Technical Report No. 56

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This multidisciplinary project was conducted with funding from the Upper Great Lakes Regional Commission and the Michigan Sea Grant Program. It is part of a broader project concerning the economic potential for commercialization of underutilized fish species which is directed by Dr. Niles R. Kevern, Chairman, Fisheries and Wildlife Department, Michigan State University, and Associate Director of the Michigan Sea Grant Program.

Several individuals contributed significantly to this effort. Dr. James Price devoted considerable time and effort to produce the product prototypes used for taste testing. Dr. Lawrence Dawson and Dr. A. Estes Reynolds developed processing of the basic fish ingredients. Dr. John W. Allen, Timary McSherry, and Gert van Nederpelt provided valuable assistance during initial stages of the project. Lucy Hartlove and Sharron Jarvis contributed expert coordination and typing of questionnaires and reports. These contributions were essential to the completion of the study.

NOTE: The appendices referred to in the text are available upon request from the Michigan Sea Grant Program, Publications Office, 2200 Bonisteel Boulevard, Ann Arbor, Michigan 48109.

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INTRODUCTION

This project was initiated in 1975 in order to evaluate the feasibility of marketing a Sucker product which, by increasing the commercial demand for Sucker, could provide employment for fishermen formerly occupied in "sportfish" harvest. The project took on several phases. During the first phase, before any particular products could be chosen for study, basic decisions concerning the type of market (national vs. regional, institutional vs. industrial vs. retail) and product form (nonprocessed fish vs. processed fish vs. use as an ingredient in a normally nonfish product) were required. Following extensive research into the many aspects of these alternatives, a specific product was chosen for evaluation. Phase II of the project examined acceptance of the "product concept", while during Phase III a group of consumers actually tasted and reacted to two product prototypes which were developed by Food Science.

A summary of Phase I decision making is presented first, followed by a description of the methodology and findings of Phases II and III with conclusions and recommendations.

PHASE I

Analysis of the market factors was first concerned with any restrictions which might be placed on the market location. After examining Michigan's backhauling system of fish shipment, the research team concluded that the delivery of fresh Sucker would have to be restricted to the Michigan area. The implications of this decision on product form were that either a non-processed fish product could be marketed within Michigan, or if a processed form was chosen, production facilities would have to be within or close to Michigan. Then considering the increased competition from other fish species as a market expands beyond the Michigan region, and the long range marketing required to achieve product distribution and acceptance under such conditions, the decision was made to limit at least the initial introduction of a Sucker product to the Michigan area. This meant that if a processed product form was chosen, it might eventually be marketed beyond Michigan, but that the work done for the project would concentrate on the Michigan market.

Having settled the geographic-size issue, attention was directed towards the specific types of markets. The industrial market was rejected mainly because the low prices received for the fish, combined with the gear restrictions placed on fishermen catching Sucker, make it difficult for fishermen to deliver the volume of fish necessary for this market to be a profitable venture.

Investigation of the retail and institutional markets was divided according to product form. Most of the fresh fish sold today is bought in specialty shops within the retail market. Owner-operators of such shops have expressed little interest in handling Sucker at any price. The boniness and the physical image of Sucker make it, in their opinion, unsellable.[1]

Frozen and canned fish products are used mainly in nonspecialty retail food stores and within the institutional market. Buyers for these markets are always looking for new fish products. They are willing to pay top price for high quality fish and are willing to buy a lot of it. However, because of poor experiences with other recently promoted underutilized species, they are increasingly negative in testing new products containing such fish.[2] The importance of high quality products is stressed in the findings of polls of institutional buyers. These polls report that buyers are in general looking for quality first, ease of preparation second, portion control third, price fourth, and packaging fifth.[3] In regard to specific product form preference trends, Quick Frozen Foods has reported that both consumers and processors are shifting away from fish sticks toward fish portions, with special preparation products such as "with sauce" or "with vegetables" receiving the most attention.[4] Yet, it is also acknowledged that it will be extremely difficult for even these new special preparation products to gain a profitable market share due to the current domination of freezer section space by the top three firms, Banquet, Swanson, and Sara Lee.[5]

Unfortunately, seasonal consistency and color differences, along with the unusual composition of the Sucker bone structure make it impossible to produce a high quality product in portion or fillet form. Between the obvious competitive disadvantages of the frozen fish product market and the physical problems inherent in the Sucker species, use of the frozen product form was rejected.

