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Determinants of Fish Consumption in Kerala: Insights from High Frequency Consumers

M. V. Sajeev and C. G. Joshy
ICAR-Central Institute of Fisheries Technology, P. O. Matsyapuri, Cochin - 682 029, India

Abstract

Kerala, the southernmost state of India, has one of the highest fish consumption levels in the country. This study examined the level of fish consumption and the key determinants influencing purchase and consumption behaviour. A household survey of 399 consumers conducted in 2020 estimated a high per capita fish consumption of 2.94 kg per month, with fish consumed at high frequency of 2–3 times per week. Using a TRANSREG regression approach, the study identified fish price as the most influential determinant, indicating that rising prices are a major barrier to sustained consumption. Sensory perception emerged as the next most influential factor, highlighting the growing importance of quality-related attributes in consumer choice. The source of fish (marine vs. freshwater), availability of preferred fish, and perceived safety also significantly influenced consumption levels. Together, quality- and convenience-related factors accounted for a substantial share of the variation in monthly fish consumption, signaling a gradual shift away from purely price- or tradition-driven choices. The findings raise concerns about the long-term ability of consumers to maintain current consumption levels amid rising prices and point to potential disruptions in traditional fish marketing systems. The study provides evidence-based inputs for policymakers and stakeholders to support sustainable fish marketing and food and nutrition security in high fish-consuming regions.

Keywords: Consumption, determinants, fish, India, Kerala

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*Email: *sajeevmv@icar.org.in*

Introduction

Fish and fishery products are globally recognised for their critical role in ensuring a healthy and balanced diet, owing to the presence of high-quality animal protein, omega-3 fatty acids, and bioavailable micronutrients (Ivoninskii, 2016; High Level Panel of Experts on Food Security and Nutrition [HLPE], 2014, 2017; Food and Agricultural Organization of the United Nations [FAO], 2020). Fish consumption is widely recommended across age groups as a nutritionally efficient option to mitigate hunger and support food and nutrition security (Christenson, O'Kane, Farmery, & McManus, 2017). Although global diets continue to be dominated by terrestrial food systems (Duarte et al., 2009), nearly 4.4 billion people derive 15–20% of their animal protein intake from fish (FAO, 2020). Consumers across regions also perceive fish as a healthier alternative to other non-vegetarian foods (Brunsø, 2003; Gross, 2003). Reflecting these attributes, global fish consumption has grown steadily over the past five decades at an annual rate of 3.1%, surpassing all other animal protein foods, with per capita consumption rising from 9 kg in 1961 to 20.7 kg in 2022 (FAO, 2022). Consequently, fish makes a substantial contribution to dietary quality and nutritional security in both developed and developing economies (Bennett et al., 2018; Murugan & Sivagnanam, 2018; Asha, Mathew, Prasad, & Ravishankar, 2020; Majagi & Somasekhar, 2020).

India is a major contributor to global fish production, accounting for 8.92% of total output with an all-time high production of 175.45 lakh tonnes in 2022–23 and at a robust annual growth rate of 7.98% (Department of Fisheries, Government of India [DoF, GoI], 2023). Despite this growth, fish consumption in India has historically remained low. National Sample Survey data reported monthly per capita consumption of only 0.27 kg in rural and 0.25 kg in urban areas (National Sample Survey Office [NSSO], 2014), with fish contributing merely 2% of

total protein intake—among the lowest globally (Needham & Funge-Smith, 2015). Consumption patterns vary widely across social and cultural settings, with only about 60% of the population consuming fish (NSSO, 2012). However, recent trends indicate a shift, with annual per capita fish consumption among fish-eating households rising to 12.33 kg in 2021–22 and projected to reach 19.8 kg by 2029–30 (Padiyar et al., 2024).

Within this national context, Kerala represents a distinctive case. The state has a long coastline of 589.5 km, accounting for 10% of India's total coastline, and ranks third in marine landings, contributing 15% of national landings (Department of Fisheries, Government of Kerala [DoF, GoK], 2017; The New Indian Express, 2020). Kerala consistently reports the highest levels of fish consumption in India, with monthly per capita consumption exceeding 2.2 kg in both rural and urban areas (NSSO, 2012) and an annual per capita consumption of 20.65 kg, more than double the national average (DoF, GoI, 2023). The proportion of fish-consuming households is also substantially higher than that in other states. Despite this strong consumption base, growing concerns over fish quality and safety, particularly reports of adulteration with unapproved chemicals, have begun to influence consumer perceptions and behaviour (Food Safety and Standards Authority of India & ICAR-Central Institute of Fisheries Technology, 2018; Sajeev et al., 2021).

