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Utilization of marine bio-resources by fish cutting centres in Karnataka: Implications on sustainable exploitation and livelihood security of fisherfolk

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Original Article

Abstract

Fish cutting centres (FCs) are ancillary small-scale pre-processing units supporting major fish processing industries. The FCs are involved in partial dressing (beheading, de-skinning, degutting and washing) of fishes. The partially processed fishes form raw material input for canning and surimi plants. Primary data on types of fish processed, quantity and cost of different species purchased from landing centres, quantity processed per day, production cost, the final selling price of processed products, number of workers in the firm, labour cost, number of working days, cost of other inputs (ice, electricity, etc.) were collected from the selected FCs in Karnataka through customised schedules. The net benefit earned, resource utilization patterns and processing cost of each resource were calculated. Threadfin breams were the major resource (42-43% of the total threadfin bream landings in Karnataka) processed by FCs followed by Indian mackerel, lizardfishes, rock cod, ribbonfish and oil sardine. While the processed threadfin breams, lizardfishes, rock cods, and ribbonfish formed the raw material for surimi plants, the oil sardine and the Indian mackerel were taken by canning and processing plants. A maximum profit was observed in the case of rock cods, while a minimum in the case of oil sardine. The FCs are also very important from the socio-economic point of view as each cutting shed unit provides seasonal part-time employment to nearly 80-100 fisherwomen and each earns ₹200 - 300 per day. These units not only provide alternate livelihoods to fisher-women but also generate nominal profits for the FCs operators.

Keywords: *Fish Cutting Centres, fisherwomen, livelihood, marine bio-resources, management*

Introduction

Marine products are one of the most globally traded products and the fisheries sector generates maximum employment for the coastal communities (FAO, 2016). In India, seafood export is evolving rapidly mainly due to the growing demand for Indian seafood products across the world. Based on an Economic survey (2020), the fishery sector plays an important role in socio-economic development and contributes around 5.23% of agricultural GDP, employing 14.5 million people in India. Besides this, the country earns a large amount of foreign exchange through exports of marine processed fish products. Fish processing plants and industries add value as well as shelf life to the harvested fish. Traditional fish processing methods include curing, drying, freezing, filleting, canning, etc. The present-day focus is to generate more value for the products by doing value addition. One such product is surimi (minced fish meat), which is used for preparing simulated or analogue products.

Fish cutting centres are ancillary small-scale pre-processing units which support major fish processing industries like surimi, canning and processing plants. These units are involved in the pre-processing (beheading, removal of scales and viscera, washing) of fishes, which become the raw material for further processing through the processing units. The major pre-processing centres available in coastal Karnataka during the study period were shrimp peeling centres. Some of them were gradually converted over time to

FCs. The importance of FCs seems to stem from the fact that they reduce the space constraints and pre-processing cost of export-oriented processing plants. The FCs in Karnataka are usually operated during the post-monsoon phase from September to January when there are good landings of bio-resources and the surimi, canning and processing plants with their existing capacities cannot directly utilise the catch landed. The number of FCs in the State has steadily increased from 25 in 2014 (Rajesh *et al.*, 2014) to 52 in 2017, a rise of more than 100% during the period. The huge hike in the number of FCs units points to the lucrative nature of this small-scale business. Hence a study was undertaken to understand the utilization of bio-resources by FCs, profit generated from various bio-resources and their role in improving the socio-economic status and livelihood of rural fisherwomen.

Material and methods

Data collection

Among the fifty-two FCs located in Mangaluru, Malpe, Kundapur and Karwar in Karnataka, fourteen FCs were randomly selected for the data collection. Customised schedules were prepared to collect data on types of fish processed, quantity purchased from different fishing harbours (FHs), purchase price, days of operation in a year, quantity processed per day, cost of production, price of the final product, number of workers in the firm, labour cost, cost of ice, etc. Threadfin breams, lizardfish, ribbonfish, rock cods, Indian mackerel and Indian oil sardine were procured and pre-processed by the FCs. Among these, the partially processed threadfin breams, lizardfish, ribbonfish, and rock cods were supplied to the surimi plants. The Indian mackerel and Indian oil sardine were sent to canning and processing plants.

