DFM Report

# Understanding the Dynamics of the Dried Fish Sector in Maharashtra

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Social Sciences and Humanities Research Council of Canada

Conseil de recherches en sciences humaines du Canada

Canada

This work draws on research supported by the Social Sciences and Humanities Research Council of Canada.

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## Executive summary

The practice of preserving fish by drying or curing is ancient and a significant practice for fishing communities worldwide. However, the dried fish sector's potential in improving the well-being of dependent fisher communities has been largely overlooked by policymakers. The Dried Fish Matters (DFM) project aims to bring attention to dried fish by developing a thorough understanding of the sector across South and Southeast Asia, including in India, Sri Lanka, Bangladesh, Myanmar, Thailand, Cambodia, and the Philippines.

This study is part of the DFM project and specifically focuses on Maharashtra in India – one of the country's major marine fish-producing states. The state is also known for producing high-value dried fish like Bombay duck and prawns. However, despite the significant role the dried fish sector plays in the larger social economy in Maharashtra, it remains an informal and unregulated economy that is poorly understood in terms of its contributions to economic security, nutritional security, women's empowerment, well-being, and value-chain resilience. This limited information impedes effective and inclusive policy decisions aimed at improving the well-being of dried fish-dependent communities.

To build this understanding, we conducted a coastwide study to profile the dried fish economy of Maharashtra. We collected data on the sector's value chains across the seven coastal districts of the state through literature review, interviews, and field observations.

The study revealed that two factors, environmental and socioeconomics factors of a region play an essential role in structuring fishing practices, processing methods, and trade in the dried fish sector, similar to other natural resource-based economy. Although further investigations are required, the production and trade flow of dried fish is skewed towards the northern coast of Maharashtra (from Palghar to Raigad). For example, traditional *dol* net fishing and the use of bamboo racks for drying fish are prevalent across the northern coast, which corresponds roughly with the resource distribution of three species – prawns, Bombay duck, and ribbonfish, which dominate the high-value direct-consumption dried fish markets.

However, with a decline in catches of high-value species like pomfrets and Bombay duck, the livelihood dependency of fishers on the sun-dried low-value species has increased. These fish species are not generally suitable for direct human consumption and are instead diverted to make poultry feed. An unsustainable removal of critical fauna can have implications for ecosystem health and the nutritional security of the dependent communities. While this study was able to identify species utilization across broad geographies, a site-focused case studies are required to quantify utilisation across the value chain. It will help build robust evidence to enable policy outcomes.

We found that a mix of socioeconomic factors, including the availability of fisheries resources, freight and logistical infrastructure, the presence of a large-scale seafood processing sector, and the proximity of industrial corridors, influence the structure of the dried fish value chain in Maharashtra. The length of the dried fish value chain varies significantly across the coast. We could directly trace up to three degrees of intermediary nodes between processing and retailer nodes within Maharashtra. The dried fish value chain in Maharashtra has branches in far-off geographies of the southern and northeastern parts of India. The sector is largely composed of informal actors and centres around local consumers within Maharashtra. We also observed dried fish trade linkages between coastal and highland tribal communities, signifying its nutritional and cultural significance. While the informal and complex structures of the dried fish economy in Maharashtra have their disadvantages, these same structures have also helped buffer the impacts of external shocks such as the COVID-19 pandemic.

Inter-actor dynamics play an essential role in structuring the sector's demographics. The dried fish sector in Maharashtra, while predominantly composed of traditional fishing communities, also involves a substantial number of migrants from nearby districts and other Indian states. Seasonal and intergenerational migration was documented across the nodes of the value chain, especially in the upstream nodes (harvesting and processing).

Women play a significant role in the dried fish economy, making it a candidate avenue for policy and market interventions to enable empowerment, especially through market-facing initiatives. However, the success of these initiatives depends on many factors, including accessing consumer markets, ensuring quality control, and navigating the emerging e-retail market. There is also a need to focus on leadership development, improved financial literacy, enhancing entrepreneurial capacities, and increasing transparency across the value chain to ensure the longevity of initiatives.

The study also illustrates how a small-scale sector faces sustained pressures from rapid urbanisation and tourism. The dried fish sector struggles continuously against the pressures to commercialise coastal commons and marketplaces. Such pressures are even more pronounced in the Mumbai Metropolitan Region (MMR), where dried fish is shrinking both spatially and culturally under the pressures of urbanisation and metropolitan stigmatisation. Bureaucratic hurdles and the lack of legal support systems further marginalise the fishing communities.

Despite all these challenges, the dried fish sector in Maharashtra presents opportunities to strengthen coastal livelihoods for large populations, ensure nutritional security for many poor and marginalised communities across the country, and strengthen the local economy of dependent communities. Many fishing towns across Maharashtra have strong social infrastructures that can support interventions

via the dried fish sector. The unique biocultural identities of dried fish products and their socio-cultural embeddedness can encourage the conservation of local biocultural diversity and enhance the sustainability of small-scale fisheries.

## Background and introduction

Drying or curing fish is a long-established and effective method of processing and preserving fish, widely practised in India. As of 2022, 3.9 lakh[1] tonnes of fish were used for curing (DoF, 2023). Processing and consumption of dried fish are deeply ingrained in the lives and culinary culture of many coastal, riverine, and hinterland communities across India (Shivaji et al., 2015).

The appeal of dried fish lies in its low production costs compared to other processing methods. The availability of high-protein and micronutrient-rich products with a long shelf-life at a low price makes dried fish a crucial avenue to address the nutritional security concerns of low-income and marginalised groups (Siddhnath et al., 2020). The consistent year-round supply and demand in local markets, even during lean periods, contribute to its resilience against market fluctuations (Wavare, 2015). The consistent nature of demand-supply supports livelihoods for various stakeholders along the value chain, including small-scale fishers, traders, merchants, and notably, women. During the COVID-19 pandemic, the dried fish economy demonstrated its robustness as a small and local supply chain catering to the needs of the local population (Memon, 2020).

Despite its significance, the potential of the dried fish economy as a viable source of livelihood and nutrition has yet to gain due attention from policymakers (Belton et al., 2022). Although much research has focussed on different aspects of dried fish, like processing methods and quality enhancement, studies on socioeconomically essential areas, such as nutrition, value chain, marketing, and women's involvement in various regions of India are gradually gaining traction (Joseph et al., 1988; Nath et al., 2013; Prasad & Rao, 1994; Purkait et al., 2018; Shyam et al., 2016; Thapa, 2016). However, more ground needs to be covered, especially in states like Maharashtra.

Maharashtra has a coastline of 720 km, which harbours 173 fish landing centres spread across 456 fishing villages in seven districts, showcasing a rich fishing culture and its distinct influence on Maharashtrian cuisine (Sorley, 1993 in Joseph et al., 1988; Anand, 2020). In 2017, dried fish products constituted 10% of the state's total

[1] 1 lakh = 100,000. A lakh is a unit used in Indian numbering system

processed seafood (Handbook on Fisheries Statistics 2018, 2019). Maharashtra is a significant producer and supplier of marine dried fish, including prawns and Bombay duck, to the northeastern states of India (Goswami et al., 2002). However, studies have indicated concerns over the quality of post-harvest infrastructure and handling of fish, as well as issues related to microbial infections and spoilage, including high levels of formaldehyde (Ghosh et al., 2020; Joseph et al., 1988; Karangutkar et al., 2020; Murthy et al., 2019). Additionally, the changing preferences of consumers in rapidly urbanising metropolitan areas like Mumbai pose challenges to the local dried fish market (Vikram Doctor, 2017). Furthermore, transforming traditional coastal commons, historically used by fishing communities as drying and curing yards, into conventional aesthetic spaces like public parks and tourist spots has become a significant threat to fisheries (Chouhan et al., 2016; Wavare, 2015).

A comprehensive understanding is crucial to address these multifaceted concerns and to shed light on the various aspects of the dried fish economy in Maharashtra. While previous studies have described different aspects of the dried fish sector in Maharashtra, including fisheries, dried fish markets, species utilization, quality, price trends, and consumer preferences, they are piecemeal and do not offer a holistic picture of the sector (Chavan et al., 2009; Ghosh et al., 2020; Karangutkar et al., 2020). Exploring the upstream and downstream segments of the dried fish value chain is essential to understanding the sector and its issues comprehensively. Additionally, data disaggregated based on gender and other demographic and cultural characteristics of actors involved in the dried fish sector is needed to inform efficient and inclusive policy decisions (Bevitt, 2020).

### Stacked value chain approach

The sustainability of seafood systems goes beyond ensuring the sustainability of fish harvest. It involves a host of pre- and post-harvest activities, including net-making, ice production, fish processing, trading, and retailing (Bjorndal et al., 2014; De Silva, 2011). Value chains provide an easy model to map these activities and identify knowledge and policy gaps to address and enhance sustainability. Value chains may be divided into three segments – upstream (fishers), midstream (processors), and downstream (retailers) (Belton et al., 2022). The value chain actors utilize assets (boats, nets, etc.) to transform inputs (fresh or raw fish) into goods and services as

outputs (processed dried fish), which then feed as inputs in the downstream segments of the value chain.

While the value chain approach is increasingly used in research on global agri-food production systems, it has some limitations, particularly concerning data-deficient food systems. The system in focus for this study – the dried fish sector in Maharashtra – is a prime example of such data deficiency. Similar to the global literature on dried fish, the literature from Maharashtra is skewed towards technical/operational aspects of dried fish production and upskilling of processors or upgradation of processing technology (Joseph et al, 1988; Joshi, 2014; Karangutkar et al., 2020; Mohod et al., 2014). At the same time, there is limited information on the social structure of the value chain, including cross-cutting dimensions, such as the dynamics between large and small fishers and processors, migrant workers, credit systems, and gender relations. Such skewed focus on production and technology, without accounting for other aforementioned social-ecological dimensions, renders the valuable work at the technology and innovation front non-integrative and inequitable (Guerrero et al., 2018; Löfqvist et al., 2022).

Based on the approach developed by Reardon et al. (2012), the DFM project has adopted "stacked value chain analysis" (SVCA) to address the limitations faced by conventional value chain analysis methods. It uses sample surveys to elicit differences across nodes and the functioning of each value chain segment.

Although the dried fish economy of Maharashtra meets the conditions to employ an SVCA approach, we lack data on the structure and functioning of its value chains and the various actors across all segments, which are necessary to base the detailed "stacked surveys" (Reardon et al., 2012). Through this study, by covering the coastline of Maharashtra, we attempted to establish this baseline as a foundation. This report, we delve into the value chain and socioeconomic importance of the dried fish sector in Maharashtra, shedding light on the various aspects of its value chain, actors, and their challenges.

## Methods

The study spread across three methodological components – literature review, interviews, and field surveys. We based it on the 'reconnaissance survey' outlined by Reardon et al. (2012).

### Literature review

We collected and compiled available literature on dried fish to inform the preparation of interview guides for stakeholder interviews. Along with key informant interviews, this process aided in prioritising and shortlisting landing centres and harbours for field surveys relevant to the dried fish sector. Academic and grey literature, in English and Marathi, were extensively surveyed to capture the ecological, economic, social, cultural, and historical significance of dried fish in Maharashtra.

### Interviews

We initiated this stage by interviewing key informants, leveraging the research team's existing network, and then snowballing to other actors in the dried fish value chain (Bernard, 2012). We gathered demographic information on the actors along the different segments of the value chain, including interlinkages with other industries and broader issues and challenges faced by the dried fish sector.

Interviews were conducted using a semi-structured approach, building on template interview guides (Appendix I) developed by Dried Fish Matters (DFM). We also incorporated region-specific insights from the literature review. The interviews followed a purposive sampling method to ensure representation from all major stakeholders, including fishers, processors, traders, and retailers, taking into consideration aspects such as gender and labour in an attempt to generate rich, demographically disaggregated data (Pratap Singh & Jadhav, 2023).

Most interviews were conducted in the participants' local language (Marathi). All interviews adhered to standard ethics protocols by obtaining participants' free, informed, and ongoing consent in their local language. We audio-recorded the

interviews when given permission and took notes to prepare summaries otherwise. In total, we conducted 30 interviews.

**Field Observations**

In addition to interviews, we collected information through documentation and field notes. We chose the sites based on literature and key informant interviews. Field observations supplemented the information obtained from the interviews. They generated qualitative data on the ecology and social economy through impromptu conversations, observations, and visual documentation of the dried fish value chain. These were especially useful in documenting some of the issues in the dried fish sector in Maharashtra, such as tourism, urbanisation, shifting consumer preference, and social behaviours and power dynamics between actors.

*Figure 3: Team members observing and documenting the dried fish retail market in Borivali, Maharashtra*

## Analysis

The interview summaries were collated, and interviews were transcribed in English and coded to identify major themes. We used QGIS (QGIS Development Team, 2023), Google Suite (Google LLC, 2020), and NVivo (Lumivero, 2023) to analyse and visualise collected data.

## Limitations

The team faced difficulties in the initial stages of data collection due to the prolonged monsoon season along the Maharashtra coast. Respondent recruitment also slowed down as a result. We photo-documented all significant harvest and fish processing centres across the Maharashtra coast except for those in Raigad district due to logistical constraints. Interviews with experts and value chain actors (primarily traders) working in Raigad provided a representative picture of prevalent practices and value chain structure

## Study area: Maharashtra coast

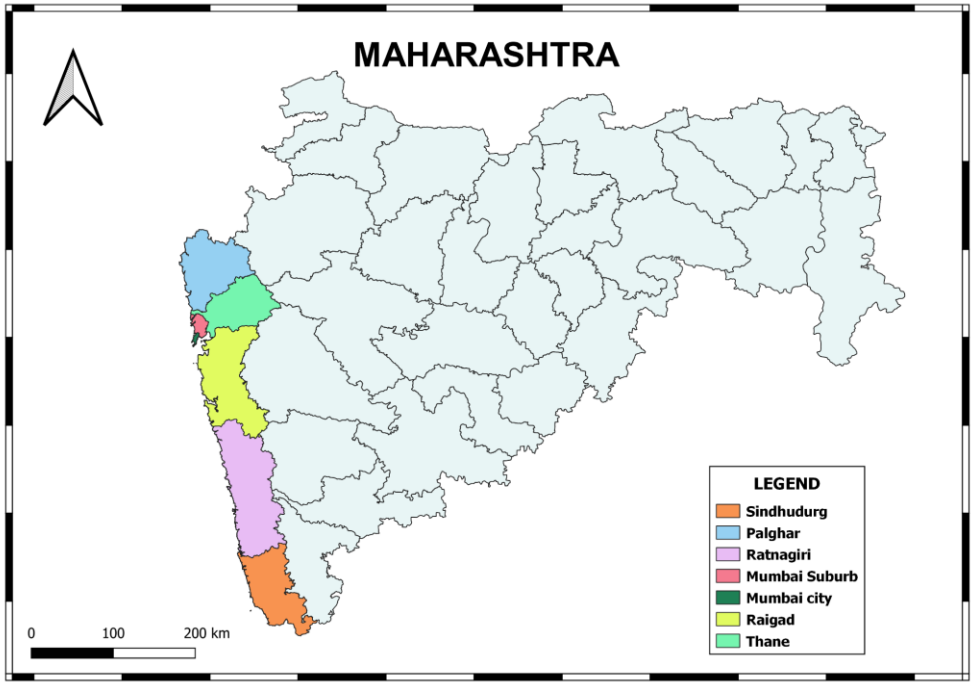



*Figure 4: Coastal districts of Maharashtra under the scope of this study*

The coastal region of Maharashtra, also known as the Konkan coast, spans over 720 km. It stretches 50 km wide between the Arabian Sea on the west and the Western Ghats on the east. The Konkan belt harbours distinct types of coastal ecosystems, including sandy and rocky beaches, mangroves and mudflats, coral reefs, and creeks. These ecosystems foster highly diverse flora and fauna along the coastline (Kehimkar, 2017).