In moving towards the selection of a processed or "ingredient only" product over a nonprocessed product, the details of possible distribution channels became relevant factors. As a nonprocessed fish product, the normal channels used are either for the buyer to go directly to the wholesaler, with a fairly high markup on the product being paid; or for a fish brokerage to work between the wholesaler and buyer levels. A great deal of buyer expertise is required for the first method to be successful in terms of a quality product reaching the ultimate consumer. On the other hand, brokers admittedly sell top quality fish to their high volume buyers, while poorer quality fish eventually reaches consumers through the lower volume channels.[6] Nonfish and processed fish products have quality controls set at the manufacturing stage and presumably avoid the issue of inconsistent product quality. Given the quality complications of the Sucker species mentioned previously, it was deemed important to choose a product form which would have the best chance of eliminating quality control problems. It was determined that if a consistent processed fish product or nonfish product utilizing Sucker as a primary or main ingredient could be developed, it would meet with less resistance than an inconsistent quality nonprocessed fish product.

Keeping in mind that a processed fish product would probably use more fish than the nonfish-ingredient-only alternative, attention was next directed towards a bottled or canned fish product. Gefilte fish, the only food product currently manufactured from Sucker, provides a ready market for commercial fishermen. However, the consumer market for this product is quite limited, and was therefore not considered a viable alternative. The canned good route was also dropped, due to the high failure rates of previous attempts to market canned fish other than tuna and salmon. It was found that it would be difficult at this time, in particular, to find retail buyers for a canned product because of the extremely low margins currently held by canned tuna.

Entering the realm of a traditionally nonfish product which might use fish as an ingredient, the first step was to exchange ideas with people trained in food science technology. After further consideration of alternative products in regard to their potential capacity for fish contents, and the state of competition in each particular product market, the decision was made to use a fairly popular, consumer oriented product - hot dogs. Although the institutional market could still be considered a likely channel of product distribution, the research team decided to focus its work on the consumer market; if consumer response was good, this would provide information concerning product quality, as perceived by "users", which might contribute to institutional market decision making. The major advantage of the hot dog product form perceived by the researchers was that the product could actually by produced and tested in a range of content forms going from virtually 100% fish through various fish/meat blends. Since the quantity of fish used by the product would directly affect the fate of the commercial fishermen, this potential for high volume was encouraging. The Food Science Department was instructed to start work on some product samples, and the development of Phase II and Phase III of the study was begun.

GENERAL RESEARCH OBJECTIVES

The overall objective of this project was to determine consumer's willingness to accept a hot dog containing fish as the main ingredient.

Among the general issues examined in the research are:

1. Consumer's existing use and purchase habits for hot dogs.

2. Attitudes toward alternative ingredients or content.

3. The importance of certain specific product attributes such as taste and color.

4. Attitudes toward fish versus meat in general and specifically, as a major hot dog ingredient.

The research was conducted in two phases. Phase II tested the product concept of a hot dog containing fish as the main ingredient.

Phase III was a taste test conducted using two fish hot dog prototypes developed over the course of Phase II.

PHASE II

Objectives

Phase II of the research focused on consumers' reactions to the concept of a fish hot dog. The central objective of Phase II was to compare consumers' attitudes toward hot dogs in general with their attitudes toward a hot dog containing fish as the main ingredient.

Consumers' preferences for and the relative importance of 10 specific hot dog product attributes were examined. These attributes included:

nutrition	texture
calories	color
taste	size of product
protein	price
ingredients	package

Since these attributes can be moderately controlled in the productive process, it is possible to develop a new product to meet the preferences of consumers, once these preferences have been identified. In the same way, the advertising/promotional message can emphasize those characteristics of the new product that are consistent with the consumer's needs and wants.

In addition to the attitudes and preferences of consumers, Phase II also examined certain behavioral characteristics of consumers, such as purchase and consumption habits.

Methodology

The Phase II methodology consisted of both a qualitative and quantitative part. The qualitative part was used to determine those issues of importance to the consumer market for hot dogs. The quantitative part was then used to assign numerical or probability estimates to determine the extent to which these issues characterized the market.

Two focus group interviews were conducted to delineate the attributes of importance to consumers when they purchased or consumed hot dogs. In this way, no *a priori* expectations were made by the researchers; all questions in the study were generated by consumers themselves. The group interviews were also used to determine broad patterns of purchase and consumption behavior.

