Small-Scale Fishing Communities of Mahuva Bandar, Bhavnagar, Gujarat: Livelihoods, Climate Risks, and Development Pathways

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Need Assessment Report

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Message from CEO, Utthan

It gives me great pleasure to present this need assessment report on the fishing community of **Mahuva Bandar village in Bhavnagar district**. This study is part of Utthan's continuing journey to strengthen gender-just, climate-resilient livelihoods and to ensure that the voices of marginalised communities are placed at the centre of development planning.

For over four decades, Utthan has worked alongside **women farmers, fisherfolk, and tribal communities** across Gujarat. Through this engagement, we have consistently learnt that sustainable change emerges when communities are empowered to articulate their realities and actively shape solutions. This assessment of Mahuva Bandar fisherfolk is therefore more than a technical exercise; it is an effort to capture the lived experiences, challenges, and aspirations of a community deeply tied to the sea, yet often overlooked in policy and programmes.

The findings highlight both strengths and vulnerabilities. Mahuva Bandar's fisherfolk demonstrate resilience through women's federations, traditional knowledge of the sea, and strong social solidarity. At the same time, they face deep structural barriers: fragile and seasonal incomes, minimal access to welfare schemes and insurance, ecological decline, and persistent conflicts with industrial fishing. These realities underline the urgent need for systemic reforms that place small-scale fisherfolk on an equal footing with other livelihood groups in terms of rights, recognition, and state support.

The recommendations emerging from this study are grounded in community voices and validated through village assemblies. They point to practical interventions — from decentralised licensing and fisherfolk collectives to cold storage, insurance, social protection, and climate adaptation measures. Implementing these measures will require the collective will of government, civil society, and the private sector, working in partnership with fisherfolk themselves.

I extend my sincere gratitude to the fisherfolk of Mahuva Light House for sharing their experiences and insights. My appreciation also goes to **Ms. Pallavi Sobti-Rajpal** (Joint CEO) and **Ms. Jaya Chavda** (Area Manager, Coastal) for their guidance in shaping this study. A special thank you to **Dr. Selvakumar Vellingiri** and **Ms. Manisha Patel** for leading the research and report writing, and to the field team — **Mr. Jitendra Maru** and **Ms. Shilpa Bambaniya** — for their dedication to data collection, facilitation, and community engagement. We also gratefully acknowledge the support of the **Duleep Matthai Nature Conservation Foundation (DMNCF)**, which made this study possible.

It is our hope that this report not only informs programmes and policies but also strengthens the dignity, security, and sustainability of fisherfolk livelihoods in Gujarat.

Warm regards,
Pravin Bhikadiya
CEO, Utthan

Executive Summary

This need assessment of Mahuva Bandar village, Mahuva block, Bhavnagar district, is based on a household survey (N = 64) and village assemblies conducted in 2025. The study examines livelihoods, socio-economic conditions, institutional linkages, and environmental challenges, highlighting both resilience and persistent vulnerabilities.

Key Findings

- **Livelihoods:** Fishing dominates, with 82.8% of households dependent on Pagadiya fishing and limited diversification beyond fish selling (10.9%) and small-boat ownership (6.2%). Women contribute significantly through vending and processing, but their roles remain undervalued.
- **Economic Conditions:** Incomes are modest and seasonal (median ~₹75,000/year). Borrowing is confined to informal networks, insurance coverage is absent, and expenditures are food-dominated. Housing ownership is high but without pattas, leaving tenure insecure.
- **Social Capital:** Women's federations achieve near-universal membership, yet no fisherfolk collective exists. Identity documents are widespread, but uptake of social welfare and fisherfolk-specific schemes is negligible.
- **Physical Capital:** Electricity and gas connections are nearly universal, but only one-third of households have functional toilets or drinking water taps. Infrastructure support for fishing (cold storage, auction facilities) is almost absent.
- **Natural Capital:** Most households (78.1%) reported declining fish diversity, especially Pomfret, Bombay Duck, and Hilsa. Cyclones affected two-thirds of households, causing economic losses and disruptions. Plastic waste is routinely encountered, though its ecological impacts are poorly recognised.**Governance:** Awareness of fishing regulations is strong, but legal aid access is minimal (95% without support). Net damage from trawlers is widespread. Alcohol consumption is pervasive, and 70.3% of households do not wish their grandchildren to continue fishing, signalling intergenerational disillusionment.

Recommendations

- **Livelihoods & Skills:** Support diversification through rope making, aquaculture, and women-focused enterprises with stipends and follow-up mentoring.
- **Financial Inclusion & Protection:** Ensure transparent access to pensions, health insurance, and fisherfolk-specific schemes; introduce low-premium insurance for boats and nets.
- **Infrastructure & Markets:** Invest in cold storage, auction platforms, and subsidised inputs; create women's cooperative stalls and digital market linkages.
- **Climate & Environment:** Strengthen awareness on juvenile fish capture, combine IMD alerts with traditional knowledge, and promote mangrove restoration.
- **Gender equity in fisheries governance**: Ensure that women's representation is included in village-level committees, such as disaster management committees and policy-related decision-making bodies.
- **Governance and support system:** Establish fisherfolk collectives, expand extension services, and set up grievance mechanisms for issues like net damage. Ensure the inclusion of fisherfolk needs in the Gram Panchayat's village development plan (GPDP).

Conclusion

Mahuva Bandar's fisherfolk demonstrate resilience through federations and traditional knowledge but remain economically fragile, environmentally vulnerable, and institutionally marginalised. Strengthening financial access, market systems, and governance structures is essential for securing sustainable and equitable futures.

Chapter 1: Introduction

Aquatic food systems are highly diversified and furnish a variety of environmental, economic, and social benefits and services. They are increasingly recognized – both in the international arena and in the majority of countries and communities – for their nutritional value and ecosystem services that they deliver, upholding healthful diets and sea life. More than they've ever been, they are viable solutions and avenues for increasing global food security and nutrition, enhancing income, and preserving the environment.[1]

The Indian fishery sector plays a pivotal role in the nation's economy, employment generation, and food security. As one of the **top global producers of fish**, India contributes significantly to both **domestic nutrition** and **international trade**. According to recent data from the Ministry of Fisheries, Animal Husbandry and Dairying, India achieved a **total fish production of approximately 17.545 million metric tonnes in 2022–23**, reflecting a substantial increase from previous years and marking a robust growth trajectory[2]

This growth has been especially driven by the inland aquaculture segment, which accounted for over **131.13 lakh tonnes**—more than doubling since 2013–14. India now contributes about **8% of global fish production**, ranking as the **third-largest fish producer** globally and the **largest inland fish producer**[3]. These figures highlight the sector's growing importance and its alignment with national objectives under schemes such as the Pradhan Mantri Matsya Sampada Yojana (PMMSY), aimed at enhancing sustainable fisheries, infrastructure, and livelihoods.

India, with a coastline stretching over 8,000 kilometres and an extensive network of rivers, lakes, reservoirs, and other inland water bodies, possesses immense potential for the development of both capture and aquaculture fisheries. The fisheries sector continues to serve as a vital source of livelihood for millions of fishers and fish farmers, particularly in rural and coastal regions. Beyond its economic significance, the sector contributes meaningfully to the nutritional requirements of the population, with fish being recognised as a major source of affordable animal protein. In this context, the **National Fisheries Policy** has been envisaged as a comprehensive framework aimed at enhancing fish production and productivity, encouraging the adoption of sustainable and responsible fishing practices, and improving the socio-economic well-being of the fisherfolk through targeted interventions and institutional support mechanisms. (Ministry of Fisheries, Animal Husbandry and Dairying, 2020).

Moreover, the Indian fisheries sector is confronted with several critical challenges, including overexploitation of marine resources, degradation of aquatic habitats, and the adverse impacts of climate change, all of which pose significant threats to the long-term sustainability of fish stocks and the health of aquatic ecosystems. Recognising these concerns, the Government of India has undertaken a series of measures aimed at ensuring ecological balance and sustainable resource utilisation. Key interventions include the promotion of responsible fishing practices, the encouragement of technological innovations in aquaculture, and the establishment and effective management of marine protected areas (MPAs). These efforts are aligned with national policy objectives and international commitments to conserve biodiversity while securing the livelihoods of fishing communities[4].

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[1] https://openknowledge.fao.org/items/06690fd0-d133-424c-9673-1849e414543d
[2] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2083813
[3] https://nfdb.gov.in/PDF/State_Fishes_and_Aquatic_Animals_of_India_2024.pdf
[4] Pillai, N. G. K., et al. (2021). Sustainable Fisheries Management in India: Challenges and Opportunities. Indian Journal of Fisheries.

Oceans constitute the largest ecosystem on Earth, covering nearly three-fourths of the planet's surface, and form a critical arena for addressing complex and interlinked developmental challenges such as livelihood generation, climate resilience, maritime trade, and national security. Within this context, the Indian Ocean holds strategic importance, contributing significantly to the economic sustenance, food security, and geopolitical interests of its littoral states. For India, the maritime domain is both vast and vital—comprising a coastline of 8,118 kilometres, encompassing nine maritime states—namely Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, and West Bengal—and four maritime Union Territories, including Daman and Diu, Puducherry, Lakshadweep, and the Andaman and Nicobar Islands. This extensive coastal and island geography provides direct and indirect livelihood opportunities to millions of coastal communities, particularly those engaged in fishing, aquaculture, and allied marine activities. The Indian coastline, therefore, is not only a geographical asset but also a socio-economic lifeline for the nation's blue economy aspirations.[5] This extensive coast supports a 0.53 million km^2 continental shelf and an Exclusive Economic Zone (EEZ) of 2.02 million km^2, with an estimated annual fish yield potential of 3.93 million tonnes according to Standing Committee on Agriculture (2019–2020).[6]

Marine fisheries constitute a crucial component of India's fisheries sector, with substantial contributions originating from coastal states such as Gujarat, Tamil Nadu, Kerala, West Bengal, and Maharashtra. India is currently recognised as the third-largest fish-producing country globally and holds the distinction of being the second-largest aquaculture producer, following China. The nation contributes approximately 7% of global fish production, underscoring its strategic position in the global seafood economy.

Further enhancing its ecological significance, India is identified as one of the 17 mega-biodiverse countries, harbouring more than 10% of the world's fish biodiversity. This rich aquatic diversity supports a range of marine and inland ecosystems, reinforcing both ecological sustainability and resource availability. In addition to being the largest producer of shrimp globally, India's fisheries sector plays a vital role in ensuring domestic food and nutritional security, while also catering to a robust and expanding international seafood export market. These strengths position the country as a key stakeholder in advancing sustainable fisheries governance and blue economy objectives at both regional and global levels.

India's Coastal and Fisherfolk Profile: A State-wise Perspective

As per the Marine Fisheries Census, 2016, India's extensive coastline, measuring approximately 8,162 kilometres, spans 13 coastal states and Union Territories, supporting a dynamic and culturally rich maritime ecosystem. This coastal belt encompasses 1,363 landing centres and 3,477 marine fishing villages, serving as the backbone of the country's marine fisheries infrastructure. The sector supports a sizable and socio-economically significant population of 37,74,577 fisherfolk, including 6,00,890 families classified as living below the poverty line, thus underscoring both the economic relevance and developmental challenges of coastal communities in India.

Among the maritime states, Tamil Nadu stands out prominently with 349 landing centres and 575 fishing villages, sustaining the largest fisherfolk population, estimated at 7,95,708 individuals. The state also accounts for one of the highest numbers of traditional fishing families, numbering 1,96,784, reflecting its deep-rooted association with marine livelihoods. Andhra Pradesh follows

[5] https://pib.gov.in/PressReleseDetailm.aspx?PRID=1802384&reg=3&lang=1

[6] MPEDA, 2018. MPEDA Annual Report. Retrieved from. https://www.mpeda.gov.in /MPEDA/admin/app/webroot/files/annualreport/1550120514MPEDAAR201718. pdf.

as another significant contributor to the sector, with 1,52,062 traditional fishermen families, highlighting its pivotal role in India's marine fisheries production and coastal economy.

These figures not only illustrate the scale and dispersion of India's coastal fishing population but also reaffirm the critical importance of ensuring inclusive policy frameworks that support livelihood security, infrastructure development, and social protection mechanisms for coastal fisherfolk.

Kerala holds a prominent place in India's fisheries landscape, rooted in a long-standing maritime tradition and a robust coastal culture. The state is home to 1,16,598 traditional fishermen families and supports a fisherfolk population of 5,63,903, reflecting both its historical engagement and contemporary significance in the marine fisheries sector. In contrast, Gujarat, despite possessing the longest coastline in the country—approximately 1,600 kilometres, accounts for 67,610 fishermen families, underscoring the regional diversity in fisheries resource distribution and utilisation across coastal states.

Among the Union Territories, the Lakshadweep Islands and the Andaman & Nicobar Islands make notable contributions to India's artisanal fisheries sector. Though their populations are comparatively smaller, these island territories possess ecologically unique and sensitive coastal ecosystems, which support traditional fishing practices and serve as the primary livelihood base for local fisherfolk communities. Their role in sustaining small-scale marine livelihoods, conserving marine biodiversity, and preserving indigenous fishing knowledge systems is critical, particularly within the broader framework of sustainable coastal resource management and inclusive blue economy development. (see Table 1).

Table 1 India's Coastal area and Fisherfolk state wise

State	Coastal length (km)	Landing centres	Fishing villages	Fishermen 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).[7]

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.[8]

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.

1.1 India's Aquatic Biodiversity: Marine Dominance, Freshwater Riches, and Conservation Concerns

India's aquatic ecosystems reflect a vast and diverse ichthyofauna. Marine ecosystems dominate this diversity, accounting for 75.6% of all fish species in the country. Approximately 2,443 marine fish species are recorded across 927 genera and 230 families. The Andaman and Nicobar Islands, a remote and ecologically distinct archipelago, are recognized as a major hotspot of marine biodiversity, harbouring a remarkable 1,431 fish species (Gopi & Mishra, 2015).

India's freshwater ecosystems—including rivers, lakes, wetlands, and reservoirs—also support a rich variety of fish species. These are especially concentrated in the ecologically sensitive regions of the Western Ghats and Northeast India.

In terms of endemism, India is home to 223 endemic fish species, representing 8.75% of the country's total fish species. However, this rich biodiversity is under threat. Approximately 50 marine fish species are listed as threatened and 45 as near threatened on the IUCN Red List, underscoring the urgent need for targeted conservation efforts.(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

[7] https://pib.gov.in/PressReleasePage.aspx?PRID=2075160

[8] https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=151994&ModuleId=3&reg=3&lang=1

renowned naturalists like Francis Day and Alcock, who meticulously documented numerous species (Nair & Kumar, 2018; Joshi et al., 2017).

1.2 Fisheries Landscape of Gujarat: Coastal Riches and Socio-Economic Realities

Gujarat, located along India's western coast, possesses abundant natural resources that support a thriving fisheries sector. Contributing nearly 20% of India's total marine fish catch, Gujarat's fisheries are a cornerstone of the state's coastal economy, providing livelihoods to over 300,000 fisherfolk (Gujarat Fisheries Statistics, 2020). Fishing has historically been the primary livelihood for many coastal communities across Gujarat's extensive 1,600 km coastline, which spans 15 maritime districts, including Valsad, Navsari, Surat, Bharuch, and Bhavnagar.

According to the Marine Fisheries Census 2016, Gujarat is home to a total fisherfolk population of 3,54,992. The state comprises 280 fishing villages and 107 landing centres. Gir Somnath emerges as the leading district, with the highest fisherfolk population (83,538), traditional fishing families (12,905), and total fishermen families (14,515), establishing it as a central hub for marine fisheries in the state. Valsad follows with 48,091 fisherfolk, making it the second-largest district in terms of population, trailed by Jamnagar (30,839) and Porbandar (25,073). In contrast, districts like Anand and Bhavnagar report limited engagement in marine fisheries, with only six and 20 fishing villages respectively, and the lowest fisherfolk populations—2,375 and 6,464.

Interestingly, Kutch, despite having the highest number of fishing villages (70), has a moderate fisherfolk population of 22,835. This suggests potential variations in fishing intensity, village size, or family structure. In terms of poverty indicators, Devbhumi Dwarka records the lowest number of Below Poverty Line (BPL) families (238), whereas Valsad and Gir Somnath reflect more 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
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)						

1.3 Districtwide and species wise marine fish production

Gujarat remains a major contributor to India's fisheries output, accounting for approximately 20% of national marine fish production and ranking second in overall fish production[1]. In the fiscal year 2023–24, total fish production was projected at 9.15 lakh metric tonnes, comprised of ~7.02 lakh MT marine catch and ~2.13 lakh MT inland yield.[9]

In terms of economic value, fishery production in Gujarat reached ₹15,710 crore in 2023–24, rising sharply from ₹11,743 crore in 2022–23. Simultaneously, exports of fish and fish products climbed to ₹6,087 crore.[10]

Species-wise data from the Commissioner of Fisheries, Gujarat indicates that Ribbonfish and Small Sciaenids are dominant in production. Ribbonfish contributed 70,441 MT, valued at ₹96,074.94 lakhs, while Small Sciaenids accounted for 1,03,510 MT, worth ₹1,09,613.85 lakhs.[11]

High-value species such as White Pomfret, Bombay Duck, and Lobster—despite lower volumes—generate significant revenue. Their aggregated values underscore their premium status in both domestic and export markets.

A breakdown by district reveals:

- Gir Somnath and Junagadh contribute strongly across multiple species, including Ribbonfish, Shrimp, and Threadfin.
- Valsad and Navsari specialize in Bombay Duck and Shrimp.
- Jamnagar and Kachchh focus heavily on Small Sciaenids.
- Amreli demonstrates prominence in Threadfin and Squid/Cuttlefish, while
- **Bhavnagar** stands out for its output of **Catfish** and diverse **miscellaneous species**, among which the latter were estimated to total **6,599 MT** with appreciable value [11]

In total, **Shrimp/Prawns** contribute **₹75,535.19 lakhs** and **Squid/Cuttlefish** contribute **₹62,195.26 lakhs**, emphasizing the economic significance of crustaceans and cephalopods[11]. The **miscellaneous species category**, accounting for **1,08,491 MT** of catch valued at **₹92,526.42 lakhs**, further reflects the ecological diversity of Gujarat's marine waters[11]. Collectively, the districts **Gir Somnath**, **Junagadh**, and **Porbandar** emerge as key hubs for marine fish production due to their volume-weighted contributions and species diversity, making them central to the state's fisheries economy and strategic planning.

1.4 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

[9] ICSF. (2024). Gujarat ranks 2nd in marine fish production. International Collective in Support of Fishworkers. Available at: https://www.icsf.net/newss/gujarat-ranks-2nd-in-marine-fish-production

[10] Indian Express. (2024). Gujarat Budget: What's for fisheries sector – ₹1,622 crore package, key policy decision and more. The Indian Express, 3rd February 2024. Available at: https://indianexpress.com/article/cities/ahmedabad/gujarat-budget-whats-for-fisheries-sector-rs-1622-crore-package-key-policy-decision-and-more-9847599

[11] Commissioner of Fisheries, Gujarat. (2024). District-wise and Species-wise Marine Fish Production and Value in Gujarat State – 2023–24. Government of Gujarat. Available at: https://data.gov.in/resource/district-wise-and-species-wise-marine-fish-production-and-value-gujarat-state-2023-24

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 2023-2024 [12] 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 3).

[12] https://cof.gujarat.gov.in/Index

Table 3 Fish Production and export of Gujarat in 2023-2024

FISH PORDUCTION & 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
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

1.5 Small scale 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 subsistence[13] 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

[13] *small-scale fishing practices where fish are caught for personal consumption or for the consumption of dependents*

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

Table 4 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 in Gujarat

Women play a vital role in Gujarat's fisheries sector. Their participation spans the entire fisheries value chain—from fish seed collection to post-harvest processing and marketing. In fact, women dominate post-harvest activities, especially in peeling, drying, and vending, where they form the backbone of local economies (Joshi et al., 2016).

In Amreli and nearby districts, their engagement in fish processing often compensates for the irregular income patterns of male fishers (Vase et al., 2019). Despite this, women still face structural barriers, including poor access to technology, credit, training, and market linkages. While some policies do aim to support their participation, much of their work remains informal and unrecognized (Sharma et al., 2017).

Key Challenges Faced by Fishing Communities in Gujarat

1. Declining Fish Stocks and Overfishing

Industrial fishing and environmentally harmful practices have led to reduced marine biodiversity and lower catch volumes for traditional fishers. Artisanal fishers in Bhavnagar and Amreli report a consistent drop in catch, which has exacerbated livelihood insecurity (Gujarathi-Talati, 2022).

2. Climate Change and Environmental Stress

Shifts in sea temperature, irregular monsoons, and extreme weather events have disrupted fishing calendars. Fish migration and breeding cycles are also changing, posing challenges to traditional fishing knowledge systems (Das, 2017).

3. Gender Inequality and Marginalization

Women continue to be left out of fisheries decision-making, despite their essential contributions. Their work is often classified as secondary or supplementary, limiting access to benefits and policy support (Johnson & Jyothis, 2006).

4. Limited Access to Resources and Technology

Most artisanal fishers in Gujarat still depend on traditional techniques. In regions like Amreli, small-boat owners and crew lack access to cold chains, better gear, or reliable transportation, reducing their competitiveness (Vase et al., 2019).

5. Economic Vulnerability

Fishing households, especially those led by women or operating in informal markets, are vulnerable to price shocks, debt, and lack of safety nets. Many are stuck in low-income cycles without diversification options (Burman & Katyaini, 2022).

6. Inadequate Government Support

Despite their role in marine food security, artisanal and small-scale fishers struggle to access benefits from government schemes, often due to bureaucratic inefficiencies or lack of awareness at the community level (Sharma et al., 2017).

7. Unsustainable Fishing Practices

Illegal trawling and unregulated mechanized fishing continue to degrade the ecosystem, particularly affecting the livelihoods of Pagadiya fishers in Bhavnagar and Veraval (Parappurathu & Achamveetil, 2020).

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Chapter 2: Methodology

2.1 Introduction

Understanding the layered challenges faced by small scale fisherfolk demands a methodology that is both analytically rigorous and deeply attuned to the lived realities of coastal communities. This chapter presents the methodological approach adopted for the needs assessment of Bandar village located in Mahuva block of Bhavnagar district. The research was designed and conducted by Utthan, an organization with more than four decades of experience advancing the rights and livelihoods of vulnerable groups across Gujarat.

The assessment sought to explore not only what fisherfolk *do*—in terms of fishing practices, occupations, and seasonal work—but also how they experience vulnerability, navigate change, and aspire for transformation in the face of mounting environmental, economic, and social pressures. Recognizing that these phenomena cannot be understood through numbers alone, the research design deliberately combined quantitative and qualitative methods to enable a layered and participatory understanding.

To frame this inquiry, a conceptual model was developed to guide the collection, analysis, and interpretation of data. This model—explained below—places the resilience and vulnerability of fisherfolk households at its center, shaped by their entitlements, assets, exposures, and aspirations.

2.2 Conceptual Framework

This study is guided by the **Sustainable Livelihoods Framework (DFID)**, which posits that a household's capacity to withstand shocks, adapt to change, and enhance its quality of life is shaped by five interconnected domains:

1. **Structural Identity** – Social position shaped by caste, gender, religion, age, disability, and household composition.
2. **Livelihood System** – Nature of fishing practices, ownership of gear and boats, diversification of income sources, and opportunities for alternative employment.
3. **Economic Conditions** – Stability and amount of income, access to credit, levels of indebtedness, and financial burdens.
4. **Environmental Exposure** – Degree of vulnerability to cyclones, saline intrusion, biodiversity loss, and other climate change impacts.
5. **Institutional and Social Support** – Access to government schemes, identification documents, cooperatives, self-help groups (SHGs), and village-level federations.

Importantly, gender is embedded as a cross-cutting axis within this framework. Women's restricted access to assets, institutions, markets, and mobility systematically constrains their capacity to cope with risks and to drive change.

Table 5 Domains of the Sustainable Livelihoods Framework Applied in the Study

Domain	Key Elements
Structural Identity	Gender, caste, religion, age, disability, household composition
Livelihood System	Fishing type (Pagadiya, mechanized), boat/net ownership, diversification of income, seasonal variation
Economic Conditions	Income stability, access to credit/loans, debt burden, financial obligations
Environmental Exposure	Cyclones, saline intrusion, fish catch decline, biodiversity loss, plastic waste
Institutional & Social Support	Access to schemes/SHGs, legal documents, cooperatives/federations, awareness of entitlements
Gender as a Cross-Cutting Dimension	Gendered labour, women's decision-making, mobility constraints, unequal workload and discrimination

2.3 Objectives of the Study

The assessment sought to answer a core question: **How do fisherfolk in Bandar navigate vulnerabilities across structural, economic, environmental, and institutional dimensions, while negotiating gendered constraints and seeking pathways for more secure and sustainable livelihoods?**

To address this, the following objectives were framed:

- To profile the demographic, social, and gendered structure of fisherfolk households.
- To document fishing practices, ownership of assets, diversification of income, and seasonal migration patterns.
- To examine income stability, access to credit, indebtedness, and related financial pressures.
- To assess exposure to environmental shocks and ecological risks, and the coping strategies adopted by the community.
- To analyse access to welfare entitlements, cooperatives, SHGs, and government programmes.
- To understand the specific challenges faced by women in accessing resources, institutions, and decision-making spaces.
- To capture the aspirations of community members, particularly youth and women, regarding future livelihood pathways.

2.4 Research Questions

The study was guided by the following research questions:

1. How do caste, gender, age, and household composition shape fisherfolk households' vulnerabilities and opportunities?

2. What fishing practices, asset ownership patterns, and livelihood diversification strategies are followed in Bandar?
3. How stable are household incomes, and what challenges do fisherfolk face with credit access, debt burdens, and financial obligations?
4. How do climate change, cyclones, saline intrusion, biodiversity loss, and fish stock decline affect livelihoods and resilience?
5. What institutional mechanisms—government schemes, SHGs, cooperatives, federations—are accessible to fisherfolk, and how inclusive are they?
6. How do gendered roles and norms influence women's access to assets, institutions, markets, and decision-making power?
7. What are the immediate needs and long-term aspirations of the community, particularly youth and women, regarding fishing and alternative livelihoods?

2.5 Study area: Mahuva Bandar, Katpar Gram Panchayat

Katpar is a situated in Mahuva block of Bhavnagar district, Gujarat, along the Saurashtra coast of the Arabian Sea. Administratively, it is recognised as both a Gram Panchayat and a Census Town. It includes 3 fishing villages including Katpar,Bandar, Light house. Its jurisdiction extends over 18.34 km^2, encompassing dense residential clusters and fishing-related spaces such as curing yards, landing points, and local markets.

The Census of India (2011) recorded Katpar's population at 8,677 persons across 1,814 households. Of these, 4,405 were male and 4,272 females, yielding a sex ratio of 970 females per 1,000 males, higher than the Gujarat average. Children (0–6 years) constituted 16.4% of the population (1,423 persons), signalling a youthful demographic.

Literacy remains a critical challenge. The overall literacy rate was 62.03%, considerably lower than the state average. Male literacy (77.15%) outpaces female literacy (46.47%) by a wide margin, highlighting entrenched gender disparities in education that directly affect livelihood diversification and women's empowerment.

The Gram Panchayaat is overwhelmingly Hindu (~99.5%), with a very small Muslim minority (≈0.5%). Caste and community affiliations continue to shape access to entitlements, cooperative membership, and local power structures, reflecting wider patterns in Gujarat's fishing communities.

Mahuva Bandar Village Profile (Marine Fisheries Census 2016)

Bandar also called as Mahuva Bandar is a marine fishing village situated in Mahuva taluka of Bhavnagar district under Katpar Gram Panchayat. It is a traditional marine fishing settlement where livelihoods are deeply rooted in artisanal fishing practices. According to the Marine Fisheries Census 2016, the village consists of 228 fishing families, all of whom are engaged in traditional fisheries. Of these, 74 households are identified as Below Poverty Line (BPL), reflecting the socio-economic vulnerability that shapes everyday life in the community.

