

Market Opportunities For Pacific Whiting

by

Gregory Peters

Internship Report

Submitted To

**Marine Resource Management Program
College of Oceanography
Oregon State University
Corvallis Oregon 97331**

1991

**in partial fulfillment of
the requirements for the
degree of**

Master of Science

June, 1991

Internship: Coastal Oregon Marine Experiment Station

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HIGHLIGHTS

HISTORICAL MARKET DEVELOPMENT Headed and gutted (H&G) is the only product form of Pacific whiting which has been successfully developed by the domestic west coast seafood industry. This success is attributed to the development of a production and marketing concept which minimized enzyme and texture related quality problems. Attempts to market other product forms have been too small and too disorderly to effectively address product quality issues. Profits and margins for the H&G west coast industry, however, have been relatively modest due to disorganized marketing efforts and limited bargaining power. Given the specialized markets for H&G whiting, significant production increases by west coast processors could lead to price reductions.

NATIONAL MARKET SURVEY A national market survey was conducted to explore market opportunities for expanded shore-based production of Pacific whiting. Survey objectives included developing information on optimal product forms, relative importance of product characteristics, product demand, and the effects of alternative contractual arrangements.

PORTFOLIO OF PRODUCT FORMS By strategically controlling product quality a "portfolio of" product forms could be processed from Pacific whiting including H&G, fillets, surimi, minced, and breaded products. Given variations in both market conditions and intrinsic product characteristics, strategies based on diversified products would be advantageous for sustaining development and reducing overall industry risks.

PRODUCT CHARACTERISTICS Alternative characteristics of Pacific whiting are not considered as important as price for low value products such as H&G. For higher priced products such as fillets and breaded portions, other product characteristics become relatively more important in impacting marketing opportunities.

PRODUCT DEMAND IN INTERMEDIATE MARKETS Various characteristics of intermediary market buyers will influence the demand for alternative whiting product forms, product attributes, and contractual arrangements. In general, the further downstream the market sector the relatively more important product characteristics become. These findings have important implications for developing marketing and sales strategies.

COOPERATION AND RISK SHARING A significant degree of cooperation, risk sharing, and marketing commitment is essential among industry sectors in order to effectively solve product quality problems. To address these issues the industry should develop formal associations and generic quality standards.

STATE SUPPORT State and local governments should encourage the industry to control product quality, solve waste disposal problems, and develop effective fisheries policy strategies.

REGULATORY STRATEGIES Regulatory strategies for the Pacific whiting fisheries should be structured to effectively control fishing effort and to consider market related issues in order to realize the full economic potential of this developing industry.

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Chapter I

INTRODUCTION

Pacific Whiting (Merluccius productus) is the largest stock of groundfish found off the west coast of the United States, with a maximum sustainable yield (MSY) averaging 200,000 metric tons (mt) per year and a maximum yield (MY) varying from 175,000 to 325,000 mt depending on annual stock size and quota regulations. The fisheries has been considered "under-utilized" since only a small proportion of the harvest is presently processed by the domestic industry. Most of the available resource has been harvested by American trawl vessels participating in joint venture (J.V.) operations. The joint venture vessels have delivered whiting to processing ships from Europe and Asia including the Soviet Union, Japan, Korea, and Poland.

Presently only a few U.S. firms along the Pacific Northwest coast process any substantial quantities (6,000-10,000 mt annually). Most of the catch is processed into headed and gutted product forms (H&G) destined for domestic, low income, ethnic markets. While periodic attempts during the last 25 years have been made to develop other product forms from Pacific whiting, most attempts have failed (Jenson 1990). Market prices for fillets or breaded products have generally been found to be near or below perceived production costs. Low market prices have been related to poor yield, short shelf life, soft texture, and related parasite and protease enzyme problems.

Recent changes in market conditions, institutional arrangements, and technological developments have led analysts to believe that a substantially greater volume of Pacific Whiting products will be profitably processed by the U.S. industry. From a global perspective these factors include:

- 1) the globalization of seafood trade and the diversification of seafood fisheries markets;
- 2) limitations and/or reductions in global fisheries supplies;
- 3) improvements in processing and preservation technologies, and;
- 4) increased global demand for many fisheries products.

From a regional and fisheries specific focus these changes include:

- 1) the development of technologies to improve Pacific whiting product quality by improving texture, increasing shelflife, and inhibiting the effects of protease enzymes through better handling techniques and the use of enzyme inhibitors;

- 2) the successful development of the U.S. surimi industry and the potentials for using Pacific whiting as a surimi ingredient;
- 3) recent price increases for many groundfish species including cod, cod substitutes (including whiting), and surimi;
- 4) the over-capitalization of the Seattle-based Alaskan catcher-processor fleet and recently enacted limitations on fishing effort for Alaskan pollock have led the catcher-processing fleet to request, for the first time in history, large allocations (over 300,00 metric tons) of Pacific whiting (at the mid March 1991 meeting of the Pacific Fisheries Management Council 104,000 mt of Pacific whiting were allocated to domestic factory trawlers, 88,000 reserved for vessels which could deliver to shore side or at sea processors, and 36,000 mt held in reserve for the local shore-side fleet);
- 5) the strong interest of joint venture boats, which could be displaced by U.S. catcher-processor vessels, to develop a whiting based shoreside processing industry, and;
- 6) the strong interest of coastal communities in Washington, Oregon, and California to accelerate the development of shoreside processing of Pacific whiting in order to avoid not only the loss of income resulting from the termination of the joint ventures, but to avoid the destabilizing impact if J.V. vessels were to transfer their under-utilized capacity to other already over-capitalized regional fisheries.

