

CIRCULATING COPY
Sea Grant Depository



Florida Sea Grant

CONSUMER ACCEPTANCE OF LOW TEMPERATURE
SMOKED FISH FILLETS

BY

Robert L. Degner, W. Steven Otwell
and John A. Koburger

Technical Paper No. 20
March 1981

Florida Agricultural Market Research Center,
Food and Resource Economics Department,
Institute of Food and Agricultural Sciences
University of Florida
Gainesville, FL 32611

Technical papers are duplicated in limited quantities for specialized audiences requiring rapid access to information and may receive only limited editing. The preparation of this paper was supported in part by Florida Sea Grant College and NOAA Office of Sea Grant, U.S. Department of Commerce, grant number 04-8-M01-76. It was published by the Marine Advisory Program which functions as a component of the Florida Cooperative Extension Service, John T. Woeste, Dean, in conducting Cooperative Extension work in Agriculture, Home Economics, and Marine Sciences State of Florida, U.S. Department of Agriculture, U.S. Department of Commerce, and Boards of County Commissioners, cooperating. Printed and distributed in furtherance of the Acts of Congress of May 8 and June 14, 1914. The Florida Sea Grant College is an Equal Employment Opportunity-Affirmative Action Employer authorized to provide research, educational information and other services only to individuals and institutions that function without regard to race, color, sex, or national origin.

ABSTRACT

A sample of 402 consumers in Jacksonville and Tampa, Florida was used to evaluate a new seafood product form called "low temperature smoked (LTS) fish fillets." Skinless fish fillets are smoked for a relatively short time at relatively low temperatures. After smoking, the product is packaged and stored like other seafood products. Upon thawing, it can be cooked in conventional ways.

For this test, mullet fillets which had been frozen for about one month after smoking were deepfat fried and presented to the consumer panel. Sensory evaluations were very favorable. Acceptance was also indicated by purchase intentions. Ninety-one percent of the primary food shoppers in the sample indicated they would buy the product if available in retail food stores, and about 68 percent of all respondents expressed a willingness to order the product if available in restaurants.

NOTE:

This paper was originally published in September 1980 by the Florida Agricultural Market Research Center as Industry Report 80-3.

A companion paper, "Low Temperature Smoked Fish Fillets: A Potential New Product Form For Florida Fish," Florida Sea Grant Technical Paper No. 19, December 1980, discusses the technical aspects of the production process in preparing low temperature smoked fish fillets.

TABLE OF CONTENTS

	Page
LIST OF TABLES	v
LIST OF APPENDIX TABLES	vii
ACKNOWLEDGEMENTS	viii
SUMMARY	ix
INTRODUCTION	1
OBJECTIVES	1
The Product	2
Research Procedure	4
FINDINGS	5
The Consumer Sample	5
Test Product Evaluation	10
Sensory Evaluation	10
Effects of Socioeconomic and Demographic Characteristics on Product Appeal	14
Acceptability as a Menu Item	15
Comparison of the Test Product With Other Smoked Fish	15
Evaluations by Primary Food Shoppers	17
Respondents' Ability to Identify Species	18
Suggestions for Product Improvement	18
Evaluation of Possible Product Names	21
Evaluation as a Retail Product	22
Purchase intentions	22
Substitution of the test product for currently available frozen fish fillets	22

TABLE OF CONTENTS--Continued

	Page
Pricing	25
Preferred package size	28
Evaluation of a restaurant menu item	28
Restaurant order intentions	28
CONCLUSIONS	30
APPENDIX	33
REFERENCES	48

LIST OF TABLES

Table	Page
1 Nonrespondents' reasons for not sampling the test product....	7
2 Number and percent of primary food shoppers, both cities....	8
3 Frequency of use of frozen fish fillets, both cities.....	8
4 Usual cooking method for frozen fish fillets, both cities...	9
5 Consumer ratings of physical attributes of the smoked fish fillets.....	11
6 Consumer ratings of characteristics of the test product and previously eaten smoked fish.....	13
7 Number and percent of respondents that had previously eaten smoked fish, Jacksonville and Tampa.....	14
8 Mean overall appeal ratings for the test product by selected demographic variables and classifications.....	16
9 Ratings of selected characteristics of smoked fish fillets, by primary food shoppers.....	17
10 Respondents' ability to correctly identify species from which test products were made.....	19
11 Suggested improvements for the test product.....	20
12 Respondents' ratings for selected names for the test product.	23
13 Primary food shoppers' purchase intentions for the test pro- duct at a "competitive price".....	23
14 Primary food shoppers' indicated substitution of the test product for currently available frozen fish fillets, at prevailing prices.....	25
15 A summary of primary shoppers' estimates of a "fair" retail price for the test product.....	26
16 Primary shoppers' anticipated frequency of use of the test product at various retail prices.....	27

LIST OF TABLES -- Continued

Table	Page
17 Primary food shoppers' preferred package sizes for frozen fish fillets.....	29
18 Frequency of consumption of fish fillets in restaurants, all respondents.....	30
19 Respondents' intentions to order the test product if available in restaurants, by current frequency of fish fillet orders.....	31

LIST OF APPENDIX TABLES

Table		Page
1	Socioeconomic and demographic composition of the consumer panel.....	33
2	Species identified by respondents as the source of the fish fillets.....	35
3	Primary shoppers' estimates of a "fair" retail price for the test product.....	36

ACKNOWLEDGEMENTS

Appreciation is expressed to the Florida Sea Grant College and the Gulf and South Atlantic Fisheries Development Foundation, Inc. for their financial support. Special thanks are also due Judy King, FAMRC statistician, for her assistance in editing and analyzing the data, and to Patricia Beville and Cyndy Cooper for typing the manuscript.

The Florida Agricultural Market Research Center is a service of the Food and Resource Economics Department of the Institute of Food and Agricultural Sciences. Purpose of the Center is to provide timely, applied research on current and emerging marketing problems affecting Florida's agricultural and marine industries. The Center seeks to provide research and information to production, marketing, and processing firms, groups and organizations concerned with improving and expanding markets for Florida agricultural and marine products.

The Center is staffed by a basic group of economists trained in agriculture and marketing. In addition, cooperating personnel from other IFAS units provide a wide range of expertise which can be applied as determined by the requirements of individual projects.

SUMMARY

A new seafood product form was recently developed by the Food Science and Human Nutrition Department and consumer tested in cooperation with the Food and Resource Economics Department.

The product is known as "low temperature smoked (LTS) fish fillets". It is a skinless fish fillet which has been flavored by smoking at relatively low temperatures for a relatively short period of time. It is smoked at 120°F for 1 1/2 hours, compared with smoking temperatures of 150° to 200°F for 4 to 12 hours for conventionally smoked fish.

The new process requires less heat for production and results in less product shrinkage, only 2 percent compared with 40-50 percent for conventional smoking.

After smoking, the product is packaged and frozen like other fish fillets. Upon thawing, it can be deep fat fried, pan fried, or broiled. The product for this consumer test had been frozen one month and was prepared by deep fat frying.

A wide range of species can be used. For this test, mullet fillets were prepared. Use of underutilized species like mullet offers Florida fisherman and seafood processors the opportunity to convert low valued species to a profitable item.

A consumer sample of 402 individuals was obtained using the mall intercept approach. Two hundred in Jacksonville and 202 in Tampa. After sampling the product, respondents were interviewed to determine their sensory reactions and fish fillet use patterns.

Consumers' evaluations of product color, smoked flavor, texture, saltiness, smell, overall taste, and overall appeal were very favorable for all socioeconomic and demographic classes.

Respondents rated the test product significantly higher than previously eaten smoked fish.

Acceptability of the product as a family meal received relatively high ratings. Acceptability as a special meal for friends and as a restaurant meal was rated somewhat lower, but judged to be quite favorable nevertheless.

Respondents' ability to correctly identify mullet as the species used for the test product had no effect on overall appeal ratings.

Ninety-one percent of the primary food shoppers interviewed said they would buy the product if available in retail food stores.

