

# The Dried Fish Industry of Malvan

Supply chain, economy and relationship with the fishmeal industry

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## **Executive Summary**

Dried fish is an important component of the diet and fisheries economy of many communities in India. The long-term survival of this industry is at risk, threatening the food security and livelihoods of those dependent on it. The fishmeal industry is one potential threat, where large volumes of low-value fish are processed on a large scale to produce feed for poultry and aquaculture. This pilot study, conducted jointly by Dakshin Foundation and the Dried Fish Matters (DFM) project, assessed the structure, supply chain and trends of the dried fish economy at Malvan, Maharashtra and its possible links with the fishmeal industry.

The dried fish industry in Malvan is relatively small, with about 20-25 local traders and 8-10 traders who do not belong to the local communities – all of whom carry out the fish processing and drying themselves. These traders buy and process large volumes of fish, which is sold outside Malvan but within the region (i.e. Sindhudurg district and Goa). A separate chain exists where small-scale traders, largely women, buy fish from boats and sell it at the local market, both fresh and dried. A large diversity of fish is used for drying, the most common being mackerels, croakers and ribbonfish, with traders and retailers showing no preference for any.

Fish catch in Malvan has significantly declined in the past decade, reducing the dried fish trade as well. Overfishing and prevalence of fishing practices such as LED fishing and high-speed trawling were cited as the main reasons for this decline. Dried fish trade is possibly further diminished by the development of the fishmeal industry. We found that fish for drying may be increasingly diverted to fishmeal, as the latter is less labour-intensive and generates steady profits. The future of fish drying therefore appears to be under threat, largely due to a low and unsteady supply of fish and potentially due to industries like fishmeal as well. Further research into the dried fish economy and its connection to fishmeal is needed.

## **Background:**

Dried fish is of vital nutritional, economic, social, and cultural importance for many of the poor and marginalised communities of South and Southeast Asia (Van Veen, 2012, Hossain et al., 2013). It has been found to be an accessible and low-cost food source, and can contribute a large percentage of protein and key micronutrients to the diets of the poor (Kawarazuka & Béné, 2011, Abbey et al., 2017). India is the 3<sup>rd</sup> largest fish producer globally (FAO, 2019) and 17% of the total catch is used for drying (Bharda et. al., 2017), which is higher than the global average of 12% (FAO, 2018). Production and trade of dried fish contribute to livelihoods and employment, especially for women (CMFRI, 2010). It also forms an important food source, particularly during the fishing ban period when availability of fresh fish is low (Madan et al., 2018).

However, there are serious concerns about the long-term viability of the dried fish industry in the country. Ecological changes, industrial competition, and problems such as contamination, lack of infrastructure and labour exploitation form growing threats to the dried fish economy, exacerbated by a lack of research and knowledge-sharing across regions, disciplines, and sectors (Funge-Smith, Lindebo, & Staples, 2005; Ghorai et al., 2014; Madan et al., 2018).



Figure 1. Scad fish kept out for drying. Photo by Manini Bansal

The last few decades in India have also witnessed the emergence of the fishmeal industry. Fishmeal, a powder used largely as feed in aquaculture and poultry, is produced from a mix of undersized and/or non-commercial fish captured as bycatch in fishing vessels – known as ‘trash fish’ (Lobo, Balmford, Arthur, & Manica, 2010). High demand for fishmeal as aquaculture and poultry feed has fuelled the rapid growth of this industry in India. Although it provides extra income to fishers and supports the livelihoods of thousands in the industry, there are growing concerns regarding the impact of fishmeal on the ecological integrity, resource sustainability and food security (Funge-Smith, Lindebo, & Staples, 2005). Due to the overlap of species used for fishmeal and for drying, the fishmeal industry may pose a threat to the dried fish economy (Hossain et al., 2013); however, this has not been investigated.