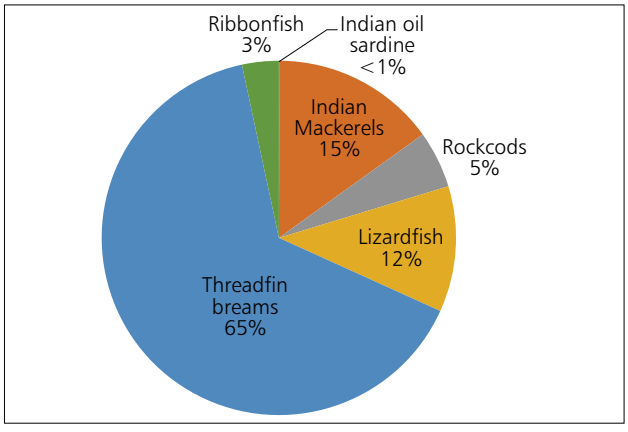

Fig. 1. Percentage share of various resources processed by FCs

The marketing channels for the selected fishery resources handled by the FCs were collected from the selected harbours (Mangalore FH, Malpe FH and Karwar FH). Primary data on catch share of various resources by different stakeholders in the value chain were also collected. Secondary data on total landings of the fishes handled by FCs from selected harbours were obtained from the data bank of the National Marine Fisheries Data Centre (NMFDC) of ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI) for the year 2016. The quantum of catch traded by different stakeholders was estimated based on landings data and catch share by various intermediaries.Net benefit earned from each resource was calculated using the formulae.

The profit earned = (Total quantity traded * average selling price/kg)–(cost of fish purchase+ marketing costs+ processing costs).

Results and discussion

The quantum of various resources utilised, purchase cost, marketing and processing cost, selling price and average profit generated by the FCs is given in Table 1. The fish processing charges in FCs include the transportation charges, cost of ice, labour charges, water charges, electricity charges and cost of sanitation. Of these, the labour charges were the highest. On average, each cutting Centres spend ₹25000 per day on labour. These centres employ women labourers and they are paid ₹2 per kg of cleaned fish. The average processing charges vary from ₹4 per kg for Indian Mackerel to ₹7.5 per kg for oil sardine. The processing charges for other fishes are given in Fig. 2.

Table 1. Estimated resources utilization and profit generated by the FCs in Karnataka

Resource	Quantity utilised (kg)	Average purchase price (₹/kg)	Final quantity after processing (kg)	Processing charges (₹/kg)	Average selling price of final product (₹/kg)	Net profit (₹/kg)
Indian oil sardine	30843	30	21590	7-8	60	6-7
Indian Mackerel	7439344	120-125	2975738	4	320-330	8-10
Rock cods	2584203	40	1808942	6	80	14-16
Lizardfish	5689603	25-30	3982722	7	60	10-14
Threadfin breams	32149086	30	22504360	7	60	7
Ribbonfish	1659906	100	1161934	7	160	7-8

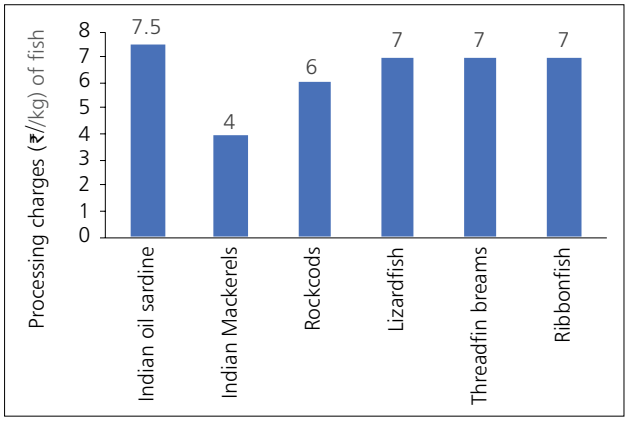

Fig. 2. Average processing charges (₹/kg) for various fish resources processed in FCs