Fish consumption, like other food choices, is shaped by a complex interplay of socio-economic, qualitative, situational, and environmental factors. Existing literature has extensively examined the influence of demographic and socio-economic variables such as age, income, education, occupation, religion, and proximity to markets on fish purchase and consumption (Verbeke & Vackier, 2005; Sabat, Sharma, & Salim, 2008; Mugaonkar, Ananthan, Samal, & Debnath, 2011; Prasad & Madhavi, 2014; Herath & Radampola, 2016; Bhuyan, Goswami, & Kakati, 2017; Supartini, Oishi, & Yagi, 2018). Location, seasonality, household economic status, and temporal factors have also been shown to affect consumption levels (Thilsted, James, Toppe, Subasinghe, & Karunasagar, 2014), while risk perceptions related to quality, safety, and financial implications further shape consumer behaviour (McCarthy & Henson, 2005; Angulo & Gil, 2007; Yüksel & Yüksel, 2007). Given the perishable nature of fish, price dynamics, availability, source (marine or inland), and place of origin play a decisive role in consumption decisions (Olsen, 2004; Akpinar et al., 2009; Birch, Lawley, & Hamblin, 2012; European Market Observatory for Fisheries and Aquaculture Products [EUMOFA], 2017; Helsedirektorat, 2020). Broader ecosystem variability, climatic conditions, and fisheries management policies restricting harvest during certain seasons also influence availability and access (Perry & Sumaila, 2007; Thilsted et al., 2014).

While several studies identify health, taste, and convenience as major drivers of seafood consumption, and price, availability, and quality concerns as key barriers (Christenson et al., 2017), most of this evidence remains descriptive. Even in high fish-consuming regions such as Kerala, the relative contribution of individual determinants to actual consumption levels has not been empirically quantified. Given increasing consumption rates and a tendency towards more impulsive fish purchasing behaviour (Borah, 2019), understanding the relative importance of competing attributes becomes critical for sustaining consumption, safeguarding traditional markets, and ensuring food and nutritional security. The present study addresses this gap by moving beyond identification of determinants to quantifying their individual contribution to per capita fish consumption.

In this context, a study was conducted with the following objectives

1. To estimate the level and patterns of fish consumption, preference for fish species and consumption of fish in relation to other meat.
2. To identify the social and economic profile of consumers in relation with fish purchase and consumption and
3. To ascertain the major determinants of fish consumption and measure their individual contribution.

Materials and Methods

This cross-sectional study was conducted during 2020 in four purposively selected districts; Ernakulam, Kozhikode, Palakkad and Kottayam of Kerala state, India. Data collection was done by visiting households personally and having a personal interview with the members of the household.

Random sampling method was adopted for selecting survey locations and households for the present study. Two coastal districts (Kozhikode and Ernakulam) and two inland districts (Palakkad and Kottayam) were selected purposively in order to offset any biases arising out of varied levels of fish consumption if any; between coastal and inland districts. From each district, 100 fish consuming households were selected randomly giving representation to every taluk in the selected district thus covering rural, peri-urban and urban areas, making a final sample size of 400 (Table 1). However, the final number of households surveyed were 399.

Based on review of literature, field interactions and expert opinion, a structured interview schedule was developed for gathering primary data. The interview schedule was having eight sections namely: fish purchase and consumption behaviour (42 questions), market choice and preferences (14 questions), knowledge (25 items), attitude (10 items) and perception (19 items) of consumers regarding health benefits, safety and quality issues, factors affecting fish consumption (16 items) and socio-personal (7 variables) and economic profile of consumers (5 variables).

Within each selected taluk, villages were randomly selected in each direction. Only those households where all members consumed fish regularly were surveyed. We started with an introduction about the study and confirmed their consumption of fish before starting the survey. All attempts were made to survey the womenfolk of the household and in households where men acted as major respondent; women were present during the survey and available for clarifications.

The members of the household were asked to recall fish consumption pattern of last four weeks. The major items in first part of the questionnaire were on purchase and consumption pattern of fish, favourite fishes, most purchased fishes, family fish consumption and purchase of fish in comparison with other meat, eggs and milk. In the section on determinants of fish consumption; 16 factors namely price of fish, availability of favourite fish, market accessibility, health and nutritional benefits of fish eating, safety of fish, quality of fish, time spent for purchasing fish, familiarity with vendor/seller, convenience perception (ease of cooking), sensory perception (feel of fish while handling), knowledge of fish recipes, place of origin of fish (Inter/Intra State/National), source of fish (Marine/Freshwater), production method (Capture/Farmed), information on fish sold in market and availability of dressing facility were presented to respondents for rating. Seven socio-personal variables namely age, sex, family size, education level, information sources used, place of residence and working status of spouse and five economic variables; occupation of the respondent, monthly family income, monthly living expenditure, monthly expenditure on food and monthly expenditure on fish purchase were recorded. To understand the consumer willingness to spend on fish purchase, the Willingness to Pay (WTP) for fish per purchase was recorded as categories upto Rs. 100, 200, 300 and above 300. Each household survey took roughly 60 minutes to complete. A total of 423 households were surveyed and data from 399 households were analyzed.