Dakshin Foundation has been studying trash fish and the fishmeal industry since 2018, to understand its composition, trends, and role in the fisheries economy. The Dried Fish Matters (DFM) project aims to produce a comprehensive study on the dried fish economy of the Indian

Ocean, including the investigation of the potential link between the fishmeal industry and fish drying. To this end, the purpose of this collaboration was to conduct a pilot study on dried fish and its link with trash fish at Dakshin Foundation's study site of Malvan. We aimed to (1) characterise the structure, supply chain and key actors of the dried fish industry, (2) assess quantities and economics of the main dried fish products and trends of the same over the last 5 years, and (3) understand the relationship between the dried and trash fish industries.

## Methodology

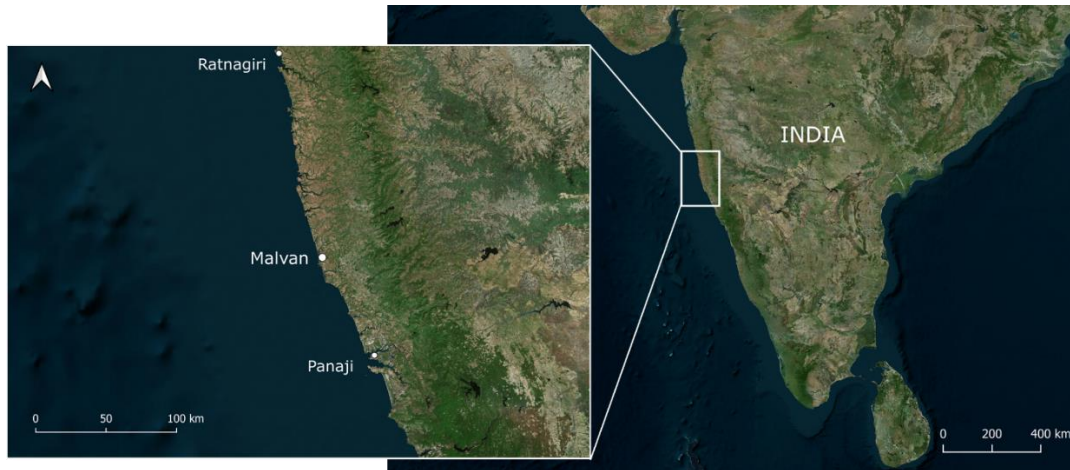


Figure 2: The study site. Map courtesy of Bing maps

This study was conducted at Malvan, a fishing town in Maharashtra, on the west coast of India (Figure 1). Malvan hosts a diverse fisheries operating largely between August to May, with a mandatory two-month ban imposed over June and July. There are between 80-100 trawlers operating here, as well as a few hundred gillnets and some artisanal fisheries such as shore seines, hook and lines, etc.

We conducted interviews with diverse participants of the dried fish supply chain in Malvan: Boat owners (n=4), traders (n=3), labourers (n=2) and retailers (n=1). Participants were selected through purposive sampling in order to interview experts or key informants at each stage. Interviews were mixed methods with both qualitative and quantitative questions, conducted using an interview guide in the local language (Marathi). Ethics clearance was obtained from the Ethics Committee at Dakshin before conducting interviews. We also obtained informed oral consent from each participant to conduct and voice record the interviews.

## Detailed Findings

### 1. Supply chain - Structure, Actors and Activities

The structure of the supply chain can be found in Figure 3. Fish for drying is captured and sold by all the different types of fishing vessels operating in Malvan, although none appear to be

specifically targeting these fish. Trawlers and purse seines were cited by traders as the main source of fish for drying, with smaller amounts coming from gillnets and the artisanal sector.

There are between 20-25 dried fish traders in Malvan, operating as two different factions. Additionally, there is a group of 8 traders originally from Mangalore, trading in fresh and dried fish and fishmeal in Malvan. Traders don't appear to have any fixed supplier and buy from all boats through their agents. Many of the traders also operated in nearby towns like Devgad and Vengurla, though Malvan was usually the main centre.