The total fisherfolk population of Mahuva Bandar stands at 905 individuals, with an average household size of four members. Men constitute 494 of the population, while women number 411, resulting in a sex ratio of 832 females per 1,000 males. Within this, there are 281 adult males and 242 adult females, alongside 88 young children under the age of five and 294 children above five years, highlighting the presence of a sizeable dependent population.

Fishing is the primary occupation, with 228 individuals recorded as active fisherfolk. All of them are engaged full-time, and no part-time fishers or fish seed collectors were reported. The total occupied population is 387 individuals. Beyond direct fishing, a considerable share of households depends on allied activities, where women's contributions are especially significant. In Mahuva Bandar, 124 individuals are engaged in fish marketing, of whom 109 are women. Smaller numbers are involved in net making and repair (4 persons, all men) and as labourers (2 women). Notably, no one is engaged in curing, processing, or peeling. Additionally, 35 persons are employed in occupations outside the fisheries sector.

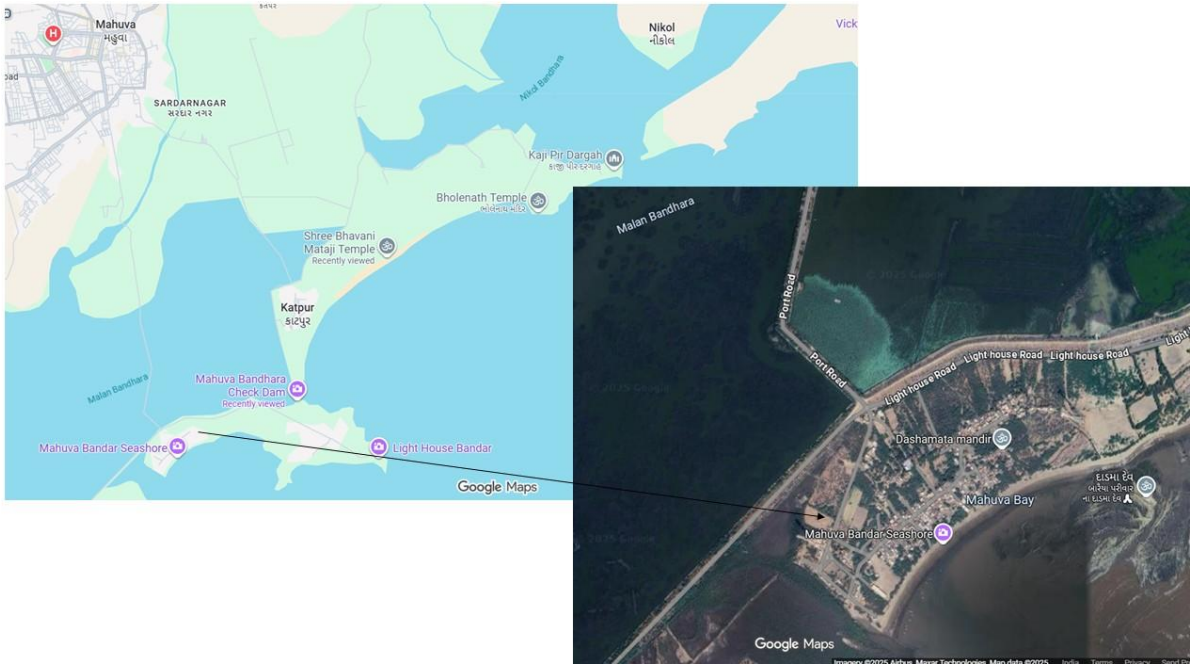
The housing profile reflects moderate material security, with 217 pucca houses and 11 kutcha structures. Most homes are small, with fewer than three rooms. Despite universal electrification and reliable access to potable water through taps, sanitation remains a critical concern, as 227 out of 228 households reported not having toilets within the house.

Mahuva Bandar is socially homogenous, with all families belonging to the Hindu religion and none to Scheduled Castes or Scheduled Tribes. Institutional engagement, however, is limited: the village reported no membership in fisheries cooperatives or other cooperative societies, leaving fisherfolk with little collective bargaining power.

The village possesses a modest but fully motorised fleet, with fisherfolk owning 41 fishing crafts, all of which are inboard. No mechanised, outboard, or non-motorised crafts were reported. This reflects reliance on small-scale, inboard craft-based fishing, which continues to sustain household livelihoods despite limited infrastructural and institutional support.

In sum, Mahuva Bandar emerges as a fishing settlement with strong dependence on traditional marine fishing, significant participation of women in marketing, and modest improvements in housing and utilities. However, high levels of poverty, widespread absence of sanitation facilities, and near-total exclusion from cooperative structures highlight structural vulnerabilities that undermine livelihood security and resilience.

Figure 1 Mahuva Bandar Village -map



2.6 Research Design and Strategy

This study employed a cross-sectional, mixed-methods design, combining quantitative surveys with qualitative participatory tools. This approach allowed for both the breadth of household-level data and the depth of community insights, thereby ensuring a holistic understanding of fisherfolk realities in Bandar.

Sampling

A complete enumeration strategy was adopted. 64 fisherfolk households in Bandar were surveyed, ensuring full coverage and inclusivity. This method strengthened the representativeness of the findings and provided a robust base for disaggregated analysis across gender, occupation, and socio-economic status.

Village Assemblies

In parallel, eight village assemblies were conducted as part of the broader process of fisherfolk mobilisation and collectivisation. These assemblies provided a forum for fisher families to voice their concerns, priorities, and suggestions. The deliberations from these assemblies were systematically documented and integrated into the analysis, thereby grounding the findings in the lived experiences and perspectives of the community.

2.7 Data Collection Methods

2.7.1 Structured Household Survey

The household questionnaire was developed based on Utthan's field experience, policy gaps observed, and community insights. It was digitized using KoboCollect, ensuring real-time data validation and minimizing manual error.The data been collected between April – May 2025.

The survey covered modules on:

- **Demographics**: Age, gender, religion, education, disability
- **Livelihoods**: Type of fishing, secondary income, seasonal work
- **Assets**: Boat, net, GPS, insurance, cold storage, housing
- **Income and Debt**: Daily wages, loan sources, credit burdens
- **Access to Services**: Water, electricity, sanitation, healthcare
- **Scheme Participation**: PMMSY, Ayushman Bharat, SHGs, KCC, e-Shram, widow pensions
- **Environmental Impacts**: Declining catch, plastic waste, cyclone damage
- **Aspirations**: Interest in rope making, goat rearing, aquaculture, seaweed farming

Interviews were conducted in Gujarati by trained field staff. All respondents provided informed oral consent.

2.7.2 Village Assemblies

In addition to household surveys, the village assemblies were conducted as part of the broader process of fisherfolk mobilisation and collectivisation. These assemblies created platforms for fisher families to discuss challenges and propose solutions. The issues raised were systematically documented and integrated into the analysis.

These discussions centred on:

- Changing fishing patterns and environmental signals
- Debt traps, migration, and intergenerational transitions
- Gendered labour roles in fish drying, selling, and unpaid care work
- Community narratives of risk, resilience, and future aspirations

By combining survey data with participatory dialogues, the methodology ensured that the report reflects both the quantitative dimensions of vulnerability and the qualitative richness of lived experiences.

2.8 Data Analysis

The survey data were processed and analysed using Open-source data analysis software. This enabled the generation of descriptive statistics and cross-tabulations across key variables. Findings from the quantitative analysis were further triangulated with insights from village assemblies, ensuring that patterns observed in the data were interpreted in light of community perspectives. This integration strengthened the validity and contextual grounding of the results presented in this report.

2.9 Ethical Considerations

The study adhered to strict ethical standards to safeguard the dignity and rights of participants. Before each interview or discussion, researchers sought and obtained oral informed consent, ensuring that participants clearly understood the purpose of the study and their role within it. At every stage, respondents were reminded that their participation was voluntary, and they retained the right to skip questions or withdraw altogether without any consequence. In conducting the fieldwork, particular attention was paid to cultural norms and gender sensitivities, so that both women and men felt comfortable and respected during the process.

2.10 Limitations

This study has certain methodological and contextual limitations that must be acknowledged. First, the research design is cross-sectional, providing a snapshot of community conditions at a single point in time. Consequently, the analysis may not capture the seasonal fluctuations in fish catch, household income, and migration patterns that are integral to the livelihoods of fisherfolk.

Second, data related to income, debt, and participation in government schemes were self-reported by respondents. Such data are susceptible to recall bias, underreporting, and reluctance in disclosing sensitive financial information, which may affect the precision of estimates.

Third, while the sampling strategy aimed for inclusivity through complete household enumeration and village assembly discussions, it is possible that the perspectives of certain marginalised groups, such as persons with disabilities, are underrepresented in the dataset.

Finally, although the study engaged extensively with community narratives regarding environmental change, declining catch, and climate-related risks, it did not employ scientific climate modelling or longitudinal environmental datasets. As a result, the report reflects primarily the perceptions and lived experiences of the community, rather than providing formal projections of long-term climate trends.

Chapter 3: Results

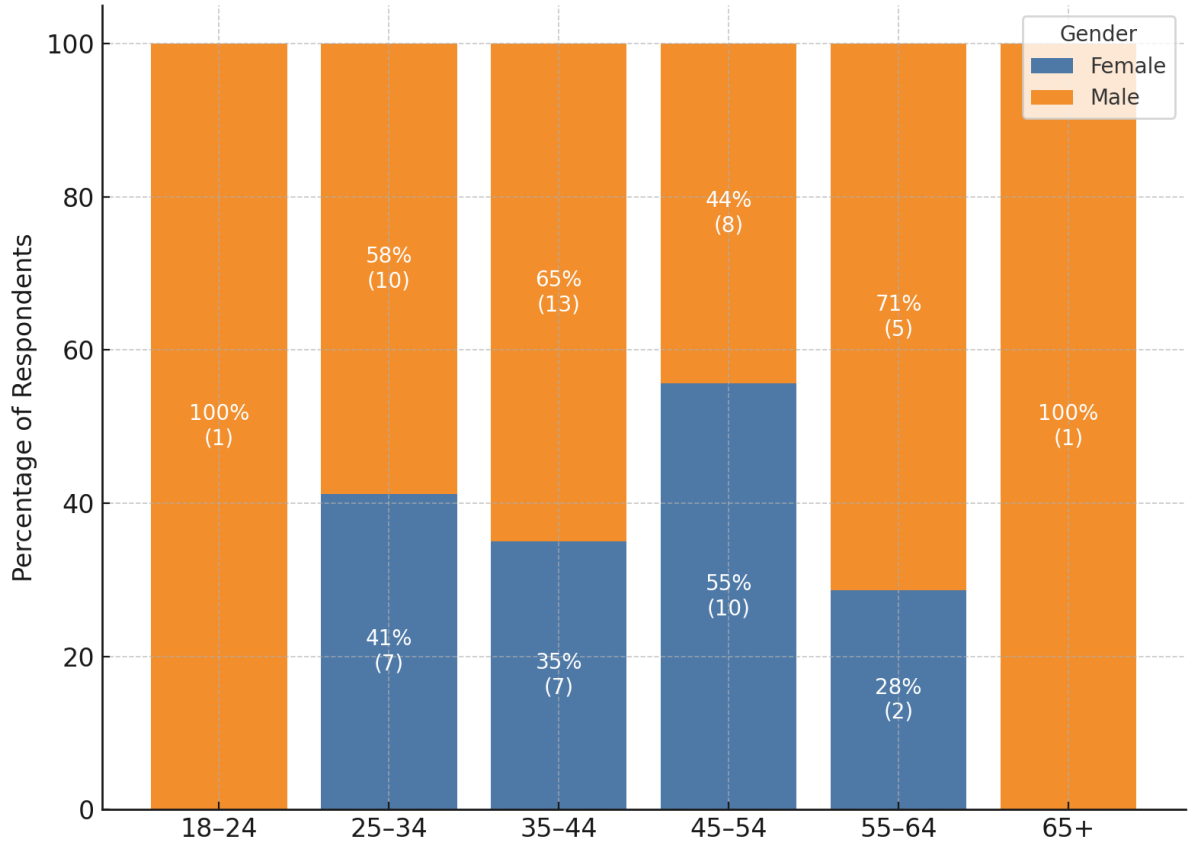
3.1 Structural Identity of Fisherfolk Households

The structural identity of fisherfolk households in Bandar provides a critical lens to understand the socioeconomic and institutional positioning of this community. Household characteristics such as age, gender, caste, religion, marital status, household size, education, and the presence of elderly or disabled members shape the ways in which vulnerability and resilience are experienced. This section draws on data from the 102 fisherfolk households surveyed and presents a disaggregated profile of the community.

3.1.1 Age and Gender Profile

The survey in Bandar village covered 64 households, providing insights into the demographic composition of this coastal fishing settlement. Respondents were fairly balanced by gender, with 56.0% women (n = 36) and 44.0% men (n = 28), ensuring representation of both men and

Figure 2 Age and gender distribution of the respondents



Note: Number of respondents is shown in brackets next to each percentage.

women in livelihood and household perspectives.

The age profile is concentrated in the 30–49-year group, which forms the active labour force of the village. A smaller proportion of younger respondents (18–29 years) were recorded, while the

elderly (60 years and above) constituted only a minority. This pattern points to a labour-active population, with limited presence of dependents among the youngest and oldest age groups.

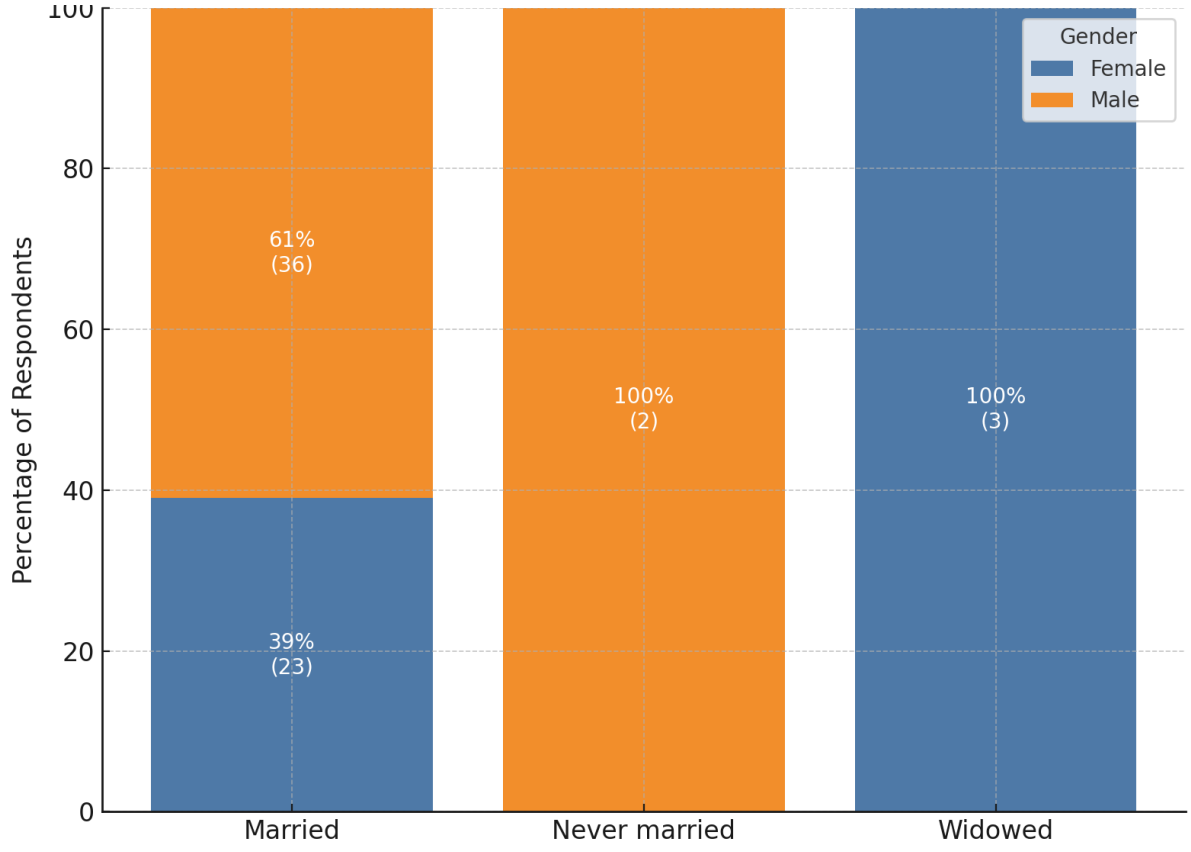
Such a demographic structure reflects the physical demands of artisanal fishing, where households rely heavily on working-age members to sustain daily activities. The relatively low representation of youth suggests a gradual shift away from direct engagement in fishing, while the smaller elderly population underscores the limited longevity associated with physically intensive occupations.

Overall, Bandar's age and gender profile depicts a workforce-driven community with strong female representation, highlighting both the centrality of active labour and the importance of women's roles in sustaining fisherfolk livelihoods.

3.1.2 Marital Status

In Bandar village, marital status reflects the centrality of family units within the social fabric. Out of 64 respondents, the majority were married (92.2%, n = 59), comprising 36 men (61.0%) and 23 women (39.0%). This highlights marriage as the dominant social institution, shaping both household organisation and livelihood decision-making.

Figure 3 Marital status of the respondents by gender



Note: Number of respondents is shown in brackets next to each percentage.

A very small proportion of respondents were never married (3.1%, n = 2, both men). The complete absence of never-married women reinforces the prevalence of early and near-universal marriage for women, a social norm strongly embedded in fishing communities.

Notably, 3 respondents (4.7%), all of whom were women, reported being widowed. This all-female composition of the widowed group reflects a broader gendered demographic pattern in coastal villages: women tend to outlive their male partners and, in the absence of remarriage, often assume responsibility as household heads. Such households are frequently characterised by reduced earning capacity, restricted access to productive assets, and higher dependency burdens.

Overall, Bandar's marital status profile underscores the dominant role of the marital unit in sustaining livelihoods, while also highlighting the heightened vulnerability of widowed women, who require targeted institutional and social support.

3.1.3 Social Category and Religion

The social identity of Bandar village is marked by complete homogeneity in both religion and caste. All surveyed respondents (100%, n = 64) reported being Hindu, and all identified as belonging to the Other Backward Classes (OBC) category. This uniformity indicates that the settlement is predominantly inhabited by a single caste group historically engaged in artisanal fishing.

The OBC status reflects both the historical marginalisation of the community, characterised by limited access to resources, and their recognition within state-supported frameworks aimed at enabling social and economic mobility. Among the respondents, 38 were men (59.4%) and 26 were women (40.6%), reaffirming a balanced gender representation within this homogenous social structure.

3.1.4 Disability Presence

In Bundar village, none of the surveyed respondents reported the presence of disability either in themselves or among their family members. All 64 households confirmed the absence of disability within their immediate families. This complete lack of reported cases suggests that disability is not currently perceived as a factor influencing household vulnerability or access to livelihoods in the village.

3.1.5 Household Headship

Bundar village, out of the 64 surveyed households, the majority were reported as male-headed, with 45 households (70.3%) under male leadership. At the same time, 19 households (29.7%) were identified as female-headed. This proportion, while smaller, represents a significant presence of women in positions of household leadership within the community. The relatively high share of female-headed households' points to shifting household structures and underscores the importance of recognizing women's roles in decision-making, livelihood management, and access to institutional support in coastal contexts.

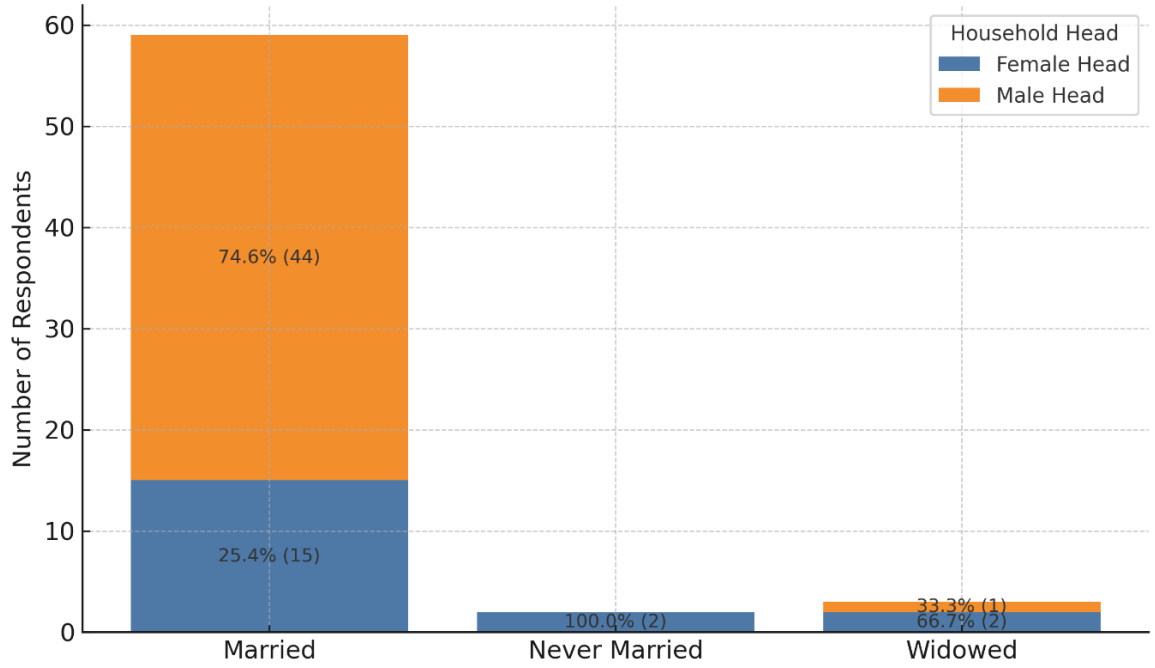
The relationship between marital status and the gender of the household head in Bunder demonstrates a moderate yet statistically significant association ($\chi^2 = 7.22$, $p = 0.0271$). This finding indicates that household leadership is not evenly distributed across marital categories but is shaped by demographic and structural dynamics within the community.

Among the 64 surveyed respondents, the majority—59 individuals (92.2%)—reported being married. Of these, 44 (74.6%) resided in male-headed households, while 15 (25.4%) were part of female-headed households. A smaller group of 3 respondents (4.7%) reported being widowed; 2 of them (66.7%) lived in female-headed households. Interestingly, both respondents (100%) who reported never having been married resided in female-headed households.

Within the 19 female-headed households identified in the village, 15 (78.9%) were led by married or never-married women, while only 2 (10.5%) were headed by widows. This distribution

suggests that widowhood, though historically a common pathway to female headship, is not the sole determinant in this context. The presence of married and never-married women as household heads highlights evolving patterns of leadership that may reflect broader socio-economic and gendered shifts within Bunder's fishing community.

Figure 4 Marital status and household headship



3.1.6 Educational Status

In Bandar, gender differences in literacy and schooling are highly pronounced. A vast majority of women (80.8%) reported being non-literate, and only a small fraction (15.4%) indicated basic reading and writing ability. By contrast, men demonstrated relatively higher educational attainment: 39.5% reported the ability to read and write, 34.2% had completed primary schooling, and smaller proportions had progressed to secondary (2.6%) and higher secondary education (2.6%).

The chi-square test ($\chi^2 = 26.46$, $p < 0.0001$) confirms a statistically significant association between gender and educational status. These findings highlight the persistence of gendered disparities in access to education within Bandar's fishing community, with women facing substantial barriers that limit their literacy and schooling outcomes.

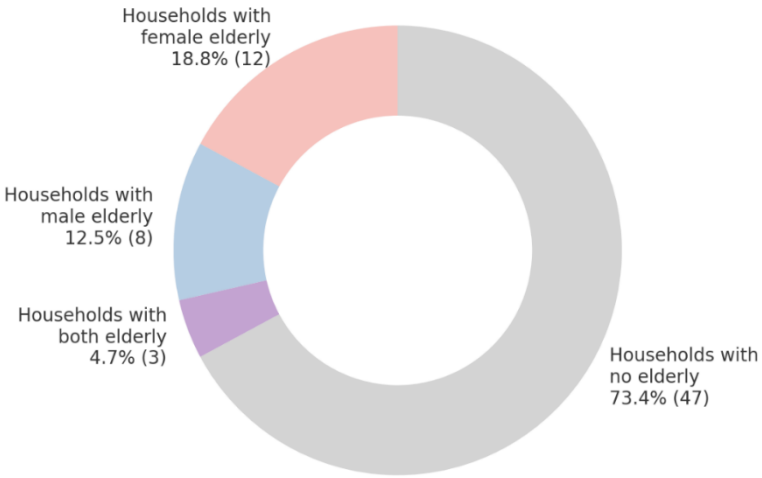
Table 6 Educational status of the respondents

Sex (N)	**Ability to read and write**	**Higher Secondary**	**Non-literate**	**Primary Schooling**	**Secondary Schooling**
Female (N=26)	4 (15.4%)	0 (0.0%)	21 (80.8%)	1 (3.8%)	0 (0.0%)
Male (N=38)	15 (39.5%)	1 (2.6%)	8 (21.1%)	13 (34.2%)	1 (2.6%)
Grand Total (N=64)	19 (29.7%)	1 (1.6%)	29 (45.3%)	14 (21.9%)	1 (1.6%)

3.1.7 Household Size and Elderly Population

In Bandar, the average household size was 4.5 members, with household composition ranging from a minimum of 2 to a maximum of 8 individuals (SD = 1.43). With respect to the elderly population (individuals aged 60 years and above), 26 households (65.0%) reported the presence of at least one elderly member. The mean number of elderly persons per household was 0.8 (SD = 0.80), with values ranging from 0 to 3. A gendered distribution indicates that 21 households (52.5%) included at least one elderly woman, 15 households (37.5%) had at least one elderly man, and 10 households (25.0%) reported both male and female elderly members. In contrast, 14 households (35.0%) reported no elderly members.

Figure 5 Household size and elderly population



Note: Count of households is shown in brackets.

These findings point to the prevalence of multi-generational living arrangements in Bandar, with a notable presence of elderly women. The fact that nearly two-thirds of households include elderly members highlights the importance of embedding eldercare, age-sensitive social protection, and health outreach into community development strategies in coastal fishing villages such as Bandar.

Summary 3.1: Structural Identity

Bandar village presents a workforce-driven population, with most respondents in the 30–49 age group and women forming a slight majority (56%). Marriage is the dominant social institution, though nearly one-third of households are female-headed, reflecting shifting leadership roles beyond widowhood. The community is socially homogenous—entirely Hindu and OBC—with no reported disability cases. Education levels reveal sharp gender disparities, as over four-fifths of women are non-literate compared to one-fifth of men, a statistically significant gap. Households average 4.5 members, and two-thirds include elderly members, particularly women, highlighting the importance of integrating eldercare into development planning.

Section 3.2: Livelihood system of Fisherfolk Households

Livelihoods in coastal fishing communities are shaped by the sea, the seasons, and the changing economy. In Bandar, most households depend on fishing as their main source of income, but very few rely on it alone. Families often combine fishing with other forms of work, such as wage labour, small trade, farming, or livestock rearing. These activities help them manage the seasonal nature of fishing, fluctuations in catch, and rising household expenses.