Most primary food shoppers said they would substitute the LTS fillets for conventional fillets from 1/3 to 1/2 of the time. It is likely, however, that availability of the product would increase total fish consumption.

On a volume basis, the test product could substitute for about 50 percent of conventional fillet purchases.

The average suggested "fair price" for the test product was \$2.02 per pound; the median was \$1.90 and the mode was \$1.50. The range was \$0.60 to \$6.00 per pound.

Over 68 percent of all respondents said they would order the LTS fillets if available in restaurants.

In conclusion, the LTS fillets were well accepted by the consumer sample. Because an acceptable product can be made from currently under-utilized species, Florida fishermen and seafood processors can also gain by development of this product.

CONSUMER ACCEPTANCE OF LOW TEMPERATURE SMOKED FISH FILLETS

Robert L. Degner, W. Steven Otwell
and John A. Koburger

INTRODUCTION

In the face of continually changing consumer tastes and preferences new product development is a constant challenge to any industry. One of the functions of the Food Science and Human Nutrition Department of the Institute of Food and Agricultural Sciences at the University of Florida is to develop new uses and new forms of products from agricultural commodities and fishery resources. An essential part of this developmental process is the evaluation of consumer response to newly created products. The Florida Agricultural Market Research Center of the Food and Resource Economics Department conducts extensive consumer research. Without adequate evaluation at various stages of the developmental process, much technical and scientific effort can be lost if the product does not conform to consumers' needs and desires.

OBJECTIVES

The study is designed to determine consumer acceptance of low temperature smoked (LTS) fish fillets. Specific objectives were to

Robert L. Degner is assistant professor in Food and Resource Economics, and W. Steven Otwell is an assistant professor and John A. Koburger is a professor of the Food Science and Human Nutrition Department, all of the University of Florida

obtain consumer evaluation of basic product characteristics such as exterior and interior color, smoked flavor, texture, saltiness, smell, and acceptability as a family meal, a special meal for friends, and as a restaurant menu item. Acceptable retail prices for the LTS fillets were also estimated.

The Product

The low temperature smoked fish fillets are a new product form recently developed by Drs. Koburger and Otwell of the Food Science and Human Nutrition Department of the University of Florida, in cooperation with the Florida Sea Grant College. The product was developed to expand the use of traditional and underutilized fish species harvested in Florida. The product is a skinless fish fillet which has been flavored by smoking at relatively low temperatures for a relatively short time. The fillets are smoked at 120°F for 1 1/2 hours, compared with smoking temperatures of 150° to 200°F for periods ranging from four to twelve hours for conventionally smoked fish. Obviously, the low temperature process has the advantage of requiring less heat energy for production, compared with the traditional hot smoking process. Another advantage is reduced product shrinkage. Preliminary tests show a loss of only 2 percent, compared with 40 to 50 percent for hot smoking procedures.

After smoking, the product is cooled, frozen and packaged like other seafood products. Tests have demonstrated that the LTS fillets made from mullet can remain frozen for over three months with no detrimental effects on flavor and texture. Prior to serving, the product can be fried, baked, or broiled. Cooking results in a final product that

differs from the traditional hot smoked fish in that it has a higher moisture content and a greater yield.

The process may be used for a wide variety of species. Tests show that the product can be made from lean or fatty fish, from popular or underutilized fish (Otwell, et al., 1980). Also, the process is ideally suited for utilization of "spent" (roe removed) mullet carcasses. This is particularly important because Florida is the principal mullet roe exporting state. After removal of the roe for export, spent mullet carcasses are usually dumped overboard or sold at very low prices. The LTS process offers a means of converting the low-value spent mullet fillets into a potentially profitable item for fishermen and seafood processors.

Further, the process and the basic characteristics of the product lend itself to most seafood distributors' operations. The product offers the advantages of extended shelf-life, high yield, and portion control, which are important to retail outlets, restaurants, and other food service firms. Preliminary taste panel tests indicated that the product would be well received by consumers, offering them an additional choice of seafood items.

The LTS fillets used in this consumer study were made from spent mullet that had been frozen for approximately one month. Details of the LTS process are included in the Appendix. The test product samples for this consumer study were thawed under refrigeration, then deep fat fried in peanut oil at 350°F for two minutes. The six-ounce cooked fillets were cut into two-ounce samples for presentation to consumers. Cooking of the product samples was done at the test sites by Otwell and Koburger to ensure quality control.

Research Procedure

Four hundred and two consumers received samples of the test product and were personally interviewed by professionally trained interviewers. Two hundred consumers were interviewed in Jacksonville and 202 in Tampa, Florida. Jacksonville and Tampa were selected as the test cities because both are relatively large metropolitan areas which afford a broad spectrum of consumers from various socioeconomic backgrounds. Further, market research firms with test kitchen facilities and trained interviewers were available in both cities.

The consumer sample was obtained using the mall intercept approach in late February 1980. Interviewers solicited respondents from shoppers patronizing large malls in each city. Approximately two-thirds of all shoppers approached consented to sample the product and submit to a brief interview. Interviewers screened respondents to 1) include only those who ate fish, 2) include only those over 18 years of age, and 3) to include equal proportions of males and females. In both malls, the pedestrian traffic flow was sufficiently low to allow interviewers to approach all shoppers passing by the intercept location. Thus, the interviewers were not allowed to exercise any discretion as to the shoppers they approached.

Upon giving their consent to sample the product and to be interviewed, respondents were taken to a private interviewing area adjacent to the test kitchen. Each respondent was given a warm sample of the test product along with a bland milk cracker and a glass of water. The cracker was provided in order to neutralize the taste of food, tobacco

items, and gum that respondents may have consumed. The water was provided so that the respondents could rinse after sampling the product.

Immediately after sampling the test product, respondents were asked to evaluate the product and then questioned about their basic consumption patterns for fish fillets. The duration of the interviews ranged from approximately five to seven minutes. The questionnaire, which had been thoroughly pretested on Gainesville area homemakers, is also included in the Appendix.

FINDINGS

The results of this consumer study are discussed below in two general sections. The first major section discusses the socioeconomic and demographic composition and fish consumption patterns of the consumer sample, and the second presents the consumers' evaluations of the test product.

The Consumer Sample

The socioeconomic and demographic characteristics of the consumers in Jacksonville and Tampa were very similar with respect to household size, the number of children, age, and income. As mentioned previously, respondents were preselected on the basis of sex, thus the proportions of female and male were equal. The two cities differed, however by education level and race of the respondents. The Tampa sub-sample contained a disproportionately larger number of respondents with less than high school educations and a significantly smaller proportion of blacks than did the Jacksonville sample.

Although the income distributions for the sub-samples were not significantly different from each other, the income distributions for the respective cities were significantly different from published estimates (Survey of Buying Power, 1979). The sub-samples in both cities had disproportionately high numbers of incomes, over \$25,000 per household per year, and disproportionately low numbers of incomes less than \$8,000, (Appendix Table 1). This probably results in conservative product ratings since the highest income category rated the product slightly lower than other income categories and blacks tended to rate it higher than white respondents. These findings are discussed in more detail in a later section. It should be pointed out, however, that most socioeconomic and demographic characteristics did not appear to significantly affect the product ratings and other consumer responses. Thus, it is reasonable to assume that conclusions drawn from this study apply to other populations even though the socioeconomic and demographic characteristics may be somewhat different.

As mentioned previously, approximately two-thirds of the shoppers contacted in the two malls agreed to sample the product and be interviewed. Those who declined were asked for their primary reason. The majority, slightly over half, indicated a lack of sufficient time (Table 1). The next largest group, about 14 percent, said they disliked fried fish. About 7 percent said they disliked a smoked flavor and an equal proportion declined because of diet restrictions. A few refused to sample the product because of uncertainty as to quality and sanitation of the product, the time of day, proximity to a meal, or because of a fear of fish bones. About 14 percent refused to cooperate and refused

to give a reason (Table 1). The racial composition of the non-respondent group was not significantly different from the group of consumers that agreed to sample the product.

