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Original Article

Traditional fish processing in Odisha, India

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Abstract
The present study documents the traditional fish drying techniques used by the fisher folk communities of Bhadrak district, Odisha, India. Information on local knowledge and the use of different fish drying methods within the study area was collected from 72 fisher folk through semi-structured questionnaires, free interviews, informal conversations and direct observations. The results showed that sun drying was the most extensively used method for fish preservation. About 19.4% of the informants preferred to spread the fishes directly on earth, 34.8% on the mat, 5.5% on palm leaves, 29.2 % over bamboo bars and 11.2% followed interlocking of snouts/jaws on bamboo sticks. Almost all the fish drying devices are handmade with bamboo, wooden pole and sometimes nylon threads following traditional technologies. The quality of the dry fish could be improved by educating fishermen on hygiene, sanitation, use of good water quality and raw materials for processing. In this context, the low-cost solar dryer can be constructed by using locally available materials, thus preventing contamination and dependence on weather conditions. The dry fish production can play a crucial role in socio-economic upliftment, employment generation and poverty alleviation particularly to women as they depend on it directly for their livelihoods.

Keywords: Bhadrak district; dried fish; indigenous knowledge; raw fish; sun drying

1 | INTRODUCTION

Throughout the world, traditional knowledge and wisdom of the indigenous people is an important tool for ecosystem-based management approaches that help human beings to interact, perceive and live within the environment and use its resources (Berkes *et al.* 2000; Drew 2005; Anwani and Vaccaro 2008; Davis and Ruddle 2010; Friday and Scasta 2020).It is acquired by local people through the accumulation of experiences, informal experiments and intimate understanding of the environment (Warren and Rajsekharan 1993). India is a well-known country for its traditional knowledge over the years (Patil *et al.* 2014) and this knowledge is expressed in the form of stories, songs, folklore, proverbs, dances, myths, cultural values, beliefs and rituals (Agarwal 1981; Singh *et al.* 2002; Sethi *et al.* 2011). The world's population is expected to rise to more than 9 billion by 2050 eliciting 70% increase in global demand for food, feed and fibre. Moreover, rapid changes are expected in the lifestyle and consumption patterns due to growing urbanization resulting in the decline in shares of grains and pulses and the huge increase in the consumption of vegetables, fruits, meat, dairy and fish (FAO 2009). This frightening challenge will give rise to alarming situations particularly in developing countries where people still suffer from poverty and hunger (World Bank 2014). In such a scenario, fish and fish

products are expected to play a vivacious role in providing nutritional security to the food basket of rural, urban and coastal populations (Needham and Funge-Smith 2014; Subasinghe 2014).

The Indian people have used fishery resources for a long time and even today, fish is very important in Indian food culture. The fisheries' resources of the country comprise both marine (exclusive economic zone (EEZ) of 2.02 million km^2, a continental shelf area of 530000 km^2 and a coast-line of 8118 km and inland (45000 km of rivers, 3 m ha of reservoirs) with total fish production 12.60 million mt (NFDB 2020). India is the third-largest producer of fisheries and second of aquaculture with 50 different types of fish and shellfish products being exported to 75 countries around the globe, and this sector has been recognized as the dominant income and employment generator especially for a large section of the economically underprivileged population of the nation (Kumar and Datta 2009; NFDB 2020). Moreover, fish is nutritionally valuable, contains high-quality proteins, minerals, vitamins, and lipids especially the omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) (Kawarazuka and Bene 2011; Calder 2016; Tilami and Sampels 2018; Horn *et al.* 2019). The EPA and DHA have the ability to reduce the risk of cardiovascular disease, hypertension and regulates many physiological processes including neuroprotection, cell survival, inflammation and neuronal signalling (Bazinet and Laye 2014; Calder 2016; Tilami and Sampels 2018; DiNicolantonio and OKeefe 2019; Horn *et al.* 2019). Rogers *et al.* (2013) stated that the EPA and DHA is highly accumulated in the central nervous system and retina, and thought to be essential for optimal development of these regions. This indicates a clear link to health and life expectancy in correlation with the consumption of fish.

