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# Identifying Frequent Seafood Purchasers in the Northeastern U.S.

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Factors affecting the frequency of purchase of fish and other seafood for at-home and restaurant consumption by Northeastern consumers were investigated. Cluster analysis identified six groups of consumers with similar perceptions of the attributes of fish. Demographic and cluster membership variables were employed in logistic regressions to identify the characteristics of frequent at-home use and restaurant purchasers. At-home purchase was more likely to be frequent among respondents with white collar occupations, older ages, urban/suburban and New England residence, recreational fishing participation, and membership in one of five attitudinal clusters. Restaurant purchase was more likely to be frequent among whites and among those with higher incomes, white collar occupations, recreational fishing involvement and among members of two clusters with favorable attitudes toward fish; it was less likely to be frequent in households with children age 10 and under present.

## Introduction

Important structural changes are occurring in the seafood industry which impact on both marine fishery and aquaculture operations. After peaking in 1987, per capita seafood consumption has declined in recent years, apparently as the result of seafood safety scares and the high cost of seafood relative to meat and poultry (Harvey). Despite this decline, overall consumption has held relatively steady as a result of population increases.

Significant supply changes also are occurring with aquaculture production making up an increasing proportion of total seafood supplies. Farm-raised salmon and shrimp, mostly imported, make up 16 and 40 percent respectively of the supplies of these two species. Almost 100 percent of the catfish, trout and hybrid striped bass consumed domestically are farm-raised in the U.S. (Harvey).

In the face of these changes, both the marine and aquaculture portions of the industry need to take a new look at consumption patterns. Historically, consumers in the Northeast have been major seafood purchasers with distinctive consumption patterns. Northeastern consumers' distinctive differ-

ences in frequency of consumption (McGee, Delenbarger and Dillard), in expenditure levels (Smallwood) and in price elasticities of demand (Capps and Havlicek) make a separate investigation of their seafood purchases useful.

Marketing research increasingly focuses on identifying market segments which appear to be promising targets for promotional efforts (Senauer, Asp and Kinsey, p. 3). One approach to market segmentation is to identify heavy users or frequent purchasers who will provide repeat sales (Assael, pp. 564-566). This study focuses specifically on identifying consumers in the northeastern U.S. who are the frequent purchasers of seafood for at-home and restaurant consumption. For the purposes of this study, seafood includes wildcatch and aquaculture-produced finfish and shellfish. The resulting information should be useful in the marketing efforts of seafood distributors, retailers and restaurants.

## Factors Affecting Seafood Usage

A number of recent studies have assessed different aspects of seafood marketing and demand. Many of these studies have focused on catfish, crawfish or other particular varieties of seafood. They have identified a variety of economic, demographic and attitudinal factors which affect seafood usage. In reviewing the findings of these studies, we will focus on analyses of recent consumer-level data.

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### *Income and Price*

Income and price have been found to play a significant role in explaining consumption in several studies. Income has been found to be positively related to expenditures for finfish for at-home consumption (Cheng and Capps), salmon consumption at home (Egan) and the frequency of catfish purchases for at-home use (Dellenbarger et al.). Income also was found to be positively related to restaurant consumption of salmon (Egan). Israel, Kahl and Pomeroy found the probability of restaurant catfish consumption was lower in the lowest income category (under \$10,000) but did not differ significantly among the higher income categories.

Own-price elasticities for finfish and shellfish for at-home use to have been found to be negative and inelastic (Cheng and Capps). Own price was found to have a positive effect on the budget share spent for fresh fish, prepared fish and miscellaneous fish items, while own price has a negative effect on the budget share for shellfish (Wellman). Perception of catfish as relatively inexpensive compared to other fish was found to be positively related to consumption (McGee, Dellenbarger and Dillard) and to the probability of restaurant purchases (Israel, Kahl and Pomeroy).

### *Demographic Factors*

A variety of demographic factors have been considered in recent studies of household seafood use. The results for these factors have been somewhat mixed. Household size was found to have a significant positive effect on expenditures for finfish and shellfish for at-home consumption (Cheng and Capps), on the budget share for prepared fish and miscellaneous fish products (Wellman) and on the frequency of at-home catfish purchases (Dellenbarger et al.). Cheng and Capps found the presence of children to be negatively related to total expenditures for finfish. Wellman found the presence of children to have a negative effect on the budget shares for fresh fish, frozen fish and shellfish.

Region of residence could be expected to have underlying links to both availability and preferences with resulting effects on usage. Region was found to have a significant effect on expenditures for at-home use (Cheng and Capps), on budget shares for several seafood items for at-home consumption (Wellman) and on the probability of restaurant catfish consumption (Israel, Kahl and Pomeroy). Urbanization levels were found to affect shellfish expenditures (Cheng and Capps). More urban residence was found to have a positive

effect on away-from-home catfish use (Israel, Kahl and Pomeroy).