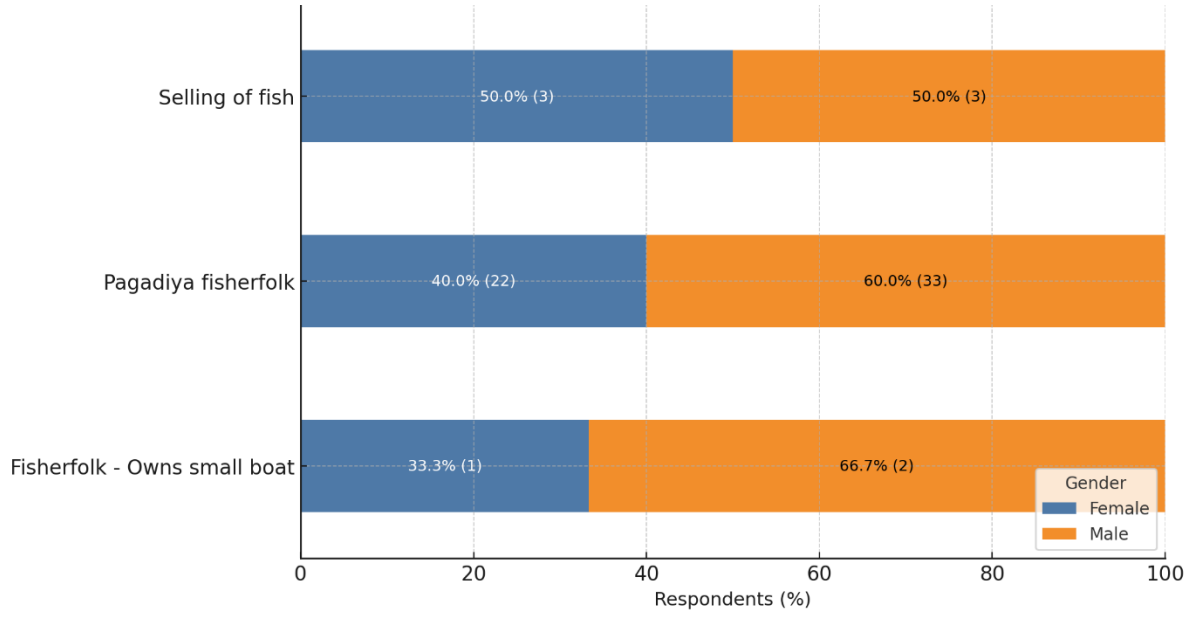
This section looks at how fisherfolk in Bandar secure their living. It considers both primary occupations, such as fishing, and secondary occupations, which households use to support themselves when fishing is not enough. It also pays attention to gender roles, showing how men and women contribute differently to household economies, and how women's work, especially in post-harvest and unpaid tasks, often goes unrecognised.

By examining these patterns, the section provides insights into the economic strategies, risks, and resilience of fisherfolk households in Bandar.

3.2.1 Primary Occupations

T In Bandar, the occupational landscape is marked by clear gender segregation, with men dominating most recognised livelihood roles. Pagadiya fishing emerged as the predominant occupation, reported by 58 respondents, of whom 82.8% (n = 48) were men and only 17.2% (n = 10) were women. This distribution reflects enduring gendered norms in marine fishing and the constraints women face in directly accessing resource-based activities.

Figure 6 Primary Occupation by Gender



Note: Values shown as percentage with count in brackets.

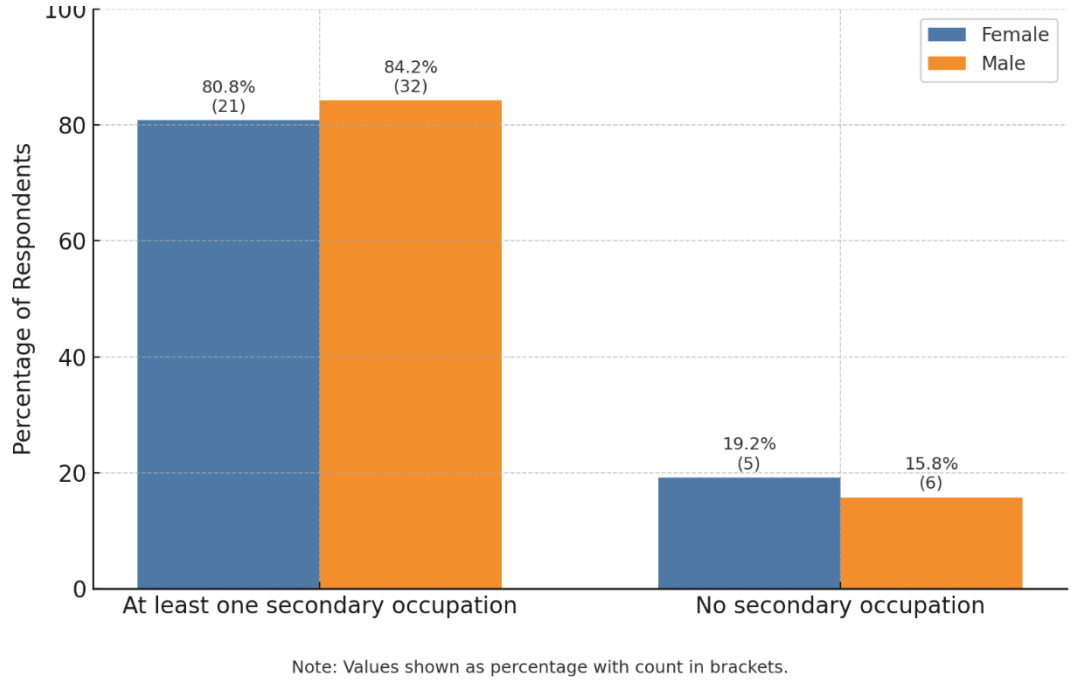
The post-harvest segment, particularly fish vending, displayed a similar skew. Among the six individuals engaged in vending, five (83.3%) were men, suggesting that women's contributions to the marketing chain are either underrepresented or insufficiently recognised. In addition, occupations that demand higher levels of capital or mobility—such as boat ownership (n = 4) and commercial driving (n = 2)—were reported exclusively by men. These patterns reinforce structural inequalities in access to productive assets and occupational diversification within Bandar's fishing community.

3.2.2 Secondary Occupations

Secondary work is common but shallow in Bandar. 53 of 64 respondents (82.8%) reported one secondary occupation—women: 21/26 (80.8%); men: 32/38 (84.2%)—while 11 (17.2%) reported none (women: 5; men: 6). Everyone who diversified listed only one secondary activity (min = 1, max = 1, median = 1), indicating breadth rather than depth of diversification.

Among those whose primary occupation is Pagadiya fishing (n = 58), the most common secondary activity was agricultural daily wage labour; a few also reported fish selling (n = 2), animal husbandry (n = 1), and construction work (n = 1). This pattern reflects seasonal risk management and the tight linkage between coastal fishing and inland wage markets. Women's high participation in secondary work underscores their economic role, though opportunities remain concentrated in low-capital, labour-intensive activities—pointing to the need for gender-responsive, asset-light livelihood options (e.g., small livestock, home-based processing, value addition).

Figure 7 Secondary Occupation of the respondents



Note: Values shown as percentage with count in brackets.

3.2.3 Fishing Experience

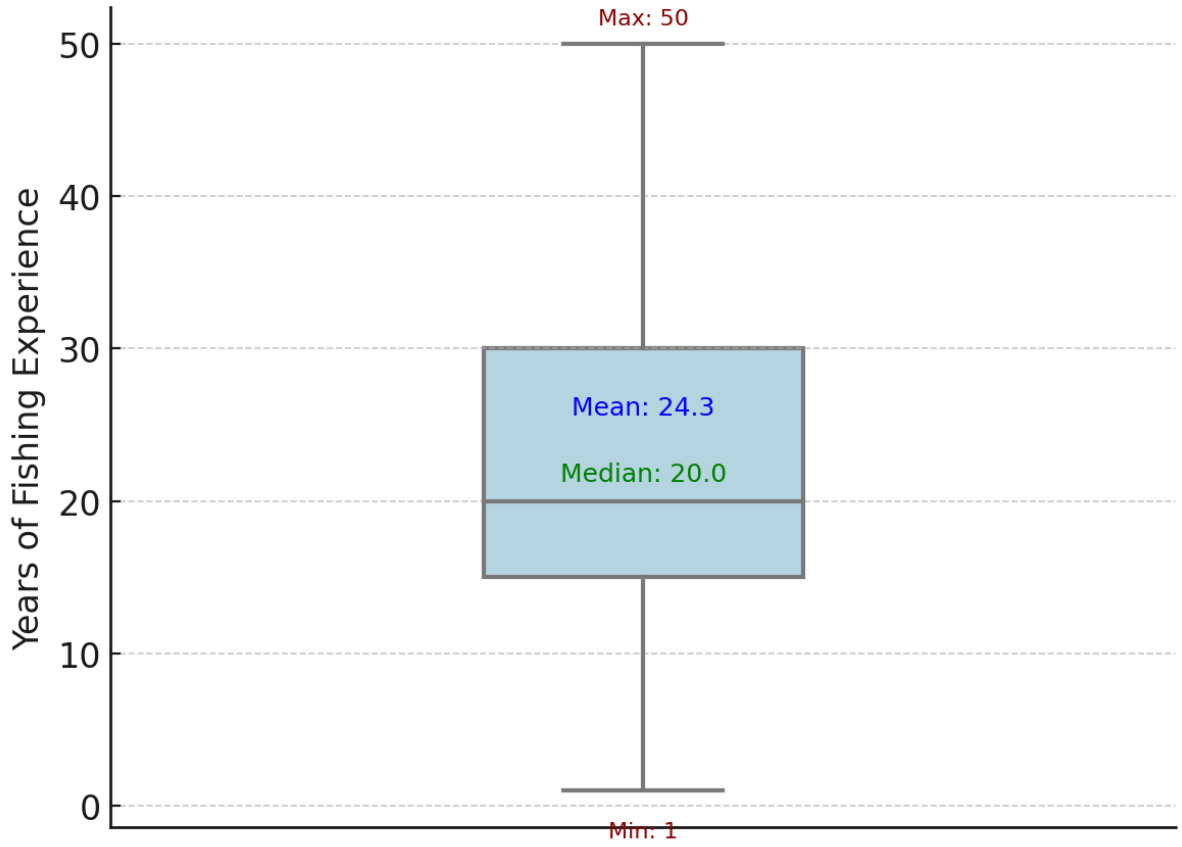
In Bandar village, the distribution of fishing experience among respondents reflects moderate-to-high occupational continuity. The average (mean) fishing experience was 24.3 years, while the median was 20.0 years, suggesting a right-skewed distribution in which a smaller group of highly experienced fishers elevated the mean above the central tendency. Reported experience ranged from 1 to 50 years, highlighting both recent entrants—likely linked to intergenerational transitions or economic necessity—and long-standing practitioners, whose lifelong engagement underlines the persistence of artisanal fishing traditions. The relatively tight interquartile range indicates some homogeneity among the middle 50% of respondents, pointing to a stable occupational base.

A gender-disaggregated analysis provides further insights. Men reported a mean of 26.2 years and a median of 22.5 years, with experience ranging from 5 to 50 years. Women, by comparison, reported a mean of 21.6 years and a median of 20.0 years, spanning a range of 1 to 40 years. These differences suggest that men are more likely to remain in fishing for longer durations, potentially

due to greater access to productive assets and sustained engagement across the life course. Women's fishing tenure, while still substantial, appears constrained by household responsibilities and limited control over livelihood resources.

Overall, the findings indicate that Bandar preserves strong continuities in artisanal fishing knowledge, while also undergoing gradual demographic shifts within its occupational base. The data highlight both the embeddedness of fishing as a livelihood and the gendered inequalities that shape long-term occupational engagement.

Figure 8 Distribution of fishing experience



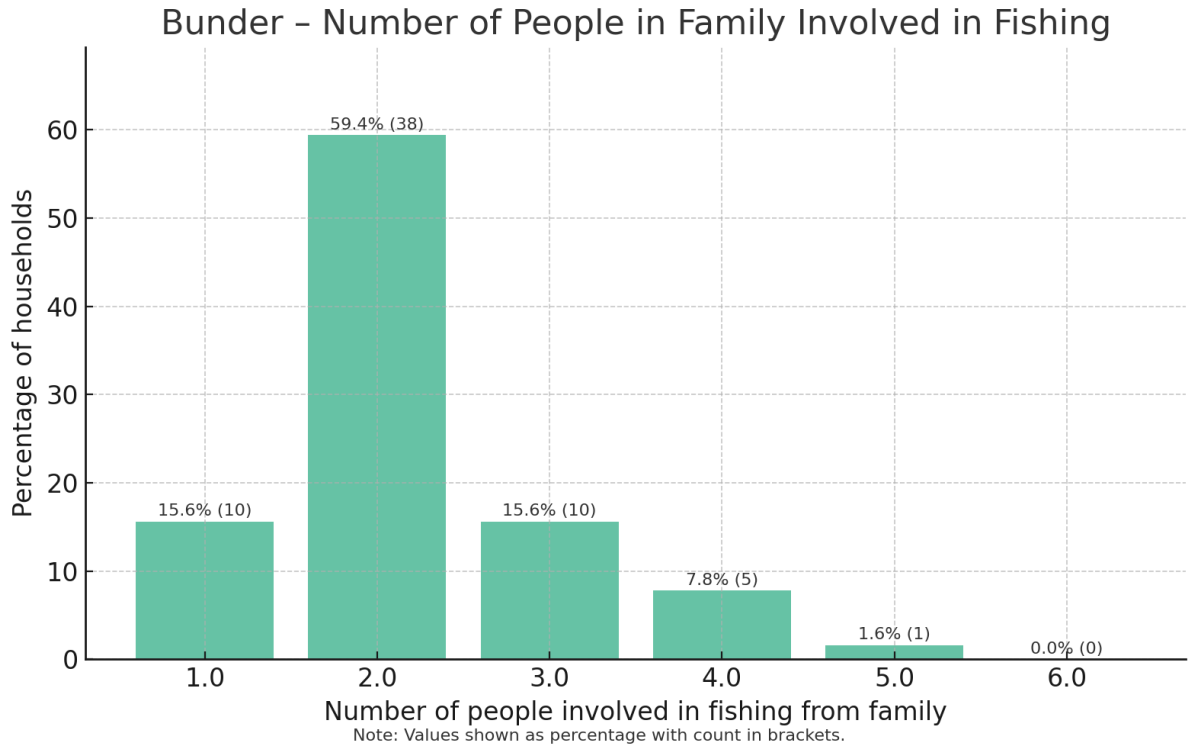
Note: Labels indicate descriptive statistics for each village's respondent group.

3.2.4 Household Labour in Fishing

In Bandar, fishing participation is primarily concentrated in households with two active members, reported by 59.4% of households (n = 38). This was followed by single-member fishing households (15.6%, n = 10) and three-member households (15.6%, n = 10). A smaller share reported four members (7.8%, n = 5) or five members (1.6%, n = 1) engaged in fishing, while no household reported six or more members.

These findings highlight that artisanal fishing in Bandar is most commonly sustained by pairs of household members—often reflecting spousal or parent–child collaboration—rather than by entire families. While multi-member engagement beyond two remains relatively limited, the distribution suggests that fishing is embedded as a shared but not universally dispersed household occupation, with other members likely contributing through post-harvest or supplementary livelihoods.

Figure 9 Number of members from the household involved in fishing



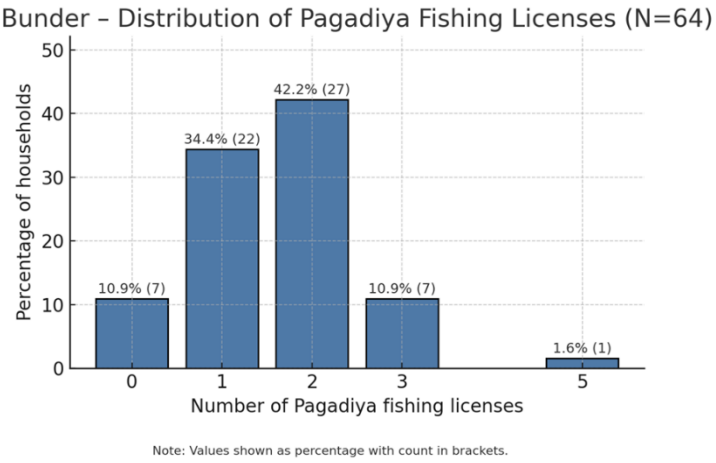
3.2.5 Fishing License Ownership at the Household Level

Fishing license ownership in Bandar was examined across three categories—Pagadiya fishing licenses, vessel/boat licenses, and fish selling licenses—with the total license count per household calculated as the sum of all three types.

A. Pagadiya fishing licenses

The majority of households reported holding Pagadiya fishing licenses, with only 10.9% (n = 7) operating without one. The most common ownership level was two licenses, reported by 42.2% of households (n = 27), followed by one license in 34.4% (n = 22). Smaller proportions held three licenses (10.9%, n = 7) or five licenses (1.6%, n = 1).

Figure 10 Distribution of Pagadiya Fishing Licenses per Household



The license range extended from 0 to 5, with a mean of 1.56 licenses per household. The concentration around one to two licenses indicates that most fishing households maintain moderate levels of formal recognition through licensing, providing both regulatory legitimacy and potential access to fisheries-related entitlements.

B. Vessel/boat licenses

Among the 55 surveyed households, the majority—**61.8% (n = 34)**—reported having no vessel licenses. Ownership of a single license was reported in **25.5% (n = 14)** of households, while **9.1% (n = 5)** held two licenses. Only a small minority, **3.6% (n = 2)**, reported three or more licenses.

This distribution points to a predominant reliance on non-vessel or shore-based fishing activities, with relatively few households possessing formal rights to operate boats. The limited concentration of multiple licenses suggests that vessel ownership remains scarce and unevenly distributed, reflecting barriers of capital and access within the community.

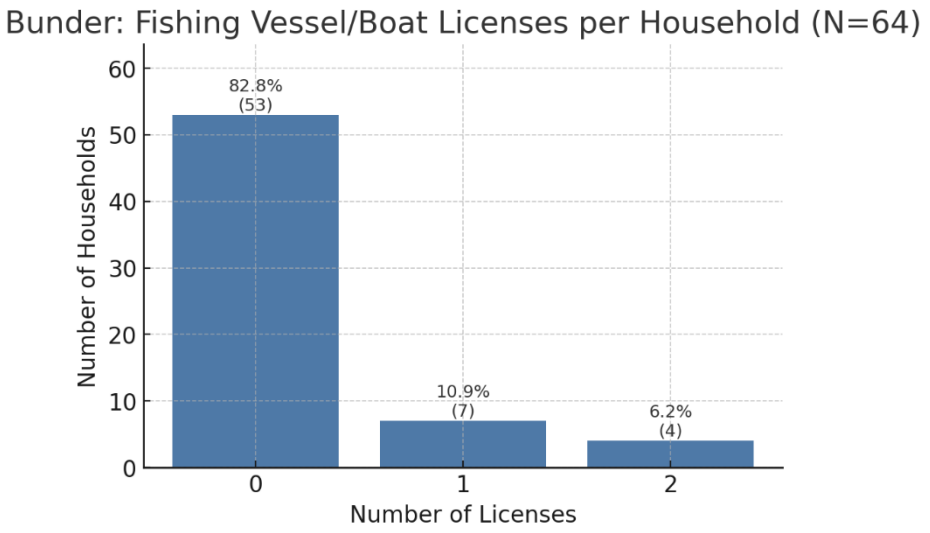


Figure 11 Distribution of Vessel/Boat Fishing Licenses per Household

C. Fish selling licenses

The average number of fish selling licenses per household was 0.70, with a range from 0 to 2 licenses. A substantial share of households—42.2% (n = 27)—reported having no license. Among those that did, the majority held only one license, while a smaller fraction possessed two licenses.

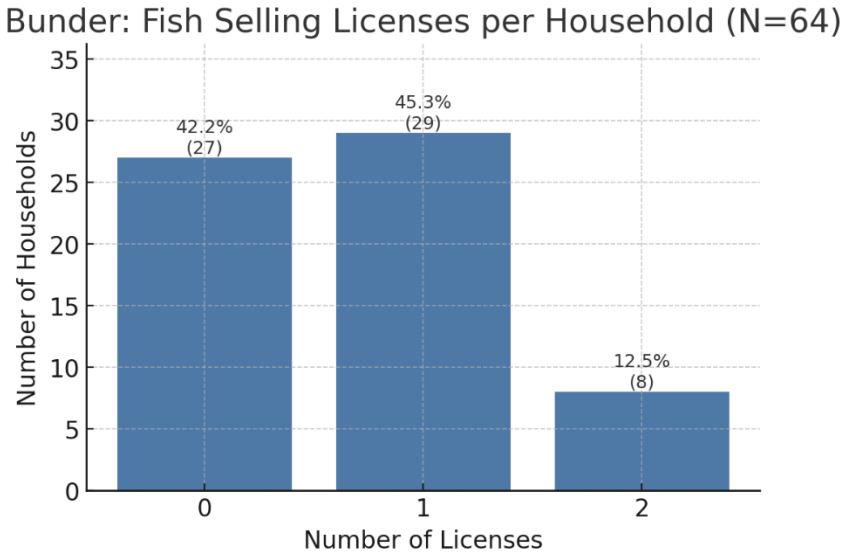


Figure 12 Distribution of Fish Selling Licenses per Household

D. Total licenses (sum of three types)

Licences were analysed at the household level, based on whether a family held at least one of each type—Pagadiya fishing, vessel/boat, or fish selling. Responses were grouped into six distinct combinations: all three, any two (by type), only one (by type), or none.

The largest share of households (40.6%, n = 26) reported holding both Pagadiya and fish selling licences, combining rights to shoreline fishing with direct market participation. Another substantial segment (31.2%, n = 20) held only Pagadiya licences, reflecting exclusive dependence on artisanal shore-based fishing without vessel or sales entitlements. Households with all three licences accounted for 10.9% (n = 7), while vessel licences were rare, appearing in just 6.2% (n = 4) of households and always in combination with Pagadiya rights. A small proportion held only selling licences (6.2%, n = 4), and 4.7% (n = 3) had no fishing-related licences at all.

This distribution underscores the primacy of Pagadiya licences as the foundation of household-level fishing rights, frequently paired with selling rights, while vessel entitlements remain highly limited.

Table 7 Fishing License Combinations in Bandar

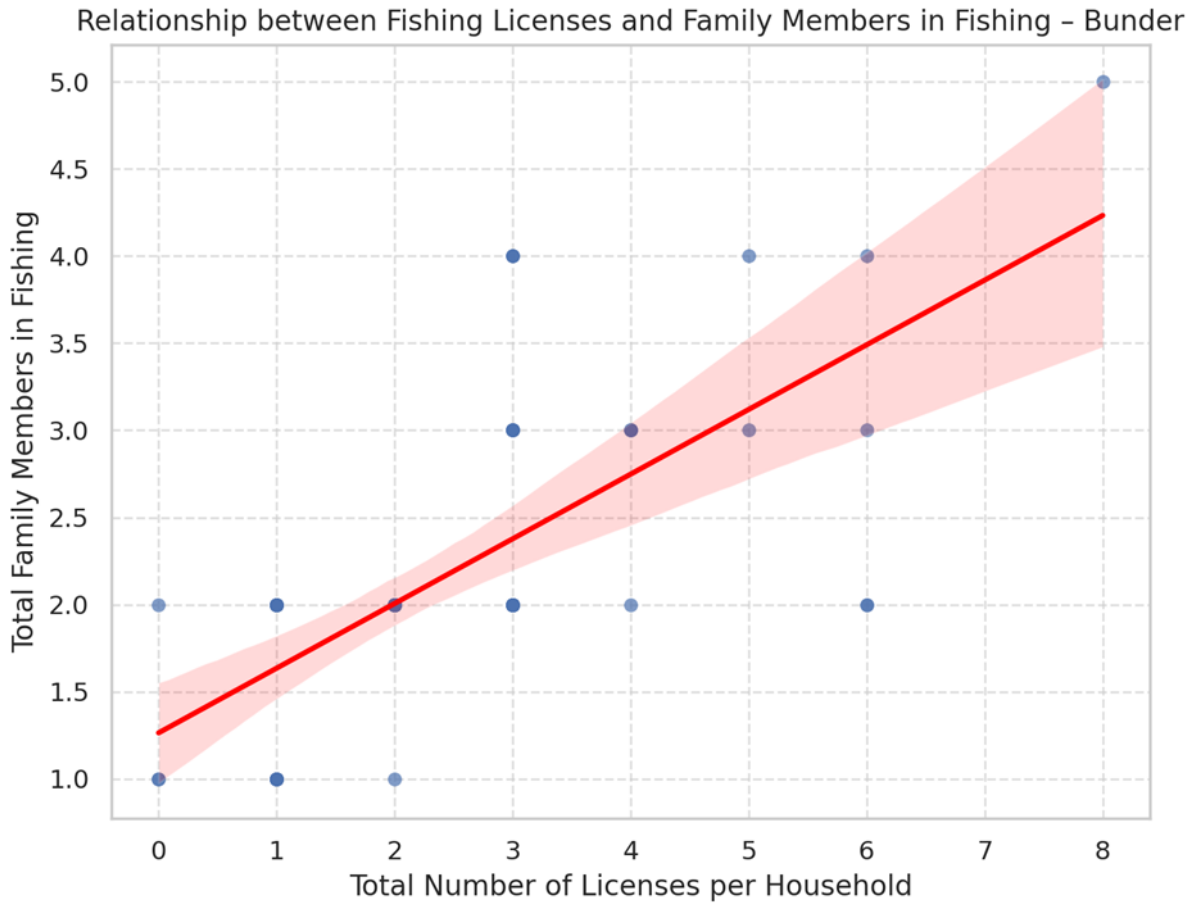
Licence Combination	Households	%
Pagadiya + Selling	26	40.6%
All three	7	10.9%
Only Pagadiya	20	31.2%
Only Selling	4	6.2%
Pagadiya + Vessel	4	6.2%
No licences	3	4.7%
Total	**64**	**100%**

F. Licenses and household labour

A correlation analysis was conducted to examine the association between license capacity and labour mobilisation. The Pearson correlation coefficient between total licenses per household and the number of household members engaged in fishing was **r = 0.694 (p < 0.001)**. This strong, statistically significant relationship indicates that households with more licenses also tend to involve more family members in fishing activities.

The findings point to a heterogeneous licensing landscape. While Pagadiya and selling licenses dominate, vessel/boat licenses remain rare, limiting mechanised participation. The correlation between license ownership and household fishing involvement highlights licenses as a key determinant of operational scale. At the same time, the existence of a small share of license-less households underscores the continued presence of families excluded from formal regulatory frameworks, raising questions about access, recognition, and vulnerability within the community.

Figure 13 Scatterplot: Total Fishing-Related Licenses vs Number of Household Members in Fishing



3.2.6 Household Ownership of Fishing Assets

Household Ownership of Motorised Boats

Out of 64 surveyed households, only 6 (9.4%) reported owning a motorised fishing boat powered by a diesel or petrol engine, while the vast majority (90.6%, n = 58) did not. The limited presence of such capital-intensive assets indicates selective access to mechanised operations, shaping differences in the scale and range of household fishing activities.

