

An Empirical Analysis of Fish Consumption Pattern in Gujarat

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Abstract

Despite significant consumption of fish by Indian people (12.8 percent of total animal protein sources), the country still falls short on fish protein availability at 5.04 kg per person per year, compared to world consumption at 20.5 kg per person in 2021. Fish does not play a substantial role in the food basket of Gujarat, as local consumption of fish is very low. Even though the state is the highest seafood producer in the country, consumption reflects a poor performance. Keeping in view the above hurdles in significance of the marine sector, the fish consumption patterns were studied simultaneously to estimate the impact. Based on the daily transactions of the market, 150 consumers from three major retail markets were purposefully selected for the study. The current paper attempts to assess consumption pattern and consumer preferences of fish and fish products in Gujarat for which descriptive statistics, percentage analysis and ordered probit model were used. Among fish consumers, consumer average per capita annual income and per capita monthly income is ₹ 3,53,200.0 and ₹ 29,433.33, respectively. Among the fish groups, consumers prefer (39.02%) marine fish at first place, freshwater fish (32.84%) at second place and brackish water fishes (28.14%) at third place. The maximum likelihood estimates of coefficients (OPM) reflect that an increase in age and income of consumers will lead to a decrease in probability to buy ribbonfish. It may be due to the reason that ribbonfish and sciaenid are considered as less preferred hence cheap fishes. With high income consumer may prefer to buy fishes like shrimp, pomphret and

tuna. Increase in age, income and family size of consumers will lead to a decrease in the probability to buy sciaenid. The frequency to buy ribbonfish also reveals increase in age is more likely to fall in the category of “twice a week” or “weekly” and less likely to fall in the rest while age is more likely to fall in the category of “every two months” and “fortnightly” and less likely to fall in the rest in case of sciaenid.

Keyword: Fish consumption, Maximum Likelihood, Socio-Economics, Marine fish

Introduction

Dietary habits of population in different regions of the world have been determined mainly by the availability of the local food and practices. Since, all foods are not of the same quality from a nutritional point of view, man's ability to meet his nutritional needs and maintain good health depends upon the type and quality of food stuffs available. Fish is a kind of food of excellent nutritional value and it makes a very significant contribution to the diet of many fish consuming communities in both developed and developing world.

The Indian fish market was worth INR 1,110 Billion in 2018. The market is further projected to reach INR 1,998 Billion by 2024, growing at a CAGR of 10.2% during 2019-2024. Accounting for nearly 6% of the global fish production, India today represents one of the largest producers of fish in the world. Both, domestic consumption as well as export of fishes have witnessed a strong growth in India over the last few years. The per capita consumption of fish has also shown a continuous growth over the last several years. A number of factors are currently driving the consumption of fish in India. These include life style changes, increasing cost of meat and the perception of fish as a healthy food with high levels of digestible protein, PUFA and cholesterol lowering capability.

The per capita consumption of fish has been continuously increasing over the past few decades. As a result of increasing disposable incomes and changing food habits, we expect the consumption of fish to continue increasing in the coming years. The growth of the organized food retail market is expected to increase the accessibility of processed fish, particularly, canned and frozen fish products for consumers. This is expected to create a positive impact on market growth. The market for health and wellness foods in India is currently exhibiting strong growth. As previously discussed, fishes are perceived as a healthy food containing high levels of digestible protein, PUFA and cholesterol lowering capability. Increasing awareness of fish as a food associated with health and wellness is expected to create a positive impact on its consumption in the coming years. India is also emerging as a leading exporter of fishes with export values exhibiting double digit growth rates. The country is currently one of the key suppliers of frozen shrimp and frozen fish in various international markets.

Fish does not play a substantial role in the food basket of Gujarat, as local consumption of fish is very low. The domestic consumption of fish in the state is in

the form of fresh fish or dry fish. Dry edible fish in Gujarat is mostly consumed in tribal pockets and urban centres like Ahmedabad, Baroda, Surat and in smaller towns. A major part of the dry edible fish is transported to Mumbai, from where it is dispatched to the North Eastern states and Southern states of the country. During the year 2013-14, the total fish production in Gujarat was about 7,98,493 MT, of which 5,00,502 MT. (*i.e.* 62.68 percent) was for consumption within the state and 37.32 percent was used for international and domestic export.