The fish consumption in relation with that of other meat were estimated and measured in kg. Participants' socio-personal and economic profile were summarized using frequencies and percentages (N, %) for categorical variables and means and standard deviations (M, SD) for continuous variables. Conjoint analysis was performed to measure the percentage contribution of determinants of fish purchase and consumption among the respondents. Regression model with transformation (*'TRANSREG'*) procedure was employed to decompose the variability in the average monthly fish consumption as a function of different qualitative attributes and a numeric utility score was computed for each level of the quality attributes. Finally, Importance or percentage utility of each quality attribute was numerically ascertained to see which quality attribute mostly affected the monthly fish consumption and purchase (Green, Krieger, & Wind, 2004). Statistically, the conjoint model as a function of judgment scores of different quality attributes was expressed as

$$\phi\ (Y_{ijk}) = \beta_0 + \beta_{1jk} + \beta_{2jk} + \ldots\ \beta_{ijk} + \ldots + e_{ijk};$$

$$i = 1,2,\ldots13;\ j = 1,2,\ldots,\ k = 1,2,\ldots,$$

where $\beta_{1jk} = \beta_{2jk} = \ldots\ \beta_{ijk} = 0$

$\phi\ (Y_{ijk})$ is the monotonic transformation of the dependent variable monthly fish consumption (Y_{ijk}), β_0 is the intercept, β_{1jk} is the regression coefficients of attributes or independent variables, e_{ijk} is the error term. The normality of error terms was tested

using normal probability plot and independence of error terms was tested using run test at 5% level of significance. The model was fitted using ordinary alternating least square algorithm (Young, 1981) method using SAS 9.3. Metric conjoint analysis was employed to estimate the relative utility of selected non-socio-economic determinants influencing monthly per capita fish consumption. This approach enables decomposition of consumption behaviour into measurable attribute-level effects while preserving the ordinal nature of key variables through monotonic transformation of the dependent variable. By applying conjoint analysis in a consumption context, rather than a hypothetical choice setting, the study provides a robust framework for assessing how price, quality-related attributes, and situational factors jointly influence fish consumption in a high-consuming region.

Results and Discussion

The study revealed that a significant portion of households in Kerala exhibit high fish consumption frequencies. In Kozhikode district, the majority (64%) of households reported daily consumption of fish (Table 2). In contrast, in districts like Ernakulam (46%), Kottayam (67%), and Palakkad (38%), fish was commonly consumed 2-3 times a week. The most typical quantity per purchase across all districts was 1.0 kg, with morning being the preferred time for purchase, and same-day cooking was favoured by the majority of households. Notably, family fish consumption was generally equal among all members, except in Kozhikode, where men were found to consume most fish purchased in the household. Fish curry and fish fry emerged as the most preferred modes of fish preparation in all districts.

These findings underline the high frequency of fish consumption among Keralites, consistent with previous studies. While the majority (50.3%) of the surveyed households reported consuming fish 2-3 times a week, Kozhikode stood out with 64% of respondents indicating daily consumption. However, Palakkad presented a contrasting pattern, with one-third of respondents (33%) consuming fish only 1-2 times a month. This high frequency of fish consumption is reflective of Kerala's dietary habits, where fish, along with rice and vegetables, forms a staple part of the diet, similar to patterns observed in Bangladesh (Thilsted, 2013) and Assam (Bhuyan et al., 2017). In contrast, northern India shows lower fish consumption frequencies, as reported by Sabat et al. (2008), where fish was purchased only twice a month by nearly half of the respondents.

The preference for purchasing 1.0 kg of fish aligns with the average family size in Kerala, typically 4-5 members. The inclination to buy fish in the morning and cook it the same day reflects the preference for fresh fish, a key aspect of Kerala's culinary culture. The deviation in Kozhikode, where men consume the largest share of fish, can be attributed to the region's social norms. The consistent preference for fish curry and fish fry across all districts is rooted in traditional recipes passed down through generations, reinforcing these as the preferred methods of fish preparation.

Sardines and mackerel emerged as the most purchased and favourite fish among consumers across Kerala, reflecting their widespread preference regardless of financial status. Seer fish in Ernakulam, pomfret in Kozhikode, prawns and catla in Palakkad, and pearl spot and yellowfin tuna in Kottayam were also identified as highly favoured species. Additionally, anchovies, yellowfin tuna, pink perches, tilapia, prawns, and sole fish were popular choices among the surveyed households.

