

The role of consumers in fisheries product market development in Oman

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Rich fishing grounds populate the coastal waters of the Sultanate of Oman. Capitalizing on this resource is important in Oman's economic diversification and necessitates both domestic and international market development. While fish exports to the European Union have expanded rapidly, domestic fish markets have grown slowly, constrained by consumers' habits. Oman consumers display very strong preferences for fresh fish over other product forms, but even fish iced during transport or short-term storage are not considered fresh. These consumer views largely exclude development of fish product alternatives. This paper relates fish market and product development to consumer habits, perceptions, income, and other socio-economic factors through descriptive statistics and logic model analysis.

The study collects and analyzes information needed for guiding public and private decisions in domestic fish market development. A 1994 survey interviewed a sample of 130 rural and urban Omani consumers to evaluate consumer buying behavior in varying fish outlets with respect to product quality, safety, and diversification. The analysis involved three stages: descriptive characteristics of Omani fish markets and an assessment of their organization; an examination of market types inferred by consumers' behavior; and identification of opportunities to develop markets that accept new quality and safety standards, new product diversification, and diversified market outlets. Purchasing and consumption habits of fish product forms and species are

associated with income and educational levels, urban/non-fishing and rural/fishing locations, and fish and market characteristics. Consumer preferences, habits, income, and select behavioral factors affect market dimensions and potential product development.

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Rich fishing grounds populate the coastal waters of the Sultanate of Oman. Capitalizing on this resource is important in Oman's economic diversification and necessitates both domestic and international market development. While fish exports to the European Union have expanded rapidly, domestic fish markets have grown slowly, constrained by consumers' habits, Omani consumers display very strong preferences for fresh fish over other processed forms. Even fish iced during transport or short-term storage are not considered fresh. These views impede development of fish product alternatives. Our paper relates fish market and product development to consumer habits, perceptions, income, and other demographic and socioeconomic factors.

The Oman Fishing Sector

The fishing sector in Oman has developed rapidly during the last two decades. Landings during 1990 reached 119,000 Mt., of which 100,000 Mt. were produced by the traditional fishing sector, representing 84% of total national production, and the remaining 19,000 Mt. were produced by the industrial sector. The total value of the landings reached 35 million Rials (U.S. \$90.9 million) during 1990, of which 27.1 million Rials (\$70.4 million) represented the value of the traditional sector and 7.5 million Rials (\$19.5 million) the value of the industrial fishery (Dept. of Fisheries Statistics, 1992, 1993). For this level of production, local and international market development is important. The local market absorbs more than 80% of the annual fish production. High and growing GNP per capita, population growth and the increasing rate of urbanization induce this increased local consumption.

The fish available for local consumption is estimated at 56,500 Mt., an annual consumption rate of 18.8 kg per capita. Some of the production is rejected, either because of low demand or poor handling and processing (Department of Fisheries Statistics, 1990). Ingvarsson (1988) found that frozen fish is only accepted as a substitute for fresh fish by consumers where the availability of fresh fish is poor. Frozen fish is available to these distributors at all times.

The Omani domestic market, while important, is still described by government officials as less than efficient and not completely developed. Thus, domestic fish markets offer slower growth and development than the potential might indicate. Many factors are recognized as contributing to this situation. Consumer behavior and consumption habits are among the most important of these factors (Dept. of Fisheries Statistics, 1993). Ryu (1993) has suggested that greater acceptance of seafood varieties currently not familiar to consumers is key to future success in the Oman industry. From field observation and prior studies of Omani dietary habits, it was asserted that "consumers prefer fresh vegetables, fresh fruits, fresh meat, fresh fish... all fresh commodities as produced on the farm or landed on the sea-shore". (Ryu, 1993, p. 1)

Omani demand for seafood is higher than that of other Arabic countries, but very low when compared with Japanese and Korean consumers. Two major factors may contribute to this: (1) hot weather that leads to rapid putrefaction, and (2) the traditional food customs from Islamic Food Laws, from the Halal, only fresh seafood and animals which live in water all the time are permitted.