Keeping in view the above hurdles in significance of the marine sector, the fish consumption patterns were studied simultaneously to estimate the impact.

The present study was undertaken to identify the consumer behaviour pattern and consumer preferences at each stage of the seafood value chain in the state of Gujarat. The study aimed at analysing the market operation of market intermediaries along the chain, and to demonstrate how the consumer behaviour alters with respect to different markets. Finally, the study was expected to provide some useful information about socio demographic condition of consumers and the constraints associated with them.

Material and Methods

The present study aims at investigating socio economic condition, consumer behaviour, and constraints associated with fish consumption for suggesting suitable measures to improve consumption pattern in the state of Gujarat.

To understand fish consumers' behaviour, 50 consumers visiting each of the selected retail fish markets on the date of the survey are selected based on their willingness to participate in the interview. In this way, a total of 150 consumers are selected for the study. The consumers are from different landing centres *i.e.* Veraval, Mangrol, Porbandar, Jafrabad. In order to get a better understanding of income and consumption relationship, fish consumers have been classified into three groups on the basis of their income that is economically weak section (EWS), low income (LIG) and middle income group (MIG). The consumers constitute 16 fish consumers of EWS, 11 of Lower income group (LIG) and 3 of Middle income group (MIG).

Collection of Data

Data for the study was collected from both the secondary and primary sources. The secondary data related to fish consumption was collected from the Department of Fisheries, Government of Gujarat, articles & publications and other related institutions. The primary data for the study was collected from the sample stakeholders using personal interview method with the help of pretested schedule specially designed for the study.

Analytical Framework

Besides simple statistical tools such as average, standard deviation and percentage analysis, socio economic analysis, maximum likelihood estimate using Ordered probit model (OPM) were used to meet the objectives of the study.

A. Socio Economic Analysis

As per Baker and Burnham (2001) and Kotler (2004) consumer behaviour is often linked with economic variables. They view that socio-economic characteristics of consumers may have contribution in market segmentation and their bearing on consumer behaviour. Also, choice of fish as food in family consumption is influenced by socio-economic features of the consumers. Socio-demographic and economic variables are found as robust criteria in food consumer research and stood as effective segmentation tool. In case of ribbonfish and sciaenid, socio-economic conditions and demographic characteristics have played a vital role and also affected their consumption significantly. Several prior studies have also shown that seafood preferences and willingness to pay are affected by seasonal supply and demand, socio-economic conditions, cultural background and demographic features. (Spinks and Bose 2002; Redkar and Bose, 2004). Several studies prove the existence of the relationship between seafood consumption and socio-demographic aspects (Myrland *et al.*, 2000; Verbeke & Vackier, 2005). These few research findings reflect the importance of socio-demographic studies in consumer behaviour.

B. Ordered Probit Model

In order to identify the factors affecting the frequency of buying ribbonfish and sciaenid by consumers, the ordered probit model is used and marginal effect and coefficients are estimated. The ordered probit model (OPM) is estimated by maximum likelihood. The model is described as follows:

$$Y^* = \beta'X + \varepsilon, \varepsilon \sim N(0,1) \quad (1)$$

Y^* = Latent index of reported frequency of buying seafood

X = Vector of independent variables

β = Vector of regression coefficient

ε = Vector of stochastic error term

X = Age, Income, Years of schooling, Family size, occupation

Once y_i^* crosses a certain value we have to report never, then rarely, then sometimes, then always. The observed y_i is related to unobserved y_i^* . The threshold value is determined by the statistical software used e.g. STATA. Where Y_i (0, 1, 2, 3, 4, 5) for (no buy, Every two months, Monthly, Fortnightly, Twice a Week, Weekly).

