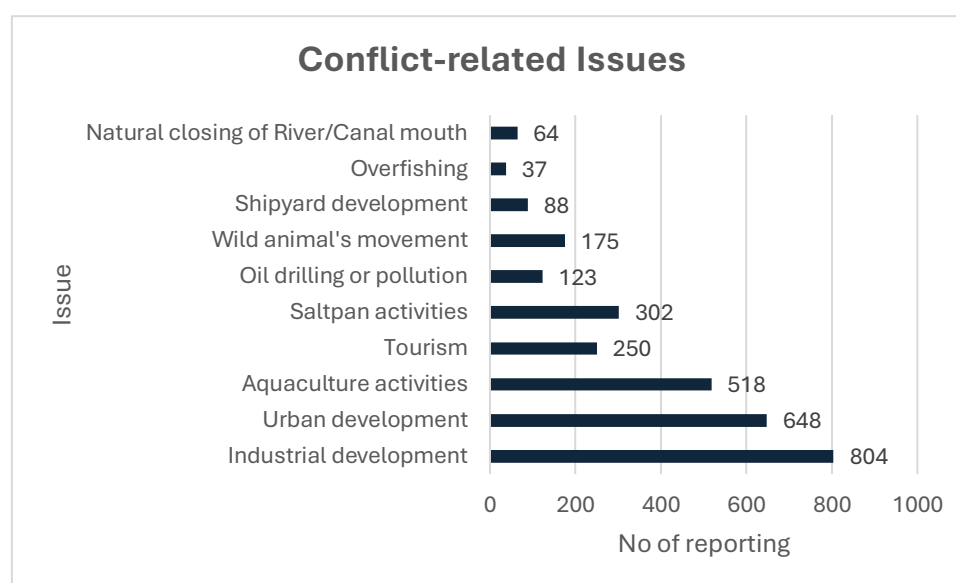


Table 37 Conflict related issues across the blocks

Rank	Conflict-related Issues	No. of reporting				
		Ghogha	Mahuva	Rajula	Talaja	Total
1	Industrial development	191	236	135	242	804
2	Urban development	172	189	126	161	648
3	Aquaculture activities	72	104	105	237	518
4	Tourism	105	20	109	16	250
5	Saltpan activities	40	36	153	73	302
6	Oil drilling or pollution	48	4	65	6	123
7	Wild animal's movement	13	119	43	0	175
8	Shipyard development	21	4	61	2	88
9	Overfishing	16	4	15	2	37
10	Natural closing of River/Canal mouth	24	16	22	2	64

The table above highlights the top conflict-related issues faced by artisanal fishers in four blocks, ranked by the total number of reports. Industrial development emerges as the most reported issue, with a total of 804 mentions across all blocks, particularly concentrated in Talaja (242 reports) and Mahuva (236 reports). Urban development follows closely with 648 reports, again showing the highest numbers in Ghogha (172 reports) and Mahuva (189 reports). These two issues are clearly the dominant concerns for the fishing communities, reflecting the impact of large-scale industrial activities and urban expansion on the livelihoods and ecosystems of artisanal fishers.

Voices from the Field — Saving Diesel, Cutting Nets

For Pagadiya fishers across the Katpar, Bandar and Lighthouse cluster, gear damage from passing cargo vessels is not an occasional accident but a daily event. “It’s continuous. It’s a daily thing. We repair it daily,” one fisherman said of large ships cutting through nets laid inside the stretch informally used for shore-based fishing. No shipping lane has ever been formally marked and enforced here; vessels instead follow whichever path saves the most fuel. “It runs on the direction of the wind... it’s not a government route. It’s their own route. They go as they please,” one fisherman explained, comparing it to cycling with or against the wind: “It’s all about saving diesel.”

The arrangement leaves artisanal fishers absorbing a cost that a clearly marked and enforced shipping corridor could largely prevent. Asked what this meant for them day to day, the answer was blunt: “they harass us. Nothing else.”

(Field Group Discussion, Katpar/Bandar/Lighthouse cluster, 5th November 2023)

Aquaculture activities rank third with 518 reports, particularly significant in Talaja, where it received the highest number of mentions (237 reports), pointing to tensions between fishers and the growth of aquaculture in the region. Other issues such as tourism (ranked fourth with 250 reports), saltpan activities (ranked fifth with 302 reports), and oil drilling or pollution (ranked sixth with 123 reports) also contribute significantly to the conflicts faced by the communities, especially in Rajula and Ghogha. Meanwhile, overfishing, shipyard development, and the natural closing of river/canal mouths appear less frequently as concerns. The issues highlighted here point to a broader conflict between traditional fishing practices and modern development pressures, emphasizing the need for sustainable development strategies that address the concerns of artisanal fishers.

Table 38 Perceptions of Artisanal fishers on the reliability of traditional fishing as a source of regular income

Do you believe traditional fishing remains a reliable source of regular income?	Block				Total
	Ghogha	Mahuva	Rajula	Talaja	
No	170	95	171	111	547
	72.65 %	38.93 %	61.51 %	44.94 %	54.54 %
Yes	64	149	107	136	456
	27.35 %	61.16 %	38.59 %	55.11 %	45.56 %
Total	234	244	278	247	1003
	100%	100 %	100 %	100 %	100 %

The contingency table presents the responses of artisanal fishers across four blocks (Ghogha, Mahuva, Rajula, and Talaja) regarding their belief in the reliability of traditional fishing as a source of regular

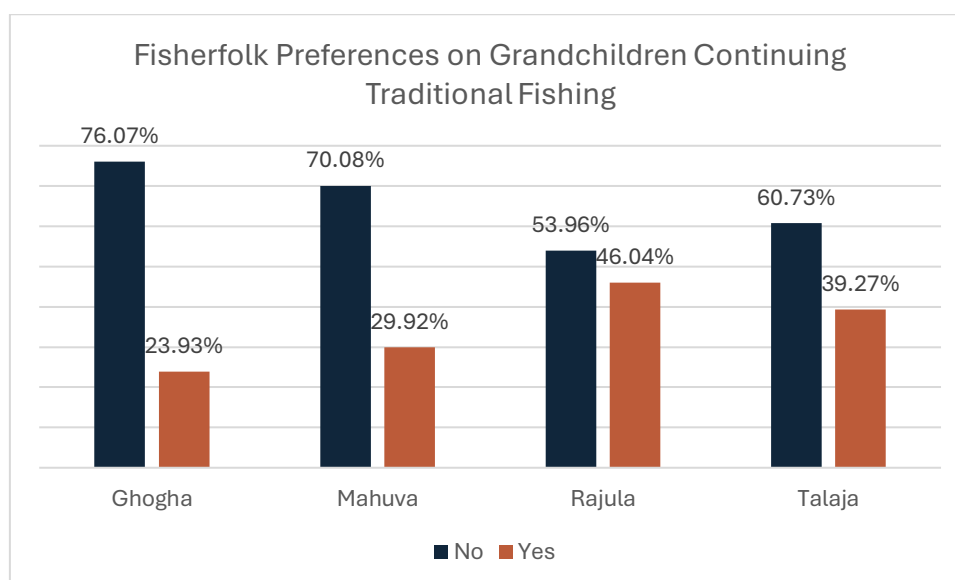
income. Out of 1003 respondents, 547 (54.5%) believe traditional fishing is no longer a reliable income source, while 456 (45.5%) maintain that it is still reliable.

The highest proportion of respondents who expressed doubts about the reliability of traditional fishing is from Ghogha (72.7%), followed by Rajula (61.5%). Mahuva has the highest proportion of respondents affirming traditional fishing's reliability at 61.1%, while Talaja also shows a majority believing in its reliability (55.1%).

The Chi-Squared test statistic ($X^2 = 69.548$) with a p-value of <0.001 indicates a statistically significant association between the responses and the blocks, suggesting that perceptions about the reliability of traditional fishing as a livelihood vary significantly across the blocks.

Table 39 Desire for Grandchildren to Continue Traditional fishing practices

Fisherfolk Preferences on Grandchildren Continuing Traditional Fishing	Ghogha	Mahuva	Talaja	Rajula	Total
No	178	171	150	150	649
	76.07%	70.08%	60.73%	53.96%	64.71%
Yes	56	73	97	128	354
	23.93%	29.92%	39.27%	46.04%	35.29%
Total	234	244	247	278	1003
	100%	100%	100%	100%	100%



Voices from the Field — “The Sea Is My Heart”

Not every account of artisanal fishing life is one of a wanted exit. In a group discussion spanning Katpar, Bandar and Lighthouse, when asked whether they would leave fishing for a job in a city like Ahmedabad, the response was immediate and collective. “We don’t want to leave,” one fisherman said. “Everyone has their life in the village. We were born here. How can

we leave our motherland?" Another put it more simply still: "The sea is my heart. The sea is my heart. We will never leave it. No matter what kind of job you offer, we won't go."

Children in the group described the same pull. Asked what he liked most about the sea, one boy answered without hesitation: fish, swimming, and going out "when it's raining." A parent confirmed the pattern extends across the household: "When he comes home from school, he will put his bag down and go straight to the seashore." This attachment sits alongside the same communities' acknowledgement, reflected elsewhere in this study, that fishing alone increasingly cannot support a family — a reminder that the choice facing many young people here is not simply between an unwanted tradition and a better life, but between a livelihood they love and one that no longer reliably sustains them.

(Field Group Discussion, Katpar/Bandar/Lighthouse cluster, 5th November 2023)

The data presented in the table reflects the responses of artisanal fishers from four blocks regarding the continuation of traditional fishing practices by their grandchildren. The majority of respondents across all blocks (64.7%) expressed that they do not wish for their grandchildren to carry on the tradition of traditional fishing. Ghogha recorded the highest percentage of such responses at 76.1%, followed by Mahuva at 70.1%, Rajula at 54%, and Talaja at 60.7%.

On the other hand, a smaller percentage of respondents, totalling 35.3%, expressed a desire for their grandchildren to continue traditional fishing. The highest proportion of "Yes" responses came from Rajula (46.0%) and Talaja (39.3%), while Ghogha (23.9%) and Mahuva (29.9%) had lower percentages. The Chi-Square test results ($X^2 = 32.092$, $p < 0.001$) indicate that the differences in responses across the blocks are statistically significant, suggesting that regional variations in attitudes toward the continuation of traditional fishing exist.

Table 40 Perception of the need to Improve fisheries extension services

Need to Improve Fisheries extension services	Ghogha	Mahuva	Talaja	Rajula	Total
No	24	64	79	136	303
	10.26%	26.23%	31.98%	48.92%	30.21%
Yes	210	180	168	142	700
	89.74%	73.77%	68.02%	51.08%	69.79%
Total	234	244	247	278	1003
	100%	100%	100%	100%	100%

The table presents the responses from artisanal fisherfolk across four blocks regarding the need to improve fisheries extension services to promote technology adoption and reduce losses. A clear majority of respondents in all blocks, with a total of 69.79%, believe that there is a need to improve these services, as indicated by the "Yes" responses. The highest support for this viewpoint is observed in Ghogha (89.74%), followed by Mahuva (73.77%), Talaja (68.02%), and Rajula (51.08%).

In contrast, the "No" responses were relatively low, with the highest proportion seen in Rajula (48.92%). The overall data suggests a strong consensus among fisherfolk that enhanced fisheries extension services are necessary to address challenges, promote the adoption of modern technologies, and reduce losses.

Table 41 Perception of work-life balance: time spent with family by fisherfolk in traditional fishing

Is fishing allowing the fisherfolk to spend enough time with the family (work-life balance)?	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No	172	118	111	157	558
	73.50 %	48.36 %	44.94 %	56.47 %	55.63 %
Yes	62	126	136	121	445
	26.50 %	51.64 %	55.06 %	43.53 %	44.37 %
Total	234	244	247	278	1003
	100 %	100 %	100 %	100 %	100 %

The table highlights the perception of work-life balance among fisherfolk, specifically regarding whether fishing allows them to spend enough time with their families. Overall, 55.63% of respondents across the surveyed blocks indicated that fishing does not allow sufficient time for family, while 44.37% believed it does.

Among the blocks, Ghogha reported the highest proportion of fisherfolk (73.50%) expressing dissatisfaction with work-life balance, followed by Rajula (56.47%) and Mahuva (48.36%). In contrast, Talaja had the highest percentage (55.06%) of respondents who felt they could maintain a good work-life balance, followed by Mahuva (51.64%) and Rajula (43.53%).

Table 42 Alcohol consumption prevalence among the fisherfolk

Alcohol consumption prevalence among the fisherfolk	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No	192	52	64	130	438
	82.05 %	21.31 %	25.91 %	46.76 %	43.67 %
Yes	42	192	183	148	565
	17.95 %	78.69 %	74.1 %	53.24 %	56.33 %
Total	234	244	247	278	1003
	100 %	100 %	100 %	100 %	100 %

The table presents the prevalence of alcohol consumption among the fisherfolk in the surveyed blocks. Overall, 56.33% of the respondents reported consuming alcohol, while 43.67% stated they did not.

The block-wise analysis shows a significant variation in alcohol consumption. Mahuva had the highest percentage of alcohol consumption, with 78.69% of respondents reporting alcohol use, followed by Talaja at 74.09%, and Rajula at 53.24%. Ghogha had the lowest prevalence, with only 17.95% of respondents consuming alcohol.

Table 43 Prevalence of health issues among fisherfolk communities

Block	Highest Issue	Value
Ghogha	Skin Disease	216
Mahuva	Skin Disease	238
Talaja	Skin Disease	238
Rajula	Worm Infestation	134

Health Issues	Ghogha	Mahuva	Talaja	Rajula	Total	Rank
Skin Disease	214	236	236	60	746	1
Gastric Problem	170	104	69	126	469	2
Worm Infestation	103	24	70	134	331	3
Psychological Imbalance/Suicide	11	5	58	132	206	4
Anaemia	37	115	204	43	399	5
Snakebite	38	144	70	124	376	6
Heart Attack	58	22	7	45	132	7
Sexually Transmitted Diseases	4	34	17	95	150	8
Diabetes	40	44	8	10	102	9
Cancer	25	2	0	65	92	10

The table sheds light on the pressing health concerns facing fisherfolk communities across four blocks - Ghogha, Mahuva, Talaja, and Rajula. A grim picture emerges, with Skin Disease dominating the list, a testament to the harsh realities of life at sea and potential occupational hazards. Following closely are Gastric Problems, reflecting the challenges of maintaining a healthy diet and accessing proper sanitation in coastal environments.

A particularly alarming trend is the high prevalence of Psychological Imbalance/Suicide, ranking fourth among the reported health issues. This underscores the need for increased mental health support and awareness within these communities. While Anemia and Snakebite are expected concerns given the nature of their work, the significant number of cases warrants attention. The data reveals stark regional variations. While Skin Disease is a prevalent concern across all blocks, Psychological Imbalance/Suicide appears to be a more significant issue in Rajula.

Chapter 6: Participation in Fisherfolk Associations

Table 44 Presence of fisherfolk organisations at the Village level

Does your village have a fisherfolk association?	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No/ not aware	70 (60.34 %)	85 (34.98 %)	108 (44.44 %)	188 (71.21 %)	451 (52.08 %)
Yes	46 (39.66 %)	158 (65.02 %)	135 (55.56 %)	76 (28.79 %)	415 (47.92 %)
Total	116	243	243	264	866

The data reveals significant variations in the awareness and presence of fisherfolk associations across the four surveyed blocks Ghogha, Mahuva, Talaja, and Rajula. Overall, just under half of the respondents (47.92%) confirmed the existence of fisherfolk associations in their villages, while a slight majority (52.08%) either lacked such associations or were unaware of their presence.

Mahuva stands out as the block with the highest level of awareness or association presence, with 65.02% of respondents affirming their existence. This indicates a strong organisational framework or effective community engagement efforts within the block. Talaja also performed well, with 55.56% of respondents confirming the presence of fisherfolk associations, showcasing its potential as a region with relatively active community structures.

In contrast, Rajula reported the lowest awareness, with 28.79% of respondents indicating the presence of or unawareness about fisherfolk associations. Ghogha followed, with 60.34% of respondents in a similar category. These findings suggest that these two blocks may lack sufficient outreach, visibility, or establishment of fisherfolk associations, leaving communities less organised and possibly more vulnerable to challenges in their livelihoods.

Table 45 Membership in fisherfolk Association at Village level

Are you a member of the fisherfolk association?	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No	32	37	103	48	220
	78.05 %	23.57 %	76.87 %	63.16 %	53.92 %
Yes	9	120	31	28	188
	21.95 %	76.43 %	23.13 %	36.84 %	46.08 %
Total	41	157	134	76	408
	100%	100 %	100 %	100 %	100 %

Out of the 415 individuals who reported that their village has a fisherfolk association, 408 individuals responded to the question about their personal membership in such associations. Among these, 188 individuals (46.08%) indicated that they are members of a fisherfolk association, while the remaining 220 individuals (53.92%) stated that they are not members.

The membership distribution varies significantly across the blocks:

- Mahuva stands out with the highest membership rate, as 76.43% (120 out of 157 respondents) confirmed their participation in fisherfolk associations. This highlights a strong culture of community engagement and organisational involvement in the block.
- Ghogha and Talaja, on the other hand, show the lowest membership rates, with only 21.95% (9 out of 41 respondents) and 23.13% (31 out of 134 respondents), respectively, being members. A vast majority in these blocks—78.05% in Ghogha and 76.87% in Talaja—reported not being members, suggesting either limited access or awareness about these associations.
- In Rajula, the membership rate is moderate, with 36.84% (28 out of 76 respondents) confirming participation, while the remaining 63.16% are not members.

Receiving the training: Out of the 188 individuals who are members of fisherfolk associations, 125 (66.49%) reported having received training from their respective associations, while 63 (33.51%) stated they had not received any training.

Chapter 7: Awareness on Fisheries Institutes and Knowledge-Seeking Behaviour

Table 46 Fisher's Awareness on fisheries institutes

Fisher's Awareness on Fisheries Institutes	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No. of Fishers	Percent (%)	No. of Fishers	Percent (%)	No. of Fishers	Percent (%)	No. of Fishers	Percent (%)
Central Marine Fisheries Research Institute (CMFRI)	1	0.4	0	0	2	0.82	14	5.04
National Fisheries Development Board (NETFISH)	0	0	2	0.85	0	0	8	2.88
Fishery Survey of India	0	0	8	3.42	0	0	8	2.88
Central Institute of Fisheries Technology (CIFT)	0	0	2	0.85	0	0	10	3.6
Central Institute of Fisheries Nautical and Engineering Training (CIFNET)	0	0	0	0	1	0.41	3	1.08
Department of Fisheries, Bhavnagar	0	0	3	1.28	0	0	3	1.08
M. S. Swaminathan Research Foundation (MSSRF)	0	0	1	0.43	0	0	6	2.16
Fisheries Research and Training Centre, Mahuva	0	0	57	24.36	166	68.03	21	7.55

The table highlights a significant disparity in awareness levels among fisherfolk regarding key fisheries research and training institutions across the four blocks. Awareness of national-level institutions such as CMFRI, NETFISH, FSI, CIFT, and CIFNET remains generally low across all blocks, indicating a gap in information dissemination and outreach efforts from these institutions to fisherfolk communities. In contrast, Mahuva stands out with a notable 68.03% of fishers aware of the Fisheries Research and Training Centre, Mahuva, reflecting a strong local influence and potentially better outreach by this specific institution. On the other hand, Ghogha and Rajula show the lowest awareness levels across all institutions, pointing to a critical need for enhanced information dissemination and outreach in these regions.

Table 47 Fisher's source of Information

Source of Information	Talaja (N=247)		Ghogha (N=234)		Mahuva (N=244)		Rajula (N=278)	
	No of fisher	Perc ent	No of fisher	Perc ent	No of fisher	Perc ent	No of fisher	Perc ent
Central Marine Fisheries Research Institute (CMFRI)	0	0	0	0	0	0	2	0.72
Central Institute of Fisheries Technology (CIFT)	0	0	2	0.85	1	0.41	5	1.8
M. S. Swaminathan Research Foundation (MSSRF)	0	0	0	0	0	0	1	0.36
Fisheries Research and Training Centre, Mahuva	0	0	8	3.42	70	28.69	5	1.8
Department of Fisheries, Bhavnagar	1	0.4	14	5.98	0	0	0	0
College of Fisheries Science	0	0	1	0.43	0	0	1	0.36
TV	0	0	15	6.41	1	0.41	18	6.47
WhatsApp	1	0.4	35	14.96	1	0.41	5	1.8
Radio	0	0	7	2.99	1	0.41	2	0.72
Newspaper	0	0	38	16.24	0	0	13	4.68
Fisherfolk Association	1	0.4	8	3.42	0	0	17	6.12
Internet	0	0	37	15.81	0	0	11	3.96

The data highlights regional variations in the sources of information accessed by fisherfolk in Talaja, Ghogha, Mahuva, and Rajula. In Mahuva, the Fisheries Research and Training Centre, Mahuva stood out as the most relied-upon source, with a significant 28.69% of fisherfolk referring to it. Additionally, WhatsApp was used by 1.8% of the fisherfolk in Rajula, while television was a key source of information in both Ghogha (6.41%) and Rajula (6.47%). Newspapers had a notable presence in Ghogha (16.24%) but were less significant elsewhere. Moreover, radio and internet usage were also more common in Ghogha, with 15.81% of its fisherfolk relying on the internet, followed by Rajula at 3.96%.

Conversely, Talaja demonstrated minimal reliance on most information sources, with only WhatsApp and Department of Fisheries, Bhavnagar seeing a small fraction of usage (0.4%). CIFT and MSSRF had limited engagement across the regions, with Mahuva showing a slight interest in these sources. Interestingly, Fisherfolk Associations and College of Fisheries Science were utilized less frequently, except in Rajula, where the Fisherfolk Association saw a higher level of engagement (6.12%). Overall, the findings suggest that while Mahuva and Rajula have relatively diverse information channels, Ghogha and Rajula, especially in terms of television, internet, and newspapers, rely more on mass media sources.

Voices from the Field — The Forms We Never Filled

When government relief follows a cyclone in Chanch, it reliably reaches the village's boat owners — and just as reliably bypasses its Pagadiya fishers. “Pagadiya people didn't get anything, only big boats,” one resident said, describing a pattern the research team heard repeated in nearly identical terms across several villages.

