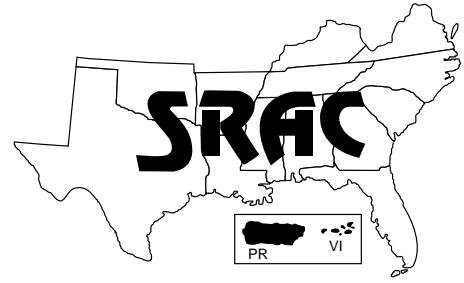


**Southern
Regional
Aquaculture
Center**



November 1998

Analysis of Regional and National Markets for Aquacultural Food Products in the Southern Region



Final Project Report on the
SRAC Regional Research Project

Analysis of Regional and National Markets
for Aquacultural Food Products in the Southern Region

SRAC No. 601

Compiled by
Carole R. Engle

Southern Regional Aquaculture Center
P.O. Box 197
Stoneville, Mississippi 38776

Telephone: 601-686-9311
Fax: 601-686-3569

Preface

The project summarized in this report was developed and funded through the Southern Regional Aquaculture Center, which is one of five regional aquaculture research and Extension centers established by Congress in 1985 and administered by the United States Department of Agriculture. The five centers are located in the northeastern, north-central, southern, western, and tropical Pacific regions of the country. The Southern Regional Aquaculture Center began organizational activities in 1987, and the first research and Extension projects were initiated in 1988. The thirteen states and two territories included in the Southern Region are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, Puerto Rico, South Carolina, Tennessee, Texas, U.S. Virgin Islands and Virginia.

The regional aquaculture centers encourage cooperative and collaborative research and Extension educational programs in aquaculture having regional or national applications. Center programs

complement and strengthen existing research and Extension educational programs provided by the Department of Agriculture and other public institutions.

The mission of the centers is to support aquaculture research, development, demonstration, and Extension education to enhance viable and profitable domestic aquaculture production for the benefit of consumers, producers, service industries, and the American economy. Projects developed and funded by the centers are based on regional industry needs and are designed to aid commercial aquaculture development in all states and territories. The centers are organized to take advantage of the best aquaculture science, education skills, and facilities in the United States. Center programs ensure effective coordination and a region-wide, team approach to projects jointly conducted by research, Extension, government, and industry personnel. Interagency collaboration and shared funding are strongly encouraged.

Project Participants

Auburn University

Clemson University

Louisiana State University

Mississippi State University

Texas A&M University

University of Arkansas at Pine Bluff

Upton Hatch, Henry Kinnucan

Robert Pomeroy

Lynn Dellenbarger

James Dillard

Oral Capps, Jr.

Carole Engle

Contents

Project Participants	i
List of Tables	iii
List of Figures	iv
Executive Summary	1
Comprehensive Market Information From Consumers, Retail Groceries and Restaurants	1
Effectiveness of Advertising and Promotion of Farm-raised Catfish	1
Potential for Producing and Marketing Catfish	1
Project Background	3
Project Objectives	4
Objective 1: Comprehensive Market Information from Consumers, Retail Groceries and Restaurants	5
Consumers	5
Characteristics of consumers	5
Consumer profiles.....	8
Retail Groceries.....	9
Market penetration, characteristics, potential and constraints of farm-raised catfish in retail groceries	9
Using scanner data to evaluate marketable catfish product forms in retail groceries	11
Seafood counters in grocery stores	12
Restaurants	13
Objective 2: Effectiveness of Advertising and Promotion of Farm-raised Catfish	16
Effects of Catfish Advertising on Consumers' Attitudes, Purchase Frequency and Farmers' Incomes	16
Returns on Catfish Advertising and Optimal Spending Levels	18
Objective 3: Potential for Producing and Marketing Catfish	21
Publications and Presentations	26

List of Tables

Table 1.	Percentage of catfish consumer households in various sociodemographic categories	6
Table 2.	Ranking by relative strength of discriminating variables in classifying a catfish consumer	7
Table 3.	Percentage of grocery stores selling catfish (1987-88) and percent likely to add catfish sales in the next year by region	9
Table 4.	Percentage of grocery stores reporting catfish sales by product form and region	10
Table 5.	Respondents' reasons for not selling catfish in grocery stores	10
Table 6.	Estimated regional retail grocery market potential for catfish	11
Table 7.	Five most popular fish and seafood species in restaurants nationwide	14
Table 8.	Product form (%) of catfish purchased by restaurants by region.....	14
Table 9.	Number and percentage of respondents, by type of ownership, whose menus include catfish.....	15
Table 10.	1988 impact of catfish advertising on awareness, beliefs, attitudes and purchase frequency in the U.S.	17
Table 11.	Impact of generic advertising by the U.S. catfish industry, 1987-89, at the wholesale and farm levels	19
Table 12.	Cost and returns from generic advertising, U.S. catfish industry, 1987-89 average	19
Table 13.	Weighted average of catfish consumer groups' ranking of catfish within each region by attribute	22
Table 14.	Favorite finfish of consumers by region.....	23

List of Figures

Figure 1. U.S. census regions	5
Figure 2. Percentage of consumers in each category as shown by the 1988 survey of households	6
Figure 3. Product form preferences of consumers	24

Executive Summary

This document summarizes the findings of the Southern Regional Aquaculture Center project *Analysis of Regional and National Markets for Aquacultural Products Produced for Food in the Southern Region*. The primary objectives of the project were to obtain and analyze comprehensive market information from consumers, retail groceries and restaurants; to assess the effectiveness of advertising and promotion of farm-raised catfish; and to develop an overall assessment of the potential for producing and marketing catfish in the Southern Region.

Comprehensive Market Information

National telephone surveys were conducted in 1988 of 3,600 households, 1,800 grocery stores and 1,800 restaurants. The surveys collected information about consumer demographics, attitudes, perceptions, awareness, frequency of consumption and consumption levels of catfish by region of the United States.

The household survey indicated that farm-raised catfish was being consumed, to some extent, in all regions of the United States by consumers with a wide range of ethnic, income, age, religious and occupational characteristics. Results suggested, however, that the typical catfish consumer was likely to have a professional occupation, have some college education or a degree, have an income range of \$20,000 to \$30,000, be between 20 and 39 years of age, and reside in urban areas. The broad characterization that fish are nutritious and healthy was shared by four out of five consumer profiles. This represents a major marketing advantage for aquaculture producers.

Analysis of the retail grocer survey data indicated that the top three regions for new market development, in decreasing order of potential, were the South Atlantic, East North Central and Pacific regions. Restaurants that characterized their cuisine as seafood or as a combination of steak and seafood held the greatest promise for market expansion. The regions that promised the greatest return on catfish market promotion and develop-

ment expenditures from restaurant sales included the New England, Middle Atlantic, East North Central and Pacific regions. Catfish availability, quality, taste, price and preparation were attributes that should be stressed in advertising and promotion to educate restaurant managers about catfish. An educational campaign on the use and preparation of catfish that is designed for restaurant managers and chefs would aid market expansion.

Effectiveness of Advertising and Promotion

The consumer's attitude toward catfish is one of the most important factors affecting both at-home and restaurant purchase frequency. Attitude is most strongly influenced by perceptions of the flavor of catfish; nutrition and absence of fishy odor are relevant but less important. Perceptions of flavor, in turn, are determined largely by whether the consumer is aware of the farm-raised product. Thus, product promotion should stress flavor attributes and pond culture. Estimated net producer returns of \$0.48 to \$7.46 per media dollar expended suggest that the industry advertising effort is profitable for catfish producers. Optimal spending levels for advertising were computed to range from 1.04 to 2.28 times the actual level of spending in 1989, and were dependent upon the opportunity cost of advertising funds and the supply elasticity. It appears that the program could have generated more profits if it had been better funded.

Potential for Producing and Marketing Catfish

Consumer attitudes toward catfish apparently have changed in non-traditional catfish consumption areas. Consumers perceive that catfish is a nutritious, high-quality product that is easy to prepare. Perhaps in response to these changed attitudes, consumers across the United States are eating more catfish, and grocery store and restaurant managers are adding catfish to their product lines. The restaurant survey indicated that the New England, Middle Atlantic, East North Central and Pacific

regions had the greatest potential for market expansion through restaurant outlets. Grocery stores in the New England and Middle Atlantic regions have been adding catfish more rapidly than stores in other regions. The East North Central and South Atlantic regions have a large base of stores that have been selling catfish for many years and have

above-average numbers of new stores that added catfish within 2 years after the surveys. As long as the farm-raised catfish industry continues to produce a consistently high quality product in an efficient manner, potential consumer demand will support further industry growth.

Project Background

Aquaculture, particularly catfish production, continues to grow in importance in the Southern Region of the United States, where acreage devoted to commercial production exceeds 173,000 acres. The farm-raised catfish industry has become an important source of farm and agribusiness employment and income. Sales of processed catfish increased from \$18.5 million in 1978 to \$149.7 million in 1988. By 1997, sales totaled \$422 million.

The rapid expansion of the catfish industry is the result of many factors. Health-conscious consumers are eating more fish and less red meat. Industry advertising and promotional efforts, as well as large purchase contracts, have expanded catfish markets beyond the traditional southeastern area. The traditional seafood industry is harvesting preferred marine fish species at maximum sustainable yields. The catfish industry, however, has positioned itself as a cost-effective alternative to help meet the growing demand for high quality fish and seafood while reducing imports and creating jobs.

The Southern Region is in a favorable position to capitalize on the growing demand for aquacultural products, with abundant land and water suitable for aquaculture development, a favorable climate, and a core of scientific and technical support within the region. From a production standpoint, the industry could continue to put more ponds into production and expand at the current rate for many years. However, demand could become the limiting factor long before the region exhausts its ability to produce. Demand is influenced by price of the product, prices of related goods, consumers' tastes and preferences, population numbers, income levels of consumers, and future expectations.

In a young industry such as this, it is imperative that producers, processors and distributors have as much market information as possible. It is important to understand demographic characteristics such as geographic location, consumer characteristics and consumer attitudes toward the product. This information can be used by industry to

expand markets into other geographic areas or to increase consumption in traditional market areas. Market information is essential in the development of effective advertising campaigns and promotional activities.

In 1987, the catfish industry significantly increased its advertising and promotional efforts, and catfish sales increased. However, the amount of the sales increase attributable to increased advertising was not known. Part of the increase could have been related to a combination of lower retail prices for catfish, higher prices for substitutes and the general upward trend in fish and seafood consumption. Prior to this project, no research had attempted to quantify and isolate the effect of advertising on demand for catfish.