Fish tends to perish immediately sometime after the catch and becomes unfit for consumption within 12 – 20 h of capture unless it is subjected to some sort of processing (Ames *et al.* 1999; Liyasu *et al.* 2011) which include preservation by drying. In India, about 17% of the landings go into the dry fish trade (Bharda *et al.* 2017). Drying has, perhaps, been the oldest method of preservation of fish practiced extensively in India. Various traditional methods of fish preservation are carried out in India such as hot air drying (Balachandran 1969; Nagwekar *et al.* 2017), smoking (Tamang *et al.* 2012; Sharma *et al.* 2013), salting, or brining involving the use of common salt (sodium chloride) or spices like turmeric (Alex and Eagappan 2017), solar drying where fish is dried in an enclosure which traps sunlight energy (Patterson *et al.* 2018) and sun drying through exposure to direct sunlight (Shivaji *et al.* 2015; Payra *et al.* 2016; Madan *et al.* 2018). Drying of fish maintains the quality of the fish in terms of its nutrient, flavour, texture, appearance and provides continuous availability of animal protein to the people throughout the year. Odisha, a maritime state along the east coast of India has 6.83 lakh ha. of freshwater resources, 4.18 lakh ha of brackish water resources and 480 km of coastline for fisheries which provides employment and income generation for overall socio-economic prosperity. Traditionally, fish has played an important part in the diet of the Oriya people. The state has 589 marine fishing villages and 3289 inland fishing villages with just over 1 million fishermen population (Nayak *et al.* 2012). The fish production of Odisha during 2000-01 was 2.60 lakh mt, which has increased to 7.59 lakh mt comprising freshwater: 5.07 lakh mt, brackish water: 0.94 lakh mt and marine: 1.58 lakh mt during 2018-19, which is a threefold increase over last 19 years. Per capita fish consumption in the state has increased from 7.71 kg in 2000 to 15.38 kg in 2018-19 (Anonymous 2019a). Although a number of studies have been conducted in different parts of India to document the available traditional fish drying process (Bhat *et al.* 2013; Shivaji *et al.* 2015; Payra *et al.* 2016; Bharda *et al.* 2017; Solanki 2020) but in Odisha it is sporadic while there is absolutely no report from Bhadrak district. This paper provides information on the importance of traditional fish processing interventions by the fisher folk to achieve food and nutritional security in the country. Sustainable utilization of fish as a resource through various means such as catching, processing and preservation will help to meet the nutritional, social, economic, and cultural needs of the people.

2 | METHODOLOGY

2.1 Study area

Odisha, a state of ancient land and temples with 480 km coastline is situated on the eastern coast of the Indian peninsula. It has one of the most dynamic coastal environments in India due to its location and physical factors especially its network of barrage, powerful rivers with their delta and estuarine systems, each with a variety of ecological niches and habitats. The coastline traverses six coastal districts of Odisha, viz. Balasore (80 km), Bhadrak (50 km), Kendrapara (68 km), Jagatsinghpur (67 km), Puri (155 km) and Ganjam (60 km). Bhadrak district (20°43′ – 21°13′N and 86°6′ – 87°E) is located (Figure 1) in northeast Odisha and covers an area of 2505 km^2, with a population of 1.507 million (2011 Census). It borders the Balasore district in the north, Jajpur in the south, Bay of Bengal and Kendrapara district in the east and Koenjhar in the west. The district accounts for 1.61% of the state's territory and shares 3.62% of the state's population. The climate of the district is warm and humid. The maximum and minimum temperatures range from 37.4°C to 17.7°C respectively, and the annual average rainfall is approximately 1428 mm (Anonymous 2019b) of which about 71% occurs in the monsoon season. The varying intensities of cyclones, drought and flood are the characteristic feature of the district (Prabhakar *et al.* 2019). The fish production

of the district during 2018–19 is 51100 mt comprising inland water 38090 mt (freshwater 18335 mt, brackish water 19755 mt) and marine water 13010 mt (Anonymous 2020).