According to Ryu, "The Omani appetite for seafood seemingly yearns for very little variety" (Ryu. 1993. P.4). Although more than 150 species of fish have been identified in Omani waters (Dept. of Fisheries Statistics, 1993), only five to ten species are preferred by Omani consumers. Fishery officials contend that consumers are willing to pay premium prices for freshness, with less attention paid to quality and product differentiation. Many Omani consumers do not accept fish, which are transported in flaked or shaved ice. They believe that a fish preserved in ice is not fresh. As a result, fish reach the interior parts of Oman by retailers in trucks without ice. Although the fish spoil en route, consumers still buy them as fresh (Ryu. 1993). Frozen fish have a very thin market in Oman, limited to a large extent to expatriate consumers (Ingvarsson. 1988). Many more fish products could be processed and consumed if a market is developed for them. Moreover, a more organized and efficient fresh product market could be generated from a rational and adaptive consumer behavior that accepts, or even desires, quality, safety and efficiency standards. An extended fish market, if developed, can offer new opportunities for business development to dispose efficiently of fish products in the Sultanate. Likewise, market development can reduce waste and spoilage losses and provide better service and quality to consumers, as well as more profit to producers.

The overall objective of this study is to collect and analyze information for guiding public and private decisions in the development of fish markets through descriptive statistics and LOGIT model analysis. The study examines the fish consumers' dimensions, including: (1) demographics, (2) economic characteristics, and (3) attitudes and buying habits. This paper will be organized as follows: first, the data collection methods are discussed briefly and a framework for the analysis is developed for the present study. The following section discusses the analysis of select data generated from a survey. Finally, we present conclusions and implications with regard to acceptance of new quality and safety standards, new product diversification, and diversified market outlets.

Study Methods

The information processing (Nelson. 1970)/evoked set model assumes that once consumers have accumulated information about a product, they formulate attitudes about it. Consumer perceptions of a product influence preferences for a choice, or evoked set, including the product. Huang (1993) suggests "Perceptions reflect an individual's subjective mental construct, which is dynamic in nature and can change significantly over time. Depending on an individual's needs, motives or goals, and experiences, criteria for evaluating choice alternatives are established" (p-380).

In examining Omani fish market development potential, it is thus important to know the consumers' attitudes toward products. An item pool, similar to one used in the Southern Regional Aquaculture Center (1989) study, consisted of both open-ended and close-ended responses. The close-ended part ordered responses following the

Liken, five-point scale (Simon and Burstein 1985), with the items written in such a way that a degree of agreement or disagreement could be registered (5) strongly agree/very important through (1) strongly disagree/not important.

The groups of items were presented to a pilot sample of respondents, ID questionnaires, five in an urban (fishing/coastal) area and five in a rural (non-fishing / inland) area. Their responses were scored and tested for the inclusion of questions in the final survey instrument. The survey was conducted in 1994 based on face-to-face interviews with a convenience sample of rural and urban Omani consumers to elicit attitudes and behavior in various fish marketing outlets.

Data for this study were collected in both rural and urban areas, which covered five regions namely: Muscat region, Al-Batinah region, Al-Sharqiyah region, Al-Dakhiliyah region and Dhofar region (see map of Oman. Figure 1). Of the total sample of 124 usable observations, 55 observations were from urban areas and 69 from rural areas. Descriptive statistics and LOGIT modeling were used to analyze the data for this study. Frequencies in the descriptive analysis were used to determine which variables were most likely important, to calculate and analyze consumers' background and household characteristics, to plot the perceived product characteristics, and annual household incomes of the respondents. Information-revealing variables were then used to frame a LOGIT model to test the hypotheses concerning differences in consumer choice by demographic-economic and attitudinal factors collected above.

Consumer Choice/Evoked Set Model Hypotheses

Consumer attitudes and preferences, income, and select behavioral factors are hypothesized to affect market dimensions and potential product development (Cheng and Capps, 1987; Dellenbarger and Schupp, 1987; Engle, Hatch and Swinton, 1987; Robinson, Bacon, Toensmeyer and Gempesaw, 1995; Stayman, Alden and Smith, 1992; Simonson and Winer, 1992; Gempesaw, Bacon, Wessells and Manalo, 1995). A consumer choice (evoked set) model is tested to identify which variables most closely associate with fish/shellfish consumption in Oman.