Table 1.--Nonrespondents' reasons for not sampling the test product.

Reason	Number	Percent
Do not have time	104	53.1
Dislike fried fish	28	14.3
Dislike smoked flavor	13	6.6
Diet restrictions	13	6.6
Unsure of quality or sanitation	5	2.6
Too early in morning or too soon after eating	5	2.6
Product may contain bones	1	0.5
No specific reason	27	13.8
Totals	196	100.0 ^a

^a

Does not sum to 100 percent due to rounding.

All 402 respondents were asked*to evaluate the product and to answer questions related to general usage of fish fillets. However, those respondents who were primarily responsible for food shopping in their households and who had purchased frozen fish fillets for at home consumption were asked to provide additional detail with respect to frequency of use and to retail prices. It was felt that "primary shoppers" would be able to provide reliable data on these questions. A total of 191 primary shoppers were interviewed in the two cities (Table 2).

Table 2.--Number and percent of primary food shoppers, both cities.

Do you shop for most of your household groceries?	Both cities ^a	
	<u>Number</u>	<u>Percent</u>
Yes	191	58.8
No	134	41.2
Total	325	100.0

^a
Chi-square analysis indicates no significant difference between cities at the 0.05 probability level. $\chi^2 = 1.06$, with 1 degree of freedom.

In the overall sample of consumers, approximately 20 percent reported never using frozen fish fillets at home. A similar number, almost 19 percent, said frozen fish fillets were served infrequently, that is less than once per month. Approximately 37 percent said that frozen fish fillets were served in their households once or twice a month, while nearly one-fourth of the respondents said that they were served once per week or more (Table 3).

Table 3.--Frequency of use of frozen fish fillets, both cities.

Frequency	Number	Percent ^a
Never	80	19.9
Infrequently, less than once per month	75	18.7
Frequently, once or twice per month	148	36.8
Very frequently, once per week or more	99	24.6
Totals	402	100.0

^a
A chi-square analysis indicated no statistically significant differences between cities, $\chi = 3.97$ with 3 degrees of freedom.

The usual method of cooking frozen fish fillets was similar in the two cities. Almost 40 percent usually bake them while almost equal proportions, 23 percent, pan-frying is the predominant method of preparation. Very few households, less than 1 percent, usually steam or microwave cook frozen fish fillets. Roughly 3 percent of the respondents could not specify the most common method of cooking but instead use a combination of baking, frying or broiling (Table 4). The usual method of cooking cited by the respondents had no significant effect on their ratings of overall product appeal or overall taste. This is consistent with laboratory taste tests which indicated the manner in which the test products were prepared had little effect on the test product ratings.

Table 4.--Usual cooking method for frozen fish fillet, both cities.

Usual cooking method ^a	Number	Percent
Baked	127	39.6
Panfry	74	23.1
Broil	73	22.7
Deepfat fry	34	10.6
Miscellaneous ^b	3	0.9
Undetermined ^c	10	3.1
Totals	321	100.0

^a When the usual cooking methods are aggregated into the two general categories "fried" and "baked" (broiled, microwave cooking and steaming are included in the baked category and "undetermined" category responses were assigned on the basis primacy) chi-square analysis indicates no statistically significant difference in preparation methods between cities, $\chi^2 = 0.015$ with 1 degree of freedom.

^b Miscellaneous includes microwave cooking and steaming.

^c Respondents were unable to specify their "usual" cooking method, but four said the broil and bake equally, three panfry and broil equally, two panfry and bake equally, and one reportedly deepfat fries and broils filets with equal frequency.

Test Product Evaluation

Sensory Evaluation

Immediately after the respondents had sampled the test product, they were asked to evaluate selected physical attributes of the LTS fish fillets. These attributes included exterior and interior color, smoked flavor, texture, and saltiness. Respondents evaluations of these attributes were obtained with a series of semantic differential scales. Numerical values of one to five were assigned to the semantic differential scales and means and standard deviations calculated. A mean value of 3.0 indicated a "just right" rating on each attribute. Percentage distributions for the various responses are also reported (Table 5).

Many respondents rated the exterior and interior color of the fillets as being slightly too dark. The mean ratings were 2.6 and 2.7, respectively. Approximately 63 percent of the respondents felt that the exterior color was just right, but one-third rated the exterior color at being slightly too dark. The distribution of the ratings for interior were very similar (Table 5). Obviously, the exterior and interior color of the fillets can be influenced by the choice of species used for the product, and variations in production and cooking methods. It is encouraging to note the relatively large proportion of respondents that was satisfied with the color of the mullet fillets.

The evaluation of the smoked flavor was judged to be of particular importance. The mean rating of this attribute was 3.0. Over 78 percent of the respondents indicated that the smoked flavor was just right. About 12 percent said that the product did not have quite enough smoke flavor. On the other hand, almost 8 percent was slightly too smokey.

Table 5.--Consumer ratings of physical attributes of the smoked fish fillets.

Attribute	Mean ^a value	Standard deviation	Percent of respondents
Exterior color	2.6	0.6	-----
Much too dark	---	---	2.2
Slightly too dark	---	---	33.1
Just right	---	---	63.2
Slightly too light	---	---	1.5
Much too light	---	---	0.0
Total			<u>100.0</u>
Interior color	2.7	0.5	-----
Much too dark	---	---	1.2
Slightly too dark	---	---	30.9
Just right	---	---	66.7
Slightly too light	---	---	1.0
Much too light	---	---	0.3
Total			<u>100.0</u>
Smoked flavor	3.0	0.6	-----
Much too "smokey"	---	---	2.2
Slightly too "smokey"	---	---	7.7
Just right	---	---	78.4
Not quite enough smoked flavor	---	---	11.7
Need much more smoked flavor	---	---	0.0
Total			<u>100.0</u>
Texture	2.8	0.5	-----
Much too tough	---	---	0.5
Slightly too tough	---	---	28.1
Just right	---	---	69.2
Not quite tough enough	---	---	2.2
Need to be much tougher	---	---	0.0
Total			<u>100.0</u>
Salt	2.9	0.6	-----
Much too salty	---	---	2.0
Slightly too salty	---	---	16.9
Just right	---	---	65.9
Not quite enough salt	---	---	14.9
Needs much more salt	---	---	0.3
Total			<u>100.0</u>

a

Means were calculated by assigning numerical values of 1-5, respectively, to the semantic differential scales in the order listed. Thus, a mean of 3.0 would indicate a "just right" rating on each attribute. According to Chi-square tests for each attribute there were no statistically significant differences in ratings between the two cities. There were 402 observations.

b

Does not sum to 100 percent due to rounding.

Only 2 percent said that the product had too much of a smoked flavor and none said that it needed much more smoked flavor (Table 5). On the basis of these results, it appears that the smoking time of 1 1/2 hours is sufficient to please a very large proportion of the consumer sample.

The texture of the fillets was evaluated by using the term "toughness". Almost 70 percent of the respondents said that the degree of toughness was just right. However, slightly over 28 percent said the product was slightly too tough as compared to only 2 percent that said the product was not tough enough. One-half of 1 percent said the product was much too tough but no one said the product needed to be much tougher. Again, the choice of species has an effect on texture. While a significant proportion of the sample viewed the test product as being slightly too tough, it should be noted that there was a high degree of acceptability.

Since brining is essential to the production process, consumer reactions to the degree of saltiness is also of considerable importance. However, as with the other basic variables, the brine concentration may be adjusted to improve acceptability. The mean rating of 2.9 indicates that the product may be slightly too salty. However, examination of the rating distribution reveals that almost two-thirds rated thought the degree of saltiness was just right. Almost equal proportions of respondents said that the product was slightly too salty or not quite salty enough, 17 percent versus 15 percent. Two percent said the product was much too salty, compared with only 0.3 percent who said it needed much more salt (Table 5).

Respondents were also asked to rate the product with respect to smell, overall taste, overall appeal, and its acceptability as a menu item for a family meal, a special meal for friend, and a restaurant menu

item. They were also asked to rate any smoked fish they had previously eaten for comparison. Interviewees were asked to rate these characteristics using a 0 to 10 rating scale where 10 equaled excellent and 0 equaled extremely poor.