The coastline of Maharashtra includes seven districts: Palghar, Thane, Mumbai Suburban, Mumbai City, Raigad, Ratnagiri, and Sindhudurg. The coastline is also divided into three broad regions. The north Konkan region comprises Palghar, Thane, Greater Mumbai, and Raigad districts. The central Konkan region includes the southern parts of the Raigad district and the northern parts of the Ratnagiri district. Southern Konkan encompasses the southern parts of Ratnagiri and the Sindhudurg district (Gole, 1997).

The coastline of Maharashtra also has an extensive continental shelf of 1.12 lakh sq km that provides productive fishing ground for both small and large-scale fishers. The

important species harvested in Maharashtra include pomfret, Indian mackerel, penaeid and non-penaeid prawns, ribbon fish, Bombay duck, and tunnies. In 2021-22, 87.24% of the catch was utilized for consumption in fresh form, while 12.08% (52272 t) was dried, and 0.68% (2933 t) was used for salting (Department of Fisheries, 2022).

In 2022, the estimated landing of fish in Maharashtra was 1.7 lakh tonnes. Raigad accounted for the highest share of the state's landings at 28%, followed by Mumbai City (26%) and Ratnagiri (23%). The major fish group contributing to the state's landings was sardines.

The proportion of fishing vessels with engines for propulsion (motorised) and mechanical devices to handle fishing gear (mechanized) is important in profiling a fisheries landscape and the fisheries production of a region. Generally, both motorisation and mechanisation reduce fishing effort and increase fishing efficiency, resulting in higher catch per unit of effort and higher landings[2]. In Maharashtra, mechanised fishing vessels accounted for 71.6% of the total landings, followed by motorised (27.8%) and non-motorised (0.6%) vessels (CMFRI, 2023). Purse seines were the dominant fishing gear, contributing 62,000 tonnes, followed by multi-day trawlers and motorised dol nets.

Fishing and allied activities support over 87,717 families along the Maharashtra coast. Raigad has the highest number of fishing households (27,676), followed by Palghar with 22,837 households, and Ratnagiri with over 16,600 households (CMFRI-DoF, 2016). In allied activities, women predominate in marketing, curing or processing, and peeling, while men are primarily engaged in net handling and other work. Curing and processing activities are particularly prevalent in Raigad and Palghar districts. Across the Maharashtra coast, the ratio of women working in the curing/processing sector for every male is 31:1 (CMFRI, 2023).

[2] In India, the boundaries of small-scale fisheries and large-scale fisheries is unclear, rather the classification into the following three categories is more prevalent:

1. Mechanised – the fishing vessels that use in-board engines for propulsion and a machine mechanism for handling fishing gear. Usually can be looked as large-scale, multi-day fishing.
2. Motorised – fishing vessels with an engine source for propulsion, either outboard or inboard. Usually, small-scale fishing practices fall in this category.
3. Non-motorised – vessels without motor or mechanised gear. Usually, small-scale, artisanal fishing practices fit this category.

The fishing activities along the Maharashtra coast up to 12 nautical miles are governed by the Maharashtra Marine Fishing Regulation Act (MFRA) of 1981. However, customary governance systems are also practised (Karnad, 2017). The MFRA includes provisions for regulating fishing and implementing conservation measures in territorial waters, such as mesh size regulations, gear restrictions, and seasonal fishing bans (Edwin, 2022). Along the west coast, a seasonal monsoon fishing ban is imposed from 1st June to 31st July each year to conserve fish stocks (Rajesh, 2013).

## Major geographies for the dried fish sector in Maharashtra

Geography is a significant factor in influencing the landscape of seafood systems and their value chains. It affects the time and effort spent trading fresh and processed dried products based on the capacity, availability, and accessibility of modes of transport, infrastructure, and other logistics (Rodrigue, 2020).

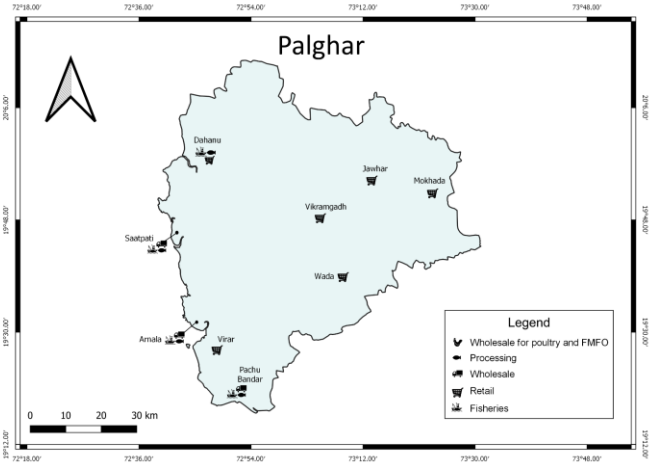
In Maharashtra, although fish drying was observed along the entire coast, the upstream segments of the value chain, including harvesting and processing, were concentrated in the northern coastal districts of Thane, Palghar, Mumbai Metropolitan Region, and Raigad. While further study is needed to determine the quantum of fish processed across the coast, field surveys and interviews point towards the difference in production and quality. These differences can be a result of a combination of factors, such as the availability of fisheries resources (including Bombay duck, ribbon fish, and shrimp species) and accessibility to markets because they are located in the vicinity of Mumbai's logistical hubs (Mukim, 2013).

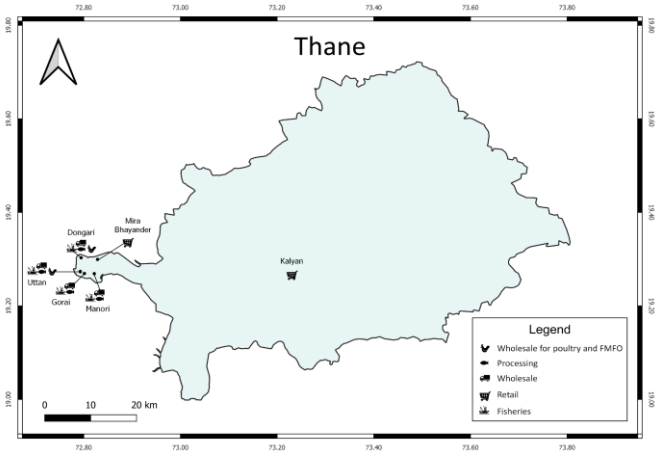
The downstream segments, including distribution and retailing, of dried fish value chains are more dispersed but remain mainly restricted to the Konkan belt. We found a high frequency of linkages along the coastal belt, especially markets in the south Maharashtra districts, including Sindhudurg and Ratnagiri. These areas experienced a large inflow of products, including varieties of dried and salted shrimp and Bombay duck, from the north coast. We also found linkages from the coastal districts to the inland districts. The districts frequently mentioned during interviews and informal market conversations were Nashik, Pune, Satara, and Kolhapur. While respondents informed us that consumer demand has been growing in the city centres of these districts, villages located on the highlands of the Western Ghats range seem to be major consumption sites for dried fish products.

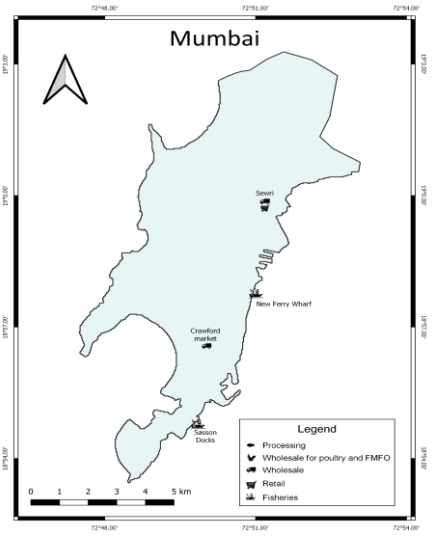
The interviews revealed that trade linkages between coastal communities (locally called *kinaar-patti*, transl. coastal-belt) and Western Ghat-dwelling highland tribal communities (locally called *jungle-patti,* transl. Jungle-belt) are very old. The markets located on the foothills have been shaped by these trade routes of essentials, including grains and fish, between these communities. These trade links showed resilience during recent waves of the COVID-19 pandemic when supply chains witnessed total

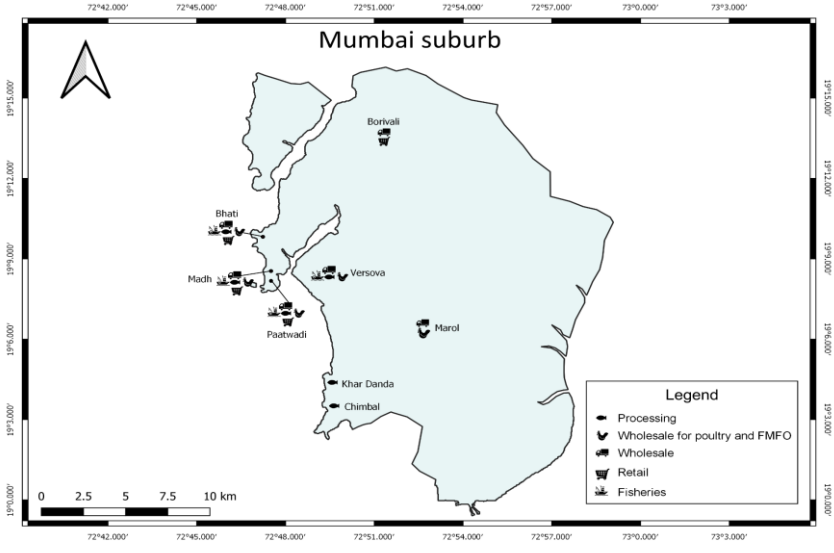
collapse (Fish Lovers Prefers Dried Fish, 2020). Although currency is undoubtedly the primary trading medium, we observed instances of bartering between dried fish processors and highland tribal communities in Ratnagiri and Palghar districts. Further investigation of this socio-cultural and trade relationship is needed to decipher the rootedness and importance of dried fish for highland communities in the Western Ghats. Besides sun-dried fish, salted and cured fish are also processed and traded in Maharashtra. However, the processing of these products is limited to a few areas.

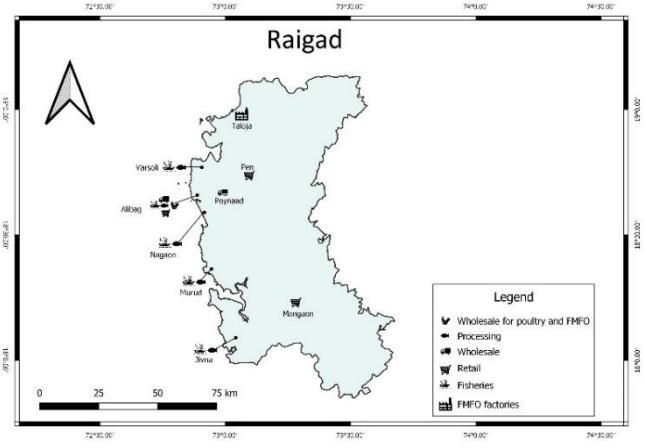
*Figures 5-12 (below, left to right in four rows) show the major geographies where different segments of dried fish are located based on interviews and field observations.*

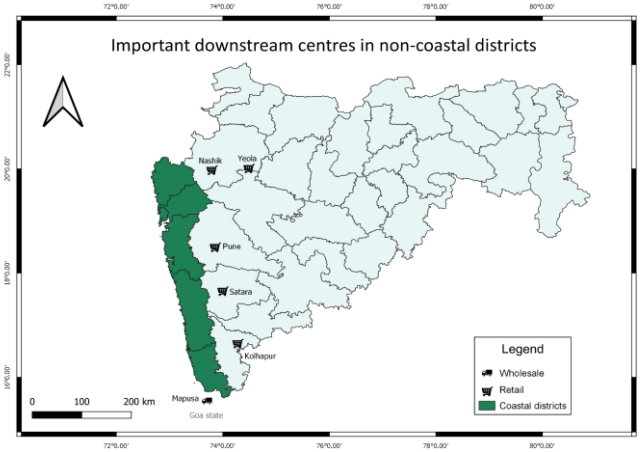


## Species harvested for drying and their utilization

In Maharashtra, Bombay duck (*Harpadon nehereus*), penaeid prawns, non-penaeid prawns (especially paste shrimp – *Acetes* spp.), ribbonfish (Trichuridae), golden anchovy (*Coilia dussumeiri),* catfish (*Arius spp.*), squids (*Uroteuthis* spp.) are the main faunal groups used for the purpose of drying for direct consumption as food.

Even though the Indian oil sardine is a significant fishery in Maharashtra, most of the catch is not used for drying or fresh consumption; instead, it is used for fish meal and fish oil. The Indian oil sardine is the preferred ingredient for producing high-quality fishmeal and fish oil because of its high oil content. In addition to the drying of the oil sardine, we also observed mixed fish catch being sun-dried for processing into fishmeal. This mixed catch was composed of juveniles and commercial-sized individuals of scads (Carangidae, mostly *Alepes* spp.), red tooth trigger fish (*Odonus niger*), pufferfish (*Lagocephalus inermis*), *Decapterus spp.,* lesser sardines (Clupeidae, *Sardinella spp.*), mantis shrimps, etc. The sun-dried catch was mainly used for making poultry-quality fishmeal and fish oil.

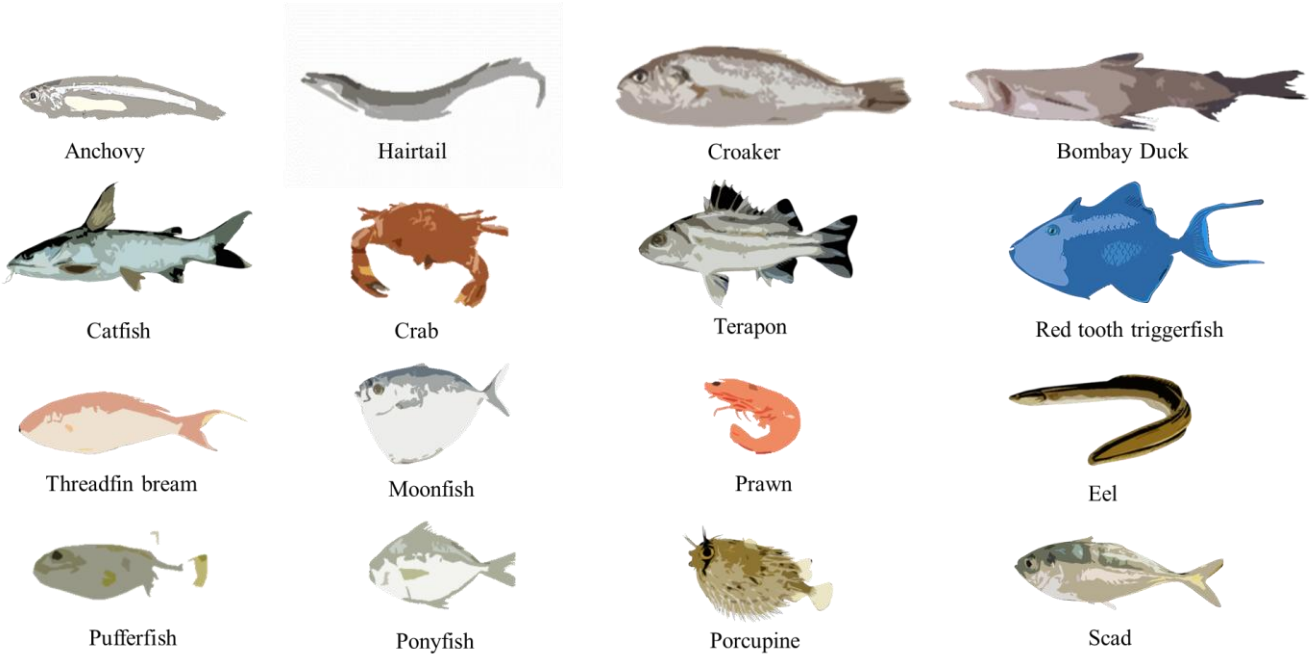



*Figure 13 Commonly observed species during field observations at landing centres*

Although palatability and preference play a major role, multiple other factors also affect the disposition of fisheries catch, including quality, the quantity of catch while harvesting, consumer demand, and processing and handling.