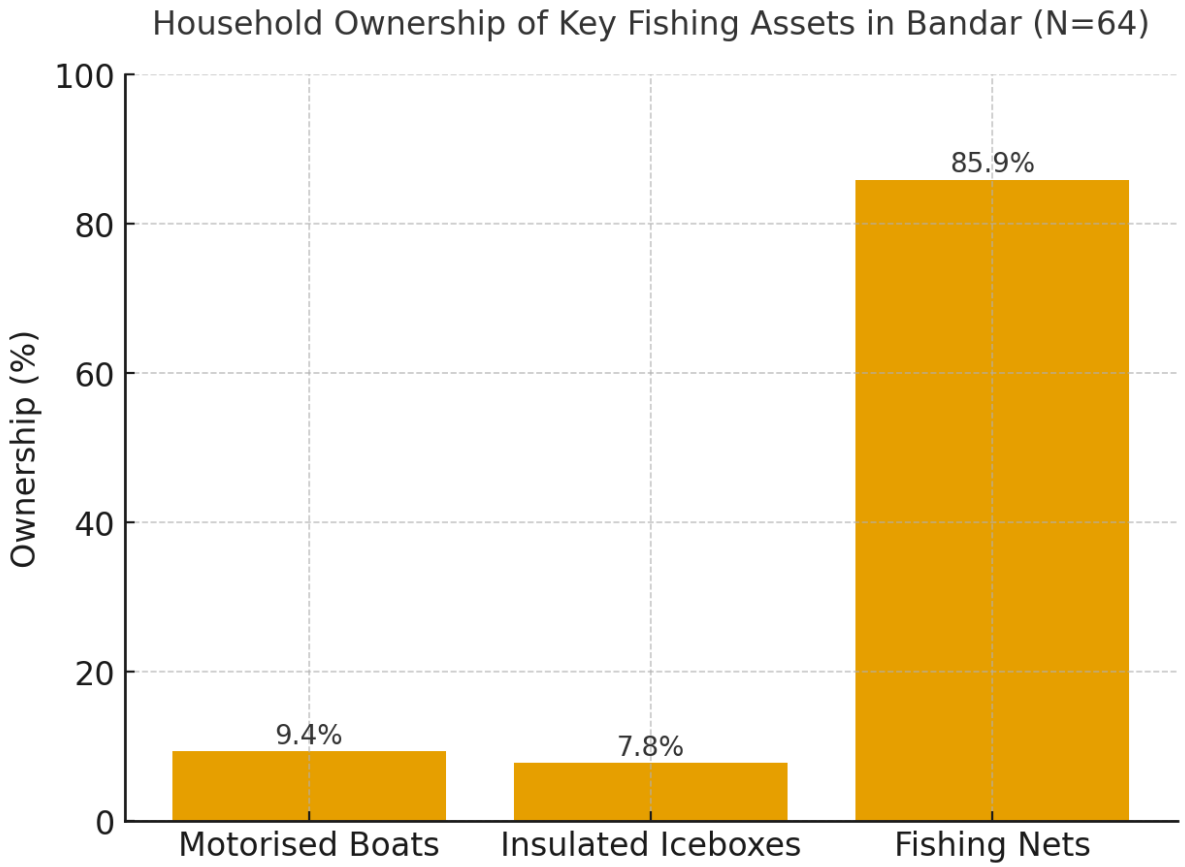
Household Ownership of Insulated Iceboxes

Ownership of insulated iceboxes was similarly limited, with only 5 households (7.8%) reporting access. The remaining 59 households (92.2%) lacked this basic cold storage infrastructure. Households with iceboxes are better positioned to maintain fish quality post-harvest, reduce spoilage, and secure improved returns in market sales.

Household Ownership of Fishing Nets

Fishing nets were the most widely owned asset, reported by 55 households (85.9%). Only 9 households (14.1%) indicated they did not own nets. This high rate of ownership underlines the essential role of nets in artisanal fishing practices and their centrality to sustaining livelihoods.

Figure 14 Household Ownership of Key Assets



Absence of Other Infrastructure

None of the surveyed households reported ownership or access to critical infrastructure such as cold storage facilities, fish holding tanks, GPS navigation systems, or quality testing laboratories. Similarly, no respondents reported ownership of non-motorised boats or insurance coverage for fishing assets. This widespread absence highlights systemic gaps in both productive and protective infrastructure, increasing vulnerability and limiting the competitiveness of the village's fishing economy.

3.2.7 Gaps in Licensing Coverage

In Bunder village, unlicensed participation in Pagadiya fishing was found to be minimal. A total of **four individuals** across **three households** were reported as engaging in fishing without a license, which represents **4.69 percent of the 64 households surveyed**. When calculated across all households, this amounts to a mean of **0.06 unlicensed Pagadiya fishers per household**, indicating that such activity is rare and dispersed within the community.

Similarly, unlicensed selling of fish was reported by **three individuals** belonging to **three households**, again accounting for **4.69 percent of the surveyed households**. In this case, the mean comes to **0.05 unlicensed sellers per household**, reflecting the marginal nature of such practices.

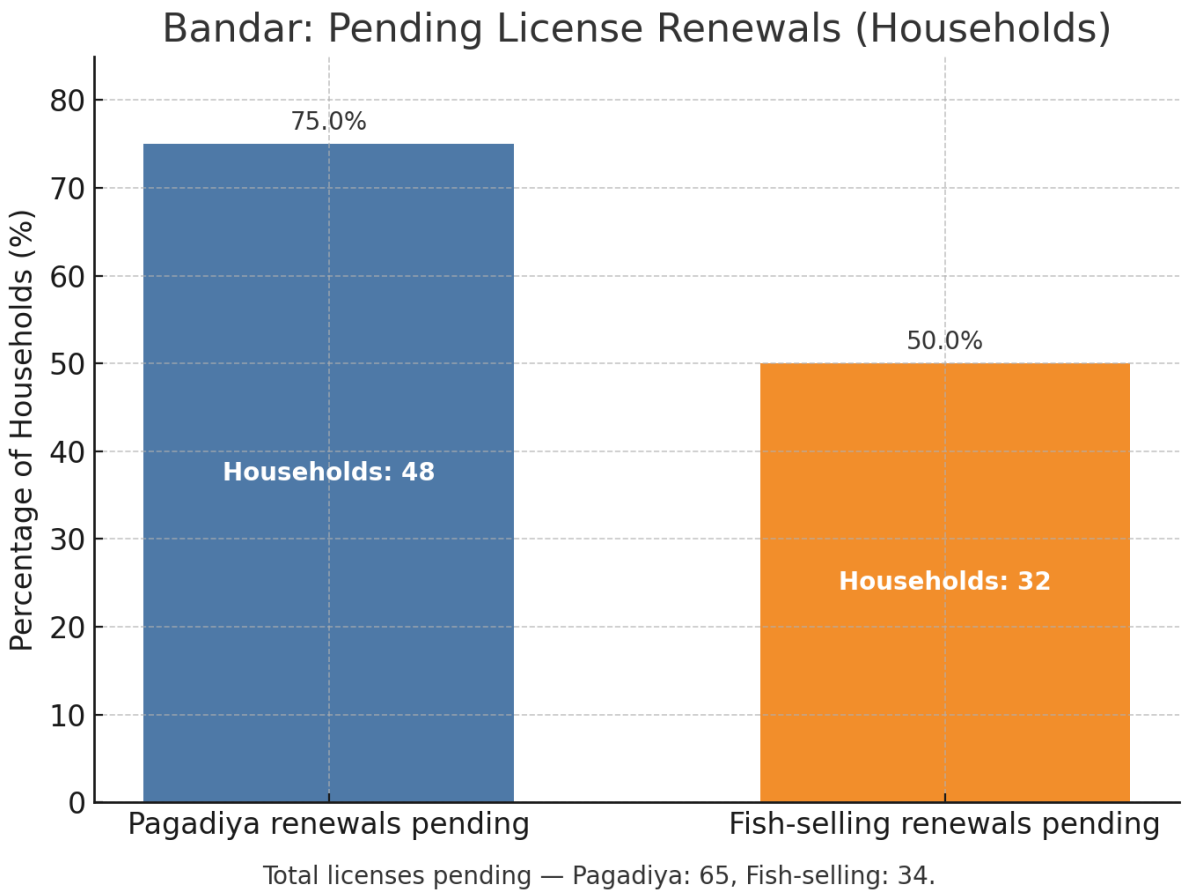
Such patterns highlight gaps in licensing coverage rather than deliberate avoidance of regulation. In many artisanal fishing households, multiple members participate in livelihood activities, but formal registration systems typically recognise only a single individual. As a result, supporting roles—often women or younger family members—remain outside the formal framework, even though they contribute directly to fishing or marketing. This reflects a mismatch between regulatory procedures and the lived realities of artisanal fishing communities.

While the overall incidence of unlicensed activity in Bunder is low, these findings draw attention to the structural constraints that can leave certain household members unregistered. Addressing this requires not only simplifying procedures and reducing costs but also expanding the scope of licensing frameworks to acknowledge and include the diverse roles within artisanal households. Such measures would ensure fuller coverage, enhance compliance, and strengthen equity within the regulatory regime.

3.2.8 Pending License Renewals

In Bunder village, licensing insecurity was observed not only in relation to unlicensed fishing and selling but also with regard to the renewal of existing licenses. The issue of pending Pagadiya license renewals is particularly widespread. Out of the 64 surveyed households, 48 households (75 percent) reported at least one license pending renewal. In total, 65 licenses were pending, which corresponds to a mean of 1.02 licenses per household. This points to a high level of administrative backlog or procedural delay in the renewal process. It also indicates possible difficulties among fishers in completing renewal requirements on time, either due to limited awareness of procedures, challenges with documentation, or financial constraints.

Figure 15 Pending License Renewals



A similar situation is observed in relation to fish-selling licenses. Here, 32 households (50 percent of those surveyed) reported at least one license pending renewal, with a total of 34 licenses identified as pending. This translates into a mean of 0.53 pending licenses per household, highlighting that half of the fishing households are directly affected. Although the burden is moderate when spread across the village, the 50 percent exposure rate underscores that licensing insecurity extends well beyond isolated cases and represents a systemic challenge.

These findings reveal that the gaps in licensing coverage in Bunder are not primarily about deliberate non-compliance but rather about processes of renewal that remain incomplete or delayed. In artisanal households, multiple members often participate in fishing and marketing activities, yet formal systems typically recognise only a single individual. As a result, supplementary contributors—frequently women or younger family members—are excluded, and even when licenses are issued, their timely renewal is not assured. This reflects a mismatch between the regulatory framework and the lived realities of fishing households.

Addressing these gaps requires attention on two fronts: institutional streamlining to reduce administrative delays and procedural burdens, and local facilitation to support households in navigating renewal requirements. More importantly, unresolved licensing insecurity places a substantial share of Bunder's fishing population at heightened legal and financial risk. If enforcement becomes stricter, households with pending renewals may find their livelihoods directly threatened. This vulnerability underscores how regulatory gaps intersect with broader livelihood insecurity. Ensuring timely, inclusive, and accessible licensing processes would not only improve compliance but also strengthen the resilience of artisanal fishers, safeguarding their rights and sustaining their contributions to coastal economies.

3.2.9 Fishing Effort and Productivity

Fishing in Bandar is characterised by high levels of family labour engagement and modest yields, reflecting the artisanal nature of Pagadiya practices alongside a small segment of mechanised operations.

Fishing Intensity Among Pagadiya Fisherfolk (

In Bandar, the distribution of fishing days outside the prohibited period reflects two distinct occupational groups. The majority identified as Pagadiya fisherfolk, who practice non-motorized, shore-based fishing. On average, they reported fishing on 16.1 days per month (SD = 6.0), a figure that suggests moderate intensity but also reveals constraints arising from tidal dependence and the physical demands of manual labour.

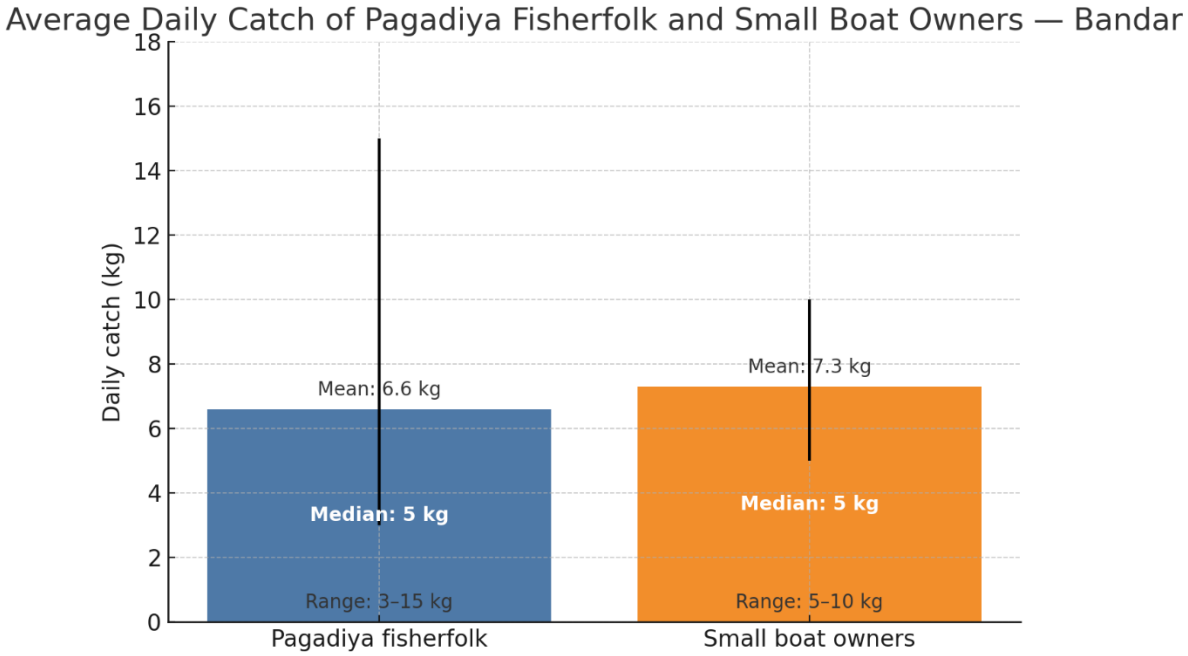
In contrast, a smaller group of fishers owning small boats (N = 4) demonstrated significantly higher levels of activity, averaging 24.8 days per month (SD = 8.1). This pattern indicates that even limited mechanization allows fishers to increase their fishing frequency and reduce interruptions linked to tidal cycles or shoreline access.

Daily Fish Catch Patterns

Catch data also reveal differentiation within Bandar's fishing economy. Among the respondents, Pagadiya fisherfolk and 3 were small boat owners. After removing statistical outliers, Pagadiya fisherfolk reported a mean daily catch of 6.6 kg, with a median of 5 kg and a range from 3 to 15 kg. These values are modest but consistent, aligning with the non-motorized nature of their methods.

Small boat owners reported an average daily catch of 7.3 kg, with a median of 5 kg and a narrower range of 5 to 10 kg. Although mechanization would typically be expected to yield larger returns, the overlap between the two groups in Bandar is striking. The difference in catch quantities is minimal, reflecting both the limited scale of boats in the village and local ecological constraints, such as depletion of nearshore resources.

Figure 16 Average Daily Catch of Pagadiya Fishers and Small Boat Owners



3.2.10 Motivations for Fishing and Allied Activities

The decision to continue fishing as a livelihood in Bandar reflects both practical and cultural dimensions. The most frequently cited reasons were *commercial purpose (business)* and *flexible timing*, each reported by 60 respondents (93.8%), highlighting a dual emphasis on economic viability and occupational flexibility. *Traditional occupation* was identified by 49 respondents (76.6%), underscoring the inherited and intergenerational character of fishing. *Self-interest* was cited by 45 respondents (70.3%), reflecting personal attachment and a sense of autonomy. In contrast, only 11 respondents (17.2%) selected *regular profit*, and just 7 respondents (10.9%) mentioned *no other jobs available*, showing that fishing is largely sustained by choice rather than compulsion.

Gendered Patterns

Among women (n = 26), *flexible timing* (92.3%) and *commercial purpose* (84.6%) were the most frequently reported motivations, followed by *traditional occupation* and *self-interest* (each 73.1%). Fewer women mentioned *regular profit* (26.9%) or *no other jobs available* (7.7%), suggesting that women value fishing primarily for its adaptability to domestic responsibilities and its cultural significance.

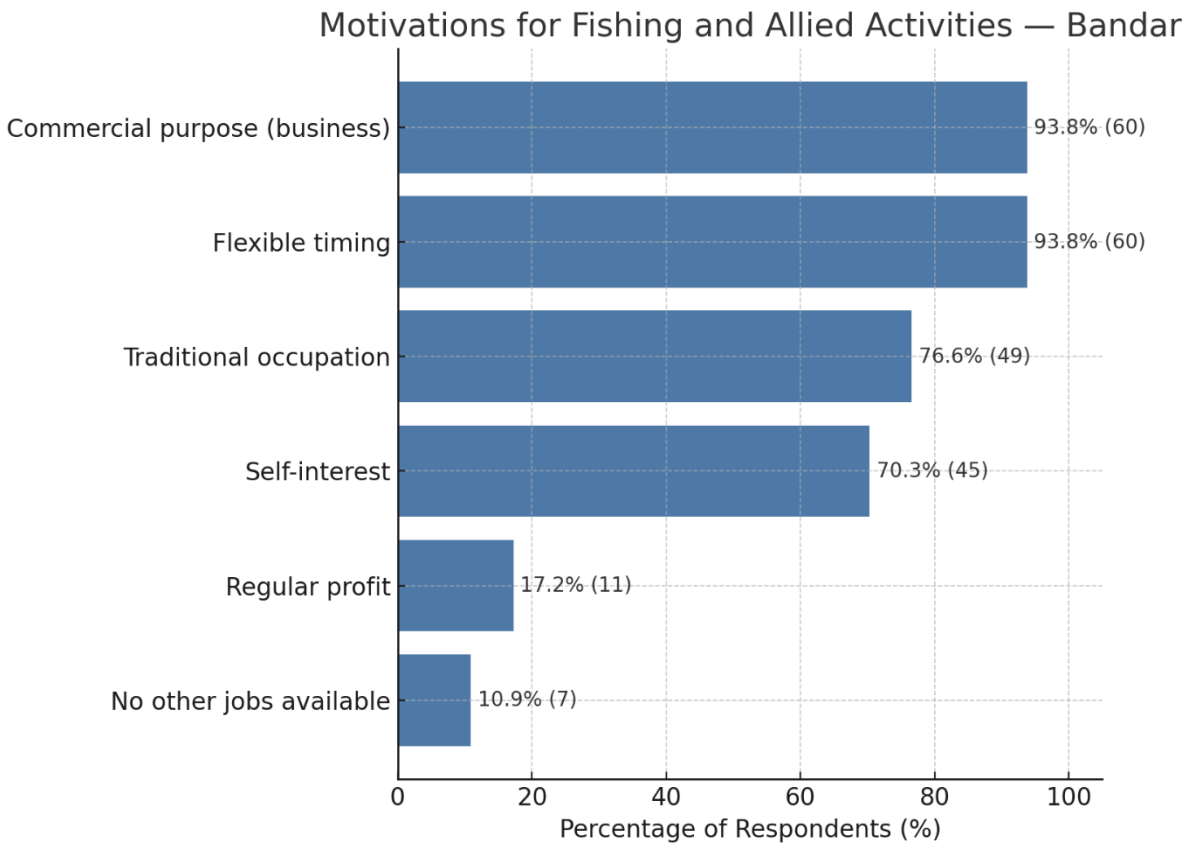
Among men (n = 38), *commercial purpose* was cited by all respondents (100%), followed closely by *flexible timing* (94.7%). *Traditional occupation* (78.9%) and *self-interest* (68.4%) also featured prominently, while *regular profit* (10.5%) and *no other jobs available* (13.2%) were less frequent.

This indicates that men largely frame fishing as a commercial pursuit, though cultural and personal factors remain important.

Occupational Differences

Disaggregating by primary occupation shows consistent emphasis on commerce and culture, with some variation:

Figure 17 Motivations for Fishing Reported by Respondents



- **Pagadiya fisherfolk (n = 55):** Commercial purpose (93.0%; 51), flexible timing (92.7%; 51), traditional occupation (74.5%; 41), self-interest (69.1%; 38), regular profit (18.2%; 10), and no other jobs (10.9%; 6).
- **Small boat owners (n = 3):** All respondents (100%) highlighted commercial purpose, flexible timing, and traditional occupation, while two (66.7%) mentioned self-interest. None reported regular profit, and one (33.3%) cited no other jobs.
- **Fish sellers (n = 6):** Commercial purpose (100%; 6) was universal, followed by flexible timing (83.3%; 5), traditional occupation (66.7%; 4), and self-interest (66.7%; 4). Two respondents (33.3%) noted regular profit, and one (16.7%) mentioned no other jobs.

The findings indicate that motivations for fishing in Bandar are anchored more in cultural inheritance, livelihood flexibility, and commercial logic than in expectations of stable profit. The relatively low proportion citing "no other jobs" suggests that fishing functions less as an employment fallback and more as a chosen livelihood. These dynamics underscore the continued importance of fishing as both an economic and socio-cultural foundation, with household-level

participation reflecting the interplay of business orientation, family traditions, and adaptability to daily life.

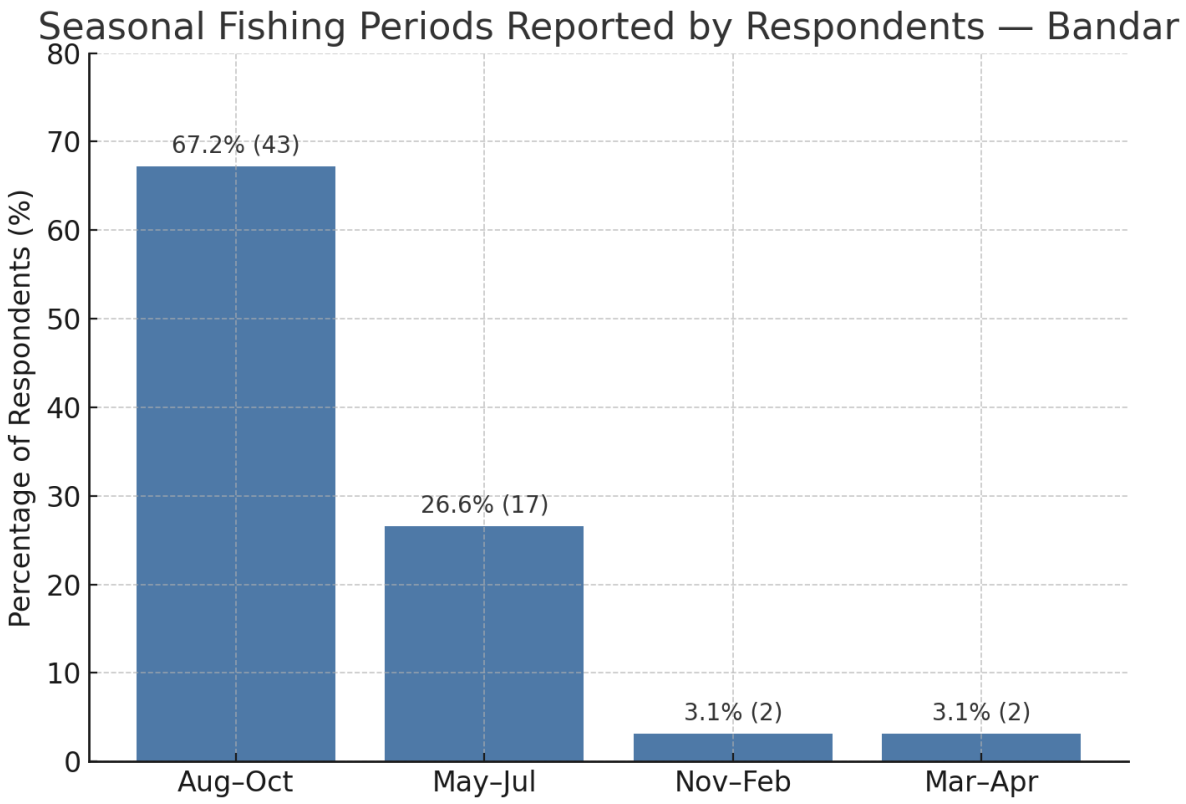
3.2.11 Seasonal and Species Patterns

Fishing in Bandar, as reported by respondents, follows a strongly seasonal pattern with activity concentrated in the monsoon and pre-monsoon periods. The August–October window was identified by 43 respondents (67.2%) as the most favourable for fishing, reflecting ecological recovery and high fish availability after monsoonal turbulence. A further 17 respondents (26.6%) reported fishing mainly during May–July, despite associated regulatory and weather-related challenges. Very few respondents identified fishing during November–February (2 respondents; 3.1%) or March–April (2 respondents; 3.1%), confirming that fishing activity is heavily concentrated in two annual peaks, with the dominant season being the post-monsoon months.

Species composition

Among Pagadiya fisherfolk (N = 54), the most commonly reported species were Palva (61.1%; 33 respondents), Bumla (61.1%; 33), and Paplet (61.1%; 33). Khagi and Kati were also widely cited, each by 31 respondents (57.4%). A small minority reported Surmai (11.1%; 6) and Jhinga (3.7%; 2). Other species commonly recorded in nearby coastal sites—such as Kut, Karchala, Lepta, and Tīṭan—were not mentioned at all, indicating their limited or absent availability in the Bandar coastal ecosystem.

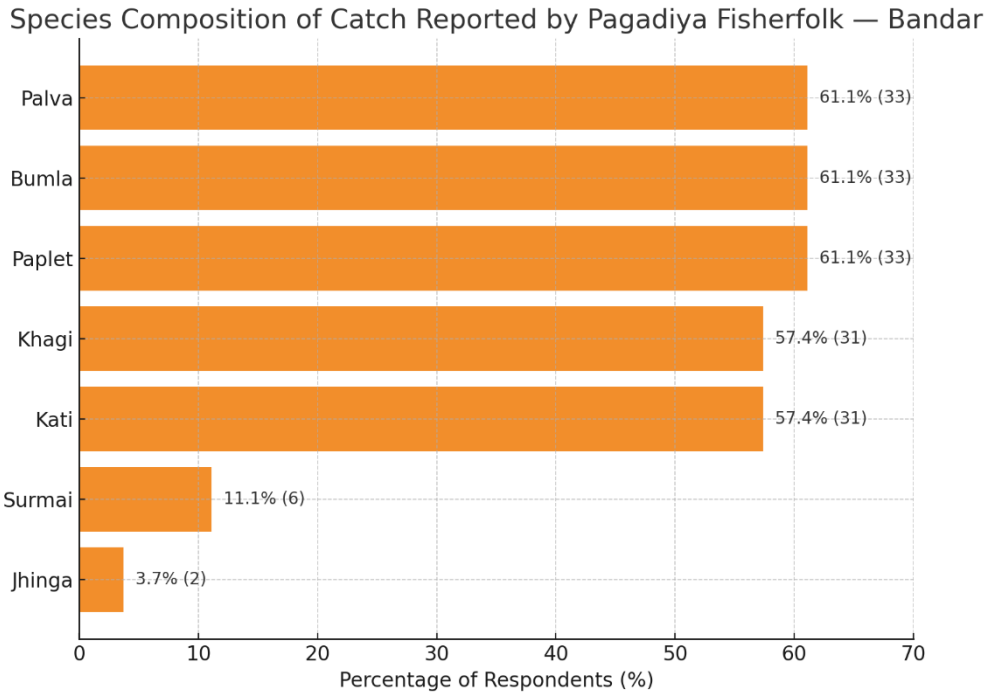
Figure 18 Seasonal Fishing Periods Reported by Respondents



Catch data from boat owners reveal a broadly even distribution across Palva, Bumla, Kati, Khagi, and Paplet (each 16.7%; 3 respondents). Surmai was noted by 2 respondents (11.1%) and Kut by one respondent (5.6%), while species such as Maghara were absent. This pattern reflects a

relatively balanced but selective catch structure, with reliance on a core set of species and limited targeting of high-value or less abundant varieties.

Figure 19 Species Composition of Catch Reported by Pagadiya Fishers



The findings underscore the dual-season nature of fishing in Bandar, with concentrated peaks in post-monsoon and pre-monsoon months. The species composition reveals dependence on a relatively narrow group of fish—particularly Palva, Bumla, Paplet, Khagi, and Kati—while high-value species like Surmai and Jhinga remain marginal. This indicates that livelihoods are closely tied to predictable seasonal cycles and selective species availability, reflecting both ecological realities and adaptive strategies within the fishing community.