The ratings for smell, overall taste, and overall appeal were 7.8, 8.2, and 7.9, respectively for all respondents. Respondents in the two cities rated these characteristics similarly (Table 6).

Table 6.--Consumer ratings of characteristics of the test product and previously eaten smoked fish.

Characteristics	Both cities ^a	Tampa	Jacksonville
	----- <u>Mean rating</u> -----		
Smell	7.8	-----	-----
Overall taste	8.2	-----	-----
Overall appeal	7.9	-----	-----
As a family meal	-----	7.4	8.0
As a special meal for friends	-----	6.4	7.0
As a restaurant meal	6.6	-----	-----
Rating of previously eaten smoked fish	6.9 ^b	-----	-----

^a
Means are based on a rating scale where 10 = excellent and 0 = extremely poor. Where only one mean is reported for both cities, a t-test indicated that differences between cities were not statistically significant at the 0.05 level.

^b
A paired t-test indicates the difference between the overall appeal rating and the rating given previously eaten smoked fish is statistically significant at the 0.01 probability level, $t = 5.49$ with 319 degrees of freedom.

Effects of Socioeconomic and Demographic Characteristics on Product Appeal

Analysis of covariance was used to determine whether respondent's ratings for overall appeal were influenced by sex, race, income, age, household size or ability to correctly identify the species from which the product was made. The effect of the time of day interviewed on the overall rating was also examined, but was judged to have little impact.

Sex, race, income, and household size apparently influence the overall appeal ratings. Females rated the product significantly higher than males. The average overall appeal rating given by women was 8.6, compared with 8.2 for men (Table 7). Black respondents tended to rate the product higher than did white, 8.7 compared with 8.0.

Table 7.--Number and percent of respondents that had previously eaten smoked fish, Jacksonville and Tampa.

City	Had previously eaten smoked fish ^a			
	Yes		No	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Jacksonville	144	71.3	58	28.7
Tampa	180	90.0	20	10.0

^a Chi-square analysis indicates a statistically significant difference at the 0.01 probability level, $\chi^2 = 22.50$, with 1 degree of freedom.

The overall appeal ratings for most income categories were similar, except for the highest income category. Households which exceed \$25,000 in annual income rated the product significantly lower than did all others. However, even though they gave it a lower rating, their rating of 7.8 is judged to be satisfactory.

The overall appeal ratings did not appear to be significantly related to age. The average ratings for the various age categories were quite similar (Table 8).

Acceptability as a Menu Item

Acceptability of the test product as a family meal and as a special meal for friends received significantly higher ratings in Jacksonville, but ratings in both cities were relatively high. These differences are attributed to the finding that blacks tended to rate the product higher as a family meal and as a special meal for friends than did the white respondents and the Jacksonville sample contained a larger proportion of blacks. Rating of the product as a family meal averaged 7.4 in Tampa and 8.0 in Jacksonville, and the ratings as a special meal for friends averaged 6.4 in Tampa and 7.0 in Jacksonville. Ratings of the test product's acceptability as a restaurant meal were similar for the two cities. The average rating was 6.6 (Table 6).

Comparison of the Test Product With Other Smoked Fish

Respondents that had previously eaten some type of smoked fish were asked to rate it using the 0 to 10 rating scale. The average rating for previously eaten smoked fish was 6.9 compared with the overall appeal rating of 7.9 for the test product (Table 6).

A significantly larger proportion of the consumers in Tampa had previously eaten smoked fish. Ninety percent of the Tampa respondents had eaten smoked fish compared with only 71 percent of the Jacksonville consumers (Table 7). Greater familiarity with smoked fish was expected for the Tampa consumers because of the prevalence of seafood processors producing smoked products. Smoked fish items have traditionally been

Table 8.--Mean overall appeal ratings for the test product by selected demographic variables and classifications.

Product characteristic demographic variable, classification	F value ^a	Mean rating
Overall appeal		
Sex	5.93*	-----
Female	-----	8.6 ^a
Male	-----	8.2 ^b
Race	7.29**	-----
White	-----	8.0 ^a
Black	-----	8.7 ^b
Income	2.79*	-----
Under \$8,000 per year	-----	8.5 ^a
\$8,000 - 9,999	-----	8.7 ^a
\$10,000 - 14,999	-----	8.5 ^a
\$15,000 - 24,999	-----	8.2 ^a
\$25,000 - over	-----	7.8 ^b
Age	0.87	-----
Under 18 ^c	-----	8.3 ^a
18 - 24	-----	8.2 ^a
35 - 49	-----	8.5 ^a
50 - 64	-----	8.4 ^a
65 +	-----	8.4 ^a
Household size	1.76	-----
1	-----	8.4 ^a
2	-----	8.5 ^a
3	-----	8.6 ^a
4 or more	-----	8.0 ^b
Species	0.29	-----
Do not know	-----	8.3 ^a
Correct	-----	8.3 ^a
Incorrect	-----	8.5 ^a

^a Statistical significance at the 0.05, 0.01 levels is indicated by one and two asterisks, respectively.

^b Means reported here are least squares means. Means for a given demographic variable followed by the same letter are not significantly different at the 0.10 percent probability level.

^c Although respondents were screened to eliminate those under 18 years of age, two were inadvertently included.

more readily available in the Tampa area. It should be noted, however, that the ratings in the two cities for previously eaten smoked fish were similar and the test product received higher overall appeal ratings in both.

Evaluations by Primary Food Shoppers

The ratings for overall taste, overall appeal, and acceptability for various types of meals were also analyzed to determine whether primary food shoppers and non-shoppers evaluated the product similarly. Primary food shoppers rated the product significantly higher with respect to overall taste than did non-shoppers. The average rating for overall taste was 8.4 for primary shoppers compared with 8.0 for the non-shoppers. There were no statistically significant differences in ratings for the remaining characteristics (Table 9).

Table 9.--Ratings of selected characteristics of smoked fish fillets, by primary food shoppers.

Characteristics	Primary food shopper	Non-shopper	All respondents ^a
	<u>Mean ratings</u>		
Overall taste	8.4	8.0	8.2
Overall appeal	---	---	7.9
As an occasional meal	---	---	7.7
As a special meal for friends	---	---	6.7
As a restaurant meal	---	---	6.6

^a Where only one mean is reported for all respondents, a t-test indicated that means for the two groups were not significantly different at the 0.05 probability level.

Respondents' Ability to Identify Species

Few respondents, only 23 percent, correctly identified mullet as the species from which the test product were made. Nearly 40 percent said they did not know, and almost 37 percent ventured an incorrect species. A significantly larger proportion of Tampa respondents (Table 10) correctly identified the species as mullet. Nearly a third of Tampa respondents correctly identified the species, compared with only 14 percent in Jacksonville.

The 147 respondents that incorrectly identified the species mentioned 31 different species as the possible source of the fillets. The most frequently mentioned species were trout, flounder, perch, mackerel, grouper, codfish and whiting, mentioned by a total of 23 percent of the respondents (Appendix Table 2). Other guesses ranged from high value species such as salmon and halibut to rarely eaten species such as shad and bonito (Appendix Table 2).

Respondents' ability to correctly identify the species from which the fillets were made did not seem to affect the overall appeal ratings. Respondents that did not know what species the product was made from and those that correctly identified the species had the same mean rating, 8.3 (Table 7). Those that incorrectly identified the species had a mean rating of 8.5. However, this difference was not statistically significant.

Suggestions for Product Improvement

Over half were satisfied with the product as prepared and offered no suggestion for improvement. Most suggestions dealt with product attributes and characteristics which were evaluated using the rating scales previously discussed, and were consistent with the ratings.

Table 10.--Respondents' ability to correctly identify species from which test products were made.