The simple explanation of analysis is given below;

0 = No buy	if $y_i^* < u_1$
1 = Every two month	if $u_1 < y_i^* < u_2$
2 = Monthly	if $u_2 < y_i^* < u_3$
3 = Fortnightly	if $u_3 < y_i^* < u_4$
4 = Twice a week	if $u_4 < y_i^* < u_5$
5 = Weekly	if $u_5 < y_i^* < u_6$

Where, (u_1, u_2, u_3, u_4, u_5) are unknown threshold values. In OPM, the error term (ε) is distributed normally with mean 0 and variance 1. The probability of any observed

outcome $y=m$, given X can be calculated using the equation, in this equation β_0 or t is constrained to 0 to identify the model.

$$Pr(y_i = m | x_i, \beta, t) = F(t_m - x_i \beta) - F(t_{m-1} - x_i \beta) \quad (2)$$

Maximum likelihood estimation use to regress y_i^* on x . In OPM, the sign of estimated coefficients and the statistical significance indicates the direction of the response associated with the presence or category of a particular variable. Probability of consumers making each of four choices compute from estimated coefficients by following expression (Greene, 1998).

$$\frac{\partial p(y=j)}{\partial x_k} = [\varphi(\mu_{j-1} - \sum_{k=1}^K \beta_k x_k) - \varphi(\mu_j - \sum_{k=1}^K \beta_k x_k)] \beta_k \quad (3)$$

Where,

$\frac{\partial p(y=j)}{\partial x_k}$ is the derivative of probability with respect to x_k , β is the ordered probit x_k 's parameters.

The ordered probit model is used to estimate the coefficients and marginal effects. These estimates are obtained by using statistical software STATA 12.

C. Rank Based Quotient (RBQ)

Rank Based Quotient (RBQ) is used to quantify the data collected by preferential ranking technique for ranking the parameters and then calculating the Rank Based Quotient (RBQ) as given by Sabarathnam (1988):

$$R.B.Q = \frac{\sum fi (n+1-i)}{N \times n} \times 100$$

Where in,

fi = Number of respondents reporting a particular problem under i^{th} rank

N = number of respondents

n = number of problems identified

Results

Socio-Economic Profile of Consumers

A total of 30 fish consumers are interviewed to understand consumer behaviour with special reference to ribbonfish and sciaenid. The socio-demographic characteristics of the fish consumers/consumers have been presented in table 1.0.

Table 1.0: Socio-economic characteristic of consumer

Characteristics	Income group			Total
	EWS	L.I	M.I	
	n=16	n=11	3	n=30
Age (%)				
<15	0.00	0.00	0.00	0.00
15-30	25.00	27.27	100.00	33.33
30-45	62.50	45.45	0.00	50.00
>45	12.50	27.27	0.00	16.67
Gender (%)				
Male	93.75	72.73	100.00	86.67
Female	6.25	27.27	0.00	13.33
Family Size (No.)				
FS	4.50	5.30	4.16	4.66
NVE	3.18	4.27	2.16	3.20
FE	1.00	1.03	2.00	1.34
Veg	0.32	0.00	0.00	0.11
Income (₹/households)				
Monthly	18937	35273	64000	29433
Annual	227250	423273	768000	353200
Education (%)				
Matriculation	50.00	8.33	0.00	26.67
HS	28.57	16.67	25.00	23.33
Grad	21.43	41.67	25.00	30.00
PG & above	0.00	33.33	50.00	20.00
Occupation (%)				
Gov. Emp.	50.00	45.45	0.00	23.33
Pvt. Emp	37.50	0.00	0.00	20.00
Business	12.50	54.55	100.00	56.67

*FS=family size, NVE=Non-veg eaters, FE=fish eaters, HS=Higher secondary, GRAD=graduate, PG&above= Post graduate and above, Govt. Em= government employee, Pvt. Em= Private employee, Business= entrepreneur

Nearly 30% of the fish consumers are graduates followed by matriculates (26.67%), educated up to higher secondary level (23.33%) and PG and above (20%). Most of the fish consumers are of age group 30-45 years (50.0 %) and is followed by age group of 15-30 years (33.33%).