While these factors increase the potential for new domestic opportunities, production and market uncertainties may still limit industry growth. Past attempts to increase domestic processing of Pacific whiting had also been prompted by improvements in technology and market conditions but were constrained by a number of factors including: 1) unfavorable changes in market condition; 2) resource supply problems; 3) variation in product quality; 3) uncooperative attempts at market development, and; 4) a level of industry operations too small and too disorderly to effectively address production and marketing issues.

The following report summarizes the results of a recent study sponsored by the Oregon Department of Agriculture, the Oregon Department of Economic Development, Captain Barry Fisher, and the Coastal Oregon Marine Experiment Station of Oregon State University, to develop market information for expanding primary and secondary processing of Oregon-based Pacific whiting industries. In order to develop this information, over 125 seafood industry firms representing a relatively diverse cross-section of the industry were surveyed through the use of personal interviews and mail surveys. Personal surveys were conducted in the following cities and their surrounding areas: Boston, Philadelphia, Atlanta,

Jacksonville, St. Petersburg, Miami, Chicago, St. Louis, Dallas, Houston, San Francisco, Los Angeles, and Seattle. Completed mail surveys were received from firms covering a more complete cross-section of the national industry.

Information developed from these surveys was used to address the following questions:

- 1) What are the characteristics of U.S. and global whiting markets?
- 2) What are the market opportunities of alternative product forms?
- 3) What are the product specifications for alternative product forms?
- 4) What is the market demand for whiting products?
- 5) What is the relative importance of product attributes?
- 6) What are the industry expectations for future market developments?
- 7) What type of contractual arrangements could or should characterize the Pacific whiting industry?
- 8) What product forms appear to have the greatest likelihood of success?

This report is organized into ten chapters. Chapter II provides a brief overview of the development of the Pacific whiting industry and describes the details of the survey methodology. Chapter III summarizes general survey results. Chapters IV-VII detail survey information for alternative product forms, including headed and gutted, fillets, surimi, breaded, minced, and meal. Chapter VIII summarizes information about the European whiting market. Chapter IX combines preliminary supply and demand information within a product selection and product optimization framework. Chapter X summarizes study results.

Chapter II

OVERVIEW

Introduction

During the last decade a new wave of domestic and global market forces has begun to reshape the way that the U.S. seafood industry perceives its role and its opportunities. These forces, including 1) the globalization of trade, 2) the reduction in availability of new capture supplies, 3) the rise in aquacultural production, 4) the rapid increase in fleet capitalization, 5) the concern over product safety, 6) and the continued growth in seafood demand, have compelled the industry to re-evaluate traditional production, distribution, and marketing strategies. Increasingly, market driven approaches have begun to replace supply oriented strategies.

The relatively recent development of the U.S. Alaskan pollock (*Theragra chalcogramma*) fishery illustrates these market issues. As late as the mid 1980's pollock was thought to be a highly abundant, but relatively low quality trawl fish acceptable only as an ingredient for surimi production (Natural Resource Consultants 1990a). However, it soon became apparent that if handled properly, pollock was capable of being a relatively high quality product which could compete with other higher priced cod substitutes. As supplies of cod and cod substitutes leveled off or decreased, pollock prices rose to historical levels. Today pollock fillets command over \$1.50 per pound. These price increases have led to an increase use of pollock for blocks and individual fillet products, and away from its traditional use as the primary ingredient in producing surimi.

Unfortunately, like many successful fisheries, poorly crafted institutions (rules and regulations) have allowed the success of this industry to become the cause of its own demise. The early success of U.S. based surimi producers coupled with recent increases in pollock prices have resulted in an increase in fishing effort by both shore-based and at-sea catcher-processors at such high levels that seasons are becoming increasingly shortened, and competition between shore and at-sea based fishing fleets increasingly intense. The result is an excess of effort and an over-capitalized fleet forced to broaden its efforts into other west coast fisheries including Pacific whiting.

The increase in prices for pollock and cod have provided an incentive to increase production of other cod-like fish including the whittings and the hakes. The species which make up this complex assemblage of cod-like fish are found off several continents, and includes species found off the coasts of the United States (for a thorough review of global hake and whiting resources and markets

see Natural Resource Consultants 1990b). In the United States these fish have generally been considered a poor man's fish due to their relatively soft texture, and have received market prices lower than that of cod, pollock or other trawl fish. In Europe, which has a longer tradition of handling and consuming a multitude of whiting species, this group of fish is more readily accepted and has a better reputation than in the U.S. Some species of whiting in Europe command prices equal to that of cod.