Response	Tampa		Jacksonville		Both cities	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Did not know species	77	38.7	83	41.1	160	39.9
Correctly identified species	65	32.7	29	14.4	94	23.4
Incorrectly identified species	<u>57</u>	<u>28.6</u>	<u>90</u>	<u>44.6</u>	<u>147</u>	<u>36.7</u>
Totals ^b	199	100.0	202	100.0	401	100.0

^a Chi-square analysis indicates a statistically significant difference in responses between cities, at the 0.01 probability level, $\chi^2 = 21.40$, with 2 degrees of freedom.

^b Percentages may not sum to 100 due to rounding.

For example, about 3 percent of the respondents suggested that the exterior color should be lighter and only one respondent, 0.3 percent said the exterior color should be darker (Table 11). Almost 9 percent suggested that the interior color of the fillets should be lighter and only 0.5 percent, two respondents, suggested that the interior color be darker. With respect to smoked flavor, 15 respondents or 3.7 percent suggested that the smoked flavor be reduced, and 21 respondents, or 5.2 percent recommended increasing the smoked flavor.

A few respondents, 7 of the 402, recommended using a batter or a breading. Interestingly, two respondents suggested using less batter, despite the fact that none was used on the test product.

Table 11.--Suggested improvements for the test product.

Suggestion	First response		All responses	
	Number	Percent	Number	Percent
None	207	51.5	----	----
<u>Basic characteristics</u>				
Exterior color should be lighter	7	1.7	12	3.0
Exterior color should be darker	0	0.0	1	0.3
Interior color should be lighter	25	6.2	35	8.7
Interior color should be darker	1	0.3	2	0.5
Reduce smoke flavor	12	3.0	15	3.7
Increase smoke flavor	19	4.7	21	5.2
Texture should be more tender	19	4.7	26	6.5
Reduce salt	25	6.2	33	8.2
Increase salt	11	2.7	18	4.5
Use filet that does not taste or smell as strong	8	2.0	9	2.2
Make less greasy	3	0.8	4	1.0
Should be more moist	16	4.0	23	5.7
Should be less moist	3	0.8	3	0.8
Make thicker	7	1.7	9	2.2
Make smaller (bite-sized)	2	0.5	2	0.5
Make larger	2	0.5	2	0.5
Change shape	1	0.3	2	0.5
<u>Breading or batter</u>				
Needs more batter	3	0.8	5	1.2
Needs less batter	2	0.5	2	0.5
Bread with cornmeal	2	0.5	2	0.5
<u>Cooking</u>				
Microwave	1	0.3	1	0.3
Do not overcook	4	1.0	8	2.0
Miscellaneous	9	2.2	9	2.2
<u>Serving suggestions</u>				
Add spices	2	0.5	4	1.0
Serve with sauce	9	2.2	10	2.5
Flavor with lemon juice	2	0.5	5	1.2
Totals	402	100.0 ^a	---- ^b	---- ^b

^a

Does not sum to 100 percent due to rounding.

^b

Not summed due to multiple responses.

A few respondents recommended alternative cooking methods such as cooking in a microwave oven, conventional baking, or pan frying. About 2 percent of the respondents felt that the fillets had been overcooked, and that prevention of overcooking could result in a better product. A few suggested that the product would be enhanced by serving with sauces or other flavorings such as lemon juice (Table 11).

Evaluation of Possible Product Names

Several fanciful names were developed and evaluated to illustrate various types of names that could be used for the test product. There are undoubtedly many names which could be informative and at the same time convey a favorable product image to the consumer. These names are intended only as a point of departure.

All respondents were asked to rate four possible names for the new product using the rating scale where 10 = excellent and 0 = extremely poor. Of the four names tested, "Natural Smoked Fish Fillets" was preferred; it received an average rating of approximately 6.9 (Table 12). From a statistical standpoint, "Natural Smoked Fish Fillets" was rated significantly higher than "Smoked Flavored Fillets" and "Florida Smokies", which had mean ratings of approximately 6.0 and 5.8, respectively. The two latter means were not significantly different from each other. The fourth name, "Campfire Fish Fillets" received relatively low evaluations in both cities. The mean ratings for the name "Campfire Fish Fillets", were 5.6 and 5.9 for Tampa and Jacksonville respondents, respectively; the mean rating by Tampa respondents was significantly lower than the mean rating by Jacksonville respondents. When responses are analyzed on an

overall basis, the mean rating for "Campfire Fish Fillets" was 5.2, significantly lower than the three previous names (Table 12).

Evaluation as a Retail Product

Purchase intentions

Primary food shoppers were asked whether or not they would buy the test product if available at "competitive prices". Ninety-one percent said they would buy the product if available, only 9 percent said they would not (Table 13). Responses were similar in both cities. The exceptionally high proportion of positive responses indicate considerable potential as a retail product.

Substitution of the test product for currently available frozen fish fillets

Primary shoppers were asked to indicate their probable rate of substitution of the test product for currently available frozen fish fillets if the LTS fillets were "priced the same" as the fillets usually bought. Respondents in Jacksonville expressed a greater willingness to substitute the LTS fillets for the conventionally prepared product. About one-fourth of the primary food shoppers in Jacksonville said they would substitute the test product 100 percent of the time, compared with only 9 percent of the Tampa respondents. However, approximately 30 percent of the Tampa respondents said they were willing to substitute the test product about 20 to 25 percent of the time compared with 12 percent of the Jacksonville consumers. Overall, about 18 percent of the primary shoppers who said they were willing to buy the test product were willing to substitute it exclusively for conventional frozen fish fillets. An additional 11

Table 12.--Respondents' ratings for selected names for the test product.

Name	Both cities	Statistical significance ^a
	<u>Mean rating ^b</u>	
"Natural Smoked fish fillets"	6.94	A
"Smoked flavored fillets"	5.97	B
"Florida Smokies"	5.84	B
"Campfire fish fillets"	5.24	C

^a Ratings for the various names were compared using paired t-tests. Means connected by a series of the same letter are not significantly different at the 0.05 probability level. The mean ratings for the name "Campfire fish filets" were 5.64 and 4.85 for Tampa and Jacksonville respondents, respectively. A standard t-test indicated that the difference in these means was statistically significant at the 0.05 probability level. Means for other names were similar for the two cities.

^b Means are based on a rating scale where 10 = excellent and 0 = extremely poor. There were 402 observations for each mean.

Table 13.--Primary food shoppers' purchase intentions for the test product at a "competitive price".

Purchase intentions	Number	Percent ^a
Yes, would buy if available	171	91.0
No, would not buy	17	9.0
Totals	188	100.0

^a Chi-square analysis indicates no statistically significant difference in purchase intentions by city, $\chi^2 = 0.90$, with 1 degree of freedom. Chi-square analyses for purchase intentions by age, income, race, or household size were not statistically valid because of sparse numbers of observations.

percent said they would substitute it three-fourths of the time, while one-half of the shoppers expressed a probable substitution rate of one-third to one-half of the time. The remaining 20 percent of the primary shoppers said they would probably substitute the test product from 20 to 25 percent of the occasions when frozen fish fillets were served at home.

An estimate of the total annual quantities of frozen fish fillets bought by the entire sample of 402 respondents was made by utilizing the information on frozen fish fillet purchase frequency and preferred package size. Assuming that the preferred package size is indicative of the quantity served on each occasion, the 190 primary food shoppers would purchase a total of 7,272 pounds of frozen fish fillets annually. Given each respondent's stated substitution ratio, it appears that primary food shoppers would substitute 3,889 pounds of the test product for conventional frozen fish fillets. This amounts to 53 percent of the total. Indications are the estimated per capita consumption of frozen fish fillets of the respondents households is biased upward. The estimated per capita consumption of frozen fish fillets in the primary shopper households is almost 14 pounds per year, compared with 2.7 pounds for the U.S. as a whole (U.S. Department of Commerce, 1980). While part of the discrepancy can be justified on the basis of the manner in which the consumer sample was selected, the important consideration is the substitution ratio. The estimated consumption of the test product was probably also overstated as well, therefore, substitution ratio of the test product for the conventional fish fillets may be reasonably accurate. However, even if the substitution ratio is greatly exaggerated, the market potential for the product appears to be very favorable (Table 14).