Part of the problem is design, not eligibility. A twice-yearly government scheme distributing cycles, storage boxes and other equipment to Pagadiya households now runs entirely online — and no one in the group had filled out the form. Fishers could name a scheme they had benefited from before (Manav Garima) but not the process for the newer one, and support received fifteen years earlier through Utthan and the Fisheries Department had not been repeated since. As the research team noted while explaining the online application process to the group, the barrier was not awareness of the scheme's existence but the format it now required. The gap is one of reach, not rules: benefits calibrated for larger ports like Jafrabad, Porbandar and Veraval simply do not arrive, by design, in villages the size of Chanch.

(Fisher interview, 6th Nov. 2023, Chanch)

Chapter 8: Market and Selling Practices

Table 48 Place of selling the fish

Where do you sell the fish if you are fishing or buying and selling them?	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
Local market - Retail	37	26	88	86	237
	37.37 %	12.21 %	37.45 %	58.11 %	34.10 %
Within the Village - Fish traders	10	24	28	5	67
	10.10 %	11.27 %	11.91 %	3.38 %	9.64 %
Within the Village – Retail sellers /customers	52	163	119	57	391
	52.53 %	76.53 %	50.64 %	38.51 %	56.26 %
Total	99	213	235	148	695
	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

The data reveals the primary markets where fishers sell their catch across the different blocks. In Ghogha, 37.37% of respondents sell fish at local retail markets, while 52.53% opt for selling within the village to retailers. Mahuva shows a similar pattern, with 76.53% selling directly to retailers in the village, and 12.21% selling in the local market. In Talaja, the distribution is more balanced, with 37.45% selling at local markets and 50.64% selling within the village to retailers. Rajula stands out with 58.11% of fishers selling in the local market and 38.51% selling within the village to retailers. Fish traders within the village account for a small percentage of sales across all blocks, with the highest proportion in Mahuva (11.27%) and the lowest in Rajula (3.38%). Overall, a significant majority

(56.26%) of fishers sell within the village, highlighting the importance of local retail networks for fish distribution.

The analysis of selling patterns based on boat ownership and selling methods reveals that among those owning small boats, 53.49% sell their catch within the village to Retail sellers /customers, 27.91% sell to fish traders in the village, and 18.60% sell at local retail markets. Pagadiya fisherfolk predominantly sell within the village to Retail sellers /customers, with 63.17% of respondents following this route. A smaller proportion (28.91%) of Pagadiya fishers sell at local retail markets, and only 7.92% sell to village fish traders. For those involved in buying and selling fish, 50.81% sell at local retail markets, 39.46% sell within the village to Retail sellers /customers, and 9.73% sell to village fish traders. This shows that selling within the village is most common among those owning small boats and Pagadiya fishers, while fishers involved in buying and selling fish are more likely to use local markets.

Table 49 Practice of segregating and selling of fish catch

Do you segregate different fish varieties before selling them?	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No	27	46	54	79	206
	26.73 %	21.90 %	23.18 %	49.07 %	29.22 %
Yes	74	164	179	82	499
	73.27 %	78.10 %	76.82 %	50.93 %	70.78 %
Total	101	210	233	161	705
	100%	100%	100%	100 %	100 %

Voices from the Field — Eight Rupees, Eighteen Rupees

Fishers in the Katpar-Bandar-Lighthouse cluster describe a market structure where the largest margins go to whoever stands between the water and the buyer, not to the people doing the fishing. “That Pirbhai... we give him fish at eight rupees. He earns eight rupees himself for no effort,” one fisher said of a local contractor controlling access to a shared creek fishery. A visiting fisheries trainer, drawing a comparison to onion farming, put the arithmetic starkly: “They take onions from us for one rupee and sell them in the market for 10 rupees. They earn nine rupees without any effort. After all our hard work, we earn just one rupee.”

One proposal raised in the same discussion was for young, literate members of the community itself to take on the middleman’s role — buying the catch directly from fishers and selling it onward — so that the margin currently captured by outside traders could stay within the village. Whether such a change is realistic depends on capital, trust and existing relationships within these tightly-knit fishing communities, but the arithmetic fishers themselves point to —

a nine-fold markup on onions, and a comparable gap between what one contractor pays and what he must be earning — makes clear how much value currently leaves these villages with the trader rather than the producer.

(Field Group Discussion, Katpar/Bandar/Lighthouse cluster, 5th November 2023)

The data shows the fish segregation practices among the pagadiya fishers and small boat owners before selling. A majority of fishers segregate different fish varieties, with 73.27% in Ghogha, 78.10% in Mahuva, 76.82% in Talaja, and 50.93% in Rajula reporting that they do so. Overall, 70.78% of fishers across all blocks separate fish varieties before selling. In contrast, 29.22% of fishers, including 26.73% in Ghogha, 21.90% in Mahuva, 23.18% in Talaja, and 49.07% in Rajula, do not segregate the fish before sale. This indicates that while segregation is common across the blocks, a notable portion of fishers in Rajula do not practice it.

Usage of weighing scales: The usage of weighing scales for selling fish varies across blocks. Overall, 62.71% of fishers use weighing scales, while 37.29% do not. Ghogha (70.30%), Mahuva (72.04%), and Talaja (63.09%) show high usage rates, indicating a preference for precise weight-based transactions. However, in Rajula, only 45.40% of fishers use weighing scales, with 54.60% relying on other methods.

Practice of bonded selling: Among fisherfolk who own small boats, 37.21% (16 out of 43) report engaging in bonded sales with traders, while a majority of 62.79% (27 out of 43) do not. Similarly, for Pagadiya fisherfolk, 31.48% (147 out of 467) engage in bonded sales, while 68.52% (320 out of 467) do not.

Chapter 9: Climate Change, Disasters, and Migration

Table 50 Decline in fish diversity and population in the coast

There is a decline in fish diversity and population in the coast	Occupation				Total
	Fisherfolk - Owns small boat	Labour in the fishing boat	Pagadiya fisherfolk	Selling of fish	
No	10	45	143	76	274
	24.39 %	41.28 %	28.43 %	39.18 %	32.35 %
Not aware	2	20	136	45	203
	4.88 %	18.35 %	27.04 %	23.20 %	23.97 %
Yes	29	44	224	73	370
	70.73 %	40.37 %	44.53 %	37.63 %	43.68 %
Total	41	109	503	194	847
	100 %	100 %	100 %	100 %	100 %

The table reveals the perceptions of fishers along the Gujarat coast regarding the decline in fish diversity and population. Among the different categories of occupation:

- A significant proportion (70.73%) of fisherfolk who own small boats believe that there has been a decline in fish diversity and population, with fewer acknowledging it as a concern in the other categories (e.g., 40.37% of labourers on fishing boats and 37.63% of those selling fish).
- The category with the highest percentage of individuals unaware of the issue is the "Pagadiya fisherfolk" (27.04%), followed by fish sellers (23.20%) and small boat owners (4.88%).
- While a substantial 43.68% of all respondents agree that fish populations have decreased, a notable 23.97% are unaware of any changes, suggesting a lack of awareness in some segments of the fishing community.

In conclusion, the decline in fish diversity and population is widely observed, especially among boat owners and fish sellers, while awareness of the issue is less pronounced among labourers and pagadiya fisherfolk.

Block wise analysis: In terms of the observed decline in fish diversity and population, the highest proportion of respondents acknowledging this issue is from Ghogha Block, where 61.06% report a decline. This is followed by Mahuva Block, with 44.58% of respondents agreeing on the decline. In Talaja Block, 40.93% of respondents observe a decline, while Rajula Block has 37.74% acknowledging the decrease in fish populations.

Table 51 Awareness of Bycatch Impacts on fish stocks among fisherfolk

Do you believe that the increased capture of non-targeted juvenile fish could be a factor contributing to the overall decrease in fish catch?	Fisherfolk - Owns small boat	Labour in the fishing boat	Pagadiya fisherfolk	Selling of fish	Total
No	11	41	155	71	278
	25.58 %	37.96 %	30.75 %	36.41 %	32.71 %
Not aware	5	38	126	41	210
	11.63 %	35.19 %	25.00 %	21.03 %	24.71 %
Yes	27	29	223	83	362
	62.79 %	26.85 %	44.25 %	42.56 %	42.59 %
Total	43	108	504	195	850
	100 %	100 %	100 %	100 %	100 %

The data reflects the perspectives of different groups within the fishing community regarding the belief that increased capture of non-targeted juvenile fish contributes to the overall decrease in fish catch.

- A majority (42.59%) of respondents across all categories believe that the increased capture of juvenile fish is a contributing factor to reduced fish catch, with 62.79% of small boat owners, 44.25% of Pagadiya fisherfolk, and 42.56% of fish sellers agreeing with this view.
- A smaller proportion (32.71%) disagrees, with 25.58% of small boat owners, 30.75% of Pagadiya fisherfolk, and 36.41% of fish sellers answering "No."
- A significant portion (24.71%) is not aware of the issue, with 35.19% of boat labourers and 21.03% of fish sellers indicating a lack of awareness.

The block wise analysis shows that

- Ghogha: 50.43% believe the capture of juvenile fish is a contributing factor, 35.65% disagree, and 13.91% are unaware.
- Mahuva: 57.50% believe in the negative impact, 24.58% disagree, and 17.92% are unaware.
- Talaja: 51.05% believe in the negative impact, 34.60% disagree, and 14.35% are unaware.
- Rajula: 17.44% believe in the negative impact, 37.21% disagree, and 45.35% are unaware.

Overall, 42.59% of respondents across all blocks believe that juvenile fish capture contributes to the decline in fish catch, 32.71% disagree, and 24.71% are unaware. Awareness is strongest in Ghogha, Mahuva, and Talaja, while Rajula shows the lowest belief and the highest proportion of unaware respondents.

Table 52 Natural calamities that impacting the fisherfolk

Occupation	Cyclone	Drought	Earthquake	Salinity Increase	Increase in Temperature	Irregular Rainfall
Fisherfolk - Owns Small Boat	22	10	0	9	7	0
Labour in the Fishing Boat	57	26	0	3	12	0
Pagadiya Fisherfolk	211	124	0	68	93	10
Selling of Fish	65	44	2	44	28	5

The fishing community faces a range of climate-related stressors, with each occupational group experiencing varying degrees of impact. Among them, Pagadiya Fisherfolk (N=497) emerge as the most vulnerable, particularly to cyclones, droughts, salinity increases, and rising temperatures. Their traditional, small-scale fishing methods leave them exposed to harsh environmental changes, as seen in their significant challenges with cyclones (211 times reported) and droughts (124 times reported). They also face the highest struggles due to salinity increase (68) and rising temperatures (93), which directly affect fish habitats and availability.

Labourers in fishing boats, though somewhat less affected than Pagadiya Fisherfolk, also report considerable difficulties. Cyclones (57) and droughts (26) are their primary concerns, though salinity increase (3) and temperature rise (12) appear to pose limited challenges to their work.

For those selling fish (N=198), the impacts are more varied. They report significant disruption due to droughts (44) and salinity increase (44), while cyclones (65) and temperature rise (28) also challenge their livelihoods. Interestingly, they are one of the few groups to cite earthquakes (2) as a minor concern, possibly due to infrastructure or transportation vulnerabilities.

In the same way, small boat-owning fisherfolk (N= 43), with cyclones (22) and droughts (10) being their primary stressors. Their smaller scale and perhaps more localized fishing activities might shield them slightly from other stressors, such as salinity increases (9) and temperature changes (7).

Overall, the results highlight the stark vulnerabilities of Pagadiya Fisherfolk, who bear the brunt of nearly all climate stressors. Labourers, fish sellers and small boat owners experience moderate challenges.

Table 53 Impact of Natural Calamities, Including Cyclones, on Families in the Last 5 Years

Has your family been affected by any natural calamities, including cyclones in the last 5 years?	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
No	26	25	42	74	167
	22.41 %	10.46 %	17.36 %	28.79 %	19.56 %
Not aware	17	66	58	103	244
	14.66 %	27.62 %	23.97 %	40.08 %	28.57 %
Yes	73	148	142	80	443
	62.93 %	61.92 %	58.68 %	31.13 %	51.87 %
Total	116	239	242	257	854
	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

Over the last five years, natural calamities, including cyclones, have significantly impacted coastal blocks, with Ghogha and Mahuva showing the highest vulnerability. In Ghogha, 62.93% (73 families) reported being affected, the highest among the blocks, while 61.92% (148 families) in Mahuva also reported impacts, though a notable 27.62% (66 families) in Mahuva were unaware of the events. Talaja followed closely, with 58.68% (142 families) affected, though a considerable 23.97% (58 families) were unaware of the calamities. In contrast, Rajula reported the lowest impact, with only 31.13% (80 families) affected, while 40.08% (103 families) were unaware, and 28.79% (74 families) reported no impact.

Overall, across the four blocks, 51.87% (443 families) reported being affected, highlighting widespread vulnerability, while 28.57% (244 families) were unaware of the events, and 19.56% (167 families) did not experience any impact.

Voices from the Field — “We Are Sea Farmers Too”

Katpar-Bandar sits inside a designated cyclone zone that sees one major cyclone every two to three years and three or four smaller ones annually — yet its fishers say they have never received the kind of disaster compensation routinely extended to farmers for damaged crops. “We didn’t get a single penny from the Government,” one woman said. “Usually the Government gives compensation or financial help to farmers, but we did not get any. We are also kind of ‘sea farmers.’”

The comparison is more than rhetorical: like farmers, Pagadiya fishers lose their primary productive asset — nets left in the water — to weather they cannot control, yet fall outside compensation frameworks built around agricultural loss. Some relief now exists on paper: boat owners in the village have recently gained access to an insurance scheme, but Pagadiya fishers whose nets are damaged still have no equivalent cover. Even those who qualify rarely file a claim. “Because it is a very costly and tedious process,” one fisherman explained — a reminder that eligibility on paper is not the same as access in practice.

(Fisher interview, 5th Nov. 2023, Katpar-Bandar)

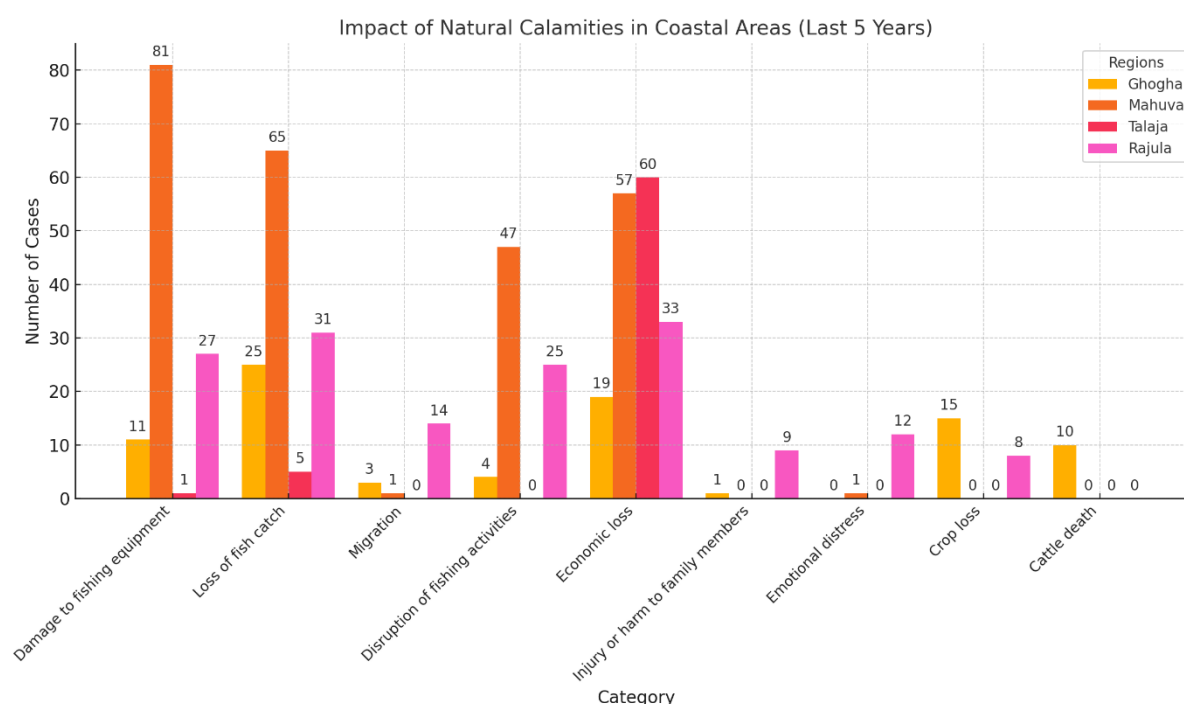
Voices from the Field — When the Net Cannot Be Saved

Of the fifteen to twenty Pagadiya fishing families in Ucha Kotda, only two own boats; everyone else depends entirely on nets set by hand and left in the shallows. That dependence became a liability during the last major cyclone: as the storm approached, police barred fishers from entering the water to retrieve their equipment. “Our net is already there unattended,” one woman recalled, “and that is how we lost everything.”

With no boat to fall back on and no insurance covering Pagadiya gear, the loss of a single net in a single storm can end a household’s fishing income outright. Residents describe catches that were already shrinking before the storm — down to small prawns and Boya fish — which they attribute to chemical discharge from passing boats and waste left behind by weekend picnickers: “people are dumping their waste in the sea and our livelihood is over.” “No one helped us” was the refrain that followed almost every question about recovery, whether from the cyclone or from the slower damage done by pollution.

(Fisher interview, 5th Nov. 2023, Ucha Kotda)

Figure 8 Impact of natural calamities on study participants and their families in coastal areas

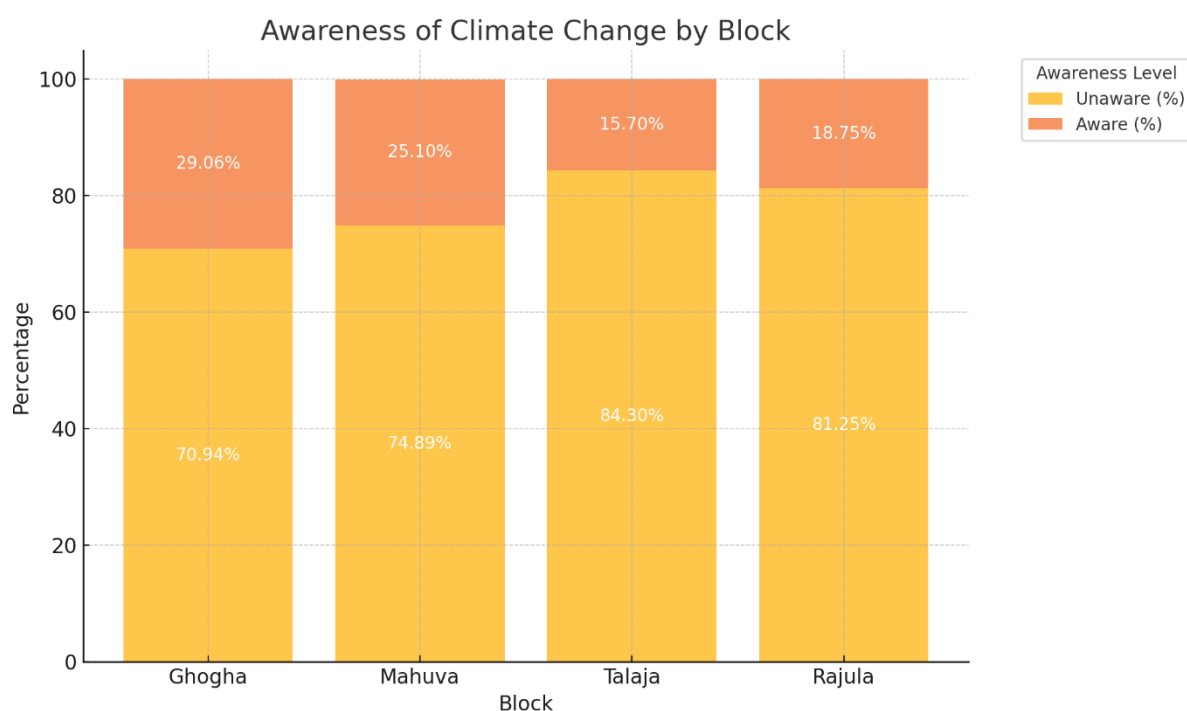


Over the past five years, natural calamities have severely disrupted the livelihoods of fisherfolk in Ghogha, Mahuva, Talaja, and Rajula. Economic losses, affecting 169 families, were compounded by the destruction of fishing equipment (120 cases) and the loss of fish catch (126 cases). Mahuva experienced the most significant disruption, with 47 instances of halted fishing activities, while Rajula faced high emotional distress and forced migration. These events underline the fragility of coastal livelihoods and the urgent need for support. The impact extended beyond fishing, with 23 crop losses and 10 cattle deaths, further destabilizing families dependent on multiple income sources. Migration, emotional tolls, and injuries illustrate the personal hardships endured, particularly in Mahuva and Rajula. While Ghogha and Talaja fared slightly better, economic losses and equipment damage highlight their vulnerability.