Occupationally, most of the consumers are businessman (56.67%) followed by government employees (23.33%) and private employee (20%). Among fish consumers, the average per household annual income and per household monthly income is ₹ 3, 53,200 and ₹ 29,433, respectively. The average family size of

consumers is 4.66 where on average the number of non-vegetarians and the number of fish eaters in the family are 3.2 and 1.4, respectively. Further, the majority of the fish consumers are male (86.67%) and only (13.33 %) are female in the fish markets.

Most of the fish consumers (62.5%) of the age group of 30-45 years belong to EWS group and 45.45 percent belong to LIG. From the EWS respondents, 93.75% are male while remaining 6.25 are female. In low income group, 72.73% are male, while only 27.27 % are female. All the consumers of MIG are male. The average family size is the highest in LIG (5.3) followed by EWS (4.5) and MIG (4.16). The average per household monthly income estimated for EWS is ₹ 18937.5 while it is ₹ 35271.75 and ₹ 64000 for LIG and MIG, respectively.

Nearly 50 percent of fish consumers of MIG are educated upto post graduates level and above 25% are graduate and 25% are educated up to high school level. In LIG, 41.67 percent of the fish consumers are graduate and 33.33 percent are PG and above educated. In the case of EWS 50 percent of the consumers are matriculate followed by higher secondary pass (28.57%) and graduate (21.43%).

On the whole, 50 percent of EWS group are government employee followed by private employee (37.5%) and business (12.5%). In the case of LIG, the majority of the consumers (54.44%) are businessman followed by government employee (45.45%). All the consumers in MIG have business as their occupation.

Fish Consumption Pattern of Household

With increase in population, urban migration and higher level of disposable income of the people in India, there is a definite increase in protein rich food consumption including seafood. Table 2.0 depicts the household consumption pattern of seafood. Growth of household incomes, particularly in BRIC countries is associated with a decline in consumption of starchy food staples and diversification of diet into dairy, meat and fish. This transition conforms to Bennette's Law, where the food share of starchy staples decline as income increases. The shift towards vulnerable, shorter shelf-life item is associated with greater food waste and a greater draw on land and other resources. The transition varies by country and culture, e.g. in India, there is less pressure on resources compared with China, where demand for meat is increasing rapidly.

Table 2.0: Household consumption pattern

Category	Income group			Total
	EWS	L.I.G.	M.I.G.	
	n=16	n=11	n=3	n=30
Per capita Income	18937.50	35272.73	64000.00	29433.33
Per capita food exp.	6075.00	9181.82	12833.33	7890.00
(%)	(32.08)	(26.03)	(20.05)	(26.81)
Non-veg	2187.50	3909.09	6333.33	3300.00
(%) of food expenses	(36.01)	(42.57)	(49.35)	(41.83)
Fish	943.75	1609.09	2966.67	1390.00
(%) of food expenses	(15.53)	(17.52)	(23.12)	(17.62)

Note: Figures in parenthesis represent the percentage

The average per capita monthly income of fish consumers is ₹ 29,433.33 out of which about 26.81 percent is spent on food. Out of total food expenditure, about 41.83 percent is spent on non-veg items and 17.62 percent is spent on fish which is a 4.72 percent of the total monthly income of a consumer. Further, the money spends on non-veg to that of total monthly income is 11.21 percent. This reflects that the amount spends on fish consumption is very low and closer to the amount spend by LIG consumers (17.52%).

It can be observed that the EWS spend the highest share (32.08%) of their per capita monthly income on food items followed by LIG (26.03%) and MIG (20.05%). A study conducted by Dey *et al.*, (2005) found that the EWS or LIG consumers have share of more expenditure on fish protein in total animal protein expenditure than MIG and HIG consumers. The middle income group has spent the highest share (49.35%) of their total food expenses) on non-veg, while EWS and low income groups spend 36.01 percent and 42.57 percent, respectively. The share of fish consumption in total food expenses is the highest in MIG with 23.12 percent followed by LIG (17.52%) and EWS (15.53%). A similar finding was reported by Dey *et al.* (2005) for Asian consumers that increase income lead to an increase in per capita fish consumption.