Odds of choosing to consume individual fish species or processed forms of fish were modeled as being related to sets of variables such as demographics, household size, education, age of respondent, and rural/urban household, plus economic product characteristic, and attitudinal variables. Thus, the choice model for the desirability of fish *by species* (Kingfish, Shrimp, Tuna, *Jeydah*) was modeled:

$$(1) \text{ Fish Species}_i = f(\text{hhsz}, \text{education}, \text{rural}, \text{age}, \text{income}, \text{inincr}, \text{price}, \text{pexpt-market}, \text{Fcomp}, \text{supm}, \text{fishop}, \text{retail}, \text{odor}, \text{texture}, \text{moistness}, \text{flavor}, \text{overall}, \text{avai. spofd}),$$

where fish species = 1 if respondent answered question. "When you think of a good fish to eat which species do you think of?". "always" or "frequently", and = 0 otherwise: household size (hhsz), respondent's education and age were numeric size or years, respectively; rural =1 if respondent lived in the rural area and = 0 otherwise: income = 1200 (Omani Rials) if income <-R.0.2400. =4200 if 2401 < income < 6000, = 8000 if 6001 < income < 10000. and = 15000 if income > 10001: income increase (inincr) =1 if an increase in income would positively influence

purchases of fish. = 0 otherwise; price of fish is important (price) = 1 if very important/important. = 0 otherwise; price expectation (pexpt) = 1 if a future price decrease would increase purchases of fish, = 0 otherwise; on-shore market (markt) = 1 if generally purchase at market. = 0 otherwise; fisheries company (fcomp) = 1 if generally purchase from this source. = 0 otherwise; supermarket (supm) = 1 if generally purchase at supermarket. = 0 otherwise; fish shop (fishop) = 1 if generally purchase from tills source, = 0 otherwise; retailer (retail) = 1 if generally purchase from retailer/trucker, = 0 otherwise; odor, texture, moistness, flavor, and overall attractiveness (overall) = 5 if respondent rated fish purchases very good (Likert scale) through = 1 if unsatisfactory for these characteristics: availability (avai) = 1 if respondent answered that fish availability was important in the substitution for meat. = 0 otherwise; and spouse food decision (spofd) = 1 if spouse of respondent makes decision. = 0 otherwise.

Similarly, the specification of choice of processed fish product (fresh, frozen, canned, iced) was modeled:

$$(2) \text{ Fish Product}_i = f(\text{hhsz, education, rural, age, income, inincr, price, pexpt, market, fcomp, supm, Fishop, retail, odor, texture, moistness, flavor, overall, avai, spofd}).$$

where fish products included fresh, frozen, canned, and iced, and the explanatory variables were as above. The primary hypotheses tested among this group encompassed the acceptability of iced fish in comparison to fresh and to determine potential for educating consumers and distributors in the advantages of transporting and displaying fish products in this medium.

Empirical Results

Survey results indicate that 75.4% of the rural respondents and 90.9% of the urban respondents buy their fish/shellfish at a direct market when they are in season. Many reasons were given for not buying fish/shellfish when they are in season. These included the availability of markets, high prices, poor quality, do not like the selection, and inconvenience. Other reasons given include: no variety (i.e., few species available), do not have time, and poor processing. None of the respondents mentioned safety or availability of information to consumers. In the rural (urban) areas, 78.3% (69.1%) of the respondents said they purchase at these direct market outlets due to location, 59.4% (69.1%) due to convenience and services, and only 18.8% (29.1%) due to cleanliness and hygienic reasons. Cleanliness and hygiene appear lesser in importance. In deciding purchase in both the rural and urban areas, 84.1% of the respondents ranked quality to be important, followed by nutritional value (79.7%), and appearance.

In the rural (urban) areas, 67.7% (87.3%) of the respondents purchase their fish/shellfish at an on-shore market, 33.3% (10.9%) purchase from a retailer, 20.3% (29.1%) at a fish shop, and 7.2% (18.2%) at a supermarket. The rural area results were unanticipated, given the distances to the on-shore markets. However, almost every respondent had a car and used it to travel to the market, because local retailers typically do not offer sufficient variety. When asked about product form *when purchasing* fish/shellfish, 91.3% (92.7%) of the rural (urban) respondents indicated they purchase whole fish, 62.3% (58.2%) purchase fish

slices (fillets or steaks), 39.1% (56.4%) purchase whole shrimp, and 24.6% (40.0%) purchase whole lobster.