Table 54 Awareness of Climate change

Block	Unaware	Unaware (%)	Aware	Aware (%)	Total	Total (%)
Ghogha	83	70.94	34	29.06	117	100
Mahuva	179	74.89	60	25.1	239	100
Talaja	204	84.3	38	15.7	242	100
Rajula	208	81.25	48	18.75	256	100
Total	674	78.92	180	21.08	854	100

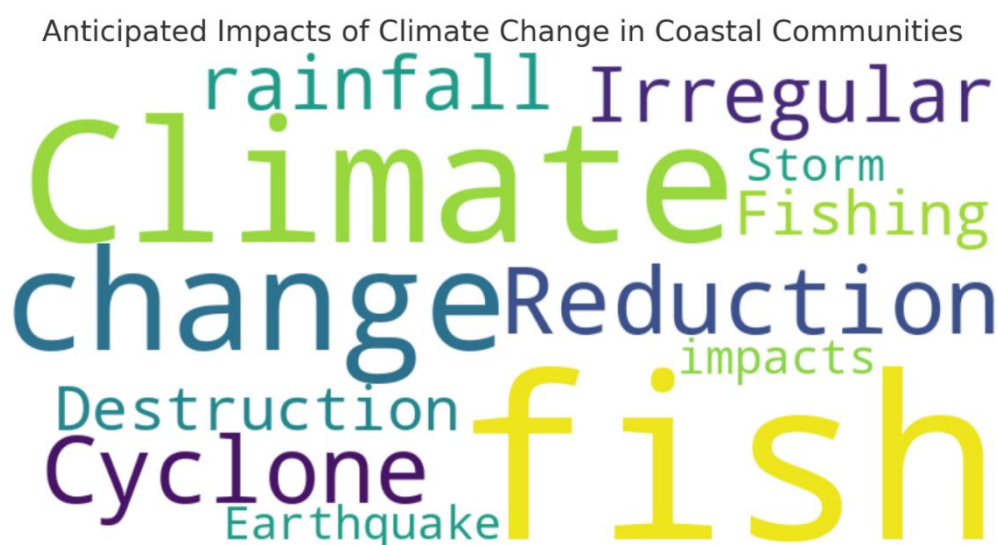
Figure 9 Awareness of Climate change by block



The data reveals significant gaps in climate change awareness among fisherfolk across the surveyed blocks. Overall, **78.92%** of respondents are unaware, with **Rajula (81.25%)** and **Talaja (84.30%)** reporting the highest levels of unawareness. **Mahuva (74.89%)** and **Ghogha (70.94%)** follow closely, indicating widespread knowledge gaps across all regions.

In contrast, only **21.08%** of respondents across all blocks report being aware of climate change. **Ghogha (29.06%)** has the highest proportion of aware respondents, followed by **Mahuva (25.10%)**, while **Talaja (15.70%)** and **Rajula (18.75%)** show much lower levels of awareness.

Figure 10 Anticipated Climate Change Impacts

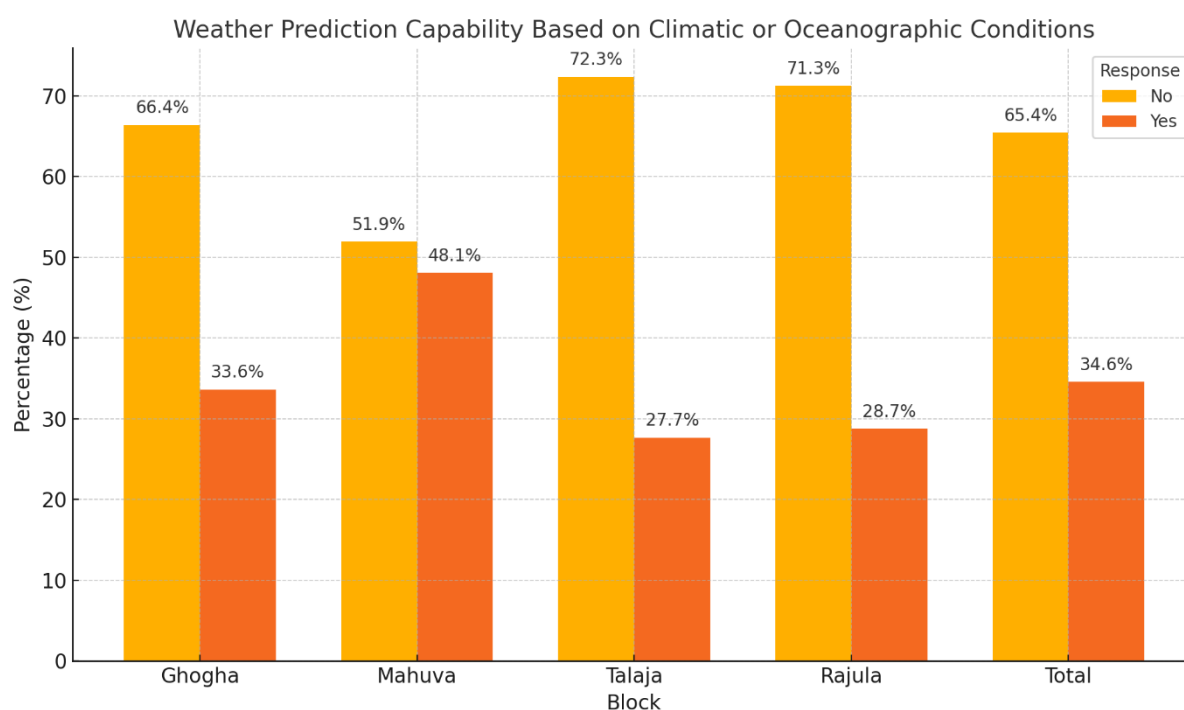


The word cloud captures the anticipated impacts of climate change as reported by coastal communities over the next 5-10 years. Key concerns such as **"Climate change," "Cyclone,"** and

"Storm" highlight the increasing threat of extreme weather events. Cyclones, in particular, were frequently mentioned by respondents from Ghogha, where such events are known to have a significant impact on livelihoods and infrastructure. Similarly, **"Irregular rainfall"** reflects concerns over unpredictable weather patterns that can disrupt fishing activities and affect water-dependent ecosystems.

Terms like **"Reduction in fish"** and **"Destruction of fish"** reflect widespread anxiety about the dwindling fish stocks, which directly threaten the primary livelihood of these communities. These concerns were most prominently reported in Mahuva and Rajula, where fishing forms a critical economic backbone. Additionally, **"Earthquake"** underscores fears of geological instability, albeit reported less frequently but with potential catastrophic implications. Together, these terms provide a snapshot of the multifaceted vulnerabilities faced by these communities, underscoring the pressing need for climate adaptation strategies and resilience-building measures in regions like Ghogha and Mahuva, where these concerns are particularly acute.

Figure 11 Weather prediction capability based on climatic or oceanographic conditions

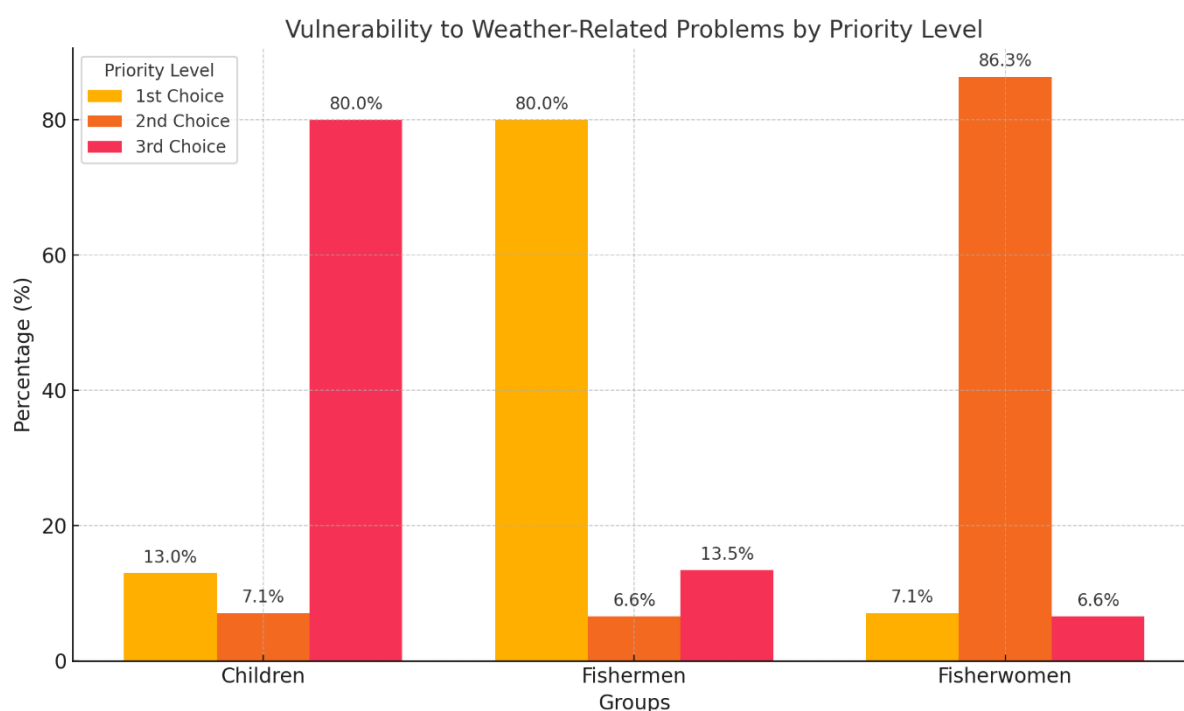


The chart illustrates the self-reported ability of individuals across four coastal blocks—Ghogha, Mahuva, Talaja, and Rajula—to predict weather based on climatic or oceanographic conditions. A significant majority in all blocks indicated they are unable to make such predictions, with Talaja (72.34%) and Rajula (71.26%) reporting the highest percentages of 'No' responses. Mahuva stands out with a comparatively higher percentage of 'Yes' responses (48.10%), suggesting a slightly better capability or confidence in weather prediction within this block.

Overall, 65.44% of respondents across all blocks reported being unable to predict weather, highlighting a prevalent gap in meteorological knowledge or access to predictive tools among these coastal communities. This underscores the need for targeted educational programs and resources to

enhance weather prediction capabilities, which are crucial for the safety and economic stability of populations reliant on maritime activities.

Figure 12 Vulnerability to weather-related problems by priority level



The chart illustrates the perceived vulnerability of different groups within the fishing community to weather-related problems, based on their prioritization as first, second, and third choices. Fishermen overwhelmingly dominate the first-choice category, with 79.96% of respondents identifying them as the most vulnerable.

In the second-choice category, fisherwomen emerge as the most vulnerable group, with 86.34% of respondents acknowledging their reliance on stable weather for activities like fish sorting, processing, and selling. Their vulnerability underscores the cascading effects of weather impacts on livelihoods that extend beyond fishing to include post-harvest economic activities. In contrast, children dominate the third-choice category, with 79.96% identifying them as vulnerable.

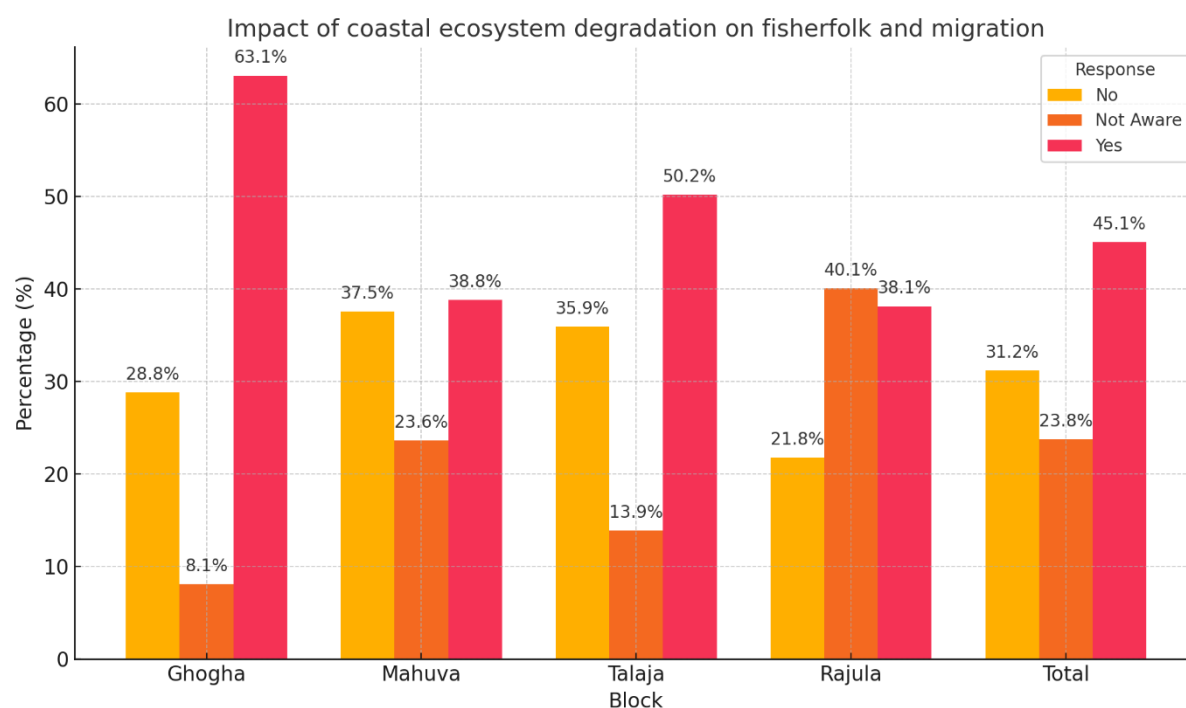
The narrative reveals how the progression from first to third choice paints a holistic picture of vulnerability in the fishing community. While fishermen face the most immediate risks, the broader impact extends to women and children, emphasizing the need for comprehensive, community-wide interventions to mitigate weather-related challenges.

Vulnerability to weather-related problems based on type of fishing

The data reveals that **Pagadiya without boats** are overwhelmingly seen as the most vulnerable to weather-related problems, with 83.55% of respondents across all blocks identifying them as their first choice. This perception is especially high in Talaja (96.76%) and Mahuva (92.62%), reflecting the heightened risks faced by manual fishing systems dependent on stable weather conditions. Other groups, such as **fisherfolk with diesel engine boats** (4.49%) and **fishing boats big in size** (4.29%), are less frequently mentioned but show notable vulnerability in Rajula. **Pagadiya with small boats** are recognized as vulnerable by 7.68% overall, with the highest concern in Rajula (15.11%). These

findings emphasize the need for targeted interventions for small-scale and manual fishing systems, which are disproportionately exposed to weather-related challenges.

Figure 13 Impact of coastal ecosystem degradation on traditional fisherfolk and migration



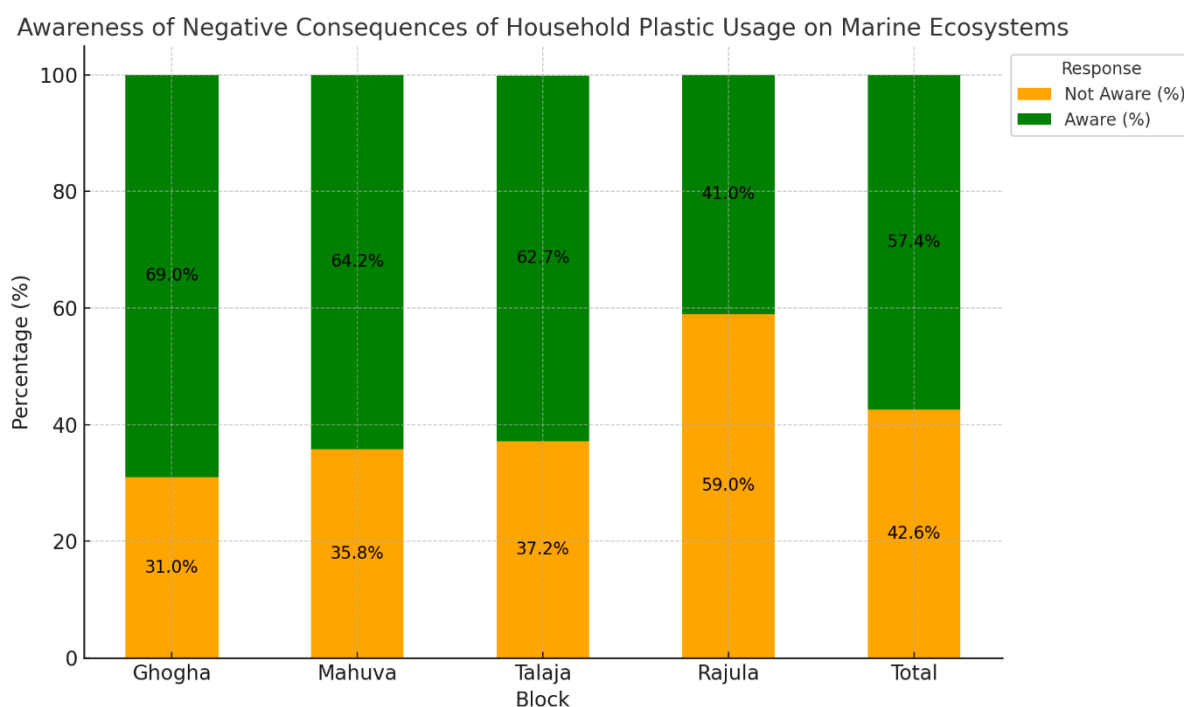
The chart highlights the perceptions of coastal communities regarding the impact of ecosystem degradation on traditional fisherfolk and migration. Across all blocks, 45.06% of respondents believe that coastal ecosystem degradation is indeed driving migration among fisherfolk. This concern is most pronounced in Ghogha (63.06%) and Talaja (50.20%), where ecosystem health directly influences livelihoods.

Notably, Rajula has the highest percentage of respondents (40.08%) reporting they are "Not Aware" of the connection between ecosystem degradation and migration. This suggests a need for targeted awareness programs in this block. Meanwhile, "No" responses are most frequent in Mahuva (37.55%) and Talaja (35.92%), indicating that a segment of the population does not perceive a direct link.

Where they migrate:

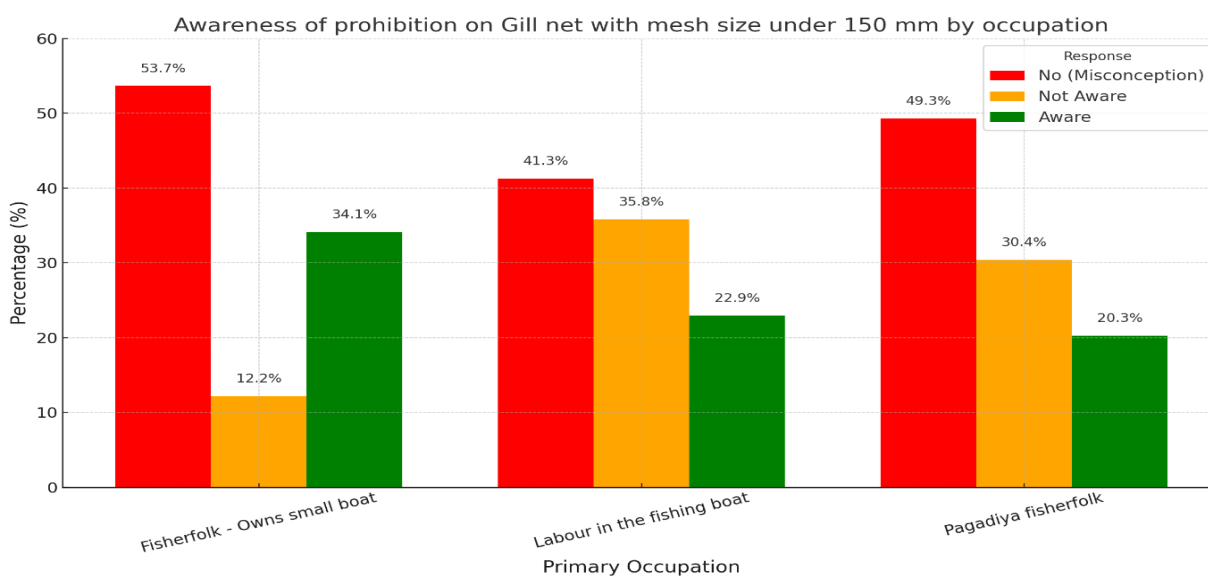
The migration analysis shows that Rajkot (52.25%) and Veraval (17.12%) are the primary migration destinations, driven by occupations like Pagadiya Fisherfolk (62.30% in Rajkot) and Labour in the Fishing Boat (66.67% in Veraval). Porbandar (13.51%) also attracts migrants, especially Pagadiya Fisherfolk (14.75%). Other destinations like Ahmedabad, Bhavnagar, and Surat account for less than 10% of migrations. Overall, migration aligns with occupational needs, with coastal hubs and inland centres playing key roles. A total of 111 migrations were recorded, highlighting Rajkot and Veraval as significant migration hubs.

Figure 14 Awareness of negative consequences of household plastic usage on marine ecosystems



The chart illustrates awareness levels regarding the negative impact of household plastic usage on marine ecosystems. Ghogha (69.0%), Mahuva (64.2%), and Talaja (62.7%) exhibit relatively high awareness, while Rajula (41.0%) has the lowest awareness and the highest proportion of unawareness (59.0%). Across all blocks, 57.4% of respondents are aware, emphasizing a need for targeted awareness programs, especially in Rajula, to address knowledge gaps and promote sustainable practices.

Figure 15 Awareness of prohibition on Gill net with mesh size under 150 mm by occupation



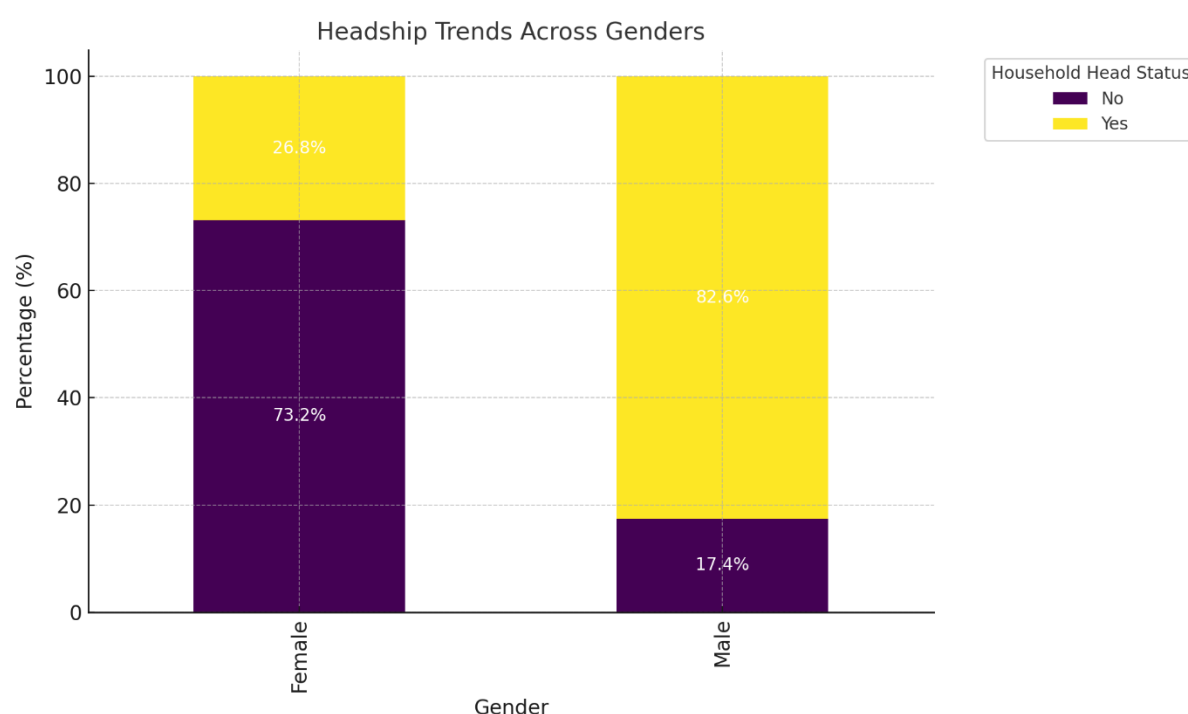
Gill nets with a mesh size under 150 mm are prohibited in India to prevent the capture of juvenile fish and ensure the sustainability of marine ecosystems. However, awareness about this regulation varies significantly across different occupational groups within the fishing community.