In 1988, the Board of Directors of the Southern Regional Aquaculture Center approved the development of a project to conduct national surveys to determine market penetration and demand characteristics associated with farm-raised catfish, and to identify market areas with the greatest potential for expansion. This project was handled by a competitive grant process. A request for proposals was mailed to all Agricultural Experiment Stations in the Southern Region to solicit cooperative, multi-state proposals. In response, the project entitled *Analysis of Regional and National Markets for Aquacultural Products Produced for Food in the Southern Region* proposed national surveys on three market levels—consumer, retail grocery store and restaurant. The project was approved for funding in 1988 by the United States Department of Agriculture, Cooperative States Research, Extension, and Education Service.

The following report summarizes the project's findings and recommendations for marketing and promotional strategies to enhance expansion of the catfish industry. Additional information may be obtained from the individual publications listed at the end of this report.

Project Objectives

Goal: To develop comprehensive market information to aid in the market expansion and diversification of farm-raised catfish production in the Southern Region.

- Objective 1. Obtain and analyze comprehensive market information from consumers, retail groceries and restaurants.
- a. Develop socioeconomic and attitudinal profiles of fish and seafood consumers; estimate catfish consumption at home and away from home; and determine substitutability with other meat products.
 - b. Determine market penetration (geographic distribution) and demand characteristics in retail groceries and identify market potential and constraints related to regional and national market expansion and diversification.
 - c. Determine catfish use and costs in restaurants and identify market potential and constraints for regional and national market expansion.
- Objective 2. Assess the effectiveness of advertising and promotion in increasing sales of farm-raised catfish.
- Objective 3. Develop an overall assessment of the potential for producing catfish in the Southern Region and marketing the product nationwide.

Objective I: Comprehensive Market Information from Consumers, Retail Groceries and Restaurants

Market data for this objective were obtained through a national telephone survey of 3,600 households, 1,800 grocery stores and 1,800 restaurants. The survey was conducted by a private research firm between April and June 1988. The sample of telephone numbers was selected at random from within the continental U.S. census regions of New England (NE), Middle Atlantic (MA), South Atlantic (SA), East North Central (ENC), East South Central (ESC), West North Central (WNC), West South Central (WSC), Mountain (M) and Pacific (P) (Fig. 1). If an interview was not completed for any reason, another telephone number within the same area code was used.

Consumers

Characteristics of Consumers

The estimated total number of households in the United States in 1988 was 89,142,300. These households represented a total of 241,587,000 persons, or an average of 2.71 persons per household. Estimated average income was \$33,206 per household. An estimated 92.5% of households had telephones. The household survey consisted of a random sample of 400 households from each of the nine U.S. census regions.

Methods

The questionnaire was designed to collect information about consumer demographics, attitudes, perceptions, awareness, frequency of consumption, and consumption levels of catfish by region of the U.S. To obtain the data, the interviewer asked to speak with an adult

male living in the household. If an adult male was not present, an adult female was substituted. Such substitution continued until the quota of female respondents was filled. Each respondent was told that an opinion survey about people's food purchases was being conducted. The interview began with a series of general questions about the fish and seafood consumption habits, preferences and attitudes of the household. Then specific questions concerning catfish consumption were asked. They included whether the respondent had heard of farm-raised catfish, whether the farm-raised product was perceived as different from other catfish, whether the respondent had ever eaten catfish and, if so, the place, frequency, amount and type of purchase. The final section of the questionnaire dealt with the socioeconomic characteristics of the household. Time required to complete an interview averaged 12 minutes. The success rate was one completed interview for every three phone numbers.

Data from the household survey were used to classify consumers into three categories according to consumption of fish and seafood. If respondents reported that they ate catfish to any extent, either at home or away from home, they were classified as

“catfish” consumers as opposed to “other fish and seafood” or “non-fish” consumers.

Linear discriminant analysis has been used in market research to distinguish between two or more groups. In this study, linear discriminant analysis was used to identify differences in demographic and attitudinal characteristics between consumers

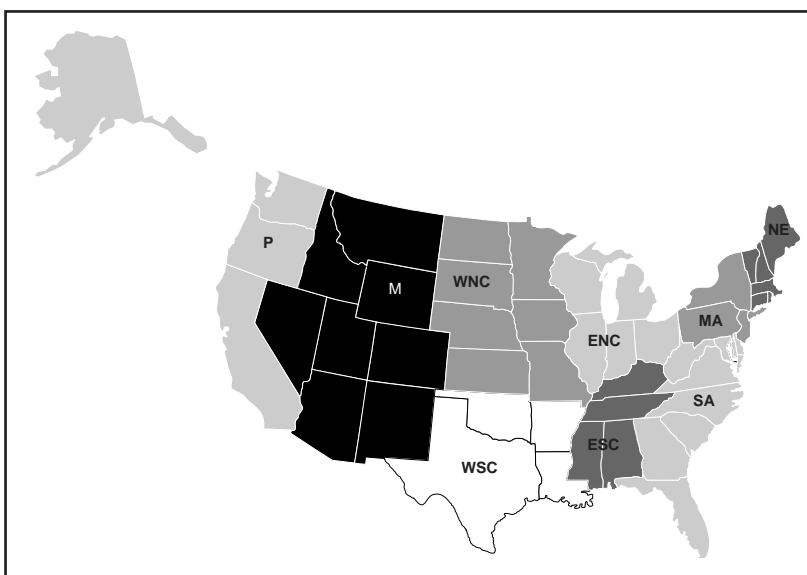


Figure 1. U.S. census regions.

and non-consumers of catfish. Results were then used to develop a demographic profile of consumers who were more likely to eat catfish.

Results

Of the 3,600 consumers, 43% were classified as “catfish” consumers, approximately 48% as “other fish and seafood” consumers, and 9% as “nonfish” consumers (Fig. 2). The greatest numbers of “catfish” consumers were in the West South Central and East North Central regions. Three-fourths of all consumers in the East and West South Central regions were classified as “catfish” consumers.

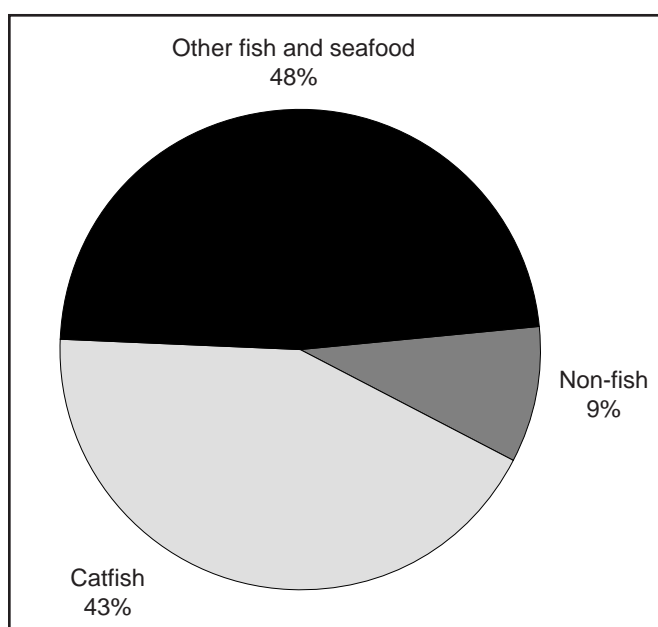


Figure 2. Percentage of consumers in each category as shown by the 1988 survey of households.

The highest percentage of “catfish” consumers were in professional occupations, blue-collar positions and retired (Table 1). Fewer “catfish” consumers were unemployed than the other categories. There were more “catfish” consumers than “other fish” consumers among agricultural workers. In all other occupational groups more people consumed “other fish.” In all occupational groups, except the unemployed, more than 40% of respondents consumed catfish. Approximately 57% of the “catfish” consumers reported that they were college graduates or had at least some college education.

Table 1. Percentage of catfish consumer households in various sociodemographic categories.

Category	Households
<i>Occupation</i>	
Professional	36
Blue-collar	22
Retired	18
Sales or clerical	9
Other	14
<i>Education</i>	
Advanced college degree	12
College graduate	20
Some college	20
High school graduate	31
Less than high school degree	12
<i>Income</i>	
Greater than \$50,000	13
\$40,000-50,000	9
\$30,000-40,000	15
\$20,000-30,000	20
\$10,000-20,000	18
Less than \$10,000	9

“Catfish” consumers were found in significant numbers in all income levels, although the numbers varied across income levels. The highest percentage of “catfish” consumers was in the \$20,000 to \$30,000 income level, the second highest was in the greater than \$50,000 level, and the lowest percentage was in the less than \$10,000 income level.

The average size of households surveyed was 2.93 members. A total of 33.78% of “catfish” consumers were in two-member households. Approximately 73% of all “catfish” consumers were in either two-, three-, or four-member households.

In ranking by size of household, respondents in 48.70% of households with six or more members were classified as “catfish” consumers versus “other” or “nonfish” consumers. In single-member households, 38.75% of respondents were classified as “catfish” consumers.

As categorized by race, more than 83% of all “catfish” consumers were white, almost 10% were black, and fewer than 5% were in all other non-

white racial categories. However, approximately 60% of blacks reported that they consumed catfish. Within the different racial groups, Hispanics contained the smallest percentage classified as “catfish” consumers, whereas blacks had the smallest percentage who were “nonfish” consumers. In all racial groups except black, a larger percentage was classified as “other fish and seafood” consumers versus “catfish” or “nonfish” consumers.

Age of respondents ranged from 15 to 92 years, with an average of 44. Almost 42% of the respondents were in the 20- to 39-year-old group. This age category was composed of 40.39% “catfish” consumers, yet had the largest number of “nonfish” or “seafood” consumers. The 40- to 59-year age group had the highest percentage (47.76%) classified as “catfish” consumers.

When asked what product form they generally purchased, almost 50% of all “catfish” consumers listed fresh fillets as a first choice, followed by fresh whole-dressed fish. The product forms mentioned least were the prepared entrees and frozen steaks. Respondents in all regions preferred fresh fillets to other product forms. Almost 70% of the “catfish” consumers nationwide preferred fresh fish. Respondents in the Mountain Region had the greatest preference for frozen fish.