The results of the group interviews were used to general the list of 10 product attributes of importance to consumers. (See previous section.) These "qualitative" results were then used to develop a consumer survey so that these attributes and their importance could be quantified. A copy of the questionnaire is contained in Appendix A. Another purpose was to examine consumer's reactions to the idea of a new hot dog containing fish as the primary ingredient.

The survey portion of Phase I consisted of 195 interviews with respondents randomly selected from the shopping traffic at a Lansing mall. All the

questionnaires were self-administered (i.e., respondents filled out the questionnaires themselves).

If a respondent had a question regarding the proper way to complete the questionnaire, it was answered verbally "on-the-spot" by a member of the research team. However, the wording of questions was never interpreted for a respondent.

The dates of interviewing and the number of questionnaires completed are given in the following table:

Date	Completed Questionnaires
May 6, 1976	105
May 7, 1976	90
TOTAL	195

A questionnaire that was terminated by the respondent was not counted. Descriptive statistics were computed for each question.

Results

Tables giving the results for each survey question are presented in Appendix A. Computer-drawn graphs to describe the results of selected questions are presented in Appendix B.

The purpose of this section will be to present the most salient findings of the survey. Interested readers are encouraged to refer to Appendices A and B for additional findings.

All the percentages are based upon the number of respondents who answered the particular question. Respondents who did not answer a question, therefore, are not included in the percentage figures.

Taste and Physical Appearance: Eighty-two percent of the respondents strongly or somewhat agree that there are a lot of differences in the taste of various brands of hot dogs. Sixty-eight percent strongly or somewhat agree that mildly flavored hot dogs are better than spicy ones, and sixty-six percent strongly or somewhat prefer plump hot dogs over thin ones.

Ingredients: There are several important findings concerning the ingredients of hot dogs. Seventy-two percent of the respondents strongly or somewhat agree that they try to buy foods that have few artificial ingredients, and sixty-eight percent strongly or somewhat agree that they would like to purchase hot dogs which are not artificially colored. Sixty percent of respondents strongly or somewhat agree that hot dogs are usually made from scraps and parts of animals that meat processors cannot sell, and fifty-four percent agree that all beef hot dogs are the only kind they will buy.

Nutrition, Protein, and Calories: Nutritionally, fish fillets are perceived as better than hot dogs. Sixty percent of the respondents strongly or somewhat agree that fish is nutritionally better for growing children than are hot dogs, and fifty-four percent strongly or somewhat disagree that all meat hot dogs contain more protein than fish fillets. Half the respondents agreed that hot dogs contain more calories than a comparable portion of fish, but only twenty percent feel that hot dogs contain too many calories.

Price and Package: Seventy percent of the respondents prefer resealable packages. A little less than a third of the respondents felt that higher priced hot dogs are more nutritious and less than twenty percent say they usually buy the least expensive brand of hot dogs. Respondents were asked how much they would pay for a standard size package of regular hot dogs, and how much they would pay for a standard size package of hot dogs with fish as the main ingredient. The mean price, median price, and standard deviation for regular hot dogs were $1.10, $1.00, and $.28, respectively. The same statistics for hot dogs with fish as the main ingredient were $1.07, $1.00, and $.30 respectively.

Consumers' Reactions to the Fish Hot Dog Concept

In a second section of the questionnaire, the concept of "fish hot dogs" was explored with several questions. The concept received a very positive response. The results of those questions are presented in Table I.

Respondents were divided, however, with respect to what they would like the new hot dogs to taste like (46 percent for fish taste, 54 percent for meat hot dog taste) or expect it to look like (49 percent for the same as meat hot dogs, 51 percent for different than).

TABLE I

"Fish Hot Dog" Concept

The _____ in "fish hot dogs" would be:

	Higher Than		Same As		Lower Than		Meat Hot Dogs	
	n	%	N	%	n	%	N Total	%
Quality of Ingredients	83	45	84	46	16	9	183	100
Nutritional Value	102	56	68	37	13	7	183	100
Amount of Protein	115	63	59	32	10	5	184	100
Number of Calories	17	9	34	19	131	72	182	100

Summary, Phase II Findings

Consumers prefer hot dogs that are plump, mildly flavored, and that contain no artificial ingredients. Over half the respondents say that all-beef hot dogs are the only kind they will buy. Price is not a major factor in consumers' choice of hot dogs.