An overall decline in fish quantity and diversity was a prevalent theme in interviews and on-field conversations during field visits.

***"The current catch is much less than we used to get 10- 20 years back. Earlier, we used to get so much catch that we didn't have time to eat, and now sometimes, we don't even get fish to eat. During such times, we also have to buy fish from the market despite being from a fishing family."***

**- Dried fish processor from Manori, Thane**

***"Fish stocks have been declining for the past 4-5 years. Fishing is not easy. So I don't want my kids to continue fishing."***

**- Dried fish processor from Arnala, Palghar**

***"Because of purse seine boats, the catch has declined so much that some species are not found now. The best example is the Shingada fish (catfish). Earlier, we used to get so much that sometimes we used to throw them away, and now we don't even get them for our subsistence, and even if we get them, they are being sold for Rs 500 per kg."***

**- Dol net fisherman from Uttan, Thane**

## Fisheries associated with the dried fish sector in Maharashtra

The major fishing practices that contribute to the production of dried fish in Maharashtra include trawl, purse seine, gill net, and dol net fisheries. We observed that while bycatch or low-value catch from large-scale fishing practices like trawling and purse-seining is utilized for drying, small-scale fisheries, including dol net fishing along the north Maharashtra coast and gill net fishing along Satpati (Palghar) and southern Maharashtra coast at Malvan, often utilize the entire catch for drying in the glut season (November-February).

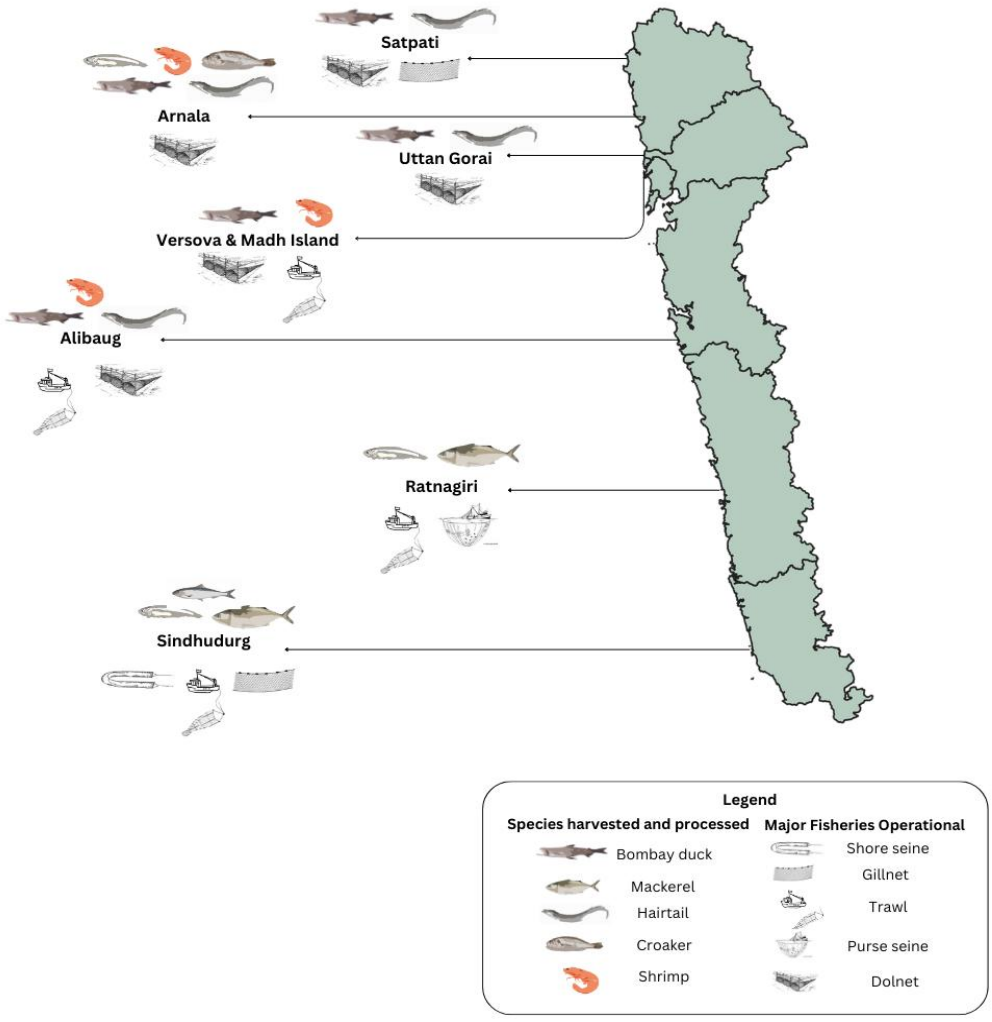



*Figure 14 Major fishing practices and species harvested and processed for drying at major fish landing centres based on field observations and interview*

*Figures 15-25 Major dried fish products from coastal Maharashtra. First row from L to R: 15- dried golden anchovy, 16- pomfret salted in brine, 17- salted and sun-dried croaker, 18 - Indian mackerel salted in brine; Second row: 19 - King mackerel and tuna cuts salted in brine, 20 - sun-dried ribbon fish, 21 - sun-dried Bombay duck, 22 - different varieties of sun-dried shrimps; Third row: 23 - 25 - sun-dried mix low-value fish for fishmeal or poultry feed*

**Dol net fisheries and its close connection to dried fish**

*Figure 26 - Dol net fishing vessels, Manori*

The dol net is a traditional, labour-intensive, and passive fishing method practised along the northwest coast of India (Sikotaria et al., 2018). In 2016, more than 1500 mechanized dol-net fishing vessels were operating in the state (CMFRI-DoF, 2016). Dol net fishing is synonymous with dried fish processing in Maharashtra. It is closely associated with the identity of many fishing communities involved in dried fish processing at the household level. Although more study is needed to know the proportional contribution of dol net fisheries to the total production of dried fish in Maharashtra, literature, field observations, and interviews pointed towards the significant contribution of dol net harvested fish in the dried fish economy of Maharashtra (Khileri et al., n.d., Sikotaria et al., 2018).

A dol net is a type of conical set bag net operated generally by small-scale fishermen in various countries of South Asia, including Bangladesh, Indonesia, Malaysia, Myanmar, and Thailand, albeit with regional variations in gear design and methods of operation (Pradhan et al., 2019). There are variations in the operation along the northwest coast of India as well, from Raigad to Umbergaon, Amreli, and the Gulf of Kutch in Gujarat (Raje & Deshmukh, 1989; Sehara and Karbhari, 1987). The fishermen select the depth of operation based on factors such as the capacity of their fishing vessel and the number of nets to be used. Dol nets broadly resemble a trawl net in their structure, albeit they are stationary. With changes in cod end mesh size and the

number of sinkers and floaters, dol net fishers can capture various species of different sizes occurring along the water column (Sehara and Karbhari, 1987).

We found that dol net fishing is prevalent in all fish landing centres from Raigad to Palghar, except for the large fishing harbours of Sassoon Docks and New Ferry Wharf, where purse seining and trawling are more prevalent. However, the density and scale of dol net operation were found to be higher in the Gorai – Uttan coastal stretch to Arnala and Dahanu in the Palghar district. In Madh and Versova, trawlers have increased in numbers over the last few decades. Respondents indicated that the number of trawlers increased during the mechanisation of the fishing industry in India. However, it was interesting to note that the dol net fishery adapted to the motorisation and mechanisation period of the fishing sector in Maharashtra, which started in 1950-51 (Joshi, 1987). In 2021, the mechanized dol net fishery contributed the highest catch per unit effort, underscoring the efficiency of dol net fishing compared to trawl fishing (CMFRI, 2022).

Despite competition from large-scale trawl fisheries and other pressures such as urbanisation, pollution, and infrastructure development, dol-net fisheries and the dried fish sector in Thane and Palghar are flourishing. Insights from interview data suggest that this could be because of the presence of creeks, estuaries, and the wide continental shelf of Saurashtra and the north Konkan coast. However, more studies are needed to corroborate. Compared to other fishing villages in Mumbai, the dol net fisheries show high prevalence across the Gorai-Uttan coastal stretch of Thane district and Arnala in Palghar district, indicating better resilience and adaptability to the 'modernisation' of fisheries in India. Having said that, anthropogenic pressures cannot be ignored. A woman involved in fish processing in Thane informed us about the consequences faced by fishermen due to the large mechanized vessels (trawlers or purse-seines) as they fish and haul through their fishing grounds.

***"Although the government has ruled that large vessels must use the area beyond 12 nautical miles, they don't follow those rules. The government doesn't even check what happens at sea."***

**- Dried fish processor from Manori, Thane**

Rich fishing grounds are constantly threatened by upcoming infrastructure and development projects along the coast. A recent example is the highly contested Vadhavan port development project near Dahanu, Palghar, which puts the ecologically sensitive Dahanu coastline and all dol netters in nearby regions at stake (Bavadam, 2018).

## Dried fish processing across coastal Maharashtra

Curing and salting large fish are two common methods: wet salting for fatty varieties and dry salting for lean varieties of fish (Jeyakumari et al., 2021).



*Figures 27-29 (left to right) - Big fish such as tuna are salted fresh (left) or cured in brine (centre), while small fish such as anchovies are dried in the sun (right)*

Fish drying is affected by a multitude of factors, including the fat content, surface area, and size of fish, and environmental factors such as temperature, relative humidity, and air velocity (Jeyakumari et al., 2021). While Bombay duck, ribbon fish, and prawns are most suitable for sun-drying, other fish, including Indian mackerel, croakers, tuna, or king mackerel, have relatively higher fat content and must be salted or cured in a brine solution.

Along the coast of Maharashtra, fishers and fish processors employ different ways to dry and cure fish, using limited coastal and community lands. The following are the methods and processes we observed during the scoping survey across the coast.

### *Khale*/drying units

The rocky, hilly, and inclined coastlines of North Maharashtra are used for drying fish like shrimp, anchovies, croakers, and other mixed catch fish. These areas are divided into separate units belonging to different households. Earlier, these units were constructed with earthen flooring, but in recent decades, they have been built with

cement and more durable materials. The drying units, locally called *Khale*, resemble terraces in terrace farming.


*Figures 30-31 (left and right) Khale at Dongri, Uttan*

While the coastal land is not legally owned by the locals, they have the right to use it for purposes such as drying and net-mending. We observed various local governance systems for using drying units. In Raigad, customary rights to use drying units remain within the same household across generations. The access to use is transferred patrilineally to women of the household. We also came across a governance system for drying fish with the active involvement of the local fishers' society. We were informed that *khale* in the *Koliwadas* of Madh Island were constructed with government support, and the usage was being administered by one of the local fisheries societies. The units were distributed among the fisher members of the fisheries society via lottery. While the land is owned by the government, the members had the use rights to the *khale* for a year on affordable monthly rent (2022-23) in this particular case.


*Figures 32-33 (left and right) A woman from the Kharva community drying half-processed ribbon fish on a tarpaulin sheet at Versova; A migrant woman fish worker from Andhra Pradesh drying half-dried Bombay duck at Madh Island*

On the hilly slopes of Dongri, Gorai, and Manori, *khale* were maintained by villagers themselves, and the usage rights have remained with the same fishing households for generations. In the same region, we observed agricultural lands owned by non-fishing communities that are leased out seasonally for fish drying.

Although fish drying has significantly declined in Malvan, a limited quantity is dried on cement platforms. We observed the wider street crossings in the narrow alleys of *Koliwadas* of Mumbai and Vasai (Pachubandar) used for drying fish.



*Figures 34-36 (left to right) - Migrant fishworkers drying fish on street crossings; (centre and right) courtyards and verandahs being used for drying fish at Ratnagiri and Malvan, respectively*

**Bamboo racks**



*Figures 37-39 (left to right) - Bamboo racks at Versova; Migrant fishworkers from Andhra Pradesh drying Bombay duck on bamboo racks at Versova; A woman fish processor drying her boat's catch (ribbon fish) at Uttan*

The use of bamboo racks (locally called Volandi, Ballandi, or Valadi), made of 11-12ft vertical poles tied horizontally (Figures 37-39), is a common and age-old practice along the northern coast of Maharashtra for drying Bombay duck and ribbonfish. During our field observations, we found the use of bamboo racks in Arnala,

Pachubandar, Uttan, Gorai, Manori, Madh, Bhati, Patwadi, and Versova *Koliwadas*. We were informed that this practice spreads across the *Koliwadas* of Mumbai and parts of the Raigad district. Using bamboo racks coincides with the geographical distribution of Bombay duck in Maharashtra waters. We observed that the Bamboo racks were either placed parallel to each other or arranged in semi-circles to maximize the use of available space and minimize drying time, considering the direction of wind and sunlight in relation to the shape of the seashore.


*Figures 40 and 41 (left and right) - the interlocking jaws of the Bombay duck and elongated dorsal fins of ribbon fish make it easier to use bamboo racks for drying*

The morphology of Bombay duck (interlocking jaw) and ribbon fish (long tails that can be knotted) has allowed the evolution of bamboo racks as a drying method all across north Konkan and parts of the Saurashtra and Kutch coasts, where these resources are abundant (Figures 40 and 41). The process of drying Bombay duck and ribbon fish takes 3-4 days, if all conditions are optimum. The bamboo racks are only used for initial drying, especially in the case of ribbon fish, where, after 2-3 days, the fish are spread out on mats on the ground to ensure complete dehydration (Figures 32 and 33).

While open sandy beaches or cement platforms are preferred to building drying racks, we observed that bamboo racks were built on a breakwater's boulders in Pachubandar *Koliwada* due to the declining availability of coastal commons, making access significantly more difficult for fisherwomen. Upon inquiry, a respondent from

Paachubandar (Vasai) explained how the shoreline has changed due to the coastal erosion of their beach. Even though the harvest is good, there is no space for drying.