Discriminant analysis indicated that respondents who were young, non-Hispanic, had at least a high school education, worked in a blue-collar occupation, and lived in an urban area in one of the two South Central regions were more likely to be catfish consumers (Table 2). However, perceptions of

flavor, quality, ease of preparation, and availability were the highest-ranking variables in terms of classifying individuals as “catfish” consumers. Almost two-thirds (64.74%) of “catfish” consumers lived in the four central regions (ENC, WNC, ESC, WSC), while nearly three-fourths (71.94%) of consumers who consumed catfish frequently lived in these four regions. The highest-ranking negative effect on classification of a “catfish” consumer was residence in regions other than the WSC, ESC and ENC. A larger number of “catfish” consumers resided in suburban areas than in urban or rural areas. Professionals, blue-collar workers and retired persons were the majority of “catfish” consumers. A majority of “catfish” consumers also were white, Protestant, had at least a high school education and lived in households of either two or three persons.

Conclusions

Farm-raised catfish is consumed, to some extent, in all regions of the United States by consumers with different ethnic, income, age, religious and occupational characteristics. Catfish consumption appeared to cut across most sociodemographic characteristics. It was not possible to statistically isolate one or two demographic variables, other than geographic region, to identify potential “catfish” consumers.

The results suggest that “catfish” consumers usually have a professional occupation, an education level of at least some college, income in the range of \$20,000 to \$30,000, are 20 to 39 years old, and live in urban areas. These results do not support the

Table 2. Ranking by relative strength of discriminating variables in classifying a catfish consumer.

Rank	Positive effect	Rank	Negative effect
1	Perceived flavor	1	Middle Atlantic region
2	Perceived quality	2	New England region
3	Perceived as easy to prepare	3	Pacific region
4	Perceived availability	4	South Atlantic region
5	Educational level of head of household	5	West North Central region
6	Perceived appearance and packaging	6	Mountain region
7	Perceived as being inexpensive vs. other fish	7	Respondent was Hispanic
8	Blue-collar occupation	8	East North Central region
9	Place of residence is urban	9	Age of respondent
		10	An "other" type occupation

“conventional wisdom” that catfish consumption is highest among poorly educated, low-income households.

Consumer Profiles

Methods

Cluster analysis was used to identify and characterize five distinct consumer profiles. A logit model was chosen to identify underlying socio-economic and demographic factors associated with frequent purchasers of seafood in each predetermined consumer profile.

Results

The cluster analysis of consumer perception/belief variables indicated that there were five distinct groups of fish consumers. These groups were labeled “totally favorable,” “favorable, but expensive,” “favorable, but dislike odor and boniness,” “moderately favorable,” and “not favorable.” Four of the five groups were “favorable;” that is, they “approved” of fish products. The two most favorable profiles toward seafood were differentiated by alternative views of fish pricing: one group found fish inexpensive; the other, expensive. Another profile was identified by its dislike of sensory characteristics such as “boniness” and “difficulty of preparation.”

The results suggested that frequent purchasers for at-home consumption of seafood tend to be non-white and have consumption patterns that vary seasonally across all five attitude profiles. Otherwise, the most favorable profiles are notable for their lack of any clear-cut pattern of statistically significant factors related to “at-home” consumption. Frequent purchasers at restaurants are much more likely to have an annual income of more than \$20,000, and especially more than \$40,000. The “totally favorable” profile also tends to have a small household size associated with frequent purchase, while frequent purchasers in the “not favorable” profile tend to fish recreationally.

The results suggested that the likelihood of frequent seafood purchases for home consumption (three or more purchases per month) was greater among households in urban-suburban areas with higher family incomes (more than \$30,000), and in which the respondents had more formal education

(4 or more years of college) and were non-white. The likelihood of frequent seafood purchases was lower among families with children age 10 or under. The probability of frequent seafood purchases increased with the age of the adult respondent, but at a declining rate. Households that had family members participating in recreational fishing tended to be frequent purchasers.

Conclusions

Although not conclusive, these results suggested that the following factors were related:

- seafood price increases in the 1980s;
- consumer perception that fish is expensive compared to other meat; and
- the corresponding post-1987 decline of 8% in per capita seafood consumption in the U.S.

Aquaculturalists must recognize the developing resistance of consumers to rising prices. This suggests a need to focus on high value food fish varieties and offer “value-added” service to offset the “expensive” perception.

Income, race, seasonality, number of small children and adherence to the Catholic faith were found to be factors important to fish consumption at restaurants. This suggests a strategy that is targeted toward frequent purchasers at restaurants, particularly “white table cloth” restaurants that cater to high-income consumers with few small children.

The results suggested that the most promising customers for at-home sales are consumers who are older, urban-suburban residents, well-educated, non-white, who are in families without young children and who have higher incomes. The frequent restaurant purchases of similar white households suggested that they, also, are a promising target market.

Most consumers recognize that fish are nutritious and healthful. This is a major marketing advantage for aquaculture producers. However, if aquaculture’s current high rate of growth is to continue, more effective marketing related to consumer profiles is needed. Marketing should address consumers’ concerns about the cost, preparation, availability and sensory attributes (such as boniness) of catfish.

Retail Groceries

Market Penetration, Characteristics, Potential and Constraints of Farm-raised Catfish in Retail Groceries

A national survey of 1,800 retail grocery store managers was conducted from April through June 1988. Each of the nine census regions was equally represented in the survey (200 completed surveys from each census region).

Methods

The survey had two primary sections. Questions in one section pertained to catfish, and in the second section to demographic characteristics of the stores. Grocers were first asked whether or not they sold catfish. If they did not sell catfish, they were asked to explain why and they were asked if they would add catfish to their product line in the next year. Grocers selling catfish were asked questions pertaining to time of product introduction, supply problems, quality problems, product form, level of sales, price, and promotion of catfish. Grocers who sold catfish also were asked if the national advertising campaign for catfish influenced their decisions to add catfish to the stores' product lines. The final section dealt with the socio-economic characteristics of the stores, including weekly sales volume, store size, location (rural, urban, suburban and census region information), income and race of the clientele, membership in a retail grocery chain, present or future availability of a specialized fish section, and top selling fish and seafood products.

A logit model was used to analyze the effect of sales volume, race, income, and other demographic factors on the store manager's decision to add catfish. Grocery store managers were asked if they sell catfish. If they answered "no," they were asked if they might add catfish within the next year. A binary choice (logit) model was developed with the qualitative dependent variables being the likelihood of a store to add catfish to its product line.

Results

Forty-five percent (45%) of all stores in the survey sold catfish (Table 3). The traditional catfish consumption regions had the highest percentage of retail groceries selling catfish (54% in ESC and 59% in WSC). Penetration of other areas was indicated by relatively high percentages in the ENC (47%), WNC (49%), and P (46%) regions. The east coast regions (NE, MA, SA) and the mountain region (M) had the lowest percentages. Sixty-one percent (61%) of stores selling catfish were members of a chain, compared to 41% in the entire sample being chain stores. Thirty-nine percent (39%) of stores selling catfish had total weekly sales of more than \$100,000, as opposed to 26% for the entire sample.

Table 3. Percentage of grocery stores selling catfish (1987-88) and percentage likely to add catfish sales in the next year by region.

Region	Grocery stores selling products	Likely to add catfish products
Northeast	27	15
Middle Atlantic	27	12
East North Central	47	23
West North Central	49	13
South Atlantic	40	25
East South Central	54	26
West South Central	59	26
Mountain	41	19
Pacific	46	23
U.S.	45	21

Twenty-one percent (21%) of respondents who did not sell catfish said they were likely to add it in the next year. Outside the traditional consumption region (ESC and WSC), 25% of stores likely to add catfish were in the SA, 23% in the ENC, and 23% in the P region. Quantitative analysis of factors influencing the decision to add catfish to a retail grocery store's product line is presented in a later section.

Fresh catfish dominated product form availability and sales volume (Table 4). In terms of availability, fresh whole dressed (64%) and fresh fillets (63%) were followed by block-frozen fillets (38%), frozen

Table 4. Percentage of grocery stores reporting catfish sales by product form and region.

	Fresh whole dressed	Fresh fillets	Frozen whole dressed	Block-frozen fillets	Individually frozen fillets	Breaded/processed
Northeast	40	83	18	16	0	24
Middle Atlantic	43	81	14	31	15	29
East North Central	60	66	22	35	11	25
West North Central	61	46	44	38	12	23
South Atlantic	75	72	22	33	16	24
East South Central	63	50	22	44	10	22
West South Central	63	62	31	52	17	33
Mountain	60	66	36	44	11	17
Pacific	76	60	24	19	3	13
U.S.	64	63	26	38	13	25

whole dressed catfish (26%), breaded/processed catfish (25%), and individually frozen fillets (13%). The top selling product forms were fresh whole dressed (37%), fresh fillets (33%), block-frozen fillets (14%), frozen whole dressed (5%), breaded/processed (2%), and individually frozen fillets (1%). Fresh whole dressed catfish was the top seller in all regions except NE, MA and WSC, where fresh fillets were the top sellers. Frozen whole dressed was the third preferred product form in the WNC, but this form was not highly rated in any other region. Block-frozen fillets was the third ranked preference in all regions except NE (where breaded/processed was third) and the WNC. Individually frozen fillets were generally not carried by stores in the NE and P regions, but some popularity for them was indicated in the MA region.

Grocers in stores that did not sell catfish on a nationwide basis gave negative consumer attitudes (21%) and storage problems (13%) as the primary

reasons for not selling catfish products (Table 5). The third most common reason was lack of availability at certain times of the year (8%), followed by unreliable supply (6%) and lack of awareness (4%). Two percent (2%) each of respondents reported a high wholesale price and lack of product freshness as significant problems.

The largest number of grocers who had not heard of catfish were in the NE region (36%). Grocers not selling catfish in the MA (18%), P (16%) and SA (10%) regions also cited not having heard of catfish as a reason for not selling catfish.

Shrimp dominated preferences at the national level, with catfish and cod tied for second place. Shrimp was the preferred fish and seafood item in the MA, M and P regions. Catfish was the top seller in the WSC, ESC and WNC regions and ranked third in the SA region. Cod, flounder and perch were the leaders in the NE, SA and ENC regions. Cod was among the top sellers in the NE, MA, ENC, WNC and M

Table 5. Respondents' reasons for not selling catfish in grocery stores.