Race has been found to have effects on usage in several studies. The Blacks and others category was found to have higher expenditures than whites on both finfish and shellfish (Cheng and Capps). Wellman found Blacks to have larger budget shares for fresh fish while non-Black households had larger budget shares for prepared and miscellaneous fish products. Dellenbarger et al. found that Blacks were more likely to consume catfish at home. Israel, Kahl and Pomeroy found some race effects on frequency of away-from-home catfish purchases. Several other demographic variables have been found to have significant effects in one or more studies (Cheng and Capps; Dellenbarger et al.; Egan; Israel, Kahl and Pomeroy; and Wellman). These include religion, ethnicity, education, employment of the homemaker and age of the homemaker or respondent.

### *Attitudinal Factors*

There is evidence of the importance of attitudinal factors from both focus group and survey based studies. Three major attitudinal segments were identified in questioning eight focus groups in four different cities (Data Development Corp.). A segment which held very favorable attitudes toward seafood was identified. This group enjoyed a wide variety of seafood and was knowledgeable about both selection and preparation. They liked the variety of seafood items and the fact that seafood seems lighter and less filling. A second group had negative attitudes toward seafood. These attitudes seemed grounded on negative experiences in their youth with taste, appearance and odor and with enforced consumption for religious reasons. A third group was essentially neutral. Overall, freshness was found to be a central concern in the selection of seafood.

Positive attitudes toward the flavor, quality, ease of preparation, availability, appearance and packaging and the price of catfish relative to other fish all were found to be important variables in discriminating catfish users from non-users (McGee, Dellenbarger and Dillard). There also is evidence of the importance of product perceptions relating to health and nutrition. Fish has been recommended frequently as a substitute for higher fat, high cholesterol meat items (National Research Council). A study of changes in per capita fish consumption over the period 1966 to 1988 found per capita fish consumption to be positively related to an index based on a running total of articles on

cholesterol available to the medical profession (Capps and Schmitz).

In many consumer-level studies, demographic variables are used as proxies for unobserved product preference variables. The studies of seafood consumption cited suggest that a full range of attitudinal variables should be taken into account explicitly where possible.

Logistic regression models have proven useful in employing qualitative variables to differentiate usage levels (Israel, Kahl and Pomeroy; Dellenbarger et al.). In this study logistic regression was used with economic, demographic and attitudinal variables to differentiate frequency-of-usage levels.

## The Data

The seafood consumer data analyzed in this study are based on 400 responses for consumers in each of three regions: the New England states (CT, MA, ME, NH, VT and RI), the Middle Atlantic states (NJ, NY and PA) and the East North Central states (IL, IN, MI, OH and WI). These groups of states follow Bureau of the Census definitions. The data were obtained in a nationwide study funded jointly by the Southern Regional Aquaculture Center (SRAC) and cooperating universities including Auburn University, University of Arkansas at Pine Bluff, Clemson University, Louisiana State University, Mississippi State University and Texas A&M University. The consumer data were collected in telephone interviews in early 1988, with 400 observations from each of nine Census regions. A random sample of adult consumers, 600 males and 600 females obtained with quota sampling was used in this study.

The survey included questions on the frequency of purchase of fish and other seafood for restaurant and home consumption, attitudes toward various fish attributes and demographic characteristics. Additional questions focused on seasonality of consumption, favorite types of fish and seafood, and participation in recreational fishing. Data from this survey have been the basis of several studies of catfish and crawfish usage (e.g., Israel et al.; McGee et al.; Kinnucan and Venkateswaran). This study is based on survey questions about overall purchases of fish and other types of seafood for at-home and for restaurant consumption. Fresh and processed wild catch and aquaculture-produced finfish and shellfish (crustaceans and mollusks) are included.

The means and standard deviations of the economic and demographic variables used in this

study are shown in Table 1. The means of the attitudinal data are shown in Table 2.