Caution should be used in interpreting the closeness of prices respondents gave for regular hot dogs, and hot dogs with fish as the main ingredient. Respondents, with scant information on which to estimate a price, may simply have used the price they stated for regular hot dogs as their estimate of price for "fish hot dogs". The rather large drop (only 131 of 195 respondents gave a price for "fish hot dogs") in response reflects the difficulty respondents had with the question.

Consumers responded positively to the idea of a hot dog containing fish, but were divided in their attitudes regarding what a product like this should look like or taste like.

PHASE III

Objectives and Methodology

During Phase III a taste test was conducted to evaluate the fish hot dogs developed in Food Science. The test was split into two parts. The first part was a questionnaire (see Appendix C) concerned with the following objectives:

1. To determine the sample's willingness to purchase, and preference for fish hot dogs versus eight other content hot dogs. (Ballpark All Beef, Ballpark Beef & Pork, Topco All Beef, Topco Beef & Pork, Soy Protein-Meat Flavor, Kosher, Fish-Meat Flavor, Fish-Fish Flavor, Hickory Smoked, Chicken-Chicken Flavor).

2. To evaluate the importance of nine hot dog attributes (plumpness, texture, flavor, juiciness, color, spiciness, smokiness, thickness of skin and firmness).

3. To identify demographic-socioeconomic characteristics of the sample.

After administering the first questionnaire, subjects were divided into small groups. The groups were allowed to taste one type of hot dog at a time, completing a questionnaire (see Appendix D) on each. Four types of hot dogs were used: all beef (Ballpark), beef and pork (Topco), fish and soy, and fish and beef. The all fish hot dog was not used due to its relatively poor consistency and color. The objectives of this second questionnaire were:

1. To evaluate initial reactions to the fish hot dogs relative to meat hot dogs.

2. To receive product change preferences (how might the fish hot dog be improved).

The questionnaire asked subjects to express their feelings toward the test hot dogs by:

1. Rating each hot dog in terms of the nine product attributes mentioned previously.

2. Suggesting changes to be made in the hot dog in terms of the same nine attributes.

To minimize bias in the data collection, several controls were used in conducting this phase of the project. Questions in the first questionnaire were placed in random order, and the pages of the questionnaire, except for the demographic-socioeconomic section were rotated. Product attributes were randomly listed in the second questionnaire, and the order of hot dog presentation to the subject groups was rotated (via a full Latin square design). The hot dog types being tested were not identified during testing to avoid content or brand knowledge influence.

The subjects used for this phase of testing were M.S.U. undergraduates from three marketing classes. Approximately 50 percent of the final sample of 92 came from one class, with the other half split between the remaining classes.

Results

Descriptive statistics were computed for the attribute importance ratings. The mean ratings, with standard errors (see Note), are presented in Table II. Meaty flavor is by far the most important attribute for subjects, followed by plumpness, juiciness, and firmness, respectively. Smooth texture is seen as somewhat important while the remaining attributes are perceived as relatively neutral in importance.

Descriptive statistics were also computed for subjects' preference rankings, subjective purchase probability and probability X certainty ratings of ten stimulus hot dogs. These results are presented in Table III. The rank orders are consistent with a few minor reversals. Ballpark hot dogs dominate the other nine stimulus hot dogs. Fish hot dogs which taste like meat are consistently ranked and rated higher than fish hot dogs which taste like fish.

NOTE: One can be 95% confident that the population mean lies with ± 2 standard errors of the mean.

The standard error of the difference is given by the following formula:

$$S_{\bar{x}_1 - \bar{x}_2} = \sqrt{S_{\bar{x}_1}^2 + S_{\bar{x}_2}^2}$$

If the observed difference between sample means exceeds two standard errors of the difference, one can conclude that there is a significant difference ($p < .05$) between the means.

For example, in Table IV the mean plumpness of Ballpark was 1.783 with a standard error of .111 while the mean plumpness of Topco All Beef was 3.108 with a standard error of .129. The standard error of the difference is calculated as follows:

$$S_{\bar{x}_1 - \bar{x}_2} = \sqrt{(.111)^2 + (.129)^2}$$

$$= \sqrt{.012 + .017}$$

$$= \sqrt{.029}$$

$$= .170$$

The observed difference between sample means is 1.325, while two standard errors of the difference is only .340. Thus, one can conclude that Ballpark is significantly more plump than Topco.