Price increases, due in part to supply shortages and market and institutional developments in Europe and Asia, have provided incentives for nations with whiting stocks located in their territorial seas to re-evaluate marketing opportunities, and to determine whether better capture, handling, and processing techniques could raise prices and increase profits. The over-capitalization of the Alaskan pollock fleet and the decline in other west coast groundfish supplies have led the U.S west coast fishing industry to re-evaluate the potential opportunities for processing Pacific whiting. This species of fish now constitutes the single largest stock of groundfish off the U.S. West coast (excluding Alaska). With a potential yield of approximately 200,000 mt per year, successful utilization could lead to a sizable increase in West coast processing activities.

Today, Pacific whiting today is positioned at the same market level, and held with the same disrespect, that characterized Alaska pollock during the 1970's, and most South American whittings during the early to mid 1980's. The types of changes in market and institutional conditions which stimulated the successful development of these fisheries will also motivate the expansion of the domestic Pacific whiting industry. Perceptions will change, quality will improve, and product and market development will proceed. Note that the market acceptance for pollock fillets exceeded forecasts by NRC (1981) and the Alaska Fisheries Development Foundation (ASMI) 1981. In similar fashion the market development of Pacific whiting may rapidly accelerate beyond what are now considered reasonable predictions.

Over the past 25 years a significant amount of private and public effort has been expended in attempts to understand and solve biological, technological, and marketing problems related to Pacific whiting. Research funded by private companies and government agencies have been detailed in numerous articles, reports, and scientific journals. In 1970 the Bureau of Commercial Fisheries (now the National Marine Fisheries Service) issued a comprehensive report summarizing early public research efforts (Bureau of Commercial Fisheries 1970). In 1985 an entire issue of Marine Fisheries Review was dedicated to reviewing recent studies related to biological, technical, and applied industry problems (Marine Fisheries Review 47(2) 1985).

As these studies progressed it became apparent that the relatively soft texture of the fish (as compounded by the presence of myxosporidian parasites (Kudoa sps)), and limited shelf life problems, could be minimized if handling of the product was strategically controlled and coordinated along the entire distribution chain, from fishermen to consumers. Research by Crawford et al. 1972, Crawford et al. 1979, and Nelson et al. 1985 demonstrated that careful handling during capture and processing, combined with the use of proper freezing techniques, could extend shelflife for up to 18 months for fillet based products, while still maintaining acceptable sensory characteristics for taste and texture. In addition, research by other investigators including Chan-Lee et al. (1989), and R. Porter (1990) have shown that with the addition of enzyme inhibitors, Pacific whiting could be used for the production of surimi. Nippon Suisan, the world's largest fishing company, has for a number of years been successfully producing surimi from Pacific whiting as part of its joint venture fishing operation off the U.S. West coast (see Chapter VI for a more complete discussion).

The results of these studies, along with the research efforts of the private sector have served as the foundation for a number of applied projects. A significant portion of this work has been sponsored by the West Coast Fisheries Development Foundation (WCFDF), and has been focused on applied economic and market development. These studies have included:

- 1) production, economic analysis, and market testing of fillet blocks made from Pacific whiting on a catcher-processing vessel (WCFDF 1980);
- 2) consumer surveys for evaluating approaches of marketing Pacific whiting to Hispanic communities (WCFDF 1984);
- 3) analysis of optional package design for headed and gutted Pacific whiting (Elwell 1985);
- 4) review of market opportunities for alternative product forms produced from Pacific whiting (Wyatt 1983);
- 5) a summary of requirement for supplying seafood to the Federal procurement/feeding programs, with special reference to Pacific whiting (WCFDF 1986);
- 6) an economic feasibility study of the potentials of using Pacific whiting for production of surimi (Beale and Jensen 1988).

While these research efforts have led to a better understanding of alternatives for developing production and market opportunities, the growth rate of domestic production has remained disappointing (at least up to 1991). A number of domestic processing firms have experimented with alternative product forms,

such as frozen and breaded fillet products but with little success. Problems related to texture and shelflife combined with the product's poor national reputation, low prices, and the industry's limited marketing commitment, constrained the development of new opportunities.

This situation is now rapidly changing. The Oregon seafood industry and the state of Oregon perceive a "window of opportunity" due to rapidly changing market and institutional conditions. In order to avoid past mistakes and maximize this opportunity a comprehensive effort was undertaken to evaluate market opportunities and develop detailed requisite market information. Rather than rely on information from secondary sources, a market survey was conducted of the national seafood industry. The remaining sections of this report detail the findings of this effort.

Design of the Market Survey

In order to address market-related issues a market survey of downstream industry firms (e.g., importers, wholesalers, brokers, retailers, etc.) which handle significant quantities of whiting products was conducted from July to December 1990. A personal and mail survey was designed for three product forms: headed and gutted, fillets, and surimi (see Appendices A, B, and C). Surveys were designed to encourage responses that when evaluated would answer the market questions summarized in Chapter I. A significant number of survey questions were designed to develop requisite market information. Analytic methods were based on the concept of Pacific whiting as a heterogenous product composed of varying levels of attribute characteristics. This design allowed product demand to be analyzed as a function of product attributes and contractual arrangements. Gross benefits of alternative product forms or marginal benefits of improvements in product attributes could then be compared to total and marginal costs in order to estimate firm level short run demand and determine the "best" marketing and product concepts.