Figure 3: Washing and cleaning of fish for drying. Photo by Manini Bansal

Traders also carried out the fish drying, there was no separate processor for this. Local traders in Malvan appeared to hire only women for this task, whereas the Mangalore traders employed men. The women labourers were all local (from Malvan and nearby settlements). Tasks were divided into two: washing, for which there were 4-5 women, and salting, conducted by two factions of 5 women. The Mangalore traders employ 16 men (2 per trader), who were responsible for carrying out all the labour involved in fish drying as well as packing, storing and transporting the fresh and trash fish that were also traded.

Table 1: The main actors of the dried fish supply chain in Malvan, their role and activities.

<b>Actor</b>	<b>Chain 'segment'</b>	<b>Assets</b>	<b>Inputs</b>	<b>Activities</b>	<b>Outputs</b>	<b>Notes</b>
<b>Fishers</b>	Upstream	Boats, nets	Ice, fuel, labour, credit	Catching fish	Fresh fish	Includes a diversity of vessels: trawlers, purse seines, gillnets, artisanal fisheries
<b>Traders + Processors</b>	Midstream	Capital, warehouses, shops, vehicles	Fresh fish from fishers, labour, salt, fuel, credit	Aggregating fish, sorting, gutting, salting, drying, fermenting	Dried fish	Traders purchase fish from vessels through an agent (i.e. auctioneer). Traders employ a team of labourers (largely women) to carry out the fish drying processes
<b>Retailers</b>	Downstream	Shops, vehicles	Dried fish products from processors	Selling to consumers	-	Retailers within Malvan also sell fresh fish. Some conduct the processing (i.e. drying) themselves