***"Fish drying is not practised in large quantities here currently. There was a time when it was done in large quantities because, back then, the jetty was safe and sound. Now it is completely in shambles due to erosion. We used to dry fish up to the area where the boats are currently docked (pointing towards boats). It is all washed away now."***

**- Senior fisher leader, Vasai**

Customarily, the usage rights of coastal commons lie with the *Koli* community. Other communities, such as the *Kharvas* from Veraval and Jafrabad in Gujarat and non-fishing Maharashtrian communities, lease lands from *Kolis* to dry fish in the *Koliwadas* of the Versova and Madh islands.

**Drying platforms or *Mandav***

*Figures 42-43: Different types of Mandavs constructed in the intertidal zone near the Versova landing centre.*
*In areas prone to water inundation, the Mandav is constructed on stilts, while on sandy beaches, both stilt and non-stilt (Figure 43) constructions were observed.*

A lack of a suitable area for drying led to a different structure for drying in Versova. Here, the dried fish processors from the *Kharwa* community lease marshy intertidal land from the *Kolis* at INR 70,000/year. They build bamboo platforms/pavilion-like structures raised on stilts, with drying racks on all four sides of the platform, called *Mandav*. The platform is matted with fish-nets, which allows rainwater to seep through the mesh and bamboo, minimising spoilage. Building and maintenance of *mandavs* is done by the *Kharwa* community and costs around ₹50,000/year.

**Salting and curing in brine solutions**

*Figure 44 Fish catch composed of Indian mackerel and lesser sardines being washed with seawater by migrant fishworkers (right top corner) at Malvan, while their children play in the foreground. This fish catch will be rewashed with fresh water before being salted.*

During the scoping study, we observed that salting and curing were less prevalent than sun drying, and processing and production centres were limited to small pockets at Rajiwada in Ratnagiri and the Marol dried fish market in Mumbai. The processors

source low-grade fish of otherwise high-value fish such as king mackerel, tuna, billfish, large sharks, and rays. Smaller high-value fish, including Indian mackerel and pomfret, are also salted during the glut season (~ September-January). We observed that the consumption of large salt-cured fish products appears to be declining, and preference seems culturally restricted to Muslim consumers. On the other hand, smaller salt-cured fish are bought by a broader base of consumers, especially closer to the off-season.

## Trading, wholesaling, and retailing of dried fish

*Figures 45 Borivali (left) wholesale and retail market. The market has weekly wholesale and daily dried fish retail markets.*

*Figure 46 (right) Dried fish wholesale and retail market, Sewri*

### Actors involved in intermediary nodes

The mid-value chain actors in the dried fish sector in Maharashtra, especially women, often wear multiple hats. In Palghar and Thane districts, we observed that the entire household was involved in dried fish value chain activities, albeit at different scales – from harvesting and processing to wholesaling and retailing. However, unlike household-based pluriactivity in Thane and Palghar, we observed a clear division of labour among the actors across the value chain nodes in the *Koliwadas* of the Mumbai Metropolitan Region (MMR). In Ratnagiri and Sindhudurg, except for fishermen, all other actors played overlapping roles.

We observed that aggregators and secondary traders, particularly in longer value chains, were predominantly men from non-fishing communities. Many second-generation traders were Muslims, especially from the *Konkani Muslim* community. Other communities from Maharashtra and Gujarat were also observed in fish trading. The sociopolitical dynamics between these actors play an important role in

determining the flow of capital in the value chain. Although nuanced information on the demographic profile of downstream segments is needed to understand inter-actor dynamics better, many conversations highlighted the impact of the shifting political landscape on pre-existing trade relations.

### Structure of value chains in the dried fish sector

Even though we found some value chains reaching as far as Tamil Nadu, West Bengal, and Northeastern India, the majority branched off to hinterland districts within the state. We need more data to decipher the quantum of flows in the different value chains. Within Maharashtra, the length and complexity of dried fish value chains varied across the coast. Based on connectivity between actors, nodes, and geographies, however, the product channels in the dried fish sector in northern Maharashtra (Palghar to Raigad dist.) seemed more networked and overlapping (Figure 47).

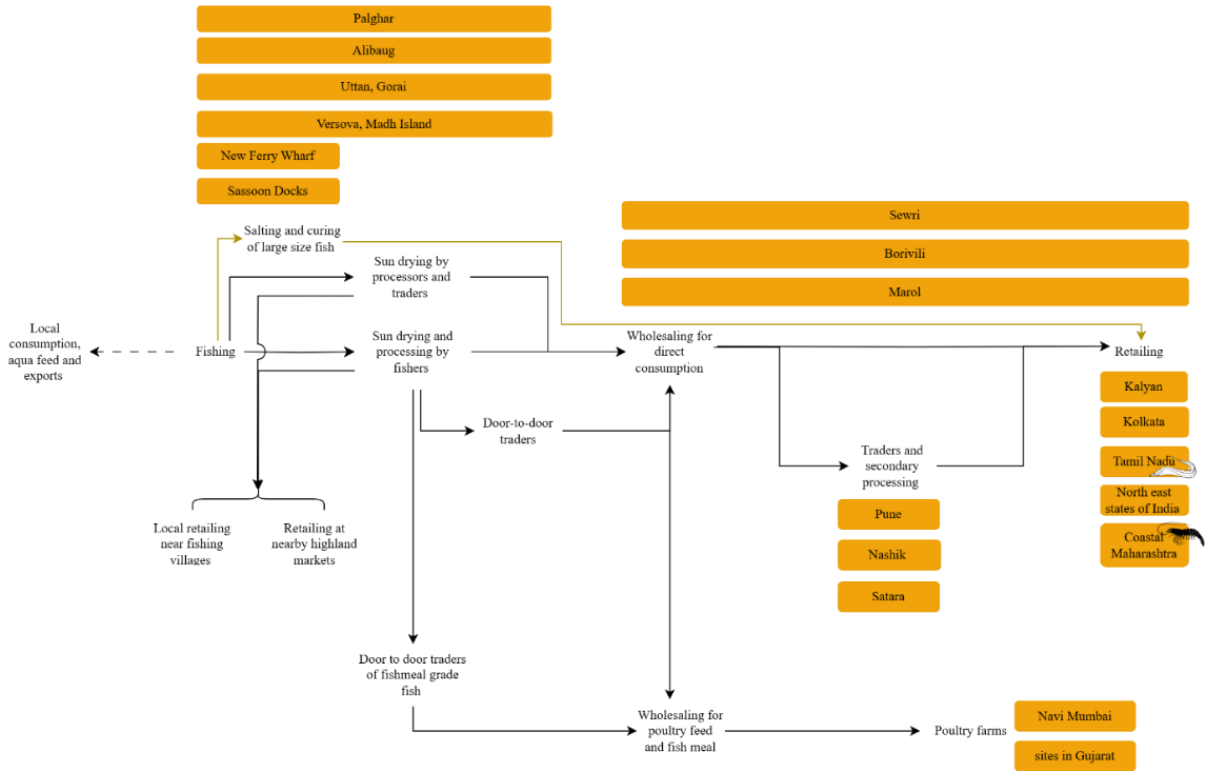



*Figure 47 Representation of major dried fish value chains in north coastal Maharashtra. The value chain of salted and cured large fish (represented in dark yellow) does not overlap with the value chains of other dried fish products. Significant locations are mentioned besides each value chain node. The length of location boxes represents the value chain nodes it covers, for example, Marol is a major centre for wholesaling, trading, and retailing. Dried ribbon fish and shrimps (shown as icons) are highly traded products to Tamil Nadu and coastal Maharashtra, respectively. Nodes connected with dashed arrows represent value chains that are either out of the scope of this study or for which we have less information.*

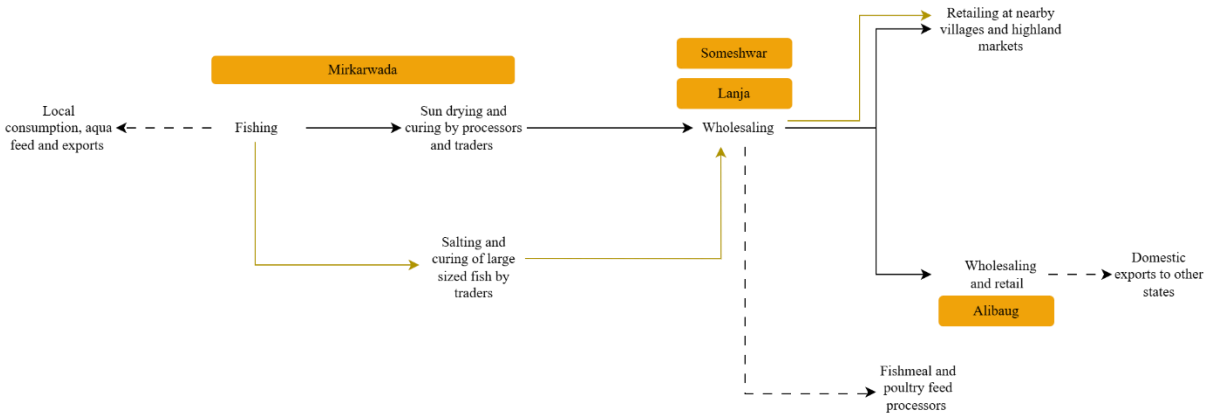



*Figure 48 Representation of major dried fish value chains in Ratnagiri. The value chain of salted and cured large fish (represented in dark yellow) do not overlap with value chains of other dried fish products. Nodes connected with dashed arrows represent value chains that are either out of the scope of this study or for which we lack information.*

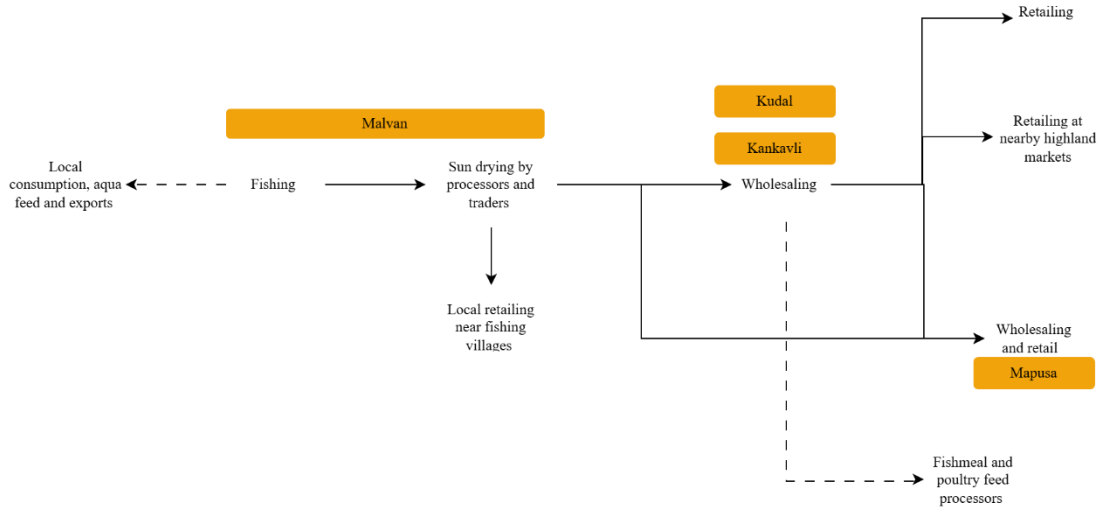



*Figure 49 Representation of major dried fish value chains in Malvan. Nodes connected with dashed arrows represent value chains that are either out of the scope of this study or for which we lack information.*

Our observations and interviews indicated that the length and complexity of the value chain vary based on factors that include:

i. Availability of fisheries resources and quality and quantity of dried fish product – For example, both Bombay duck and shrimps are harvested along the northern coast, creating a natural difference in demand for dried fish products. In addition, the differences in processing, as quoted by respondents, also contribute to the varying demand for dried fish products between north and south Maharashtra.

   We could not observe a strong flow of dried fish for fishmeal and poultry feed; instead, the responses indicated a shift in demand from dried fish to fresh fish for fishmeal at Malvan, as noted in previous studies (Gupta et al. 2020). We need further investigation to validate these observations and determine the reasons behind them.

ii. Access to markets, access to logistics, and capital - The northern coast of Maharashtra features longer dried fish value chains that reach more distant geographies than the southern coast (Figures 47-49). As compared to the Mumbai Metropolitan Region, Malvan and Ratnagiri processors face limitations due to low connectivity to the next node (wholesale trade centres). Small and medium-scale actors of the dried fish sector benefit through the agglomeration of formal-informal economies in urbanising spaces like the Mumbai Metropolitan Region (Mukim, 2013). The presence of industrialised centres around Mumbai has promoted infrastructure development which likely aids the expansion and strengthening of informal economies in the same landscape and also connects far off geographies for trading (Government of MSME).

## Value Addition

Dried fish is processed multiple times before it reaches consumers. While the major processing (70-80%) is done by dedicated actors (processors) in the upstream segment, further processing, which consists of regular sun-drying, cleaning, and sorting, is done by all downstream actors, including traders, wholesalers, and retailers, to maintain the product quality and shelf life over time.

In addition to processing (sun drying, salt curing), further value addition is also carried out in the form of grading, sorting, cleaning, packaging, and marketing, among other activities. These processes significantly increase the economic value of the product. However, the quality and handling of dried fish depend upon the final utilization of the dried fish product (domestic consumption, export, fishmeal, or fish oil). The price of dried fish products varies significantly based on the quality of the products, consumer demand for fresh vs dried fish, season (the rates are higher in low-production months, i.e., June to August), and input costs (salt, bamboo racks, baskets, ice, tarpaulin sheets, etc.).

Although the profit margins in fish drying sustain the livelihoods and households of thousands, they are still lower compared to fresh fish. A few leaders and experts in our study opined that dried fish has lower preference and value than fresh/frozen fish.

***"People usually purchase that fish (processed dried fish) only when the (high-value) fresh fish is not available."***
***- Fisheries scientist***

An increase in value realisation was noted in the case of Bombay duck at Satpati and Dhakti Dahanu in Palghar district. Respondents reported a gradual change in the disposition of Bombay duck – from dried to fresh – with the advent of cold storage. While this change was cited as one of the primary reasons for the decline in fish drying activities in the region, the change in disposition also meant higher and faster value realisation. However, this transition has also led to a higher diversion of Bombay duck to high-capital, streamlined fresh fish value chains within urban market centres, as

opposed to traditional lower-capital, dispersed, and often fragmented dried fish value chains.

### Credit, transaction, and economic relationships between the value chain actors

Multiple credit arrangements exist between various actors in the dried fish sector in Maharashtra. While financial capital forms the basis, these relationships are influenced by intersectional demographic aspects such as gender, migration, and religion.

In multiple sites along the Maharashtra coast, all upstream and mid-segment actors follow either a shorter credit cycle of 8 days or a longer cycle of approximately 8 months (yearly) for credit settlements. The relationships between fishers and local wholesalers and traders have developed over generations and appear to be more flexible regarding settlement terms compared to the credit relationships between traditional fishers and new non-local traders.

The payment arrangements between the fishing community and migrant workers were observed to vary. While migrant workers from nearby districts are paid a daily wage, those from other Indian states receive payment at the end of the fishing season. Apart from this, in-kind payments in the form of food and living arrangements (either onboard fishing vessels or on land) are also commonly practiced.