Each survey consisted of the following six sections:

- 1) Discussion section (personal survey only): The initial section was designed to encourage the respondent to discuss their experience and attitudes regarding the seafood industry in general, and whiting markets in particular
- 2) Self explicated utility analysis: This technique which is one type of a value expectancy modelling approach (Rosenberg 1956) was employed in order to qualify the relative importance of the entire array of product attributes and contractual arrangements. Based on pre-survey discussions with industry, government, and academic professionals, a list of product attributes and contractual issues

important in the decision to produce, handle, or sell whiting products was developed. The respondents were asked to rate the importance of attributes for either fillets, headed and gutted, or surimi (depending on the quantity of product volume) for individual attributes using an 11 point scale from 0 ("not important") to 10 ("very important"). Respondents were then asked to rank the desirability of specific attribute characteristics using another 11 point scale ranging from -5 ("very undesirable") to +5 ("very desirable") with the mid-way score of 0 indicating "indifference". Scores for attribute importance were then multiplied by the attribute desirability scores to determine the overall importance of each attribute characteristic. This information was statistically analyzed using standard means tests and was later used to determine product demand and optimal product design.

3) Conjoint analysis: The research method known as conjoint analysis (Green 1974) was employed in order to develop information on the relative importance of a subset of product attributes in contributing toward the relative profitability of the firm. Using a factorial research design and orthogonal arrays (Addelman 1962), three sets of eight hypothetical whiting-based products were developed (see survey appendices). One set consisted of fillet products, another of headed and gutted, and a final set consisted of raw surimi products. Each respondent was asked to evaluate one set of products. Each of the eight products represented a different combination of four or five product attributes considered important for products developed from Pacific whiting. Evaluation of each of the eight products was based on a 21 point profitability scale, ranging from -10 ("highly unprofitable") to +10 "highly profitable" with zero as the "break-even" point. Respondents were asked to select one score for each of the eight products without using the same score more than once. Rank and score results were statistically analyzed using ordinary least square regression techniques (OLS) and multinomial estimation procedures. The use of this technique allowed the attributes to be evaluated according to their relative contribution to the firm's profitability and to estimate the relationships of attributes to the probability that the firm would handle a given product.

4) Market development and market forecasts: In this section respondents were asked to provide their opinion regarding the potential opportunities for product development and estimates of price and supply condition during the next two year period for both the seafood and whiting markets.

5) Bidding game: For each of six different prices the respondent was asked to evaluate a single hypothetical product comprised of a combination of product attributes representative of a headed and gutted or fillet product made from Pacific whiting. For each of the six prices the respondent was asked to score the product using the same profitability scoring scale described in section 3 above. For each score in the positive range, the respondent was asked to

estimate the amount of annual product volume which his firm might handle. Using regression analysis, product demand was estimated as a function of positive product scores. These results were then combined with the probabilities of purchase in order to develop an expected relative demand curve (probabilities multiplied by quantities). This information was used to develop an index measuring potential firm level demand as a function of improvements in product quality attributes. Results were used with product optimization to determine optimal product design. The results of the bidding game were also used to compare the results of the value expectancy models and the conjoint analysis.

6) Other information: The last section of the survey was designed to develop information on the characteristics of the firm and the seafood experience of the respondent. This information was used to evaluate market characteristics and weight survey responses according to firm experience and size. These objectively weighted responses were compared to subjectively weighted responses based on the evaluation of the interviewer regarding the participation and knowledge of the respondent.

Chapter III

GENERAL FINDINGS

Introduction

The following chapter summarizes the general results of the national market survey. Specific results related to product forms and product attributes are discussed in chapters IV-VII. Most of the information discussed in this chapter falls into two categories: specific information about the size, behavior, and characteristics of the firms which were interviewed; and general and more qualitative information regarding their opinions of (i) the seafood industry, (ii) present and future markets for alternative whiting species and, (iii) present and future markets for alternative product forms which could be developed from Pacific whiting (the reader should be warned that the firms which were surveyed might not necessarily reflect the average attitude and behavior of firms which handle whiting products). Most of this information was generated as part of the general discussion questions which were used to encourage respondent interest and cooperation. This information, while not necessarily quantifiable, provides valuable opinions and insights related to market issues and industry development and behavior.

Description of the Firms

The firms which participated in the market surveys are broken down by primary function in Figure 3.1 and Figure 3.2. Figure 3.1 shows the break down by function for firms which primarily handled headed and gutted whiting products. Figure 3.2 describes firms which primarily handled fillets.

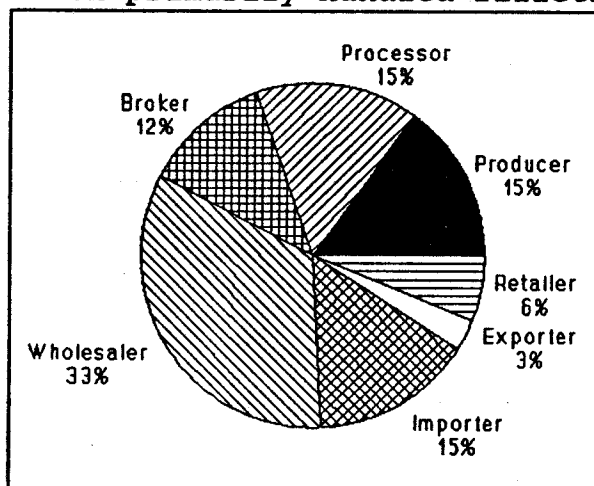


Figure 3.1 Primary industry function of firms which primarily handle H&G whiting.