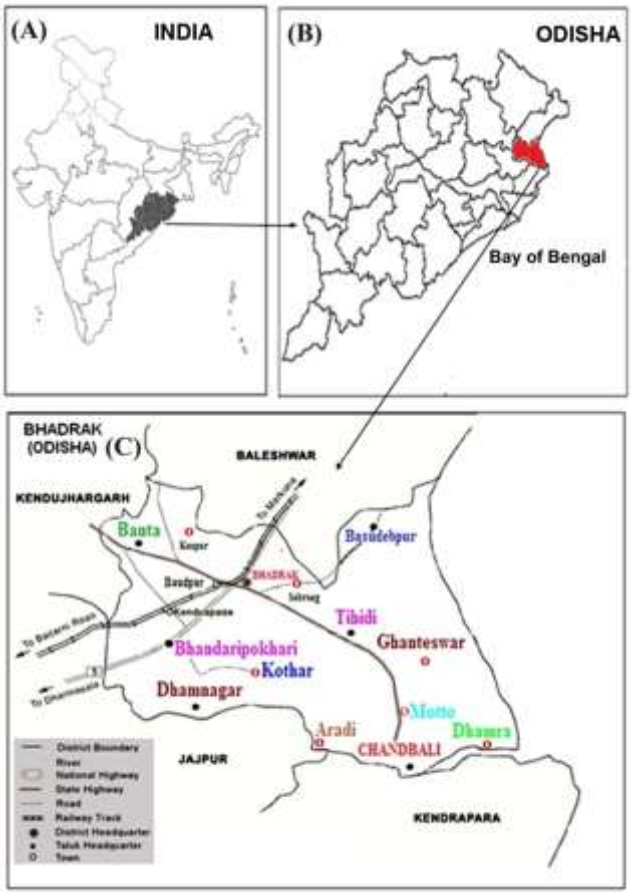

FIGURE 1 Map of the study area. (**A**) Location of Odisha state in the eastern region of India; (**B**) map of the Odisha state showing Bhadrak district; (**C**) study area showing different blocks of Bhadrak district.

2.2 Data collection

The method employed was designed with a purpose of providing baseline information on the traditional fish drying techniques, through literature survey and field visits to seven blocks of the district i.e. Bhadrak, Bhandaripokhari, Bonth, Dhamnagar, Tihidi, Chandbali and Basudevpur. The field study was carried out from October 2017 to September 2019 monthly following established and standard procedures (Jain 1987; Martin 1995). The information on the use of various methods of fish drying was obtained through questionnaires, complemented by free interviews, informal conversations and direct observations (Martin 1995; Huntington 2000). Elderly persons were considered key informants in the study, and the selection process was based on knowledge, experience, and current practices in fish drying. The interviews and discussions were carried out individually with members of the local population in the local language for each of the villages visited. During repeated visits to the study site, nine group discussions (8 – 12 people) were held at various places of the district with: i) old-age key informants and ii) with women especially skilled in fish drying technique. Personal interviews and group discussions with local inhabitants revealed some valuable and specific information about the traditional method of fish drying. Seventy-two people (36 women and 36 men) persons were consulted in different blocks of the district. During the visits, fishing practices and their management, harvest quantity, drying methods, drying season, the months that were most favourable for fish drying and storage of fishes were discussed. The fish species were identified following Talwar and Kacker (1984), Rao (2009), Jayaram (2010), web based information such as Fishbase (Froese and Pauly 2015) and the Catalog of Fishes (Eschmeyer 2014).