Table 14.--Primary food shoppers' indicated substitution of the test product for currently available frozen fish fillets, at prevailing prices.

Rate of substitution	Tampa		Jacksonville		Both cities	
	Percent	Number	Percent	Number	Percent	Number
100		7	9.1	23	25.3	30
75		8	10.4	11	12.1	19
33-50		39	50.7	46	50.6	85
20-25		23	29.9	11	12.1	34
Totals		77	100.0	91	100.0	168

a
Chi-square analysis indicates a statistically significant difference between cities at the 0.01 probability level, $\chi^2 = 12.74$, with 3 degrees of freedom.

b
Percentages may not sum to 100 due to rounding.

Pricing

Primary shoppers who indicated a willingness to buy the LTS fillets if available in retail stores were asked what they would consider to be a "fair price". The average price was slightly over \$2.00 per pound, but there was considerable dispersion as evidenced by the standard deviation of 74 cents per pound. The median fair price was \$1.90 per pound, and the mode was \$1.50 (Table 15). Respondent's estimates of a fair retail price ranged from 60 cents per pound to \$6.00 per pound. Although approximately one-third indicated a fair price would be \$1.50 per pound or less, a similar number felt a fair price would be in excess of \$2.12 per pound (Appendix Table 3).

Table 15.--A summary of primary shoppers' estimates of a "fair" retail price for the test product.

Statistic ^a	Price per pound
	--- <u>Dollars</u> ---
Mean, standard deviation	2.02 ($\sigma = 0.74$)
Median	1.90
Mode	1.50

^a All statistics are based upon 162 observations.

Primary shoppers were also asked how frequently they would serve the test product, if available, at prices of \$3.00, \$2.00, \$1.50 and \$1.00 per pound. At a price of \$3.00 per pound, approximately 22 percent of the respondents in both cities said they would never serve the product. Another 22 percent said they would serve it infrequently, that is, less than once per month. Half of the respondents said they would serve it one to three times per month, and 6 percent said they would serve it once per week or more (Table 16).

At a price of \$2.00 per pound, about 96 percent of the Tampa respondents and 92 percent of the Jacksonville respondents said they would purchase the product. Roughly 80 percent said they would serve the product frequently, more than once per month. Sixty-five percent of the Tampa respondents said they would serve it from one to three times per month if available at \$2.00 per pound and the remaining 10 percent said they would serve it at least once per week. Half of the Jacksonville respondents said they would serve LTS fillets one to three times per

Table 16.--Primary shoppers' anticipated frequency of use of the test product at various retail prices.

Price per pound, dollars/frequency ^a	Both cities ^b	Tampa	Jacksonville
	----- Percent -----		
3.00			
Never	21.9	----	----
Infrequently	22.5	----	----
Frequently	49.7	----	----
Very frequently	5.9	----	----
Total	100.0		
2.00			
Never	----	3.8	7.7
Infrequently	----	21.3	19.8
Frequently	----	65.0	49.5
Very frequently	----	10.0	23.1
Totals ^c		100.0	100.0
1.50			
Never	----	0.0	0.0
Infrequently	----	12.5	12.1
Frequently	----	75.0	50.6
Very frequently	----	12.5	37.4
Totals ^c		100.0	100.0
1.00			
Never	----	0.0	0.0
Infrequently	----	8.8	8.8
Frequently	----	66.3	38.5
Very frequently	----	25.0	52.8
Totals ^c		100.0	100.0

^a Frequency of use is defined as follows: Infrequent, less than once per month; frequently, one to three times per month; very frequently, once per week or more.

^b When only one percentage is reported for both cities, a chi-square analysis indicated that differences between cities were not statistically significant at the 0.05 probability level.

^c Totals may not sum to 100 percent due to rounding.

month if available at \$2.00 per pound, but 23 percent said they would serve them once per week or more (Table 16).

At \$1.50 per pound all respondents indicated a willingness to serve the product at least occasionally. At a retail price of \$1.50 and also \$1.00 approximately 87 to 91 percent of the primary shoppers said they would serve the product one or more times per month (Table 16).

Preferred package size.--Primary food shoppers that expressed a willingness to buy the product were asked what package size they preferred for the LTS fillets. Slightly over 16 percent expressed the need for a eight ounce package and about 22 percent specified a 12 ounce package. The largest proportion, almost 37 percent, suggested a one pound package (Table 17). Approximately 12 and 6 percent of the respondents mentioned two and three pound packages, respectively. The remaining 6 percent specified a variety of preferred package sizes ranging from one-third to six pounds (Table 17).

Evaluation as a restaurant menu item

All respondents were asked how frequently, if ever, they ordered fish fillets in restaurants. The finding were similar for the two cities. Approximately 15 percent of all respondents said they never consumed fish fillets in restaurants, and about 27 percent ordered them infrequently, that is less than once per month. The largest proportion, nearly 44 percent, ordered fish fillets once or twice per month. Fourteen percent said they ordered fish fillets once a week or more (Table 18).

Restaurant order intentions.--The order intentions for the test product were analyzed by current frequency of fish fillet orders. Surprisingly, of the 61 respondents (15 percent) who said they never

Table 17.--Primary food shoppers' preferred package sizes for frozen fish fillets.

Preferred package size	Both cities ^a	
	Number	Percent
<u>Ounces</u>		
8	28	16.4
12	38	22.2
16	63	36.8
32	21	12.3
48	10	5.9
Various ^b	11	6.4
Totals	171	100.0

^a When the 32 and 48 ounce package classifications are combined and the "various" category eliminated, chi-square analysis indicates no statistically significant difference in package size preferences between cities, $\chi^2 = 2.73$, with 3 degrees of freedom.

^b The "various" size category includes responses that ranged from 0.33 to 6 pounds.

order fish fillets in restaurants, almost 56 percent said they would order the test product if available. Thirty-six percent of this group said they would not, and 8 percent were undecided. Of the respondents that order fish fillets in restaurants less often than once per month, about 64 percent said they would order the LTS fillets, about 30 percent would not, and 6 percent were undecided. Consumers that order fish fillets once to three times per month expressed the greatest propensity to order. Seventy-eight percent said they would not, while only 5 percent were undecided.

Table 18.--Frequency of consumption of fish filets in restaurants, all respondents.

Frequency	Both cities ^a	
	<u>Number</u>	<u>Percent</u>
Never	61	15.2
Infrequently, less than once per month	108	26.9
Frequently, once or twice per month	176	43.9
Very frequently, once per week or more	56	14.0
Totals	401	100.0

^a Chi-square analysis indicates no statistically significant differences in consumption on frequency by cities at the 0.05 probability level, $\chi^2 = 2.73$, with 3 degrees of freedom.

Restaurant patrons that order fish fillets once per week or more often expressed a reasonably high propensity to order the LTS fillets. About 61 percent said they would order them, 30 percent said they would not, and about 9 percent were undecided.

When all consumers are treated as one group, about 68 percent said they would order the product as a restaurant meal, 25 percent would not, and about 6 percent were undecided (Table 19). Thus, it appears the LTS fillets would make an acceptable restaurant item.

CONCLUSIONS

The LTS fillets have considerable widespread appeal, as evidenced by the sensory evaluations of the consumer sample. Although the sensory

Table 19.--Respondents' intentions to order the test product if available in restaurants, by current frequency of fish filet orders.

Current frequency of fish filet orders	Number of respondents	Order intentions for test product			
		Yes	No	Do not know	Totals
		----- Percent -----			
Never	61	55.7	36.1	8.2	100.0
Infrequently, less than once per month	108	63.9	29.6	6.5	100.0
Frequently, one to three times per month	175	78.3	16.6	5.1	100.0
Very frequently, once per week or more	56	60.7	30.4	8.9	100.0
All respondents	400	68.5	25.0	6.5	100.0

evaluations were generally favorable, slight modifications in the production process (i.e., brining, smoking, etc.) and variations in cooking methods and times may improve ratings slightly.