Benefit shares of various resources

The fish cutting centres generate nominal profits for the operators. These units generate an average minimum profit of ₹6 per kg for oil sardines to a maximum of ₹16 per kg for rock cods. The profit shares when processing other fishes in FCs are given in Fig. 3. The availability of raw material used for the preparation of surimi was higher from September to December (Rajesh *et al.*, 2014). Hence, the utilization of threadfin breams and other white meat fishes like lizardfish, ribbonfish and rock cods by FCs is more during these months. During the peak season, each FCs unit on an average procesess10-15t of fish (Dineshbabu *et al.*, 2015) and generates a profit of ₹10-15 lakh per month. The waste generated from the FCs after the partial dressing of the raw material is utilised for feeding fishes cultured in cages or some cases used by the fish meal plant. This provided an additional income of ₹6-8 per kg for the pre-processed waste thus making the FCs business highly profitable and lucrative. In Karnataka, there were 25 FCs in 2014 (Rajesh *et al.*, 2014) which increased to 52 in 2017, showing a more than 100% increase within a span of three years. These FCs are usually registered with Marine Products Export Development Authority (MPEDA), hence the sanitary and hygienic conditions of these units are guaranteed. However, several FCs were unregistered and the sanitation and hygienic conditions in these units are questionable.

Socio-economic benefits of FCs

Each FCs employed approximately 80-100 women and the existing 52 FCs provided direct employment to around 5000 women living in the coastal area (Fig. 4). A single trained woman can process around 100-150 kg of fish every day and is paid daily at the rate of ₹2/kg of processed fish. Most of these women were homemakers, who had to depend on their partners for their small financial needs. But now, with the establishment of FCs, these women labourers earn ₹250-300/day, which not only provides additional income but also financial independence to the individual as well as to her family. It can be noted that one-third of women from the fishing population are involved in fishing-related activities along Karnataka coast. However, the contribution of women in every aspect of post-harvest handling, preservation and processing of fish is even though substantial in the overall development of the fisheries sector, their domination is more prevailed in retail fresh fish trading activity (Bhat and Aruna Rao, 2003). The involvement of around 5000 fisherwomen in the FCs has reduced the competition with other unorganized sectors which includes fish curing, fish salting and drying, retail fish marketing, etc., FCs not only provide alternate livelihoods to fisher-women but also generate nominal profits for the FCs operators. There has been little research on the role of women in fish cutting centres, an unorganized sector which is indirectly responsible for export earnings of the country by providing raw materials to the Surimi plants. Though FCs provide direct employment to the fisherfolk by playing a crucial part during the pre-processing phase of Surimi production, they operate only for a period of four months

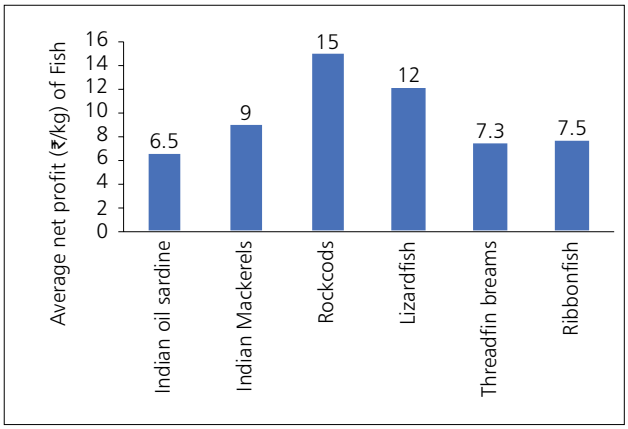

Fig. 3. Average net profit (₹/kg) for each species obtained by FCs

Fig. 4. Fisherwomen engaged in pre-processing of fish in FCs

(September to December) in a year. During the other part of the year, these women are jobless and their major apprehension during this period is a livelihood issue, as there are no business or work alternatives to this occupation. Hence, these women may be supported by Governmental and Non-Governmental organizations in the state by assisting their livelihood during the offseason. Further, the facilities provided in the FCs are to be upgraded as these women crouch down and cut fish using sickles (Fig. 4) while processing the fish (Rajesh *et al.*, 2014). The cutting tables and other types of equipment should be modified accordingly by the operators to facilitate a comfortable working environment to suit the technique of fish cutting.

Utilization and sustainable management

Of the several marine fishes procured by the FCs, the threadfin breams (65%) were the major fishery resource utilised by the FCs followed by Indian mackerel (15%), lizardfishes (12%), rock cods (5%), ribbonfishes (3%) and oil sardine (<1%) (Fig. 1). Nearly 85% of the fishes processed in fish cutting centres were utilised by surimi plants for the production of surimi, while 15% of the pre-processed fishes were used by canning and processing plants. The pre-processed threadfin breams, rock cods, lizardfishes and ribbonfishes were taken by surimi plants while pre-processed Indian mackerel and oil sardine were utilised by canning and processing plants.