Policy Context: Seasonal Fishing Ban in Gujarat

In Gujarat, the state government enforces an annual fishing ban from June 1 to August 15, totaling approximately 76 days (2.5 months). This seasonal prohibition was extended from the previous two-month period (June 1 to July 31) through the Gujarat Fisheries (Amendment) Rules, 2020, aimed at enhancing marine conservation during critical breeding periods.

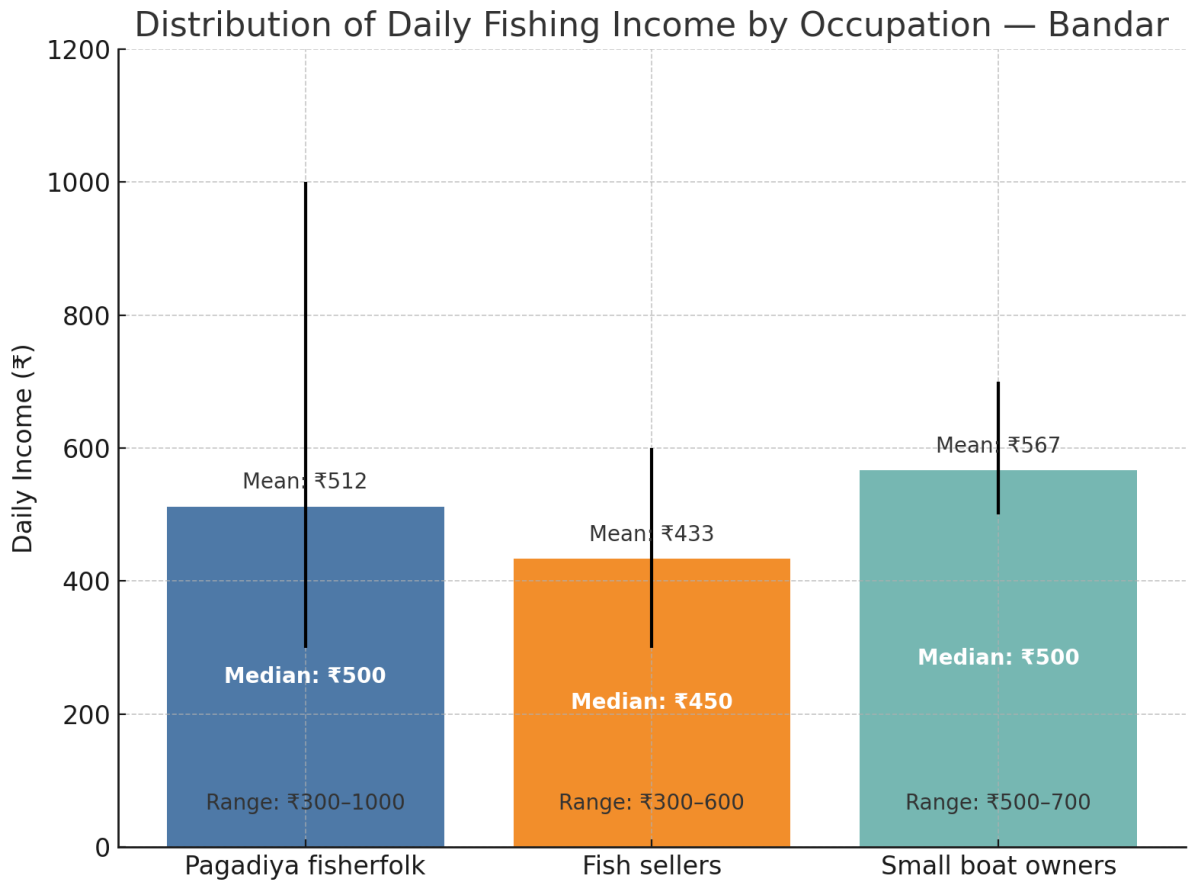
The ban applies to fishing within territorial waters, which are defined under the Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act, 1976 as extending up to 12 nautical miles (approximately 22.2 kilometers) from the baseline of the Indian coast. These waters fall under the jurisdiction of individual state governments, and fishing activity in this zone is regulated by state-specific laws.

However, as per central government directives, the ban does not apply to non-motorized fishing vessels, including Pagadiya fisherfolk, who traditionally fish without engines. These artisanal fishers are exempted from the seasonal restrictions, particularly if operating in small-scale, sustainable ways.

3.2.12 Income from Fishing

Income patterns among fisherfolk households in Bandar provide critical insights into both the economic precarity and the internal stratification of pagadiya fisheries. Respondents were asked to report their average daily earnings from their primary occupation. These figures, while self-estimated and subject to seasonal variability, serve as important indicators of livelihood security and vulnerability.

Figure 20 Distribution of Daily Fishing Income by Occupation



Across respondents engaged in fishing and allied occupations (**N = 64**), the mean reported daily income was **₹488.5**, with a median of **₹500**, a minimum of **₹100** and a maximum of **₹1,000**. The standard deviation of **₹167.9** indicates moderate variability, yet the overall clustering around the median underscores the subsistence-oriented character of most fishing activity.

Disaggregation by primary occupation shows the following patterns:

- **Pagadiya fisherfolk (N = 55):** Mean daily income of **₹511.8**, median ₹500, with a range of **₹300–1,000**.
- **Fish sellers (N = 6):** Mean daily income of **₹433.3**, median ₹450, with a range of **₹300–600**.
- **Small boat owners (N = 3):** Mean daily income of **₹566.7**, median ₹500, with a range of **₹500–700**.

The data indicate that while Pagadiya fishers represent the majority and display broader variability in income, fish sellers remain concentrated at the lower end, and small boat owners earn slightly more stable incomes but without significant advantage over Pagadiya fishers.

Figure 21 Average Daily Fishing Income by Occupation and Gender

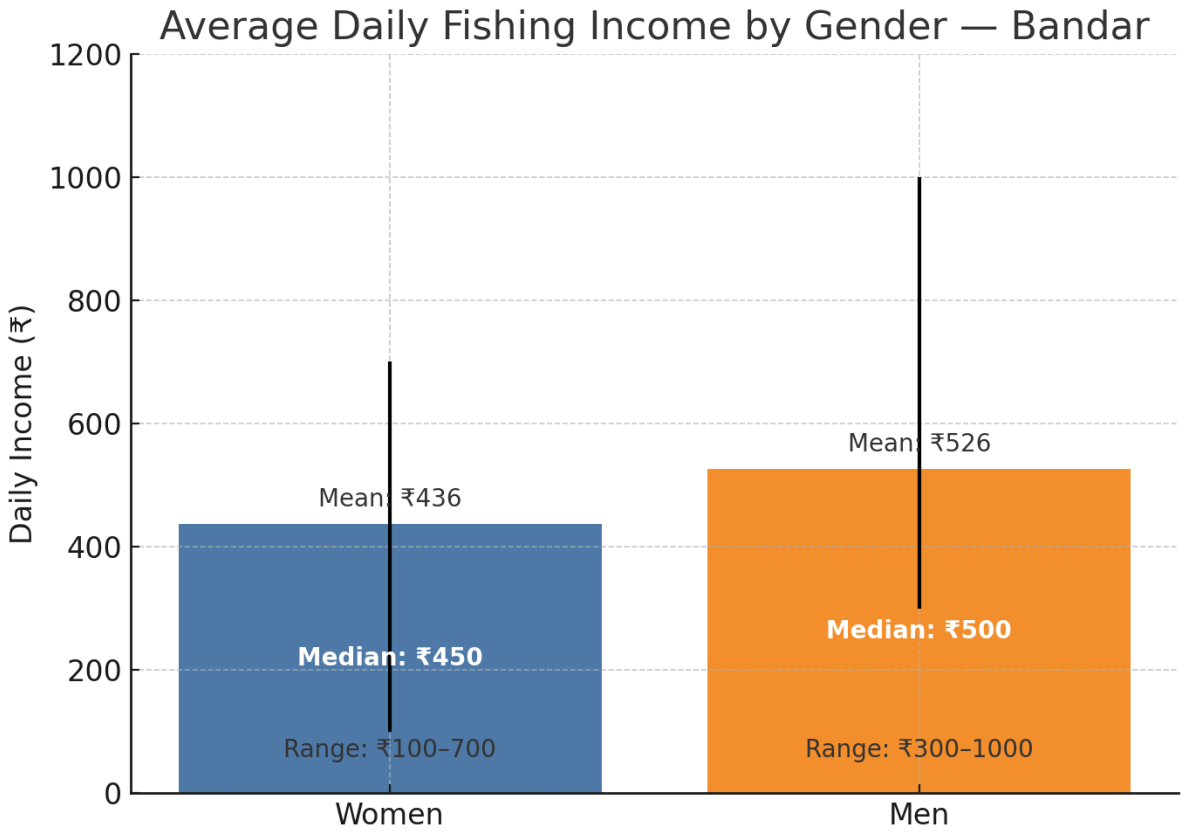


Figure 24. Average Daily Fishing Income by Occupation and Gender

Gender-based differences are evident. Among women (**N = 26**), the mean daily income was **₹436.5** (median ₹450; range ₹100–700). In contrast, men (**N = 38**) reported a mean of **₹525.6** (median ₹500; range ₹300–1,000). These results show that women's earnings are more tightly constrained within the lower tiers, while men are able to capture the upper end of the income distribution.

Three dynamics emerge from these findings. First, subsistence-level concentration is pronounced: most households remain clustered around ₹500/day, with limited scope for accumulation or reinvestment. Second, asset-based stratification is muted: small boat owners in Bandar show slightly higher and more stable earnings, but their incomes remain close to those of Pagadiya fishers. Third, gender inequality persists: women are integral to both fishing and marketing, yet their earnings are concentrated in the lower-income tiers, reflecting barriers to asset access and market participation. These results underscore the precarious but adaptive character of fishing livelihoods in Bandar.

3.2.13 Expenditure on Fishing

Expenditure data in Bandar were reported exclusively by small boat owners, as Pagadiya fishers—who constitute the overwhelming majority—incur negligible monetary costs in their shore-based, non-motorised practices. Only three respondents in the village identified themselves as small boat owners and provided details of operational costs.

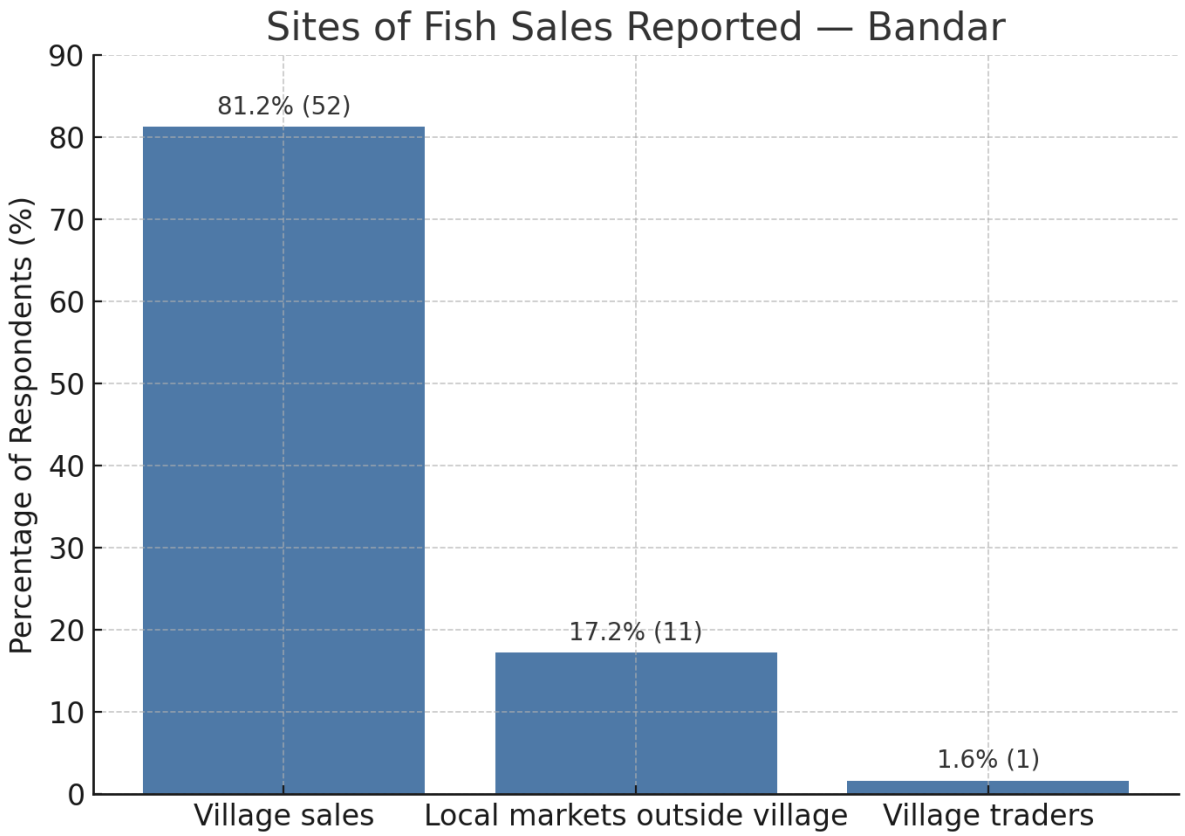
The reported expenditures were highly uniform. Each respondent noted a **trip cost of ₹1,000**, resulting in an **average of ₹1,000**, a **median of ₹1,000**, and a **range limited to ₹1,000–₹1,000**. This reflects a striking homogeneity in expenditure patterns among the very small number of boat owners in Bandar.

By contrast, Pagadiya fishers reported almost no monetary outlay, as their methods are primarily labour-intensive and reliant on family contributions rather than purchased inputs. The divergence in expenditure between Pagadiya and small boat owners illustrates the asset-based stratification of fishing livelihoods in Bandar: while boat ownership brings greater stability and potential returns, it also entails regular financial commitments, albeit modest compared to other coastal contexts.

3.2.14 Market and Selling Practices

Market engagement in Bandar reflects the localized and small-scale character of pagadiya fisheries. Among the 64 surveyed households, nearly universal access to markets was reported: **96.9% (n = 62)** indicated that a fish market was available within 10 km, while only two households (3.1%) reported otherwise. Despite this proximity, respondents emphasized challenges in securing space within markets, highlighting competition for stalls and dependence on informal arrangements.

Figure 22 Sites and Practices of Fish Sales Reported



Sites of sale.

Most fisherfolk rely on village-level transactions. **81.2% (n = 52)** reported selling fish directly in the village through home-based vending or small stalls. A smaller proportion, **17.2% (n = 11)**, used local markets outside the village, and only **1.6% (n = 1)** sold to village traders. Bonded sales were virtually absent: **98.4% (n = 63)** denied engaging in advance or debt-based transactions . This suggests that Bandar fisherfolk retain significant independence in marketing compared to debt-linked arrangements found in some other coastal regions.

Practices of weighing and segregation.

Attention to product quality and fairness in transactions is notable. 93.8% (n = 60) reported segregating fish varieties before sale, while 100% (n = 64) confirmed use of weighing scales. These practices demonstrate strong adherence to marketing norms and contribute to transparency in local exchanges.

Mode of exchange.

Among fishing households (**n = 58**), the vast majority—**93.1% (n = 54)**—sold directly to consumers at the village level, with only **6.9% (n = 4)** using the village fish market as an intermediary space . This indicates a system heavily oriented toward direct-to-consumer sales, minimizing both trader involvement and integration with larger markets.

Gendered dynamics.

Women are particularly visible in direct sales. Most of the fish-selling households reported that women undertook the role of vending, especially in door-to-door and stall-based retail. This arrangement provides flexibility and ensures women's income contribution to the household economy. However, women's limited participation in external markets restricts their ability to capture higher prices and expand sales volumes.

Market practices in Bandar thus reveal both strengths and constraints. On the one hand, the absence of bonded sales, universal use of weighing scales, and widespread segregation of fish varieties point to a fair and relatively organized local system. On the other, heavy reliance on village-level sales limits bargaining power, price realization, and opportunities for scale. Gendered constraints are also apparent, as women's concentration in local vending curtails their access to more profitable markets.

3.2.15 Seasonal Migration for Fishing

Survey data from Bandar recorded that none of the 64 households reported migration for fishing or related work. On the surface, this suggests that mobility is absent from the village economy. However, the village assembly held in 2025 revealed that fisherfolk are increasingly engaged in new forms of mobility and occupational shifts which they do not categorise as "migration."

Extent and patterns.

Community members explained that while they continue to live in Bandar, many have begun moving daily to nearby places such as Mahuva and surrounding agricultural fields for wage labour. As one participant stated: "We go in the morning and return in the evening. That is not migration." Such movements involve cotton-seed picking or casual daily-wage work in fields and yards, supplementing or replacing fishing incomes. Importantly, these are day-based movements rather than seasonal relocations, hence absent from household survey data.

Shift in profession and livelihood strategy.

Discussions highlighted that declining fish availability has pushed fishermen into agriculture and wage labour. "Fishing was our main profession, but now it does not give enough. I am working as an agriculture labourer because I was not getting enough money from fishing," explained one fisher. Households increasingly rely on multiple earners: women and youth take up factory, farm, or wage labour to cope with rising expenses, with some families reporting monthly incomes of only ₹10,000–12,000 despite multiple members working.

Drivers.
The assembly attributed this shift to three structural causes:

- **Environmental change and infrastructure:** The construction of a *bandhara* between sea and freshwater has dried up a bay that once sustained Pagadiya fishing. *"That bay was 15–20 feet deep earlier. Now it is dry, and Pagadiya fishermen lost their work,"* participants explained.
- **Trawler intrusion and destructive nets:** The spread of micro trolling nets by larger boats from Jafrabad was identified as a major reason for the decline of nearshore fish stocks.
- **Financial unsustainability:** After deducting costs, fishers sometimes make as little as ₹100 profit per day, forcing families to seek alternative incomes.

Impact on labour and future generations.

These pressures are reshaping work and family dynamics. Many Pagadiya fishers have shifted to working as *khalasi* (labourers) on small boats. However, boat numbers are declining as owners struggle to find crew and are forced to sell their boats. Low incomes also affect education: *"Children are leaving school after Grade 7 or 8, because we cannot afford to keep them,"* reported one participant. This points to a worrying cycle of intergenerational precarity.

The apparent absence of migration in survey data masks significant shifts in livelihoods and hidden forms of mobility. Bandar fisherfolk remain physically rooted, but their occupational geography has expanded to include daily wage labour in agriculture and nearby towns. These changes reflect both resilience and crisis: households adapt by diversifying income sources, yet structural drivers—environmental modification, industrial fishing, and financial unsustainability—threaten the continuity of Pagadiya traditions and the prospects of future generations.

Summary of Section 3.2: Livelihood System

Livelihoods in Bandar are rooted in Pagadiya fishing but supplemented by wage labour, vending, farming, and small trade. Occupational structures are highly gendered: men dominate fishing and all capital-intensive roles, while women are concentrated in low-capital secondary activities and post-harvest work. Diversification is widespread yet shallow, with most households reporting only one secondary occupation, primarily agricultural daily wage labour.

Fishing experience is substantial (mean 24.3 years), and most households involve two members in fishing. Licence ownership is dominated by Pagadiya rights (mean 1.56 per household), but vessel licences are rare and renewals remain a major gap, leaving many households in regulatory insecurity. Fishing effort shows clear stratification: Pagadiya fishers average 16 days/month with modest catches (6.6 kg/day), while small-boat owners fish 25 days/month but record similar catches due to ecological constraints.

Incomes are subsistence-level, clustering around ₹500/day, with women earning less than men and fish sellers at the lowest tier. Expenditure is negligible for Pagadiya but fixed at ₹1,000 per trip for small-boat owners. Market systems are overwhelmingly localised: over 80% of sales occur within the village, with universal adherence to weighing and segregation norms but limited access to larger markets.

While the survey recorded no seasonal migration, the 2025 village assemblies revealed **"hidden mobility"**—daily movements to Mahuva, Bhavnagar, and cotton fields for labour. These shifts are driven by declining fish stocks, destructive trawler practices, and infrastructural changes (e.g., the *bandhara* drying up a traditional bay). Families adapt through multiple earners and diversification, but financial returns remain low, boats are being sold, and children are leaving school early, underscoring the precariousness of Bandar's fishing livelihoods.

Section 3.3: Economic Conditions

Understanding the economic conditions of small-scale fisherfolk households is fundamental to assessing their vulnerabilities, adaptive capacities, and pathways for sustainable development. Economic well-being, in this context, is shaped not only by income levels but also by household expenditure patterns, indebtedness, access to credit, asset ownership, and the security of housing. These factors directly influence a household's ability to invest in productive assets, recover from shocks, and plan for the future.

For communities such as those in Gujarat's coastal villages, whose livelihoods are predominantly informal and season-dependent, economic conditions remain both volatile and deeply gendered. Income flows fluctuate with climatic cycles, fishing bans, and market access, while access to financial services is uneven, particularly for women and socially marginalised groups.

This section examines household-level economic indicators, including:

- Primary income sources and income brackets
- Credit and loan access (formal and informal)
- Debt servicing burden and repayment challenges
- Quality and security of housing infrastructure

By disaggregating these indicators by gender and livelihood role, the analysis provides insights into the intersection of poverty, financial access, and social exclusion. These findings help identify entry points for inclusive financial services, housing support, and livelihood strengthening strategies that build long-term economic resilience.

3.3.1 Livelihoods and Income Sources

Household economies in Bandar remain overwhelmingly dependent on fishing, with limited diversification beyond the coastal sector. The 2025 household survey shows that **82.8% of households (n = 53)** reported Pagadiya fishing as their primary income source, followed by **10.9% (n = 7)** engaged in fish selling and **6.2% (n = 4)** deriving income from small-boat ownership. No household reported boat labour as a main occupation, underlining the primacy of independent artisanal fishing and post-harvest roles. This profile indicates a high degree of exposure to ecological pressures and market risks associated with coastal fisheries.

Household Income Diversification

Analysis of household-level income portfolios shows extremely limited diversification. A large majority of households (**N = 60**) reported earning income from exactly two meaningful sources (≥10% of household income), most commonly a combination of **fishing and fish selling**, reflecting the community's marine-based dependence. Only **three households** were found to be monodependent, deriving over 90% of their income from fishing alone—placing them at particularly high risk from ecological and market shocks. Just **one household** reported earnings from three or more distinct sources, underscoring the near absence of broader diversification into agriculture, services, or salaried employment. The findings highlight Bandar's bi-sectoral livelihood structure—heavily reliant on both the harvesting and trading of marine produce—with minimal penetration of alternative sectors.

Table 8 Primary Income source of the household

Primary Income source of the household	Mean Income (Rs)	Median Income (Rs)	Min Income (Rs)	Max Income (Rs)
Pagadiya fisherfolk	84000	75000	30000	200000
Boat owners	110000	120000	80000	150000
Fish sellers	65000	65000	60000	70000
Agricultural/Labour	45000	45000	40000	50000

Income distribution across occupations reveals marked stratification.

- **Pagadiya fisherfolk** reported annual household incomes ranging from ₹30,000–200,000, with a mean of ₹84,000 and a median of ₹75,000, pointing to modest but widespread dependence on subsistence-level earnings, with only a few outliers achieving higher incomes.
- **Boat owners** enjoyed higher returns on average (mean ₹110,000; median ₹120,000) due to mechanisation and larger catches, but their incomes displayed greater variability, reflecting vulnerability to fuel costs, weather shocks, and fluctuating landings.
- **Fish sellers** occupied the lower-middle tier, reporting relatively stable incomes between ₹60,000–70,000 annually. These smaller margins highlight the constraints of marketing compared to primary production.
- **Agricultural labourers and daily wage workers** reported the lowest and most irregular incomes (~₹45,000 annually), underscoring the marginal role of agriculture as a fallback rather than a central livelihood.

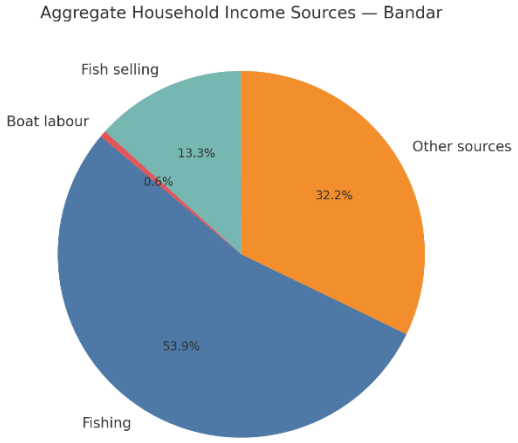
Insights from the **village assemblies** underline how declining fish availability has forced households to diversify. Respondents described shifting into agricultural work, factory labour, and cotton-seed picking to cope with low fishing returns. As one participant noted: *"Fishing was our main profession, but now it does not give enough. I am working as an agriculture labourer because I was not getting enough money from fishing."* Families increasingly rely on multiple earners, including women and youth, to sustain household budgets, though total monthly income for most households remains limited to **₹10,000–12,000**.

Bandar's livelihood system is thus defined by the dominance of Pagadiya fishing, stratified but fragile boat-based incomes, and constrained margins in fish selling. Wage labour and agriculture supplement but do not substitute for fishing, reflecting both necessity-driven diversification and the lack of robust alternatives. Household income strategies reveal resilience through multi-earner arrangements, but structural drivers—declining fish stocks, ecological change, and inflation—continue to entrench economic vulnerability.

3.3.2 Aggregate Household Income Sources

The chart illustrates Bandar's strong dependence on marine-based livelihoods. Fishing generates nearly ₹3.98 million, forming the backbone of household income. "Other sources" contribute ₹2.38 million, though these are fragmented and irregular, linked to casual labour, remittances, and informal activities. Fish selling adds a commercial dimension (₹0.98 million), while boat labour income remains marginal (₹42,500). The near absence of land-based or formal sector income highlights the vulnerability of Bandar households to fluctuations in fisheries productivity and market conditions.

Figure 23 Aggregate Household Income Sources



3.3.3 Household Debt and Borrowing

The household survey (N = 64) recorded a complete absence of formal or institutional borrowing. None of the surveyed households reported loans from banks, cooperatives at the time of the interview. However, village assembly discussions revealed that households borrow small amounts from relatives, neighbours, or other known individuals. Such informal borrowing is typically short-term and based on personal trust, functioning more as reciprocal support networks than as structured credit arrangements.

While the absence of formal borrowing shields households from the debt burdens common in many fishing communities, it also reflects financial exclusion. Without access to institutional credit, fisherfolk lack the resources to invest in productive assets or withstand economic shocks. Instead, they remain dependent on informal, trust-based borrowing, which provides immediate relief but offers limited scope for long-term livelihood strengthening.

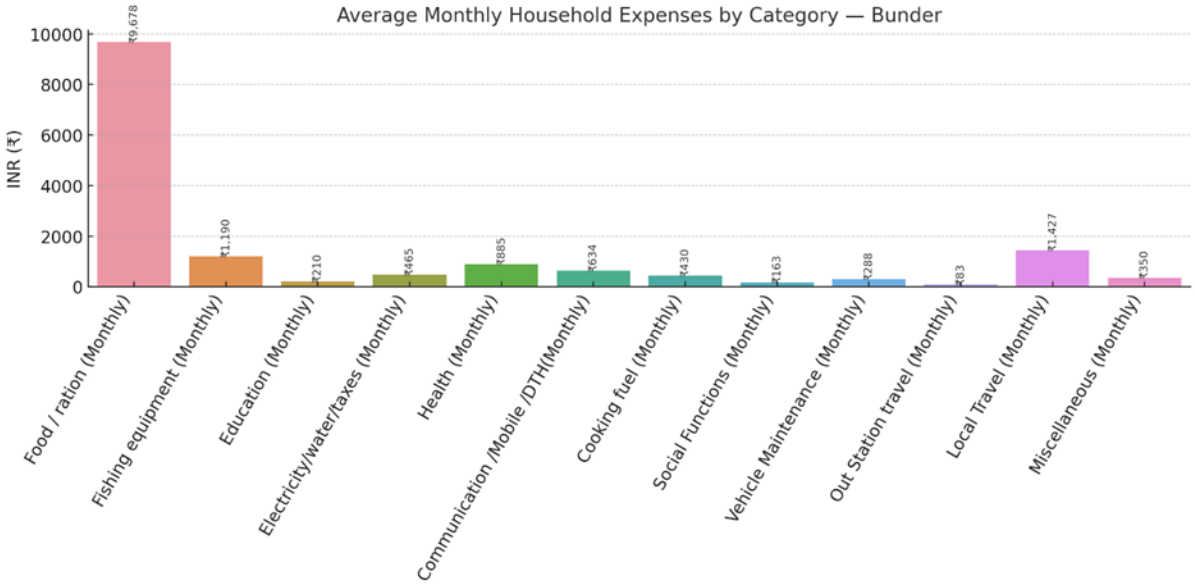
3.3.4 Household Expenditure Patterns

Household spending is overwhelmingly concentrated in essential categories. The average monthly expenditure on food and ration was ₹9,678, indicating that subsistence consumes the bulk of household budgets. This dominance of food-related spending underscores both limited income diversification and constrained financial flexibility.