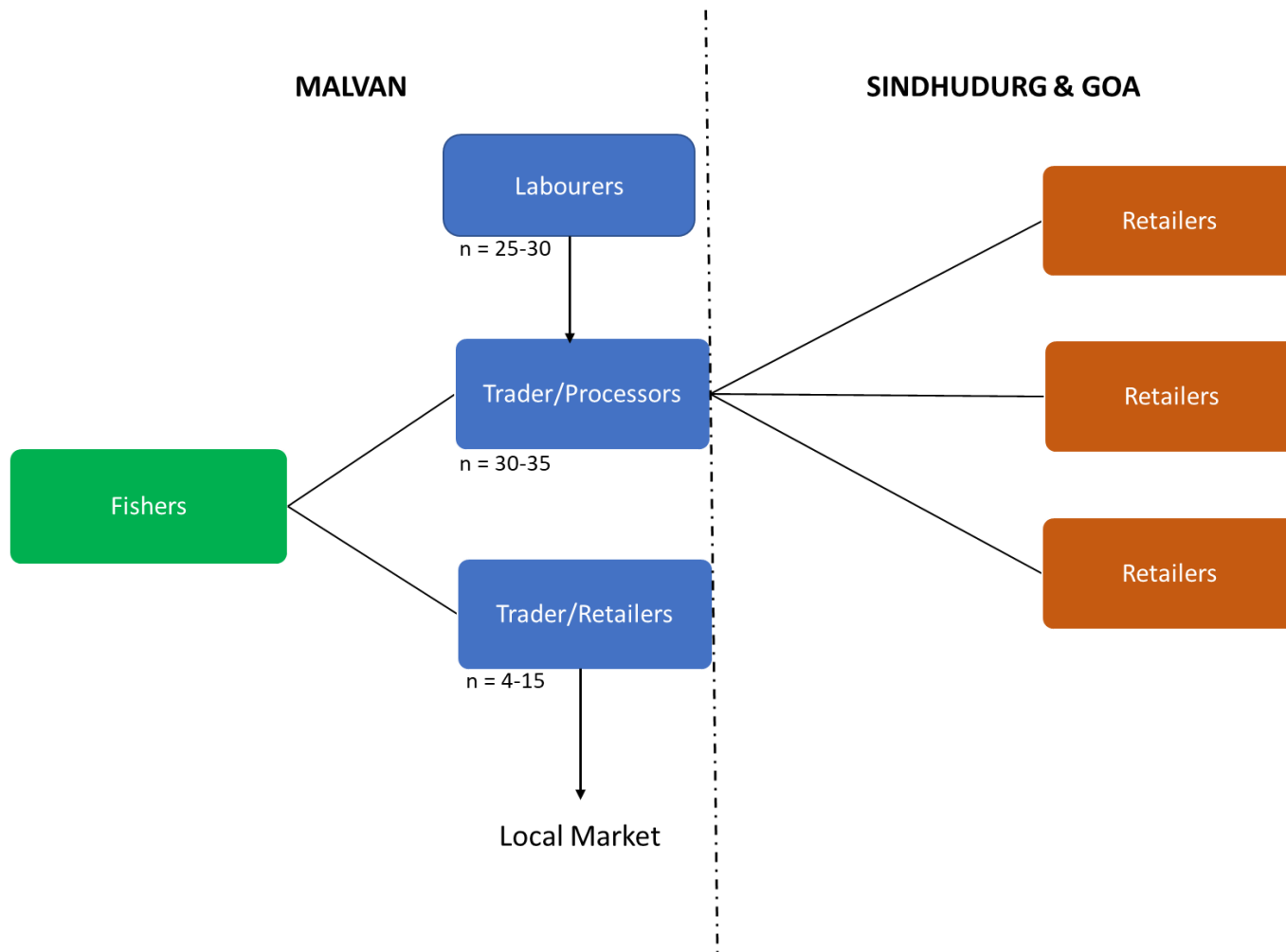


Figure 4: Structure of the dried fish supply chain, depicting the average number of actors in each segment and their geographical locations

The main input for the fish drying was salt, which was sourced from outside Malvan. Local traders obtained it through the local Fisheries Society, while the Mangalore traders sourced it from Palghat in northern Maharashtra.

Dried fish traders sold their product wholesale to retailers or other traders in other towns in the district like Kudal and Kankavali, as well as in Mapusa (in Goa). Some traders also used to sell their fish to buyers in Andhra Pradesh, but no longer due to reduced supply. None of these traders sold fish to retailers within Malvan. Dried fish retailers in Malvan were a separate segment, constituting traders (mostly women) who purchased fish from fishing boats and sold it at the local market – fresh as well as dried. They generally dry the fish themselves. There are up to 15 such retailers trading dried fish in the market during the peak season. The main actors in the supply chain and their activities can be summarised in Table 1.

## 2. Dried Fish Species

The main species used for drying are mackerel (*Rastrelliger kanagurta*), followed by croaker (Sciaenidae) and ribbonfish (Trichiuridae). Other species include sharks, rays, anchovies, sardines, jacks and many others. Small-sized mixed fish are generally sold for drying. Boat owners also stated that they sold fish for drying if it was damaged, or if the rate for fresh fish was low. Traders indicated that they had no preference for any particular species and bought what was available in the market.



Figure 5: Salt used for the fish drying. Photo by Trisha Gupta



### 3. Details of the Trade – Costs, Profits and Volumes

Most boat owners said that the quantity of fish sold for drying was very varied, but agreed that it was a small proportion of their total catch. One trawler owner said that between 10-20% of their catch may be sold for drying. Owners could not quantify the portion of their income from dried fish, but indicated that income from dried fish had reduced over the past decade.

Traders were unable to provide an average daily quantity of fish purchased for drying, as it was highly variable and supply dependent. Cost of the fish was dependent on species and size: mackerels, croakers and large ribbonfish were bought at up to 60 INR per kilo, whereas smaller ribbonfish and sardines were 30 INR per kilo on average. Large stingrays were also occasionally purchased for drying, costing between 5000 – 10,000 INR.

Mode of payment varied among the labourers: Women conducting the washing and cleaning of fish were paid per basket washed: approximately 25 INR per basket. Women conducting the drying process had a fixed salary from the traders: 4000 – 4500 INR per month, irrespective of volume of fish processed. Male labourers of the Mangalore traders were also given a fixed salary of 12,000 INR per month.

Traders sold the dried fish by the kilo or per basket, price of which was dependent on the species and size again. During the peak months of trade, small-sized fish were sold for an average of 150 INR per kilo, while larger fish for 300-400 INR per kilo. Buyers don't appear to prefer any fish type and buy all species.