TABLE II

Mean Importance Ratings of Hot Dog Attributes

Attribute	$\bar{X}$	$S_{\bar{x}}$ [a]	Rank-Order
Red Color	2.674	.115	7
Spicy	2.837	.104	8
Smoky	2.880	.114	9
Thickness of Skin	2.641	.115	6
Firm	2.087	.101	4
Plump	1.923	.094	2
Smooth Texture	2.293	.114	5
Meaty Flavor	1.391	.067	1
Juicy	1.978	.094	3

Note: Scoring: very important, 1; neutral, 3; very unimportant, 5.

[a] $S_{\bar{x}}$ is standard error of mean.

TABLE III

Preference Ranking, Subjective Purchase Probability and Probability X Certainty Ratings

Hot Dog	Preference		Sub. Purchase Probability		Probability X Certainty	
	median rank	rank order	mean	rank order	mean	rank order
Hickory Smoked	4.012	4	63.213	3	4570.483	4
Topco Beef & Pork	5.014	6	47.112	6	3187.607	6
Soy Protein (meat taste)	7.012	7	26.494	8	1571.618	7
Composed of Fish (fish taste)	9.978	10	9.303	10	461.775	10
Ballpark All Beef	1.031	1	80.067	1	7135.888	1
Kosher	4.988	5	48.258	5	3536.169	5
Chicken (chicken taste)	8.001	8	27.360	7	1471.135	8
Ballpark Beef & Pork	2.976	2	65.573	2	5092.618	2
Topco All Beef	3.979	3	61.607	4	4691.101	3
Composed of Fish (meat taste)	8.012	9	19.876	9	1122.584	9

Note: Scoring: Preference, most prefer, 1; least prefer, 10. Sub. Pur. Prob., 0 --→ 100.
Probability X Certainty, Prob. 0 --→ 100 multiplied by Certainty 0 --→ 100.

A multivariate analysis of variance with repeated measures was performed on the taste test data utilizing orthogonal (uncorrelated) contrasts. Orthogonal contrasts allow one to test several hypotheses of interest independently. The mean attribute ratings, with standard errors, are presented in Table IV for reference.

The multivariate null hypothesis of no significant differences between the fish and beef, and fish and soy hot dogs with respect to the attribute set was rejected, F (9,74) = 6.6254, $p < .0001$. The attributes on which significant differences were found were plumpness, redness in color, spiciness, thickness of skin, and firmness. It can be seen from Table IV that the fish and soy hot dog possessed significantly less of these attributes than did the fish and beef hot dog.

The multivariate null hypothesis of no significant differences between the Topco hot dog, and the two experimental hot dogs grouped together (Topco mean - $\frac{\text{(fish and beef mean + fish and soy mean)}}{2}$ with respect to the attribute set was rejected, F (9,74) = 24.4835, $p < .0001$. There were significant univariate differences on all attributes with the exception of thickness of skin ($p < .6410$). It can be seen from Table IV that the Topco hot dog possessed significantly more of these attributes than the grouped experimental hot dogs.

The multivariate null hypothesis of no significant differences between the Ballpark hot dog and the other three hot dogs grouped together (Ballpark mean - $\frac{\text{(Topco mean + fish and beef mean + fish and soy mean)}}{3}$ with respect to the attribute set was also rejected, F (9,74) = 25.2425, $p < .0001$. There were significant univariate differences on all attributes (all $p < .005$). An interesting finding not reflected in this analysis was that the Topco hot dog was perceived as being smoother in texture than the Ballpark hot dog (2.157 versus 2.422, respectively).

Descriptive statistics were computed for subjects' satisfaction with the amount of attribute possession for each of the four hot dogs in the taste test. The mean satisfaction of each hot dog with respect to each attribute, with standard errors, is presented in Table V. These results are consistent with those provided by the analysis of variance. The Ballpark hot dog is perceived as the most satisfactory on each attribute except smoothness in texture and juiciness where the Topco hot dog is most satisfactory. The fish and beef hot dog is perceived as more satisfactory than the fish and soy hot dog on every attribute with the exception of smoothness in texture and juiciness.