Reason	U.S.	NE	MA	ENC	WNC	SA	ESC	WSC	M	P
Had not heard of it	4	36	18	4	6	10	2	0	8	16
Negative consumer attitudes	21	14	15	12	11	8	6	6	15	14
Unreliable supply	6	8	15	8	8	9	11	9	18	14
Storage problem	13	11	12	8	9	13	13	15	8	11
Wholesale price too high	2	7	15	15	7	4	26	4	11	11
Not fresh	2	18	6	12	6	12	0	12	12	24
Seasonal supply	8	13	9	13	9	12	13	7	12	10
Other	43	14	16	12	10	12	8	8	11	9

regions and shrimp was among the top sellers in all regions except the ENC and WNC. Orange roughy was on the preferred list in several regions (WNC, ENC and WSC).

Results of the logit analysis of the survey data suggested that the top three regions in terms of new market development, in decreasing order of potential, were the SA, ENC and P regions (Table 6). Results from the time path of adoption reported in the survey results section supported the SA and ENC as two regions with both a good base of stores that have been selling the product for several years and a greater proportion of stores that are likely to add the product, relative to the other census regions.

Conclusions

The grocery store survey documented good penetration of catfish products in many areas of the U.S. Nearly one-fourth of those not selling it were likely to add it. Reasons for not selling catfish included: (1) negative consumer image; (2) supply problems in the form of seasonality and insufficient quantities; (3) lack of freshness and off-flavor of catfish products; and (4) competition from other fish and seafood products. Continued advertising and other promotional activities should enhance the image of catfish among consumers. A high level of quality control that prevents off-flavor and other substandard quality catfish from entering market channels must be maintained. Competition from other fish and seafood products being produced in aquacul-

tural production systems (for example, shrimp) may increase, while competition from species dependent on declining natural stocks may decline.

Using Scanner Data to Evaluate Marketable Catfish Product Forms in Retail Groceries

Methods

Although marketers have had scanner data for several years, this is a new form of information to the aquacultural sector. This study was a pilot test of the use of scanner data to investigate the demand for catfish and crawfish products for a local market (retail food firm) in Houston. The analysis was conducted from January 1987 to November 1988.

Weekly scanner data were collected from a retail food firm in Houston. Seven individual catfish and crawfish products were analyzed, as well as commodity aggregates (fresh and convenience catfish and crawfish). Econometric models were estimated that related point-of-sale purchases per 1,000 customers as a function of prices, seasonality, advertising and trends. The purpose of this phase of the project was to identify and assess factors that could allow producers, processors and distributors to anticipate consumer behavior in retail markets, improve planning, and provide better service to consumers. This analysis was limited to the Houston area, but the methodology can be replicated in other geographic regions.

Table 6. Estimated regional retail grocery market potential for catfish.

Region	Population (millions)	Sell (%)	Probability (%)	Market index	Rank
New England	12.3	28	10	0.9	7
Middle Atlantic	36.8	27	9	2.4	5
East North Central	41.7	46	21	4.7	2
West North Central	17.2	49	8	0.7	9
South Atlantic	36.9	40	28	6.2	1
East South Central	14.7	53	27	1.9	6
West South Central	23.7	59	35	3.4	4
Mountain	11.4	41	12	0.8	8
Pacific	31.8	46	26	4.5	3

Results

The major catfish product sold in the Houston area was fresh catfish fillets, and the major convenience items were catfish fillets and strips. The major crawfish product was fresh cooked crawfish; an etouffé product with rice was the most popular ready-to-eat convenience item. Fresh catfish and crawfish products were more costly on a per unit basis than the ready-to-eat convenience products.

With few exceptions, the models demonstrated significant variation in purchase patterns. The key variables in this analysis were own-price (price of the product itself), own-advertising (advertising specific to the product itself), and seasonality. In particular, consumer purchase patterns were highly sensitive to price changes and moderately sensitive to the effects of advertising.

The own-price elasticities of catfish were negative and elastic (-3.150 to -4.937). This indicates that small changes in price would result in large changes in quantity purchased. A small price decrease would be followed by a larger increase in purchases. However, the elasticity for fresh whole catfish was not statistically different from zero. There was evidence of serial correlation in each of the relationships, primarily because of missing price and advertising variables. Neither the influence of the lagged dependent variable nor seasonality was statistically significant. There was a downward trend in purchases of fresh catfish fillets per 1,000 customers when holding other variables constant.

For convenience catfish products, the own-price elasticities were statistically significant, negative and very elastic (-3.285 to -11.550). This indicates that a small change in price will generate a very large change in the quantity purchased. The positive lag variable indicates the importance of habit in consumption and buying patterns.

Because demand for individual catfish products in the firm supplying the data was elastic, there may be an incentive for lower prices. Lower prices would increase total revenue. Assuming that costs do not change, this strategy is particularly important because of the general insignificance of cross-product prices.

Own-price effects were important only for fresh, farm-raised catfish fillets and the aggregate of all fresh catfish products. Own-advertisement elasticities for these products were positive but very inelastic. Nevertheless, increased advertisement of fresh, farm-raised catfish may be worthwhile to boost demand, subject to the costs of advertising. Own-advertisement effects were not significant for crawfish products or for individual convenience catfish products. It may not be possible to make national or regional projections from this analysis. Therefore, results of such local analyses should not be used on a stand-alone basis.

Seafood Counters in Grocery Stores

Consumption of seafood at home begins with the decision to purchase seafood at the store or market. Although one cannot say whether demand or supply comes first, access to high quality seafood has been essential to the growth in demand during the 1980s. However, there is little doubt that the creation of a separate seafood counter in grocery stores increased the visibility of the product for consumers, led to better handling practices by the stores, and made fresh seafood more accessible.

Generally, the development of more complex seafood counter marketing technology meant that consumers could buy a wider variety of fresh, high-quality seafood, presented in a more attractive manner, than was previously available in their grocery stores. Accordingly, the use of seafood counters enhances the visibility of seafood among the thousands of other food products in grocery stores. Identifiable patterns differentiate stores that have separate seafood counters from stores that do not. Region, store size, store volume, clients' income, clients' race and store ownership are all possible factors in determining whether a store now has, or will have in the future, a separate seafood counter. The objectives of this non-species specific marketing study are to identify grocery store characteristics important to the presence of seafood counters, and to identify the socio-economic characteristics of store clientele that are consistent with the presence or absence of seafood counters.

Methods

Models using limited dependent variables are now the accepted approach for dealing with problems that involve distinct choices, such as the decision to have a seafood counter or not in a grocery store. In these models, the probability that an event will occur, given certain characteristics of the person (or business) making the decision, is estimated. The contribution of particular attributes of the person (or business) to the odds that an outcome will occur can then be estimated as well. A logistic regression model was used to explore relationships between the characteristics of the store, its clientele and its location, and whether the store had or is likely to add a seafood counter.

Results

Of the 1,800 respondents, 402 (22%) had a seafood counter. Of the remaining 1,398 respondents, 203 (14%) said they were likely to have a separate counter in the future. Those stores having a separate seafood counter tend to be larger than stores that do not. They also tend to be in non-rural areas and to have a clientele with high income. Stores that are part of a regional or national chain are much more apt to have seafood counters than those that are not. Regional differences are not large except in the East South Central region and in New England. In the ESC, where seafood counters are much less common than in the U.S. as a whole, 7.2% of respondents had seafood counters. In New England, where seafood counters are more common, 14.4% of respondents had counters..

Factors that greatly increase the odds in favor of a seafood counter were floor space greater than 40,000 square feet, a high-income customer base, and membership in a regional chain. Grocery stores with weekly sales of \$40,000 to \$99,000 were 1.18 times more likely to have a seafood counter than grocery stores with sales of \$39,999 or less. Stores with floor space of 40,000 square feet or more were 3.51 times more likely to have a seafood counter than stores of 20,000 square feet or less. Stores with high-income clients were 3.54 times more likely to have counters than stores with low-income clients. For stores that do not already have a seafood counter, the odds are that one will not be added. However, the odds increase most

significantly for chain stores that have weekly sales greater than \$40,000.

Conclusions

Separate seafood counters were most likely to exist in larger stores with high-income clientele, especially in urban or suburban sites. The largest stores with more than 40,000 square feet of floor space were far more likely to have seafood counters than stores with 20,000 to 39,000 square feet. Stores identifying nonwhite customers as a primary clientele group were more likely to have seafood counters, but were less likely to add a seafood counter in the future if one did not exist. Chains were the leaders in using seafood counters. Areas with a fishing and fish-eating tradition, such as New England, were more likely to have separate seafood counters. The degree of regional differences, and the relative scarcity of seafood counters in some areas such as the Pacific and East South Central regions, were striking.

Restaurants

The restaurant survey included 200 randomly selected restaurant managers in each of the nine U.S. census regions for a total of 1,800 restaurant managers nationwide. The estimated total number of full-service restaurants in the United States in 1988 was 321,667.

The restaurant questionnaire consisted of four sections. The first three sections related to fish and seafood, catfish and crawfish. The first section included questions about sales and seasonality of fish consumption. The second and third sections dealt with supply, quantity purchased, product form, preparation and quality associated with catfish and crawfish. Restaurant managers were asked attitudinal questions about why they did or did not include fish and seafood, catfish and crawfish on their menus. The respondents were asked to agree or disagree with a series of statements. On a scale of 1 to 10, 1 meant strongly disagree and 10 meant strongly agree. Statements related to control of selection of menu items, supply, patrons' preferences, quality, taste, ease of preparation, price, and willingness to add product to the menu. The fourth section concerned restaurant characteristics such as location, seating capacity, years in business, type

of ownership, and type of food served. The time required to complete an interview averaged 10 minutes.

The survey data were weighted when appropriate to reflect regional differences in sampling rates. The sample data for each region were expanded or weighted by the reciprocal of the sampling rate. The expanded data were then used to calculate weighted percent distributions. A logit analysis (a binary choice model between those that do or do not offer catfish on their menus) was estimated with the survey data. This type of model provides information on the probability with which certain types of restaurants would be likely to offer catfish on their menus.

Results

More than 29% (406) of the 1,800 restaurants offered catfish on their menus. Ninety percent (90%) of the restaurants serving catfish reported that they were able to get a consistent supply of catfish. Only in New England did restaurant managers report a problem in obtaining catfish at certain times of the year. Catfish was identified as the third most popular type of fish and seafood in restaurants (Table 7).