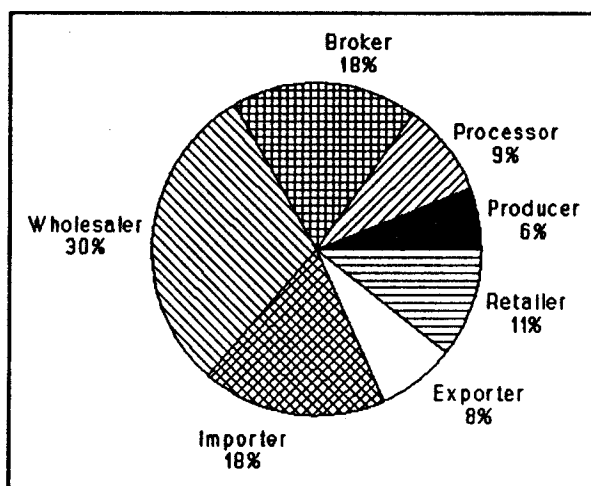


Figure 3.2 Primary industry function of firms which primarily handle whiting fillets.

As these figures illustrate, a relatively wide range of firms were surveyed for both the fillet and headed and gutted products. Wholesalers, brokers, and importers were the predominant functions of firms which were surveyed.

Figures 3.3, 3.4, 3.5, and 3.6 demonstrate the market sectors which the average firm purchases from, and sells to, for both those firms which primarily handle H&G products and firms which primarily handle fillets.

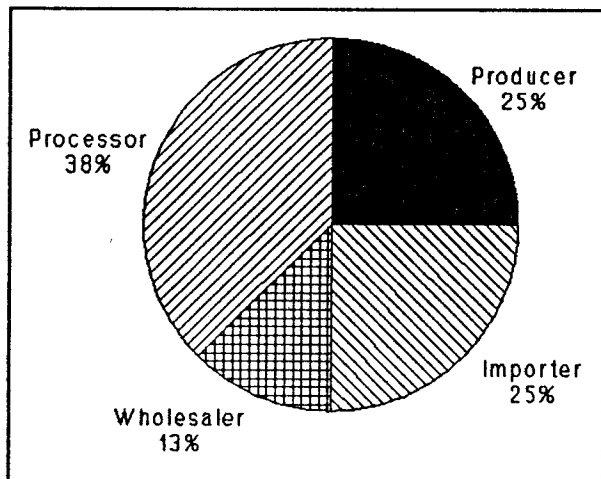


Figure 3.3 Market sectors from which H&G whiting product is purchased.

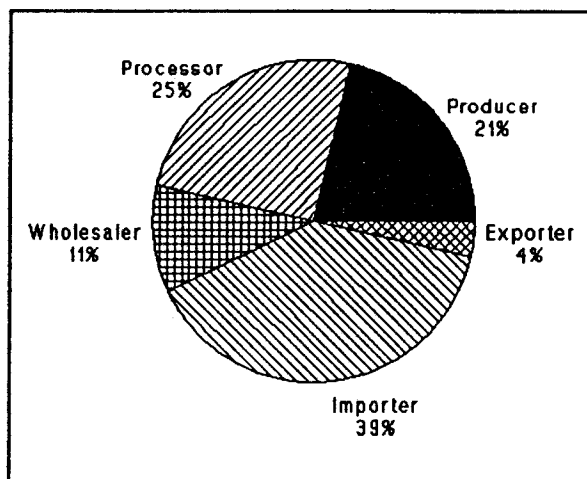


Figure 3.4 Market sector from which whiting fillet product is purchased.

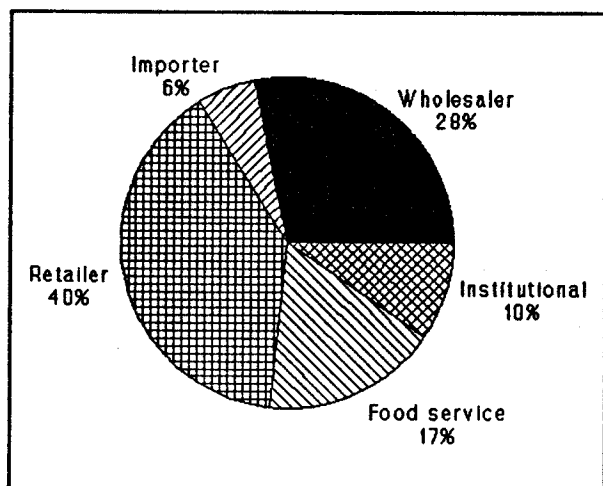


Figure 3.5 Market sectors in which H&G product is sold.