The frequency of consumption of fish/shellfish in rural and urban areas is almost equal; some 2.9% of the rural respondents consume fish/shellfish every day, while none consume fish/shellfish on daily basis in the urban area. Conversely, only 1.4% of the rural respondents consume fish/shellfish less than once a month, while 3.6% of the urban households report consuming fish/shellfish less than once a month. Some 47.8% of the rural and 38.2% of the urban respondents reported never eating fish/shellfish away from home. Urban area consumers appear somewhat more likely to consume fish/shellfish due to health reasons. Some 67.2% of the consumers agreed with the statement "red meat causes heart disease", while in the rural area only 55.1% of the consumers agreed with the same statement.

Consumption Choice by Fish Species

When asked: "When you think of a good fish to eat, which species do you think of?", 78% of the respondents answered that they always/frequently think of Kingfish as a good fish to eat. 68% answered that *Jeydhar* (yellow-fin tuna) is the species they think of and 65% answered (all other) Tuna. Kingfish appears the most popular species. Table 1 presents the relative frequency of responses by fish species.

For the LOGIT analysis of evoked choice (Table 2), the estimated coefficients and asymptotic t-ratios demonstrate the relationship of the choice explanatory variables to select species consumed by Omanis. While few of the variables used to describe the choice of desirable fish species were significant at commonly accepted levels, several appeared to be important in the Tomek and Robinson (1990) sense of theoretical consistency and asymptotic t-values of one or greater.

Variables which were significant and positive in the odds of respondents choosing Kingfish included odor, moistness; and flavor, while household size, texture, and overall attractiveness were significant but negative. That is, attitudes toward product characteristics of Kingfish were pronounced and important in the odds of respondents' choice, but the larger the household, the less likely to include Kingfish in an evoked set. Rural household and availability appeared important and positive influences in choice, while spouse food decision indicated that influence was important but negative. No market sources were particularly important in selecting Kingfish. Indicating its availability/lack of availability extends to each outlet seasonally and does not influence species choice.

One third of the respondents indicated that they think of Shrimp as a good shellfish to eat. For Shrimp, the significant variables included income, which was positive, and education and rural location, which were negative. Rural households, particularly, have lower odds of consuming shrimp (and other shellfish). Household size, on-shore market, retailer, and availability were important and positive for considering shrimp consumption, while age was important but negative.

Tuna and *jeydhar* (yellow-fin) are seasonal species which are very common and widely consumed in both rural and urban areas. Only two variables were significant

in the odds of choosing Tuna as a desirable fish texture, which was positive, and flavor, negative. None of the explanatory variable was significant in the odds of choosing *jeydhar*, but a few appeared important. Household size and education, which were positive, and on-shore market source, which was negative, seemed to influence *Jeydhar* attractiveness somewhat, while retailer outlet and overall attractiveness, which were positive, and price importance, fisheries company source, and supermarket were important but negative influences in choosing Tuna. Almost every Omani consumer thinks of these two species when they think of a good fish to eat.

Product Form

Rural and urban attitudes toward choice of fish product form are shown in Table 3. In the rural (urban) households, 85.5% (89.1%) of the respondents indicated their perceptions of fresh fish to be very good/good, while only 43.5% (52.7%) thought the same for frozen fish. Similarly, for iced fish in the rural (urban) households, 56.5% (67.3%) rated the fish product very good/good. Dried fish rated much lower in both areas.

Table 4 displays the estimated coefficients and asymptotic t-ratios of the odds of choosing a particular product form in terms of processing fresh, frozen, canned, and iced. Variables, which were significant in the choice of fresh fish form, included income increase, retailer, odor, moistness, and availability, which were positive, while household size, education, rural household, price importance, supermarket, fish shop and spouse food decision were all negative. Age appeared to be important and positive, meaning older respondents were more likely to prefer fresh fish. Overall, attractiveness was important but negative. Significant in the choice of frozen form were odor and moistness, which were positive, while price, on-shore market outlet, and fish shop were negative. On-shore market and fish shops purchases consist primarily of fresh product, lowering the odds of choice of frozen fish for respondents frequenting those outlets. Many variables appeared to be important for frozen fish/shellfish product form, including price expectation, supermarket purchase and availability, which were positive. On the other hand, rural households, income increase fisheries company outlet purchase, and texture were important hi 1 negative factors in respondents' choice of frozen fish products.