The large proportions of the respondents that expressed a willingness to buy the product at retail food stores or restaurants and the indicated frequency of use provide further indications of favorable consumer reaction.

This study has demonstrated that an acceptable product can be made from a currently underutilized species. Thus, Florida fishermen and seafood processors can gain by development of this product.

APPENDIX

Appendix Table 1.--Socioeconomic and demographic composition of the consumer panel.

Demographics	Both cities ^a	Jacksonville	Tampa
	----- Percent -----		
Number of adults in household			
1	14.2	----	----
2	58.5	----	----
3	17.7	----	----
4	6.7	----	----
5	2.0	----	----
6	1.0	----	----
Total ^b	100.0		
Number of children in household			
0	55.8	----	----
1	20.5	----	----
2	16.8	----	----
3	5.3	----	----
4	1.5	----	----
6	0.3	----	----
Total ^b	100.0		
Education			
11th grade or less	----	4.0	11.0
12th grade	----	42.6	34.5
13, 14 or 15 (college or vocations)	----	29.2	29.5
16 or more	----	24.3	25.0
Totals ^b		100.0	100.0
Age			
Under 18 years	1.0	----	----
18-24 years	28.9	----	----
25-34 years	24.2	----	----
35-49 years	20.7	----	----
50-64 years	18.2	----	----
65 + years	6.7	----	----
Refused	.3		
Total ^b	100.0		

Appendix Table 1.--Socioeconomic and demographic composition of the consumer panel--Continued.

Demographics	Both cities	Jacksonville	Tampa
	----- Percent -----		
Income ^c			
Under \$8,000 per year	9.7	----	----
\$8,000 - 9,999	8.0	----	----
\$10,000 - 14,999	17.5	----	----
\$15,000 - 24,999	29.9	----	----
\$25,000 and over	32.7	----	----
Refused	2.2	----	----
Total ^b	100.0		
Sex			
Female	50.3	----	----
Male	49.8	----	----
Total ^b	100.0		
Race			
White	----	85.2	97.0
Black	----	14.8	3.0
Totals ^b		100.0	100.0

^a Where only one percentage is reported for both cities, a chi-square analysis indicated that differences between cities were not statistically significant at the .05 level.

^b Does not sum to 100 percent due to rounding.

^c The income distributions for the consumer panel in the two cities differed substantially from published estimates of income distributions (Survey of Buying Power, 1979). Chi-square analysis indicated the differences statistically significant at the 0.01 levels, $\chi^2 = 62.28$ and 38.13 with 4 degrees of freedom in Tampa and Jacksonville, respectively. The consumer sample in both cities had disproportionately high numbers of high incomes (over \$25,000 per household per year) and disproportionately low numbers of low incomes (less than \$8,000).

Appendix Table 2.--Species identified by respondents as the source of the fish fillets.

Species	Frequency	Percent
Do not know	160	40.00
Mullet	94	23.50
Trout	17	4.25
Flounder	17	4.25
Perch	13	3.25
Mackeral	12	3.00
Grouper	11	2.75
Codfish	11	2.75
Whiting	11	2.75
Bass	7	1.75
Salmon	4	1.00
Snapper	4	1.00
Catfish	4	1.00
Shark	3	0.75
Haddock	3	0.75
Whitefish	3	0.75
Redfish	3	0.75
Halibut	2	0.50
Pollack	2	0.50
Sole	2	0.50
Tuna	2	0.50
Herring	2	0.50
Carp	1	0.25
Drum	1	0.25
Pike	1	0.25
Kipper	1	0.25
Bluefish	1	0.25
Turbot	1	0.25
Dolphin	1	0.25
Swordfish	1	0.25
Pompano	1	0.25
Shad	1	0.25
Bonito	1	0.25
"Saltwater" (non-specific)	1	0.25
"Freshwater" (non-specific)	1	0.25
Total	400	100.00

Appendix Table 3.--Primary shoppers' estimates of a "fair" retail price for the test product.

Suggested price per pound ^b	Respondents		
	Dollars	Number	Percent
			Cumulative percent
0.60	1	0.62	0.62
0.69	1	0.62	1.24
0.89	2	1.23	2.47
0.98	1	0.62	3.09
0.99	1	0.62	3.71
1.00	3	1.85	5.56
1.15	1	0.62	6.18
1.19	1	0.62	6.80
1.25	4	2.47	9.27
1.29	2	1.23	10.50
1.33	3	1.85	12.35
1.39	4	2.47	14.82
1.49	3	1.85	16.67
1.50	28	17.28	33.95
1.59	2	1.23	35.18
1.60	2	1.23	36.41
1.65	1	0.62	37.03
1.67	1	0.62	37.65
1.69	2	1.23	38.88
1.70	2	1.23	40.11
1.75	4	2.47	42.58
1.79	6	3.70	46.28
1.80	3	1.85	48.13
1.89	2	1.23	49.36
1.90	2	1.23	50.59
1.95	2	1.23	51.82
1.98	3	1.85	53.67
1.99	1	0.62	54.29
2.00	17	10.49	64.78
2.10	1	0.62	65.40
2.12	1	0.62	66.02
2.25	5	3.09	69.11
2.29	1	0.62	69.73
2.33	1	0.62	70.35
2.35	1	0.62	71.97
2.50	17	10.49	81.46
2.52	4	2.47	83.93
2.59	1	0.62	84.55
2.64	1	0.62	85.17
2.67	6	3.70	88.87
2.87	1	0.62	89.49
2.95	1	0.62	90.11

Appendix Table 3.--Primary shoppers' estimates of a "fair" retail price for the test product--Continued.

Suggested price per pound	Respondents		
	<u>Number</u>	<u>Percent</u>	<u>Cumulative percent</u>
3.00	5	3.09	93.20
3.19	2	1.23	94.43
3.32	3	1.85	96.28
3.33	2	1.23	97.51
3.49	1	0.62	98.13
3.72	1	0.62	98.78
5.32	1	0.62	99.37
6.00	1	0.62	100.00
Totals ^b	16	100.00	100.00

^a Some prices were calculated from respondents' suggestions based on 12-ounce packages.

^b Percentages may not sum to 100 due to rounding.

The Basic Low Temperature Smoking Process

The following procedures were used for preparation of the test product samples. Additional information on alternative procedures are reported by Otwell et al.

Brining

Soak clean skinless fish fillets in a prechilled (40°F) salt brine. The recommended salt concentration is 4 percent (4 cups salt per 9 gallons water). Soaking time should be no less than 30 minutes. Occasional, gentle stirring will facilitate soaking. After brining, the fillets should be dried on racks held in refrigeration for approximately 30 minutes, until a glaze-like pellicle develops on the surface.

Smoking

Place racks of fillets in a preheated smokehouse and smoke for 1 1/2 hours at 120°F in moderate smoke at a relative humidity of approximately 60 percent. Smoking temperatures between 80 to 120°F may be effective depending on the characteristics of different smokehouses. The finished product is not cooked, but has a pale yellow, damp appearance and the surface flesh is firm.

Packaging and Storage

Refrigerate the cold smoked fillets to 40°F or below, then package. Fillets should be layered with freezer paper and wrapped in plastic bags. Avoid bulk packaging to permit a more rapid freeze. Store frozen at 0°F (-20°C) or below.

Cooking

Thaw frozen fillets in refrigeration overnight, then fry, bake or broil as desired. Deep fat frying at 305°F until golden brown is an excellent cook method. Frying does not require batter or breading.

Time of interview _____

PRODUCT EVALUATION

After respondent has sampled the product ask the following; circle responses.
How would you rate this product with respect to _____ (Hand Sheet A).