## Consumers' Attribute Perceptions

A major goal of this study was to determine the role of demographic and attitudinal factors in differentiating levels of seafood usage. In the survey, respondents were questioned on their attitudes about the availability, cost, sensory characteristics, nutritional value and ease of preparation of fish. Respondents were asked to indicate their agreement or disagreement with ten attitudinal statements (10 equals strong agreement, 1 equals strong disagreement). These data are employed in this study recognizing that they represent attitudes toward fish, rather than the broader category of seafood. The responses to the ten attitudinal questions were found to be highly intercorrelated, with

**Table 1. Descriptive Statistics for the Dependent and Demographic Variables Employed in Models**

Variable	Mean	Standard Deviation
<b>The Dependent Variables</b>		
Frequent Purchasers of Fish (Home)	0.39	0.49
Frequent Purchasers of Fish (Restaurant)	0.26	0.44
<b>The Explanatory Variables</b>		
Age of the Respondent	42.33	15.65
Race of the Respondent		
White	0.88	0.33
Other*	.12	0.33
Presence of Young Children (10 years & under)		
Present*	0.31	0.46
Not Present	0.69	0.46
Residence of the Respondent		
Nonrural	0.72	0.45
Rural*	0.28	0.45
Occupation of Household Head		
White Collar	0.38	0.49
Other*	0.62	0.49
Annual Household Income		
Less than \$20,000*	0.21	0.41
\$20,000-\$30,000	0.21	0.41
\$30,000-\$40,000	0.17	0.38
Greater than \$40,000	0.25	0.43
Not reported/refused	0.15	0.36
Region		
Mid-Atlantic*	0.33	0.47
New England	0.33	0.47
East North Central	0.33	0.47
Recreational Fishing by Family Member(s)	0.49	0.50

Note: All variables except age are dichotomous.

\*Omitted category in logistic regression analyses.

**Table 2. Mean Values of Clustering Variables for the Six Clusters\***

Perception Variables for Fish	1	2	3	4	5	6	Overall
	Very Favorable n = 261	Favorable But Expensive n = 253	Nutrition and Convenience Focused n = 168	Availability, Nutrition, and Quality Focused n = 327	Indifferent** n = 126	Do Not Like Fish n = 65	n = 1200
Readily Available	9.38	9.36	4.94	9.50	5.44	4.57	8.11
Inexpensive Compared to Other Meat	8.64	3.68	5.46	5.26	4.90	3.68	5.57
Consistently High Quality	9.05	8.70	5.78	7.61	5.35	3.46	7.44
Attractive Appearance & Packaging	8.33	7.83	5.38	5.80	5.52	2.77	6.53
No Undesirable Fish Odor	7.17	7.91	4.92	3.23	6.10	2.45	5.57
Mild, Delicate Flavor	8.76	8.75	6.79	6.36	5.10	3.32	7.15
High Nutritional Value	9.53	9.60	9.02	8.88	4.57	4.58	8.51
Easy to Prepare at Home	9.33	8.71	7.89	7.41	4.66	3.34	7.66
Has Few Bones	8.32	6.79	6.42	4.68	4.95	3.25	6.11

\*Ratings: 1 (low agreement) to 10 (high agreement).

\*\*Omitted category in logistic regression analyses.

over half of the simple correlation coefficients falling in the .30 to .62 range. The high intercorrelations suggested a patterning of responses with many respondents rating fish high (or low) on most (or all) attributes. Factor analysis supported this conclusion, with all ten attitude variables correlated to a single underlying factor.

Because of the number of intercorrelated variables, the use of the attribute rating scores as separate independent regression variables to explain frequency of purchase was deemed inappropriate. The patterning of the survey responses suggested application of cluster analysis to group participants who gave similar responses to attitude questions. Using this technique, consumers who had similar perceptions of fish were grouped into the same cluster.

The clustering procedure FASTCLUS, a SAS procedure (SAS Institute Inc.; Romesburg), was used. The attitudinal variable concerning belief that doctors recommend eating fish for good health was found to be complicating initial cluster results and was dropped from the analysis. This variable was highly correlated ( $r = .62$ ) with the respondents' belief that fish has a high nutritional value and the decision seems likely to result in only a minimal loss of explanatory power. The nine remaining questions employed in the cluster analysis are listed in Table 2.

Solutions ranging from two to ten clusters were examined. The value for the cubic clustering criterion, a measure of stable cluster composition, came to a local peak for the six cluster solution,

indicating a larger difference between the observed R-squared and the expected R-squared for the six cluster solution than for adjacent solutions. The results for the six cluster solution are reported in Table 2.

Two groups, Clusters 1 and 2, are characterized by highly favorable attitudes. Cluster 2 did not, however, agree that fish is relatively inexpensive compared to other meat. Seven of the perception variables were rated higher in Cluster 1 than in Cluster 2, but the differences were quite small except in the cases of boniness and relative cost. Respondents in Cluster 1 was labeled "very favorable," while respondents in Cluster 2 were labeled as "favorable but expensive."