For canned form, only three variables were significant. These included price expectation and availability, which were positive, while moistness was negative. That is an expected price decrease would positively influence the odds of choosing canned fish, while the preference for moistness qualities in fish would negatively influence the odds of purchasing canned products. Many other variables appeared to be important in influencing the odds purchasing this product form. Education, age, income flavor and overall attractiveness were associated in a positive way while those generally purchasing fish at on-shore markets, from the fisheries company, or from fish shops would influence the odds negatively. Canned product form was expected to be significant and positive in the rural area, due to its ease in storage. Although results indicated that it was positive, it was not significant. Price expectation being significant and positive confirmed that this product form is more likely to be purchased during periods of price reductions, or, alternately, during increases in prices of other forms. That is, the probability of rating canned form good to very good increases as the price decreases.

Variables, which were significant and positive in influencing the choice of iced fish, included price expectation and availability, while price importance, on-shore market purchase, and fisheries company purchases would influence the odds of choosing iced fish negatively. Only one other variable appeared to be important and positive: odor. Other variables were important and negative including household size rural households, purchasing at a fish shop and spouse food decision. That is, larger households and rural households would be less likely to desire iced fish than their urban counterparts. Increased availability of this form and lower costs of getting it to consumers would appear to significantly increase the odds of its acceptability, or even preference over other forms, particularly in the urban areas.

Conclusions

Increases in the standard of living (income) and in educational attainment generally result in an increase in consumption of fresh product and greater acceptance of new higher-quality products. Similar to previous studies, we found significant differences in choice of fish products related to demographic, economic, and attitudinal characteristics. Over the set of demographic variables used in the choice models, educational attainment and rural households demonstrated the most significant relationships to likelihood of choice by species and form. Income group, importance of price and price expectations were significant for economic characteristics. Attitudinal characteristics include: (1) place of purchase, where on-shore markets and retailers were important; (2) fish product characteristics, where availability, odor and flavor were generally significant, and moistness and texture also important; and (3) purchasing decision, where spouse food decision was significant only for fresh fish.

Rural households and household size hold special roles in the odds of consumption of fish species and product form by processing. Income affected the consumption of fish products by species and product processing form. For example, the odds for shrimp choice were affected positively by income, meaning the higher the income the more likely the consumers are to think of shrimp as a good shellfish to eat.

Success of the seafood industry's future in Oman depends on gaining greater consumer acceptance of different seafood products not common to the Omani diet. Therefore, the government role could include: (1) education of consumers and processors about the nutritional value and the importance of quality of the fish products, (2) emphasizing the need to utilize the available cheap or underutilized fish resources by developing recipes to increase their acceptance in the Omani diet, (3) establishing an inspection program to determine and enforce quality standards, and to (4) support trial fishery methods and upgraded fishing techniques.

None of the survey respondents stated product safety or labeling information to be important in their open-ended responses. This could be due to a lack of knowledge about the hazards of these products. Programs may be required to teach consumers about the importance of product safety, quality, and the need for proper labeling for food products. Sound quality and sanitation regulations must be

enforced to guarantee successful development of the fish industry ensure entrance to other markets and premium prices.

Respondents' perceptions of iced fish (fish preserved in ice) are higher than perceived by the industry, and results indicated that the willingness of the consumer to buy fish preserved in ice is as high as their willingness to buy fresh and frozen fish. To develop traditional fisheries, the government could support the greater availability of ice and the installation of cooling equipment on fishermen's boats. The advantages of using ice properly are that it rapidly removes heat from fish, holds fish at or near 0°C throughout distribution, continuously flushes away bacteria, blood, and slime as it melts, and prevents dehydration.

Customer satisfaction is the key for local market development. The perception of rural area consumers for iced and frozen fish is as high as that of urban area consumers. Therefore, if the market is well developed for them they are more likely to increase consumption. Seafood processing and marketing companies must be aware of the variety of species available in Omani waters and their names in terms of different regions of the country, and adopt proven marketing techniques to facilitate consumer acceptance of the new products. Acceptance of various fish species differs according to geographic regions, mainly derived from the lack of name recognition or name appeal. Unappetizing names, such as catfish, lizard fish, parrot fish, and ray, work against the acceptance of many species. The perception of these species was very poor, some consumers treating these species as if they do not exist. However, well prepared and determined effort to improve both facilities and attitudes in the Omani fish market are required in order to improve quality and sanitary aspects of fish sold.