### Informality in the dried fish sector and the impact of externalities

A large proportion of the dried fish social economy in Maharashtra is informal, which has its pros and cons. The dried fish networks and trade routes have formed over hundreds of years, evolving and persevering through many shocks. Across multiple sites, we were informed that networks were robust even during the COVID-19 pandemic when other supply chains in fisheries took a major hit (Ragumaran et al., 2021).

However, we received varied responses on the impact of COVID-19 on the dried fish business. The first wave of the pandemic in India affected the dried fish sector. A few

processing workers informed us they could not return to their homes during their 2020 COVID-19 lockdown due to a lack of livelihood opportunities back home.

***"During the COVID-19 lockdown, our business was affected as there was hardly any fishing, and we survived by working for the boat owners."***

**- Migrant processor/worker from Versova**

The response to the pandemic varied across places and actors. A trader from Madh island informed us that, like all other big traders, he suffered losses of about INR 2 lakhs (200,000) while only small-scale direct-to-home vendors were able to make profits.

However, informality also means that the dried fish sector lacks visibility in 'formal' statistics and adequate representation in survey data. This trend is not limited to the state of Maharashtra or even India, but also other countries (Galappaththi et al., 2021). It limits the scope of legal instruments to check for scams and illegalities in the sector efficiently, and heightens the vulnerabilities and risks for the actors, especially the marginalized women and migrant workers who typically have low bargaining power. Similar themes emerged in some other studies in the region as well (Patilkhede et al., 2018). This was exemplified by one of the respondents who informed us about a trader who made off without settling his borrowings and his yearly payments:

***"These people come, stay on rent, take our fish (trade), establish trust... Now, approximately 4-5 crores, in total, of the entire village are gone. That man took (INR) 25000 from someone (fisherwoman), (INR) 1 lakh from someone, (INR) 3 lakhs from someone...and ran away. We are facing huge difficulties even registering the case, as that trader was not on any record."***

- **Senior fisher leader from Thane**

## Women and the dried fish sector of Maharashtra

The sustainability of fisheries and associated food systems depends not only on the socioeconomics and ecology of resources at the macro level but also on intersectional aspects such as gender, migration, religion, and other demographic variables (Ferguson, 2021). These intersectionalities can produce disparate policy outcomes for different sections of a population (Nightingale, 2011). While there is increasing consideration of these aspects, much remains to be unpacked. For example, even though women represent half of the total workforce, their efforts remain largely invisible and grossly undervalued (D'souza, 2020). They have a particularly strong presence in pre- and post-harvest activities, especially small-scale activities.

According to the 2016 fisheries census, women constitute 96% of the processing node. However, the data does not provide a discrete picture of how the participation of women varies across sub-sectors of fisheries, such as dried fish sectors, fresh and frozen fish exports, etc. We also do not have information on the roles of women (entrepreneurs, workers, business owners/partners) within these sectors. While the roles and their boundaries are unclear, the lack of appraisal of women's roles limits policymakers' ability to make gender-sensitive decisions.

The dried fish sector in Maharashtra presents an opportunity to take a nuanced look into the interplay of gender, fisheries economy, marginalisation, and empowerment. Like other DFM project sites, except for harvesting, women form the majority of the labour force in all the nodes across the local dried fish value chains and the upstream nodes in the interstate dried fish value chains (Galappaththi, 2021; Surathkal et al., 2023). From large-scale trawlers to small-scale dol netters, the management beyond fishing trips was observed to be coordinated by women. Even the dried fish workers assisting in cleaning, processing, and sorting were predominantly women.

As outlined earlier, the actors in the dried fish social economy in Maharashtra display flexibility in terms of roles. In addition, women in the fishing household also show a high level of pluriactivity (Bateman and Ray, 1994). This gendered pluriactivity in the dried fish sector is very likely an adaptive response to various stressors, both

endogenous (debt, lean seasons, health reasons, etc.) and exogenous (cyclone, climate change).

Many of the systemic issues of the dried fish sector are exacerbated by gender (Galappaththi et al., 2021). Some of the common issues that emerged from the study include use and ownership rights of drying yards, the burden of care, access to commons, financial and digital literacy, limited agency, and poor representation in decision-making at the policy level.

Within the dried fish sector in Maharashtra, some pilots have attempted to venture into value-addition activities through collective entrepreneurship. Daryawardi Mahila Sangh, a Mumbai-based women-led organization, exemplifies such a pilot initiative focused on marketing, aiming to bring together fisherwomen from the *Koliwadas* of Mumbai. While there are prominent issues, it is essential to note that the *Koli* fishing community of Maharashtra is also one of the most vocal and enterprising fishing communities (Team Stades, 2017; Vipinkumar et al., 2013). However, the lack of representation in the government and community institutions means that women's voices go largely unheard (Peke, 2013).

The success of such initiatives greatly depends on the market base. As outlined earlier, value addition in dried fish in Maharashtra faces limitations, particularly at downstream nodes, due to lower preferences for dried fish compared to fresh fish. Multiple respondents elicited the shortfalls of the government's intent to promote dried fish products. Despite multiple efforts through capacity and skill development programs, the sector faces challenges in translating these efforts proportionately into value realisation. A lack of needs assessments and the scoping of market access and product scalability were cited as significant pitfalls in past efforts

**Case study: Marol market**

Every Thursday, the Marol market sees a footfall of more than 2000 people to trade dried fish. Largely predominated by women, fishworkers from more than 20 *Koliwadas* from Versova to Arnala sell their catch to traders and retailers from all over India. The same place functions as a dried fish retail market for fisherwomen from the Versova and Madh island *Koliwadas* on Fridays and Saturdays. The market gives the essence of what the dried fish sector of north Maharashtra looks like, along with all its major value chains, its actors, and their dynamics, in a 2000 sq. m land parcel located in the heart of Andheri – a prime real estate neighbourhood of Mumbai (Vipinkumar et al., 2013). It symbolises the social movements and women's empowerment in Maharashtra (Vipinkumar et al., 2013).

The weekly dried fish wholesale and retail market has been running for over a century and has seen the laws and regulations transition from colonial rule to the contemporary multi-governance model of Mumbai (Vipinkumar et al., 2013). The market used to function without basic amenities, including sun-sheds, storage, and toilets until very recently. It was only around 2007, after years of efforts put into collectivisation and mobilisation by *Koli* women that the local authority took cognisance and provided sheds and platforms to sell fish. *Marol Bazaar Maase Vikreta Koli Mahila Sanstha* (MBMVKMS; transl. - Marol Market Fish-selling Koli Women's Society) was registered in 2007 to challenge constant pressures on the market in a structured manner. One of the major aims of the society is to get Marol Market notified specifically for dried fish and secure a fish-vending licence for all their 2000-odd women members. While the market is popular for dried fish, the authorities cannot notify a market for one specific product according to the current legal structure. Furthermore, licenses can only accommodate a fraction of vendors due to limited space.

The market also exemplifies the changing dynamics of local fishing communities with migrants. While the market space is a lucrative redevelopment opportunity for builders, the *Koli* women have to compete for space with migrants seeking a marketplace to sell other products, like vegetables, prepared food, and clothes.

While the dried fish wholesalers and vendors perceive the influx of migrants as negative and informed us about many clashes in past and present, it was interesting to observe different communities evolving to occupy their niches in the market. Upon inquiry, we found that the dried fish marketing society (MBMVKMS) in recent years has allowed actors other than dried fish sellers to sell their products as an adaptation strategy to attract customers and increase revenue. We were informed that there has been a decline in the quantity and quality of top-selling fish such as Bombay duck and *Acetes* shrimp. Allowing space for Jafarabad (Gujarat) wholesalers has helped the market retain bigger traders, which has consequentially helped the sale of other dried fish produced by local *Koli* women.

Retailing has taken a hit since the COVID-19 pandemic. Many dried fish vendors expressed deep concerns about the decline in customer numbers with the rise of the online retail business after the pandemic.

***"There is demand, we know that. But customers are getting cheaper prices online."***

- **Dried fish vendor from Marol market**

In addition, the respondents told us that fish vending at Marol market as the primary mode of livelihood support is only viable for a particular demographic. This demographic includes either older fisherwomen who are unable to dry fish under harsh conditions or fisherwomen who have lost their partners and fishing vessels at sea. These vulnerabilities make the survival of the Marol market as a dried fish market even more pertinent.

***"Friday bazaar has no demand. I have (INR) 50,000 - 60,000 worth of dried fish and haven't even made a sale of (INR) 500 since morning. How will we survive for the next eight days?"***

- **Dried fish vendor from Marol market**

***"We lost all our earnings in fisheries (of high-value fresh fish). We had to sell our boats and even our land to repay loans. Dried fish is our only hope now. That's why we fight (for the Marol market)."***

- **Dried fish vendor from Marol market**

*Figures 50-52 (left to right) - glimpses of the weekly dried fish wholesale market at Marol.*

*Figures 53-55 (left to right) - a woman inspecting the quality of ribbon fish at the wholesale market; a migrant worker working as a head loader for traders at the wholesale market; a glimpse of Friday retail market at Marol, which in contrast to Thursday stands quiet; Gujarati migrants selling clothes under the dried fish sheds.*

## Migrants and the dried fish sector of Maharashtra

As per the 2011 census, more than 2 million people from other states of India migrated to Maharashtra in search of better livelihood opportunities – the highest in India (Ministry of Labour & Employment, 2022). The seafood processing industry represents one of the largest employers in India's migrant workforce (Deshinkar and Akter, 2009). Although there is a lack of industry-wise disaggregated data on migrant workers in Maharashtra, the facts mentioned earlier suggest a substantial number of migrants are employed in fisheries. In addition to interstate migration, the industrialised coastal belt of Maharashtra also attracts people from other districts of Maharashtra (Cherian, 2023).

Despite being traditionally restricted to local fishing communities of Maharashtra, fishing has increasingly absorbed a huge migrant workforce as crew members. Beyond harvest, a multitude of low-skill jobs are done by migrant workers. We were informed that most processing workers are paid once per year (₹1-1.5 lakhs/year) at the end of the fishing season before they leave for their hometowns for 3-4 months during the monsoon season. We still need data on the recruitment process of migrant workers in the dried fish sector, especially in post-harvest activities. Although there are many documented cases of mistreatment of migrant workers in Indian fisheries, much of the data is restricted to the fishing crew, capturing inadequate housing and sanitation facilities, non-payments, discrimination, etc (Rao and Sophia, 2023; Roshan, 2016). Documentation of nuanced issues using disaggregated data based on gender and caste, including downstream workers, is required in Maharashtra (Deshinkar and Akter, 2009).

Like other seasonal employment-based sectors in India, the dried fish sectors also show circular migration, where a person keeps moving between host and home destinations (Cherian, 2023). We observed migration from multiple Indian states and recorded incidences of migration from the bordering country of Nepal. The largest proportion of dried fish processing workers we interacted with on the northern coast were small holder farmers from Andhra Pradesh. While there was a sizeable migrant population from Uttar Pradesh, Bihar, Madhya Pradesh, etc., workers from Andhra Pradesh constituted largest proportion in the fishing node. Women migrant workers

were mainly from adjacent districts within Maharashtra and were employed in fish processing (drying, sorting, cleaning, etc.).

A few communities have moved out of the circular migration loop and have slowly carved out a niche for themselves in the already diverse dried fish sector. For example, the *Kharva* fishing communities from the Jafrabad region in Gujarat, initially seasonal migrants, have now been residing in Versova for at least three generations. While they do not own fishing vessels, they have established themselves in the post-harvest nodes of the dried fish value chain as processors and wholesalers, dealing in dried fish for direct consumption as well as for FMFO production. Our conversations with them suggested that they do not have equal access to major wholesale centres like the Marol and Sewri dried fish markets, as the local fishing communities do. They prefer selling their dried fish directly to door-to-door traders. Non-fishing migrant workers have also made a niche as dried fish traders, truck drivers, etc., over the years.

*Figure 56 Dried fish processors from the Kharva community drying ribbon fish at Versova*

Previous researchers have described the perceptions of locals regarding migration in detail (Peke, 2013; Gaikwad & Nellis, 2017; Nair, 2021). The current study elicited mixed perceptions. While there are insecurities among the local fishers regarding migrant workers, they form a sizable and vital fraction across all nodes.

Even though the ownership of fishing vessels remains within the local community, respondents informed us of the effects of a sharp decline in the number of active fishers from the local traditional fishing communities. On one hand, the occupational shift amongst *Koli* fishers has made the role of migrant workers in fisheries and processing all the more necessary. On the other hand, the locals raised concerns regarding the loss of culture and skills due to changes in demographics in the region brought by the inflow of migrants and the emigration of local fishing community members to other states in India and other countries

*Figures 57-58 (left to right) migrant woman from Andhra Pradesh stacking dried Bombay ducks at drying units on Madh island; Hands of the same woman. Working with dried Bombay duck and ribbon fish regularly results in cuts to their palms and finger*

*Figure 59 Migrant worker from Andhra Pradesh collecting dried low-value fish in gunny bags*

## Drying fish in a fast-transforming landscape: the conundrum of the commons

The coastline and the coastal settlements across Maharashtra are undergoing a rapid transition driven by multiple factors, including climate-change-induced erosion and accretion, land-use changes on the shoreline to cater to the conventional aestheticisation and development discourses, infrastructural and built-up area changes, securitisation, tourism, and residential and industrial demand (Luo and Chi, 2022; Thackeray and Shitole, 2021). The small-scale fisheries and associated industries, especially the dried fish sector, are deeply affected by these developments (Kamath and Dubey, 2020; Malakar et al., 2018). The theme of diminishing land and ocean commons used for drying fish, mending nets, and harvesting fish has emerged across all sites, involving actors throughout the value chain. Even though the issue of diminishing commons has been covered by other researchers in great detail, especially in the context of Mumbai, focus on the dried fish sector tells a cohesive story of how a small-scale sector sustains in the face of pressures – both, near-shore as well as inland marketplaces (Bhide and Karmakar, 2013; Kamath and Dubey, 2020; Karmakar, 2010).

*Figures 60-61 (left and right) Bamboo drying racks on the Versova coasts; Ribbon fish being dried on jute bags at Malvan with a backdrop of fishing and tourist boats*

In Sindhudurg, observations and interviews have revealed that tourism has increased in the past five years. Fish drying platforms and dry fish storage hutments face land-grabbing pressures, as fish drying does not fit the mould of tourist centre aesthetics. In north Maharashtra, industrial development-related projects are increasingly shrinking the available drying areas.

***"Development projects like Vadhavan port are dangerous for everyone. The big ships will pass through the area where we cast our nets (dol). They will rip those nets and go to Vadhvan port... How would we live? Why is the Vadhvan port even needed?"***

**- Fisher from Vasai, Palghar**

In addition to the pressures of the 'perpetual growth' paradigm, the governance systems also confound the problem of the commons. Traditional fishing communities have been utilising coastal spaces to dry fish for centuries. In India, even though the ownership of this land is with the government, the governance of its use often lies at the intersection of legal and customary systems (Karnad, 2017). The recognition of the utilisation of commons by traditional fisherfolk is still at a nascent stage. For example, in Ramdas Janardan Koli vs Ministry of Environment and Forests, traditional fishing communities of Raigad district moved the National Green Tribunal to claim rehabilitation and compensation for the loss of livelihoods and right to fish due to project activities by Jawaharlal Nehru Port Trust (National Green Tribunal, 2015).