A large proportion of fisherfolk owning small boats (53.66%) and Pagadiya fisherfolk (49.30%) incorrectly believe that using such nets is not prohibited. These misconceptions highlight critical gaps in understanding the regulation, particularly among small-scale and traditional fishers. Labourers in fishing boats (35.78%) and Pagadiya fisherfolk (30.42%) reported high levels of being "Not Aware," reflecting limited access to information or outreach efforts from regulatory bodies. This group likely lacks direct interaction with enforcement mechanisms or awareness campaigns.

Awareness of the prohibition is relatively higher among fisherfolk owning small boats (34.15%) compared to Pagadiya fisherfolk (20.28%) and labourers in fishing boats (22.94%). This may indicate that small boat owners have more frequent interactions with regulated markets or authorities.

Chapter 10: Women Fisherfolk and Their Life

Table 55 Headship trends across gender

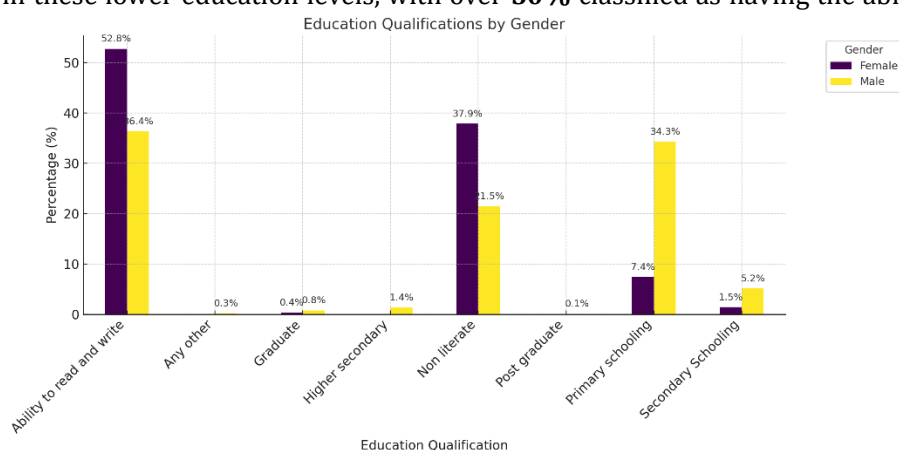


The analysis highlights a stark gender disparity in household leadership roles. Men overwhelmingly dominate as household heads, with over 80% of male respondents identified as such, reflecting traditional societal norms where men are often viewed as the primary decision-makers. In contrast, less than 20% of female respondents are household heads, underscoring a significant gap in leadership roles within families.

For women who are not household heads, the majority occupy roles such as **Wife** (176 respondents, ~80% of non-head women) and **Daughter-in-Law** (9 respondents, ~4%). Men, on the other hand, rarely take on non-head roles, further emphasizing the traditional association of men with household leadership. These findings highlight the entrenched patriarchal structures and the need for gender-inclusive approaches to empower women in household decision-making and leadership.

Figure 16 Educational qualifications by Gender

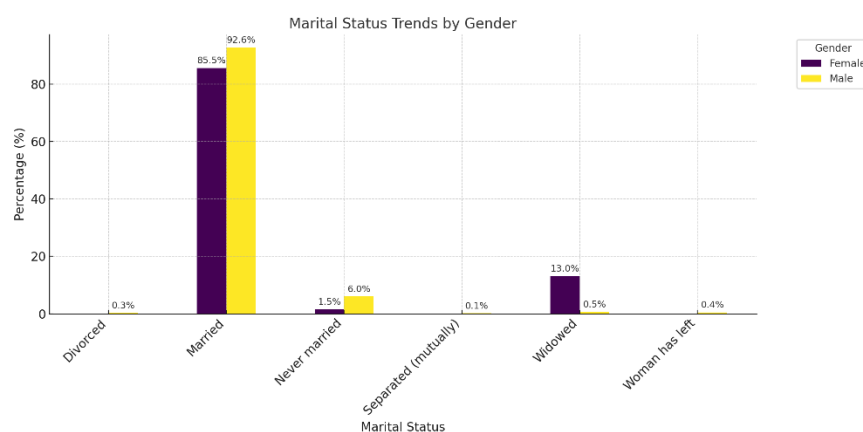
The analysis of education qualifications highlights significant gender disparities. A majority of both males and females have limited formal education, with **"Non-Literate"** and **"Ability to Read and Write"** categories accounting for the largest proportions. Women are disproportionately represented in these lower education levels, with over **50%** classified as having the ability to read and write and



37.9% as non-literate.

Men show a relatively higher representation in higher education levels, such as **Secondary Schooling** and **Graduation**, albeit in small numbers.

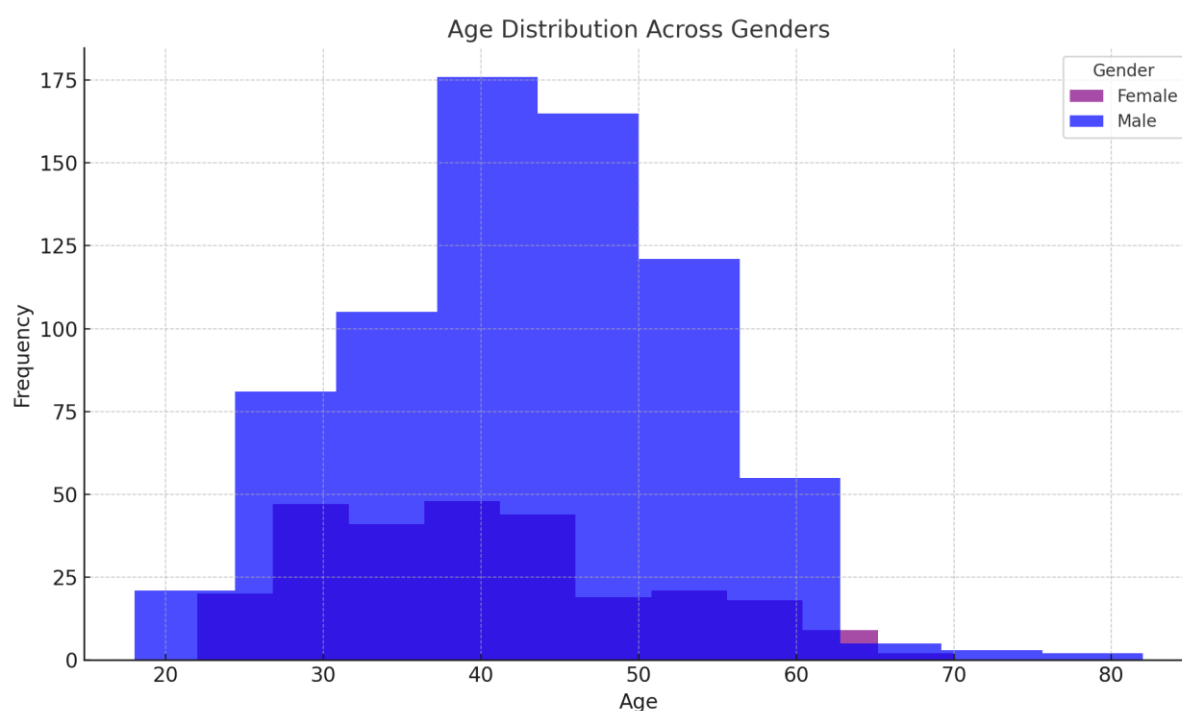
Figure 17 Marital status by Gender



The analysis of marital status reveals significant trends across genders. The majority of both men and women are **married**, with **92.6% of men** and **85.5% of women** falling into this category. However, a notable gender disparity exists among the **widowed**, where **13% of**

women are widowed compared to a negligible proportion of men. This highlights a potential vulnerability among widowed women, likely stemming from societal or economic challenges.

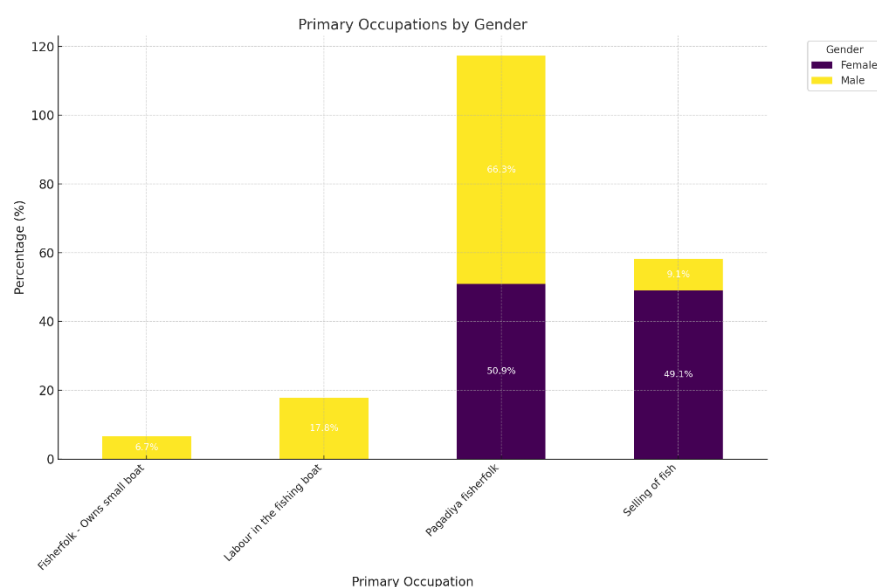
Figure 18 Age distribution across genders



The age distribution analysis underscores significant gendered differences within the surveyed population. Women, with an average age of **40.3 years**, are predominantly concentrated in the **35–50 age group**, highlighting their critical role during middle adulthood in both economic and domestic spheres. The age range for women, spanning **22 to 70 years**, is narrower than that of men, suggesting limited representation of both younger and older women, which may reflect barriers to participation or demographic realities.

The slightly higher standard deviation for women's ages (**10.7 years**) compared to men (**10.1 years**) indicates greater age-related diversity among female respondents.

Figure 19 Primary and secondary occupation by gender



Among women, the distribution is nearly balanced between **Pagadiya Fisherfolk** (50.9%) and **Selling of Fish** (49.1%). These roles reflect women's reliance on locally accessible and traditional occupations, highlighting their active participation in fisheries-related activities within their communities.

In contrast, men are predominantly represented as **Pagadiya Fisherfolk** (66.3%), aligning with their traditional roles in

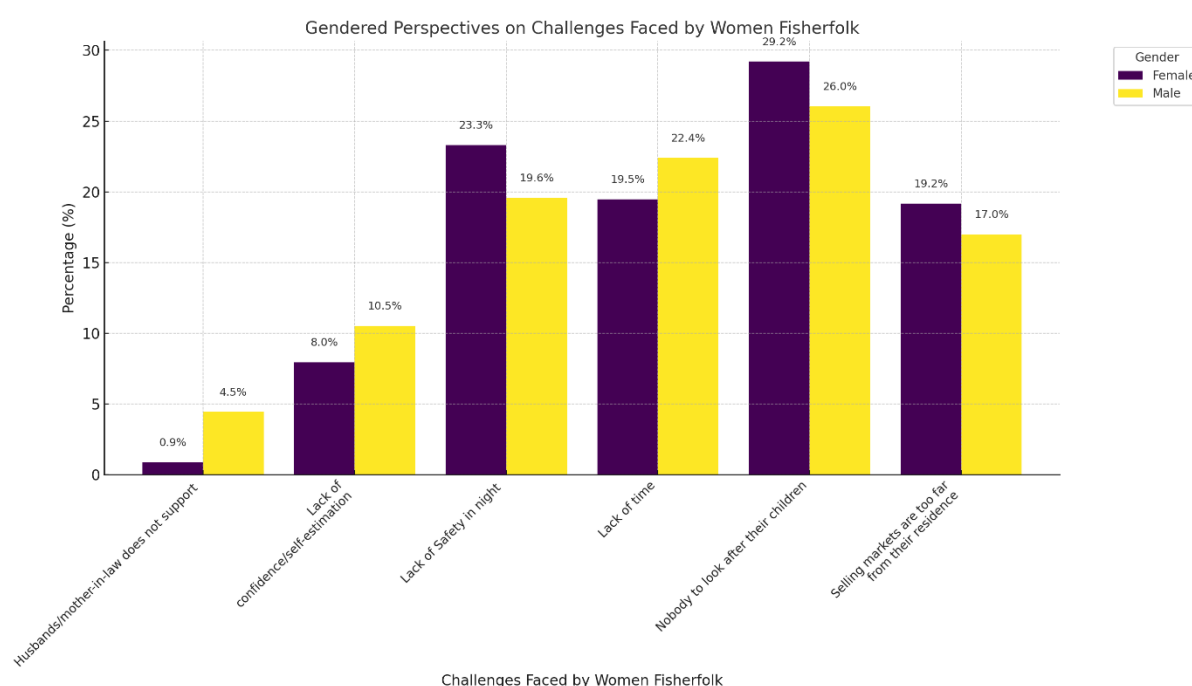
artisanal fishing. A smaller proportion of men engage in roles such as **Labour in the Fishing Boat** (17.8%) and **Fisherfolk - Owns Small Boat** (6.7%), which often require resource ownership and physical mobility.

Secondary Occupation

Women are heavily represented in roles such as Agricultural Daily Labourer and Home Maker (Unpaid Work), which often involve low wages and limited mobility. Women's participation in multiple occupations highlights their dual role as economic contributors and household managers. However, their roles are predominantly characterized by informal and undervalued labour. Engagement in secondary occupations such as Home-Based Work and Pagadiya Fisherfolk reflects women's reliance on occupations that are locally available and compatible with their domestic responsibilities.

Men dominate in resource-intensive and physically demanding roles, including Labour in the fishing boat and drivers of commercial vehicles. These roles are often associated with higher income potential and greater access to external markets. Men's engagement in secondary occupations is less diverse compared to women but aligned with traditional expectations of mobility and resource ownership.

Figure 20 Gendered perspectives on challenges faced by women fisherfolk



The analysis of challenges faced by women fisherfolk highlights significant insights when viewed through both women's and men's perspectives. This dual approach provides a nuanced understanding of the barriers women encounter in the fishing profession, encompassing personal, logistical, and systemic issues.

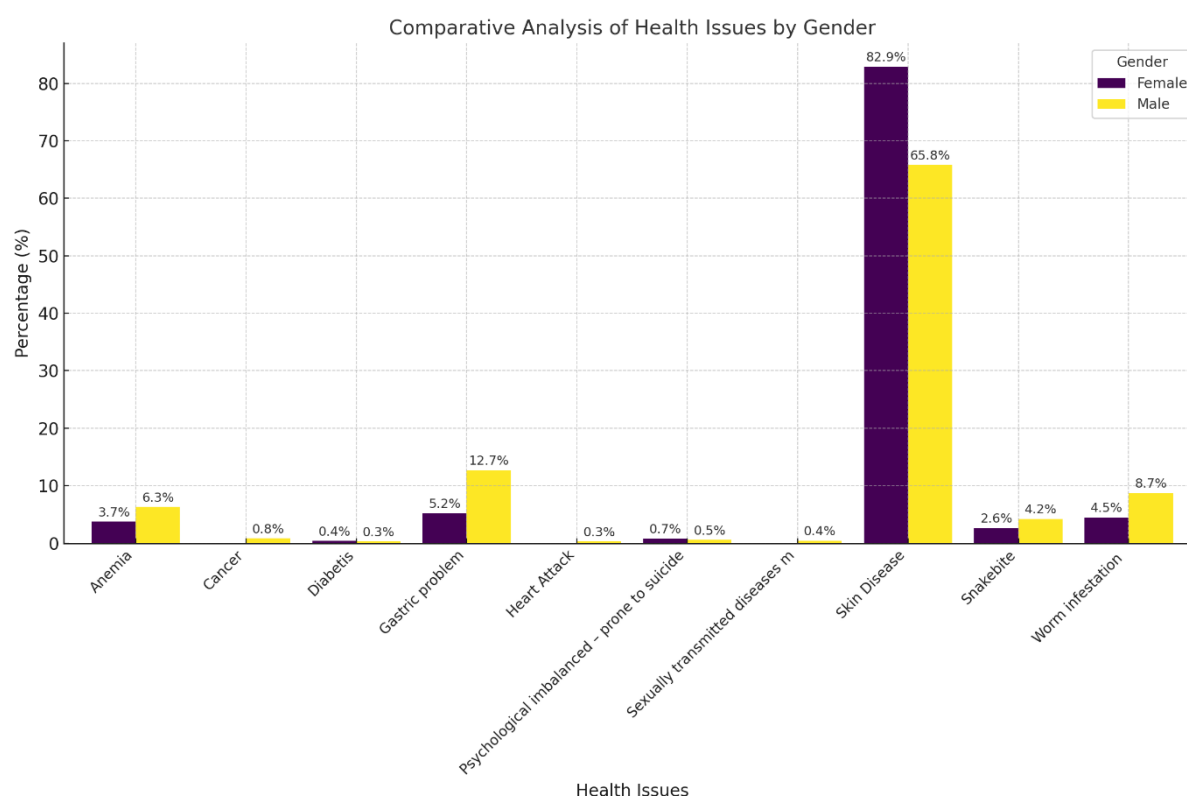
From women's perspectives, the most pressing challenge is the lack of childcare support, with 29.2% of women citing "nobody to look after their children" as a critical barrier. This finding underscores the dual burden many women face as caregivers and economic contributors. Additionally, 23.3% of women expressed concerns about safety at night, reflecting vulnerabilities tied to their participation

in this sector. Challenges such as lack of confidence/self-estimation (8%) also point to the internal barriers stemming from societal norms and limited opportunities.

From men's perspectives, logistical constraints emerge prominently, with 22.4% of male respondents highlighting lack of time as a key barrier for women, reflecting an acknowledgment of the heavy demands on women's schedules. Similarly, 19.5% of men emphasized safety at night, showcasing shared concerns about women's vulnerabilities. A notable 17% of men identified the distance to selling markets as a significant hurdle, illustrating their awareness of the structural barriers limiting women's economic mobility.

Although both men and women cited familial dynamics, such as the lack of support from husbands or mothers-in-law, this challenge was less frequently mentioned, with 4.5% of men and only 0.9% of women identifying it as a priority. This suggests that while familial challenges exist, they are overshadowed by broader systemic and situational issues.

Figure 21 Major health issues faced by the traditional fisherfolk

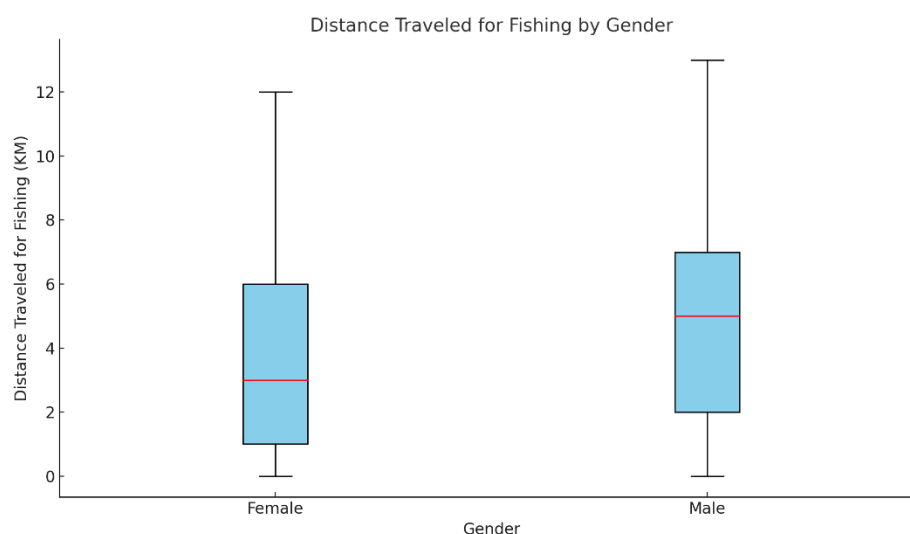


The analysis of major diseases affecting traditional fisherfolk, as perceived by both men and women, provides critical insights into community health challenges. Both genders commonly identified skin diseases as a significant health issue, reflecting the occupational hazards of prolonged exposure to water and harsh environmental conditions. Gastric problems and worm infestations were also frequently cited, highlighting the impact of inadequate sanitation and limited dietary diversity.

Gender-specific trends reveal notable differences in health perceptions. Women emphasized conditions such as anemia and respiratory diseases, which align with their vulnerabilities related to nutritional deficiencies and exposure to indoor air pollution from cooking fuels. In contrast, men were

more likely to highlight muscle strain and injuries, reflecting the physical demands of fishing-related activities like net handling and boat operations.