Frozen and fresh fillets were the primary product forms purchased by restaurants nationwide (Table 8). Whole fresh catfish was the next most preferred product form. Whole fresh catfish was the primary product form purchased in the South Atlantic region. In the East and West North Central regions, whole fresh and frozen catfish were purchased more frequently than fillets.

Table 7. Five most popular fish and seafood species in restaurants nationwide.

Species	Restaurants	
	number	%
Shrimp	899	27
Cod	348	10
Catfish	225	7
Scallops	171	5
Flounder	153	5

Fifty-five percent (55%) of the restaurants that offered catfish purchased less than 50 pounds of catfish per week; 15% purchased 50 to 99 pounds; 6% purchased 100 to 199 pounds; and 9% purchased more than 200 pounds per week. Restaurants in the three southern regions, SA, ESC and WSC, purchased the most catfish per week. Restaurants in the NE, MA and P regions purchased the smallest quantities of catfish per week.

The majority of restaurants nationwide that served catfish prepared it fried and served it as a main dish. Catfish was prepared most often as a breaded product, followed by baked, broiled and blackened preparations.

Independent (43%) and family-owned (34%) restaurants included catfish on their menus more often than national chain (14%) or regional chain (7%) restaurants (Table 9). Catfish was served primarily in restaurants that characterized themselves as combination (43%), steak (21%), and seafood (17%). Catfish was served primarily during dinner and lunch, and it was important as a carry-out item. More suburban restaurants (41%) served catfish

Table 8. Product form (%) of catfish purchased by restaurants by region.

Response	U.S.	NE	MA	ENC	WNC	SA	ESC	WSC	M	P
Whole fresh	19	14	14	18	22	29	20	15	23	19
Whole frozen	14	7	5	19	26	14	13	10	10	13
Fresh fillets	19	25	32	17	7	18	16	24	25	29
Frozen fillets	30	25	35	23	36	20	33	35	28	13
Fresh steak	5	0	11	8	1	8	5	6	3	3
Frozen steak	3	0	3	1	2	4	6	2	3	6
Prepared fresh entree	2	7	0	4	0	4	3	1	3	3
Prepared frozen entree	4	11	0	4	1	4	3	4	8	6
Other	3	11	0	5	4	0	3	3	0	6

Table 9. Number and percentage of respondents, by type of ownership, whose menu includes catfish.

Type of ownership	Menu includes catfish	
	number	%
National chain	57	14
Regional chain	29	7
Independent	175	43
Family owned	138	34
Other	9	1

than urban (31%) or rural (29%) restaurants. The majority of restaurant managers who served catfish reported that it was a high quality fish, that it had a nice flavor, and that it was easy to prepare. Nationally, 42% of the restaurant managers serving catfish reported that catfish was too expensive in relation to their patrons' desire to eat catfish. This was especially true in the South Atlantic and Pacific regions. More than 70% of the managers agreed that the patrons of their restaurants like the menu variety that catfish provides.

Restaurant managers not serving catfish had limited knowledge about supply and quality characteristics of catfish and their patrons' attitudes toward catfish. A large percentage of the restaurant managers responded "don't know" to attitudinal statements such as the following:

- The supply of catfish is of reliable quality.
- Catfish is always readily available.
- Catfish is a high-quality fish.
- Patrons of my restaurant do not eat catfish.
- The patrons of my restaurant would like the variety that adding catfish to the menu would provide.

Logit analysis results indicated that the type of cuisine served in restaurants had a significant effect on the probability that catfish would be on their menus. In particular, the probability that catfish was offered was significantly higher among steak,

seafood and combination restaurants and significantly lower among hamburger restaurants. Seating capacity, years in business and restaurant ownership did not significantly influence the probability that restaurants included catfish on their menus.

Region also influenced the probability that restaurants served catfish. Specifically, restaurants in the NE, MA, WNC, SA, M and P regions had a significantly lower probability of offering catfish than restaurants located in the ESC region. However, there was not a significant difference in the probability of offering catfish between restaurants located in the WSC region and the ESC region.

Urbanization did not affect the probability that restaurants offer catfish. The coefficients of the urbanization variable are insignificant. This suggests that the probability that catfish is offered in rural or urban restaurants was not substantially different from that among restaurants in suburban areas.

Conclusions

The regions that promised the greatest return to catfish market promotion and development expenditures include the NE, MA, ENC and P regions. Restaurants that characterized their cuisine as seafood, combination and steak hold the greatest promise for market expansion. Other restaurant characteristics such as location, seating capacity or type of ownership were not statistically significant.

Catfish availability, quality, taste, price and preparation are attributes that should be stressed in advertising and promotion to educate restaurant managers about catfish. Most restaurant managers who did not serve catfish were not familiar with the product. There is a need for restaurant managers to learn more about their patrons' preferences and attitudes toward catfish. An educational campaign for restaurant managers and chefs on the use and preparation of catfish would aid in market expansion.

Objective 2: Effectiveness of Advertising and Promotion of Farm-raised Catfish

Industry sponsored media advertising of catfish began in April 1987 after feed mills in Mississippi agreed to a voluntary levy of \$6 per ton of feed sold to finance the program. The advertising budget of The Catfish Institute, an industry marketing organization, was about \$1.5 million in 1992. Decisions about spending levels, the appropriate amount to charge per ton, and whether programs should be continued are increasingly important in market planning for producers, the industry and in public policy. However, the necessary information to make informed decisions is not readily available. Research on the effect of the marketing program is often beyond the means of the industry organization or policy maker.

Effects of Catfish Advertising on Consumers' Attitudes, Purchase Frequency, and Farmers' Incomes

The objective of this phase of the project was to determine whether a limited-budget, generic advertising campaign could favorably influence consumers' perceptions and increase consumption.

Methods

An eight-equation econometric model was estimated that linked advertising awareness to consumers' beliefs and attitudes about catfish. These, in turn, were linked to purchase behavior. The model was then used to determine the effect of advertising on consumers' perceptions of catfish and on purchase frequency.

An eight-equation model was specified as follows:

Awareness Equations

- (1) $SEENAD=f_1(Z_1,e_1)$
- (2) $AWARCAT=f_2(SEENAD,Z_1,e_2)$

Belief Equations

- (3) $NUTR=f_3(AWARCAT,SEENAD,Z_1,e_3)$
- (4) $FLAV=f_4(AWARCAT,SEENAD,Z_1,e_4)$
- (5) $NOODOR=f_5(AWARCAT,SEENAD,Z_1,e_5)$

Attitude Equations

- (6) $ATT=f_6(NUTR,FLAV,NOODOR,ATHOME,REST,e_6)$
- (7) $ATHOME=f_7(SEENAD,ATT,Z_2,e_7)$
- (8) $REST=f_8(SEENAD,ATT,Z_3,e_8)$

SEENAD and AWARCAT are binary variables indicating self-described awareness of catfish advertisements and farm-raised catfish. NUTR, FLAV and NOODOR are the consumers' rankings of catfish for nutritional value, flavor, and absence of undesirable fishy odor (1 to 10 scale). ATT is the consumers' ranking of catfish relative to other fish and seafood (1 to 10 scale). ATHOME and REST are the frequency of monthly purchases (0 to 4) of catfish for home and restaurant consumption. Z_1 is the vector of sociodemographic characteristics defining the target audience, Z_2 and Z_3 are vectors of exogenous variables affecting catfish purchases for home and restaurant consumption, and e_1 is random error terms.

Results

Awareness

Estimated coefficients of the advertising awareness equation indicated that only four variables were significantly related to advertising awareness: non-reporting of income; M or P census regions; household residence; and gender of respondent. Despite the insignificance of a number of variables defining the target audience, the advertising campaign appeared to have been successful in increasing consumers' awareness of farm-raised catfish. The estimated coefficient of the advertising recognition variable was significant at the 1% level. Moreover,

the probability of being aware of the farm-raised product was 12 percentage points higher for those aware of catfish ads compared to those who were unaware of the ads. Specifically, the probability of the reference household in equation (2) being aware of farm-raised catfish was 0.62. By comparison, household heads who had seen or heard catfish advertisements have a significantly higher probability (0.74) of being aware of farm-raised catfish than household heads who had not seen catfish advertisements.

A number of socioeconomic variables were significantly related to awareness of farm-raised catfish. The variables showing a positive relationship included: high income households (\$40,000 to \$50,000 range); education (high school or some college); location in ENC, WNC, ESC and WSC census regions; and rural residence. Respondents in the NE, MA, M and P census regions were not aware of farm-raised catfish.

Beliefs

Advertising increased awareness of the farm-raised product, which in turn improved consumers' beliefs about catfish. This indicated that advertising played an indirect role in belief formation.

A number of socioeconomic variables were significantly related to beliefs. High income consumers rated catfish lower on nutrition than did other consumers. Some occupational categories rated catfish lower on both flavor and "no fishy odor." Educational level was inversely related to the respondents' ratings of flavor. Consumers in the ENC, WNC, ESC and WSC census regions gave catfish a higher nutrition rating than did consumers in other regions.

Attitudes

The most important determinant of attitude was flavor, followed by nutrition and no fishy odor (Table 10). Specifically, flavor was approximately three times as important as nutrition and six times as important as odor in influencing attitude. This is important because an off-flavor problem afflicts the industry. The coefficient for at-home consumption frequency was positive and significant, indicating that the respondents' experiences in consuming catfish at home favorably influence their attitudes toward the product.

Conclusions

Consumer attitude toward catfish is one of the most important factors affecting both at-home and restaurant purchase frequency. Attitude (the consumer's self-described preference for catfish relative to other fish and seafood) is most strongly influenced by perceptions of the flavor of catfish; nutrition and absence of fishy odor are relevant but of lesser importance. Perceptions of flavor, in turn, are determined largely by whether the consumer is aware of the farm-raised product. Thus, advertising copy should stress two themes: flavor attributes and pond culture.

Female respondents and those residing in the NE, MA, M and P census regions had the least awareness of farm-raised catfish. Ads designed to distinguish the farm-raised product from "wild" catfish should be targeted toward a female audience and, if the budget permits, placed in media that will give exposure to markets in the NE, MA, M and P.

Table 10. 1988 impact of catfish advertising on awareness, beliefs, attitudes and purchase frequency in the U.S.