Cluster 3 was labeled "nutrition and convenience focused" since there was strong agreement that fish has high nutritional value and the ratings on ease of preparation and quality were above the overall mean values. Cluster 4 was labeled as "availability, nutrition and quality focused" because of the high agreement with the attitude statement on availability and the above average agreement with the other two statements. Cluster 5 was labeled "indifferent" since the average scores were about five, indicating neutral positions on the statements used in questioning. Cluster 6 was labeled "do not like fish." Those in this cluster tended, on average, to disagree with the attitude statements.

The two most favorable clusters (1 and 2) constitute 42.9 percent of the total respondents. Clusters 3 and 4 which liked the nutritional benefits of

fish and certain other attributes make up an almost equal proportion, 41.5 percent. The indifferent/negative clusters (5 and 6) make up only 15.9 percent of the respondents. The pattern in which high or low ratings on some attributes are generalized to other attributes, has been labeled the *halo effect* (Mowen, p. 260). This effect is particularly apparent in the ratings on sensory attributes: quality, appearance, odor and flavor. In all except the fourth cluster, which rated fish low on fishy odor, the mean scores on these four sensory variables were similar.

When we examine the distribution of individual variables across the six clusters, we see that fish was perceived as relatively expensive in five of the six clusters, representing 79 percent of the households. On the other hand, the nutritional value of fish was viewed very favorably by four of the six clusters, representing 84 percent of the households.

The six clusters derived appear to be relatively homogeneous and to offer interesting insights into the structure of consumer attitudes toward fish. One measure of their worth, of course, is their usefulness in explaining variation in purchase and consumption. The relationship of attitudes toward fish to frequency of seafood purchase for at-home and for restaurant consumption is examined in Table 3. Both at-home and restaurant purchases of seafood differed sharply across the six clusters. Separate chi-square analyses were conducted for at-home and restaurant purchases. The results indicate that the frequency of seafood purchases is not independent of attitudes toward fish (in interpreting these results the reader should note that the clusters are based on attitudes toward fish, not toward all seafood).

As would be expected, Clusters 1 and 2 were frequent purchasers of seafood for at-home use. Frequent purchase for at-home use was less common in Clusters 3 and 4. Cluster 5 included the fewest frequent purchasers and the most non-purchasers. Although Cluster 6 expressed the most negative attitudes toward fish, over 30 percent of the respondents reported that their households purchased seafood for at home consumption three or more times a month. At least two explanations for this discrepancy seem possible:

(1) The respondents had little control over household purchases.

(2) Other non-fish seafood items, i.e. shellfish, were purchased. Other results from this survey indicate that shellfish are highly popular. When respondents nationwide were asked their three favorite seafood items, five of the ten most frequently-

named items were shellfish, with shrimp at the top of the list (Kinnucan, Nelson and Hiariy).

The frequency of restaurant purchases also varied sharply across the six clusters. The biggest differences were in the percentages of non-purchasers which were lowest in Cluster 2 followed by Cluster 1. Over half of Cluster 5 were non-purchasers as were over 38 percent of Cluster 6. The purchases of seafood by those in Clusters 5 and 6 seem likely to be largely shellfish items.

### The Logit Model of Attitudinal and Demographic Attributes

As noted earlier, heavy users and frequent purchasers are important to sellers because of their repeat purchases. In this study a logistic regression model of frequent seafood purchasers versus all others was employed to analyze purchases for at-home and restaurant consumption. The standard dichotomous logit model was developed for identifying consumer attributes associated with both home and restaurant purchases. Under the dichotomous choice scenario, suppose that  $p_i$  and  $p_j$ , are respectively, the probabilities associated with two events, frequent purchase and non-frequent purchase of seafood. The econometric relationship can be written as:

$$p_i = \frac{1}{1 + e^{-x'\beta}}$$

where,

$p_i$  = probability of frequent purchase of seafood

$x$  = a vector of socioeconomic, demographic, and attitudinal determinants, and

$\beta$  = a vector of parameter estimates associated with  $x$ .

The log of odds of choosing the two events, that is,  $\log(p_i/p_j)$  is conveniently written as a linear function in parameters and is given by  $x'\beta$  (Maddala).

Respondents who purchased seafood were asked how frequently they purchased it. Four response categories were offered: less than once a month, one or two times a month, three or four times a month, and more than four times a month. Non-purchasers constituted a fifth category. Since the data were multicategorical we initially utilized both ordered logit and multinomial logit procedures. The chi-square, McFadden R-square and

correct prediction statistics all indicated poor model fit. Further logit analyses indicated limited differences between purchasers and nonpurchasers and between more and less frequent purchasers. More clear-cut differences were found between frequent purchasers (those that purchased seafood three or more times a month) and all other users (including infrequent and non-purchasers). Since frequent purchasers are an important target of marketing activities, the analysis was focused on identifying this group.