Other significant recurrent costs include local travel (₹1,427) and fishing equipment (₹1,190), reflecting the importance of mobility and livelihood maintenance. Moderate spending was reported on health (₹885), communication (₹634), utilities (₹465), and cooking fuel (₹430), suggesting a consistent baseline of household utility use.

Discretionary expenses remain marginal: education (₹210), social functions (₹163), and outstation travel (₹83) were the lowest reported categories. These figures point to conservative spending patterns, likely reflecting both limited disposable income and restricted access to higher-order goods and services.

Figure 24 Average Monthly Household Expenditure



3.3.5 Financial Inclusion

In Bandar (N = 64 households), financial inclusion at both the household and individual level is notably strong. A large majority of households (89.1%; n = 57) reported having a Jan Dhan Yojana account, while only seven households (10.9%) lacked such coverage. At the individual level, access is universal: all 64 respondents (100%) confirmed holding a personal bank account. The findings highlight an important paradox. While Bandar households report no engagement with formal borrowing, their near-universal access to bank accounts suggests that they are well-positioned to benefit from financial inclusion policies. The challenge lies not in access, but in leveraging these accounts for productive credit, savings, and long-term livelihood strengthening.

3.3.6 Housing Tenure and Quality

Housing conditions in Bandar reflect both high levels of asset ownership and persistent vulnerabilities in tenure and structural quality.

Ownership and tenure security.

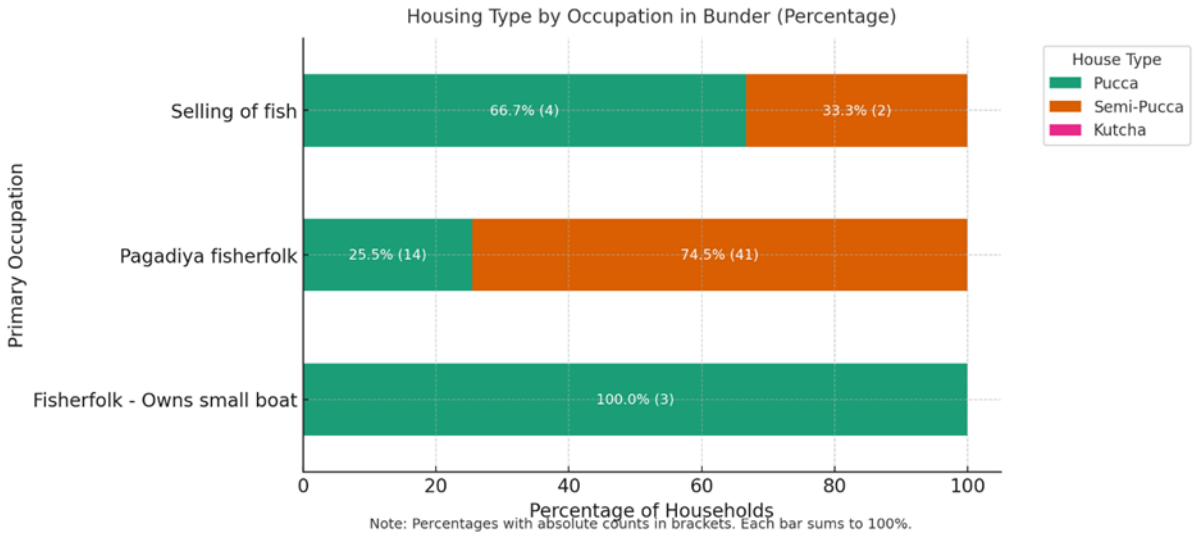
House ownership is near-universal: 62 of 64 households (96.9%) reported residing in dwellings they consider their own, with only two households (3.1%) lacking ownership. This high level of ownership provides a degree of stability and social standing. **However, none of the surveyed households reported possession of formal land ownership documents or pattas, leaving all families in a precarious legal position.** Without pattas, tenure remains informal and vulnerable to contestation, limiting access to institutional credit and exposing households to heightened insecurity during displacement or climate events.

Housing materials.

Roofing structures remain fragile. A clear majority (67.2%; n = 43) rely on thatched roofs, while 18.8% (n = 12) use cement/concrete and 14.1% (n = 9) rely on tin sheets. The dominance of thatch underscores exposure to cyclones, heavy rains, and fire hazards, with incremental improvements suggesting that households strengthen walls before investing in more durable roofing. In contrast, wall materials are relatively strong: 84.4% (n = 54) reported concrete walls, 14.1% (n = 9) brick, and only 1.6% (n = 1) stone. This indicates widespread investment in strengthening lower structures against storms and flooding, even as roofs remain weak points.

Differentiation by occupation.

Figure 25 Housing type



Housing resilience is unevenly distributed across occupational groups. Among Pagadiya households (the majority), 35.7% (n = 20) live in Pucca houses, 60.7% (n = 34) in Semi-Pucca dwellings, and 3.6% (n = 2) in Kutcha structures. The dominance of Semi-Pucca housing reflects partial improvements, where walls or roofs are upgraded but rarely both. Fish sellers fare better: 75% (n = 3) live in Pucca houses, with only one household (25%) in Semi-Pucca. These differences suggest that occupational income patterns shape adaptive capacity, with Pagadiya households more exposed to climate and infrastructural risks.

3.3.7 Agricultural Land Ownership

Agricultural land ownership in Bandar is negligible. Out of 64 surveyed households, only five (7.8%) reported holding any land, while 59 households (92.2%) declared themselves landless. The combined extent of land owned was less than five acres, translating to an average of under one acre per household.

Of this, 4.5 acres (90%) was reported as cultivable and 0.5 acres (10%) as non-cultivable. These very small holdings are insufficient to supplement household livelihoods in any meaningful way. The near absence of agricultural land underscores Bandar's overwhelming dependence on fishing. With neither secure land assets nor an agrarian fallback, households remain highly exposed to fluctuations in marine resource availability and market conditions.

3.3.8 Livestock Ownership

Livestock ownership in Bandar is limited, underscoring the community's overwhelming reliance on marine-based livelihoods. Out of 64 surveyed households, only a small minority reported keeping animals. Goats were the most common, owned by six households (9.4%), with a total of 12 animals (average 2.0 per owning household). Cows were reported by three households (4.7%), with a total of four Buffaloes were owned by four households (6.3%), with a total of five. These figures indicate that livestock holdings in Bandar are minimal and primarily subsistence-oriented, serving household milk needs or functioning as small savings assets.

3.3.11 Insurance Coverage

In Bandar (N = 64), no households reported holding any form of insurance related to fishing or livelihood security. Coverage was absent across all categories, including boat or equipment

insurance, net insurance, cold storage/icebox insurance, family health insurance, personal accident or life insurance, government-linked insurance schemes, crop or livestock insurance, and private policies. As a result, 100% of households confirmed having no insurance coverage of any kind.

> Not a single household in Bandar reported holding any type of insurance—whether for boats, nets, cold storage, health, life, or livestock. This complete absence of coverage leaves all 64 households (100%) fully exposed to everyday risks and extreme events, with no formal mechanisms for risk transfer.

The complete absence of insurance leaves the community entirely exposed to both routine risks—such as gear damage or health expenses—and extreme shocks, including cyclones, accidents at sea, and the sudden loss of productive assets. Without formal risk transfer mechanisms, households are compelled to depend on informal coping strategies, such as borrowing from relatives or liquidating small assets, which further erodes long-term resilience.

3.3.12 Fishing Grounds and Distance

In Bandar, the survey identified 58 active fishing households. The overwhelming majority are Pagadiya fisherfolk (55 households; 94.8%), relying on non-motorised, shore-based methods. Only three households (5.2%) reported ownership of motorised boats powered by diesel or petrol engines, indicating the very limited presence of mechanisation. Fishing grounds are divided between the open sea (39 households; 67.2%) and the Banthara (Check dam) nearshore zone (16 households; 27.6%), with a small residual share not specified. Reported distances travelled for fishing averaged 14.6 km, with a median of 17.5 km and a range of 0–30 km.

Summary of Section 3.3: Economic Conditions

Household economies in Bandar remain overwhelmingly dependent on Pagadiya fishing (82.8%), with smaller shares in fish selling (10.9%) and boat ownership (6.2%). Income diversification is extremely limited: most households combine only two sources, while three are monodependent on fishing alone. Median annual incomes cluster at modest levels (₹75,000 for Pagadiya fishers), with fish sellers at the lower tier and boat owners somewhat higher but more volatile.

Expenditure is dominated by food (₹9,678/month), with little left for health, education, or investment. No household reported formal borrowing; instead, families rely on small, trust-based loans from relatives or neighbours. Paradoxically, financial inclusion is high: 89.1% of households hold Jan Dhan accounts and all respondents have personal bank accounts, though these remain underutilised for credit.

Housing ownership is nearly universal (96.9%) but legally insecure, as no household holds pattas. Most houses have strong walls, yet 67.2% still depend on thatched roofing, leaving them exposed to climatic risks. Agricultural land and livestock ownership are negligible, and insurance coverage is entirely absent across all categories.

Overall, Bandar's economy is marked by heavy reliance on fishing, minimal diversification, insecure tenure, and absence of risk protection, underscoring high vulnerability to ecological decline and climate shocks.

3.4 Social Capital

Social capital underpins the collective strength and resilience of fishing communities, shaping how households interact, engage in local organizations, and access state entitlements. In small-scale, resource-dependent economies like Bandar—where financial and physical assets are scarce—social networks and institutional linkages serve as critical safety nets.

For women, federations and collective platforms provide vital spaces for representation, voice, and negotiation with governance systems. At the same time, the presence of identity documents, enrolment in social protection schemes, and awareness of fisheries-related institutions signal the degree to which fisherfolk are integrated into state structures of welfare and regulation.

This section assesses the social capital of Bandar households across multiple dimensions:

- Membership in women's federations and community-based organizations,
- Participation in public employment (MNREGA),
- Possession of identity and entitlement documents,
- Access to welfare schemes and infrastructure,
- Uptake of fisherfolk-specific programmes, and
- Awareness and engagement with fisheries institutions.

Together, these indicators reveal both strengths and gaps in Bandar's social capital base, showing how gendered participation, limited programme outreach, and uneven institutional engagement shape the community's capacity to mobilize resources and assert rights.

3.4.1 Membership in Women's Federations

In Bandar, federation membership among women is near universal. 96.2% (n = 25) of women reported being members of *Shakti Mahila Sangathan*, with only one woman (3.8%) outside the federation. By design, men are not part of the federation, and all 38 surveyed men (100%) reported no affiliation. Federation membership in Bandar demonstrates the strong reach of *Shakti Mahila Sangathan* as a women-focused platform.

3.4.2 Absence of a Fisherfolk Munch

While women's federations in Bandar achieve near-universal membership, the village has no fisherfolk munch, cooperative, or collective body to represent the occupational interests of fishers. The absence of such an institution constrains the community's ability to organise around shared challenges, negotiate market access, demand infrastructure, or secure entitlements under state and central schemes.

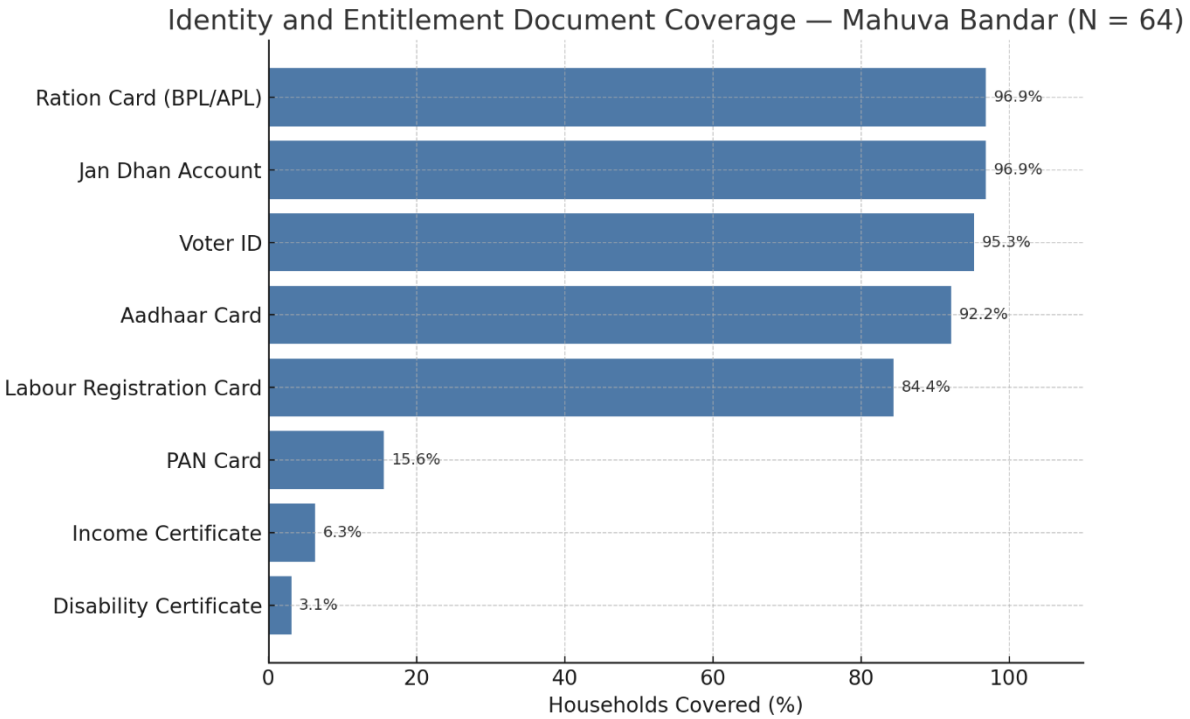
3.4.3 Access to MNREGA

In Bandar, **none of the surveyed respondents**—neither women (n = 26) nor men (n = 38)—reported receiving employment under MNREGA. The absence of MNREGA engagement suggests that households are not currently accessing this statutory entitlement. Strengthening linkages with MNREGA could provide an important source of supplementary income during lean fishing periods, especially for women.

3.4.4 Possession of Identity and Entitlement Documents

In Mahuva Bandar, all respondents (100%; n = 64) reported possession of at least one government-issued identity or entitlement document. The most common were Ration Cards (96.9%; n = 62), Jan Dhan Yojana Bank Accounts (96.9%; n = 62), Voter Identity Cards (95.3%; n = 61), Aadhaar Cards (92.2%; n = 59), and Labour Registration Cards for Construction Workers (84.4%; n = 54). Secondary documents were less prevalent, including Permanent Account Number (PAN) Cards (15.6%; n = 10), Income Certificates (6.3%; n = 4), and Disability Certificates (3.1%; n = 2). No respondents reported possession of MNREGA Job Cards, Caste Certificates and Kisan Credit Cards.

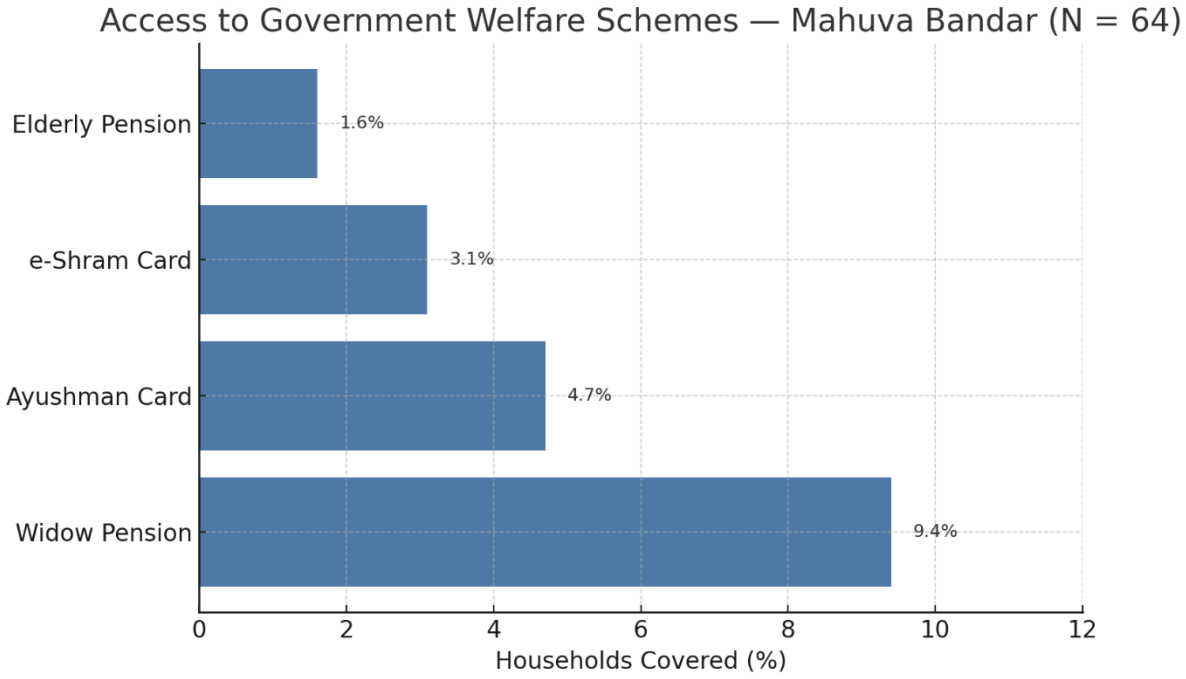
Figure 26 Possession of Identity and Entitlement Documents



3.4.5 Access to Social Welfare Schemes

In Mahuva Bandar (N = 64 households), access to government welfare schemes was limited. The most frequently reported scheme was the Widow Pension, accessed by 9.4% of households (n = 6). Smaller proportions reported coverage under the Ayushman Card (4.7%; n = 3), e-Shram Card (3.1%; n = 2), and Elderly Pension (1.6%; n = 1). No households reported access to other programmes such as *Palak Mata Pita Yojana, Vahali Dikri Yojana, Kuvarbainu Mameru, Sukanya Samruddhi Yojna, Ghar Divada Yojna, Sankat Mochan Yojna, Manav Garima Yojana, Saat Pagla Yojna,* or the *PM Vishwakarma Scheme.*The absence of uptake across schemes indicates barriers in translation of entitlements into practice. Expanding facilitation and outreach could improve household-level access and enhance livelihood security.

Figure 27 Access to Social Welfare Schemes



3.4.6 Access to Fisherfolk-Specific Government Schemes

In Mahuva Bandar (N = 64 households), only two households (3.1%) reported accessing the Gujarat Fishermen Welfare Fund Scheme. No households reported access to other fisherfolk-specific programmes, including the Pradhan Mantri Matsya Sampada Yojana (PMMSY), Diesel VAT Relief Scheme, Matsya Udhyog Awas Yojana (Housing), Khedut Akasmat Vima Yojana (Accident Insurance), or the Kisan Credit Card (KCC) for fisherfolk. Access to fisherfolk-specific schemes in Mahuva Bandar is extremely limited, with uptake restricted to a single programme and only a small fraction of households benefitting. This suggests possible barriers related to awareness, eligibility, or facilitation, leaving most households outside the reach of targeted fisheries support.

3.4.7 Infrastructure Support through Government Schemes

In Mahuva Bandar (N = 64 households), access to fishing-related infrastructure through government schemes was very limited. Only four households (6.3%) reported receiving fishing nets, while two households (3.1%) reported access to boats with diesel/petrol engines and one household (1.6%) reported an insulated icebox. No household reported receiving support for cold storage facilities, fish holding tanks, GPS equipment, quality testing laboratories, or non-motorised boats. The data suggest that infrastructure provisioning in Mahuva Bandar has been confined to a handful of households and basic inputs, leaving significant gaps in the availability of post-harvest facilities, safety equipment, and value chain infrastructure.

3.4.8 Awareness of Fisheries Institutions and Engagement with the Department

In Mahuva Bandar (N = 64), awareness of fisheries-related institutions was extremely limited. Only 12.5% of households (n = 8) reported knowledge of any institute, and this was exclusively the Fisheries Research and Training Centre, Mahuva. No respondents reported awareness of national or international institutions such as the Central Marine Fisheries Research Institute, the Department of Fisheries, or the Food and Agriculture Organization.

These findings indicate that fisher households in Mahuva Bandar remain largely disconnected from broader institutional networks, with their exposure confined to the training centre located nearby.

Summary of Section 3.4: Social Capital

Social capital in Mahuva Bandar is shaped by strong women's federation membership but remains weak in occupational collectives, programme participation, and institutional linkages. Women's membership in *Shakti Mahila Sangathan* is near universal (96.2%), providing an important platform for voice and support, yet the absence of a fisherfolk-specific collective limits occupational representation.

Access to public employment is absent, with no household reporting MNREGA engagement. Identity coverage is strong—nearly all households possess Ration Cards, Jan Dhan accounts, Voter IDs, Aadhaar, and Labour Registration Cards—but secondary documents such as PAN, income, or disability certificates are less common.

Engagement with social welfare schemes is selective and low: only 9.4% of households access Widow Pension, while Ayushman, e-Shram, and Elderly Pensions reach small fractions. Access to fisherfolk-specific schemes is even narrower, limited to 3.1% of households under the Gujarat Fishermen Welfare Fund Scheme. Infrastructure support is restricted to a handful of items (nets, engines, and one icebox), with no provision of post-harvest or safety facilities. Awareness of fisheries institutions is also minimal, confined to the local training centre in Mahuva.

Overall, Mahuva Bandar shows strong women's federated social capital but very limited programme outreach, welfare access, and institutional engagement, leaving the community with partial support structures and significant gaps in occupational and state linkages.

3.5 Physical Capital / Household Infrastructure

Physical capital refers to the material resources and infrastructural services that shape household living conditions and livelihood sustainability. In coastal villages such as Bandar, small-scale fisherfolk depend heavily on reliable access to water, sanitation, energy, and housing infrastructure—not only for daily well-being but also for effective participation in social and economic life. Adequate infrastructure reduces health risks, supports productivity, and enhances overall quality of life, while deficits perpetuate exclusion and vulnerability.

This section reviews access to essential household services in Bandar, with a focus on sanitation, water supply, electricity, and cooking fuel. These indicators highlight the infrastructural foundations that underpin well-being and resilience in the community.

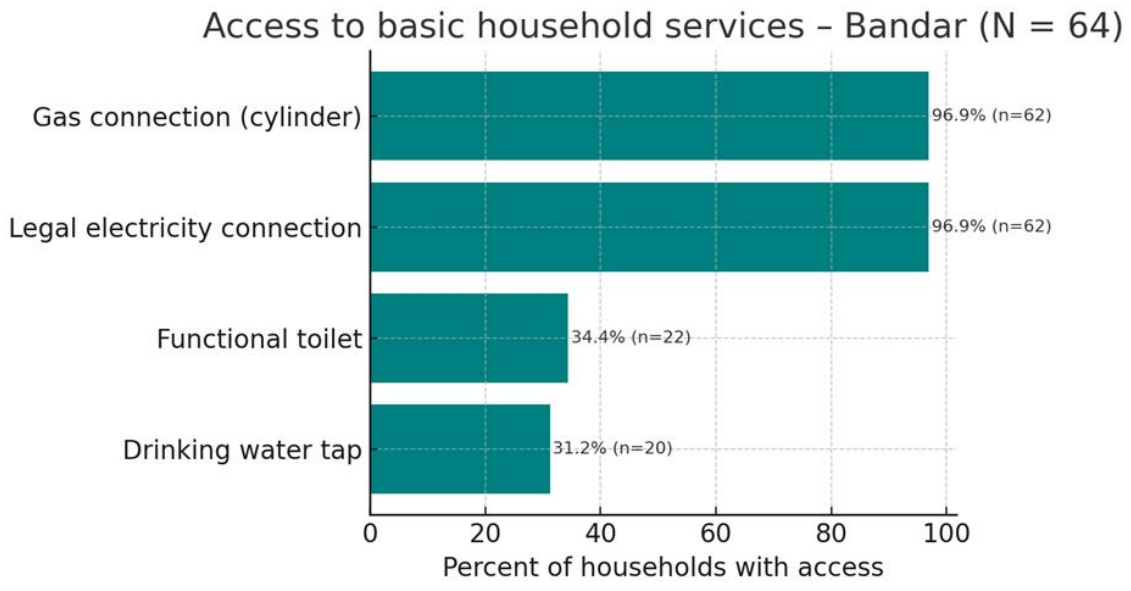
3.5.1 Access to Basic Household Services

In Mahuva Bandar (N = 64 households), access to basic services shows a sharp contrast between energy and sanitation. Nearly all households reported access to legal electricity connections (96.9%; n = 62) and gas connections (96.9%; n = 62), indicating near-universal coverage of household energy needs.

In contrast, only 34.4% of households (n = 22) reported having a functional toilet, and 31.2% (n = 20) had access to a drinking water tap. These results highlight persistent gaps in sanitation and water infrastructure, which stand in stark contrast to the strong energy access recorded in the village.

While Mahuva Bandar demonstrates significant progress in energy access, the limited coverage of sanitation and drinking water facilities points to critical deficits in basic infrastructure. Addressing these gaps will be central to improving health, dignity, and resilience in the community.

Figure 28 Access to Basic Services



Summary of Section 3.5: Physical Capital / Infrastructure

Physical infrastructure in Mahuva Bandar is marked by strong energy access but persistent deficits in sanitation and drinking water. While households benefit from near-universal electricity and gas connections, the limited reach of toilets and drinking water taps highlights critical gaps in basic services that directly affect health, dignity, and resilience.

3.6 Natural Capital / Environment & Climate

Natural capital refers to the ecological resources and environmental conditions that sustain the livelihoods of fishing communities. In Bandar, small-scale fisherfolk depend on marine ecosystems as the basis of subsistence, yet these same systems are also a source of vulnerability. Shifts in fish populations, climate variability, and exposure to natural hazards directly shape household security and community well-being. At the same time, local ecological knowledge remains central, enabling fishers to anticipate weather patterns and adjust to environmental stress. This section examines household perceptions of ecological change, climate risks, and adaptive practices in Bandar, highlighting both the pressures exerted by the environment and the strategies through which the community seeks to maintain resilience.

3.6.1 Observed Decline in Fish Diversity and Population

In Mahuva Bandar (N = 64), the majority of households (78.1%) reported a decline in fish diversity and population along the Gujarat coast, while 21.9% did not share this perception. Gender-wise, men (84.2%) expressed stronger awareness of the decline than women (69.2%), reflecting their more direct engagement in fishing. These findings highlight a widely recognised concern about diminishing marine resources and its implications for livelihood security.

3.6.2 Perceptions on Juvenile Fish Capture and Species Scarcity

A large majority of respondents (71.9%; n = 46) recognised the adverse impact of juvenile fish capture on overall catches, while 28.1% (n = 18) did not share this view. Gender differences were modest: 76.3% of men (n = 29 of 38) endorsed the perception compared to 65.4% of women (n = 17 of 26). When asked to identify species that had become scarce over the past decade, respondents most frequently mentioned Pomfret (Paplet), Bombay Duck (Bombil), Hilsa (Modar/Palva), and smaller varieties of Prawns (Jhinga).