Winter was stated as the best time for fish drying, with high demand for dried fish and high quality of product. September to November were the peak months for the dried fish trade, while February to May were the low months.

### 4. Trends over the past 10 years.

All respondents stated that fish quantities had significantly reduced over the past decade. The dried fish business had therefore come down as well. Some respondents said that 10 years ago, the number of fishing vessels was much higher, and a bulk of the fish for drying came from the shore seines ("Rampan"). However, number of fishing vessels decreased due to reduced catch, and artisanal fisheries such as the Rampan had especially been affected. Species like ribbonfish were said to have particularly declined in Malvan.

"We used to catch up to 3 tonnes of ribbonfish in one day, making 1.5 lakhs just from this fish. Now we get nothing, earning only 4000 INR per day" – A boat owner

Unregulated fishing by purse seines, LED fishing vessels and high-speed trawlers were cited as the main reasons for the reduced fish catch. However, respondents also stated that the number of traders and retailers in the business had not changed over the last decade, despite the lower volumes of fish. Most respondents also believed that the industry would continue to decline in the coming years.



Figure 6: Dried fish sold at a local market in Malvan. Photo by Trisha Gupta

##### 5. Relationship with the Fishmeal Industry

Our study on trash fish found that most of the species used for drying were also used for fishmeal (Gupta et al., unpublished). However, when directly asked, respondents did not perceive any competition between dried fish and fishmeal. Although respondents agreed that the same species were used for both purposes, they perceived a clear distinction between fish for drying and for fishmeal. Poor quality or rotten fish was sold for fishmeal, irrespective of the species, whereas the better-quality fish of certain species was used for drying. So it appeared that the fish were graded by quality and price.

However, our study found that good quality, commercially important fish were regularly used for fishmeal (Gupta et al., unpublished). Respondents also admitted that before the fishmeal industry, the poor quality fish was also used for drying. The traders from Mangalore stated that with the development of the fishmeal industry, most of the fish that they used to dry are now sold for fishmeal. The fishmeal business was also easier work in terms of time and labour, and formed a more reliable source of income.

“The time for fish drying is dead. Once the fishmeal industry started, no other fish processing stood a chance” – A fish trader

Boat owners also indicated that fish will be sold for either drying or fishmeal depending on the market rate. If the rate for fishmeal is high, boat owners will divert their catch there and if the rate is low, the catch is sent for drying. Therefore, there does appear to be a connection between these two industries, and a possible shift of fish from drying towards fishmeal. However, perception of local fishers and traders is that there is no link between these two industries.



Figure 7: A crate of anchovies, sardines, scads and other fish sold as ‘trash fish’ for fishmeal production. Most of these species are commonly used as dried fish. Photo by Manini Bansal

## **Conclusion**

This pilot study on dried fish produced several important findings to guide further research and policy interventions. The dried fish industry in Malvan has significantly reduced over the past decade due to dwindling fish catches, apparently as a result of overfishing and unsustainable practices such as LED fishing. Furthermore, the growth of the fishmeal industry may be diverting fish away from drying and other sectors towards aquaculture and poultry feed.

Decline of the dried fish economy poses a major threat to the livelihoods of the actors involved, which is especially concerning given the large fraction of women working in the industry. Fish availability in the region may also be reduced, given that the dried fish industry appeared to be highly localised. Several studies have highlighted the importance of low-priced and dried fish in the diets of the poor (Kawarazuka & Béné, 2011, Pauly 2019). There is still little known about the nutritive value of dried fish in India, however, and its role in the food security of marginalised communities is a research priority.

The fishmeal industry continues to grow across the country, and may be driving marine capture fisheries towards unsustainability (Lobo et al., 2010). This puts the long-term survival of the fish drying and other small-scale industries at risk. There is a need for improved regulations on fishmeal and interventions to safeguard the dried fish industry. Further research to understand and quantify the relationship between dried fish and fishmeal is critical.

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