TABLE IV

Mean Attribute Ratings of Four Hot Dogs

Bipolar Adjective Pair	Ballpark		Topco		Fish and Beef		Fish and Soy	
	$\bar{X}$	$S_{\bar{x}}$	$\bar{X}$	$S_{\bar{x}}$	$\bar{X}$	$S_{\bar{x}}$	$\bar{X}$	$S_{\bar{x}}$
Plump - Not Plump	1.783	.111	3.108	.129	3.301	.128	3.819	.132
Smooth in Texture - Not Smooth in Texture	2.422	.121	2.157	.098	3.301	.137	3.060	.149
Meaty Flavored - Not Meaty Flavored	2.482	.128	2.458	.117	4.337	.106	4.241	.117
Juicy - Not Juicy	2.410	.114	2.373	.104	3.229	.133	3.241	.148
Red in Color - Not Red in Color	2.699	.121	2.916	.120	4.145	.113	4.723	.069
Spicy - Not Spicy	2.819	.118	3.108	.119	3.651	.140	3.964	.117
Smoky - Not Smoky	3.253	.123	3.313	.121	3.892	.131	4.036	.113
Thick Skinned - Not Thick Skinned	2.892	.128	3.687	.119	3.313	.132	4.181	.107
Firm - Not Firm	2.301	.113	3.060	.123	3.687	.137	4.108	.121

Note: Possession of attribute scored 1, absence scored 5.

$S_{\bar{x}}$ is standard error of mean.