These perceptions highlight widespread concern about unsustainable practices, particularly the capture of juvenile fish, and underline the ecological and economic risks posed by the decline of commercially important species.

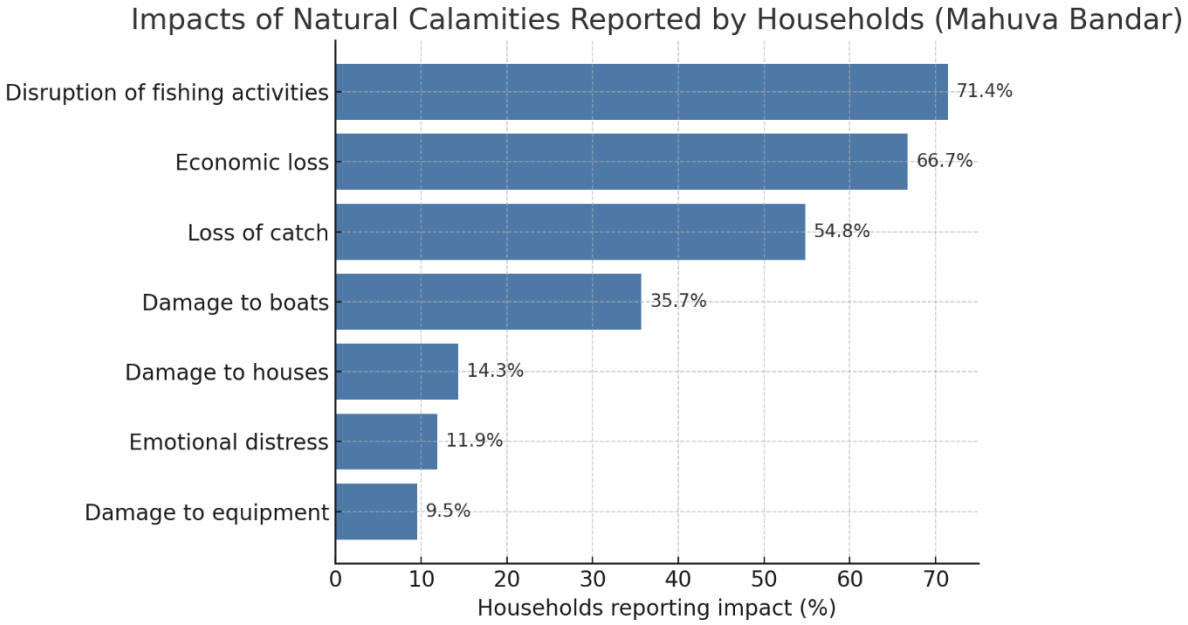
Figure 29 Discarded juvenile fish on the shore after Pagadiya fishing (Photo: Authors)

3.6.3 Household Experiences of Natural Calamities

A majority of households (65.6%; n = 42) reported being affected by natural calamities in the past five years, while 34.4% (n = 22) indicated no direct impact. Gender-disaggregated data show that 71.1% of men (n = 27 of 38) reported exposure compared to 57.7% of women (n = 15 of 26), reflecting men's higher direct engagement in fishing activities.

Among the affected households, the most common impacts were disruption of fishing activities (71.4%; n = 30) and economic loss (66.7%; n = 28). More than half reported loss of catch (54.8%; n = 23), while 35.7% (n = 15) experienced damage to boats. A smaller proportion reported damage to houses (14.3%; n = 6), emotional distress (11.9%; n = 5), or damage to equipment (9.5%; n = 4).

Figure 30 Impacts of natural calamities



No households reported crop loss, cattle death, displacement, or physical injury. These findings highlight that the primary vulnerabilities lie in livelihood disruptions and financial instability, with comparatively limited household or agricultural impacts.

3.6.4 Traditional Weather Prediction

A significant proportion of households reported relying on traditional methods for anticipating weather changes. Out of 64 surveyed households, 71.9% (n = 46) stated that they could predict weather patterns through observation of the sea and surrounding environment, while 28.1% (n = 18) indicated they could not. Gender-disaggregated data show that 78.9% of men (n = 30 of 38) reported such knowledge compared to 61.5% of women (n = 16 of 26). This suggests that men, who spend more time at sea, are more likely to cultivate and retain predictive skills.

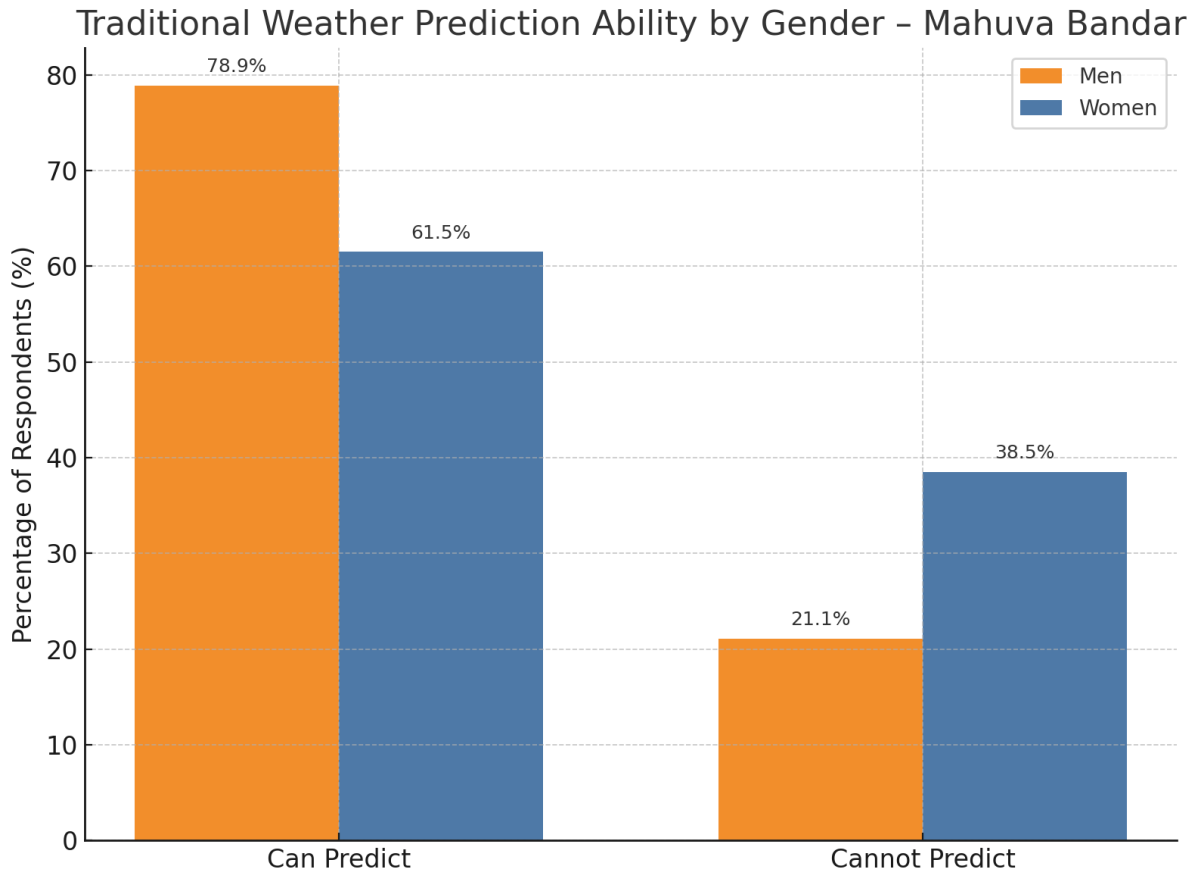
Indicators Used for Prediction

Among those with predictive ability (n = 46), the most commonly cited indicators were:

- Wind direction and speed – 71.7% (n = 33)
- Wave patterns and sea turbulence – 58.7% (n = 27)
- Cloud formations and sky colour – 47.8% (n = 22)
- Behaviour of fish and birds – 28.3% (n = 13)
- Colour or temperature of seawater – 21.7% (n = 10)

These findings demonstrate that households primarily depend on atmospheric cues, particularly changes in wind and wave conditions, to guide fishing decisions. Biological indicators, such as the behaviour of fish and birds, are used to a lesser extent.

Figure 31 Traditional Weather prediction ability



The prominence of wind, cloud, and wave cues reflects a reliance on atmospheric and marine observations as the most trusted sources of information. These findings underscore the embeddedness of local ecological knowledge in the day-to-day decision-making of Bandar fisherfolk and its importance as a cultural and practical resource for navigating climatic variability.

3.6.5 Belief in Climate Change

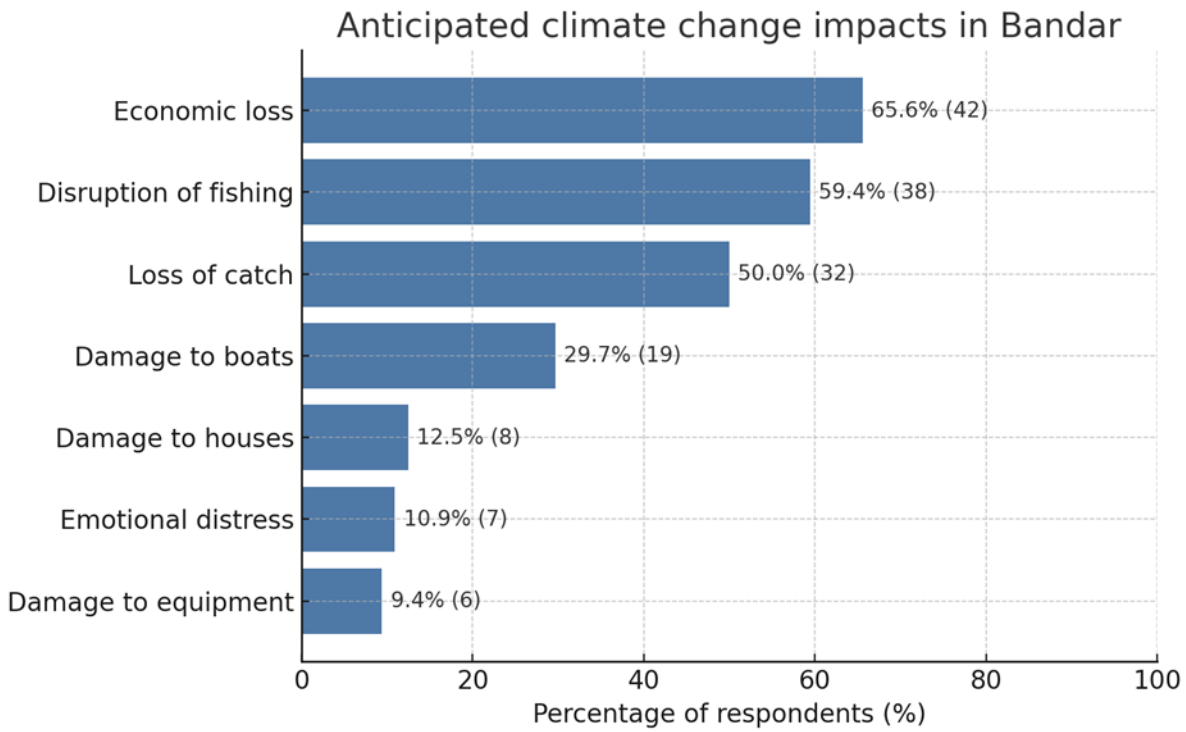
Nearly all respondents (98.4%; n = 63) reported perceiving changes in the climate, with only one respondent (1.6%) indicating no such awareness. Perceptions were universal among men (100%; n = 38) and slightly lower among women (96.2%; n = 25 of 26). These findings suggest that recognition of climatic shifts is widespread across the community, with both genders demonstrating strong awareness of changing environmental conditions.

3.6.6 Anticipated Impacts of Climate Change

In Mahuva Bandar (N = 64), households identified a range of anticipated impacts from climate change over the next decade. The most frequently cited concerns were economic loss (65.6%; n = 42) and disruption of fishing activities (59.4%; n = 38), both reflecting the community's dependence on marine-based livelihoods. Half of the respondents (50.0%; n = 32) also expected a decline in catch, while 29.7% (n = 19) foresaw damage to boats.

Less commonly mentioned were damage to houses (12.5%; n = 8), emotional distress (10.9%; n = 7), and damage to equipment (9.4%; n = 6). No respondents anticipated displacement, injury, crop loss, or cattle death. These findings suggest that community perceptions of future climate risks are concentrated in the economic and occupational sphere, consistent with households' past experiences of climate shocks.

Figure 32 Anticipated Impacts of Climate change



3.6.7 Perceived Vulnerability Within the Fishing Community

vulnerability to climate-related events such as storms, high tides, and cyclones was seen as both gendered and occupational. Respondents most frequently identified women (43.8%; n = 28) and widows (25.0%; n = 16) as particularly exposed, with smaller shares mentioning the elderly (15.6%; n = 10), children (9.4%; n = 6), and youth (6.3%; n = 4). No respondents cited persons with disabilities as a distinct group.

When disaggregated by fishing type, the majority emphasized Pagadiya fishers (68.8%; n = 44) as the most vulnerable, followed by small-scale non-mechanized boat users (18.8%; n = 12). Only a minority (12.5%; n = 8) considered mechanized boat fishers to be more exposed. These findings highlight how vulnerability in Mahuva Bandar is understood through intersecting gender and occupational identities, with women and Pagadiya fishers perceived as carrying the greatest risks.

3.6.8 Sources of Support During Fishing Losses

When households reported relying most heavily on informal networks when coping with climate-related fishing losses. Family and relatives were cited as the main source of assistance by 40.6% (n = 26) of respondents, while 14.1% (n = 9) mentioned support from the local community or fellow fishers. Only a small proportion (7.8%; n = 5) reported receiving government assistance.

At the same time, 21.9% (n = 14) indicated they received no help, and 15.6% (n = 10) stated that they had not been affected by such events. No respondents reported accessing support from cooperatives, NGOs, financial institutions, religious groups, or private companies. These findings

underline the absence of formal safety nets, leaving households dependent on kinship ties and exposing a substantial share of the community to climate-related risks without adequate institutional support.

Summary of Section 3.6: Natural Capital / Environment & Climate

Mahuva Bandar households demonstrate a deep dependence on marine ecosystems while simultaneously experiencing growing ecological stress and climate risks. A large majority (78.1%) perceived a decline in fish diversity and population, and 71.9% recognised the negative effects of juvenile fish capture, with Pomfret, Bombay duck, Hilsa, and small prawns identified as increasingly scarce.

Climate shocks have been a defining feature of recent years. Two-thirds of households (65.6%) reported being affected by natural calamities within the past five years, primarily through disruption of fishing (71.4%), economic losses (66.7%), and loss of catch (54.8%). Damage to boats (29.7%) and houses (12.5%) was less common, while no households reported crop or livestock losses.

Local ecological knowledge continues to underpin adaptive practices. Most households (71.9%) reported the ability to predict weather changes, relying on wind, wave, and cloud cues, with men more likely than women to retain such skills. Awareness of climate change was nearly universal (98.4%), and anticipated future impacts were concentrated in livelihood disruptions and financial insecurity.

Perceptions of vulnerability were both gendered and occupational. Women (43.8%) and widows (25.0%) were considered the most at-risk social groups, while Pagadiya fishers (68.8%) were identified as the most exposed occupational group.

Coping mechanisms, however, reveal significant gaps. While many households turned to family (40.6%) or fellow fishers (14.1%) for support, only a small share (7.8%) accessed government assistance. Critically, more than one in five households (21.9%) reported receiving no help at all during climate-related fishing losses. This absence of institutional safety nets underscores the reliance on informal networks and highlights the precarious position of a substantial segment of the community.

Overall, Mahuva Bandar's natural capital profile is defined by ecological decline, widespread recognition of climate change, and resilience strategies grounded in traditional knowledge and kinship ties—but constrained by limited institutional support and a significant minority left entirely unsupported.

3.7 Institutional & Governance

Institutional and governance arrangements critically influence how fishing communities access rights, comply with regulations, and seek support during periods of vulnerability. For fisherfolk in Bandar, these arrangements span formal systems—government departments, regulatory frameworks, and legal provisions—as well as informal mechanisms of community negotiation and mutual support. The effectiveness of governance determines whether households experience recognition, protection, and inclusion in welfare measures, or remain excluded and exposed to conflict and insecurity.

This section explores household awareness of fishing regulations, perceptions of destructive practices, access to legal aid, and experiences with conflict and extension services. Taken together, these findings illustrate the interface between community livelihoods and the institutional environment that frames their rights, resource use, and resilience.

3.7.1 Fishing Practices and Awareness of Regulations

Fishing practices are dominated by the use of medium-mesh nets (20–30 mm), reported by 84.4% of respondents (n = 54). A smaller share (9.4%; n = 6) reported using small-mesh nets (10–20 mm), typically targeting prawns and other small fish, while only one respondent (1.6%) mentioned the use of large-mesh nets (above 40 mm). Despite the prevalence of small- and medium-mesh gear, awareness of catch composition remains limited. Only 9.4% (n = 6) of respondents explicitly identified catching mixed species when asked about the use of small-mesh nets. This suggests that while gear practices are well-established, knowledge of the ecological implications of mesh size and species selectivity may be incomplete, pointing to potential gaps in regulatory awareness and sustainable fishing practices.

3.7.2 Legal Aid and Conflict with Industrial Fishing

Access to legal support was reported as extremely limited. The vast majority of respondents (95.3%; n = 61) stated they had no regular access to legal aid, while only 3.1% (n = 2) confirmed such access and 1.6% (n = 1) reported not being aware. This indicates that fisherfolk remain particularly vulnerable to rights violations and livelihood disputes without adequate legal recourse.

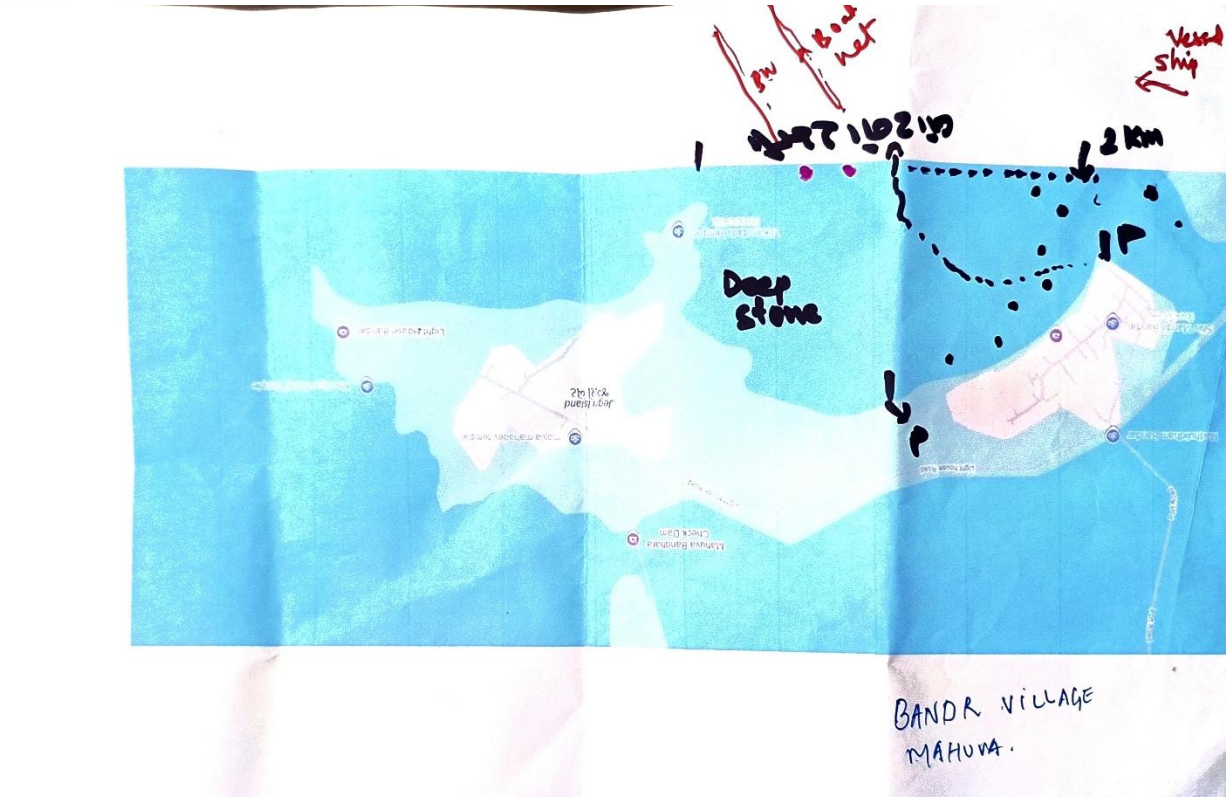
Figure 33 Participatory mapping exercise

Conflicts with larger fishing operations were widely acknowledged. Over half of the households (57.8%; n = 37) reported incidents of net damage caused by trawlers or large ships, while 42.2% (n = 27) stated they had not faced such issues.

These findings underscore the ongoing tensions between small-scale and industrial fishing practices, with tangible impacts on artisanal households. Despite these vulnerabilities, awareness of key regulatory provisions was relatively strong. A large majority (90.6%; n = 58) knew that traditional fishing is permitted up to 9 nautical miles from the shore, while only 7.8% (n = 5) lacked such knowledge. Similarly, 89.1% (n = 57) were aware that gill nets with a mesh size below 150 mm are prohibited, with a small minority either unaware (6.2%; n = 4) or denying knowledge (3.1%; n = 2).

Taken together, these findings suggest a paradox: fisherfolk in Mahuva Bandar demonstrate reasonably high levels of legal awareness but remain unable to access formal legal support or prevent conflicts with industrial operators. This gap between regulatory knowledge and institutional protection reflects a critical governance challenge for ensuring the rights and security of small-scale fishing communities.

Figure 34 Participatory Map of Fishing Grounds and Net Damage Areas



This participatory map, prepared during discussions with fisherfolk in Bandar, illustrates critical fishing areas and the zones where nets are most frequently damaged by trawlers and large mechanized vessels. The mapping exercise confirms household survey findings on gear destruction and highlights the direct spatial overlap between artisanal fishing zones and industrial intrusion. Such overlaps not only reduce catch availability for Pagadiya fishers but also impose recurrent economic losses through gear replacement costs.

Source: *Participatory mapping exercise, Village Assembly discussion, Bandar (2025).*

The Battle of the Elephant and the Ant – Conflict on the Coastline

For the small boat owners and Pagadiya fisherfolk of Bandar, the sea has become a contested and hostile space. Their struggle is against large industrial fishing boats and marine traffic that dwarf their operations, threatening not just livelihoods but survival itself. This unequal relationship was captured in the words of the S.P. of Bhavnagar, who told them:

"He compared them with an elephant and us with an ant. He told them that if they (elephant) won't get anything for 3 to 5 days then also they will survive but these ants won't survive if they won't get anything for a single day."

The primary damages come from two sources:

1. **Big Ships:** Large vessels moving without designated routes frequently tear through fixed nets. Fisherfolk explained:

"Suppose when one ship crosses over the net and damages it then it costs us around 3,000/- Rs."
When nets are aligned across 25 boats, a single passing ship "can damage all those 25 boats' net." Worse still, ships sometimes carry away the nets instead of leaving them behind for repair, compounding the loss.

2. **Trolling Boats:** Large, mechanized boats from neighbouring areas such as Jafrabad and Mangrol deploy banned micro-nets that "catch all the fish," including the smallest. In contrast, local fishers use 3–3.5 mm nets, catching only fish weighing above 200–250 grams. "We don't catch small fish because we are not getting any money for that," one fisherfolk explained. Yet the industrial trollers deplete coastal stocks, leaving little for small boats:

"I think within 1 or 2 years we have to stop this business, because we are only able to fish within 1 or 2 km of area, but bigger boats already catch them beyond that so we will not get any fish at the coastline."

Despite repeated appeals—to society presidents, the SP, MLAs, and even ministers—little has changed. As one fisherfolk concluded in frustration:

"I should say that all of them have disappeared and mark my words that in near future we have to tie our boats at the coastline because of no fish."

This story illustrates the deep inequity of the coastal fishing economy, where small-scale fisherfolk bear the brunt of unchecked industrial activity, escalating costs, and vanishing returns.

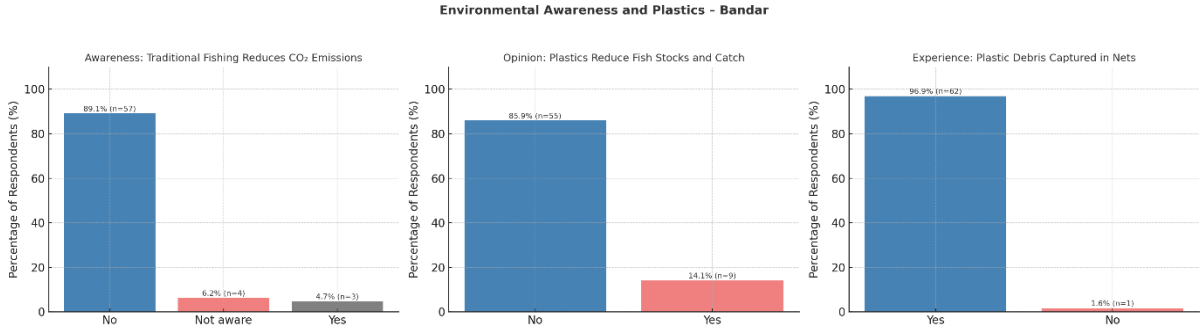
3.7.3 Environmental Awareness and Plastic Issues

Awareness of the environmental dimensions of fishing was found to be very limited. Only 4.7% of respondents (n = 3) recognised that traditional fishing contributes to reducing CO_2 emissions, while 89.1% (n = 57) disagreed and 6.2% (n = 4) reported not being aware. This highlights a substantial gap in understanding the climate benefits of low-carbon, artisanal practices.

Perceptions of plastics as an ecological threat were similarly weak. Just 14.1% of respondents (n = 9) believed that plastics contribute to declining fish stocks, while the majority (85.9%; n = 55) did not perceive such a link. Yet almost all respondents (96.9%; n = 62) reported direct encounters with plastic debris in their nets. This disconnects between daily experiences and broader ecological awareness points to a critical knowledge gap regarding the role of marine pollution in undermining fish stocks and livelihoods.