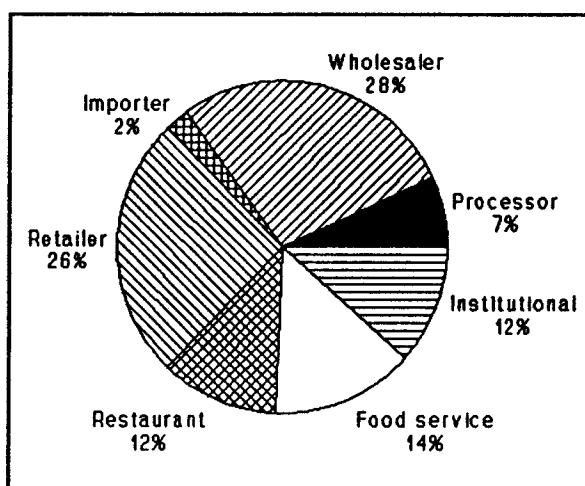


Figure 3.6 Market sectors in which whiting fillet product is sold.

These figures also demonstrate the wide variety of buyers and the nature of the distribution chains for each product form. In general, fillets are more evenly distributed across a wider variety of market segments. As will be demonstrated in Chapter IV and Chapter V, the nature of the market sector can significantly influence the firms' responses across a wide variety of product characteristics including contractual arrangements and pricing.

Another aspect of the firm which may impact attitude and behavior is company size. Figure 3.7 and Figure 3.8 demonstrate the gross sales volume of the respondents for H&G and fillets respectively. The average total sales volume (for all fish products) for firms which handle predominantly H&G was approximately 11 million dollars and the sales volume for the average fillet firm was approximately 14 million dollars. The average, however, is not necessarily the majority. There was a wide variety of relatively large and small firms interviewed.

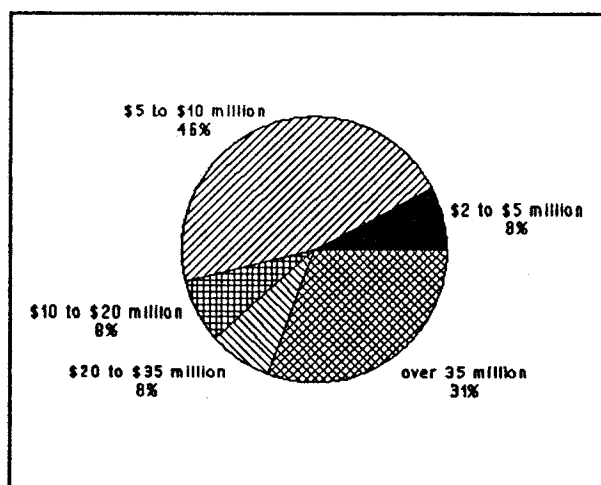


Figure 3.7 Gross sales volume of all seafood products for firms which predominantly handle H&G whiting products.

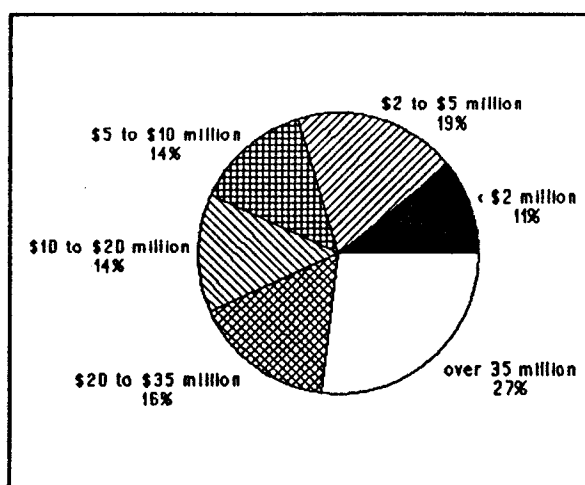


Figure 3.8 Gross sales volume for all seafood products for firms which predominantly handle whiting fillets.

Assuming that these were representative industry firms this information could be used as a rough indicator of total supplies by taking the average quantity of product which firms handle and multiplying that average by the total number of firms. Figure 3.9 and Figure 3.10 describes the volume which is handled per year by firms which handle H&G and whiting fillet products. The average quantity handled is approximately 300,000 pounds for H&G firms and about 180,000 pounds for fillet firms.

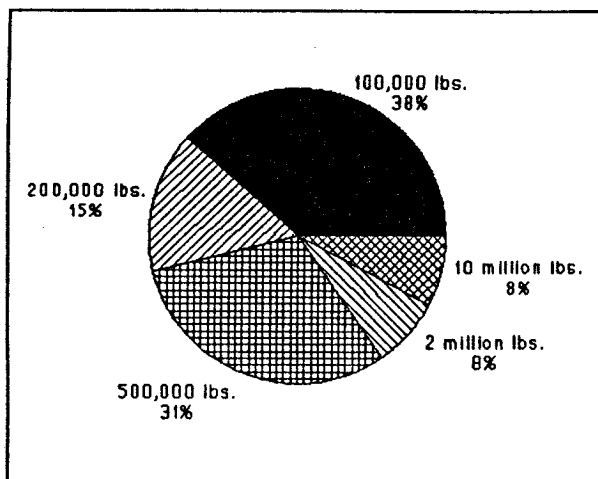


Figure 3.9 Volume of H&G whiting product handled per firm per year for firms which predominantly handle H&G whiting.