In other preliminary analyses we also estimated the at-home and restaurant purchases equations using bivariate probit techniques. Because of the potential interrelationship of at-home and restaurant purchases, we examined the residuals from the two equations for intercorrelation and found them to be only very weakly correlated. For ease of interpretation, we have presented the logit model results.

The variables used in the analysis are shown in Tables 1 and 2. The results of the logistic regressions analyzing frequent purchasers versus all others for both home and restaurant consumption are shown in Table 4. Religion (Catholic versus non-Catholic), household size and gender variables were employed in preliminary analyses with the models, but were dropped from the final models because of their nonsignificant effects. None of the three variables was found to be statistically significant in any phase of the modeling. Education of the respondent was found to be strongly correlated with occupational status. The occupational status variable was retained in the analysis.

*Purchases for At-Home Use*

Household income was found to be non-significant in explaining purchases for home use, but was retained in the final models because of its economic importance. Households in which the head was in a white collar occupation, were found to be more likely to be frequent purchasers. Purchase for home use was found to be more likely to be frequent as age of the respondent increased. A significant negative age-squared term indicates that this effect diminished at older ages. Urban and suburban households were more likely to be frequent purchasers, perhaps because of better access to well-stocked seafood counters and markets.

Regional variables were included both to identify regional effects and to control the effects of observation numbers which were not directly proportional to population size. Residence in New England, relative to the omitted Middle Atlantic region, tended to result in an increased likelihood of frequent use, perhaps because of better access to fresh fish and local dietary patterns.

While catch from recreational fishing is a potential substitute for some types of purchased seafood, households with members involved in recreational fishing were found to be more likely to be frequent seafood purchasers. This suggests that households that fish for recreation like seafood and seek it from both sources. Race and presence of children (age 10 or under) were not found to be significant in a preliminary analysis and were not included in the final model.

**Table 3. Seafood Purchase Frequencies for the Six Cluster Categories**

	1	2	3	4	5	6
	Very Favorable 21.8%	Favorable But Expensive 21.1%	Nutrition & Convenience Focused 14.0%	Availability, Nutrition, and Quality Focused 27.2%	Indifferent 10.5%	Do Not Like Fish 5.4%
Percent						
<b>Home Consumption*</b>						
Non-purchasers	10.0%	9.5%	22.0%	18.4%	49.2%	30.8%
Purchasers						
Two or fewer times a month	43.7	36.0	43.5	47.7	34.1	38.4
Three or more times a month	46.3	54.5	34.5	33.9	16.7	30.8
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<b>Restaurant Consumption**</b>						
Non-purchasers	16.8%	12.3%	22.0%	18.4%	50.8%	38.5%
Purchasers						
Two or fewer times a month	55.2	54.5	56.0	58.7	31.7	36.9
Three or more times a month	28.0	33.2	22.0	22.9	17.5	24.6
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

\*Chi-square = 100.27 (10 d.f.) p = .000.  
 \*\*Chi-square = 135.53 (10 d.f.) p = .000.

**Table 4. Logistic Regression Results**

Variables	At-Home Purchases		Restaurant Purchases	
	Demographic Variables Only	Demographic & Attitudinal Variables	Demographic Variables Only	Demographic & Attitudinal Variables
Intercept	-3.03*** (.54)	-3.71*** (.59)	-2.03*** (.29)	-2.45*** (.36)
Income \$20-30,000	-.29 (.19)	-.26 (.20)	.20 (.22)	.23 (.22)
Income \$30-40,000	.05 (.20)	.06 (.21)	.11 (.24)	.11 (.24)
Income >\$40,000	-.06 (.19)	-.05 (.20)	.75*** (.22)	.77*** (.22)
Income—Not Reported	.16 (.20)	.28 (.21)	.27 (.24)	.33 (.24)
White Collar	.32** (.14)	.31** (.14)	.28* (.15)	.27* (.15)
Race—White	—	—	.65*** (.25)	.60** (.25)
Children—Age 10 or Under Present	—	—	-.62*** (.16)	-.62*** (.16)
Age	.08*** (.02)	.06*** (.02)	—	—
Age Squared	-.001*** (.0002)	-.0007*** (.0003)	—	—
Urban-Suburban	.35*** (.14)	.41*** (.14)	—	—
New England	.46*** (.15)	.40*** (.15)	.23 (.17)	.18 (.17)
East North Central	.14 (.15)	.13 (.15)	.13 (.17)	.14 (.17)
Recreational Fishing	.23* (.12)	.18 (.13)	—	—
Very Favorable (Cluster 1)	—	1.32*** (.27)	—	.61** (.28)
Favorable but Expensive (Cluster 2)	—	1.67*** (.27)	—	.78*** (.28)
Nutrition and Convenience Focused (Cluster 3)	—	.95*** (.29)	—	.22 (.31)
Availability, Nutrition, and Quality Focused (Cluster 4)	—	.85*** (.26)	—	.35 (.28)
Do Not Like Fish (Cluster 6)	—	.80** (.36)	—	.44 (.38)
$\chi^2$ Score	49.59 (12 d.f.) p = .0001	103.29 (16 d.f.) p = .0001	58.54 (9 d.f.) p = .0001	70.92 (14 d.f.) p = .0001

\*\*\*Significant at .01 Level.