The rules governing land commons are even more complex in metropolitan cities like Mumbai, where many government institutions own and govern the public lands (Jha, 2018). Multiple owners characterise public land ownership in Mumbai, and the nature of their relationships affects the management, owing to conflicts and ambiguity regarding ownership (Jha, 2018; Udas-Mankikar, 2020). This ambiguity creates conditions for land-grabbing while the fishers are left to deal with tangled bureaucratic boundaries, leading to continuous and increasing marginalisation and disenfranchisement of the original inhabitants of Mumbai. The Marol dried fish market exemplifies this scenario as described in section 11, where the fishers face a constant threat of being thrown out to make way for a 'polished' shopping complex.

The dried fish sector captures all the diverse ways *Kolis* perceive their *Koliwadas* – an ocean from which to harvest fish, shores on which to process fish, verandas for the storage of fish, and markets in which to sell them. The dried fish sector not only claims space spatially but also through the embeddedness of dried fish in culinary culture. The process of urbanisation, through changes in the built environment and the stigmatization of dried fish, is causing both spatial and cultural spaces to shrink. The peri-urban region, such as the Gorai-Uttan coastal stretch, resembles socio-cultural islands in a rapidly urbanising centre of the Mumbai Metropolitan Region. Fish drying seems concentrated in pockets in urbanized and touristified social-ecological landscapes. All these factors challenge the resilience of the dried fish sector in Maharashtra.

# Conclusion and the way forward

## Small-scale but complex value chains and diverse actors

The dried fish sector in Maharashtra comprises a diverse range of actors in terms of roles and demography. Dried fish processing, especially sun drying, is low-input and affordable, making it accessible to a wide range of consumers with different preferences and requirements – from highland-dwelling tribal communities to inland-dwelling metropolitan consumers. With such a level of heterogeneity, interactions, dynamics, and perceptions also vary greatly. However, current policies and schemes, including Pradhan Mantri Matsya Sampada Yojana (transl. Prime Minister's Fisheries Scheme; DoF, 2020a) and the National Fisheries Policy (DoF, 2020b), do not account for the nuances demanded by small-scale fisheries and allied activities. Multiple respondents voiced concerns regarding the sociopolitical sensitivity of these policies.

## Diversion for fishmeal and fish oil

The growth of the fishmeal and fish oil (FMFO) sector in India over the last few decades, along with its reliance on the same small, affordable marine fish resources required by small-scale and local sector actors, endangers their socio-ecological security.

While respondents expressed their concerns regarding the increase in scale of diversion for fishmeal over the decades, they also mentioned that the fishmeal industry initially (1960s-70s) did provide small-scale fishers with an income for catch that was otherwise discarded. However, the history of the FMFO sector in India is closely associated with trawl fisheries and their bycatch (Dineshbabu et al. 2014). As fish protein grew in importance due to the need to supply feed to aquaculture and poultry, an increasing amount of bycatch from trawlers began to be used for fishmeal (Dineshbabu et al., 2024; Lobo, 2012). Unsustainable harvesting from the oceans to make FMFO has serious socio-ecological implications. The trawl bycatch is composed of juveniles of fish that are nutritionally, economically, and culturally significant for the dried fish sector. The lack of data on diversion in national-level statistics makes it difficult to move beyond a qualitative description of potential impacts and quantify them. Although the recent addition of 'reduction' (the technical term for the processing

of fish into FMFO) as a category in the Handbook of Statistics is indicative of the recognition of the importance of FMFO, we need data on catch utilization and diversion across the value chains of different products in the dried fish sector (DoF, 2023). This will allow us to understand the scale and identify possible transformation points, such as preventing diversion due to inefficient handling of consumption-grade dried fish products or regulating species utilization by the FMFO industry.

Formulating regulations for the FMFO sector is difficult without considering their impact on actors in the dried fish sector. We observed that the dried fish sector, especially in north Maharashtra, is deeply intertwined with the fishmeal, poultry (and likely fertilizer) industry. The value chain for fishmeal-grade dried fish is well established and overlaps with the value chains of consumption-grade dried fish products (Figure 47). The fishmeal grade dried fish sector provides additional revenue and creates livelihood opportunities for many actors, especially the marginalised sections, including single women and migrants. A decline in dried fish processing was observable in Malvan, likely making the processors vulnerable to increasing pressures from the tourism industry. These aspects highlight the importance of considering associated sectors in policymaking for the FMFO sector.

**Unique biocultural identities**

One of the oldest fish processing techniques known is using sunlight and salt for preservation. The sector's biophysical resources and socio-ecological properties have allowed it to evolve knowledge, culture, and practices that are unique to the system (Gavin et al., 2015). The dried fish system in Maharashtra is a good representation of how biocultural relationships and diversity evolve (and are innovated) with time and respond to a dynamically changing environment.

Unlike other processed seafood products, such as canned fish, fillets, or fish oil, the locally and regionally specific dried fish sector has resisted the pattern of commodification in the seafood sector (Faybinyi et al., 2022; Lobo, 2012). Although the commodification of fish offers better opportunities for integration into formal systems and access to global seafood value chains, it also raises questions about the continuity of long-standing social structures formed around the utilization of dried fish.

Even though similar fish species are harvested along the coast, slight differences in harvesting or processing can result in different quality dried fish products. For example, dried Bombay duck from Arnala stands out for its different processing, while Bombay duck (dried or fresh) from Satpati is well-known for its place of origin (harvesting). In addition to processing and harvesting, dried fish products, like products from other small-scale and local sectors, also carry the heritage, social, and cultural identities of the harvesters and processors. Although further investigation is needed, the scoping study suggests that these properties play a role in seafood consumer choices. These properties highlight the importance of conserving local biocultural diversity in fisheries and strategically encouraging dried fish products to enhance the sustainability of small-scale fisheries. It can strengthen local economies, support access to resources, and promote responsible seafood consumption (Martino et al., 2023; Reed et al., 2013).

The preference for local products does not mean that the dried fish sector of Maharashtra is foolproof or safeguarded against issues such as pollution, heavy metal contamination, low hygiene, or spoilage, as many studies have pointed out (Joseph et al., 1988; Karangutkar et al., 2020). Interestingly, however, no respondents in our study raised these issues with product contamination. Based on responses, the quality check, even though limited to organoleptic testing by value chain actors, all procurement points seem to be robust in terms of the quality of dried fish products. A larger-scale quality testing study across the value chain nodes and the coastal stretch will be beneficial in validating these claims and strategising interventions if required.

**Other areas for further research**

1. Opportunities for better social infrastructure for women – In all our interviews, we observed that the social infrastructure for fisheries is present and actively functioning in many places, such as Satpati and Uttan. However, the institutions' mandates and roles rarely or minimally extend to the dried fish sector. Multiple actors opined on the need for initiatives and interventions focused on dried fish, similar to those in the fresh fish sector.

Even though strong voices within the community raise issues and mobilise fishermen to claim their position, conscious efforts are needed to identify and nurture the second and third lines of leadership in prevalent women-led organizations to maintain momentum. The dried fish processing and marketing activities are especially promising in organizing women's self-help groups and fostering skills like entrepreneurship, leadership, and financial management.

2. Need-based market interventions - Interventions to increase market access that are tailored to the local social economies can help alleviate and empower the local communities (IFAD, n.d; Sahan and Fischer-Mackey, 2011). The dried fish sector in Maharashtra has immense potential for interventions to address these concerns. While we know the reasons impacting the markets and trade flows in the dried fish sector, viz., logistical and transport costs, product quality, imbalances in bargaining power due to inter-stakeholder dynamics, and social exclusion and marginalisation, we need focused studies to understand and prioritise some of these drivers for interventions.

3. Invisible sub-sectoral social economies - The dried fish sector is largely invisible. However, the degree of invisibility also varies within the sector. The trade and flow of dried fish between the local fishing communities and forest or highlands-dwelling tribal communities is an example of such social economies. The contribution and importance of such local economies remain largely undocumented. In our conversation, multiple respondents echoed the need to document value chains and consumption patterns in these sub-sectors. Improving understanding of these sub-systems is important not only for conserving traditional knowledge systems and evaluating their economic contribution but also for their contributions to livelihoods, nutritional, and cultural security. It can help policymakers formulate realistic policies. For example, it is well documented that tribal communities residing in the Western Ghats of Maharashtra, notably from the Palghar district, face significant challenges related to nutrition security, resulting in elevated levels of malnutrition (Ghosh and Varekar, 2019). In addition to better implementation of existing schemes and funds allocation for nutrition, it is also important to factor in the dependence of tribal communities on non-conventional nutritional

sources, such as dried fish. As food preferences and choices associated with diet are regulated by multi-level factors, focusing on diet diversification with affordable superfoods can greatly help in building nourished communities and strong local food systems, as seen in Odisha (Mohan, 2022; Monterrosa et al., 2020).

## Acknowledgements

We extend our heartfelt appreciation to the fisher communities in our research locations for their unwavering support throughout the study and beyond. A special acknowledgement goes to the fisherwomen involved in the dried fish sector, whose invaluable contributions were instrumental in bringing this report to fruition. We are thankful to Ms. Rajashree Bhanaji and Mr. Sunil Chowre (Marol Dried Fish Market Association), Dr. Wasave (Professor, Kokan Krishi Vidyapeeth), Ms. Ujjwala Patil (Maharashtra Macchimaar Kruti Samiti), and Ms. Madhuri Patil (Daryavardi Mahila Sangh) for helping us in snowballing the contacts for the study. We thank Ranjini Sen for providing editorial support and our intern, Ms Gautami Meherkar, for her dedicated efforts in assisting with interview transcriptions.

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## Annexure 1

**Common Questionnaire for Key Informants**

1. Demographic details
   - 1.1. Name:
   - 1.2. Occupation (boat owner, worker, trader, retailer, etc.):
   - 1.3. Secondary occupation: (if any)
   - 1.4. Gender (infer):
   - 1.5. Age:
   - 1.6. Religion (infer):
   - 1.7. Caste/ethnicity (infer):
   - 1.8. Highest level of education completed:
   - 1.9. Place of origin. If different from the interview location, when/why did they move here
   - 1.10. Family details: (married/unmarried, children)

2. General questions about dried fish in the region
   - 2.1. Is dried fish made/processed in this region? If yes, please tell us more about the locations where fish are dried.
   - 2.2. What purposes is it used for? - Only for direct human consumption or for fishmeal/fish oil production as well?
   - 2.3. How many markets sell dried fish in this area? Is dried fish sold alongside other seafood products, such as fresh/frozen fish?
   - 2.4. Which are the peak months/seasons for dried fish production?
   - 2.5. Which are the peak months/seasons for the sale of dried fish?
   - 2.6. What are the preferred dried fish products in this region?

3. Species used and fisheries
   - 3.1. Which species are preferred for drying?
   - 3.2. Usually, which fishing gear or craft catches these species? (details on fishing operations- mesh size, fishing locations, depth, seasons, etc.)
   - 3.3. Did the same gears catch these species earlier (5-10 years ago)?
   - 3.4. Are these species targeted or caught as bycatch? In the past? (If bycatch, what species are targeted?)
   - 3.5. Have their catches increased or decreased over 5-10 years?
   - 3.6. Are these fish consumed fresh as well?
     - 3.6.1. Are these used for other types of processing? (fillets, fishmeal, and fish oil, etc.)
   - 3.7. How do the quality, size of fish, seasons, etc., catch matter while choosing fish to dry?
     - 3.7.1. Are bigger or better-quality fish preferred for sale fresh rather than dried/cured? (E.g., in the case of shrimp)
     - 3.7.2. Is a proportion of the catch distributed among the crew members for drying?

3.7.3. Which species in the dried form are preferred locally, and which ones are exported/ supplied to other states/countries?

4. Processing
   - 4.1. Can you tell us how the dried fish products are produced? (Different ways of production – traditional, large scale, etc, process; types of products; shelf-life; spaces and commons; amount/capacity; material required; preferable seasons/changes in production with seasons; etc.)
   - 4.2. How does the process differ with different species? (w.r.t to salt, sunlight, time duration, etc.)
   - 4.3. Has the process changed over the years in this region? How? (innovations, new technology, etc.)
   - 4.4. Are there other methods for preserving, processing, or curing fish? Are these done in this area? (Details wrt dfm, if required)
   - 4.5. Are the products sold to FMFO plants as well? At which stage of the processing is the catch sold to fishmeal plants, as compared to selling in local markets?
   - 4.6. How many people work in dried fish production in this region?
     - 4.6.1. Men, women, migrants, age range, place of origins?
     - 4.6.2. Are they from fishing households/communities?
     - 4.6.3. How has it changed over the decade?
   - 4.7. How are the workers hired (if hired; contract/temporary)?
     - 4.7.1. How are they paid? Is the pay higher in other processing plants/factories?
     - 4.7.2. Where do they live?
   - 4.8. What are the major investments needed in dried fish processing? (Drying racks, salt (other chemicals), storage, packaging, etc.)
   - 4.9. What is the current price of different products? How does it vary with species and seasons?
   - 4.10. Have the prices of different products changed over the past few years?
   - 4.11. Are the prices of dried fish products the same for selling them to traders, retailers, wholesalers, or customers?
   - 4.12. How is it supplied to retailers/wholesalers? Through traders or processors themselves?
     - 4.12.1. Do processors also store the dried products? How long?
     - 4.12.2. Do they also sell the fish directly to consumers? (if yes, demographic details)
   - 4.13. Are there any standards or rules by the government for dried fish processing?
5. Traders and wholesalers
   - 5.1. How many traders supply fresh catch to dried fish producers in this region? (M/F, age, region, caste, etc.)
     - 5.1.1. Has the number/demography changed over 10 years?
     - 5.1.2. From which places do they source fresh catch?
     - 5.1.3. To which places do they supply fresh catch?

5.2. How many traders supply dried fish to retailers/ wholesalers? (M/F, age)
    5.2.1. Has the number/demography changed over 10 years?
    5.2.2. Where do they source from?
    5.2.3. To which places do they supply?
5.3. How many wholesalers of dried fish do business in this area?
    5.3.1. Where are they generally from?
    5.3.2. Has the number/demography changed over 10 years?
    5.3.3. Where are their businesses located in this region? Are there any wholesale markets in this region?
    5.3.4. Which are the major ones, and where are they located?
    5.3.5. Which are the smaller ones and where are they located?
    5.3.6. Where do the wholesalers source the dried fish products? (traders/processors)
    5.3.7. From whom?
    5.3.8. Where do they supply? (distributors/retailers to other states)
        5.3.8.1. If exporting, do they have to register with the government (MPEDA)?
    5.3.9. Do they store dried fish products? For how long? And where do they store them? (investment in storage-related queries)
    5.3.10. Do they hire workers? (demography, for what work)
        5.3.10.1. If yes, how are they paid
5.4. Which products are the highest traded? Why?
    5.4.1. How does it change with the seasons and the months, and how has it changed over the years? Why? (because of consumer demand, because of high/low catches, etc.)
5.5. Which areas or places (in MH/Ind/Int.) demand higher quantities of dried fish products?
    5.5.1. Which products are traded/supplied the most?
    5.5.2. Does it change within a year? Over the years?
5.6. Which months are generally high sales?
    5.6.1. Has it changed over the decade (decades if the respondent can provide info)? Why or why not?
5.7. Do the same traders deal with both fresh fish and dried fish?
    5.7.1. Do traders (same or otherwise) prefer selling/supplying to the fresh market/ FMFO rather than dried fish processors?
    5.7.2. Has the preference changed in the past few years? If yes, why?
5.8. How do traders/wholesalers pay fishers/dried fish processors? What is their commission? Do they lend money to pay/take an advance/credit based?
5.9. What is the current wholesale price of the different dried fish products?
    5.9.1. How (does it vary/ has it changed) with days per week/seasons/over the past decade? Why?