3| RESULTS

3.1 Fish sources

In Bhadrak district, freshwater fishes were obtained from ponds, rivers, creeks, canals and lowland paddy fields particularly during the rainy season (Figure 2a). In the case of marine catch from the Bay of Bengal, particularly Chandbali and Basudevpur block, most of the fishing boats usually undertake only one-day (or one-night) trips. If boats stay out longer, carrier boats transport the catch to the landing centres daily. Mechanized craft, as well as traditional hulled boats, sometimes carry ice on board, to preserve the species. The catch was usually unloaded at open beaches (Figure 2b). The fresh fish was retailed locally by head-load on foot or bicycle/motor cycle vendors or transported to more distant market places by lorry. The availability and variety of fish species varied from season to season. The highest landing of fish occurred in the rainy season. More variety occurred in the winter season than summer season and others.

3.2 Fish species used for drying

A good number of inland and marine fish species were used for drying by local fisher folk (Table 1). Prominent inland fishes were *Amblypharyngodon mola* (Hamilton, 1822), *Cirrhinus reba* (Hamilton, 1822), *Punitus amphibius* (Hamilton, 1822), *Salmostoma bacaila* (Hamilton, 1822), and *Xenentodon cancila* (Hamilton, 1822). Similarly, a variety of marine fishes were also used for drying. Examples include, *Arius caelatus* (Valenciennes, 1840), *Coilia dussumieri* (Valenciennes, 1848), *Johnius belangerii* (Cuvier, 1830), *Harpadon nehereus* (Hamilton, 1822), *Ilisha elongata* (Bennett, 1830), *Lates calcarifer* (Bloch, 1790), *Lepturacanthus savala* (Cuvier, 1829), *Rastrelliger kanagurta* (Cuvier, 1816), *Stolephorus indicus* (van Hasselt, 1823) and *Tenualosa ilisha* (Hamilton, 1822).

3.3 Drying process

In Bhadrak district, sunlight is the major source of energy used by the fishermen for fish drying and the fishes were

usually dried in an open condition such as on earth, on the mat, on palm leaves and over the bed prepared by using bamboo and a wooden pole. The fishes obtained from inland fisheries were almost consumed and the excess production of small fishes was subjected to sundry on the ground covered by a mosquito net. Marine fishes which were not sold due to low demand, non-availability of transport facilities or because it was not in fresh condition when landed, were dried for future use. The fishes obtained after fishing was separated, sorted and processed. The ethnic people practiced their indigenous knowledge of processing without using any synthetic chemicals or preservatives.

TABLE 1 Fish species used for dry fish preparation.

Scientific name	Common name
Ambassis gymnocephalus (Lacepede, 1802)	Chandi
Amblypharyngodon mola (Hamilton, 1822)	Mahurali
Arius caelatus (Valenciennes, 1840)	Luni/Bada kantia
Auxis thazard (Lacepède, 1800)	Kani
Chanda nama (Hamilton, 1822)	Chandee
Cirrhinus reba (Hamilton, 1822)	Pohala
Clupea pallasii (Linnaeus, 1758)	Alana kokoli
Coilia dussumieri (Valenciennes, 1848)	Ollei
Dussumieria acuta (Valenciennes, 1847)	Kharpani
Gerres filamentosus (Cuvier, 1829)	Nadiakhai
Gudusia chapra (Hamilton, 1822)	Polagara
Harpadon nehereus (Hamilton, 1822)	Newa/Lahada
Ilisha elongata Bennett, 1830	Kharpania
Johnius belangerii (Cuvier, 1830)	Sila
Lates calcarifer (Bloch, 1790)	Bhekti
Lepturacanthus savala (Cuvier, 1828)	Namalanji
Mugil cephalus (Linnaeus, 1758)	Khanaga marine
Mystus gulio (Hamilton, 1822)	Chota Kantia
Ompok bimaculatus (Bloch, 1794)	Pabda
Puntius conchonius (Hamilton, 1822)	Pitakarandi
Pampus argenteus (Euphrasén, 1788)	Silver Pamplet
Parastromateus niger (Bloch, 1795)	Black Pamplet
Puntius amphibius (Hamilton, 1822)	Karandi
Rastrelliger kanagurta (Cuvier, 1816)	Marua/Champa
Salmostoma bacaila (Hamilton, 1822)	Baunsapatri
Scomberoides commersonnianus (Lacépède, 1801)	Para
Scomberoides lysan (Forsskål, 1775)	Gaanta/Khadisa
Stolephorus commersonnii (Lacepede, 1803)	Para
Stolephorus indicus (van Hasselt, 1823)	Chauli
Tenualosa ilisha (Hamilton, 1822)	Ilishi
Xenentodon cancila (Hamilton, 1822	Gangei todi