Figure 22 Distance travelled for fishing by gender

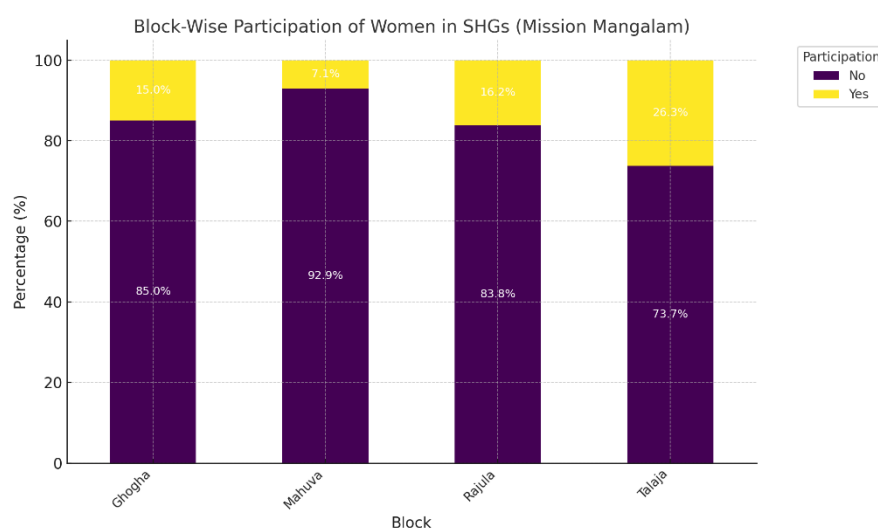


Men consistently travel farther for fishing activities, with a mean distance of **6.8 km** and a median of **5 km**, compared to women's adjusted mean of **4.2 km** and a median of **4 km**. These trends align with the traditional roles of men engaging in more resource-intensive and

mobility-dependent fishing practices.

The variability in travel distances is notably higher among men, reflecting their greater engagement across diverse fishing zones, including distant locations. Women, on the other hand, show a narrower range of travel distances, emphasizing their reliance on proximate fishing areas.

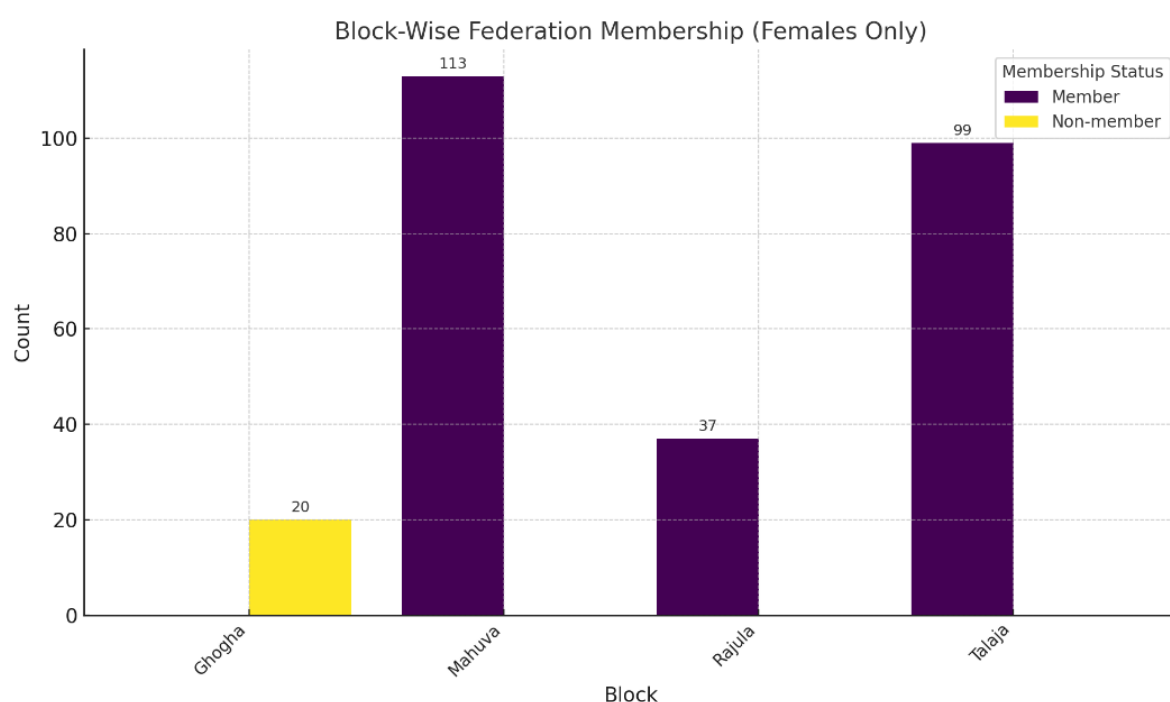
Figure 23 Participation of women in SHGs



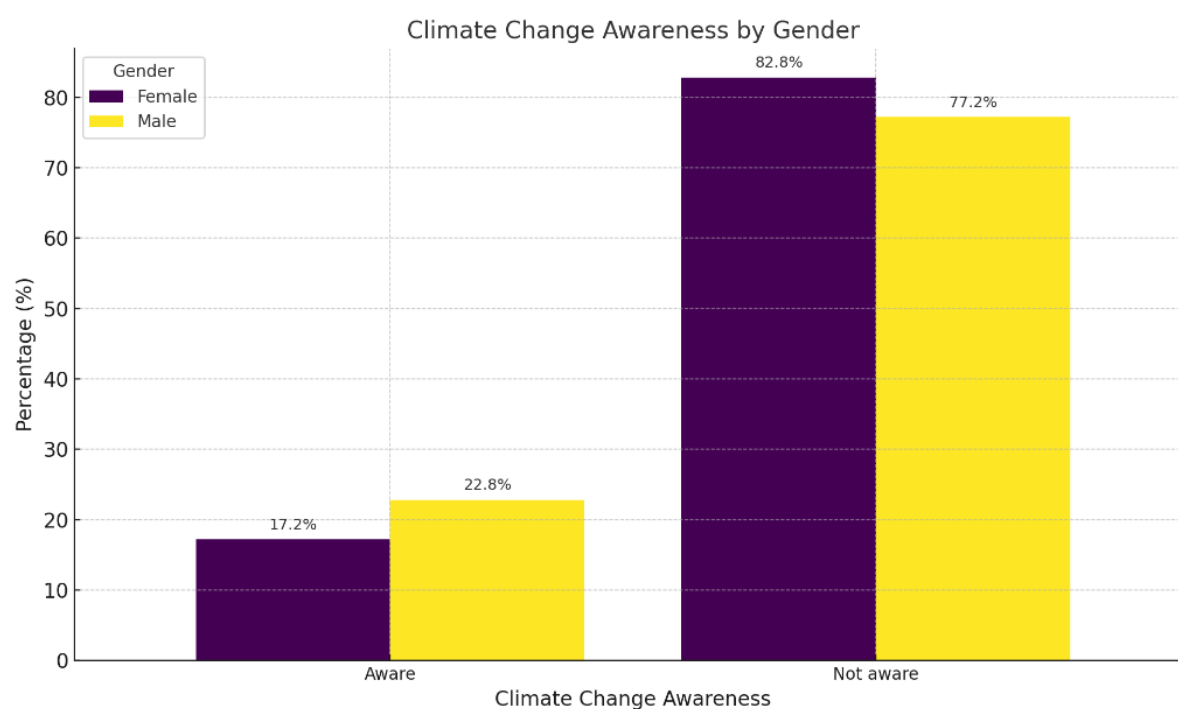
The analysis of women's participation in Self-Help Groups (SHGs) under the Mission Mangalam program reveals significant disparities across blocks. Overall, only 32.5% of women reported being part of an SHG, while a majority, 67.5%, indicated non-participation. These figures highlight

persistent barriers to women's engagement in collective financial and social initiatives.

Participation varies notably across blocks. In Ghogha, 40% of women are members of SHGs, reflecting moderate success in program outreach. Mahuva, however, reports the lowest participation rate, with only 25% of women engaged in SHGs, likely due to limited program accessibility or socio-cultural restrictions. Talaja emerges as a relative success, with 50% of women participating, suggesting localized effectiveness of the initiative. Conversely, Rajula shows the least engagement, with only 20% of women being part of SHGs, underscoring the need for targeted interventions in this region.

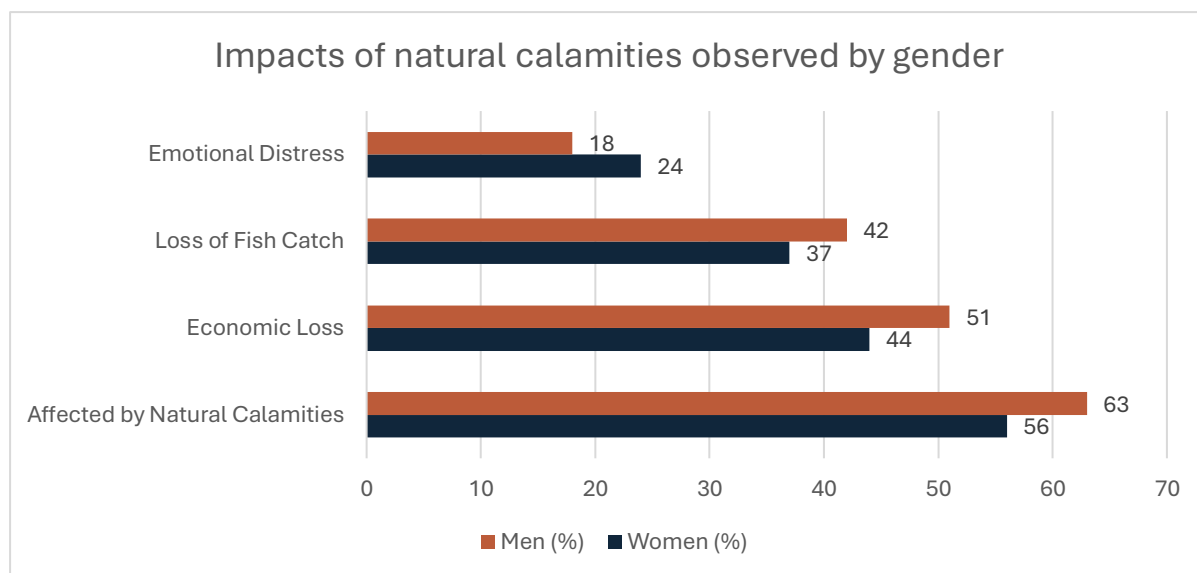
Figure 24 Membership in Utthan promoted federation

The analysis of women's federation membership reveals stark block-wise disparities in participation. In Mahuva, Rajula, and Talaja, all surveyed women (113, 37, and 99, respectively) reported federation membership, reflecting robust engagement and effective outreach in these blocks. In sharp contrast, Ghogha shows no membership among the 20 surveyed women.

Figure 25 Climate change awareness by gender

The analysis shows that men have higher awareness of climate change compared to women, with a larger percentage of women categorized as "Not aware". This highlights gendered barriers such as limited access to information and training for women.

Figure 26 Impacts of climate change observed by gender



The analysis reveals the profound gendered impacts of natural calamities on fisherfolk communities, along with anticipated concerns regarding climate change.

Impacts of Natural Calamities: Over the past five years, 56% of women and 63% of men reported being directly affected by natural calamities. Among specific impacts:

- Economic Loss emerged as the most frequently reported consequence, cited by 44% of women and 51% of men, highlighting widespread financial vulnerabilities.
- Loss of Fish Catch was a significant concern, affecting 37% of women and 42% of men, reflecting the direct impact of environmental disruptions on livelihoods.
- Emotional Distress was notably higher among women (24%) compared to men (18%), underscoring the gendered mental health challenges exacerbated by such events.

Anticipated Climate Impacts: Looking ahead, women and men anticipate distinct climate-related challenges:

- Cyclones and Irregular Rainfall were cited by 28% of women and 19% of men, reflecting widespread concern about the increasing frequency and unpredictability of extreme weather events.
- Decline in Fish Population was highlighted by 15% of men, pointing to occupational vulnerabilities and long-term risks to the fishing profession.

Table 56 Livelihood and skill development preferences for family members

Livelihood/skill development program family members would opt for	Block				Total
	Ghogha	Mahuva	Talaja	Rajula	
Agriculture and Farming	10	105	66	22	203
	4.27 %	43.03 %	26.72 %	7.91 %	20.24 %
Shrimp Culture	34	1	0	16	51
	14.53 %	0.41 %	0.00 %	5.76 %	5.08 %
Goat rearing	0	2	0	18	20
	0.00 %	0.82 %	0.00 %	6.47 %	1.99 %
Fish feed making	21	2	0	53	76
	8.97 %	0.82 %	0.00 %	19.06 %	7.58 %
Pond based fish cultivation	4	0	0	62	66
	1.71 %	0.00 %	0.00 %	22.30 %	6.58 %
Rope making	1	147	0	44	192
	0.43 %	60.25 %	0.00 %	15.83 %	19.14 %
Organic fertilizer production	0	3	0	7	10
	0.00 %	1.23 %	0.00 %	2.52 %	1.00 %
Medicinal plant cultivation	0	0	0	7	7
	0.00 %	0.00 %	0.00 %	2.52 %	0.70 %
Prawn cultivation	0	0	1	3	4
	0.00 %	0.00 %	0.40 %	1.08 %	0.40 %
Shop at seashore	10	2	0	13	25
	4.27 %	0.82 %	0.00 %	4.68 %	2.49 %

The livelihood and skill development programs preferred by family members vary significantly across blocks:

1. Agriculture and Farming emerges as the most preferred option, accounting for 20.24% of the total responses. It is particularly popular in Mahuva (43.03%) and Talaja (26.72%).
2. Rope Making is the second most favored option, with 19.14% of the responses, dominated by Mahuva (60.25%).
3. Fish Feed Making (7.58%) and Pond-Based Fish Cultivation (6.58%) are popular in Rajula, reflecting interest in fishery-related livelihood opportunities.
4. Other options like Shrimp Culture (5.08%) and Goat Rearing (1.99%) are less common, with Shrimp Culture being slightly preferred in Ghogha (14.53%) and Rajula (5.76%).

5. Less than 1% of respondents expressed interest in Organic Fertilizer Production, Medicinal Plant Cultivation, or Prawn Cultivation, indicating limited awareness or feasibility of these options.

Skill Preferences by Gender

The analysis reveals distinct preferences for skill development programs based on gender:

Female Preferences:

- Women primarily prefer Agriculture and Farming and Rope Making, reflecting their reliance on accessible and traditional skills.
- Other preferences include Vegetable Farming, Fish Feed Making, Broom Making, and Shrimp Culture, aligning with roles that support household and community-level activities.

Male Preferences:

- Men also show strong interest in Agriculture and Farming and Rope Making, indicating shared preferences with women.
- Additionally, men favor aquaculture-related skills such as Shrimp Culture, Fish Feed Making, Pond-Based Fish Cultivation, and Ornamental Fish Culture.
- Other areas of interest include Vegetable Farming and Goat Rearing, reflecting a broader engagement with diverse skills.

This suggests that while women tend to prefer skills integrating into domestic and community roles, men focus on aquaculture and resource-intensive activities requiring mobility and external engagement.

Chapter 11: Discussion and Conclusion

This chapter presents the findings of the study contextualized within broader socio-economic, environmental, and gender-based frameworks. By integrating quantitative data from tables and figures, it also integrates the results and cases derived from the qualitative research.

Key Results

Demographic and Socioeconomic Profile

- **Age:** Fishers in Bhavnagar show a balanced age distribution, while Rajula (Amreli) is dominated by the 41–50 age group (64.03%). Talaja leads in the 31–40 age group (39.68%), Ghogha has a significant 51–60 age presence (25.21%), and Rajula shows low youth participation and higher elderly representation (6.83%).
- **Marital status:** Bhavnagar has a higher widowed proportion (3.03%) compared to Amreli (6.47%), with married individuals consistently dominant across districts. Ghogha has the highest share of never-married individuals (8.97%) in Bhavnagar, while Mahuva reports the highest widowed share (5.74%). In Amreli, Rajula stands out for its higher widowed proportion (6.47%) and cases of women leaving households (0.72%), highlighting gendered vulnerabilities.
- **Social category:** Across districts, Bhavnagar (99.43%) and Amreli (99.28%) are overwhelmingly dominated by individuals from the OBC category. The general category has minimal representation in Bhavnagar (0.55%) and Amreli (0.36%), with a negligible ST presence in Amreli (0.36%). Within Bhavnagar, OBC representation is near-universal across Talaja, Ghogha, and Mahuva (99.19%–100%).
- **Religion:** The religious composition of fisher communities is predominantly Hindu across Bhavnagar and Amreli, with Mahuva, Talaja, and Rajula reporting near-total Hindu representation (99.6–100%). Ghogha stands out for its diversity, with 86.32% Hindus, 13.25% Muslims, and 0.43% Buddhists. Bhavnagar mirrors this pattern with a small Muslim minority (0.4%), while Amreli is entirely Hindu, highlighting Ghogha as the most religiously diverse region.
- **Family size:** Family sizes among fishers vary notably between Bhavnagar and Amreli districts. Bhavnagar's average family size is larger (5.01) than Amreli's (4.41). Within Bhavnagar, Talaja (5.57) and Mahuva (5.07) have moderately sized families with less variation, while Ghogha (4.39) shows greater diversity, ranging from 1 to 18 members. In Amreli, Rajula has an average size of 4.41, with the widest range (1 to 24 members) and the highest variability.
- **Family type:** In Bhavnagar, 79.55% of fishers live in joint families, contrasting sharply with Amreli, where 72.66% belong to nuclear families. Talaja (97.17%) and Mahuva (99.18%) show a strong preference for joint families, reflecting cultural norms. Ghogha is more balanced, with 57.69% nuclear and 42.31% joint families, indicating a shift towards nuclear setups. Rajula, in Amreli, stands out with a majority of nuclear families (72.66%), reflecting a transition to independent living.
- **Educational attainment:** Educational attainment varies: Talaja leads in primary schooling (74.5%) but has 25.1% non-literate. Ghogha (43.16% primary, 28.63% non-literate) and Mahuva (39.34% non-literate) rely heavily on informal literacy. Rajula has the lowest non-literacy (12.59%) and better secondary (30.94%) and higher education (2.16%).

- **Earnings per year from primary occupation:** Income patterns reveal disparities across regions. Ghogha (88.03%) and Talaja (86.07%) have the highest concentration of fishers earning less than ₹1 lakh, highlighting economic vulnerability. Mahuva (65.11%) shows a gradual shift to moderate earnings, while Rajula stands out with 63.56% earning ₹1–2 lakhs and some in higher brackets, reflecting better income opportunities.
- **Secondary Occupation:** Secondary occupations reflect a clear gender divide. Men dominate labour-intensive roles like fishing and salt work, while women focus on unpaid work and agriculture. Pagadiya Fisherfolk exhibit occupational diversity, engaging in activities such as transport and animal husbandry, aligned with regional industries.
- **Daily earnings by gender:** Daily earnings reveal gender disparities. Women are concentrated in the lowest income bracket (₹0–₹250), while men dominate higher earnings (₹751–₹1500). Moderate earnings (₹251–₹500) show balanced representation, with women slightly ahead.
- **Average Income Per Year by Activity:** Fishing remains the dominant income source across all blocks, with the highest mean income in Ghogha (₹51,635) and the lowest in Mahuva (₹39,474). Rajula stands out for its higher mean income from agricultural labor (₹41,465), reflecting its diversified livelihood strategies. Farming contributes minimally in most blocks, except for Rajula, where it shows a moderate impact (₹10,896).
- **Average Income Per Year by Gender Across Activities:** Men consistently report higher mean incomes across all activities and blocks, particularly in fishing, where their earnings dominate. For example, men in Ghogha and Mahuva earn mean incomes of ₹51,635 and ₹39,474, respectively, from fishing, while women earn significantly less. The gender disparity is also evident in agricultural labour and other activities, reflecting systemic inequalities in access to higher-income opportunities.
- **Annual Family Income:** Family income levels among fisherfolk show significant regional disparities. Rajula reports the highest average income (₹1,44,438) but also the greatest inequality, with incomes ranging from ₹18,000 to ₹5,50,000. Talaja (₹75,405) and Ghogha (₹83,528) display moderate incomes with narrower ranges, while Mahuva reports the lowest average income (₹54,156). These variations highlight economic vulnerabilities, particularly in Mahuva.
- **Income Contribution by Activity and Block:** Fishing is the primary source of income across all blocks, contributing nearly 100% in Ghogha, Mahuva, and Talaja. In contrast, Rajula demonstrates a more diversified income structure, with agricultural labor contributing significantly (mean income ₹41,465) alongside fishing. Farming and agriculture make minimal contributions in most blocks but show potential in Rajula.
- **Choice of Loan Source:** Family members are the predominant source of loans for fisherfolk across all blocks, with reliance as high as 93.03% in Mahuva and 92.31% in Talaja. Alternative sources, such as banks/credit cooperatives, are minimally accessed, with the highest usage in Rajula (13.31%). SHGs are only reported in Rajula (8.27%), indicating limited penetration elsewhere. Friends and moneylenders are secondary options, with moderate reliance in Rajula.
- **Current Loans and Sources:** The primary reasons for taking loans vary by block, with fishing nets being the most common purpose in Rajula (46.04%) and Ghogha (13.68%). Household consumption and education are significant in Rajula, each accounting for 12.23%. Health-related loans are notable in Rajula (12.95%) and Ghogha (3.42%). Across all blocks, informal sources, such as relatives and moneylenders, dominate, while institutional loans remain

underutilized. Rajula shows a slightly higher reliance on fish traders for loans compared to other blocks.