Variable	Estimated value when:		Change %
	SEENAD = 0	SEENAD = 1	
Probability of being aware of farm-raised catfish	0.71	0.81	15.11
Rating of catfish nutrition	7.61	7.88	3.48
Rating of catfish flavor	6.88	7.15	3.89
Rating of catfish odor	5.78	5.99	3.67
Rating of catfish compared to other fish and seafood	6.44	6.63	2.83
Frequency of purchase for home consumption (# times/mo.)	0.81	0.91	12.33
Frequency of purchase from restaurants (# times/mo.)	0.87	0.97	11.40

Blue-collar laborers and better-educated respondents ranked catfish lower on the flavor dimension than did individuals in other categories. Ads stressing the flavor attributes of catfish designed to appeal to these diverse groups would be beneficial.

The at-home market is still largely regional and concentrated among minority groups. Ads aimed at upscale white households in regions outside the ENC, WNC, ESC and WSC census regions would appear to be an appropriate strategy for expanding the at-home market.

The restaurant market, which accounts for more than one-half of all sales of commercially processed fish, is less well developed in the M and P census regions than elsewhere. Promotional or information programs that encourage the use of catfish as a menu item and that are tailored to the needs of restaurant managers and consumers in the M and P census regions could expand this segment of the market.

Estimated net producer returns of \$0.48 to \$7.46 per dollar expended on media suggest the industry advertising effort is profitable for catfish producers. The research represented in this report suggests that the catfish advertising program, despite its small budget, has been successful in increasing consumer demand for catfish and in improving the income of catfish producers.

Returns on Catfish Advertising and Optimal Spending Levels

The objective of this study was to determine the effects of generic advertising on equilibrium prices, output and producer returns in the catfish industry. An additional objective was to identify optimal spending levels for catfish advertising.

Methods

A four-equation econometric model of the catfish industry, in which advertising expenditures by The Catfish Institute were specified as a shift variable in the demand function, was estimated. The model consisted of three structural equations describing farm supply, wholesale demand and processor price markup behavior, and one identity that required the ending inventories of processed fish to equal the

beginning inventories plus any carryover of unsold fish during the month.

All data used to estimate the model are monthly and cover the 10-year period from 1980 to 1989. The data relating to the prices and quantities of live and processed catfish were obtained from various issues of the USDA report *Catfish*. Data for feed prices were unavailable from published sources and, therefore, had to be assembled from data provided by feed mill operators. Data relating to population, income, Consumer Price Index and minimum wage came from various government publications. Funds from a voluntary levy of \$6 per ton of feed generated an annual promotion budget of about \$1 million. These funds were used to conduct a print media advertising campaign on a continual basis since 1987. The campaign consisted of full-page color advertisements in regional editions of *Newsweek*, *Time*, *People*, *Better Homes and Gardens*, *Sunset* and several other national magazines.

The models estimated were used in simulations of wholesale- and farm-level impacts of the generic advertising campaign under two scenarios: no advertising and advertising held constant at the mean level for the period 1987 to 1989.

Results

The farm supply equation generated a supply elasticity of 0.15, which indicates inelastic supply or supply that does not respond dramatically to changes in price. The inelastic supply is consistent with the fact that commercial-sized catfish operations tend to be highly specialized and exclusive (operated as a single enterprise). The seasonal pattern in supply indicated by the monthly binary variables shows supply peaking in the spring and troughing in the summer. This pattern is consistent with industry stocking practices and the associated harvest delays caused by off-flavor.

The parameter estimates for income and imports were not significant. This may be attributable to the limited markets in which imports compete, such as the retail grocery market, and the declining importance of imports. Previous studies have indicated a negative relationship between income and catfish consumption. However, the insignificant role of income found in this study suggests the industry

may be overcoming an image problem reported in earlier studies. Also, the development of new product forms such as fillets and nuggets may have increased the desirability of catfish among the higher income segments of the population.

The advertising variable is positive and significant. The four-period lag indicated that it took about 4 months for the advertising campaign to “take hold” in terms of increased sales.

Results suggest that the advertising campaign increased farm and wholesale revenues by 8% and 9.5%, respectively (Table 11). However, because of inelastic supply, most of the simulated revenue enhancement is from price increases rather than quantity increases. In particular, while equilibrium quantities at the farm and wholesale levels are estimated to have increased 1.3% as a result of advertising, associated price increases are estimated at 6.7% and 8.2%, respectively. Thus, in the case of catfish, generic advertising appears to have affected product price more than quantity sold.

To benefit producers, a generic advertising program must yield net increases in producer income. The simulations suggest that the advertising campaign increased monthly producer surpluses at the wholesale and farm levels of the market by \$1.4 and \$1.5 million, respectively (Table 12). Subtracting the average monthly cost of the campaign over the sample period yielded benefit/cost ratios of about 13:1 for each market level.

Results indicated that the industry is underspending. Depending on the opportunity cost of advertising and the magnitude of the supply elasticity, the budget should be increased between 4% and 128% if the objective is to maximize producer income. Using the mid-range supply elasticity estimate of 0.55 and an opportunity cost of 15%, results indicated that to maximize producer returns from advertising, investment spending should be increased 34%.

Table 11. Impact of generic advertising by the U.S. catfish industry, 1987-89, at the wholesale and farm levels.

Market level	Variable	Simulated long-run equilibrium values			Absolute difference	Percent difference
		unit	without advertising	with advertising		
Wholesale						
	price	\$/lb.	1.64	1.75	0.11	6.7
	quantity	mil. lb./mo.	12.88	13.04	0.16	1.30
	revenue	mil. \$/mo.	21.12	22.82	1.70	8.00
Farm						
	price	\$/lb.	0.73	0.79	0.06	8.20
	quantity	mil. lb./mo.	24.76	25.00	0.33	1.30
	revenue	mil. \$/mo.	18.08	19.82	1.74	9.50

Table 12. Costs and returns from generic advertising, U.S. catfish industry, 1987-89 average.

Item	Market level	
	wholesale	farm
Increase in producer surplus attributable to promotion (million \$/mo.)	1.426	1.496
Cost of advertising (million \$/mo.)	0.104	0.104
Net returns (million \$/mo.)	1.322	1.392
Returns/cost ratio	12.7	13.4

Conclusions

Results suggested generic advertising increased producer returns. The distribution of the impact between price and quantity effects appears to favor price effects; advertising-induced increases in revenue were caused by increases in price rather than quantity sold. The relatively large benefit/cost ratios estimated for the program (about 13:1) are attributable in part to an inelastic short-run supply schedule for catfish. Inelastic supply ensures that any demand shifts associated with advertising translate into relatively large increases in producer income.

Optimal spending levels were computed to range from 1.04 to 2.28 times the actual level of spending in 1989, depending on the opportunity cost of advertising funds and the supply elasticity. It appears, therefore, that the program could have generated more profits if it were better funded. For example, assuming an opportunity cost for advertising funds of 15%, results suggest that an 18 to 99% increase in the advertising budget is warranted if the objective is to maximize producer returns.

Results of the study indicated that the catfish advertising program has increased returns to producers. Spending levels, moreover, were probably suboptimal in the sense that even greater returns could have been achieved if the program were better funded.

Objective 3: Potential for Producing and Marketing Catfish

New market development often follows a pattern:

- 1) developing awareness by consumers;
- 2) increasing availability of a new product;
- 3) changing attitudes toward the new product;
- 4) changing preferences for consumer products; and
- 5) developing new consumption patterns.

The surveys were designed to address issues of awareness and availability, attitudes, preferences and consumption patterns for both fish and seafood consumers and catfish consumers across the continental United States. Differentiation of these two types of consumers permits the comparison of important markets and potential markets for farm-raised catfish.

Methods

Awareness and availability issues were addressed by questions relating to catfish purchases both at home and away from home. All consumers were asked if they had heard of farm-raised catfish, and catfish consumers were asked if they were aware of advertisements promoting catfish. Information on consumer and restaurant manager attitudes toward fish and seafood in general, and catfish in particular, was elicited by asking respondents to assign a value from 1 to 10 in response to statements of attitudes concerning key product characteristics. A score of 1 represented complete disagreement with the sentence and a score of 10 represented complete agreement. These statements reflected attitudes on availability, quality, appearance and packaging, odor, flavor, nutritional value, boniness, ease of preparation and cost. Respondents to all three surveys also were asked to indicate their preferences in terms of favorite fish and seafood products and preferred product form.

Socioeconomic characteristics of consumers and grocery store and restaurant characteristics were needed in order to interpret responses to the survey. A respondent's occupation, education, income, religion and race were recorded on the consumer

survey. Grocery store managers were asked to specify store size, ownership and location, while restaurant managers were requested to provide information about the location, type of ownership, years in business and type of food served.

Results

Awareness

More than one-half (52%) of the respondents nationwide had heard of farm-raised catfish. Three-fourths of the respondents residing in the ESC and WSC regions and more than one-half of the respondents in the ENC, WNC, ESC and WSC regions had heard of farm-raised catfish. The lowest levels of awareness were in the NE and MA regions, where only 31% and 34% of respondents, respectively, had heard of farm-raised catfish.

Nationally, 60% of the respondents had eaten catfish (not necessarily farm-raised), compared to 87% who had eaten fish and seafood. The four central regions (ENC, WNC, ESC and WSC) plus the SA region accounted for more than 80% of respondents who consumed catfish. Approximately 90% of respondents in the WSC and ESC had eaten catfish, whereas only 31% and 36% in NE and MA, respectively, had eaten catfish.

Nationwide, 37% of consumers who had eaten catfish also had seen or heard some form of advertising about catfish. The ENC region had the largest percentage of respondents who had seen or heard catfish advertisements. The most widely seen advertisements were in newspapers, followed by television and magazines.

Seventeen percent (17%) of the grocery store managers who currently sell catfish replied that the national advertising campaign had resulted in a decision to add the product. Managers in the MA and SA regions added the product at the highest rate, 20% and 25%, respectively, because of the advertising campaign. Large chain stores were more likely to respond to the advertising campaign than small independent grocers.

Availability

Forty-five percent (45%) of all grocery stores in the survey sold catfish. The traditional catfish consumption regions (WSC and ESC) had the highest percentage of retail groceries that sold catfish, 53% and 59%, respectively. Penetration of other areas was indicated by relatively high percentages in the ENC (46%), WNC (49%) and P (46%) regions. The east coast regions—NE (28%), MA (27%), SA (40%)—and the M region (41%) had below-average proportions of stores that sold catfish.