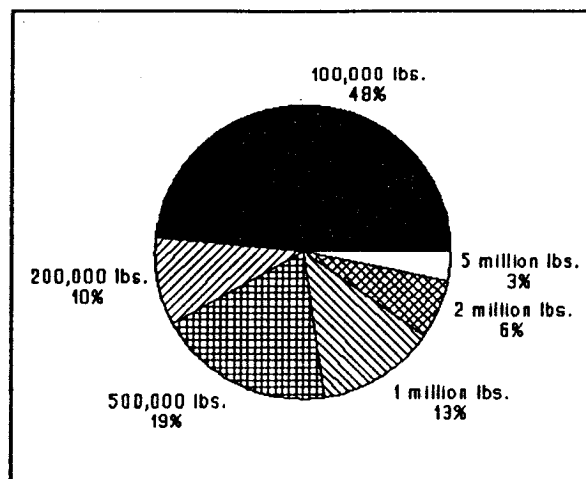


Figure 3.10 Volume of whiting fillets handled per firm per year for firms which predominantly handle whiting fillets.

Figure 3.11 and Figure 3.12 demonstrate the industry experience of the respondents. Overall, the respondents were highly experienced with 19 years for firms which primarily handle H&G whiting product and 17 years for firms which handle primarily fillets.

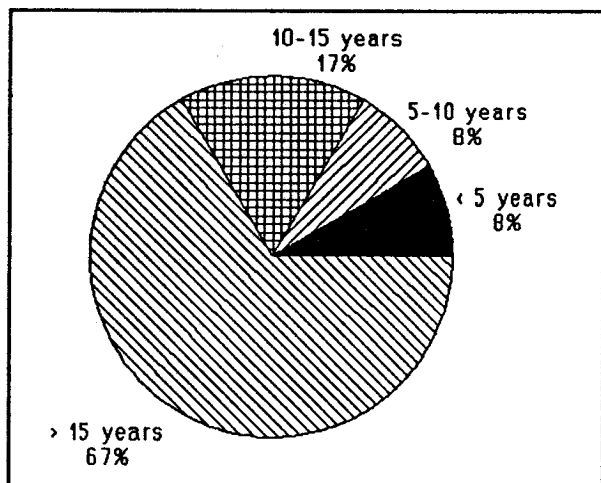


Figure 3.11 Years of experience in the seafood industry for respondents which primarily handle H&G whiting product.

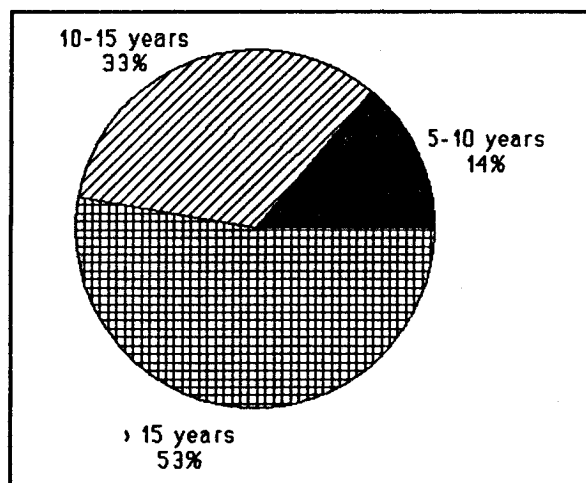


Figure 3.12 Years of experience in the seafood industry for respondents which primarily handle whiting fillets.

Species

As described in the NRC (1990a) report, whiting are a relatively large and complex assemblage of species of cod-like fish. While product quality can show considerable variation depending on species, geography, and method of handling, in general most species are considered relatively low quality. This quality problem is primarily due to (1) a moderately soft flesh texture, (2) poor handling characteristics, (3) relatively short shelf life for some species and/or product forms, (4) and in some species parasite related problems. For many species of whiting, including Pacific whiting, these problems are inter-related. These inter-relationships compound the difficulty in producing product forms which can generate a high level of economic return.

The species of whiting primarily handled by U.S. seafood firms include Argentine whiting (Merluccius hubbsi), Chilean whiting (Merluccius gayi), Atlantic whiting (Merluccius bilinearis), Peruvian whiting (Merluccius peranus), and Pacific whiting (Merluccius productus). (For a detailed review of these species see the NRC (1990a) report). Among the firms which we interviewed, most respondents believed Pacific whiting to be slightly below average quality and better than average price. While the configuration of product form for fillets shows a high degree of variation, prices and perceptions about product quality are highly correlated. Of the five major whiting species handled in the United States, Argentine whiting was perceived to have the highest quality, primarily due to flesh texture which was consistently considered relatively firm and whiter than the other whiting species. Workmanship and consistency of product quality was also considered the highest among the five species although Argentine whiting products were known to have occasional problems (primarily taste and color) as a result of seasonal changes in forage. One rule of thumb used by a number of firms was that "the quality of whiting captured in colder waters is higher than whiting captured in warmer waters." Whether this generally held perception is based on actual experience is unknown. This opinion may be the result of differences in seasonal changes in intrinsic qualities of whiting species due to spawning or forage, or it may be the result of storage and handling problems during hot weather. Whatever the reason, this commonly held perception provides an opportunity to promote "cold water" Pacific whiting.