5.10. Do they also own/have any agreement with fishers/processors/retailers?
5.11. Do they deal with the same fishers/processors (are the suppliers fixed for every trader)? Do they also work on a contractual basis with any processing companies (dried fish/FMFO) or other wholesalers or retailers?
5.12. Do traders/wholesalers also arrange the transport? (details of transport and logistics)

6. Retailing
   6.1. How many people sell dried fish in the region? (Men, Women, Locals)
   6.2. Where are the major market areas in this region?
   6.3. Can you tell us the quantity of dried fish sold per year?
   6.4. Which products are high in demand?
   6.5. How does the demand change with seasons?
   6.6. Has it changed over the years?
   6.7. What are the current prices of the different dried fish products in the region? In the peak season?
7. Perception-related questions
   7.1. Is dried fish more affordable than fresh fish? Is it healthier as well?
   7.2. Are dried fish culturally preferred in this region? Can you tell us more about it? Has the community's preference changed due to urbanization or migration from other states/communities/castes?
   7.3. What is the perception about dried fish and the dried fish industry in the general public as compared to 10 years ago (or earlier if the respondent can answer)?
   7.4. Is dried fish good for health? (Also prod use of chemicals and its impact on health)
   7.5. How did COVID-19 affect the dried fish industry/business in this region? Has it fared better than other seafood processing businesses facing supply chain issues?
   7.6. Has the growth of the fishing industry in this region changed the dried fish processing industry?
   7.7. How have the recurrent storms affected the fisheries and dried fish processing? Have such changes increased in the past 5-10 years?
   7.8. Do you think the demand for (same) species by the fishmeal and fish oil industry has an impact on the availability of fresh fish for drying / dried fish availability for direct consumption as food?
   7.9. Are there any fishers', producers', traders', retailers' associations, or SHGs? What is their role (w.r.t DFM)?
   7.10. Does the government support dried fish activities in this region? (schemes, policies, etc.)
   7.11. How important are open areas for drying fish/ selling, etc.? Do government or private actors hinder the industry through activities such as taking away beaches and other open areas?

7.12. What do you think about the prospects of the dried fish industry in the next 5-10 years? What can be done for people involved in the business?

## Annexure 2

**Segment-wise questionnaire guide - Fishers**

1. *General questions about fishing*
    - 1.1 Is this a permanent or temporary settlement? When did fishers first settle/fish from this location?
    - 1.2 If permanent settlement, how many households live in this settlement?
    - 1.3 How many households were there in the village 5/10 years ago? How many households own agricultural land?
    - 1.4 What are the main crafts and gears that are used in fishing?
    - 1.5 How many own fishing boats? How many owned fishing boats 5/10 years ago? How many boats are there? How many boats were there 5/10 years ago?
    - 1.6 How many households have members who work as fishers for other households? How many households trade fish? How many households operate fish processing businesses? How many households have members who work in the fish processing industry?
    - 1.7 If a temporary settlement, during which months do fishers settle here? How many boat owners operate here? 5/10 years ago? How many boats were there? 5/10 years ago? How many men/women workers are there here? 5/10 years ago? Where do boat owners come from? Where do their workers come from?
    - 1.8 Are there any boat owner associations here?
    - 1.9 What are the ethnicities/religions/caste groups that are involved in fishing?
    - 1.10 Is ice widely available here? When did this happen? Has this affected the proportion of fish sold fresh vs. processed? (Provide details.) When did fishing become mechanized here? How did this affect fishing methods, effort, and landings?

Before proceeding further with the interview, please establish that the interviewee is involved in fishing for fish that are subsequently dried – all subsequent questions should relate to fishing in which some of the catch is usually dried

2. *Specific questions about fishing*

Demographic details (To be recorded and stored separately)

- 2.1 Interview location:
- 2.2 Role of interviewee (boat owner, worker, trader, retailers etc):
- 2.3 Name(code/pseudonym):
- 2.4 Phone number
- 2.5 Gender:
- 2.6 Age:
- 2.7 Religion: (infer rather than ask unless appropriate)
- 2.8 Caste/ethnicity (infer rather than ask unless appropriate):

2.9 Highest level of education completed:
2.10 Place of origin. If different from interview location, when/why moved here
2.11 Family details: (married/unmarried, Children)

3. *Assets/who has what/who does what/what do they do with it?*
   3.1 Number of boat/s owned; size of boat/s (length, horsepower). When acquired, cost; source of capital; source of capital for first boat; gears fished; number of gears; cost.
   3.2 What are the main gears used for fishing here? When were these gears first introduced? Where from? What are the main fish species caught in these gears? Which among these are the main species dried? Why dried, not sold fresh?
   3.3 When did the respondent begin fishing? What was the owner's occupation before this? Do they own any agricultural land? How much? Do they have any fishing-related businesses (e.g., processing, trading)? Provide details. In which order were they established?
   3.4 Do members of your family join you in fishing? If so, who? Frequency?
   3.5 Do other members of your household/family eat fish? How many and who? What type of fishing do they do?
   3.6 Besides worker wages, boat, net repairs, what are the main costs associated with fishing (fuel, ice, food for crew) – how much is spent on each per trip or per season?

4. *Buy/who does what?*
   4.1 What are the 4 main species/types of fish landed (ranked)? Which fishing gears are used to catch them? Where are the fishing grounds?
   4.2 How much of the total quantity of fish landed did each species account for in the last 12 months? How much of each was sold for consumption as fresh fish, and how much was used for processing? What determined whether the fish was marketed fresh or processed?
   4.3 During which months does the respondent fish? Which are peak/low months? How much fish is landed on average in high/low months/weeks? 5 years ago? 10 years ago? If changed relative to now, why?
   4.4 What was the price per unit of each of the four main types of fish landed, for fish of average size and quality, during the past month? What was the average price 3 years ago/5 years ago?
   4.5 How long are fishing trips on average? Are they collecting boats used to pick up fish and deliver supplies? How long do fishers spend at sea on average?

5. *Make/who does what/who gets what?*
   5.1 What is the average profit you make from fishing? How much of it is made from selling fish to the dried fish merchant?

5.2 In the past 12 months, did the boat owner use any credit source for fishing? What were the source/s? What were the terms (e.g., rate of interest, duration, commitment to sell fish to lender); what was the loan/s purpose?

5.3 Is the fisher/boat owner a member of any association? If there are disputes with workers, how are they usually solved?

5.4 If there are disputes with processors, how are these usually solved?

5.5 If there are disputes with traders, how are these usually solved? Please provide details of any specific examples that occurred in this business – what happened, which institutions and actors were involved, and what were the outcomes?

6. *Sell/who does what/who gets what?*

6.1 How many fishers work on the boat: are they women/men/children? Does the boat owner also captain the boat? What are their roles? Are they hired long-term or on a casual basis? How much are they paid, and how frequently? Do they receive any payment in kind (give details)? Where do they originate from, and what ethnicity/religion? How are they recruited (e.g., word of mouth, through a broker, other)? Do they receive any advance wages (give details)?

6.2 How is the fish landed utilized (e.g., own processing, sell to processors, sell to urban traders, sell to local retailers, etc.)? If a mix, give proportions. At auction, in the market. How much is sold on average in each transaction?

6.3 To whom does the business sell (e.g., always the same buyer, many different buyers; different products to different buyers)?

6.4 Where are the buyer/s located - e.g., local collector, trader in local wholesale market; trader in distant wholesale market/s (specify markets)? Why sell to this buyer – e.g., took advance, good relationship/trust, relative, nearby, provides collection service, etc.? If you took an advance, provide details (amount, timing, interest, repayment schedule, whether it prevents selling to others, whether the sale price is discounted). How does the business transport its product to market? Has this changed in the past 5/10 years?

6.5 Aside from drying, are there other ways to preserve fresh fish?

7. *Social economy*

7.1 Ever received any support from the government (give details)? Ever received any support from NGOs (give details)?

7.2 What is the most significant change that has occurred in your fishing during the past 10 years? How would you describe the prospects for fishing over the next 10 years? What is the biggest challenge that you currently face as a fisher?

7.3 Would you like your children to take up fishing?

7.4 How significantly do government regulations influence how you fish?

7.5 If significant, what regulation is most important?

7.6 Do you consume dried fish? If so, how much and what quantity do you consume?

7.7 Have there been significant changes in the technology used to catch or store fish in the last 5 /10 years? If so, what are they?

# Annexure 3

**Segment-wise questionnaire guide - Processors**

1. *General questions about the Processors*
   - 1.1 How many processors are there in this locality?
   - 1.2 For how many years has processing been happening here?
   - 1.3 How many processors were there 5/10 years ago?
   - 1.4 Are there any processor associations here? If so, how many are there? Is membership compulsory?
   - 1.5 What is the purpose/functions of this association/s? Does the association enforce any rules? Who leads the association?
   - 1.6 How many workers are employed by the processors? How many M/F?
   - 1.7 How many small/medium/large-scale processors are there in the locality?
   - 1.8 What are the main species used in processing here?
   - 1.9 What are the peak fishing seasons? Do other factors, like monsoon/flooding, affect fishing?
   - 1.10 What are the challenges in the processing sector here?
   - 1.11 Are there any government policies that help or hinder fish processing?
   - 1.12 How has the supply and composition of fish changed over the past 10 years? What do you think are the reasons for these changes?
   - 1.13 What are the changes in processing within the past 10 years? What do you think are the reasons for these changes?
   - 1.14 How does the business procure fresh fish (e.g., own fishing, buy from fishers, buy from traders, etc., if a mix, give proportions); at auction, in the market, do you buy directly or via an advance contract? How is fresh fish usually paid for (e.g., immediately in cash, after the sale of dried product)?

2. *Specific questions about processing*

Demographic details (To be recorded and stored separately)

- 2.1 Interview location:
- 2.2 Role of interviewee (processor, any overlapping role?):
- 2.3 Name(code/pseudonym):
- 2.4 Phone number
- 2.5 Gender:
- 2.6 Age:
- 2.7 Religion: (infer rather than ask unless appropriate)
- 2.8 Caste/ethnicity (infer rather than ask unless appropriate):
- 2.9 Highest level of education completed:
- 2.10 Place of origin. If different from the interview location, when/why was it moved here
- 2.11 Family details: (married/unmarried, Children)

3. *Assets/who has what/who does what/what do they do with it?*
    - 3.1 When did fish drying first begin in this location? How many other fish processing businesses are there here? How many were there 5 years ago? 10 years ago?
    - 3.2 When was this fish processing business established? What was the occupation of the owner before establishing the business? Does the owner have any other fishing-related businesses (e.g., fishing, trading) – provide details. In which order were they established?
    - 3.3 Who owns the land where this business is located? If rented, who from?
    - 3.4 How large is the fish drying area? What drying equipment does the business own (e.g. drying racks, frames, mats, nets)

4. *Buy/who does what?*
    - 4.1 During which months does this business operate? Which are peak/low months?
    - 4.2 Is the supply of fish processed fairly constant during the month, or does it fluctuate with the lunar cycle?
    - 4.3 How much fish (wet weight) is procured on average in high/low months/weeks? How much in total for the whole season? What was the total 5 years ago? 10 years ago? If changed relative to now, why?
    - 4.4 What are the 4 main species/types of fish processed (ranked), and how much of the total quantity of fresh fish procured did each account for in the last complete drying season? What kinds of fishing gear are used to catch them?
    - 4.5 What was the price per unit of each of the four main types of fish processed, for fish of average size and quality, during the past month? What was the average price 3 years ago/5 years ago? Why are these fish processed rather than sold fresh?
    - 4.6 What is the drying process used for each of the 4 main types of fish processed? Describe in detail how fish is prepared before drying (e.g., sorting, gutting, de-heading, tying tails, boiling, salting, applying pesticide, rotating, etc.). Who performs each of these tasks? Length of time to dry,
    - 4.7 Where do you get your raw materials, like salt, from? Any other materials/chemicals required?
    - 4.8 What was the price per unit for dried fish of each of the four main types of fish processed, for fish of average size and quality, during the past month? What product grades are there (e.g., size, colour, quality)
    - 4.9 Do you give credit to the fishermen who sell you the fish?

5. *Make/who does what/who gets what?*

5.1 How many long-term women/men/child workers does the business employ? During which months? What are their roles?
5.2 How much are they paid, and how frequently? Do they receive any payment in kind (give details)? Where do they originate from, and what ethnicity/religion? If not local, where do they live while working here? Does this business provide accommodation?
5.3 How are they recruited (e.g., word of mouth, through a broker)? Do they receive any advance wages (give details)?
5.4 Is the business owner a member of any association? If there are disputes with workers, how are these usually solved? If there are disputes with other processors, how are they usually resolved? If there are disputes with fisheries or traders, how are these usually solved?
5.5 Please provide details of any specific examples that occurred to this business – what happened, which institutions and actors were involved, and what were the outcomes?
5.6 How many temporary women/men/child workers does the business employ? During which months? What are their roles? How much are they paid, and how frequently?
5.7 Do they receive any payment in kind (give details)? Where are they from, what ethnicity/religion? If not local, where do they live while working here? Does this business provide accommodation? How are they recruited (e.g., word of mouth, through a broker)?
5.8 Would you categorize your business as small, medium, or large? Why?
5.9 Are you a member of any association? If so, which one and why?
5.10 Are there any labour unions in your establishment?
5.11 If so, are there any agreements with them regarding the wages and benefits for labourers?

6. *Sell/who does what/who gets what?*

6.1 How frequently does the business sell dried fish? How much is sold on average in each transaction? To whom does the business sell (e.g., always the same buyer, many different buyers; different products to different buyers)?
6.2 Where are the buyer/s located - e.g., local collector, trader in local wholesale market; trader in distant wholesale market/s (specify markets)?
6.3 Why sell to this buyer – e.g., took advance, good relationship/trust, are they relatives, provides collection service, etc.? If you took an advance, provide details (amount, timing, interest, repayment schedule, whether it prevents selling to others, whether the sales price is discounted). How does the business transport its product to market? Has this changed in the past 5/10 years?

6.4 Do you provide credit to the buyers? If so, what are the terms of the credit?

6.5 Does the owner have any other business? Do any of the owners' families have any other business?

7. *Social economy*

7.1 Ever received any support from the government? (Give details.) Ever received any support from NGOs? (Please provide details.)

7.2 Are there any government regulations that restrict their business?

7.3 Are there any health concerns for the workers?

7.4 What is the most significant change that has occurred in your fish processing business during the past 10 years? How would you describe the prospects for this business over the next 10 years? What is the biggest challenge that this business currently faces?