Preferences for Fish Species

The heterogeneity of preferences signifies natural group formation and support to lay down better marketing strategy and planning. This may lead to market segmentation, targeting and product positioning. Understanding consumer preferences towards group of fishes and towards particular fish may help in market segmentation (Smith, 1956) introduce the concept of market segmentation which elaborates forming relatively homogenous groups of similar product or services interests, similar needs and desires. Paying attention to this, preferences for different fish groups, fish species and in particular ribbonfish and sciaenid are studied.

A perusal of table 3.0 reveals that, on overall basis, consumers have shown their highest preferences for shrimp (31.23%) followed by pomphret (21.11%), mackerel (14.21%), cephalopods (10.6%) and ribbonfish (7.53%). Other fish species like sciaenid and carps are ranked at 7th and 8th position in their preference, respectively. Domestic fish markets in India govern by purchasing power, taste and preferences (Sathiadas, 1998). Also, regional taste and preferences of fish eating population of the country and the frequency of fish consumption also exert substantial influence on the market (Shyam *et al.*, 2009).

Table 3.0: Preference for fish species among different income group (% of respondents)

Fishes	Income group			Total
	EWS	L.I.G	M.I.G	
	n=16	n=11	n=3	n=30
Shrimp	45.61	21.52	52.61	31.23
	I	II	I	I
Mackerel	13.65	10.01	8.92	14.21
	III	V	IV	III
Carps	3.92	11.5	6.3	3.4
	V	III	V	VIII
Pomphret	21.81	32.89	12.33	21.01
	II	I	II	II
Ribbonfish	3.32	4.23	6.14	7.53
	VI	VII	VI	V
Sciaenid	2.94	2.93	3.32	4.61
	VII	VIII	VII	VII
Cephalopods	6.2	10.82	10.2	10.6
	IV	IV	III	IV
Other	2.78	6.1	1.3	7.32
	VIII	VI	VIII	VI

Further, the preference of consumers for different groups of fish are obtained and presented across all the income group of consumers in the table. Among EWS category, shrimp (45.61%) is the most preferred followed by pomphret (21.81%) and mackerel (13.65%) at 3rd place while ribbonfish and sciaenid are preferred at 6th and 7th place. LIG consumers prefer pomphret (32.89%) the most followed by shrimp (21.52%) and cephalopods (10.82%). Ribbonfish and sciaenid are the least preferred fish species among the group. Consumers of MIG quote shrimp (52.61%) as first preference followed by pomphret (12.33%), mackerel (8.92%) and cephalopods (10.2%). Ribbonfish and sciaenid stand at sixth and seventh position of preference among the MIG consumers.

Consumption Pattern of Ribbonfish and Sciaenid

Ribbonfish and sciaenid are least preferred fish by consumers in the study area and hence it is not frequently bought by the consumers. In total, 42.88% of the consumers buy ribbonfish twice a week, 33.71% buy weekly and 11.90% buy it fortnightly (Table 4.0). The average quantity of ribbonfish bought per visit is 1.29 kg at an average price of ₹ 88.1/Kg. It is found that the maximum price pay for ribbonfish is ₹ 90.0/Kg. In the case of sciaenid, 35.40% of the consumers buy weekly; 29.97 buy fortnightly and 15.54% buy it at monthly intervals. The average quantity of sciaenid bought by a consumer is 1.19 kg per visit with an average price of ₹ 74.3/Kg.

Table 4.0: Ribbonfish and Sciaenid consumption pattern among different income groups (% of respondents)

Ribbonfish	Income group			Total
	EWS	L.I	M.I	
weekly	40.38	27.43	33.3	33.71
Twice a week	18.75	43.22	66.7	42.88
Fortnightly	24.65	11.06	0	11.90
Monthly	12.5	10.43	0	7.64
Every two month	4.7	8.2	0	4.30
No buy	0	0	0	0
Qty bought/visit (kg)	0.92	1.45	1.50	1.29
Price (₹/kg)	88.1	88.1	88.1	88.1
Sciaenid	Income group			Total
	EWS	L.I	M.I	
weekly	27.99	43.99	34.2	35.40
Twice a week	12.73	9.34	13.9	12.00
Fortnightly	35.91	29.45	24.5	29.97
Monthly	15.88	12.05	18.7	15.54
Every two month	5.59	3.64	6.5	5.24
No buy	1.9	1.6	2.1	1.87
Qty bought/visit (kg)	0.88	1.30	1.40	1.19
Price (₹/kg)	74.3	74.3	74.3	74.3