The preference for particular fish species does not necessarily correlate with overall consumption, as noted by Palash and Sabur (2004). However, in poorer households, cheaper and pelagic fishes tend to be preferred, as supported by the findings of Kawarazuka and Béné (2011) and Onumah, Quaye, Ahwireng, and Campion (2020). This study corroborates this, demonstrating that small pelagic species such as sardines and mackerel are more frequently consumed across Kerala, regardless of economic status, compared to larger pelagic species.

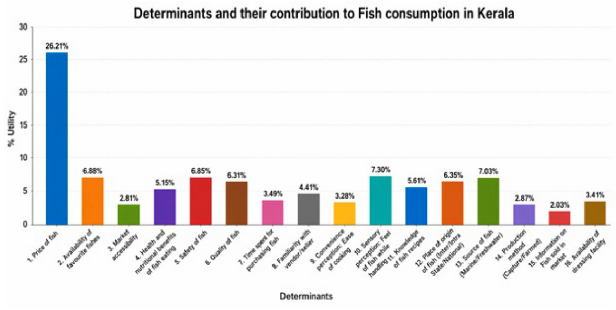

Fig. 1. Determinants and their contribution to fish consumption in Kerala.

Table 1. Survey locations and sample of households

Sl. No.	Districts selected	Locations	Households selected
1	Ernakulam (Coastal)	Aluva	14
		Kunnathunadu	13
		Kochi	16
		Kanayannur	16
		Kothamangalam	13
		Muvattupuzha	14
		Paravoor	14
2	Kozhikode (Coastal)	Kozhikode	27
		Vatakara	23
		Koyilandy	24
		Thamarassery	25
3	Palakkad (Inland)	Palakkad	18
		Chittur	16
		Alathur	16
		Ottappalam	16
		Mannarkkad	16
		Pattambi	18
4	Kottayam (Inland)	Kottayam	22
		Vaikom	18
		Kanjirappalli	20
		Changanassery	21
		Meenachil	19
		Total	399

The choice of fish species was found varying between districts and was influenced by availability. While sardines and mackerel lead in popularity, other species like anchovies, yellowfin tuna, pink perches, tilapia, prawns, and sole fish are also favoured by consumers. However, species such as pearl spot (in Ernakulam), pomfret (in Kozhikode), prawns and catla (in Palakkad), and seer fish and tuna (in Kottayam) are less frequently purchased due to factors like cost and availability in local markets, as reported by the respondents.

In recent years, the availability of sardines and mackerels in Kerala has fluctuated, particularly due to ecological impacts such as those following the El Niño event, which adversely affected the production of oil sardine—the most preferred species among Keralites (BusinessLine, 2020). This has led to a significant increase in retail prices, with sardine and mackerel prices tripling from approximately Rs. 70/kg to over Rs. 250/kg by the end of 2019 due to reduced availability and rising fishing costs (BusinessLine, 2020). Despite these challenges, the study confirms that the favourability and acceptance of these nutritious fishes remain strong among both coastal and inland populations in Kerala.

However, the persistence of these preferences raises important questions. Specifically, how long can consumers offset the effects of rising prices with their current income and maintain high consumption levels despite dwindling catches? This loyalty to favourite fish species, even in the face of economic and ecological pressures, reflects deep cultural ties to these dietary staples. As Mugaonkar et al. (2011) previously noted, a significant majority (84.3%) of consumers exhibit species-specific preferences when purchasing fish, a trend that our study also observed.

The study found that the average per capita fish consumption in the selected districts of Kerala was 2.94 kg per month. The district-wise figures were 3.21 kg/person/month in Ernakulam, 3.05 kg in Kozhikode, 1.85 kg in Palakkad, and 3.65 kg in Kottayam (Table 3). On a family basis, the average monthly fish consumption was 11.71 kg, with Ernakulam and Kottayam recording the highest at 13.28 kg per family, followed closely by Kozhikode (12.97 kg) and Palakkad (7.5 kg).

The high per capita fish consumption among Keralites is consistent with government surveys and individual studies (NSSO, 2012; DoF, GoI, 2023). In comparison with the coastal districts, Palakkad, an inland district, recorded the lowest fish consumption. However, Kottayam, another inland district, had the highest per capita consumption, which can be attributed to the ample availability of inland freshwater fish and the proximity to coastal districts like Alappuzha and Ernakulam, which supply marine fish.

The average per capita monthly consumption of 2.94 kg found in this study translates to an annual consumption of 35.28 kg per person. This figure is almost four times higher than the national average for fish-eating populations in India, which is estimated at 8-9 kg per year (NSSO, 2012), and nearly three times the ICMR recommendation of 12 kg per year per person. These findings reinforce Kerala's position as a state with a high fish consumption rate, starkly contrasting with the national average of just 0.27 kg per month in rural India (NSSO, 2014).