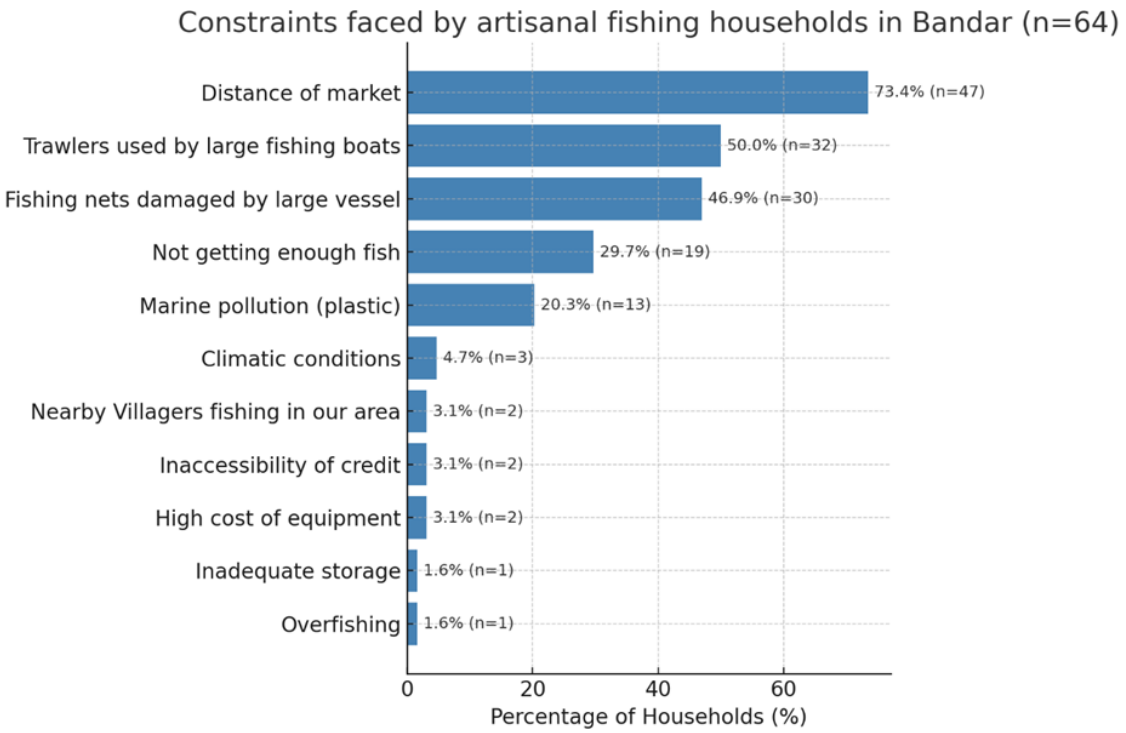
Overall, while fisherfolk in Mahuva Bandar routinely face the material consequences of plastic waste, their limited recognition of its long-term ecological impacts constrains opportunities for collective action and engagement with environmental governance.

Figure 35 Environmental awareness and plastics



3.7.4 Conflicts and Governance Challenges

Figure 36 Constraints faced by fisherfolk



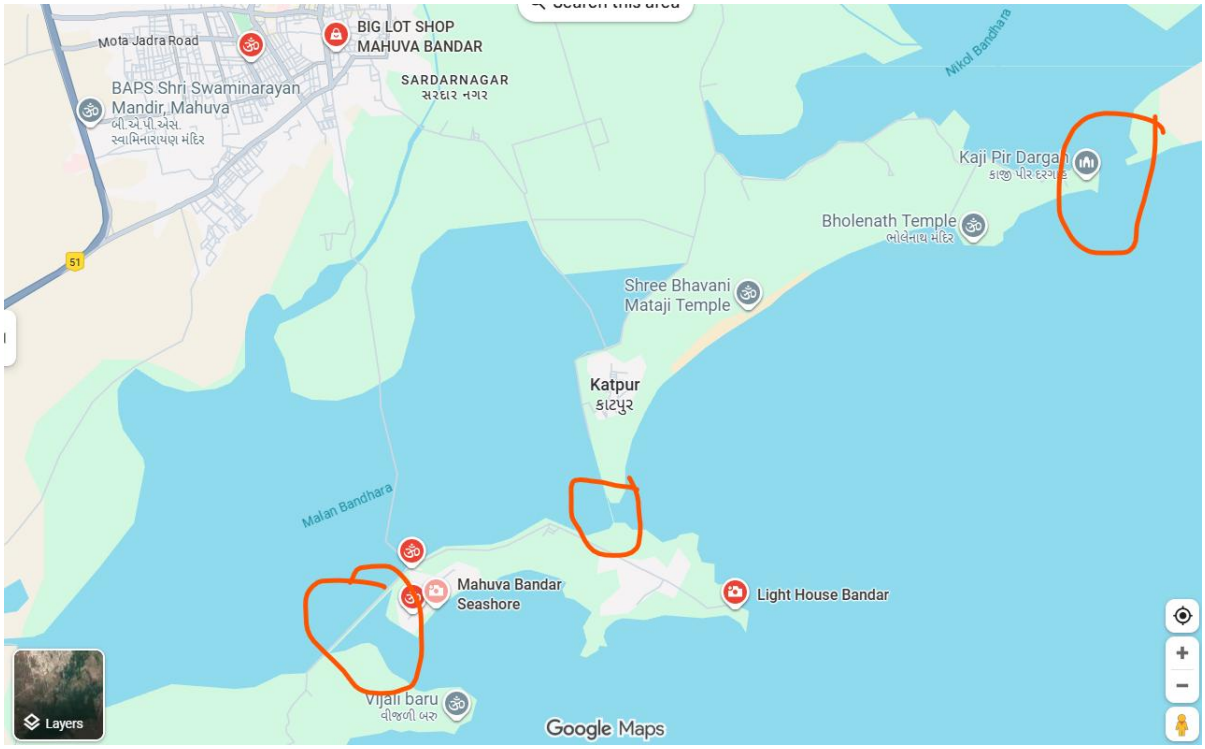
Fisherfolk identified a range of constraints shaped by structural barriers, industrial pressures, and environmental change. The most widely reported challenge was the distance of markets (73.4%; n = 47), which increases transaction costs and limits bargaining power. Conflicts with

mechanised operators followed closely: half of the households (50.0%; n = 32) cited the disruptive presence of trawlers, while 46.9% (n = 30) reported direct net damage caused by large vessels. These findings highlight the asymmetrical competition between small-scale and industrial fishing.

Other constraints included declining fish availability (29.7%; n = 19) and marine plastic pollution (20.3%; n = 13), both of which compound ecological stress. Smaller proportions pointed to the high cost of equipment (12.5%; n = 8), climatic variability (6.3%; n = 4), and lack of credit access (4.7%; n = 3). Taken together, the results indicate that Mahuva Bandar's fishing households operate within a layered vulnerability context, where market inaccessibility, industrial encroachment, and ecological degradation intersect to weaken livelihood security.

The Drying Creek – Collapse of Traditional Livelihoods

The traditional livelihood of Pagadiya fishermen in Bandar has been fundamentally disrupted by infrastructural and environmental changes. Fishing was once described as the "main and major business or profession here," sustained by a tidal creek—locally referred to as the *Baandhan* or *Bandharan*—where seawater flowed in, creating a rich fishing ground.



With the construction of a permanent structure, the *Bandhara*, this natural system was cut off. As fisherfolk explained, *"sea water won't be able to enter here and Pagadiya fishermen can't do fishing." What was once a creek with 15–20 feet of water depth has "become dry day by day,"* erasing the ecological base of shore-based fishing.

The impact has been devastating. One fisherfolk reflected:

"Earlier fishing was the main profession but nowadays they won't get more fishes from the sea so they moved to other work like cotton seed picking in the farm."

Pagadiya fisherfolk who lost their work either shifted to boats as *Khalasi* (labourers) or abandoned fishing entirely. As one fisherfolk said:

"I am the one who was a fisherman but now I am going for daily wages." When asked why, the reply was direct: "Because we are not getting enough money so what should I do?"

Women also expressed the scale of loss:

"Earlier we were getting fish worth 3 to 5,000/- Rs. and that too at cheap rates. Now we are getting high prices, but we are not getting fish."

The drying of the creek has impact families in involving in their hereditary occupation. What was once a sustainable fishery has now fragmented, pushing many into precarious wage work and low-return alternatives, marking the collapse of a traditional coastal livelihood.

Summary of Section 3.7: Institutional & Governance

Institutional and governance arrangements in Bandar reveal a striking imbalance: while fisherfolk demonstrate strong awareness of regulatory provisions, their ability to claim rights or access institutional support remains weak.

Fishing practices are dominated by medium-mesh nets (84.4%), but only a small proportion of respondents explicitly identified their catch composition, suggesting partial gaps in ecological and regulatory awareness. Knowledge of legal norms is relatively widespread, with 90.6% aware of the nine nautical mile limit and 89.1% aware of restrictions on gill nets below 150 mm mesh size. However, this contrasts sharply with the near absence of legal aid—95.3% of households reported no access—and frequent conflicts with industrial operators, with more than half reporting damage to nets by trawlers and large vessels.

Environmental awareness reflects a similar disconnect. Almost all households encounter plastic waste in their nets, yet only 14.1% recognised its role in declining fish stocks, and just 4.7% were aware of the low-carbon benefits of traditional fishing. This points to a narrow framing of environmental risks that does not extend beyond immediate lived experiences.

Broader governance challenges were highlighted in reported constraints. Distance to markets (73.4%) was the most pressing concern, followed by mechanised intrusion (50.0%) and net damage (46.9%). Ecological decline (29.7%) and plastic pollution (20.3%) were also noted, alongside smaller mentions of equipment costs, climatic variability, and credit inaccessibility. These findings situate fisherfolk in a layered context of structural barriers, industrial competition, and ecological stress.

Village assemblies held in 2025 underscored the collapse of traditional Pagadiya livelihoods following the drying of a tidal creek due to Bandhara construction, forcing many into wage labour or khalasi work. As community members reflected, "Earlier fishing was our main profession but now we don't get enough, so I am working as an agricultural labourer." Such testimonies illustrate how governance decisions and environmental change have fundamentally disrupted hereditary livelihoods.

Overall, Mahuva Bandar's institutional landscape is characterised by regulatory awareness but weak enforcement, limited legal and environmental support, persistent conflicts with industrial fishing, and underdeveloped extension mechanisms. This combination leaves households highly exposed to ecological and economic pressures, with little institutional mediation to strengthen resilience.

3.8 Gendered Dimensions of Livelihoods and Governance

3.8.1 Challenges Faced by Women Fisherfolk

Women fisherfolk overwhelmingly identified low or unstable income as their primary challenge. Nearly all respondents (96.2%; n = 25) cited livelihood insecurity, while only one woman (3.8%) reported facing no challenges. These findings highlight how women's concerns are framed almost exclusively in economic terms, with livelihood precarity emerging as the defining feature of their participation in fishing and fish selling.

Fishing Under the Shadow of Lions – Women at Risk in Coastal Livelihoods

Women in Mahuva-Bandar contribute to the fishing economy in diverse ways. They sort and dry fish at home, sell in local and city markets (including Mahuva), and also engage directly in fishing for species such as Bumla, Kharva, and Dosi. Their responsibilities extend well beyond daylight hours. As one group explained:

"We go at night too, we go there to collect the fishes."

This work is exhausting and uncertain. A fisherwoman recalled, **"I stayed there for an entire night, near the sea shore, but still we got only 1 kg of fish."** Despite such low returns, women continue to go, as the household depends on their income.

Yet, their livelihoods now carry an added and frightening risk. Mahuva-Bandar has increasingly become known as a lion's territory. When asked about difficulties working at night, one woman responded:

"Not much but at present we have an issue of Wild Animals."

Her words were echoed by others:

- **"Yes, Lion."**
- **"Lion killed people. 2 months back we had one such incident."** (later clarified as 1–2 years ago)
- **"Every 5 to 6 days you can see Lion here."**
- Villagers added: **"You can see lions moving around every day."**

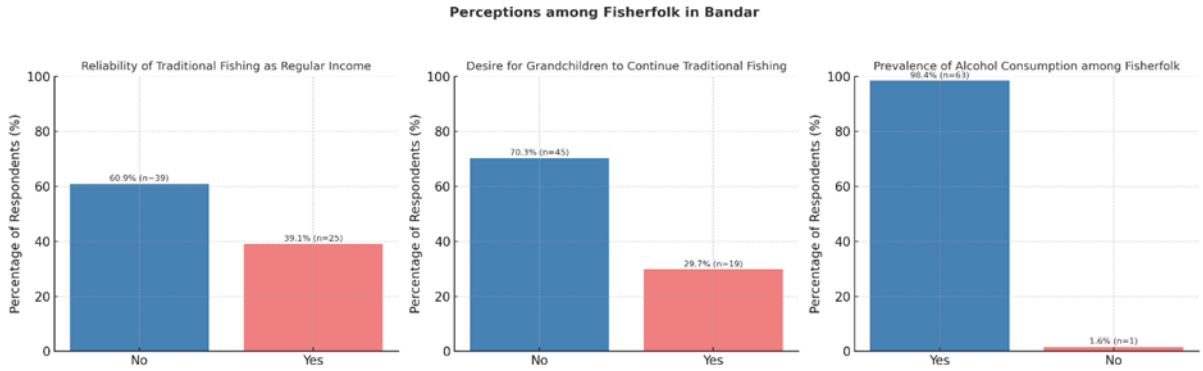
This environmental shift has created a dangerous paradox. Women must work longer and harder hours to sustain household incomes, while facing the constant threat of predators during night fishing. Their contribution to family survival and the coastal economy comes at a profound personal cost: *the courage to fish under the shadow of lions.*

3.8.2 Perceptions of Traditional Fishing and Social Issues

In Mahuva Bandar (N = 64), a majority of households expressed doubts about the sustainability of traditional fishing as a livelihood. Over half (60.9%; n = 39) viewed it as an unreliable source of regular income, while 39.1% (n = 25) affirmed its reliability. Intergenerational perspectives further underline this disillusionment: 70.3% (n = 45) reported that they would not want their grandchildren to continue in traditional fishing, compared to only 29.7% (n = 19) who supported its continuation.

Social concerns were also prominent. Nearly all respondents (98.4%; n = 63) identified alcohol consumption as widespread among fisherfolk, with only one dissenting response. These findings collectively point to a community marked by economic precarity, weakening intergenerational commitment to fishing, and recognition of persistent social challenges that shape daily life.

Figure 37 Perceptions among the fisherfolk on traditional fishing and social issues



3.8.3 Health Issues Reported in the Past Year

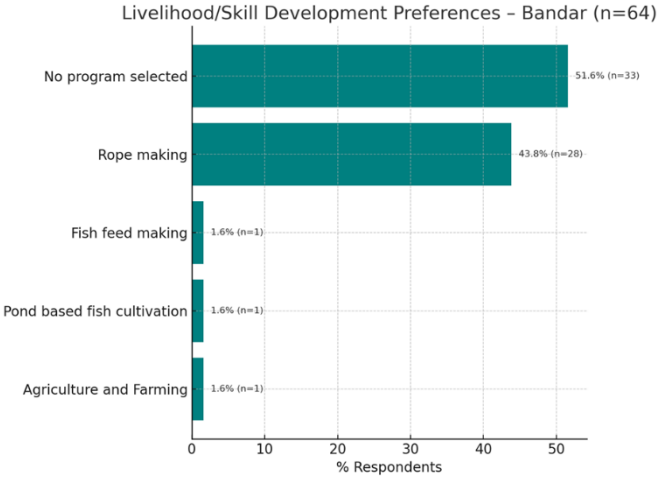
The health profile of fisherfolk is dominated by occupationally induced conditions. The most widespread issue was joint and muscle pain, reported by 62.5% (n = 40), reflecting the heavy physical strain of artisanal fishing. Tooth and gum problems were the second most common (48.4%; n = 31), highlighting gaps in oral health care and possible links to nutritional deficiencies.

Skin problems such as rashes, itching, and infections affected 29.7% (n = 19), largely attributable to prolonged exposure to saline water and unhygienic work environments. Chronic diseases were reported at lower levels: diabetes and high blood pressure/heart issues each affected 9.4% (n = 6). Other conditions—such as stress, anxiety, or gastrointestinal problems—were minimal.

Overall, the findings underscore how the health burden in Mahuva Bandar is shaped primarily by the physical demands of fishing and inadequate access to preventive health care, with chronic illnesses beginning to emerge as secondary concerns.

3.8.4 Livelihood and Skill Development Preferences

More than half of households (51.6%) did not express interest in any livelihood or skill development program. Among those who did, rope making dominated (43.8%), with only a handful choosing agriculture, fish feed making, or pond-based fish cultivation (1.6% each).



Community discussions attributed this hesitation to lack of travel and logistical support, absence of follow-up after training, limited exposure to alternatives, and reluctance to invest in uncertain options. The findings point to systemic gaps in extension services rather than a lack of willingness, underscoring the need for structured facilitation and sustained support.

Figure 38 Livelihood/Skill development preferences

Summary of Section 3.8: Gendered Dimensions of Livelihoods and Governance

Gendered vulnerabilities in Mahuva Bandar are shaped by economic precarity, social issues, health burdens, and constrained opportunities. Women fisherfolk overwhelmingly identified low and unstable incomes as their central challenge, with minimal recognition of other barriers, underscoring the acute centrality of livelihood insecurity. Skepticism about the future of traditional fishing was widespread, with most households unwilling to encourage their grandchildren to continue in the occupation, reflecting disillusionment with its reliability. Nearly all respondents also pointed to alcohol consumption as a persistent social issue affecting community life.

Health problems are dominated by occupationally induced conditions, particularly joint and muscle pain, oral health issues, and skin diseases, with chronic illnesses emerging as secondary but notable concerns. Skill development preferences further highlight systemic gaps: over half of households reported no interest in alternative training programmes, citing the absence of logistical support, post-training handholding, and exposure to viable alternatives. Rope making was the only significant skill option identified.

Importantly, women's contributions extend beyond income generation to working in highly precarious conditions. As highlighted in the case of *"Fishing Under the Shadow of Lions"*, women continue night fishing despite low returns and the increasing risk of predator encounters, reflecting the layered challenges of gender, environment, and livelihood.

Together, these findings portray a community where women's roles are critical but deeply constrained, with livelihood insecurity, social risks, and health strains reinforcing gendered inequalities in coastal fishing livelihoods.

Chapter 4: Conclusions and Recommendations

The need assessment of Bandar reveals a fishing community whose identity and livelihoods are deeply tied to artisanal Pagadiya fishing, but whose economic and social security remain fragile in the face of ecological change, industrial pressures, and institutional neglect.

Across the different dimensions studied—livelihood systems, economic security, social networks, physical infrastructure, environmental and climate conditions, governance structures, and gender dynamics—the findings underscore that while households demonstrate resilience through cultural continuity, informal networks, and modest diversification, systemic barriers prevent them from translating this resilience into sustainable and secure livelihoods.

4.1 Conclusions

1. **Livelihood Dependence and Limited Diversification**

   Fishing dominates the household economy in Mahuva Bandar, with 82.8% of households reporting Pagadiya fishing as their primary occupation. A small share engage in fish selling (10.9%) or small-boat ownership (6.2%). Only one household reported earning from three or more sources, while three households were mono-dependent on fishing. This highlights the overwhelming reliance on marine-based livelihoods with very limited diversification into agriculture, services, or salaried employment.

2. **Economic Fragility**

   Household incomes are modest, with Pagadiya fishers earning a mean of ₹84,000 annually, fish sellers averaging ₹65,000, and boat owners slightly higher at ₹110,000. Expenditure is heavily skewed toward food and rations (₹9,678 per month), leaving little for reinvestment or resilience-building. No formal loans were reported; instead, small informal borrowings from relatives and neighbours substitute for institutional credit. Insurance coverage is entirely absent, leaving households unprotected against health shocks, gear damage, or disasters.

3. **Social Capital Asymmetry**

   Women's collective strength is visible through near-universal membership in the Shakti Mahila Sangathan, but there is no fisherfolk-specific manch, cooperative, or collective body to represent occupational interests. MNREGA access is absent, and welfare coverage remains marginal: only 9.4% of households benefit from widow pensions, 4.7% from Ayushman cards, and 3.1% from e-Shram. Fisherfolk-specific schemes such as PMMSY or diesel VAT relief are virtually absent.

4. **Physical Infrastructure Gaps**

   Basic energy access is strong, with 96.9% of households reporting electricity and gas connections. However, sanitation and water remain critical deficits—only 34.4% have functional toilets and 31.2% a drinking water tap. Fishing assets are limited to nets, with minimal provision of boats, iceboxes, or cold chain infrastructure through government schemes. Housing ownership is high (96.9%), but none of the households possess pattas, leaving tenure insecure.

5. **Environmental Stress and Climate Risks**

   The majority (78.1%) reported a decline in fish diversity and stocks, with key species such as Pomfret, Hilsa, Bombay Duck, and Prawns becoming scarce. Nearly all households

(98.4%) perceived climate change, and 65.6% had experienced natural calamities in the past five years, most commonly disruptions to fishing and economic losses. While 71.9% reported ability to predict weather using traditional signs, plastic pollution and destructive juvenile fish capture remain under-recognised despite widespread encounters with debris and falling stocks.

6. **Governance and Institutional Gaps**

   Awareness of core fishing regulations is strong (over 89% aware of the 9 nautical mile artisanal fishing limit and mesh size rules), but enforcement and legal support are weak. 95.3% of households reported no access to legal aid, and more than half had experienced net damage from trawlers. Access to extension services and fisheries-related institutions is almost absent, with only 12.5% aware of the Fisheries Research and Training Centre in Mahuva and none aware of national or international institutions.

7. **Gendered Vulnerability**

   Women identified livelihood insecurity as their foremost challenge (96.2%), while also contributing significantly through fish vending, processing, and even night-time fishing under unsafe conditions, often facing risks from wild animals such as lions. Health burdens were concentrated in occupational ailments—joint and muscle pain (62.5%) and oral health issues (48.4%). Despite their strong federation membership, women remain excluded from markets, fisherfolk institutions, and credit, reinforcing their marginalisation.

4.2: Recommendations

The assessment highlights multidimensional vulnerabilities arising from heavy dependence on Pagadiya fishing, fragile incomes, weak institutional linkages, and climate pressures. The following recommendations build on survey findings and district consultation solutions to strengthen resilience and sustainability.

4.1 Licensing and Regulatory Support

- **Decentralised licensing:** Organise block-level or mobile licensing camps to reduce transaction costs and ensure timely renewals.
- **Simplified renewal process**: Implement fast-track mechanisms for license renewal to save time and resources for fisherfolk
- **Legal aid facilitation:** Establish community-based legal support cells to handle net damage claims and conflicts with trawlers.
- **Awareness drives:** Disseminate clear information on the 9 nautical mile limit, mesh size rules, and renewal procedures through federations and local schools.
- **Mobilise fisherfolk as Munch:** Collectivising the fisherfolk at village level and establishing the coordinating committee among the Katpar,Bandar and Lighthouse.

4.2 Financial Inclusion and Scheme Access

Although households hold foundational identity documents, their access to fisherfolk-specific schemes is negligible. Community consultations revealed deep dissatisfaction with opaque selection processes and low awareness.

- **Formal ownership of the fishing land:** Ensuring legal recognition of fishing grounds, ensuring that local communities hold formal titles or rights to fish in specific areas. This

can include the issuance of land titles or certificates of occupancy that confirm community ownership or access to fishing resources.

- **Gender-Sensitive Documentation:** When issuing certificates of occupancy or land titles, ensure that they are issued in a way that recognizes women's rights, especially in communities where women play a significant role in fishing but are excluded from formal ownership.
- **Transparent enrolment:** Display beneficiary lists for government schemes at the panchayat level with grievance redress channels.
- **Village-level enrolment camps:** Facilitate coverage of pensions (widows, elderly, disabled) and Ayushman Bharat.
- **Insurance penetration:** Introduce low-premium group insurance for boats, nets, and fisherfolk health, linked to licensing.
- **Strengthen credit linkages:** Use SHGs and federations as intermediaries to access Kisan Credit Cards and Matsya Sampada loans.

4.3 Training, Skill Development, and Livelihood Diversification

Despite an interest in ropemaking, most households opted out of training due to poor past experiences and lack of travel/handholding support.

- Compensated **training:** Provide stipends and travel allowances to offset wage loss during training.
- **Handholding support:** Establish mentoring and follow-up mechanisms so skills translate into income.
- **Exposure and demonstration:** Organise practical sessions in aquaculture, pond culture, rope making, and fish processing.
- **Youth engagement:** Promote school-level awareness on sustainable fisheries and marine ecology to foster intergenerational continuity.
- **Women-focused skilling:** Prioritise rope making, tailoring, food processing, and collective marketing for livelihood diversification.

4.4 Infrastructure and Market Systems

Fishing in Bandar is constrained by poor cold chain facilities, auction platforms, and market linkages.

- **Introducing high value fish seedlings**: The Malan Bandhara has resulted in a decline in marine fish catches, while freshwater fish, caught in large quantities, are sold at very low prices. To address this issue, it is crucial to introduce high-value fish seedlings, strengthen market connections, and implement value-added processing methods, such as solar drying, to improve the profitability of the catch.
- **Cold chain investment:** Develop community-managed cold storage, insulated boxes, and fish holding tanks.
- **Auction platforms:** Establish transparent auction yards with weighing facilities and dedicated stalls for women.
- **Subsidised inputs:** Ensure timely delivery of diesel relief, ice, and nets to small-scale fishers.
- **Market access:** Support digital platforms and collective marketing to reduce dependence on intermediaries and address the challenge of distant markets.

4.5 Social Protection and Welfare

Social safety nets are weak, with negligible coverage of pensions, health insurance, or calamity compensation.

- **Universal pension coverage**: Extend widow, old-age, and disability pensions to all eligible households.
- **Parity in disaster compensation:** Recognise fishing losses (boats, nets, catch) within disaster relief packages on par with crop losses for farmers.
- **Health interventions:** Strengthen Ayushman Bharat coverage and introduce mobile health camps targeting musculoskeletal and oral health problems.
- **Gender-sensitive welfare:** Promote awareness of Sukanya Samriddhi, Vahali Dikri, and educational scholarships.

4.6 Climate and Environmental Resilience

Bandar faces acute risks from cyclones, declining fish diversity, and plastic pollution. While local ecological knowledge remains strong, institutional response is weak.

- **Plastic waste management:** Install a **filtering system at Bandhara** to stop plastic inflows into the sea, complemented by school and community awareness drives on reducing single-use plastics nearby villages.
- **Sustainable fishing awareness:** Conduct campaigns on the impact of juvenile fish capture, involving fisherfolk association, federations and schools.
- **Disaster management plan:** Given the recurring cyclones every two years, a disaster preparedness plan should secure fishing equipment, boats, and nets in safe zones and train fishermen on cyclone response. Infrastructure like cyclone shelters and reinforced storage should be prioritized, along with improved boat anchoring. Post-cyclone recovery plans must include financial support, supplies, and infrastructure rehabilitation to restore livelihoods swiftly.
- **Warning system**: The overflow of water from the Malan dam causes significant damage to the nets of nearby fishermen. Implementing an advance warning system via SMS and WhatsApp notifications about the release of water can help prevent such damage.
- **Ecosystem restoration:** Promote mangrove replantation and creek rehabilitation to buffer cyclones and sustain fish breeding grounds.

4.7 Governance, Institutions, and Gender

Despite full membership of women in Shakti Mahila Sangathan, fisherfolk-specific collectives remain absent. This institutional vacuum weakens bargaining power and collective voice.

- **Fisherfolk collectives:** Establish a fisherfolk cooperative or manch to represent occupational interests and engage with the fisheries department.
- **Inclusion of the fisherfolk needs in the village development plan (GPDP):** Ensure that fisherfolk concerns, including clean beaches, disaster shelters, livelihood support infrastructure, healthcare, and education, are integrated into the GPDP. Furthermore, incorporate coastal resource management and safety measures, taking into account the risks posed by lions and the need for nighttime beach access for fishing activities.
- **Inclusion of Fisherfolk in Kisan Samman Nidhi Scheme:** Fishermen should also be included in the Kisan Samman Nidhi scheme to ensure they receive direct financial support, similar to other farmers, to improve their livelihoods and enhance economic security.

- **Conflict resolution:** Create grievance mechanisms at block level to address trawler intrusion and net damage.
- **Extension services:** Strengthen the Fisheries Research and Training Centre's outreach through regular village-level training and awareness camps.

4.8 Additional Policy Directions

In addition to community-proposed solutions, the following cross-cutting measures can deepen resilience:

- **Digital facilitation:** Support Aadhaar seeding, ration linkage, and online scheme applications through federations.
- **Safe infrastructure:** Provide toilets, resting spaces, and solar lighting for women engaged in night fishing.
- **Community-based monitoring:** Track access to schemes, insurance coverage, and compensation distribution at the village level.

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A detailed assessment of the socio-economic conditions and climate vulnerabilities of fishing communities in Mahuva Bandar, Gujarat. This report identifies critical gaps in governance and livelihoods, providing evidence-based recommendations for sustainable development and institutional support.