- **Monthly Household Expenses Across Occupations:** Food expenses dominate household budgets across all occupations, ranging from ₹3,000 to ₹3,300, with Selling of Fish households reporting the highest average at ₹3,269. Utility costs (₹300–₹600) show moderate variation, with Fisherfolk - Owns Small Boat incurring slightly higher costs (₹480). Health expenses (₹50–₹600) highlight disparities, as Labour in Fishing Boats average ₹450, reflecting occupational health risks. Education expenses (₹0–₹600) vary, with Selling of Fish households averaging ₹434. Cooking fuel costs remain consistent across groups (₹50–₹600), while Miscellaneous expenses (₹200–₹600) show flexibility, with Labour in Fishing Boats reporting the highest average at ₹451.
- **Type of house:** Housing conditions vary significantly across regions. Rajula has the highest proportion of kaccha houses (83.09%), followed by Ghogha (66.24%) and Mahuva (66.39%). In contrast, Talaja shows better housing quality, with 83.81% living in pucca houses. Overall, kaccha houses dominate (58.62%), highlighting infrastructure challenges in most regions except Talaja.
- **Household material ownership:** Material ownership varies across regions. Motorcycles are most common in Talaja (84.62%) and Rajula (73.38%), while Ghogha (41.03%) and Mahuva (2.87%) lag behind. Tractor ownership is minimal, highest in Rajula (3.6%). Television and refrigerator ownership are highest in Rajula (16.19% and 8.63%) and Talaja (15.79%), with Mahuva showing the lowest rates across all items, highlighting significant disparities in household assets.
- **Coverage of Foundational Identity Cards:**
 - **Aadhar Card:** Near-universal coverage with ownership rates above 96% across all surveyed blocks, reflecting widespread implementation of this essential identification document.
 - **Ration Card:** High ownership rates in Talaja (99.6%) and Mahuva (99.59%), but significantly lower in Rajula (77.7%), indicating uneven access to food security entitlements.
- **Access to Specific Beneficiary Cards:**
 - **Ayushman Card:** Significant disparities exist, with Talaja leading at 82.59% and Mahuva lagging at 47.54%, pointing to regional variations in health insurance access.
 - **MNREGA Card:** Ownership is highest in Rajula (42.09%) but considerably lower in other blocks like Ghogha (13.68%), indicating uneven utilization of rural employment benefits.
- **Financial Inclusion through Bank Accounts:** High levels of bank account ownership in Talaja (97.17%) and Mahuva (98.77%), suggesting effective financial inclusion measures in these blocks. Conversely, Rajula exhibits gaps, with only 57.55% of respondents having bank accounts, highlighting barriers to financial access.
- **Disability Status of Respondents:** Disabilities among fisherfolk are relatively low across all surveyed blocks. Locomotor disabilities are reported exclusively in Rajula (1.44%), while hearing impairments are minimal, with one case each in Ghogha (0.43%) and Mahuva (0.41%). Blindness or low vision is noted in Talaja (0.81%) and Rajula (0.72%). Mental health-related disabilities are rare but present in Ghogha (0.43%), Mahuva (0.41%), and Rajula (0.36%).

- **Access to basic facilities:** Access to basic facilities varies significantly across the surveyed blocks. Functional toilets are most prevalent in Rajula (82.37%) but less accessible in Ghogha (39.32%). Drinking water tap connections are highest in Mahuva (94.26%) and Rajula (81.29%), while Ghogha (40.17%) shows the lowest access. Legal electricity connections are more common in Rajula (78.42%) and Mahuva (56.15%) but limited in Talaja (30.77%) and Ghogha (33.76%).
- **Phone ownership:** Phone ownership among fisherfolk shows notable regional and gender disparities. Smartphone ownership is highest in Talaja (51.01%) and lowest in Mahuva (3.69%), where simple phones dominate (88.11%). Rajula and Ghogha exhibit moderate smartphone ownership at 27.70% and 41.45%, respectively. Gender differences reveal women are more likely to own simple phones (66.17%) and less likely to have smartphones (22.68%) compared to men. Ghogha also has the highest proportion of individuals without any phone (33.76%).
- **Agricultural Land Ownership by Households:** Agricultural land ownership among fisherfolk households is limited, with only 13.96% owning land across all blocks. Talaja exhibits the highest ownership (34.82%), followed by Rajula (18.35%), while Ghogha (1.28%) and Mahuva (0%) report minimal or no ownership. The average land size owned varies, with Talaja showing the largest range (0.4 to 5.2 acres).

Fishers' Infrastructure and Fishing Experience

- **Fishing Experience (In Years):** Ghogha has the highest average fishing experience at 15.72 years (SD: 5.65), followed by Talaja (13.51 years, SD: 6.02) and Mahuva (12.88 years, SD: 4.19). Rajula has the lowest average at 10.72 years but the highest variability (SD: 9.04) and the maximum individual experience of 52 years, indicating a mix of seasoned and less experienced fishers.
- **Insurance on the fishing infrastructure:** The majority of fisherfolk lack insurance coverage for critical infrastructure, such as nets and iceboxes, leaving them vulnerable to financial risks. However, boat owners demonstrate higher formal engagement, with all reporting ownership of licenses, indicating compliance with regulatory frameworks.
- **Licence Ownership:** Licence ownership among fisherfolk varies significantly by category. All small boat owners (100%) reported having licences, indicating full compliance. In contrast, Pagadiya fisherfolk exhibit moderate licence ownership at 57.85%, and fish sellers have the lowest coverage at 43.72%.
- **Fishing area:** Fishing area preferences vary significantly across blocks. The Open Sea is predominantly used in Ghogha (69.23%) and Talaja (50.2%), while the Creek is the most utilized in Rajula (67.27%) and Mahuva (51.23%). Banthara is minimally used, with the highest usage in Talaja (26.32%).
- **Peak season for fishing:** Fishing activities are concentrated in different seasons across blocks. November to February is the dominant peak season in Talaja (95.95%) and Mahuva (85.25%). In contrast, Rajula sees the highest activity during August to October (43.17%). Ghogha demonstrates a more balanced distribution, with notable fishing activity in both August to October (43.17%) and November to February (28.63%).
- **Fish Catches by Pagadiya Net Fishers:** Pagadiya fishers using net fishing methods primarily catch a diverse range of species, with Masli (small fish) and Dhudiya (Bombay Duck) being the most frequent. High-value species like Titan (Lobster) rank third, followed by Lepta (Ribbonfish) and Karchala (Crab), reflecting the region's biodiversity. Other species, including

Bumla (Lizardfish), Khagi (Sole Fish), Kati (Threadfin), and Kut (Flatfish), contribute to the variety, albeit in smaller quantities.

- **Fish Catches by Small boat owners:** The catch composition shows that the following fish are predominantly caught in the nets of small boat owners: Palva, Bumla, Paplet, Surmai, Khagi, Maghara, and Kut.
- **Average Daily Fish Catch across blocks and occupations:** Talaja reports the highest fish catch, with small boat owners averaging 23.2 KG and Pagadiya fisherfolk 12.4 KG, making it the most productive block. In contrast, Mahuva shows the lowest catch for Pagadiya fisherfolk at 4.1 KG, reflecting challenges in productivity. Rajula records moderate averages of 10.5 KG (small boat owners) and 6.7 KG (Pagadiya fisherfolk), while Ghogha presents balanced outcomes at 15.4 KG and 8.9 KG, respectively. The overall range spans from 4.1 KG to 23.2 KG, with an average of 11.6 KG, highlighting regional disparities in fishing productivity.

Fishers' life

- **Constraints faced by the artisanal fishing households:** Inadequate storage facilities are the most reported constraint, particularly in Mahuva. High equipment costs significantly affect Talaja, while Rajula faces challenges in accessing fuel. Ghogha reports the highest concerns about marine pollution, and Rajula faces heavy impacts from damaged fishing nets. Additionally, inadequate fish catch is a notable issue in Ghogha and Rajula, reflecting localized ecological challenges.
- **Conflict related issues across the blocks:** Industrial development emerges as the most significant conflict-related issue, particularly concentrated in Talaja and Mahuva. Urban development follows as a major concern, notably impacting Ghogha and Mahuva. Aquaculture activities are also a key issue, predominantly in Talaja, highlighting tensions between fishers and aquaculture expansion. Other concerns include tourism, saltpan activities, and oil pollution, which significantly affect Rajula and Ghogha. These conflicts underscore the need for sustainable strategies to balance traditional fishing practices with modern development pressures.
- **Reliability of traditional fishing as a source of income:** Overall, 54.5% of artisanal fishers believe traditional fishing is no longer reliable, while 45.5% still find it dependable. Doubts are highest in **Ghogha (72.7%)** and **Rajula (61.5%)**, reflecting significant challenges.
- **Attitudes toward continuation of traditional fishing:** Majority of artisanal fishers (64.7%) do not wish for their grandchildren to continue traditional fishing, with Ghogha (76.1%) and Mahuva (70.1%) leading these responses.
- **Need for improved fisheries extension services:** A significant majority of artisanal fisherfolk (69.79%) across all blocks agree on the need to enhance fisheries extension services to promote technology adoption and reduce losses. **Ghogha (89.74%)** shows the strongest support, followed by **Mahuva (73.77%)**, **Talaja (68.02%)**, and **Rajula (51.08%)**.
- **Work-life balance among fisherfolk:** The data reveals that 55.63% of fisherfolk believe fishing does not allow sufficient time for family, with **Ghogha (73.50%)** showing the highest dissatisfaction, followed by **Rajula (56.47%)** and **Mahuva (48.36%)**.
- **Alcohol consumption among fisherfolk:** 56.33% of fisherfolk reported that consuming alcohol is prevalent in their local community, with significant block-wise variations. Mahuva (78.69%) and Talaja (74.09%) show the highest prevalence, followed by Rajula (53.24%). In contrast, Ghogha (17.95%) reports the lowest alcohol consumption.

- **Health Concerns Among Fisherfolk:** The critical health concerns faced by fisherfolk across the blocks of Ghogha, Mahuva, Talaja, and Rajula. **Skin Disease** emerges as the most reported issue, reflecting the occupational hazards of life at sea. **Gastric Problems** are also prevalent, underscoring the challenges of maintaining nutrition and sanitation in coastal areas.

Participation in fisherfolk associations

- **Presence of fisherfolk organisations at the Village level:** 52.08% of respondents reported either the absence of fisherfolk associations or a lack of awareness about their presence. **Rajula (71.21%)** and **Ghogha (60.34%)** stand out with the highest levels of absence or unawareness, highlighting significant gaps in community organisation.
- **Membership in fisherfolk Association at Village level:** Out of the 408 respondents who answered that their villages has fisherfolk associations, 46.08% are members, while 53.92% are not, indicating a notable gap in organisational participation.

Awareness on fisheries institutes and knowledge seeking behaviour

- **Membership in fisherfolk Association at Village level:** A significant gap in awareness among fisherfolk regarding national-level fisheries institutions like CMFRI, NETFISH, FSI, CIFT, and CIFNET across all blocks, highlighting the need for better outreach efforts. Mahuva (68.03%) shows strong local awareness, particularly of the Fisheries Research and Training Centre, Mahuva, indicating effective local engagement. In contrast, Ghogha and Rajula report the lowest awareness levels.
- **Fisher's source of Information:** Significant regional variations in information sources among fisherfolk observed. Mahuva leads with diverse channels, notably the Fisheries Research and Training Centre (28.69%). Rajula and Ghogha rely more on mass media, with Rajula using WhatsApp (1.8%) and television (6.47%), while Ghogha leads in newspaper (16.24%) and internet usage (15.81%). Talaja shows minimal reliance on most sources, with only limited use of WhatsApp and the Department of Fisheries. Fisherfolk Associations see higher engagement in Rajula (6.12%),

Market and Selling practices

- **Fish Selling Patterns:** Fishers predominantly sell their catch within the village to retail sellers/customers, with Mahuva (76.53%) and Talaja (50.64%) showing the highest engagement. Rajula relies more on retail sellers/customers (58.11%), while Ghogha exhibits a balanced approach between village retailers (52.53%) and local markets (37.37%). Among small boat owners, 53.49% sell to retail sellers/customers within the village, while 63.17% of Pagadiya fishers follow the same pattern. Fish traders account for a smaller share, with local markets being utilized more by fishers involved in buying and selling fish (50.81%).
- **Fish Segregation:** A majority of fishers (70.78%) segregate different fish varieties before selling, with high adoption in Mahuva (78.10%), Talaja (76.82%), and Ghogha (73.27%). However, Rajula (50.93%) lags, with nearly half not practicing segregation.
- **Usage of Weighing Scales:** Across all blocks, 62.71% of fishers use weighing scales for selling, indicating a preference for accurate weight-based transactions. Mahuva (72.04%), Ghogha (70.30%), and Talaja (63.09%) lead in usage, while Rajula (45.40%) shows the lowest reliance, favouring other methods.

- **Bonded Selling:** Among small boat owners, 37.21% engage in bonded sales, while Pagadiya fishers report slightly lower participation at 31.48%. A majority in both groups prefer independent sales, reflecting a preference for flexibility and autonomy in transactions.

Climate Change, Disasters, and Migration

- **Perceptions of Decline in Fish Diversity and Population:** The data highlights a significant concern about declining fish diversity and population among fisherfolk along the Gujarat coast. **Small boat owners (70.73%)** are most aware of this decline, compared to **labourers on fishing boats (40.37%)** and **fish sellers (37.63%)**. However, awareness is limited among **Pagadiya fisherfolk (27.04%)**, with a notable portion of respondents unaware of the issue (23.97%). The block wise analysis show that **Ghogha (61.06%)** reports the highest awareness of declining fish populations, followed by **Mahuva (44.58%)**, **Talaja (40.93%)**, and **Rajula (37.74%)**.
- **The missing species of fishes:** The decline in fish diversity is reflected in the species commonly reported as missing by respondents, including Jinga, Moti Masli, Bubla, Jonga, Lobster, Masli, Paplet, Bumla, Madhra Kati, Sarp, Zinga, Titam, Boya, and Surmai.
- **Awareness of Bycatch Impacts on fish stocks among fisherfolk:** Across all blocks, 42.59% of respondents believe that capturing juvenile fish contributes to declining fish catch, with small boat owners (62.79%) and Pagadiya fisherfolk (44.25%) showing strong agreement. However, 32.71% disagree, and 24.71% are unaware, with Rajula reporting the lowest awareness (45.35%). Awareness is strongest in Ghogha (50.43%), Mahuva (57.50%), and Talaja (51.05%), reflecting regional differences in understanding the issue. These findings highlight the need for targeted awareness campaigns to address knowledge gaps, particularly in Rajula.
- **Natural calamities that impacting the fisherfolk:** The fishing community faces varying degrees of vulnerability to climate stressors, with Pagadiya fisherfolk emerging as the most impacted group. They experience significant challenges from cyclones, droughts, salinity increases, and rising temperatures, reflecting their dependence on small-scale, traditional fishing methods. Labourers in fishing boats face moderate challenges, primarily from cyclones and droughts, while issues like salinity and temperature rise have limited impact. Fish sellers experience diverse stressors, including droughts, salinity increases, and cyclones. Small boat owners report fewer stressors, with cyclones and droughts being their main concerns.
- **Impact of Natural Calamities on Coastal Families over the last five years:** Impact of Natural Calamities on Coastal Families Over the last five years, natural calamities, including cyclones, have significantly affected coastal communities, particularly in Ghogha (62.93%) and Mahuva (61.92%), highlighting their high vulnerability. Talaja (58.68%) also shows substantial impacts, though a notable portion of families in these blocks were unaware of the events. Rajula, in contrast, reports the lowest impact (31.13%), with a significant percentage of families either unaware or unaffected. Overall, 51.87% of families across the blocks reported being affected, underscoring the widespread vulnerability of coastal communities to natural calamities.
- **Type of impact of natural calamities on fisherfolk over the last five years:** Over the past five years, natural calamities have severely disrupted the livelihoods of fisherfolk across coastal blocks. Economic losses, destruction of fishing equipment, and loss of fish catch have

significantly impacted families, with Mahuva experiencing the most disruption to fishing activities and Rajula facing emotional distress and forced migration. The impact extends beyond fishing, with crop losses and cattle deaths destabilizing families reliant on diverse income sources. While Ghogha and Talaja faced fewer disruptions, economic losses and equipment damage highlight their persistent vulnerabilities.

- **Awareness of Climate Change:** The data reveals limited awareness of climate change among fisherfolk, with only 21.08% of respondents across all blocks acknowledging awareness. A significant majority—78.92%—reported being unaware, highlighting widespread gaps in understanding. Ghogha (29.06%) and Mahuva (25.10%) show relatively better awareness, while Talaja (15.70%) and Rajula (18.75%) lag behind, with Rajula having the highest proportion of unaware respondents (49.61%).
- **Anticipated Climate Change Impacts:** The research participants expect diverse climate-related vulnerabilities in the coastal communities over the next 5-10 years. Extreme weather events like cyclones and storms, particularly in Ghogha, threaten livelihoods and infrastructure. Concerns about irregular rainfall and declining fish stocks, highlighted in Mahuva and Rajula, reflect the direct impact on fishing-dependent economies. Mentions of earthquakes, though less frequent, indicate fears of catastrophic risks.
- **Weather Prediction Capabilities:** The data reveals that 65.44% of respondents across coastal blocks are unable to predict weather based on climatic or oceanographic conditions, indicating a widespread gap in meteorological knowledge. Talaja (72.34%) and Rajula (71.26%) report the highest inability, while Mahuva (48.10%) shows relatively better confidence in weather prediction.
- **Vulnerability to weather-related problems by priority level:** Fishermen are perceived as the most vulnerable to weather-related problems (79.96%), followed by fisherwomen (86.34% in second choice) and children (79.96% in third choice), highlighting community-wide impacts. Pagadiya without boats are overwhelmingly seen as the most vulnerable fishing group (83.55%), particularly in Talaja and Mahuva, due to their dependence on stable weather.
- **Ecosystem Degradation and Migration:** Coastal ecosystem degradation drives migration for 45.06% of fisherfolk, with the highest impact reported in Ghogha (63.06%) and Talaja (50.20%). Rajula (40.08%) shows the highest unawareness, highlighting the need for targeted education. Migration primarily leads to Rajkot (52.25%) and Veraval (17.12%), driven by occupations like Pagadiya Fisherfolk and Labour in Fishing Boats. These trends underscore the critical link between ecosystem health and fisherfolk livelihoods.
- **Awareness of negative consequences of household plastic usage on marine ecosystems:** 57.4% of respondents across all blocks are aware of the negative impact of household plastic usage on marine ecosystems. Ghogha (69.0%), Mahuva (64.2%), and Talaja (62.7%) demonstrate high awareness, while Rajula (41.0%) lags behind with the highest unawareness (59.0%).
- **Awareness of prohibition on Gill net with mesh size under 150 mm by occupation:** Correct awareness (prohibited under 150 mm) is limited, with 34.15% of small boat owners, 22.94% of labourers, and 20.28% of Pagadiya fisherfolk understanding the prohibition of gill nets under 150 mm. However, misconceptions are widespread, with 53.66% of small boat owners and 49.30% of Pagadiya fisherfolk believing such nets are allowed, and 35.78% of labourers and 30.42% of Pagadiya fisherfolk being unaware.

Women fisherfolk and their life

- **Age distribution across genders:** Women in the surveyed population have an average age of 40.3 years and are mostly in the 35–50 age group, highlighting their active role during middle adulthood in work and family life. Their age range (22–70 years) is narrower than men's, suggesting fewer younger and older women in the survey, possibly due to participation barriers or demographic factors. A slightly higher age diversity among women is reflected in their standard deviation (10.7 years) compared to men (10.1 years).
- **Gender Disparity in Household Leadership:** The analysis reveals significant gender disparity in household leadership, with over 80% of men identified as household heads, reflecting traditional norms that position men as primary decision-makers. In contrast, less than 20% of women hold leadership roles, with most women occupying roles like Wife (80%) or Daughter-in-Law (4%).
- **Educational Qualifications by Gender:** The analysis reveals significant gender disparities in educational attainment. Both men and women are predominantly in lower education categories, with "Non-Literate" and "Ability to Read and Write" being the most common. Women are disproportionately represented, with over 50% having only basic literacy skills and 37.9% being non-literate. Men show slightly better representation in higher education levels, such as Secondary Schooling and Graduation, though these numbers remain small.
- **Marital status by Gender:** majority of both men (92.6%) and women (85.5%) are married. However, a stark gender disparity exists among the widowed, with 13% of women being widowed compared to a negligible proportion of men.
- **Primary Occupation:** Women's primary roles are evenly split between Pagadiya Fisherfolk (50.9%) and Selling of Fish (49.1%), reflecting their reliance on locally accessible, traditional fisheries-related activities. Men, in contrast, are predominantly engaged as Pagadiya Fisherfolk (66.3%), with smaller proportions working as Labour in Fishing Boats (17.8%) and Small Boat Owners (6.7%), roles that often demand greater mobility and resource ownership.
- **Secondary Occupation:** Women predominantly engage in roles like Agricultural Labour and Home Maker, reflecting low-wage, informal work tied to domestic responsibilities. Their participation in multiple occupations underscores their dual economic and household roles. Men's secondary occupations, such as Labour in Fishing Boats and Commercial Vehicle Drivers, are resource-intensive and aligned with higher income potential and traditional mobility-based expectations. This contrast highlights gendered divides in occupation types and access to economic opportunities.
- **Gendered Perspectives on Challenges faced by Women Fisherfolk:** The analysis reveals distinct yet complementary perspectives on the challenges faced by women in the fishing sector. From women's perspectives, childcare support emerges as the most pressing issue (29.2%), highlighting the dual burden of caregiving and economic contribution. Safety concerns at night (23.3%) and internal barriers like lack of confidence (8%) also feature prominently. From men's perspectives, logistical constraints dominate, with 22.4% citing time constraints and 19.5% emphasizing safety at night. Additionally, 17% highlight the distance to selling markets, reflecting structural barriers to women's economic mobility. While familial challenges are noted, they are less significant compared to systemic and logistical barriers, underscoring the need for targeted interventions to address these multifaceted challenges.
- **Major Health Issues faced by gender:** Traditional fisherfolk face significant health challenges, with skin diseases commonly cited by both men and women, underscoring the occupational hazards of prolonged water exposure and harsh environmental conditions.

Gastric problems and worm infestations are also prevalent, reflecting inadequate sanitation and poor dietary diversity. Gender-specific trends highlight differences in health concerns. Women report anaemia and respiratory diseases, linked to nutritional deficiencies and exposure to indoor air pollution. Men, on the other hand, emphasize muscle strain and injuries, reflecting the physical demands of fishing activities like net handling and boat operations.