\*\*Significant at .05 Level.

\*Significant at .10 Level.

N = 1200

Home Purchases: 485 observations at 1, 715 observations at 0.

Restaurant Purchases: 307 observations at 1, 893 observations at 0.

Percent Correct Predictions: Equation 1—58.9%, Equation 2—62.1%, Equation 3—74.4%, Equation 4—74.8%.

As second step in the analysis, a set of dummy variables representing membership in the attitudinal clusters was added to the logit regression (Table 4). Cluster 5 was the omitted category. The augmented equation produced a substantial increase in the chi-square and McFadden R-squared statistics, indicating that the cluster variables represent an additional source of variance explana-

tion. While the explanatory power of the equation increased, there was little change in individual demographic coefficients or in their significance levels. This suggests that the attitudinal cluster variables are only minimally correlated with the demographic variables included in the model. Four of the five cluster membership variables had significant coefficients with positive signs, indicating



those in the cluster were more likely to be frequent purchasers than those in the omitted category, Cluster 5.

The odds ratios for the results are presented in Table 5 in order to facilitate the interpretation of the analysis (Hosmer and Lemeshow, pp. 39–44). Odds ratios are presented rather than marginal probabilities because all of the variables, except those for age, are binary. When explanatory variables are binary, the marginal probabilities are misleading according to Kennedy (p. 235). The odds ratios for the regressions including both demographic and attitudinal cluster variables show that certain categories were notably more likely to be frequent purchasers for at-home use. Urban-suburban households were 1.5 times more likely to be frequent purchasers than were those in the omitted rural category. New England households were 1.49 times more likely to be frequent purchasers than were those in the omitted Middle Atlantic category. Among the five attitude clusters those in Clusters 1 and 2 were notably more likely to be frequent purchasers for at-home use.

*Purchases for Restaurant Consumption*

Restaurant purchase depends on the frequency of eating away from home and how often seafood is ordered when eating out. The variables linked to frequent restaurant purchases appear to be associated more closely to eating out than to the selection

of seafood when eating out. Frequent seafood purchase in restaurants was found to be more likely in the highest income category (over \$40,000). Whites also were more likely to be frequent purchasers. Those with children age 10 and under were less likely to be frequent purchasers.

Those with white collar occupations were found to be more likely to be frequent restaurant purchasers, although this effect was of borderline significance. Age, age squared and urbanization were not found to have significant effects in preliminary analyses and were omitted in the estimation of the final model.

For the second stage of the analysis, five dummy variables representing membership in the attitudinal clusters were added to the restaurant purchase model as they were to the at-home purchase model. As with the at-home model this produced little change in the individual demographic coefficients or in their level of significance. The attitudinal cluster variables clearly have minimal correlation to the demographic variables and represent a separate source of variance explanation. Only two of the five dummy variables representing cluster membership had statistically significant coefficients. The coefficient for Clusters 1 and 2 were positive and significant.

The odds ratio results (Table 5) indicate that those in the \$40,000 and over income category were over twice as likely to be frequent restaurant seafood purchasers as those in the omitted under

**Table 5. Odds Ratios Associated with Determinants of Frequent Purchases of Seafood**

Variables	At-Home Purchases		Restaurant Purchases	
	Demographic Variables Only	Demographic and Attitudinal Variables	Demographic Variables Only	Demographic and Attitudinal Variables
Income \$20–30,000	0.75	0.77	1.22	1.26
Income \$30–40,000	1.05	1.06	1.11	1.12
Income > \$40,000	0.94	0.95	2.12	2.16
Income—Not Reported	1.17	1.32	1.31	1.39
White Collar	1.38	1.36	1.33	1.32
Race—White	—	—	1.92	1.82
Children—Age 10 or Under Present	—	—	0.55	0.54
Age	1.09	1.07	—	—
Age squared	1.00	1.00	—	—
Urban-Suburban	1.43	1.50	—	—
New England	1.58	1.49	1.25	1.20
East North Central	1.15	1.14	1.14	1.15
Recreational Fishing	1.25	1.20	—	—
Very Favorable (Cluster 1)	—	3.75	—	1.84
Favorable but Expensive (Cluster 2)	—	5.33	—	2.18
Nutrition and Convenience Focused (Cluster 3)	—	2.61	—	1.25
Availability, Nutrition and Quality Focused (Cluster 4)	—	2.34	—	1.42
Do Not Like Fish (Cluster 6)	—	2.24	—	1.56
McFadden R-squared Statistics	0.031	0.064	0.043	0.052