Interestingly, Shyam (2020) had earlier estimated the per capita monthly fish consumption in Kerala to be 2.2 kg, nearly 800 grams less than the 2.94 kg reported in this study. Comparatively, in Assam, another region with a traditionally high fish-eating population, Bhuyan et al. (2017) reported an annual per capita consumption of 14.27 kg, which is significantly lower than the figure observed in Kerala.

The study found that the average monthly purchase of fish per family in Kerala was 11.71 kg, which significantly exceeded the consumption of other meats. For comparison, the monthly consumption of chicken was 4.10 kg, mutton 1.72 kg, beef 2.27 kg, pork 0.87 kg, and duck 0.84 kg. Milk and eggs were also consumed in substantial quantities, averaging 19 liters and 31 eggs per family per month, respectively. The total average family expenditure on these items was Rs. 4349 per month (Table 4).

Fish continues to be the preferred protein source in Kerala, despite its higher cost relative to other meats. During the study period, the average retail price of fish was approximately Rs. 175/kg, making it roughly 50% more expensive than chicken, which was priced at Rs. 100-125/kg. Despite the higher price, the average family consumed nearly four

Table 2. Frequency of fish consumption in the selected districts (n=399)

Frequency	Ernakulam (%)	Kozhikode (%)	Palakkad (%)	Kottayam (%)
Daily	40	64	8	29
2-3 times a week	46	29	38	67
Weekly once	9	3	21	2
1-2 times a month	5	4	33	2

Table 3. Per capita and family consumption of fish in selected districts (n=399)

Sl. No.	Consumption (kg)	Ernakulam	Kozhikode	Palakkad	Kottayam	Total Average
1	Monthly per capita	3.21	3.05	1.85	3.65	2.94
2	Annual per capita	38.52	36.60	22.20	43.80	35.28
3	Family/month	13.28	12.97	7.5	13.28	11.71
4	Family/year	159.36	155.64	90.00	159.36	140.52

times more fish than chicken and roughly six times more fish than mutton and beef. This preference underscores the cultural and dietary significance of fish in Kerala.

The study also highlighted regional variations in expenditure and consumption patterns. Kottayam recorded the highest average monthly family expenditure on fish and other animal products at Rs. 5578, followed by Ernakulam (Rs. 5097), Kozhikode (Rs. 3632), and Palakkad (Rs. 3075). Specifically, the monthly expenditure on fish alone was Rs. 2298 in Ernakulam, Rs. 2212 in Kozhikode, Rs. 1131 in Palakkad, and Rs. 2499 in Kottayam, averaging Rs. 2037 across the state.

Notably, nearly half of the total expenditure on non-vegetarian items in Kerala was allocated to fish, with figures of 45%, 60%, 37%, and 45% in Ernakulam, Kozhikode, Palakkad, and Kottayam, respectively (Table 4). The willingness to spend on fish varied by district, with most consumers willing to spend up to Rs. 200 per purchase, except in Kozhikode, where the threshold was Rs. 100 per purchase. This difference can be attributed to the higher frequency of fish consumption in Kozhikode, where daily consumption is common, compared to 2-3 times a week in other districts.

Moreover, the study found a willingness among consumers to pay 10-15% more for high-quality fish, particularly in Palakkad, as also reported by Geethalakshmi, Ashaletha, Raj, and Nasser (2013). Despite the higher retail prices, the consistent preference for fish over other meats in Kerala emphasises the importance of fish as a dietary staple and a culturally significant food item in the state.

The socio-personal profile of fish consumers in Kerala provides insights into the demographic characteristics that influence fish consumption patterns. The mean age of respondents from fish-consuming households was 41 years, with a majority (54%) belonging to the middle-age group (35-60 years). A significant proportion of respondents (38.5%) were youth, whereas only 5% were senior citizens (Table 5). Women were the primary respondents in this study, constituting 66% of the sample, reflecting their predominant role in the purchase, cooking, and consumption of fish in households in Kerala.

Family size played a notable role in determining fish consumption. The majority of the families surveyed (61%) were medium-sized, with 4-5 members, followed by small families (2-3 members) representing a quarter of the households. About 14% of the families were large, with six or more members. Larger family size was associated with higher expenditure on fish, underscoring the significant role fish plays in the dietary habits of Keralites.