- **Distance Travelled for Fishing by Gender:** Men travel farther for fishing, with a mean distance of 6.8 km and a median of 5 km, compared to women's mean of 4.2 km and median of 4 km. This reflects traditional roles, where men engage in more resource-intensive and mobility-dependent fishing practices.
- **Women's Participation in SHGs:** Only 32.5% of women participate in SHGs under the Mission Mangalam program, with the highest engagement in Talaja (50%) and moderate participation in Ghogha (40%). Mahuva (25%) and Rajula (20%) report the lowest participation.
- **Climate change awareness by gender:** Only 17.2% of women reported being aware of climate change compared to 22.8% of men, reflecting a gap in access to information and outreach efforts. Conversely, 82.8% of women and 77.2% of men are unaware, underscoring widespread knowledge deficits among both genders.
- **Gendered Impacts of Climate Change and Natural Calamities**
 - Economic Loss is the most reported consequence, affecting 44% of women and 51% of men, underscoring financial vulnerabilities.
 - Loss of Fish Catch impacts 37% of women and 42% of men, threatening livelihoods directly tied to environmental stability.
 - Emotional Distress is higher among women (24%) compared to men (18%), reflecting the gendered mental health burden of such events.
- **Anticipated Climate Impacts**
 - Women are more concerned about cyclones and irregular rainfall (28%) than men (19%), highlighting their heightened vulnerability to extreme weather events.
 - Men emphasize the decline in fish population (15%), pointing to long-term occupational risks in the fishing sector.
- **Skill Preferences by Gender:** Women prefer Agriculture and Farming, Rope Making, and skills tied to domestic and community roles like Vegetable Farming and Fish Feed Making. Men share some preferences, such as Agriculture and Rope Making, but focus more on aquaculture skills like Shrimp Culture and Pond-Based Fish Cultivation, reflecting their engagement in resource-intensive activities. This highlights gendered approaches to skill development, with women emphasizing community-centric roles and men targeting mobility-dependent opportunities.

Discussion

This section analyzes the research outcomes in conjunction with the extant literature, incorporating quantitative survey data alongside qualitative insights derived from focus group discussions (FGDs) and interviews undertaken in the study villages. The results are framed within the context of established literature to underscore systemic challenges and identify potential avenues for intervention.

Age and Marital Status: Demographic Realities

A predominance of middle-aged fishers, particularly in Rajula, where the 41–50 age group constitutes 64.03% of the population. This contrasts with Bhavnagar's more balanced age distribution across age groups. FGDs and interviews corroborate this finding, as older fishers in Mithivirdi and Kuda expressed concerns about the physical demands of fishing and the lack of young replacements. One respondent remarked, "Young people prefer other jobs because this work is hard and not profitable enough" (Fisher interview, 4th Nov. 2023, Kuda). The study conducted by Salim et al. (2013) similarly observed that 51.7% of small fishers in Gujarat fell within the age group of 36–55 years. This highlights a comparable trend in age-wise distribution among small fishers, emphasizing the dominance of middle-aged individuals in this sector.

Marital status serves as a critical lens to understand gendered vulnerabilities, particularly in the context of widowed women. In regions like Mahuva and Rajula, widows are disproportionately represented among fishing communities. One widow from Katpar Bandar shared her experience: "Without my husband, it's tough to balance fishing and selling in the market. Everything depends on me now" (Fisher interview, 5th Nov. 2023, Katpar-Bandar). In India, widowhood is often associated with adverse health outcomes, especially for women. Studies by Perkins et al. (Perkins et al., 2016) reveal that widows frequently endure psychological distress and poorer self-rated health compared to their married peers. The duration of widowhood further amplifies these challenges. Recently widowed women are particularly vulnerable, facing heightened health risks. These difficulties are compounded by socio-economic factors, including living arrangements and the disparities between rural and urban settings Perkins et al. (2016).

Social identities

The socio-cultural composition of fishing communities along the Gujarat coast, particularly in districts such as Bhavnagar and Amreli, reflects broader historical and demographic patterns observed in small-scale marine fisheries across western India. Empirical evidence suggests that these communities are predominantly Hindu, with a relatively smaller but economically significant Muslim minority engaged in fishing and associated trade networks. For instance, localized data indicate that in Bhavnagar district, approximately 96.2% of fishing households identify as Hindu, while 3.8% are Muslim; similarly, in Amreli district, Hindus constitute around 98% and Muslims about 2% of fishing families. This distribution aligns with statewide trends reported in the Marine Fisheries Census of Gujarat (2016), which documents that nearly 74% of marine fishing households are Hindu and about 26% belong to Islam, highlighting both regional variation and the continued presence of religious diversity within the sector.

Beyond religious affiliation, caste remains a central organizing principle in the structure and functioning of fishing communities. In Bhavnagar and Amreli, the majority of fishers belong to Other Backward Classes (OBCs), with prominent caste groups including Kharwa, Machhi (Machhiyaras), Bhoi, and Koli. These communities have historically been associated with marine occupations and possess specialized ecological knowledge, fishing skills, and maritime traditions that have been transmitted across generations. Studies on Gujarat's small-scale fisheries emphasize that Kharwas and Kolis, in particular, form the dominant seafaring groups, often controlling fishing assets such as boats and gear, while also shaping labor organization and community hierarchies (Johnson et al., 2018; Parappurathu & Achamveetil, 2020).

The intersection of caste and religion also influences occupational roles and economic participation. While Hindu OBC groups dominate active fishing operations, Muslim communities have been noted to play important roles in fish processing, marketing, and trade, contributing to the value chain beyond capture fisheries. Such occupational differentiation is consistent with broader patterns observed in Indian coastal societies, where social stratification intersects with economic specialization (Roshan, 2016).

Furthermore, the persistence of caste-based identities within fishing communities is not merely cultural but also institutional, affecting access to resources, state support, and cooperative structures. Research indicates that traditional caste networks often mediate entry into fisheries, ownership patterns, and even adaptation to modernization pressures such as mechanization and market integration (Gujarathi-Talati, 2022). At the same time, demographic transitions and economic shifts are gradually reshaping these identities, with younger members of communities like the Kharwas exploring alternative livelihoods (Johnson et al., 2018).

Overall, the religious and caste composition of fishing communities in Bhavnagar and Amreli illustrates a complex interplay of tradition, occupation, and social organization. While Hindu OBC groups dominate numerically and structurally, the presence of Muslim minorities and intra-caste diversity contributes to a dynamic socio-economic fabric that underpins Gujarat's marine fisheries sector.

Family structures

Family structures among fisherfolk in Gujarat reveal a complex interplay between cultural norms and socio-economic pressures. Bhavnagar demonstrates a strong preference for joint families (79.55%), particularly in Talaja (97.17%) and Mahuva (99.18%), reflecting cultural traditions of shared responsibilities and collective living. This aligns with findings by Chettiar (2015) and Saavala (1998) who emphasize the cultural value of joint family systems in traditional Hindu communities. Joint families in these areas also benefit economically, pooling resources to navigate the uncertainties of fishing livelihoods, as noted by Straus and Winkelmann (1969) and Rosada et al. (2020).

Conversely, Amreli exhibits a significant shift towards nuclear families (72.66%), with Rajula being a notable example of independent living. This trend reflects broader societal transitions influenced by modernization and urbanization, consistent with the observations of Chettiar (2015) and Samanta (2019). The smaller average family size in Amreli (4.41) compared to Bhavnagar (5.01) further underscores the shift towards nuclear setups, driven by the desire for autonomy and reduced familial obligations.

Ghogha in Bhavnagar presents a transitional case, with 42.31% joint families and 57.69% nuclear families. This balanced distribution reflects evolving family dynamics influenced by economic pressures and generational shifts, echoing the challenges highlighted by Samanta (2019). The wide variability in family size in Rajula (1–24 members) and Ghogha (1–18 members) highlights how families adapt to localized economic and social conditions, demonstrating resilience in response to changing livelihoods.

The findings resonate with observations by Gujarathi-Talati et al., (2024) who note that collective approaches like joint family systems are effective in addressing shared challenges within fishing communities. Similarly, the persistence of joint families in Bhavnagar illustrates the continued relevance of traditional structures, even amid modern challenges. However, the shift towards nuclear

families in Amreli reflects the broader transformations described by Salagrama (2006), driven by globalization and individualism in coastal communities.

Educational Attainment and Economic Opportunities

Educational data reveals limited access to formal education, with a significant proportion of non-literate individuals (e.g., 39.34% in Mahuva). A review of the socioeconomic conditions of Indian fishers highlights that limited education correlates with low income levels, compelling fishers to incur debts to meet basic needs (DeviNongmaithem & Ngangbam, 2014). Interviews from Mithivirdi village revealed that many younger members of fishing communities leave school early to contribute to the family income. A fisherwoman shared, "We want our children to study, but sometimes we need them to help us with work. It's hard to manage" (FGD, 4th Nov. 2023, Mithivirdi).

Income disparities are stark: Ghogha and Talaja report the highest concentration of fishers earning less than ₹1 lakh annually from their primary occupation, while Rajula exhibits a broader income distribution with 63.56% earning between ₹1–2 lakhs. This mirrors the findings of Salagrama (2006) that small-scale fishing communities often face economic challenges, including low incomes and limited access to credit and insurance, contributing to their vulnerability. Pagadiya fishers interviewed in Kuda and Khera highlighted seasonal fluctuations in income, with one fisher noting, "During monsoon, we don't get many fish, and we often have to take loans to survive" (Fisher interview, 6th Nov. 2023, Khera). This aligns with Salagrama (2006) observations, which emphasize the precarious nature of artisanal fishing livelihoods due to seasonal income volatility and dependency on loans.

Family income levels among fisherfolk show significant regional disparities. Rajula reports the highest average income (₹1,44,438, Talaja (₹75,405) and Ghogha (₹83,528) display moderate incomes with narrower ranges, while Mahuva reports the lowest average income (₹54,156). These variations highlight economic vulnerabilities, particularly in Mahuva. Such disparities are indicative of the broader socio-economic challenges faced by fisher communities in Gujarat (Rao et al., 2016).

Gender Disparities in Earnings

Daily earnings among the study participants reveal pronounced gender disparities, with women largely concentrated in the lowest income bracket (₹0–₹250). This pattern reflects their predominant engagement in low-paying activities such as fish vending and processing, as noted by Joshi et al. (2016). Although these roles are integral to the fisheries value chain, they remain undervalued and are often characterized by limited institutional support, thereby perpetuating women's economic vulnerability.

In contrast, men are more prominently represented in higher income brackets (₹751–₹1500), largely due to their involvement in relatively lucrative activities such as operating mechanized boats and participating in large-scale fishing operations. This observation is consistent with the report *Changing Roles of Fisherwomen of India: Issues & Perspectives*, which highlights that women's access to such high-income opportunities is constrained by systemic barriers, including entrenched gender norms and unequal access to productive resources like boats and fishing equipment (Ashaletha et al., 2002).

The moderate income category (₹251–₹500) shows a relatively balanced distribution, with women slightly outnumbering men, likely due to their active participation in auxiliary and support roles. However, as observed by Bandyopadhyay and Joshi (2024), even within these roles, women frequently encounter disparities in wages and working conditions compared to men.

Overall, these findings mirror broader patterns in coastal economies, where women's contributions, despite being substantial, remain undervalued, and their income-generating opportunities continue to be constrained.

Housing and Asset Ownership: Indicators of Vulnerability

Housing data reveals a high prevalence of kaccha houses in Rajula (83.09%), highlighting infrastructural inadequacies. Qualitative insights reveal that many families prioritize immediate needs over long-term investments in housing. A fisherwoman in Mithivirdi remarked, "Our money goes into nets and daily expenses. We can't afford a better house right now" (Fisher interview, 4th Nov. 2023, Mithivirdi). These findings align with insights from Rural Infrastructure Disparities in Coastal Communities, which emphasize how regional economic conditions influence housing quality in coastal areas. Access to land and credit is a major barrier for fisherfolk in securing adequate housing. The formal housing supply in urban Gujarat is insufficient to meet demand, leading to the proliferation of informal settlements with poor living conditions. The involvement of NGOs in facilitating access to housing finance has been significant, yet challenges remain in providing sustainable housing solutions (Mittal & Swamy, 2014). Further, Asmal et al. (2019) argues that the quality of housing in fisherfolk communities is often substandard, with inadequate sanitation facilities and infrastructure. This is a common issue in rural coastal areas across the geographies, where environmental conditions and pollution further degrade living standards.

Identity cards and Access to Insurance Schemes

Despite high Aadhar and ration card ownership (>96% across blocks), access to Ayushman cards remains inconsistent, particularly in Mahuva (47.54%). FGDs revealed that women faced significant bureaucratic challenges in accessing schemes. A fisherwoman from Ucha Kotda mentioned, "We don't know how to apply for these cards, and no one explains the process to us" (Fisher interview, 5th Nov. 2023, Ucha Kotda). As lack of bank accounts or not functional accounts hinders the access to social security benefits like the Ayushman Bharat card among the fisherfolk

Social Security and Welfare Schemes:

Social security and welfare schemes play a critical role in safeguarding the livelihoods and well-being of fisherfolk communities, who are often exposed to economic instability, occupational hazards, and environmental uncertainties. Despite the presence of multiple government initiatives aimed at supporting coastal populations, the extent of access and effective utilization among beneficiaries remains uneven.

Field observations indicate that awareness of welfare schemes is moderate; however, actual enrollment and benefit realization are constrained by procedural complexities, documentation requirements, and limited institutional outreach. Many fishers, particularly women engaged in post-harvest activities such as vending and processing, remain excluded from formal social security coverage. This reflects the broader marginalization of women's roles within the fisheries sector, where their contributions are substantial yet inadequately recognized in policy frameworks (Ashaletha et al., 2002; Bandyopadhyay & Joshi, 2024).

Key schemes including insurance coverage for fishers, subsidized housing, old-age pensions, and livelihood support during fishing ban periods are intended to provide financial stability. However, delays in disbursement, lack of transparency, and bureaucratic hurdles often undermine their

effectiveness. Studies have noted that inconsistencies in benefit delivery and limited awareness reduce the overall impact of such programs (Mittal & Swamy, 2014; Government of India, 2020).

The role of intermediaries, such as cooperatives and local institutions, has been significant in bridging gaps between the state and fishing communities. These organizations assist in awareness generation, enrollment, and grievance redressal. In addition, non-governmental organizations contribute by facilitating access to documentation and improving outreach, although their coverage remains limited (FAO, 2018).

A major concern is the inadequacy of scheme design in addressing the diverse needs within the fisheries sector. Small-scale fishers, migrant laborers, and women require targeted interventions beyond standardized policy measures. Furthermore, increasing climate-related risks such as cyclones and coastal erosion underscore the need for more comprehensive social protection systems that integrate disaster preparedness and livelihood resilience (Allison & Ellis, 2001; FAO, 2018).

Overall, while social security and welfare schemes constitute an essential support system for fisherfolk, their effectiveness is constrained by issues of accessibility, inclusivity, and implementation efficiency. Strengthening institutional frameworks, enhancing awareness, simplifying administrative procedures, and adopting gender-sensitive approaches are essential to improving outcomes and ensuring sustainable livelihoods in coastal communities.

Insurance and Pension Schemes:

Insurance and pension schemes constitute a vital component of social protection for fisherfolk, offering a safety net against occupational risks, income shocks, and life-cycle vulnerabilities. However, the analysis of the study area indicates that their reach and effectiveness remain limited, particularly among small-scale fishers and women engaged in auxiliary activities.

Field-level observations suggest that while awareness of insurance schemes such as accident insurance for active fishers exists to some extent, actual enrollment and claim settlement remain inconsistent. Many respondents reported difficulties in navigating application procedures, delays in claim processing, and inadequate compensation. These challenges are further compounded by low literacy levels and dependence on intermediaries, often resulting in delayed or partial access to benefits. Women, especially those involved in fish vending and processing, are frequently excluded, as they are not formally recognized as primary fishers despite their critical contributions to the fisheries value chain (Ashalettha et al., 2002; FAO, 2018).

While schemes such as Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) and Pradhan Mantri Suraksha Bima Yojana (PMSBY) are available, their uptake among fisherfolk remains low, largely due to inadequate targeted outreach and limited awareness (Shekar & Veeramani, 2017). Similarly, Ramprakash and Lingan (2021) document persistent barriers to accessing health insurance among marginalized communities, emphasizing the need for simplified, localized support systems to enhance enrollment and utilization.

Pension schemes, particularly old-age pensions, are designed to provide income security to elderly fisherfolk who can no longer engage in physically demanding work. However, coverage remains uneven. Many eligible beneficiaries encounter barriers related to documentation, age verification, and delays in approval and disbursement. In addition, pension amounts are often insufficient to meet basic needs, limiting their effectiveness. These challenges are more acute among vulnerable groups such as

widows and single women, who typically lack alternative income sources (Allison & Ellis, 2001; Government of India, 2020).

The seasonal and uncertain nature of fishing livelihoods further underscores the need for robust insurance and pension mechanisms. Exposure to risks such as accidents at sea, cyclones, and fluctuating fish catch heightens economic insecurity. Despite this, existing schemes often fail to adequately account for irregular income patterns and occupational mobility, leading to gaps in coverage and continuity (FAO, 2018).

Institutional mechanisms, including cooperatives and local governance bodies, play a supportive role in facilitating awareness and enrollment. Non-governmental organizations have also contributed to improving access; however, structural constraints such as bureaucratic complexity and weak coordination between schemes persist (Mittal & Swamy, 2014).

Overall, while insurance and pension schemes are essential for strengthening livelihood security among fisherfolk, their impact is constrained by issues of accessibility, inclusivity, and adequacy. Addressing these gaps requires simplifying procedures, ensuring timely claim settlements, expanding coverage to include women and informal workers, and enhancing benefit levels to provide meaningful social protection.

Gendered Labor Roles and Secondary Occupations

Quantitative results show that women predominantly engage in Pagadiya fishing (50.9%) and fish selling (49.1%), while men dominate physically intensive roles such as boat labour. Secondary occupations like agricultural labour are more common among women. This was evident in Katpar-Bandar, where a woman shared, "When the catch is low, we work in the cotton fields to make ends meet" (Fisher interview, 5th Nov. 2023, Katpar-Bandar). These gendered labour dynamics resonate with findings by Swathilekshmi (2011), who describe the dual economic and domestic roles of women in coastal economies.

Implications of Limited Educational Attainment

Limited access to education perpetuates income disparities and restricts economic mobility. While Mahuva's high non-literacy rate (39.34%) poses challenges, Rajula's comparatively better access to secondary education (30.94%) offers a template for targeted educational interventions. Studies by Ashalatha et al. (2002) emphasize the transformative potential of education in enhancing resilience and economic opportunities for fisherfolk.

Income Stratification and Debt Dynamics

The reliance on informal credit sources, particularly family (92.31% in Talaja), reflects limited financial inclusion. Qualitative data from Khera revealed that borrowing cycles often perpetuate debt. A fisherman remarked, "We borrow from family for nets and repairs, but it's hard to repay because income is irregular" (Fisher interview, 6th Nov. 2023, Khera). Pillai et al. (2015) argue that microfinance and SHGs can mitigate such debt cycles by providing structured credit options. SHGs, though underutilized in most blocks, have shown promise in Rajula (8.27%), highlighting the potential of collective financial models to improve credit access.

Housing and Infrastructure: Regional Inequalities

The disparity between Rajula and Talaja in housing quality underscores systemic infrastructural inequalities. Kaccha houses dominate in Rajula, exacerbating vulnerabilities to climate-induced risks. FGDs from Mithivirdi emphasized the need for targeted housing schemes tailored to fisherfolk's unique vulnerabilities (Fisher interview, 4th Nov. 2023, Mithivirdi). This finding aligns with Alam et al. (2019), who note that infrastructural investments are critical for building climate resilience in coastal communities.

Conclusion

This study set out to provide a gendered assessment of artisanal fisherfolk in the coastal districts of Bhavnagar and Amreli in Gujarat, focusing on their current status, climate resilience, and future prospects. Through a detailed household survey, village-level profiling, and dedicated attention to women's roles and experiences, the research has documented how livelihoods, risks, and opportunities are distributed within fishing households and communities, and how they intersect with broader ecological and policy changes.

The findings confirm that artisanal fisheries in this region remain a critical source of income, identity, and food security, yet they are under severe stress from multiple directions. Socio-demographically, the sector is marked by a predominance of middle-aged and older fishers, with fewer young entrants, indicating that traditional knowledge systems may weaken if attractive and dignified livelihood pathways are not secured. The work of women, though central to pre- and post-harvest activities and to household reproduction, often remains unrecognised in official statistics and scheme designs, limiting their direct access to entitlements and decision-making spaces.

The research highlights substantial inequalities in access to boats, gear, infrastructure, and markets, as well as high levels of indebtedness that tie many fishers into unfavourable patron-client relationships. While some villages benefit from better infrastructure and stronger organisations, others face dilapidated landing centres, limited cold storage, and weak collective platforms, exacerbating vulnerability to price volatility and shocks. At the same time, the study documents the uneven but important roles of cooperatives, SHGs, and federations in providing spaces for savings, mutual support, and emerging leadership, especially among women.

Climate change and environmental stress emerge as cross-cutting concerns. Fishers report noticeable changes in seasons, weather, and catch composition, and feel particularly exposed to cyclones, rough seas, and competition over resources, with Pagadiya fishers and small-boat owners facing the highest levels of direct risk. Women experience these changes in specific ways, through disruptions to drying and vending, heightened uncertainty in household provisioning, and increased care burdens during and after disasters. These lived experiences echo scientific evidence on the growing vulnerability of small-scale fisheries to climate variability in the Arabian Sea and underline the urgency of integrated adaptation measures.

An important contribution of this study is its explicit focus on gender. By documenting women's labour, constraints, and aspirations, and by examining how gender norms shape access to assets, institutions, and information, the research demonstrates that gender equity is not a secondary or optional dimension but a central axis of resilience and justice in artisanal fisheries. The findings show both the persistence of structural inequalities such as male control over licences, assets, and public decision-

making and the emergence of new forms of women's agency through SHGs, federations, and youth aspirations.

The recommendations outlined in the preceding chapter translate these insights into concrete directions for action by state agencies, local governments, civil society organisations, fisher collectives, and research institutions. Taken together, they call for: recognising women as fish workers and rights-holders; simplifying and democratising licence and permit systems; strengthening inclusive infrastructure and social protection; fostering democratic and gender-responsive organisations; and co-generating ecological and social knowledge for more informed, participatory governance.

Like any empirical study, this assessment has limitations. It focuses on selected blocks within two districts and relies primarily on respondent reports, and does not include detailed ecological or catch-effort monitoring that would be necessary to fully quantify environmental change. Nevertheless, by combining quantitative and qualitative insights across a substantial number of households and by centring voices that are often marginalised—particularly those of women and crew—it offers a robust and nuanced picture of contemporary artisanal fisheries in coastal Gujarat.