\$20,000 income category. Whites were over 1.8 times more likely to be frequent purchasers than were non-whites. Those with children age 10 or under were only about half as likely to be frequent restaurant purchasers as those with no children or only older children. Again, among the cluster categories, Clusters 1 and 2 were markedly more likely to be frequent purchasers.

### **Summary and Conclusions**

This study analyzed the frequency of purchases of seafood (including both wild catch and aquacultured finfish and shellfish) for at-home and restaurant consumption with consumer survey data for the northeastern U.S. The impact of demographic and attitudinal characteristics was analyzed with logistic regression. Variables contributing to frequent at-home purchase included white collar occupation, older age, urban/suburban residence, New England location and recreational fishing participation. These variables differ somewhat from those identified in previous studies of seafood demand. Some differences are to be expected as this study focused on frequency of purchase rather than on total expenditures. Income clearly is less important in explaining frequency of seafood purchases for at-home use than it is in explaining total expenditures. Household size, the presence of children, race and religion also were found to be less important than in some earlier studies. Urbanization and region were, however, important factors as would be expected from previous studies.

Frequent restaurant purchases were found to be more likely for those in the highest income category, whites and recreational fishing involvement. Frequent restaurant purchase was found to be less likely when children age 10 or under were present. These findings suggest a somewhat different effect of income than suggested by the catfish purchase study of Israel, Kahl and Pomeroy which found a negative effect for the lowest income category. Our results seem more similar to those of Redman and of Senauer who examined total away-from-home spending. The negative effects of the presence of children also match Redman's findings. Our finding that whites are more likely to be frequent restaurant purchasers parallels Redman's finding that Black racial membership had a negative effect on away-from-home expenditures. We did not, however, find the negative effects of age for frequency of purchase that both Redman and Senauer identified for away-from-home expenditure.

Nine perception variables measuring respon-

dents' perceptions of such attributes as the flavor and nutritional value of fish were utilized in cluster analysis. The resulting six clusters parallel the results of the Data Development Corporation study which suggested the existence of three groups of seafood consumers: positive, negative and neutral. Cluster 1 and 2 clearly are highly positive, while Cluster 6 is negative and Cluster 5 is neutral. Clusters 3 and 4 appear to fit best in the positive category.

The perceptions of fish being expensive and fish being nutritious proved to be key variables in the cluster analysis. Cost perceptions were the principal factor differentiating Cluster 2 from Cluster 1. Perceived nutrition benefits were important in differentiating clusters 3 and 4 from cluster 5. While the perceived expensiveness of fish is a problem for the industry, its effect may be mitigated by the positive perception of fish's nutritional value.

When dummy variables representing membership in the attitudinal clusters were added to the at-home model, the effects of four of the clusters were found to differ significantly from those of the omitted "indifferent" cluster, Cluster 5. The cluster variables describing attitudes toward fish clearly provided an additional source of explanation of the frequency of seafood purchases and were only minimally correlated to the demographic variables. When variables representing the attitudinal clusters were added to the restaurant purchase model the effects of only two clusters were significant and there was only modest increase in the chi-square and McFadden R-square statistics. Attitudinal variables thus appear to offer less explanation of the frequency of restaurant seafood purchases than of those for at-home use. The limited explanatory power of attitudinal variables for restaurant seafood purchases may be due to the double-hurdle involved in eating seafood away-from-home: the decision to eat out and the decision to order seafood.

The findings suggest that value-added seafood products that are easy to prepare, without bones, flavorful and nutritious could be highly successful in segments of the northeastern U.S. market. The logit analysis results indicate that in targeting marketing efforts for products for at-home use particular attention should be given to suburban/urban, white collar consumers recognizing the cultural or locational effects which result in more frequent purchases in New England as compared to the Mid-Atlantic or East North Central regions. In targeting marketing efforts for restaurant purchases particular attention should be given to higher income consumers who are white and in households with no young children present.