References

Cheng. H. T. and Capps- 0-, -lr, (1987). Demand for desegregate fish and shellfish species in The United States. Virginia Agricultural Experiment Station Bulletin 87-2. Virginia Tech. Blacksburg, VA.

Dellenbarger. L. E. and Schupp, A. (1987). Socioeconomic factors influencing catfish consumption. Louisiana Agricultural Experiment Station Report, Louisiana Agricultural Center. Louisiana State University.

Department of Fisheries Statistics. (1990). Annual Statistics Report For 1990. Directorate General of Fisheries Resources. Ministry of Agriculture and Fisheries Wealth. Sultanate of Oman.

Department of Fisheries Statistics. (1994). Annual Statistics Report for 1993. Ministry of Agriculture and Fisheries Resources. Sultanate of Oman.

Department of Fisheries Statistics. (1994). Annual Statistics Report for 1994. Directorate General of Fisheries Resources, Ministry of Agriculture and Fisheries

Wealth, Sultanate of Oman.

Engle, C.R., Hatch, L. U., and Swinton- M. S. (1987). Factors affecting demand for fish and sea Food products in east central Alabama and west central Georgia. Alabama Academy of Science Annual Meeting.

Gempesaw. C.M., Bacon. J. R., Wessells, C.R., and Manalo, A. (1995). Consumer perceptions of aquaculture products. American Journal of Agricultural Economics. 77:1306-1312.

Huang. C. L. (1993). Simultaneous-equation model for estimating consumer risk perceptions, attitudes, and willingness-to-pay for residue-free produce. The Journal of Consumer Affairs. 23:377-396.

Ingvarsson-P. (1988). Distribution and marketing of fresh and frozen fish products in the Sultanate of Oman. RDA Project Paper No. 4/88.

Nelson. P. (1970). Information and consumer behavior. Journal of Political Economy. 78:311-29.

Robinson. C. L., Bacon. J. R., Toensmeyer. U. C., and Gempesaw II. C. M- (1995). Consumer wholesaler and retailer perceptions about selected marketing issues concerning fresh fish and seafood products. Journal of Food Distribution Research. XXV1(1). 72-81.

Ryu, Hong-Soo. (1993). Development of seafood industry in Oman. National Fisheries University of Pusan. Republic of Korea.

Simon, J. L.. and Burstein, P. (1985). Some Principles of Measurement. New York: Random House.

Simonson. I.,and Winer. R. S- (1992). The influence of purchase quantity and display format on consumer preference for variety. Journal of Consumer Research. 19:133-138.

Southern Regional Aquaculture Center. Demographic and attitudinal characteristics of catfish consumers. December, 1989. Mississippi Agricultural and Forestry Experiment Station.

Stayman. D. M., Alden.D. L. and Smith K. H. (1992). Some effects of schematic processing on consumer expectations and disconfirmation judgments. Journal of

Tomek. W.G. and K. L. Robinson. (1990). Agricultural Product Prices. Third Edition. Ithaca.

New York: Cornell University Press.

Table 1. Desirable Fish Consumption by Species, Oman, 1994-95

Species	Percentages				
	Always	Frequently	Sometimes	Seldom	Never
	- Rural (N=69)				
Kingfish	53.6	24.6	15.9	5.8	0.0
Grouper	43.5	21.7	21.7	4.3	8.7
Snapper	33.3	24.6	13.0	7.2	21.7
Sea bream	11.6	10.1	26.1	8.7	43.5
Shark	4.3	8.7	15.9	24.6	46.4
Catfish	0.0	1.4	4.3	10.1	84.1
Barracuda	0.0	4.3	10.1	13.0	72.5
Jobfish	2.9	8.7	15.9	14.5	58.0
Lobster	15.9	11.6	30.4	18.8	23.2
Shrimp	15.9	14.5	34.8	14.5	20.3
Sardine	24.6	27.5	23.2	7.2	17.4
Ray	0.0	2.9	5.8	4.3	87.0
Cuttlefish	13.0	10.1	17.4	8.7	50.7
Tuna	40.6	33.3	14.5	5.8	5.8
Jeydhar	49.3	26.1	13.0	5.8	5.8
	Urban (N=55)				
Kingfish	36.4	41.8	21.8	0.0	0.0
Grouper	41.8	23.6	16.4	9.1	9.1
Snapper	20.0	21.8	20.0	12.7	25.5
Scab ream	12.7	20.0	20.0	9.1	38.2
Shark	1.8	12.7	12.7	10.9	61.8
Catfish	0.0	1.8	14.5	7.3	76.4
Barracuda	3.6	0.0	14.5	12.7	69.1
Jobfish	1.8	5.5	21.8	9.1	61.8
Lobster	10.9	21.8	27.3	21.8	18.2
Shrimp	14.5	34.5	32.7	10.9	7.3
Sardine	21.8	30.9	18.2	14.5	14.5
Ray	1.8	3.6	5.5	5.5	83.6
Cuttlefish	10.9	21.8	21.8	9.1	36.4
Tuna	21.8	32.7	21.8	5.5	18.2
Jeydhar	27.3	30.9	18.2	1.8	21.8