The majority of EWS consumers (40.38%) buy ribbonfish weekly followed by fortnightly (24.65%) and twice a week (18.75%). In the case of LIG consumers, 43.22 percent of them buy ribbonfish twice a week 27.43 percent at weekly and 11.06 % at the fortnightly interval. The majority of MIG consumers (66.7%) buy ribbonfish twice a week and 33.71 percent buy on a weekly interval. The average quantity of ribbonfish bought per visit by MIG consumers is 1.5 kg followed by LIG consumer (1.45 kg) and EWS (0.92 kg).

The majority of EWS consumers (35.91%) buy sciaenid fortnightly followed by 27.99% percent of them once a week and 15.88 percent once a month. In the case of LIG consumers, 43.99 percent of them buy sciaenid on weekly basis while 29.45 percent on fortnightly basis and 12.05 percent on monthly basis. Majority consumers (34.2%) of MIG buy sciaenid once a week and 24.5 percent of them once a fortnight (24.5%). The average quantity of sciaenid bought per visit by MIG consumers is 1.4 kg followed by LIG consumer (1.3kg) and EWS (0.88kg).

Constraints in Ribbonfish and Sciaenid Consumption

Constraints in ribbonfish and sciaenid consumption across different income groups are analysed and presented in table 5.0. On the whole, ribbonfish consumers feel that the health hazard (31.45%) is the major constraint in ribbonfish consumption followed by its poor quality (28.5%), unstable price (21.7%) and lack of availability of fresh fish (11.44%). Fish consumers have concern about health issues due to the consumption of ribbonfish and scaenids of poor quality. It is also observed that most of the good quality ribbonfish and sciaenids are sent to fish processing plants and remaining are sent to local markets. In EWS consumers, the major constraint for ribbonfish consumption is its poor quality (38.91%) followed by health hazards (23.22%) and lack of fresh fish (13.53%). LIG consumers find major problems in ribbonfish consumption due to poor quality (36.33%) followed by health hazards (31.71%) and unstable price (23.88%). Health hazard (39.42%) is the major constraint for MIG consumers of ribbonfish followed by unstable price (21.22%).

Table 5.0: Constraints in ribbonfish and sciaenid consumption across different income groups (% of respondents)

Particulars	Income group			Total
Ribbonfish	EWS	L.I	M.I	
Unavailability	0	6.34	0	2.11
Irregular supply	4.29	0	10.22	4.84
Lack of fresh fish	13.53	1.8	18.99	11.44
Unstable price	20.1	23.88	21.11	21.70
Health hazard	23.22	31.71	39.42	31.45
Poor quality	38.91	36.33	10.26	28.50

Particulars	Income group			Total
Sciaenid	EWS	L.I	M.I	
Unavailability	0	0	0	0.00
Irregular supply	12.5	3.59	8.44	8.18
Lack of fresh fish	26.49	23.21	5.82	18.51
Unstable price	13.83	33.07	19.22	22.04
Health hazard	16.04	12.12	29.63	19.26
Poor quality	31.44	28.14	37.02	32.20

Willingness to Consume Ribbonfish and Sciaenid

The influence of socio-demographic characteristics on ribbonfish and sciaenid consumption revealed by maximum likelihood estimates are presented in table 6.0. The estimates of coefficients reflect that increase in age and income of consumers will lead to decrease in probability to buy ribbonfish and with increase in years of schooling, family size and price of ribbonfish, consumers are more likely to buy ribbonfish. The negative sign of coefficients of sciaenid for age, income and family size reveals the inverse relation among age, income, family size and frequency of buying sciaenid. Increase in age, income and family size of consumers will lead to decrease in the probability to buy sciaenid and with decrease in years of schooling and price of sciaenid consumers are more likely to buy sciaenid.