7.5 Would you like your children to carry on this profession, or would you recommend others to take it up?

7.6 Do you consume dried fish? Which species and how much?

# Annexure 4

## Segment-wise questionnaire guide - Traders

1. *General questions about the market*

1.1 What are this market's opening hours?
1.2 Are there any days during the week when trade is particularly high or low?
1.3 Are there any months during the year when trade is particularly high or low? Which months? Why are these peak or low months?
1.4 When was this market established?
1.5 Who owns and manages the market? Do they have an office in the market?
1.6 Do the market authorities keep records of the quantities of fish traded?
1.7 Is there a trader's association/s in this market?
1.8 What is the purpose of the association? What are its activities?
1.9 Is membership compulsory for traders in this market? How many members does the associations/have?
1.10 What are the association rules? Who leads the association?
1.11 How many traders are there in this market now? How many were there, 5-10 years ago?
1.12 Which places do most traders in this market originate from?
1.13 What is the main ethnicity/religion of traders in this market?
1.14 How many workers are employed in the market? How many M/F?
1.15 How many other dried fish wholesale markets are there in this country or state? Where are they located? Please rank them in order of size
1.16 What are the five most important species and products on traded in this market? What share of total trade in the market dos each of these account for? How about 5, 10 years ago?
1.17 Do some traders specialize in particular species or products? How many traders specialize in each kind of product/species?
1.18 How would you define small, medium, and large traders in this market?
1.19 What terms are used to refer to different types of traders operating in this market?
1.20 What are the main types of vehicles that transport dried fish to and from this market?
1.21 What are the main sizes of vehicles (e.g., 6 wheel-truck, 12 wheel truck)
1.22 How much dried/fermented product can be carried by each vehicle?
1.23 How many of each size of vehicle visit the market each day during peak/low season? How about 5 and 10 years ago?
1.24 What sort of challenges do traders in this market face?
1.25 Are there government policies or actions that benefit or hinder the dried fish trade?
1.26 How has the supply and composition of fish traded through this market changed within the past 10 years? What do you think are the reasons for these changes?

1.27 How has consumer demand for fish traded through this market changed within the past 10 years? What do you think are the reasons for these changes?

*2. Specific questions about businesses*

*Demographic details (To be recorded and stored separately)*

2.1 Interview location:
2.2 Role of interviewee (boat owner, worker, trader, retailer, etc.):
2.3 Name(code/pseudonym):
2.4 Phone number
2.5 Gender:
2.6 Age:
2.7 Religion: (infer rather than ask unless appropriate)
2.8 Caste/ethnicity (infer rather than ask unless appropriate):
2.9 Highest level of education completed:
2.10 Place of origin. If different from the interview location, when/why was it moved here
2.11 Family details: (married/unmarried, Children)

*3. Assets/who has what/who does what/what do they do with it?*

3.1 When did you establish this dried fish trading business? What did you do before that? Why did you decide to start this business?
3.2 Is the business a family firm? If so, in what capacity are family members involved in the firm?
3.3 Did/does any other family member have a similar trading business or business related to fishing?
3.4 Do you have any other businesses related to fishing (e.g., own boats, drying operations, retail shops)? If so, in what order did you establish them and why?
3.5 Do you have any businesses unrelated to fishing? What are they?
3.6 Do you have any agricultural land? How much
3.7 Do you own any vehicles used for this business? Give details
3.8 Do you own any land or buildings used for this business? Give details

*4. Buy/who does what?*

4.1 What are the five most important species/products that you trade?
4.2 What % for your total business does each of these account for? How about 5-10 years ago? Why has this changed?
4.3 How do the volumes of fish purchased vary by season? Which months are high/low season?
4.4 How much of each of the 5 main products/species do you procure on average in one month during high season, and during low season? How about 5, 10 years ago? Why has this changed?

4.5 What are the main locations that you source each of these species/products from?
4.6 Are any of the fish you buy imported from abroad? Give details
4.7 What type of suppliers do you usually procure these from (e.g., traders in this market, fish driers, etc.)?
4.8 How many regular suppliers do you have? How about 5, 10 years ago? Why has this changed?
4.9 What % of the fish you trade comes from each type of supplier?
4.10 How do you usually procure from these species/products (e.g., buy at auction, make an agreement over the phone, or advance contract)?
4.11 Do you provide credit to your suppliers? Which suppliers?
4.12 How common is this (e.g., what % of each type of supplier do you provide credit to?) How about 5, 10 years ago? Why has this changed?
4.13 What are the terms of the credit you provide (e.g., amount, duration, interest, requirement to sell to you)?
4.14 What are the details of any contracts or agreements you have with your suppliers?
4.15 How do you ensure that suppliers who take credit repay their debts?

*5. Make/who does what/who gets what?*

5.1 How do you earn an income from trading - by buying and selling or by taking a commission for organizing sales?
5.2 How long does fish usually remain in your possession? What is the maximum length of time?
5.3 How do you store fish?
5.4 How do you ensure that the fish you store remains in good condition?
5.5 Do you experience any product losses during storage? Why/how much?
5.6 Do you grade or clean the fish you store? Do you use any preservatives?
5.7 How many male and female workers do you employ (permanent and temporary)?
5.8 What are their roles?
5.9 What proportion of your workers are family members (if any)?
5.10 Where do your workers originate from? How do you recruit them? Where do they live?
5.11 How are workers paid (e.g., daily, monthly, piece rate)? How much are they paid?
5.12 Do they receive wages in advance? How much, why?
5.13 Have technological changes since you began working in this profession changed the business?
5.14 Would you categorize your trading business as small, medium, or large? Why?
5.15 Do you take credit for operating this business? If so, from what sources, on what terms? How about 5, 10 years ago? Why has this changed?
5.16 Are you a member of any business association? Which and why?

5.17 Does the association mediate disputes? Can you give an example?
5.18 Do the association/s have any political power or influence – describe?

*6. Sell/who does what/who gets what?*

6.1 Which months are high/low season for sales? Why has this changed?
6.2 What are the main locations (markets/areas) that you sell each of these species/products to?
6.3 Are any of the fish you sell exported? Give details.
6.4 What type of customers do you usually supply fish to (e.g., traders in other wholesale markets, local retailers, etc.)?
6.5 What % of the fish you trade is sold to each type of customer?
6.6 How do you usually organize sales to customers (e.g., sell at auction, agree over the phone, or advance contract)?
6.7 How many regular customers do you have? How about 5, 10 years ago? Why has this changed?
6.8 Do you provide credit to any of your customers?
6.9 How common is this (e.g., what % of each type of supplier do you provide credit to?) How about 5, 10 years ago? Why has this changed?
6.10 What are the terms of the credit you provide (e.g., value, form, duration, interest, requirement to buy from you)?
6.11 How do you ensure that customers who take credit repay their debts?

*7. Social economy*

7.1 Is this a well-regarded profession?
7.2 What sort of person does well in this work?
7.3 Is this an employment choice you'd recommend?
7.4 Would you like your children to do this job?
7.5 Does your family consume dry fish? If so, which species and how much?

# Annexure 5

**Segment-wise questionnaire guide - Retailers**

1. *General questions about the market*
   - 1.1 What are this market's opening hours?
   - 1.2 Are there any days during the week when business is particularly high or low?
   - 1.3 Are there any months during the year when business is particularly high or low? Which months? Why are these peak or low months?
   - 1.4 When was this market established?
   - 1.5 Who owns and manages the market? Do they have a stall/shop in the market?
   - 1.6 Do the market authorities keep records of the quantities of fish traded?
   - 1.7 Is there a retailer's association/s in this market?
   - 1.8 What is the purpose of the association? What are its activities?
   - 1.9 Is membership compulsory for retailers in this market? How many members does the association/s have?
   - 1.10 What are the association/s rules? Who leads the association/s?
   - 1.11 How many retailers are there in this market now? How many were there 5-10 years ago?
   - 1.12 Which places do most retailers in this market originate from?
   - 1.13 What is the main ethnicity/religion of retailers in this market?
   - 1.14 How many workers are employed in the market? How many M/F?
   - 1.15 What are the five most important species and products you sell in this market? What share of total trade in the market does each of these accounts account for? How about 5, 10 years ago?
   - 1.16 Do some retailers specialize in particular species or products? How many retailers specialize in each kind of product/species?
   - 1.17 How would you define small, medium, and large retailers in this market?
   - 1.18 What terms are used to refer to different types of retailers operating in this market?
   - 1.19 Do retailers operate outside the market (on two-wheelers/bicycles)?
   - 1.20 What are the main types of vehicles that transport dried fish to and from this market?
   - 1.21 What are the main sizes of vehicles used to bring dried fish from wholesalers (e.g., trucks, two-wheelers)
   - 1.22 What sort of challenges do retailers in this market face?
   - 1.23 Are there government policies or actions that benefit or hinder the dried fish trade?
   - 1.24 How has the supply and composition of fish retailed through this market changed within the past 10 years? What do you think are the reasons for these changes?

1.25 How has consumer demand for fish traded through this market changed within the past 10 years? What do you think are the reasons for these changes?

2. *Specific questions about businesses*

Demographic details (To be recorded and stored separately)

2.1 Interview location:
2.2 Role of interviewee (boat owner, worker, trader, retailer, etc.):
2.3 Name(code/pseudonym):
2.4 Phone number
2.5 Gender:
2.6 Age:
2.7 Religion: (infer rather than ask unless appropriate)
2.8 Caste/ethnicity (infer rather than ask unless appropriate):
2.9 Highest level of education completed:
2.10 Place of origin. If different from the interview location, when/why was it moved here
2.11 Family details: (married/unmarried, Children)

3. *Assets/who has what/who does what/what do they do with it?*
   3.1 When did you establish this dried fish retailing business? What did you do before that? Why did you decide to start this business?
   3.2 Is the business a family-run retail shop? If so, in what capacity are family members involved in the activities?
   3.3 Did/does any other family member have a similar retail business or any business related to fishing?
   3.4 Do you have any other businesses related to fishing (e.g., own boats, drying operations, retail shops)? If so, in what order did you establish them and why?
   3.5 Do you sell any other products other than dry fish? What are they?
   3.6 Do you have any businesses unrelated to fishing? What are they?
   3.7 Do you have any agricultural land? How much?
   3.8 Do you own any vehicles used for this business? Give details
   3.9 Do you own any land or buildings used for this business? Give details

4. *Buy/who does what?*
   4.1 What are the five most important species/products that you sell?
   4.2 What % for your total business does each of these account for? How about 5-10 years ago? Why has this changed?
   4.3 How do the volumes of fish purchased vary by season? Which months are high/low season?
   4.4 How do the volumes of fish consumed vary by season? Which months are high/low season?

4.5 How much of each of the 5 main products/species do you procure on average in one month during high season, and during low season? How about 5-10 years ago? Why has this changed?
4.6 What are the main locations that you source each of these species/products from?
4.7 What type of suppliers do you usually procure these from (e.g., traders in this market, fishers, etc.)?
4.8 How many regular suppliers do you have? How about 5, 10 years ago? Why has this changed?
4.9 What % of the fish you trade comes from each type of supplier?
4.10 Do you get credit for your suppliers? Which suppliers?
4.11 How common is this? 5-10 years ago? Why has this changed?
4.12 What are the terms of the credit (e.g., amount, duration, interest, requirement to sell to you)?
4.13 What are the details of any contracts or agreements you have with your suppliers?

5. *Make/who does what/who gets what?*

5.1 How long does fish usually remain in your possession? What is the maximum length of time?
5.2 How do you store fish?
5.3 How do you ensure that the fish you store remains in good condition?
5.4 Do you experience any product losses during storage? Why/how much?
5.5 Do you grade or clean the fish you store? Do you use any preservatives?
5.6 How many male and female workers do you employ (permanent and temporary)?
5.7 What are their roles?
5.8 What proportion of your workers are family members (if any)?
5.9 Where do your workers originate from? How do you recruit them? Where do they live?
5.10 How are workers paid (e.g., daily, monthly, piece rate)? How much are they paid?
5.11 Do they receive wages in advance? How much, why?
5.12 Have technological changes since you began working in this profession changed the business?
5.13 Would you categorize your retail business as small, medium, or large? Why?
5.14 Do you take credit for operating this business? If so, from what sources, on what terms? How about 5, 10 years ago? Why has this changed?
5.15 Are you a member of any association? Which and why?
5.16 Does the association mediate disputes? Can you give an example?
5.17 Do the association/s have any political power or influence – describe?

6. *Sell/who does what/who gets what?*
    - 6.1 Which months are high/low season for sales? Why has this changed?
    - 6.2 What are the main locations (markets/areas) that you sell each of these species/products to?
    - 6.3 What type of customers do you usually supply fish to (ethnicity/ religion/caste)?
    - 6.4 What % of the fish are sold to each type of customer?
    - 6.5 How many regular customers do you have? How about 5, 10 years ago? Why has this changed?
    - 6.6 Do you provide credit to any of your customers?
    - 6.7 How common is this? How about 5-10 years ago? Why has this changed?
    - 6.8 What are the terms of the credit you provide (e.g., value, form, duration, interest, requirement to buy from you)?
    - 6.9 How do you ensure that customers who take credit repay their debts?

7. *Social economy*
    - 7.1 Is this a well-regarded profession?
    - 7.2 Is this an employment choice you'd recommend?
    - 7.3 Would you like your children to do this job?
    - 7.4 Do your family consume dry fish? If so which species and how much?

# Annexure 6

## Segment-wise questionnaire guide - Workers

1. *General questions for workers associated with the dried fish sector*
   - 1.1 How many workers are there (related in some way to the dried fish economy)? Where do they come from?
   - 1.2 What is the percentage of women?
   - 1.3 Has the number of workers increased in the last few years? If yes, why? Has there been a decrease? Reason?
   - 1.4 Are there any workers associations or unions in your locality? How many? Which are they?
   - 1.5 Are there any unionized labour laws or any norms regarding work?
   - 1.6 Do they work in other sectors? Construction? Do they work in other processes related to dried fish?
   - 1.7 Are there any health hazards associated with this work?

2. *Specific Questions*

Demographic details (To be recorded and stored separately)

   - 2.1 Name (code/pseudonym):
   - 2.2 Interview location:
   - 2.3 Role of interviewee (boat owner, worker, trader, retailers etc):
   - 2.4 Gender:
   - 2.5 Age:
   - 2.6 Religion:
   - 2.7 Caste/ethnicity (infer rather than ask unless appropriate):
   - 2.8 Highest level of education completed:
   - 2.9 Place of origin. If different from interview location, when/why moved here
   - 2.10 Family details: (married/unmarried, Children)

3. *What do they do?*
   - 3.1 Where do you come from?
   - 3.2 How long have you been doing this job?
   - 3.3 How much are you paid?
   - 3.4 Are you paid in kind?
   - 3.5 Do you have your children or your partner in this trade? Are they paid? If so, how much?
   - 3.6 What types of things are workers are expected to do?
   - 3.7 What species of fish are predominantly used?
   - 3.8 What type of work do you do?
   - 3.9 Is there any specific type of work that you do?
   - 3.10 Do you work in any other sector? If so, where and why?
   - 3.11 Do you think you are adequately compensated for your work?

4. *How do they do?*
    - 4.1 Are you part of any labour unions?
    - 4.2 Does your employer have any norms or regulations to adhere to? Do they adhere to negotiated terms? If not, why?
    - 4.3 What are the different challenges you face in your occupations?

5. *Social Economy*
    - 5.1 Are there any government schemes that you are aware of helping labour in general, and also in particular, concerning dried fish?
    - 5.2 Do you eat dried fish? If so, what varieties do you prefer? Why?
    - 5.3 Have you had any health issues with regard to working with dried fish?
    - 5.4 How do other people perceive people working in the dried fish sector?
    - 5.5 Would you like your children to continue this profession? If so, why? And why not?