Educational attainment among the respondents was high, in line with Kerala's reputation for educational excellence. Nearly one-third of the respondents were graduates (32.8%), and a similar proportion

Table 4. Purchase of fish in comparison with other meat, eggs and milk (n=399)

Item(kg/Family)	Ernakulam (kg/m)	Kozhikode (kg/m)	Palakkad (kg/m)	Kottayam (kg/m)	Average/ month
Fish	13.28	12.97	7.50	13.78	11.71
Chicken	4.10	3.40	3.88	5.00	4.10
Mutton	2.12	2.13	0.57	2.06	1.72
Beef	2.70	2.80	1.37	2.21	2.27
Pork	1.43	-	0.08	1.95	0.87
Duck	1.90	-	-	1.47	0.84
Eggs nos/m	35	28	25	34	31
Milk ltr/m	20	15	18	24	19
Avg. monthly expenditure/family (Rs.)	5097	3685	3075	5578	4349
Avg. monthly expenditure/family on fish (Rs.)	2298	2212	1131	2499	2037
% of expenditure on fish out of total expenditure on meat, milk and eggs.	45	60	37	45	47

had completed secondary school (31.3%). More than one-fifth of the respondents were postgraduates (22%), while the rest had completed primary schooling (13.8%). The high level of education likely contributes to the respondents' awareness of the health and nutritional benefits of fish, as well as the importance of fish quality and safety, influencing their purchasing decisions.

Fish purchase and consumption decisions are also influenced by the sources of information available to consumers. The study found that the majority of households (44%) relied on up to two sources of information, while one-third (31%) used five or more sources. About 26% of households used 3-4 sources of information (Table 5). This reflects the high literacy rate in Kerala and the active use of various information channels, including newspapers, television, the internet, radio, and social media. Empirical studies suggest that the choice of information sources varies depending on the food product, the nature of the communicated information, and the associated health or safety risks (Gutteling & Wiegman, 1996; Jungermann, Pfister, & Fischer, 1996).

The survey also revealed that nearly half of the households were in rural areas (48.6%), followed by urban (31%) and semi-urban (20%) households (Table 5). Despite differences in the location of residence, fish consumption patterns across Kerala are presumed to be consistent. Employment status within households also influenced fish purchase behaviour. In 60% of the surveyed households, both husband and wife were employed outside the home, while in the remaining 40%, only the husband worked, with the wife being a homemaker. Households where both partners worked had a different fish purchase pattern, often purchasing fish after working hours and storing it in the refrigerators, compared to households where the wife was a homemaker and could purchase fish more flexibly.

The socio-personal profile of fish consumers in Kerala highlights the importance of fish as a dietary staple across diverse demographic groups, with

Table 5. Socio-personal profile of fish consumers (n=399)

Sl. No.	Factors	Mean	SD	Category	f	%
1	Age of the respondent	40.66	12.53	Young (<35 yrs)	154	38.5
				Middle aged (35-60 yrs)	217	54.25
				Senior (>60 yrs)	20	5
2	Gender			Male	136	34.09
				Female	263	65.91
3	Family size	4.25	1.51	Small (up to 3 members)	100	25.06
				Medium (4-5 members)	243	60.90
				Large (6 and more members)	56	14.04
4	Education level of the respondent			Primary	55	13.78
				Secondary	125	31.33
				Graduate	131	32.83
				Post Graduate	88	22.06
5	Information sources used	3.23	2.28	Low (Up to 2 sources)	177	44.36
				Medium (3-4 sources)	102	25.56
				High (5 or more sources)	120	30.08
6	Place of residence			Rural	194	48.62
				Semi Urban	81	20.30
				Urban	124	31.08
7	Working status of spouse			Employed	240	60.15
				Home Maker	159	39.85

variations in consumption influenced by factors such as family size, education, information sources, and employment status.

The economic profile of fish-consuming households in Kerala reveals significant insights into their income distribution, expenditure patterns, and prioritization of fish in their diets. The study found that nearly a quarter of the respondents (24.3%) were self-employed, followed by government employees (22.6%) and private-salaried individuals (21.3%). Other occupations included private-casual workers (13.8%), labourers (8.5%), farmers (4%), and fishers (1.5%) (Table 6). The diverse occupational profile reflects the wide variety of economic backgrounds among fish consumers in Kerala.

Households in the surveyed districts reported an average monthly family income of Rs. 42,311, with over half (52.4%) earning between Rs. 10,000-25,000. Approximately one-third (30.6%) of households earned between Rs. 25,000-50,000, while nearly 15% recorded a high monthly income between Rs. 50,000-1,00,000. A minor fraction of households earned more than Rs. 1,00,000 per month (1.5%), while 1.0% had a low monthly income of less than Rs. 10,000. The high average monthly family income in Kerala explains the relatively high levels of fish purchase and consumption despite the high retail fish prices during the study period. Studies such as Prasad and Madhavi (2014) and Shyam (2020) have also identified a positive correlation between income levels and fish consumption in Kerala.