Nationwide, stores reported negative consumer attitudes (21%) and low demand (17%) as the primary reasons for not selling catfish. The third most common reason was storage problems associated with catfish (11%), which was followed by lack of availability of catfish products at certain times of the year (8%). High wholesale prices and lack of product freshness were not rated as major problems by the grocers (2% for both).

Twenty percent (20%) of respondents who did not sell catfish said they were likely to add it in the next year. Stores outside the traditional consumption regions (WSC and ESC) that probably would add catfish were located in the SA (23%), ENC (22%) and P (21%) regions.

Nationwide, only 28% of the responding restaurants served catfish. The regions with the highest percentages of restaurants serving catfish were the WSC (60%), the ESC (53%) and the WNC (38%).

Attitudes

All consumers were asked to rank both “catfish” and “all fish” on attributes including quality, appearance and packaging, flavor, nutritional value, and ease of preparation. Rankings were made on a scale of 1 to 10, with 1 representing complete disagreement and 10 representing complete agreement (Table 13). “Catfish” ranked higher than “all fish” in the areas of “no undesirable fishy odor,” “few bones” and “less cost than other meats.” “All fish” ranked higher than “catfish” on “availability,” “quality,” “packaging and appearance,” “flavor,” “nutritional value,” and “ease of preparation.”

Most consumers did not consider catfish expensive compared to other meats or other fish. Respondents in all regions ranked catfish above 5 when asked if it was inexpensive compared to other meats or other fish. The most favorable rankings were in the traditional catfish consumption areas (WSC and ESC), and the most unfavorable rankings were in the NE and MA regions.

The highest rankings on quality were in the ESC and WSC regions, while the lowest rankings were in the NE and MA regions. Non-catfish consumers in the NE and MA regions were the only respondents to rank catfish lower than 5 on quality.

Respondents in all regions (except non-catfish consumers in New England) ranked catfish favorably (above 5) on flavor. The highest rankings were in the WSC and ESC regions. The third highest ranking by non-catfish consumers was in the P region.

Table 13. Weighted average of catfish consumer groups' ranking of catfish within each region by attribute.

Region	Appearance and packaging	No fish odor	Flavor	Nutritional value	Easy to prepare	Quality	Compared to other fish
NE	7.33	6.27	7.19	7.98	7.56	5.93	5.23
MA	6.52	6.89	7.51	7.91	7.12	7.05	5.50
ENC	6.30	6.09	7.40	7.92	7.45	7.30	5.63
WNC	6.31	5.92	7.40	8.57	7.86	7.79	5.89
SA	7.00	6.70	7.68	8.35	7.83	7.77	5.30
ESC	6.76	5.95	7.74	8.35	8.09	8.18	5.96
WSC	6.80	6.42	7.88	8.72	8.31	8.24	6.11
M	6.04	6.16	6.08	7.89	7.41	6.84	5.66
P	6.07	6.17	7.38	8.27	7.77	7.27	5.48
U.S.	6.55	6.36	7.45	8.21	7.68	7.43	5.61

“Nutritional value” received the highest ranking of all attributes for both “catfish” and “all fish.”

“Catfish” was perceived to be high in “nutritional value” for all regions. In fact, even non-catfish consumers in all regions rated catfish above 5 on nutritional value.

Although nutrition ranked higher than “no fishy odor” or “flavor,” “flavor” was the most important factor affecting consumer attitudes toward catfish (measured by consumers’ rating of how catfish compared to other fish and seafood). This attitude was the most important variable influencing purchase frequency, both at home and in restaurants.

Of all the attributes assessed, “appearance and packaging” and “no fishy odor” had the lowest average rankings, 5.73 and 5.67, respectively. “Appearance and packaging” was ranked much lower by non-catfish consumers (4.85) than by consumers of catfish (6.55). Only in the WSC and ESC regions did non-catfish consumers rank catfish “appearance and packaging” higher than 5. It appears that improving the appearance and packaging of catfish may substantially improve attitudes of consumers who do not presently eat catfish.

The majority of restaurant managers who served catfish reported that it was a high quality fish with nice flavor and was easy to prepare. A portion of the restaurant managers reported that the price of catfish was too high relative to their patrons’ desire

to eat catfish. This was especially true in the MA and ENC regions. More than one-half of the managers agreed that patrons of their restaurants liked the menu variety provided by catfish.

Preferences

Respondents who reported that they had eaten catfish were asked to rank catfish, compared to other fish, on a scale from 1 (unfavorable) to 10 (favorable) in terms of preferences (Table 13). Nationwide, the average ranking of catfish by respondents was 5.61. The WSC and ESC regions ranked catfish higher than other regions. The highest (6.11) and lowest (5.23) average rankings among all regions did not differ by more than one point.

Catfish ranked second in the grocery survey, third in the consumer survey (after shrimp and lobster) and third in the restaurant survey (after shrimp and cod) (Table 14). If canned tuna, salmon and various crab products had been included in the grocery survey, these products likely would have appeared in the list of favorite fish and seafood.

Catfish was mentioned most often nationwide as the favorite finfish (as opposed to all fish and seafood). It ranked first for consumers in the traditional consumption areas (WSC, ESC and WNC), second in the ENC, and third in the P region. In groceries, catfish was first in the traditional areas and third in the SA region.

Table 14. Favorite finfish of consumers by region.

Region	First choice		Second choice		Third choice	
	finfish	%	finfish	%	finfish	%
NE	haddock	23	cod	10	swordfish	9
MA	flounder	13	haddock	11	salmon	5
ENC	perch	12	catfish	9	whitefish	7
WNC	catfish	23	trout	6	cod/orange roughy	5
SA	flounder	21	trout	7	red snapper	7
ESC	catfish	32	flounder	7	bass	6
WSC	catfish	42	flounder	5	trout/snapper/bass	4
M	trout	14	halibut	12	salmon	11
P	salmon	17	halibut	15	catfish	7

Product Form

Sixty-five percent (65%) of catfish consumers nationwide preferred fresh fish, either as fillets or whole-dressed fish (Fig. 3). One-half of all responding catfish consumers listed fresh fillets as a first choice in product form, followed by “other” product forms (19%), fresh whole dressed fish (15%) and frozen fillets (12%). All regions preferred fresh fillets to other product forms. The region with the highest preference for frozen fish was the M region. Product forms mentioned least were prepared entrees and frozen steaks. The NE region had the highest percentage of consumers who did not know what product form they preferred.

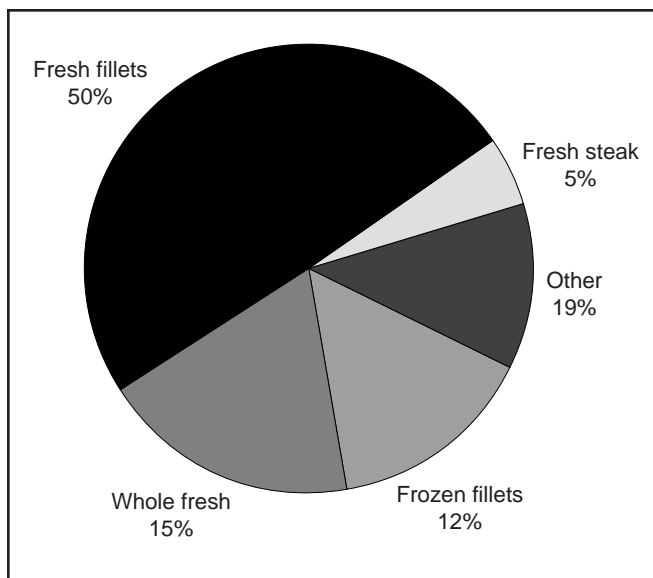


Figure 3. Product form preferences of consumers.

Frozen fillets were the primary product forms purchased by restaurants, followed by fresh fillets and whole fresh catfish. In all regions except the SA, frozen and fresh fillets were the dominant product form. In the SA region, whole fresh catfish was the primary product form purchased.

More grocery stores sold fresh catfish than any other product form, and more stores listed fresh catfish as the top-selling catfish product. Fresh fillets (63%) and fresh whole dressed catfish (64%) outranked frozen fillets (38%), frozen whole dressed catfish (26%), breaded/processed catfish (25%) and individually frozen fillets (13%) in grocery store availability. Nationally, the top-selling product was fresh whole dressed catfish (37%), followed by fresh fillets (33%), frozen fillets (14%),

frozen whole dressed catfish (5%), breaded/processed (2%) and individually frozen fillets (1%). However, fresh fillets were the top seller in the NE, MA and WSC. Individually frozen fillets were not generally available in the NE and P regions, but respondents in the MA expressed interest in this product form.

Trends in Catfish Consumption

Nationwide, 44% of restaurants in the survey sold more fish or seafood than in the previous year, while 42% sold the same amount. Compared to the previous 2 years, 51% of the restaurants nationwide sold more fish or seafood, and 24% sold the same amount. The NE, P and M regions had the largest increases in sales from 2 years previously. Sales were reported to have declined somewhat in the WSC region from their level 2 years before the survey.

New regions with potential for expanding sales of catfish in restaurants include NE, MA, ENC and P. Restaurants that characterize their cuisine type as seafood, combination and steak hold the greatest promise for market expansion. Other restaurant characteristics, such as location, seating capacity or type of ownership, were not statistically significant.

Conclusions

The restaurant survey indicated that the NE, MA, ENC and P regions had the greatest potential for market expansion through restaurant outlets. Grocery stores in the NE and MA regions have been adding catfish more rapidly than stores in other regions. The ENC and SA regions have many stores that have been long-time sellers of catfish. These two regions also had above average rates of new stores adding catfish sales in recent years.

Catfish availability, quality, taste, price and preparation are attributes that should be stressed in advertising and promotion to increase restaurant managers' knowledge of catfish. The majority of restaurant managers who did not serve catfish were not familiar with the product. There is a need for restaurant managers to learn more about their patrons' preferences and attitudes toward catfish. An educational campaign on the use and preparation of catfish designed for restaurant managers would improve market expansion.

Overall, the study indicated that consumer attitudes toward catfish have apparently changed in the non-traditional consumption areas. Consumers perceive catfish as a nutritious, high quality product that is easy to prepare. Perhaps in response to these changed attitudes, consumers across the United States are consuming more catfish and grocery

store and restaurant managers are adding catfish to their product lines. As long as the catfish industry continues to produce a consistently high quality product in an efficient manner, consumer demand will continue to support further growth of the U.S. farm-raised catfish industry.