Table 6.0: Maximum likelihood estimates of frequency of buying ribbonfish by consumers

Iteration 0: log likelihood = -36.09104
 Iteration 1: log likelihood = -33.469725
 Iteration 2: log likelihood = -33.456549
 Iteration 3: log likelihood = -33.456541
 Iteration 4: log likelihood = -33.456541

Ordered Probit Regression

Number of obs = 30

LR χ^2 (5) = 5.27

Prob > χ^2 = 0.3839

Log likelihood = -33.456541

Pseudo R^2 = 0.4230

Freq.	Coef.	Std. Err.	Z	P> z	Conf.	[95% conf. Interval]
Age	-.0128361	.0210953	-0.61	0.543	-.0541821	.02851
Income	-2.88e-06	1.38e-06	-2.08	0.037	-5.59e-06	-1.72e-07
Edu.	.0497219	.0696237	0.71	0.475	-.0867381	.186182
Family size	.0044061	.1670043	0.03	0.979	-.3229164	.3317286
Price of RF	.320103	.0327527	0.98	0.032	-.0321838	.0962045

Variable	Obs.	Mean	Std. Dev.	Min	Max
Age	30	36.23333	10.58523	21	65
income	30	353200	179037	180000	864000
Edu.	30	13.1	3.477514	8	18
Familysize	30	4.666667	1.268541	3	8
Price of RF	30	88.1	6.348228	75	100

	Y=0	Y=1	Y=2	Y=3	Y=4	Y=5
	No buy	Every two month	Monthly	Fortnightly	Twice a week	Weekly
Predicted probabilities	0	0.0582111	0.0703756	0.0474856	0.8628747	0.118235
Marginal Effect						
Age	0	-0.0009936	-0.0086532	-0.0001837	0.0077465	0.0020826
Income	0	0.0054921	-0.2165765	-0.0083221	0.6156593	-0.4956682
Education	0	-0.0286801	0.0054332	0.0005327	0.0097643	0.0073478
Family Size	0	-0.0127090	0.0054453	-0.0046450	0.0003205	0.0076532
Price of RF	0	0.0063138	-0.0585422	-0.0432880	0.0932673	-0.0045755

It is also revealed that increase in age is more likely to fall in the category of “twice a week” or “weekly” and less likely to fall in the rest. With increase in education and price of ribbonfish it is found that consumers are more likely to fall in the category of frequent consumers quoted as “twice a week”. Increase in income more likely to fall in the category “twice a week”. Increase in family size is more likely to fall in the category “weekly”.

The frequency to buy sciaenid is depicted in table 7.0 which reveals that age is more likely to fall in the category of “every two months” and “fortnightly” and less likely to fall in the rest. With increase in education, family size and price of sciaenid, consumers are more likely to fall in the category of frequent consumers quote as “weekly”. Increase in income more likely to fall in the category “weekly”.

Table 7.0: Maximum likelihood estimates of frequency of buying sciaenid by consumers

Iteration 0: log likelihood = -36.09104
 Iteration 1: log likelihood = -33.204497
 Iteration 2: log likelihood = -33.172909
 Iteration 3: log likelihood = -33.172849
 Iteration 4: log likelihood = -33.172849

Ordered probit regression

Number of obs = 30

LR chi2(5) = 5.84

Prob > chi2 = 0.3225

Log likelihood = -33.172849

Pseudo R2 = 0.4809

Freq.	Coef.	Std. Err.	Z	P> z	Conf.	[95% conf. Interval]
Age	-.0144944	.0210377	-0.69	0.491	-.0557275	.0267388
Income	-3.09e-06	1.42e-06	-2.17	0.030	-5.88e-06	-3.01e-07
Edu.	.050769	.0700081	0.73	0.468	-.0864443	.1879823
Family size	-.0222353	.1668852	-0.13	0.894	-.3493242	.3048537
Price of Sci.	.23199	.0189253	1.23	0.022	-.013894	.0602919