During the survey, three categories of processing methods were observed to be practiced in the studied area: sun-drying of large fish, sun-drying of elongated fish and sun-drying of small fish. About 19.4% of the informants preferred drying on earth, 34.8% on the mat, 29.2% over bamboo, 11.1% on interlocking and only 5.5% on palm leaves. To dry the small and medium-size raw fishes, beds were prepared by using wooden pole and bamboo splits just above 1 – 2 m height from the earth over which fishes were spread and a seine net was used to protect the fishes from crows, swans, dogs, cats and other fish-eating animals (Figure 2c). The small fishes were also spread directly on earth with or without fishing serine nets (Figure 2d and 2e). It was observed that the fishes were mainly dried on the coastal seashore or on earth. In this open place, sufficient solar radiance and wind is available for the most part of the year which is suitable for drying. The fishes were turned over (Figure 2d) again and again at an interval of two-three hours a day for better drying and to become maggot free. Generally, the large-sized fishes were first gutted and cut into long strips using a sharp knife in such a way that it keeps connected at the head and the tail. A small piece of the bamboo strip was then placed in between the strips and fish was hung from poles. This enables quick drying as the surface area was increased. Some elongated fishes, for instance, the ribbon fishes were tied up at the caudal end in pairs (for larger sized ones) or numbers ranging from 3 – 8 (for smaller sized ones) and hung-over bamboo bars (Figure 2f). The bamboos were supported by wooden poles at both ends. In some cases, the fishes were dried with their extended snouts or jaws that interlock and hung on bamboo sticks which were arranged horizontally one above the other. The frame was supported by wooden poles or bamboo (Figure 2g).

The pre-processing activities such as grading, dressing, descaling, washing, and salt pre-treatment were not the same for the three categories of fish. Large-sized fishes were graded, dressed, descaled and sometimes salt pre-treated while small fish were sun-dried without any pre-treatment. Drying took about 3 – 7 days depending on the size of the raw fish and weather conditions. When it rains the fishes were covered with polythene sheets or transferred to shelter. After drying, the fishes were sorted out according to the species, size and quality. Most of the activities in the dry fish production process such as sorting, cleaning, salting or curing, drying, packing and storage were done by both genders but women's participation was noteworthy. The fisher folk applied different manual methods for the separation of different dried fishes. Hand-picking and winnowing (Figure 2h and 2i) were widely used to separate the varieties of dried fishes. The dried fishes were taken to storage, allowed to cool for a day or two at room temperature. Packaging was done by plastic- or jute-made bags and bamboo baskets for transportation. The dry fishes were consumed mostly in the form of curry, fried and burnt over the cow dung cake.