The present study has indicated that nearly 42-43% of the total threadfin breams landed in Karnataka were pre-processed in FCs. The fishery of threadfin breams was mainly supported by *Nemipterus randalii* (55-59%), *Nemipterus japonicus* (35-40%) and 1% by other species (personal communication). Nearly 22% of the total threadfin breams landed in Karnataka were juveniles (Dineshbabu and Radhakrishnan, 2009) and much below the size preferred for domestic consumption. As there is agood market for smaller-sized threadfin breams, especially in surimi plants, a targeted fishery for threadfin bream, irrespective of its size exists and such exploitation results in an annual loss of 7% in yield and 23% in value (Dineshbabu *et al.*, 2009; Rohit *et al.*, 2016). Hence there is an urgent need to regulate the fishery of threadfin breams by introducing various management options like Minimum Legal Size for landings and also regulating the maximum quantity that can be harvested annually based on the MSY determined for the species through stock assessment studies.

The lizardfish fishery in Karnataka is constituted of several species of which two species, *Saurida tumbil* and *S. undosquamis* mainly contributed to the fishery. However, the demand for lizardfishes as food fish is minimal by the locals and a small portion of the catch landed is consumed by migrant labourers from Tamil Nadu. During the present study, it was observed that nearly 12-13% of the total lizardfishes landed in Karnataka are pre-processed by FCs for the surimi plant. The bigger lizardfishes are transported by the interstate traders to Kerala and Tamil Nadu and only smaller-sized fishes (including juveniles) were taken by FCs. Juvenile lizardfishes comprised nearly 8% of the total landings in Karnataka (Dineshbabu and Radhakrishnan, 2009), and almost the entire juvenile catch goes to the FCs. Therefore, regulating the size of the lizardfishes landed through strict implementation of the minimum legal size could improve the fishery substantially.

Groupers, also known as rock cods, are high valued table fish fetching a good price at local and export markets. Over 34 species of rock cods are commercially exploited in the region (SFP, 2020), with bulk landings of the spiny cheek grouper, *Epinephelus diacanthus*. Nearly 24-25% of the total spiny cheek grouper landed in Karnataka are pre-processed by FCs for the Surimi plant. Earlier studies (Zacharia *et al.*, 1995; Dineshbabu and Radhakrishnan, 2009) have reported that 98-100% of the rock cod landings during the post-monsoon season consist of undersized fishes and this season coincides with the active season of FCs. The undersized rock cods (<15 cm) which are not used for local consumption go to FCs. As this species attains a maximum size of over 50 cm (max length of 52 cm as stated by Nair, 2018) and also exhibits "protogynous hermaphroditism", strict management measures need to be implemented to sustainably manage this important fishery and to check the indiscriminate exploitation of undersized and juveniles. In addition to implementing the minimum legal size, management measures like the establishment of protected areas to preserve spawning grounds or spawning aggregations of rock cods (Easter and White, 2016) needs to be adopted at the earliest to protect this fishery.

The ribbonfish fishery of Karnataka is mainly sustained by a single species, *T. lepturus* (Rohit *et al.*, 2015). Large ribbonfish landed in very good condition does have high value in the domestic as well as export markets. The small-sized ribbonfishes and those landed in damaged condition fetch very low value and are then sent to FCs to be pre-processed as raw material for Surimi plants. Of the total ribbonfish landed in Karnataka, 9.3-9.4% are utilised by FCs for surimi plants and nearly 6-7% of ribbonfish landed are directly utilised by surimi plants without being pre-processed at FCs. Small-sized (juvenile) *T. lepturus,* in Karnataka, form only 1% of the total ribbonfish landings (Dineshbabu and Radhakrishnan, 2009). Hence implementation of current regulatory measures including MLS of landing would be sufficient for the management of the ribbonfish fishery.

The FCs play a significant role in improving the socio-economic conditions of the coastal communities, especially women. The

major fishery resource utilised by FCs in Karnataka are the threadfin bream. Limiting the numbers and permitting only registered FCs to function would go a great way to reduce the large-scale targeted fishery. Further, in addition to the mandatory registration of FCs by MPEDA, obtaining a license from the Department of Fisheries, would bestow a certain level of control on the FCs. Therefore, when there is a provision to control the establishment and functioning of FCs by the Fisheries Department, it would help in regulating the quantity of fish utilised by the industry and help in ensuring the quality of final products produced by the processing plants.

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