## References

- Assael, Henry. *Consumer Behavior and Marketing Action*. 4th ed. Boston: PWS-Kent. 1992.
- Capps, Jr. Oral and Joseph Havlicek, Jr. "National and Regional Household Demand for Meat, Poultry and Seafood: A Complete Systems Approach." *Canadian Journal of Agricultural Economics* 32(1984):93-108.
- Capps, Jr. Oral and John D. Schmitz. "A Recognition of Health and Nutrition Factors in Food Demand Analysis." *Western Journal of Agricultural Economics*. 16(1991):21-35.
- Cheng, Hsiang-tai and Oral Capps, Jr. "Demand Analysis of Fresh and Frozen Finfish and Shellfish in the United States." *American Journal of Agricultural Economics*. 70(1988):533-42.
- Data Development Corporation. *Analysis of Consumer Attitudes Towards Fish and Seafood*. Prepared by Food Service Research and Marketing Division of Data Development Corporation for the National Fish and Seafood Promotional Council, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. Nov. 1988.
- Dellenbarger, Lynn E., James Dillard, Alvin R. Schupp, Hector O. Zapata and Brian T. Young. "Socioeconomic Factors Associated with At-Home and Away-from-Home Catfish Consumption in the United States." *Agribusiness* 8(1992):35-46.
- Egan, David. "Profile of North American Fresh and Frozen Salmon Markets." Pp. 217-230 in Upton Hatch and Henry Kinnucan (eds.), *Aquaculture: Models and Economics*. Boulder CO: Westview Press. 1993.
- Harvey, David J. "Outlook for U.S. Aquaculture." Agriculture Outlook Conference. U.S. Department of Agriculture. December 1993.
- Hosmer, David W. and Stanley Lemeshow. *Applied Logistic Regression*. New York: John Wiley. 1989.
- Israel, Danilo C., Kandice H. Kahl, and Robert S. Pomeroy. "The Effects of Relative Price Perceptions and Demographic Factors on Restaurant Catfish Consumption." *Agribusiness* 7(1991):585-95.
- Kennedy, Peter. *A Guide to Econometrics*. 3rd ed. Cambridge MA: MIT Press. 1993.
- Kinnucan, Henry W. and Meenakshi Venkateswaran. "Effects of Generic Advertising on Perceptions and Behavior: The Case of Catfish." *Southern Journal of Agricultural Economics* 22(1990):137-51.
- Kinnucan, Henry W., Robert G. Nelson and Johannis Hiariey. "U.S. Preferences for Fish and Seafood: An Evoked Set Analysis." *Marine Resource Economics* 8(1993):273-91.
- McGee, William M., Lynn E. Dellenbarger, and James G. Dillard. *Demographic and Attitudinal Characteristics of Catfish Consumers*. MAFES Technical Bulletin 168. Mississippi State University. 1989.
- Maddala, G.S. *Limited-Dependent and Qualitative Variables in Econometrics*. New York: Cambridge University Press. 1983.
- Mowen, John C. *Consumer Behavior*. 2nd ed. New York: Macmillan. 1990.
- National Research Council (U.S.). Committee on Diet and Health. *Diet and Health: Implications for Reducing Chronic Disease Risk*. Washington, D.C.: National Academy Press. 1989.
- Redman, Barbara. "The Impact of Women's Time Allocation on Expenditure for Meals Away from Home." *American Journal of Agricultural Economics* 62(1980):234-37.
- Romesburg, H. Charles. *Cluster Analysis for Researchers*. Belmont, CA: Lifetime Learning Publications. 1984.
- SAS Institute Inc. *SAS User's Guide: Statistics*. Version 5 Edition. Cary, NC: SAS Institute. 1985.
- Senauer, Benjamin. "The Effect of Demographic Shifts and Changes in the Income Distribution on Food Away-from-Home Expenditure." *American Journal of Agricultural Economics* 61(1979):1046-57.
- Senauer, Ben, Elaine Asp and Jean Kinsey. *Food Trends and the Changing Consumer*. St. Paul MN: Egan Press. 1991.
- Smallwood, David M. *Food Spending in American Households, 1980-86*. Statistical Bulletin 791, Economic Research, U.S. Dept. of Agriculture, Washington, D.C., 1990.
- U.S. Dept. of Agriculture, Economic Research Service. *Aquaculture: Situation and Outlook*, AQUA 9 and 10, September 1992 and March 1993.
- Weld, Minot, W. Knoblauch, and J. Regenstien. "An Economic Analysis of Freshwater Finfish Aquaculture in the Mid-Atlantic States." *A.E. Res.* 90-8, Cornell University Agr. Exp. Station. June, 1990.
- Wellman, Katharine F. "The U.S. Retail Demand for Fish Products: An Application of the Almost Ideal Demand System." *Applied Economics* 24(1992):445-57.