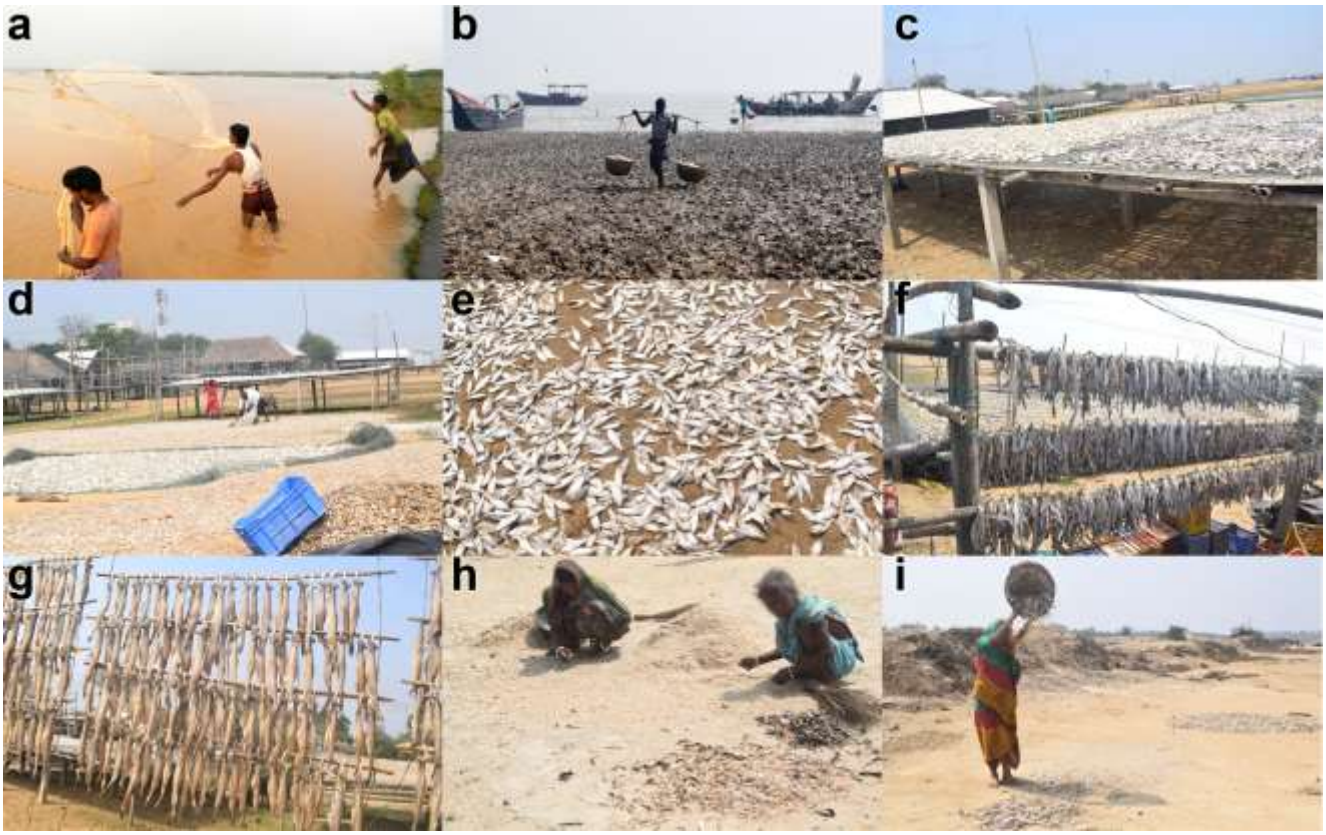

FIGURE 2 a, Inland fish catch in river Baitarani near Chandbali; **b**, marine fish catch in the Bay of Bengal near Dhamara; **c**, drying on a platform made from bamboo and wooden pole; **d**, sun-drying on the ground with fishing seine nets in open beaches; **e**, traditional sun-drying of fishes on earth; **f**, traditional sun-drying of fishes on bamboo bar; **g**, sun-drying of fish by hanging on bamboo strips; **h**, sorting by hand picking method; **i**, sorting by winnowing.