Table 2. Omani Consumer Behavior Survey. Choice Models (Fish Species by Market and Purchase Preference.).

Independent Variables	Kingfish	Shrimp	Tuna	Jeydhar
Constant	0.147 (0.057)	-0.610 (-0.921)	1.754 (-0.369)	-0.809 (-0.369)
Household size	-0.211 (-1.750)	0.130 (1.373)	0.081 (0.686)	0.122 (1.098)
Education	-0.817 (-0.134)	-0.100* (-1.775)	-0.002 (-0.027)	0.073 (1.274)
Rural/ Urban	1.145 (1.580)	-1.173** (-2.173)	0.375 (0.660)	0.443 (0.798)
Age	0.020 (0.609)	-0.043 (-1.578)	0.008 (0.275)	-0.016 (-0.590)
Income	0.310E-04 (0.398)	0.123E-03** (0.005)	0.279E04 (0.441)	-0.210E-04 (-0.341)
Income increase	0.584 (0.857)	-0.055 (-0.105)	-0.465 (-0.865)	-0.499 (-0.953)
Price expectation	-0.073 (-0.089)	0.065 (0.107)	-0.478 (-0.694)	0.603 (0.942)
Price importance	0.515 (0.834)	-0.078 (-0.170)	-0.604 (-1.205)	-0.342 (-0.691)
On-shore market	-0.827 (-0.769)	1.009 (1.337)	-0.489 (-0.599)	-0.952 (-1.090)
Fisheries company	-0.200 (0.247)	0.042 (0.065)	-0.697 (-1.049)	0.629 (0.899)
Supermarket	1.088 (0.918)	-0.285 (-0.428)	-0.765 (-1.058)	-0.032 (-0.045)
Fish shop	-0.600 (-0.858)	0.413 (0.786)	0.461 (0.821)	0.065 (0.118)
Retailer	-0.345 (-0.297)	0.893 (1,148)	1.357 (1.457)	0.534 (0.602)
Odor	1.234* (1.771)	0.326 (0.780)	-0.005 (-0.011)	0.252 (0.568)
Texture	-2.815*** (-2.763)	0.205 t0,383)	1.162* (1.943)	0.131 (0.225)

Table 2. continued

Independent Variables	Kingfish	Shrimp	Tuna	Jeydhar
Moistness	1.921*** (2.989)	-0.315 (-0.799)	0.181 (0.420)	0.414 (0.987)
Flavor	1.398** (2.236)	-0.385 (-0.827)	-1.324* (-2.338)	-0.348 (-0.722)
Overall attract	-1.163** (-2.131)	0.365 (0.842)	0.623 (1.356)	-0.297 (-0.70)
Availability	0.784 (1.252)	0.532 (1.143)	0.461 (0.917)	0.463 (0.943)
Spouse Food Decision	-0.216 (-1.159)	-0.226 (-0.164)	-0.012 (-0.074)	0.027 (0.184)
Cragg-Uhler R ²	0.325	0.178	0.284	0.183
Number of Observations	124	124	124	124
Observations at Zero	27	76	43	40
Likelihood Ratio	29.431	17.426	25.567	17.421
% of Correct Prediction	0.807	0.637	0.740	0.734

Numbers in parentheses are asymptotic t-values:

- * indicates significance at 0.10 level.
- ** = 0

Table 3. Perception of Product Form, Oman, 1994-95

Percentages					
Product Form	Very Good	Good	Fair	Poor	Unsatisfactory
	Rural(N=69)				
Fresh	43.5	42.0	4.3	5.8	4.3
Frozen	14.5	29.0	31.9	14.5	10.1
Dried	10.1	47.8	26.1	11.6	4.3
Canned	30.4	42.0	18.8	1.4	7.2
Smoked	30.4	42.0	17.4	4.3	5.8
teed	17.4	39.1	18.9	15.9	8.7
	Urban(N=55)				
Fresh	41.8	47.3	10.9	0,0	0.0
Frozen	3.6	49.1	30. ^c	16.4	0.0
Dried	1.8	30.9	45.5	12.7	9.1
Canned	30.9	34.5	25.5	1.8	7.3
Smoked	16,4	45.5	23.6	14.5	0.0
Iced	21.8	45.5	27.3	5.5	0.0

Table4. Omani Consumer Behavior Survey, Choice Models Product Form by Processing)

Product Form				
Independent Variable	Fresh	Frozen	Canned	Iced
Constant	2.060 (0.417)	-2.365 (-1.358)	-2.871 (-1.150)	-0.617 (-0.269)
Household Size	-0.751* (-1.965)	-0.086 (-0.825)	0.068 (0.624)	-0.109 (-1.085)
Education	-0.703** (-2.060)	-0.111* (-1.926)	0.093 (1.525)	0.014 (0.252)
Rural/Urban	-4.158* (-1.850)	0.973* (1.703)	0.531 (0.807)	-0.580 (-1.025)
Age	0.138 (1.265)	0.045 (1.506)	0.033 (1.091)	0.026 (0.880)
Income	0.160E-03 (0.821)	0.806E-04 (1.293)	0.788E-04 (1.058)	0.355E-04 (0.521)
Income Increase	5.757** (2.215)	-0.582 (-1.014)	-0.176 (-0.295)	-0.073 (-0.125)
Price Expectation	1.456 (0.766)	0.624 (0.927)	2.447*** (3.308)	1.225* (1.760)
Price importance	-6.392** (-2.437)	-1.007* (-1.924)	0.498 (0.882)	-0.868* (-1.699)
On-shore market	0.125 (0.057)	-0.294 (-0.392)	-1.497 (-1.440)	-2.443** (-2.600)
Fisheries company	-1.471 (-0.705)	-1.312* (-1.787)	-0.787 (-1.041)	-1.736** (-2.324)
Supermarket	-6.681** (-2.295)	-0.652 (-0.902)	0.360 (0.452)	0.687 (0.862)
Fish shop	4.649* (-1.905)	-0.507 (-0.905)	-0.677 (-1.040)	-0.818 (-1.478)
Retailer	10.294* (1.957)	0.425 (0.550)	-0.877 (-0.855)	-0.338 (-0.399)
Odor	5.395* (1.774)	-0.644 (-1.203)	-0.206 (-0.392)	0.628 (1.375)
Texture	-1.176	0.541	-0.149	0.102

Table 4. continued.

Independent Variable	Product Form			
	Fresh	Frozen	Canned	Iced
	(-0.562)	(0.745)	(-0.208)	(0.183)
Moistness 3.028*	0.341 (1.832)	-1.491*** (0.662)	-0.068 (-2.693)	(-0.159)
Flavor	0.547 (0.364)	-0.125 (-0.216)	0.919 (1.540)	-0.123 (-0.247)
Overall attract - 1.857	0.621 (-1.163)	0.609 (1.295)	0.165 (1.164)	(0.368)
Availability 6.359**	1.301** (2.513)	1.013* (2.485)	1.019* (1.754)	(1,937)
Spouse Food Decision	-2.439** (-2.327)	-0.123 (-0.507)	-0.019 (-0.117)	-0.229 (-1.479)
Cragg-Uhler R ² 0.719	0.344	0.387	0.325	
Number of Observations	124	124	124	124
Observations at Zero	16	66	38	48
Likelihood Ratio 60.402	36.885	39.709	33.961	
% of Correct Predictions	0.952	0.726	0.798	0.710

Numbers in parentheses are asymptotic t-values:

- * indicates significance at 0.10 level.
- ** = 0.05 level.
- *** = 0.01 level.

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