Variable	Obs.	Mean	Std. Dev.	Min	Max
Age	30	3353200	10.58523	21	65
Income	30	353200	179037	180000	8640006
Edu.	30	13.1	3.477514	8	18
Family size	30	4.666667	1.268541	3	8
Price of Sci.	30	74.23333	11.77573	50	90

	Y=0	Y=1	Y=2	Y=3	Y=4	Y=5
	No buy	Every two month	Monthly	Fortnightly	Twice a week	Weekly
Predicted probabilities	0.005427	0.0076654	0.0457568	0.1556338	0.013533	0.589363
Marginal Effect						
Age	-0.0057670	0.0008458	-0.0048338	0.0083685	-0.0004759	0.0005987
Income	-0.1658689	0.0047485	-0.0744633	-0.2937473	0.0478373	0.4763949
Education	-0.0088645	-0.0164770	-0.0185610	0.0374211	-0.0506501	0.0864530
Family Size	0.0006550	-0.0097754	0.0353830	-0.0573943	-0.0575440	0.0845633
Price of Sciaenid	0.0064545	0.0006383	-0.0763737	-0.0272303	0.0006353	0.0932637

Conclusion

Nearly 30% of the fish consumers are graduates followed by matriculates (26.67%), higher secondary level (23.33%) and PG and above (20%). This reflect the average education level among the consumers. Among fish consumers, consumers' average per capita annual income and per capita monthly income is ₹ 3,53,200.0 and ₹ 29,433.33, respectively. The average family size is of consumers is 4.66 where in the average number of non-vegetarians and the number of fish eaters in the family are 3.2 and 1.4, respectively. Further, the majority of the fish consumers are male (86.67%) and only (13.33 %) are female in the fish market which reflects the dominancy of male in the fish purchasing.

It is found that most of the consumers belong to the age group of 30-45 years in EWS (62.5%) and low income group (45.45%). This indicate the involvement of youth as consumer in Gujarat. The average per capita monthly income for EWS is ₹ 18937.5 while it is ₹ 35271.75 and ₹ 64000 for low income group and middle income group, respectively.

The information of income groups of consumers reveals that the EWS spend highest share (32.08%) of their per capita monthly income on food items follow by low income group (26.03%) and middle income group (20.05%). Consumers have shown their highest preferences towards shrimp (31.23%), follow by pomphret (21.11%), mackerel (14.21%), cephalopods (10.2%) and ribbonfish (7.53%) on the fifth position. Other fish species like sciaenid and carps are ranked 7th and 8th respectively. The majority of EWS consumers (40.38%) buy ribbonfish weekly follow by fortnightly (24.65%) and twice a week (18.75%). In the case of low income consumers, 43.22 percent of them buy ribbonfish twice a week 27.43 % at weekly and 11.06 % at the fortnightly interval. It is found that 'freshness' is the main attribute

(24.64%) for the consumption of fish followed by the taste of fish (21.50%) and affordable price (16.7%).

On the whole, ribbonfish consumers claim that the health hazard (31.45%) is the major constraint in ribbonfish consumption followed by its poor quality (28.5%), unstable price (21.7%) and lack of availability of fresh fish (11.44%).

The maximum likelihood estimates of coefficients reflect that an increase in age and income of consumers will lead to a decrease in probability to buy ribbonfish. With an increase in years of schooling, family size and price of ribbonfish, consumers are more likely to buy ribbonfish. It may be due to the reason that ribbonfish and sciaenid are considered as less preferred hence cheap fishes. With high income consumer may prefer to buy fishes like shrimp, pomphret and tuna. Increase in age, income and family size of consumers will lead to a decrease in the probability to buy sciaenid and with the decrease in years of schooling and price of sciaenid consumers are more likely to buy sciaenid. The frequency to buy ribbonfish also reveals increase in age is more likely to fall in the category of “twice a week” or “weekly” and less likely to fall in the rest while age is more likely to fall in the category of “every two months” and “fortnightly” and less likely to fall in the rest in case of sciaenid.

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