4 | DISCUSSION

Fish is one of the most lucrative food commodities and has been associated with man since ancient times. The importance of fish in quest of global food and nutrition security has been recognised all over the world (Zeller *et al.* 2007; Lynch 2016; Bennett *et al.* 2018; Obiero *et al.* 2019). Growing human populations and changing dietary preferences are increasing global demands for fish (Worm *et al.* 2009). According to FAO (2016), global seafood consumption has increased dramatically from 9.9 kg per capita in the 1960s to 20 kg in 2016. Drying is one of the most affordable post-harvest methods to preserve fish.

4.1 Fish sources

Bhadrak district is blessed with an abundance of fisheries resources, both inland and marine. The major sources of inland fish of the district are ponds, rivers, canals, creeks and lowland rice fields. In this region, fish is traditionally captured from the rice fields of rain-fed lowlands. In the waterlogged rice environments, naturally occurring fishes enter the field during the monsoon and grow together with the rice crop. The fishes enter the field during the wet season when field water overflows and connects neighbouring watercourses to form a vast sheet of water under the rice canopy. The floodwater carries a huge and diversified community of fish, into the rice fields. The women communities traditionally collect wild resources through group fishing using local devices. In general, small fishes are the common harvests from rice environments. The present study draws support from the studies of Das *et al.* (2000).

4.2 Fish species

Various categories of fish are caught through different gears operated in the inland waters and the Bay of Bengal. The most common fish species used for drying include *A. mola*, *A. caelatus*, *C. reba*, *C. dussumieri*, *H. nehereus*, *I. elongata*, *J. belangerii*, *L. savala*, *R. kanagurta*, *S. bacaila*, *T. ilisha* and *X. cancila*. The present result corroborates the findings of Shivaji *et al.* (2015), Payra *et al.* (2016), Madan *et al.* (2018) and Patterson *et al.* (2018). In the study area, the availability of fresh fish is not uniform throughout the year, there are months of scarcity (summer season) and periods of plenty (rainy season). The rainy season is the peak season of fish landing substantiates the findings of Robertson and Blaber (1992) and Mo-

hapatra and Patra (2012). The respondents opined that during the periods of abundant catches, they sell a major part of the catch in fresh condition, and the remaining part is preserved by sun drying.