Publications and Presentations

The following publications and presentations were developed as part of this Southern Regional Aquaculture Center project.

Journal Articles

- Capps, O. Jr., and J.D. Schmitz. 1991. A recognition of health and nutrition factors in food demand analysis. *Western Journal of Agricultural Economics* 16(1):21-35.
- Cheng, H. and O. Capps, Jr. 1988. Demand analysis of fresh and frozen finfish and shellfish in the United States. *American Agricultural Economics Association* 70(3):533-542.
- Dellenbarger, L.E., J.G. Dillard, A.R. Schupp, H.O. Zapata and B.T. Young. 1992. Socioeconomic factors associated with at-home and away-from-home catfish consumption in the United States. *Agribusiness: An International Journal* 8(1):35-46.
- Hanson, G.D., J.W. Dunn and G.P. Rauniyar. 1996. Marketing characteristics associated with seafood counters in grocery stores. *Marine Resource Economics* 11:11-22.
- Hanson, G.D., G.P. Rauniyar and R.O. Herrmann. 1994. Using consumer profiles to increase the U.S. market for seafood: implications for aquaculture. *Aquaculture* 127:303-316.
- Herrmann, R.O., G. P. Rauniyar, G.D. Hanson and G. Wang. 1994. Identifying frequent seafood purchasers in the northeastern U.S. *Agricultural and Resource Economics Review* 23(2):226-235.
- Israel, D. C., K. H. Kahl and R. S. Pomeroy. 1991. The effects of relative price perceptions and demographic factors on restaurant catfish consumption. *Agribusiness: An International Journal* 7(6):585-595.
- Kinnucan, H.W. and M. Venkateswaran. 1991. Economic effectiveness of advertising aquacultural products: the case of catfish. *Journal of Applied Aquaculture* 1:3-31.
- Kinnucan, H.W. and M. Venkateswaran. 1990. Effects of generic advertising on perceptions and behavior: the case of catfish. *Southern Journal of Agricultural Economics* 22:137-151.
- Kinnucan, H.W., R.G. Nelson and J. Hiariy. 1993. U.S. preferences for fish and seafood: an evoked set analysis. *Marine Resource Economics* 8:273-291.
- Nayga, Jr., R.M. and O. Capps, Jr. 1992. Determinants of food away-from-home consumption: an update. *Agribusiness: An International Journal* 8(6):549-559.
- Nayga, Jr., R.M. and O. Capps, Jr. 1995. Factors affecting the probability of consuming fish and shellfish in the away-from-home and at-home markets. *Journal of Agricultural and Applied Economics* 27(1):161-171.
- Olowolayemo, S.O., L.U. Hatch and W.E. Zidack. 1992. Potential U.S. retail grocery markets for farm-raised catfish. *Journal of Applied Aquaculture* 1:51-71.
- Rauniyar, G.P., R.O. Herrmann and G.D. Hanson. 1997. Identifying frequent purchasers of seafood for at-home and restaurant consumption. *The Southern Business and Economic Journal* 20(2):114-129.
- Schupp, A.R., R.S. Pomeroy and L.E. Dellenbarger. 1991. U.S. food store experience in handling crawfish. *Journal of Food Distribution Research* 22:1-968.
- Zidack, W.E. and L.U. Hatch. 1991. An econometric estimation of market growth for the U.S. processed catfish industry. *Journal of the World Aquaculture Society* 22: 10-23.
- Zidack, W.E., H.W. Kinnucan and L.U. Hatch. 1992. Wholesale- and farm-level impacts of generic advertising: the case of catfish. *Applied Economics* 24:959-968.

Agricultural Experiment Station Bulletins/Publications

- Capps, O., Jr. and J.A. Lambregts. 1990. Analysis of a local retail market for catfish and crawfish. Texas Agricultural Experiment Station Technical Bulletin. SRAC Bulletin 512, The Texas Agricultural Experiment Station, College Station, Texas.
- Engle, C., O. Capps, Jr., L.E. Dellenbarger, J.G. Dillard, L.U. Hatch, H.W. Kinnucan and R.S. Pomeroy. 1990. The U.S. market for farm-raised catfish: an overview of consumer, supermarket and restaurant surveys. Arkansas Agricultural Experiment Station Bulletin No. 925, University of Arkansas at Pine Bluff, Arkansas.
- Engle, C., O. Capps, Jr., L.E. Dellenbarger, J.G. Dillard, L.U. Hatch, H.W. Kinnucan and R.S. Pomeroy. 1991. Expanding U.S. markets for farm-raised catfish. *Arkansas Farm Research* 40(6):5-6.
- Hatch, L.U., C. Engle, W.E. Zidack and S.O. Olowolayemo. 1991. Retail grocery markets for catfish. Alabama Agricultural Experiment Station Bulletin 611, Auburn University, Alabama.
- Hatch, L.U., W.E. Zidack, T.A. Barnes and T.K. Thorpe. 1989. Catfish acceptance varies across United States. *Highlights of Agricultural Research* 36(3). Alabama Agricultural Experiment Station, Auburn University, Alabama.

- Kinnucan, H.W., W.E. Zidack, and L.U. Hatch. 1992. Returns to catfish advertising and optimal spending levels. Alabama Agricultural Experiment Station Bulletin No. 612, Auburn University, Alabama.
- Kinnucan, H.W., M. Venkateswaran and L.U. Hatch. 1990. Effects of catfish advertising on consumers' attitude, purchase frequency and farmers' income. Alabama Agricultural Experiment Station Bulletin No. 607, Auburn University, Alabama.
- Kinnucan, H.W., W.E. Zidack, M. Venkateswaran and L.U. Hatch. 1992. Catfish advertising. *Highlights of Agricultural Research* 39(4). Alabama Agricultural Experiment Station, Auburn University, Alabama.
- McGee, W.M., L.E. Dellenbarger and J.G. Dillard. 1989. Demographic and attitudinal characteristics of catfish consumers. Mississippi Agricultural and Forestry Experiment Station Technical Bulletin No. 168, Mississippi State University, Mississippi.
- Pearse, S.R., F. Niami and L.E. Dellenbarger. 1989. Nationwide grocery store markets for crawfish. *Louisiana Rural Economist* 51(3). Department of Agricultural Economics and Agribusiness, Louisiana State University, Louisiana.
- Pereira, C., and L.E. Dellenbarger. 1989. Household consumption patterns for crawfish. *Crawfish Tales*. Louisiana Crawfish Farmers Association, Louisiana.
- Pomeroy, R.S., J. C.O. Nyankori and D. C. Israel. 1990. Aquaculture products in the market place: utilization of fish and seafood and catfish products by full-service restaurants in the United States. Department of Agricultural Economics and Rural Sociology AE #464, SRAC Publication 510, Clemson University, South Carolina.

Proceedings

- Kinnucan, H.W. 1991. An evaluation of U.S. catfish advertising. Proceedings of the Symposium on Seafood Advertising and Promotion: Research and experience. David S. Liao (ed.). Charleston: South Carolina Wildlife and Marine Resources Department, International Institute of Fisheries Economics and Trade, pp. 75-90.
- Hatch, L.U. 1988. National survey of U.S. fish consumption. Proceedings, Aquaculture International Congress and Exposition, Vancouver, Canada.

Abstracts or Papers Presented

- Capps, O., Jr. and J.A. Lambregts. 1991. Retail demand for catfish and crawfish in a local market. Abstract. *Journal of Food Distribution Research*. 22:123-124.
- Dellenbarger, L.E., J.G. Dillard and A. R. Schupp. 1989. Socioeconomic factors associated with catfish consumption in the United States. Annual Meeting of the Southern Agricultural Economics Association, Nashville, Tennessee.

- Kinnucan, H.W., 1989. An evaluation of U.S. catfish advertising. Paper presented to the International Institute of Fisheries Economics and Trade Symposium on Seafood Advertising and Promotion, Orlando, Florida.
- Kinnucan, H.W., R.W. Nelson and J. Hiariey. 1993. U.S. preferences for fish and seafood: an evoked set analysis. Paper presented at the 40th Anniversary Conference of the Centre for Fisheries Economics, Bergen, Norway.
- Kinnucan, H.W. and M. Venkateswaran. 1990. Cross-sectional evaluation of generic advertising: the case of catfish. *American Journal of Agricultural Economics* 72:1354.
- Zidack, W.E., H.W. Kinnucan and L.U. Hatch. 1989. A dynamic monthly econometric model of the U.S. catfish industry. *American Journal of Agricultural Economics* 71:1358.

Theses and Dissertations

- Caplen, R.T. 1990. Product development in the restaurant industry: the case study of catfish. M.S. Thesis, Clemson University, South Carolina.
- Hiariey, J. 1992. Socioeconomic determinants of preferences for fish with emphasis on catfish. M.S. Thesis, Auburn University, Alabama.
- Israel, D.C. 1990. Total at-home and away-from-home catfish consumption in the United States: a dichotomous and ordered logit-probit analysis. Ph.D. Dissertation, Clemson University, South Carolina.

Paper Presentations

- Dellenbarger, L.E., J.G. Dillard and A. R. Schupp. 1989. Socioeconomic factors associated with catfish consumption in the United States. Annual Meeting of the Southern Agricultural Economics Association, Nashville, Tennessee.
- Hatch, L.U. 1988. National survey of U.S. fish consumption. Aquaculture International Congress and Exposition, Vancouver, Canada.
- Hatch, L.U. et al. 1989. Market dynamics of the U.S. catfish industry. Paper presented at the Western Economics Association, Lake Tahoe, California.
- Hatch, L.U. et al. 1989. Potential new retail grocery markets for farm-raised catfish. Paper presented to the American Fisheries Society Annual Meeting, Anchorage, Alaska.
- Kinnucan, H.W. and W.E. Zidack. 1989. Effects of industry structure on the stability of aquaculture markets. Annual Meeting of the American Fisheries Society, Anchorage, Alaska.
- Kinnucan, H.W. and M. Venkateswaran. 1990. Cross-sectional evaluation of generic advertising: the case of catfish. American Agricultural Economics Association, Vancouver, B.C.

This publication was supported in part by the Southern Regional Aquaculture Center through Grant No(s). 93-38500-8393, 94-38500-0045 and 96-38500-2630 from the United States Department of Agriculture.