Households were found to spend an average of Rs. 2,037 per month on fish purchases, which accounted for approximately 5% of their average monthly family income (Table 6). This expenditure on fish is substantial, given the high cost of fish in Kerala, yet it underscores the importance of fish in the local diet. The study revealed that households were almost evenly distributed into three expenditure categories: 36% of households spent between Rs. 1,378–2,696 per month on fish, 34% spent less than

Table 6. Economic profile of the respondents (n=399)

Sl. No.	Factors	Mean	SD	Category	f	%
1	Occupation of the respondent			Farming	16	4.01
				Fishing	6	1.50
				Labour	34	8.52
				Fish Vending	16	4.01
				Self-Employed	97	24.31
				Private Casual	55	13.78
				Private Salaried	85	21.30
				Govt. Service	90	22.56
2	Monthly family income (Rs.)	42310.78	36779.03	< 10000	4	1.00
				10000-25000	209	52.38
				25000-50000	122	30.58
				50K-1.0 Lac	58	14.54
				> 1.0 Lac	6	1.50
3	Monthly living expenditure (Rs.)	16226.82	9185.17	Low (<11635)	164	41.10
				Medium (11635-20819)	146	36.59
				High (>20819)	89	22.31
4	Monthly expenditure on food (Rs.)	8516.04	5675.84	Low (<5679)	125	31.33
				Medium (5679-11353)	203	50.88
				High (>11353)	71	17.79
5	Expenditure on fish purchase (Rs.)	2037.17	1318.72	Low (<1378)	135	33.83
				Medium (1378-2696)	145	36.34
				High (>2696)	119	29.82

Rs. 1,378 per month, and the remaining 30% spent more than Rs. 2,696 per month on fish.

The overall living expenditure for households averaged Rs. 16,227 per month, translating to roughly 38% of their monthly family income. A majority (41%) recorded low monthly living expenditures of less than Rs. 11,635, while more than one-third (37%) belonged to the medium expenditure category of Rs. 11,635-20,819. About one-fifth (22%) of households recorded high monthly living expenditures exceeding Rs. 20,819. The monthly expenditure on fish constituted nearly 12.5% of the total living expenditure, highlighting the significant role of fish in the household budget.

Food expenditure was another critical aspect of the economic profile, with households spending an average of Rs. 8,516 per month on food, representing around one-fifth of their monthly income (Rs. 42,311) and accounting for half of their monthly living expenditure (Rs. 16,227). Nearly half of the households (51%) incurred medium monthly food expenditures between Rs. 5,679 and Rs. 11,353, while one-third (31%) belonged to the low expenditure group, spending less than Rs. 5,679. The remaining 18% of households recorded high monthly food expenditures exceeding Rs. 11,353. The monthly expenditure on fish (Rs. 2,037) accounted for nearly one-fourth of the total monthly food expenditure (Rs. 8,516), emphasizing the high priority Keralites assign to fish in their diet (Table 6). This aligns with findings by Bhuyan et al. (2017), which reported that the proportion of monthly fish expenditure over total food expenditure varies significantly among different income groups.

Table 7. Determinants and their contribution in fish purchase and consumption (n=399)

The TRANSREG Procedure Hypothesis Test for Consumption

Sl. No	Factors	Utility	
	Intercept	16.327	
		Importance (% Utility Range)	Rank
1	Price of fish	26.21	1
2	Availability of favourite fishes	6.88	4
3	Market accessibility	2.81	15
4	Health and nutritional benefits of fish eating	5.15	9
5	Safety of fish	6.85	5
6	Quality of fish	6.31	7
7	Time spent for purchasing fish	3.49	11
8	Familiarity with vendor/seller	4.41	10
9	Convenience perception: Ease of cooking	3.28	13
10	Sensory perception: Feel of fish while handling	7.30	2
11	Knowledge of fish recipes	5.61	8
12	Place of origin of fish (Inter/Intra State/National)	6.35	6
13	Source of fish (Marine/Freshwater)	7.03	3
14	Production method (Capture/Farmed)	2.87	14
15	Information on Fish sold in market	2.03	16
16	Availability of dressing facility	3.41	12

The standard errors are not adjusted for the fact that the dependent variable was transformed and so are generally liberal (too small).

Root MSE	5.61286	R-Square	0.4988
Dependent Mean	11.60276	Adj. R-Sq	0.4028
Coeff. Var.	48.37519	Sspline (CONSUMPTION)	Algorithm converged

Overall, the economic profile of fish-consuming households in Kerala highlights the significant financial commitment to fish, reflecting its cultural and dietary importance in the region. The high expenditure on fish relative to income underscores the prioritization of this food item despite economic constraints.

The study employed a conjoint analysis to identify and rank the factors influencing fish purchase and consumption in Kerala, with a model fit yielding an R^2 value of 0.4988. The findings, summarized in Table 7, highlight the relative importance of each determinant in consumer decision-making. The analysis revealed that the 'price of fish' is the most significant factor, with a utility importance of 26.21%. This emphasises that in Kerala, despite high income levels, the escalating prices of fish are approaching a point where they might soon act as a barrier to consumption. The importance of price as a determinant has been consistently reported in literature, with various studies noting its role both as a driver and a potential barrier depending on market fluctuations (Birch et al., 2012; Prasad & Madhavi, 2014; Bhuyan et al., 2017).