4.3 Fish processing

In the present study, it became evident that the fisher folks of Bhadrak district of Odisha practice sundry, the ancient method of fish drying following the age-old process inherited from their ancestors. This process uses solar energy and the movement of air to remove moisture and preserve the fish. People living near coastal regions and rivers preserve perishable fish through sun drying without refrigeration, which is consumed as a seasoning, condiments, and side dishes during lean fishing period. The present result corroborates the findings of Salampessy *et al.* (2010) and Das *et al.* (2013). Sun-drying removes water from the fish by evaporation (Eyo 2001) and this consequently slows down or stops the autolytic activity, enzymatic reactions, microbial activities and brings a substantial reduction in weight and volume (Vega-Galvez *et al.* 2009). This method is commonly used in the Bhadrak region, due to the intensity of the sun and other favourable conditions such as dry weather, low humidity, and clear skies. The present finding draws support from other studies (Akintola 2015). The various types of traditional fish drying technique used by the fisher folk of the district substantiate the findings of similar kinds of practice in different parts of India (Balachandran 2001; Bhat *et al.* 2013; Shivaji *et al.* 2015; Payra *et al.* 2016; Bharda *et al.* 2017; Patterson *et al.* 2018; Solanki 2020). Sun drying mechanism used in this region is one of the oldest and famous methods of fish preservation practiced all over the world (Cooke *et al.* 1993; Mustapha *et al.* 2014; Dey *et al.* 2016; Akintola and Fakoya 2017). The technique of most of the methods is standardised after years of trial and error by the fisher folk. No artificial preservative is used in the fish drying process in the studied area. It is in contrast to the findings of Payra *et al.* (2016). In spite of the rapid development of freezing and canning industries in recent years, a significant number of fish landings are still preserved by the traditional method of simple sun-drying. Being the cheapest means of preservation of surplus fish, sun drying is likely to stay, especially in developing countries for quite a long time (Jain and Pathare 2007; Immaculate *et al.* 2013). The popularity of this method remains in the fact that they require little capital investment, running cost is very low, require no artificial energy sources like mineral oil or electricity and is therefore eco-friendly, needless technical knowledge, products are shelf-stable and require no refrigeration during storage and distribution and above all the products are greatly relished by many people all over the world due to their characteristic odour and flavour. It is also observed that both males and females are engaged in fish drying activities. It is worth mentioning that male members exclusively engaged in fish catching which needs more physical labour, expertise, skill and tenacity to capture fish. Of course, the female assists the male members in all possible stages of fish processing, particularly in post-harvest activities. Geethalakshmi *et al.* (2012) and Khader (2013) stated that majority of the women in coastal areas of Kerala are engaged in fish processing activities. Women are more actively involved in dry fish processing which provides employment opportunities and plays an important role in the upliftment of the socio-economic condition of the rural area of the Bhadrak district (CMFRI 2010; Kallon *et al.* 2017). The income of fisherwomen is very low as compared to their male counterparts but they used to do dry fish activities to support their family. The current investigation recorded the duration of drying varies from 3 to 7 days. The present result is comparable with the studies of Tiwari and Sarkar (2007), Samad *et al.* (2009) and Flowra *et al.* (2012). However, cloudy weather takes 2 to 3 days more for complete drying. The fisher community of the said district claims that the sundried fish can be stored for several months. It is in contrast to the method of smoking technique which does not last long as compared to salted and sundried fish (Pandey and Shukla 2015). All this knowledge and perception of natural phenomena have allowed the traditional fishermen to build up their own skills for applying appropriate techniques to exploit the natural resources in their environment. Consequently, the traditional sun drying technique shows a great diversity in the studied area. The fisher folk have poor access to transportation facilities, as they are not permitted to transport the products in public conveyances to the markets due to the foul smell of dry fish. In Odisha, Humma, Rajshunakala, Bhadrak and Remuna are the main markets for dried fish. A Significant amount of dried fish from the study site is transported to Bhadrak. A good amount is also transported to Kolkata, the biggest market outside the state for dried fish. Some people also sell by head-load or cycle from door to door or in village markets and small towns. Dried fish marketing in Odisha is carried out by a large number of intermediaries forming a long chain of market channels which is comparable with Flowra *et al.* (2010). Non-availability of good quality raw materials, lack of alternative drying methods during the rainy season, lack of open and clean space, non-availability of proper storage facilities, exploitation by middlemen, transportation during the marketing and social support are the major constraints as perceived by fisher folk.

5 | CONCLUSIONS

The present study indicates that the traditional sun-drying method of fish preservation still exists among people and plays a pivotal role in livelihood support and also testifies ancient traditions in rural areas of Bhadrak dis-

trict, Odisha, India. The adoption and use of solar radiation not only help in reducing post-catch losses but also play a vital role in addressing the issue of food and nutritional security. The materials for the construction of sun-drying are readily available, easy to maintain and operate, eco-friendly and also cheaper in terms of cost. Though the technology of fish preservation and processing has undergone revolutionary changes over the years and several new techniques have made their firm presence in the market, sun drying stills continues to be the most widely used method for fish preservation. The quality of the dry fish could be improved by educating fishermen on hygiene, sanitation, use of good water quality and raw materials for processing. In this context, the low-cost solar dryer can be constructed by using locally available materials, thus preventing contamination and dependence on weather conditions. The dry fish industry can play a crucial role in socio-economic upliftment, employment generation and poverty alleviation particularly to women as they depend on it directly for their livelihoods. Monitoring the extraction of fish resources and sustainable dry fishing practices are required to sustain a healthy ecosystem and to receive ecosystem services in the future.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

TP designed the study. All authors equally participated in data analysis and preparation of the manuscript.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request to the corresponding author.

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