A. Exterior color?

1	2	3	4	5
much too dark	slightly too dark	just right	slightly too light	much too light

B. Interior color?

1	2	3	4	5
much too dark	slightly too dark	just right	slightly too light	much too light

C. Smoked flavor ?

1	2	3	4	5
much too "smokey"	slightly too "smokey"	just right	not quite enough smoke flavor	needs much more smoke flavor

D. Texture ?

1	2	3	4	5
much too tough	slightly too tough	just right	not quite tough enough	needs to be much tougher

E. Salt ?

1	2	3	4	5
much too salty	slightly too salty	just right	not quite enough salt	needs much more salt

2. Using a rating scale where 10 = excellent and 0 = extremely poor, how would you rate this product with respect to:

Characteristic	Rating
Smell	_____
Overall taste	_____
Overall appeal	_____
As an occasional meal for your family	_____
As a special meal for friends	_____
As a restaurant meal	_____

3. Have you ever eaten smoked fish before today? 1. _____ Yes 2. _____ No

Using the rating scale where 10 = excellent and 0 = extremely poor, how would you rate the smoked fish you had eaten previously as far as overall appeal? _____

4. A. How often, if ever, are frozen fish fillets served in your household?

1. _____ Never Why not? _____

(Skip to question 8)

2. _____ Infrequently; _____ times a year

3. _____ Once a month

4. _____ Once every 3 weeks

5. _____ Once every 2 weeks

6. _____ Every week

7. _____ Times a week

(If response is 2-7):

- B. How are frozen fish fillets usually prepared in your household?

1. _____ Deep fat fry

2. _____ Pan fry

3. _____ Broil

4. _____ Baked

5. _____ Other (specify) _____

- C. Do you shop for most of the groceries for your household?

1. _____ Yes 2. _____ No (Skip to question 8)

General Product Usage

5. If these frozen smoked fish fillets were available in stores at a "competitive" price, would you or would you not buy them? (Circle 1 or 2; complete others as appropriate).

1. Would buy. What would you consider to be a fair price?(unaided)

\$ _____ 12 oz. pkg \$ _____ 1 lb. pkg

What size package would you prefer (unaided)?

- | | |
|-----------|--------------------------|
| 1. 8 oz. | 4. 2 lbs. |
| 2. 12 oz. | 5. 3 lbs. |
| 3. 1 lb. | 6. Other (specify) _____ |

2. Would not buy -- Go to question 8.

Product Pricing

6. If these smoked fillets cost \$_____, how often do you think you would buy and serve them? (Place a check in appropriate cell under each price, except for frequency classification 2 & 7. For these indicate the number of times per year or week).

Frequency	\$3/lb	\$2/lb	\$1.50/lb	\$1/lb
1. Never				
2. Infrequently, _____ times a year				
3. 1 time per month				
4. 2 times per month				
5. 3 times per month				
6. Every week				
7. _____ times a week				

7. If priced the same as the frozen fish fillets you usually buy, how often do you think you would substitute the smoked fillets for the usual ones?
1. _____ Always 2. _____ 3/4 of time 3. _____ 1/2 of time
4. _____ 1/4 of time 5. _____ Other; specify ratio of smoked to total times _____
8. How often, if ever, do you eat fish fillets in a restaurant?
1. _____ Never (If never) Why not? _____
2. _____ Infrequently; _____ times per year
3. _____ 1 time per month
4. _____ 2 times per month
5. _____ 3 times per month
6. _____ Every week
7. _____ times per week
9. If these smoked fish fillets were available in restaurants, would you order them? (Circle)
1. _____ Yes 2. _____ No 3. _____ Do not know
10. What suggestions, if any, do you have for improving this product?

11. Using the rating scale where 10 = excellent and 0 = extremely poor, how would you rate the following names for this product?
1. "Campfire fish fillets" _____
2. "Florida Smokies" _____
3. "Natural Smoked fish fillets" _____
4. "Smoke flavored fillets" _____
12. What species (kind) of fish do you think these fillets were made of? (unaided) 1. Don't know 2. (specify) _____

Demographics

13. How many adults (age 18 and older) are in your household?
14. How many children (under 18) are in you household?
15. What is the highest grade of school that you have completed? (Circle number to the right of description)
- | | | | | | | |
|--------------------------------------|----|----|----|----|----|----|
| 1. Elementary | 01 | 02 | 03 | 04 | 05 | 06 |
| 2. Junior High | | 07 | 08 | | | |
| 3. High School | | 09 | 10 | 11 | 12 | |
| 4. College
or vocational | | 13 | 14 | 15 | 16 | |
| 5. Graduate School (Master's degree) | | | | | 17 | |
| 6. Graduate School (Doctorate) | | | | | 18 | |
16. To which of the following age groups do you belong? (show card A)
- | | |
|-------------------|----------------|
| 1. Under 18 years | 5. 50-64 years |
| 2. 18-24 years | 6. 65 + years |
| 3. 25-34 years | 7. (refused) |
| 4. 35-49 years | |
17. Which of the following categories best describes your household's total after tax or take-home income from all sources? (show card B)
- | |
|---------------------------|
| 1. Under \$8,000 per year |
| 2. \$8,000-9,999 |
| 3. \$10,000-14,999 |
| 4. \$15,000-24,999 |
| 5. \$25,000 and over |
| 6. (refused) |

Thank you very much for your help. We at the University of Florida appreciate your cooperation in this smoked fish fillet marketing study.

(By observation -- Questions 18 & 19)

18. Sex of respondent: 1. Female 2. Male
19. Race:
- | |
|-------------------------------------|
| 1. White (excluding Spanish origin) |
| 2. White, Spanish/American Indian |
| 3. Black |
| 4. Oriental |

SHEET A

A. Exterior color?

1	2	3	4	5
much too dark	slightly too dark	just right	slightly too light	much too light

B. Interior color?

1	2	3	4	5
much too dark	slightly too dark	just right	slightly too light	much too light

C. Smoked flavor?

1	2	3	4	5
much too "smokey"	slightly too "smokey"	just right	not quite enough smoke flavor	needs much more smoke flavor

D. Texture?

1	2	3	4	5
much too tough	slightly too tough	just right	not quite tough enough	needs to be much tougher

E. Salt?

1	2	3	4	5
much too salty	slightly too salty	just right	not quite enough salt	needs much more salt

CARD A

CONFIDENTIALAGE

1. Under 18 years
2. 18-24 years
3. 25-34 years
4. 35-49 years
5. 50-64 years
6. 64 + years

CARD B

CONFIDENTIALHOUSEHOLD AFTER TAX INCOME

1. Under \$8,000 per year
2. \$8,000-9,999
3. \$10,000-14,999
4. \$15,000-24,999
5. \$25,000 and over

SMOKED FISH FILLET STUDY

NON RESPONDENTS

1. (If person refuses to sample fillets ask: What is the main reason you won't try the sample?)

(Circle unaided first response)

1. ☐ Do not have time
2. ☐ Do not like fried fish
3. ☐ Cannot eat fried fish because of diet restrictions
4. ☐ Do not like smoked flavor of any kind
5. ☐ May contain bones
6. ☐ Unsure of sanitation
7. ☐ Unsure of quality
8. ☐ No specific reason

(complete questions 2 - 4 by observation)

2. Sex: Male ☐ Female ☐

3. Age:

1. ☐ Under 35 years
2. ☐ 35-64 years
3. ☐ 65 + years

4. Race:

1. ☐ White (excluding Spanish origin)
2. ☐ White, Spanish
3. ☐ Black
4. ☐ Oriental

REFERENCES

Otwell, W. Steven, J. A. Koburger and R. L. Degner. Low Temperature Smoked Fish Fillets, Sea Grant Report, Florida Sea Grant College, August 1980.

Sales and Survey Marketing Management, Survey of Buying Power, 1979. Vol. 123, No. 2, Part I, New York, July 1979.

Thompson, Ralph B. (Ed.). Florida Statistical Abstract 1979. Bureau of Economic and Business Research, College of Business Administration, University of Florida, University of Florida Press, Gainesville, 1979.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Fisheries of the United States, 1979, Current Fishing Statistics, No. 8000, April, 1980.

NATIONAL SEA GRANT DEPOSITORY
PELL LIBRARY BUILDING
URI, NARRAGANSETT BAY CAMPUS
NARRAGANSETT, RI 02882