In conclusion, the study underscores that artisanal fisherfolk in Bhavnagar and Amreli stand at a critical juncture, shaped by overlapping forces of climate change, ecological degradation, market uncertainty, and entrenched social inequalities. Yet it also reveals considerable strengths: deep experiential knowledge of the sea, strong kin and community networks, emerging local institutions, and growing aspirations among women and youth for safer, more diversified, and more dignified livelihoods. The challenge and opportunity for policy, practice, and research lie in recognising and nurturing these strengths while addressing structural barriers, so that coastal development pathways in Gujarat can be both environmentally sustainable and socially just for current and future generations of artisanal fisherfolk.

Chapter 12: Recommendations

Building on the key findings of this gendered assessment, this chapter presents practical recommendations to strengthen the livelihoods and climate resilience of artisanal fisherfolk in Bhavnagar and Amreli, with particular attention to gender equity and fair access to licences and regulatory systems. Recommendations are organised by stakeholder so that responsibilities and potential entry points for action are clear.

State Fisheries Department and Related Line Departments

Artisanal fisheries in Bhavnagar and Amreli remain family-based and caste-embedded, with women contributing substantially in pre- and post-harvest activities yet rarely recognised in official records or as direct beneficiaries of schemes. The State Fisheries Department should revise fisher registration categories so that women engaged in drying, processing, vending, and ancillary work are formally recorded as “fish workers” in state databases, enabling them to directly access licences where relevant, insurance, savings-linked schemes, and seasonal relief.

Small-scale and Pagadiya fishers face significant challenges in obtaining and renewing fishing licences, with low awareness of conditions, dependence on intermediaries, and complex paperwork. The department should simplify and democratise licence and permit procedures by introducing user-friendly, multi-year licences for small-scale craft, organising village-level licence camps where officers directly assist fishers (including women) with applications and renewals, and providing clear, Gujarati-language guides with pictorial explanations of licence conditions, gear restrictions, and spatial regulations. In Katpar-Bandar, for example, households described travelling roughly 100 km to Bhavnagar every year simply to renew a Pagadiya licence, sometimes without being seen because the officer had already left — a burden that periodic local camps, staffed by a handful of officers rather than requiring hundreds of fishers to travel, would directly relieve.

Licences and boat documents are typically issued in the names of men, even where women invest resources or manage post-harvest operations. To ensure gender-equitable access to benefits and compensation, joint registration of boats and licences in the names of spouses should be encouraged for small-scale units, thereby enhancing women’s legal and financial security and their capacity to engage with institutions.

Access to social protection remains uneven, and existing schemes often do not reflect the differentiated risks faced by women, crew members, and migrants. The State Fisheries Department, in coordination with social protection agencies, should tailor accident insurance, savings-cum-relief, and pension schemes to explicitly include crew members and registered women fish workers, while simplifying procedures and ensuring portability of entitlements for seasonal migrants moving between harbours within and across states.

Infrastructure deficits at landing centres and markets such as lack of cold storage, hygienic auction platforms, potable water, and women-friendly facilities undermine both value realisation and working conditions. The department should prioritise upgrading landing centres with shaded auction areas, ice and cold storage, safe water, and separate toilets and rest spaces for women vendors, and involve fisher organisations and women’s groups in the design, monitoring, and management of these facilities.

Given fishers' heightened exposure to cyclones, erratic weather, and changing sea conditions, climate and disaster risk reduction measures need to be better aligned with the realities of small-scale fishers. Integration of IMD early warning systems with local-language SMS and voice alerts, basic safety training, and subsidised safety gear linked to licence renewal for small craft would substantially enhance safety at sea, while village-level disaster preparedness plans should explicitly involve women and youth.

Boat licences and identity documents are frequently lost when vessels capsize or gear is swept away during cyclones, yet fishers report being refused permission to resume fishing until the same documents are replaced through the ordinary renewal process, with officials telling them simply to "go get it made." The State Fisheries Department should introduce a fast-tracked, fee-waived provisional licence for households that can show evidence of a recent, officially recorded disaster or accident, so that document loss during an emergency does not compound into a prolonged loss of livelihood.

This openness to diversification coexists with strong attachment to the sea and to fishing as an identity and way of life, expressed clearly by fishers themselves during this study; diversification efforts are therefore most likely to succeed if they expand the range of viable, dignified options within and around fisheries rather than treating an exit from fishing as the only path to a better future. Finally, as youth and women increasingly seek diversified and safer livelihood options, fisheries-related institutions should support livelihood diversification with a clear gender lens. This includes targeted training, credit linkages, and incubation support for seaweed farming, small-scale aquaculture, value-added fish products, eco-tourism, and non-fish coastal enterprises, with due attention to childcare, mobility, and workplace safety.

Local Governments (Panchayats, Blocks, District Administration)

Gram Panchayats and block- and district-level administrations play a crucial role in shaping the everyday environment in which fisherfolk live and work, yet fisher-specific needs and vulnerabilities are often underrepresented in local plans. Local governments should use this study's block- and village-level evidence to integrate fisheries infrastructure, coastal protection, housing improvements, safe drinking water, sanitation, and documentation support into Gram Panchayat Development Plans, ensuring that women fish workers and Pagadiya fishers are formally invited and heard during planning processes.

Several Pagadiya settlements, such as in Kuda, sit on land the community does not legally own, leaving households unable to secure roads or a reliable drinking water supply and unable to hold the government accountable for these facilities precisely because their tenure is informal. District and block administrations, working with the Revenue Department, should assess coastal Pagadiya settlements for regularisation under existing provisions such as Nattham Patta or equivalent coastal land-use schemes, so that eligibility for basic infrastructure does not remain contingent on a form of land ownership these communities have never had the opportunity to formalise.

Lack of identity documents, bank accounts, fisher IDs, and updated licences constitutes a major barrier to accessing schemes, compensation, and formal credit. The district and block administrations, in collaboration with line departments and NGOs, should organise periodic "single-window" governance camps in coastal villages, where households can update Aadhaar, ration cards, bank linkages, fisher IDs, and licences in one place, with particular attention to widows, single women, migrants, and crew families. These camps should also provide hands-on assistance with the online applications

increasingly required for equipment and welfare schemes, since several villages reported missing successive rounds of a twice-yearly benefit distribution for Pagadiya fishers for this reason alone.

Persistent conflicts over fishing zones, gears, and regulatory enforcement—especially between artisanal and mechanised fleets highlight the need for more participatory mechanisms of conflict resolution and co-management. Local governments should support the establishment or strengthening of block-level fisheries coordination committees that include Pagadiya fishers, small-boat owners, crew, women vendors, and representatives of the mechanised sector, so that local disputes can be addressed through dialogue and joint recommendations channelled to the State Fisheries Department. Fishers in the Katpar-Bandar-Lighthouse cluster describe cargo vessels cutting their nets on a near-daily basis by departing from any fixed route to save fuel; local governments should work with the Coast Guard, Marine Police and port authorities to physically demarcate (for example with buoys) and enforce the nearshore zone reserved for Pagadiya fishers, rather than relying on voluntary compliance alone.

Utthan and Other Civil Society Organisations

Civil society organisations such as Utthan have been central in facilitating women's collectivisation, climate resilience work, and access to schemes among coastal communities. Given the emerging roles of women's SHGs and federations, there is a need to deepen women's leadership capacities and strengthen their influence in fisheries-related decision-making spaces. This can be achieved through sustained leadership and advocacy training covering fisheries laws, licence regulations, social protection, and climate adaptation, and by supporting women leaders to secure representation in harbour committees, co-management bodies, and block-level fisheries forums.

Fishers' dependence on intermediaries for licences and permits, combined with limited understanding of regulatory frameworks, points to a clear role for paralegal and documentation support. Organisations like Utthan can train community-based paralegals or "licence mitras" to help fishers navigate fisheries law and administrative procedures, complete forms accurately, track renewal dates, and contest unfair penalties, with a particular focus on more vulnerable groups such as widows, single women, and migrant crew.

Given fisherfolk's strong perceptions of ecological change and climate impacts, community-based ecosystem and climate resilience initiatives merit further expansion. NGOs can facilitate mangrove restoration, dune and creek protection, beach and creek clean-up, and participatory vulnerability mapping, combining local ecological knowledge with scientific monitoring of catches, seasons, and extreme events, and using the evidence generated to influence district and state-level planning.

Market and value-chain dynamics currently keep most artisanal fishers as price-takers and confine women to low-value segments. Civil society actors can pilot fairer models such as women-led marketing collectives, shared drying and processing infrastructure, simple digital price displays at landing centres, and linkages to institutional buyers and ethical traders, helping fishers negotiate better terms while reducing exploitative dependence on credit-tied agents. Fishers themselves have proposed identifying and training capable young community members to act as village-based aggregators or traders, so that the margin currently captured by outside intermediaries — in one village estimated at several times what the fisher receives — is more likely to stay within the community.

The high levels of stress reported by fisher households from debt, accidents, disasters, and uncertain futures highlight the need to explicitly address wellbeing and mental health within development interventions. Utthan and partners can integrate basic psychosocial support, peer groups, and wellbeing sessions into livelihood and climate programmes, train frontline staff to recognise severe distress, and develop referral pathways to the public health system.

Fisherfolk Organisations, Cooperatives, and SHGs

The study shows wide variation in the strength and inclusiveness of existing fisher associations, cooperatives, and SHGs, with some functioning as vibrant platforms and others remaining inactive or dominated by a few leaders. These organisations should work towards stronger internal democracy and accountability by regularising meetings, sharing financial information openly with members, and adopting quotas or reserved positions for women and youth in executive committees, so that decision-making better reflects the diversity of the membership. A tiered leadership model piloted in the Katpar-Bandar-Lighthouse cluster — gender-balanced village-level leaders feeding into a joint cross-village platform empowered to represent all member villages before block, district and state officials — offers one workable template for scaling this kind of representative structure elsewhere.

Artisanal fishers are simultaneously harmed by destructive fishing practices and regulatory violations and constrained by the need to maintain livelihoods under pressure. Cooperatives and associations can play a proactive role in collectively managing licence compliance and sustainable fishing norms by developing community agreements on gear types, mesh sizes, seasonal closures, and no-take areas that align with state regulations, and by creating peer-support mechanisms to help members comply, rather than relying solely on external punitive enforcement.

Income volatility and indebtedness remain central challenges, with heavy reliance on informal lenders. SHGs and cooperatives can strengthen savings, insurance, and risk-pooling mechanisms by encouraging regular savings, facilitating group enrolment in insurance schemes, and establishing small emergency funds for accidents, disasters, and gear losses, thereby reducing dependence on high-interest credit and improving resilience to shocks.

Research and Academic Institutions

The findings underscore the richness of fishers' experiential knowledge about ecological and climatic changes, while also revealing gaps in systematic, local-scale ecological and social data. Research and academic institutions should co-generate evidence with communities by partnering with fisher organisations and NGOs to implement catch diaries, participatory stock assessments, and climate vulnerability mapping in coastal Gujarat, ensuring that results are translated into local languages and fed back into community and policy dialogues.

Vulnerability and resilience among fisherfolk are shaped by intersecting factors of gender, age, caste, migration status, and asset base, and these dynamics evolve over time. There is a need for intersectional and longitudinal research that follows women, youth, migrants, and Pagadiya fishers across seasons and years to understand how policy, markets, licences, and climate jointly influence their options, risks, and wellbeing, informing more nuanced interventions.

Local leaders and federations are emerging as important actors in fisheries governance but currently lack sufficient technical support to engage with complex policy and licence regimes. Research and training institutions can contribute by developing short courses and practical toolkits in Gujarati on

fisheries law, licence processes, budget analysis, and data use, tailored for community leaders and staff of organisations such as Utthan, thereby strengthening bottom-up, evidence-based advocacy.

A regional fisheries and aquaculture training centre already exists near Bhavnagar, offering guidance on aquaculture techniques, market linkages, and access to schemes, yet engagement from fishers in the Katpar-Bandar-Lighthouse cluster has remained minimal. This is not for lack of institutional effort, but reflects the practical constraints of a daily-catch livelihood that leaves little room for travel or multi-day training, alongside the accumulated effect of past discouraging experiences with government offices. Rather than relying on communities to travel to the centre, the university and partner institutions should pilot mobile extension units and periodic on-site sessions in the villages themselves — including on under-used local assets such as creek-based ('bandhara') aquaculture — with logistical and mobilisation support from Utthan, so that technical expertise that is already funded and available is more likely to reach the communities it is intended to serve.

Chapter 13: From Evidence to Implementation: Utthan's Post-Research Field Interventions

13.1 Overview: Operationalizing the Research Findings

The preceding chapters of this assessment paint a clear picture of the multi-layered vulnerabilities faced by artisanal fisherfolk, especially Pagadiya (foot) fishers and fisherwomen, across coastal Gujarat. Rather than allowing these findings to remain static data points in a late-published report, Utthan immediately utilized the real-time insights from this study to design and execute a dedicated, action-oriented field project from **November 2024 to October 2025**.

Supported by the **Duleep Matthai Nature Conservation Foundation (DMNCF)**, the project—*"Building Socio-Ecological Resilience of Pagadiya Fishers in Fishing Villages under Katpar Gram Panchayat, Bhavnagar"*—directly targeted three highly vulnerable and marginalized marine fishing settlements: **Katpar-Bhavani, Bandar, and Lighthouse**. This chapter outlines how Utthan took the core research findings regarding gender disparities, climate risks, lack of institutional voice, and livelihood insecurity, and converted them into tangible grassroots actions.

13.2 Institutionalizing Community Voice: Mobilization and Platform Building

The research clearly highlighted that a lack of voice and institutional representation severely limits the Pagadiya fishers' capacity to claim their rights. To systematically counter this marginalization, Utthan focused on building collective identity and local leadership.

- **Local Leadership & Household Trust:** A local **Community Resource Person (CRP)** was identified, trained, and embedded within the community. Utilizing the KoBoToolbox mobile platform, the CRP and field team conducted **236 comprehensive household surveys**, creating a trusted baseline and opening a direct channel of communication with the most marginalized families.
- **Fisherfolk Village Assemblies:** Over the project cycle, Utthan facilitated **24 village-level Gram Assemblies** (8 per village). These assemblies served as the first formal participatory platforms for traditional fishers, drawing a total of **1,379 participants**, heavily represented by women (**1,109 women and 270 men**). Participants collectively deliberated on declining catch, marine plastic pollution in intertidal zones, and the lack of basic infrastructure like fish landing centres.
- **Formation of the 'Manchs':** To give these voices permanent structural weight, Utthan supported the creation of localized community collectives:
 - **Ekta Machimar Manch** (Katpar)
 - **Sahyog Machimar Manch** (Lighthouse)
 - **Bandar Machimar Manch** (Bandar)

Together, these collectives mobilized **554 active members**, who established a joint coordination committee to negotiate directly with local government and line departments.

13.3 Promoting Livelihood Diversification and Technical Training

As noted in the primary research data, declining fish diversity and ecological changes have rendered traditional foot-fishing highly volatile. In response, Utthan partnered with premier scientific institutions to pilot climate-resilient, supplementary livelihoods, with a primary focus on women.

Seaweed Cultivation Pilot (Partnership with CSIR-CSMCRI)

On **April 11, 2025**, marking the 72nd Foundation Day of the **Central Salt & Marine Chemicals Research Institute (CSMCRI)**, Utthan signed a formal MoU to implement climate-smart, women-led seaweed farming.

- **The Pilot:** Ten Pagadiya fisher households along the Katpar coast initiated a monsoon seed preservation pilot for *Kappaphycus alvarezii*.
- **Adaptive Learning:** Phase I deployed 107 seaweed bags, many of which faced severe damage due to monsoon surges and shallow water turbulence. In Phase II, bags were re-anchored with modified technical specifications. While Lighthouse sites showed improved survival rates, Katpar experienced losses from tidal surges. These pilots provided invaluable data regarding seasonal risks, anchoring technologies, and site selection, leading to a refined ongoing second-round pilot.

Certified Crab Culture Training (Partnership with Kamdhenu University)

To break the cycle of single-income vulnerability, Utthan collaborated with the **Fisheries Research and Training Centre (FRTC), Mahuva**, a unit of Kamdhenu University.

- **The Intervention:** A certified three-day technical training program on crab culture was organized.
- **Participants:** **50 fisherfolk, predominantly women**, from the three project villages.
- **Core Curriculum:** The training covered crab life cycles, site preparation, cage vs. pond methods, market strategies, and low-cost feed management using fish waste and vegetable scraps. This marked the first time that local Pagadiya women directly accessed state-linked technical institutions.

13.4 Bridging the Gap: Productive Assets and Universal Social Protection

The assessment data revealed stark realities: low asset ownership, severe reliance on informal moneylenders, and zero formal insurance coverage. Utthan rolled out immediate asset distribution and scheme linkage drives to alleviate these pressures.

Distribution of Livelihood Assets

To strengthen fishing capacities and reduce physical drudgery, asset distribution criteria were co-developed with the village Manchis:

- **Fishing Nets:** In July 2025, **50 fisher households** received subsidized fishing nets on a cost-sharing model to build community ownership.

- **Post-Harvest Support:** In August 2025, **80 dhamelas** (hygienic aluminum containers) were distributed exclusively to women fish vendors across the three villages to improve hygienic handling, maintain product quality, and boost visibility in the local value chain.

Scheme Convergence and Institutional Rights

Using the platform of **Shakti Mahila Sangathan's Common Service Centres (CSCs)**, the field team and CRPs streamlined documentation and systematically linked **582 individuals** to key state entitlements:

Welfare Scheme / Platform	Number of Beneficiaries Linked	Impact Area
Manav Kalyan Yojana	137 individuals	Livelihood toolkits & asset support
PM Vishwakarma Yojana	109 individuals	Skill recognition & artisanal support
e-Shram Registration	86 individuals	Formal unorganized sector recognition
National Fisheries Digital Platform (NFDPS)	83 fishers	Formal institutional recognition

*Note: Multiple households were also successfully linked to **Ayushman Bharat & ABHA Cards** for critical healthcare coverage and financial protection.*

13.5 Policy Advocacy and Multi-Stakeholder Convergence

To sustain these local changes, Utthan sought to bridge the gap between the intertidal mudflats and macro-policy makers.

The District-Level Multi-Stakeholder Consultation

On **October 7, 2025**, Utthan convened a landmark consultation at the **Nilambag Palace Hotel, Bhavnagar**. The platform brought together fisher representatives, Panchayat leaders (including Katpar Sarpanch Bharat Dudha Baraiya), and key figures from CSMCRI, Kamdhenu University, Seatang, Pidilite Industries (Trivenikalyan Foundation), and the Dakshin Foundation.

The event successfully shifted the narrative of Pagadiya fishers from passive victims of coastal change to active, traditional stewards of the intertidal commons.

Voice of the Pagadiyas:

"Ours is an indigenous fishing community that has practiced this livelihood for centuries. Pagadiyas fish on foot without boats or engines, entering shallow coastal waters during low tide. We depend entirely on ancestral knowledge of the sea — its winds, tides, and rhythms. This is not just a job. It is our identity, our heritage, and our way of life."

Major Policy Breakthrough with the Fisheries Commissionerate

A persistent challenge uncovered by the research was the heavily backlogged, decentralized licensing process that left nearly 40% of fishers without valid documentation. By escalating these field insights

to the state level, Utthan held high-level meetings with the **Commissioner of Fisheries, Government of Gujarat**. In a historic move, the Commissionerate expressed deep interest and invited an activity plan to sign a **non-financial Memorandum of Understanding (MoU)** with Utthan to co-manage fisher registrations, simplify licensing frameworks, and scale up community-led coastal governance models across Gujarat.

13.6 The Strategic Roadmap Ahead

Building on the momentum of this intervention, Utthan has structured a clear, community-backed roadmap to scale these actions from the initial 3 pilot villages to **28 designated fishing villages across Bhavnagar**, and eventually across other coastal districts of Gujarat.

1. **Coastal and Marine Stewardship:** Setting up plastic interception systems at Malan Bandhara, executing community-led mangrove restoration, establishing water-quality tracking, and documenting Traditional Ecological Knowledge (TEK).
2. **Tenure and Housing Security:** Partnering with the Revenue and Panchayati Raj Departments to secure house-site *pattas* (land titles) and retrofitting thatch-roof homes to withstand cyclones via the Pradhan Mantri Awas Yojana–Gramin (PMAY-G).
3. **Market Infrastructure & Cold Chains:** Establishing dignified, designated fish vending spaces in Mahuva town, providing iceboxes, and eliminating predatory middlemen through Direct-to-Consumer (D2C) marketing linkages.
4. **Health, Wellbeing, and Social Safeguards:** Launching mobile medical health camps tailored for fisherwomen and executing community-led campaigns to curb substance and alcohol abuse among coastal youth.

By linking the research findings, responsive actions on the ground, Utthan models an adaptive framework where the traditional custodians of the coast are fully equipped to protect both their livelihoods and the marine ecosystems they call home.

PHOTOS (November 2024 to October 2025)

MOU with CMSCRI the occasion of their Foundation Day



Completion of Certified Seaweed Farming – 3 team members participated in the training run by CSCMCRI





PRA and meeting with Fisher women



Seaweed deployment



Village Assemblies with Fisherfolk conducted by CRP supported by Utthan team



Net and Dhamela distribution



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Fisher interview, 6th Nov. 2023, Chanch

Field Group Discussion, Katpar/Bandar/Lighthouse cluster, 5th November 2023

Photos from research process





GENDERED ASSESSMENT OF ARTISANAL FISHERFOLK IN BHAVNAGAR AND AMRELI, GUJARAT

ABOUT THIS REPORT

This report presents a assessment of artisanal fisherfolk across Bhavnagar and Amreli districts, Gujarat, combining a large-scale household survey with focus group discussions conducted by Kongunadu Arts and Science College and Utthan. It examines socio-economic conditions, climate vulnerability, and the specific barriers facing women in fishing communities, and closes with stakeholder-specific recommendations for more inclusive, climate-resilient coastal livelihoods.

PREPARED IN PARTNERSHIP BY



Utthan

36, Chitrakut Twins, B/h Management Enclave, Nehru Park, Vastrapur, Ahmedabad, Gujarat 380015