The 'sensory perception' of fish, particularly the tactile experience while handling, emerged as the second most important factor with a 7.30% utility. This factor, combined with 'availability of dressing facilities' (3.41%) and 'convenience perception' (3.28%), accounts for approximately 14% of the utility, underscoring the role of convenience in fish purchase decisions. The shift in household dynamics, where younger generations and working women prefer pre-dressed fish due to time constraints and aversion to handling, has amplified the importance of these factors. This is consistent with findings by Birch et al. (2012) and Sajeev et al. (2021), who identified convenience as a key driver for fish consumption.

The 'source of fish'—whether marine or freshwater—was identified as the third most significant determinant with a 7.03% utility. The preference for marine fish among 80% of respondents reflects cultural and taste preferences in Kerala, where species like sardines and mackerel are favoured. This is followed by the 'availability of favourite fish' (6.88%) and 'safety of fish' (6.85%), which rank as the fourth and fifth most important factors, respectively. The latter's importance has surged in recent years due to widespread media coverage of adulterated fish, leading to heightened consumer awareness and demand for quality assurance.

Other notable determinants include the 'place of origin of fish' (6.35%) and 'quality of fish' (6.31%), both of which are closely related to consumer concerns about safety and freshness. These factors have been corroborated by previous studies in Kerala, which emphasise the significance of freshness and quality in consumer decision-making (Geethalakshmi et al., 2013; Altintzoglou & Heide, 2016).

Additionally, 'knowledge of fish recipes' (5.61%) and 'health and nutritional benefits' (5.15%) also contribute to fish consumption behaviour, reflecting the role of cultural knowledge and health consciousness in dietary choices. Less influential factors included 'familiarity with the vendor/seller' (4.41%), 'time spent purchasing fish' (3.49%), and the 'production method (capture or farmed)' (2.87%), which still play a role in specific contexts.

Lastly, 'market accessibility' (2.81%) and 'information on fish sold in the market' (2.03%) were found to have minor contributions to fish purchase decisions. However, these factors still highlight the importance of consumer access and awareness, as confirmed by recent studies (Shyam, Monolisha, & Sunil, 2020).

In summary, while the price of fish is the dominant determinant in Kerala, a combination of sensory perception, convenience, source, availability, and safety also significantly influences consumer behaviour. As fish prices continue to rise, their impact on consumption will likely increase, potentially altering the current dynamics of the market.

This study provides empirical evidence on the determinants of fish consumption in a high-consuming context, moving beyond descriptive assessments to quantify the relative contribution of key attributes influencing per capita fish consumption in Kerala. While the findings reaffirm Kerala's distinct dietary reliance on fish and the continued preference for small pelagic species, the more important contribution of the study lies in demonstrating how economic, sensory, and situational factors jointly shape consumption behaviour under conditions of rising prices and increasing quality concerns.

At the same time, the results must be interpreted in light of certain methodological limitations. First,

the study is based on cross-sectional data collected during a single year, which constrains the ability to capture temporal changes in consumption behaviour arising from seasonal availability, price volatility, or shocks such as climatic events and policy interventions. Second, although metric conjoint analysis enabled decomposition of attribute-level utilities, the analysis was confined to selected non-socio-economic determinants; broader structural factors such as income dynamics, long-term price elasticity, and inter-household substitution effects were not modelled within the conjoint framework. Third, the dependent variable relied on recall-based self-reported consumption data, which may be subject to recall bias, particularly in households with high purchase frequency. Finally, the absence of an experimental conjoint design limits the ability to infer hypothetical trade-offs under controlled choice scenarios.

These limitations point to several avenues for future research. Longitudinal studies tracking household consumption over time would help assess how sustained price increases, declining marine catches, and regulatory interventions influence consumption patterns and resilience. Integrating socio-economic variables into hybrid models combining conjoint analysis with demand or panel data approaches could offer deeper insights into substitution patterns between marine, freshwater, and farmed fish, as well as between fish and other animal proteins. Further research is also needed to examine how emerging retail formats, including online and organised fish markets, reshape consumer preferences related to convenience, sensory attributes, and trust. In addition, experimental and choice-based conjoint designs could be employed to simulate consumer responses to certification, traceability, and safety assurance mechanisms.

Overall, the study underscores that sustaining high levels of fish consumption in Kerala cannot be assumed to be automatic, even in a traditionally fish-eating society. Rising prices, shifting preferences towards convenience and quality, and growing safety concerns signal structural changes in consumption behaviour. Addressing these challenges will require coordinated efforts across fisheries management, market infrastructure, quality assurance systems, and consumer awareness initiatives to ensure that fish continues to play a central role in food and nutritional security in Kerala and comparable high-consuming regions.

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