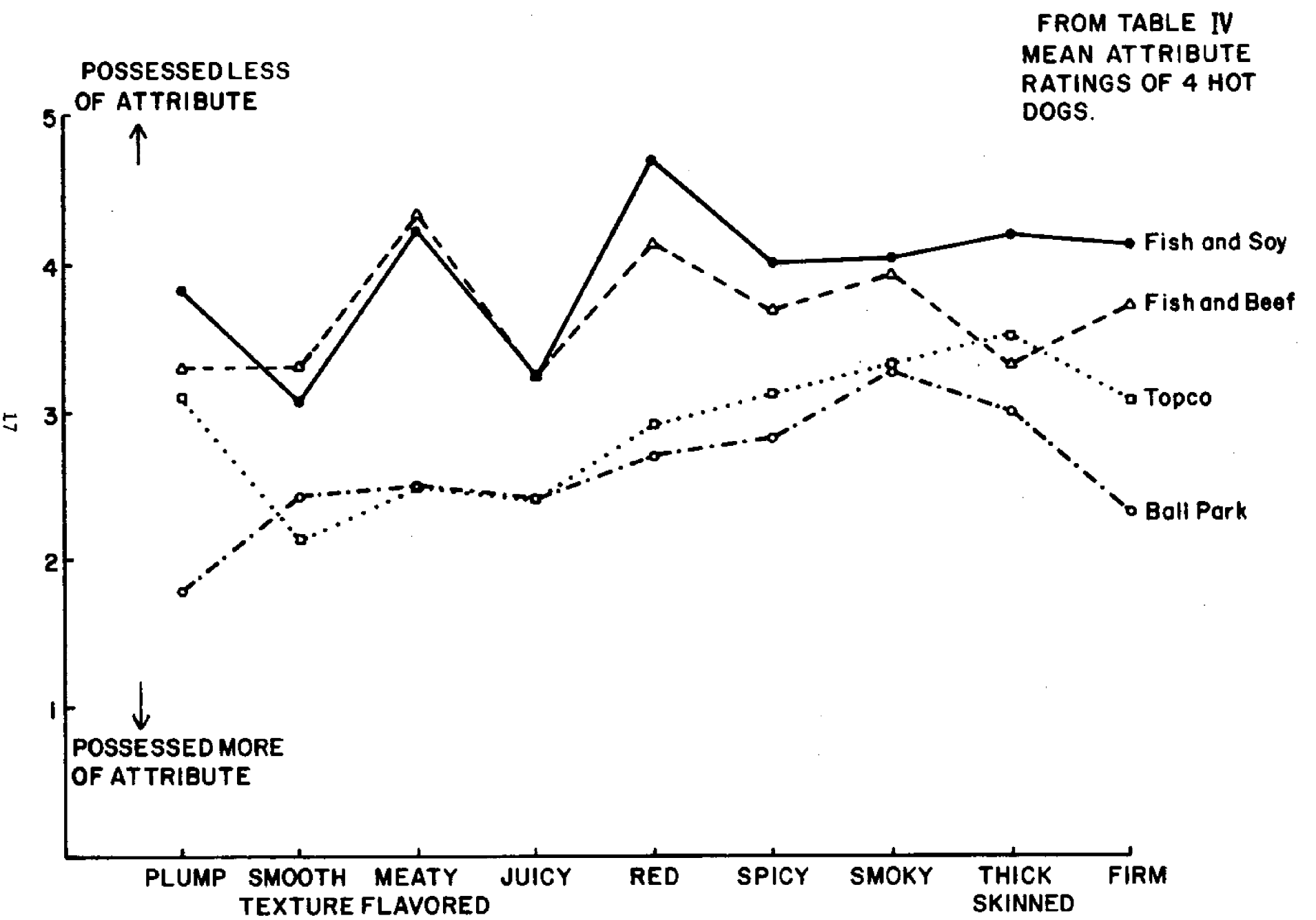

FROM TABLE IV
MEAN ATTRIBUTE
RATINGS OF 4 HOT
DOGS.
POSSESSED LESS
OF ATTRIBUTE
5
4
3
2
1
POSSESSED MORE
OF ATTRIBUTE
Fish and Soy
Fish and Beef
Topco
Ball Park
PLUMP
SMOOTH
TEXTURE
MEATY
FLAVORED
JUICY
RED
SPICY
SMOKY
THICK
SKINNED
FIRM

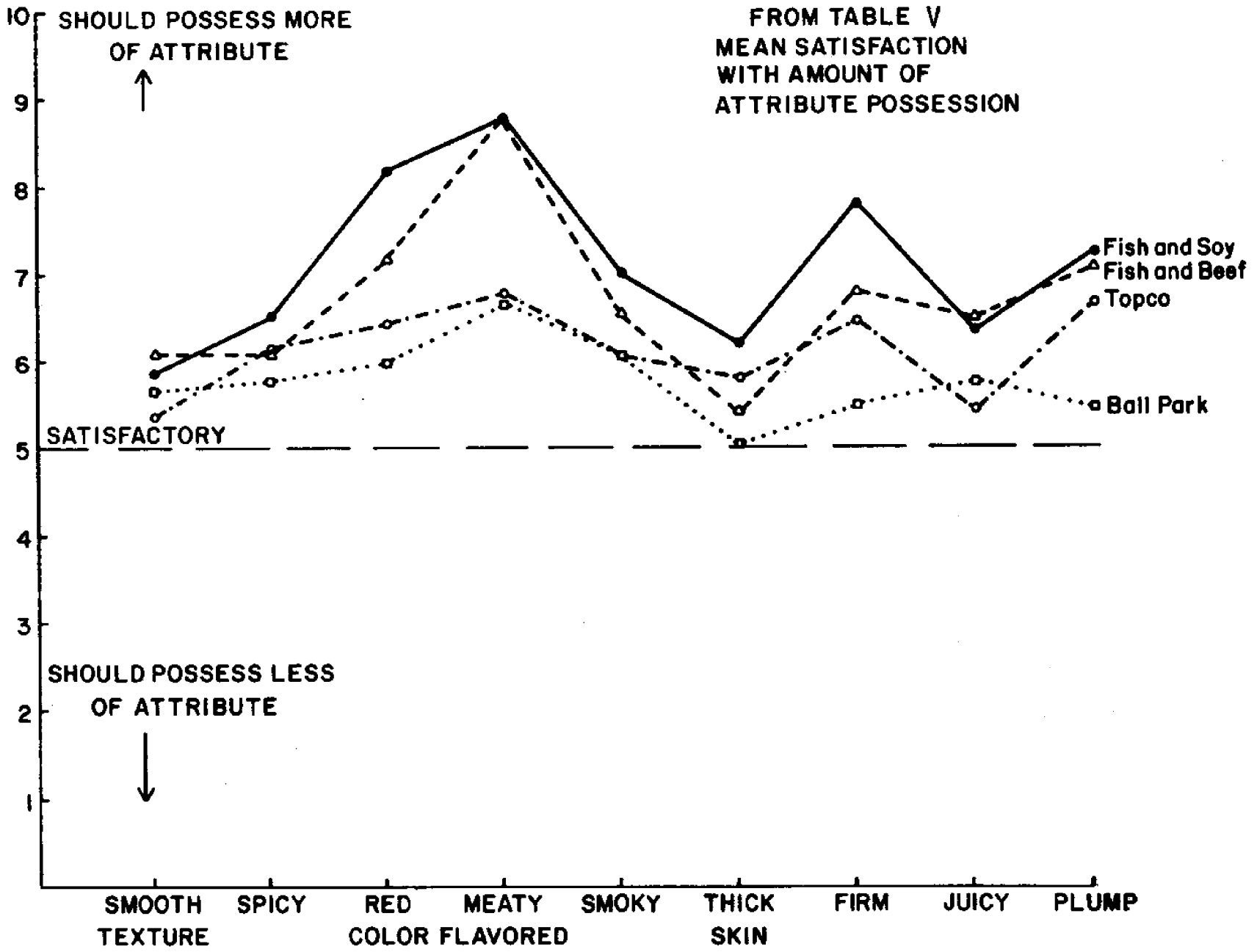
TABLE V

Mean Satisfaction With Amount of Attribute Possession

Attribute	Ballpark		Topco		Fish and Beef		Fish and Soy	
	$\bar{X}$	$S_{\bar{x}}$ [a]	$\bar{X}$	$S_{\bar{x}}$	$\bar{X}$	$S_{\bar{x}}$	$\bar{X}$	$S_{\bar{x}}$
Smooth in Texture	5.615	.119	5.352	.125	6.067	.193	5.791	.210
Spiciness	5.769	.176	6.165	.156	6.077	.244	6.484	.231
Redness in Color	5.956	.137	6.385	.170	7.231	.211	8.209	.183
Meaty Flavor	6.626	.189	6.725	.190	8.714	.190	8.736	.169
Smokiness	6.088	.161	6.089	.167	6.495	.230	7.000	.202
Thickness of Skin	5.045	.183	5.791	.166	5.429	.233	6.233	.219
Firmness	5.506	.130	6.429	.158	6.769	.215	7.756	.177
Juiciness	5.764	.125	5.473	.139	6.505	.222	6.344	.239
Plumpness	5.478	.131	6.648	.188	7.055	.200	7.244	.196

Note: Scoring: less of attribute, 0; satisfactory, 5; more of attribute, 10.

$S_{\bar{x}}$ [a] is standard error of mean.


10
9
8
7
6
5
4
3
2
1
SHOULD POSSESS MORE OF ATTRIBUTE
FROM TABLE V
MEAN SATISFACTION WITH AMOUNT OF ATTRIBUTE POSSESSION
Fish and Soy
Fish and Beef
Topco
Ball Park
SATISFACTORY
SHOULD POSSESS LESS OF ATTRIBUTE
SMOOTH TEXTURE
SPICY
RED COLOR
MEATY FLAVORED
SMOKY
THICK SKIN
FIRM
JUICY
PLUMP

Summary and Overall Conclusions

During Phase III testing, subjects stated that the most important attributes of hot dogs were meaty flavor, plumpness, juiciness, and firmness, respectively. On the basis of these attributes, as well as many others, a consistent preference for currently marketed all beef and beef and pork hot dogs over fish hot dogs was found. Within the fish hot dog category, fish and beef received a more favorable reaction than the fish and soy hot dog.

Given that the subjects who participated in this research are representative of the target market, the findings indicate that fish hot dogs would not be well received by consumers. Yet, looking back at the Phase II conclusions, consumers seemed interested in the product concept. There are two possibly overlapping explanations for the apparent drop in product enthusiasm between the phases. First, the Phase II testing may be biased because certain product characteristics which people apply to general food evaluations, such as nutrition, calories, and protein, were brought to the attention of respondents by the questionnaire. These particular product attributes, when compared across meat and fish products, tend to place fish products in a favored position. If the Phase II questionnaire led people to draw such a conclusion, then it may have produced a cognitive set (i.e., frame of mind) favorable to the fish hot dog concept.

Phase III testing did not include any references to these "fish favorable attributes". It relied on overall product image and actual taste and appearance attributes. It is quite clear that in the probable absence of, or at least unaided thought concerning those attributes, attitudes towards the overall product concept were less favorable. Thus, one might conclude that if fish hot dogs were put on the market, a heavy promotional campaign emphasizing the attributes of nutrition, calories, and protein might attract consumers, and could result in some initial product purchases.

However, there remains the second problem - product development. It can be concluded that there would be few repeat purchases (i.e., continued use) of fish hot dogs if they are of the form used during Phase III testing. Significant improvements would be required especially in terms of the four most important attributes - meaty flavor, plumpness, juiciness, and firmness. Although meaty flavor was found to be most important, it may be viable to consider a hickory smoked version since this was fairly well received by subjects.

On the basis of this research, it must be concluded that the fish hot dog, in its present product form, is not a viable product to use in Michigan's effort to aid the commercial fishing industry. If a higher quality fish hot dog were developed, further testing might provide a more favorable conclusion.