For the other four species of whiting there was less consensus regarding their overall quality. Chilean whiting was, in general, considered to have the second highest level of quality attributes, although many respondents claimed that workmanship and quality showed a great deal of variation. Some respondents suggested that it was important to work with South American processors which had good reputations. In general, workmanship and handling were considered to be improving. Atlantic whiting got mixed reviews.

While many respondents claimed that this species over-all had reasonably good intrinsic sensory quality attributes, its relatively small size, inconsistent quality related to at-sea and on-shore handling especially during the summer, seasonal spawning related degradation of intrinsic quality attributes, and variations in annual supply levels, limited the potential opportunities for improving market opportunities. Peruvian was considered to be the lowest quality whiting. Peruvian whiting not only had intrinsic quality problems related to color and texture, but had quality problems related to poor handling and poor workmanship. Importers which distribute this product, however, had begun to see an improvement in workmanship during the last few years. In many cases, this improvement was the result of U.S. importers working directly with the plants and fishermen in order to improve product quality.

There was no clear consensus about Pacific whiting. Many respondents claimed that it was a low quality species, only slightly above Peruvian whiting in terms of overall quality. Many respondents felt that product quality showed tremendous variation. Ironically, however, within the headed and gutted market, Pacific whiting was considered by many to be relatively high quality, depending on the brand and label. It should be noted, however, that the headed and gutted market is relatively unique, and that quality standards, beyond that of some basic level of "wholesomeness" (healthy for human consumption) were often not considered significant. In fact discussions about the characteristics of Pacific whiting often focused on the packaging rather than intrinsic quality attributes. (see chapter IV for a complete discussion of this issue). There was complete agreement among those respondents that handle Pacific whiting that quality attributes would have to be improved and standardized before the product could be moved out of the H&G market to product forms such as fillets which most firms agreed could generate higher returns and margins for all levels of the industry. Yet there was consensus that the H&G opportunities were limited and that the market would not be able to absorb significant increases without a proportional decrease in price.

The species of whiting which were utilized by the responding firms are broken down in the following figures. Figure 3.13 shows the species handled by H&G firms, and Figure 3.14 demonstrates the species used by firms which predominantly handle whiting fillets. As these figures demonstrate, fewer species are used in the headed and gutted market which is dominated by Pacific whiting. In contrast, the United States whiting fillet market is dominated by Argentine product.

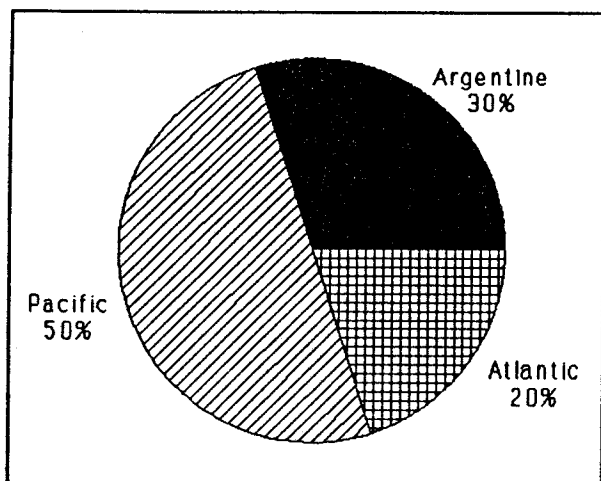


Figure 3.13 Species of H&G product for firms which handle primarily H&G product.

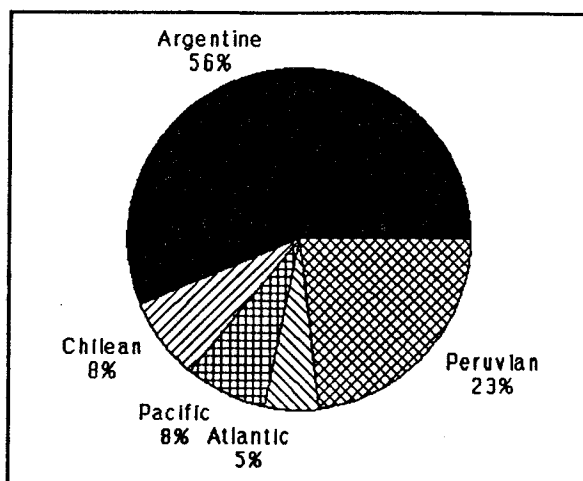


Figure 3.14 Species of fillet products handled for firms which handle primarily fillet products.

Substitute Products

The better quality whiting products such as Argentine and Antarctic whiting ((*Merluccius australus*) - a high quality South American whiting with declining abundance - see NRC 1990a for details) were considered as substitutes for mid-level priced ground fish products such as Alaska pollock (*Theragra chalcogramma*). The rapidly increasing prices for pollock were forcing users to substitute lesser priced products such as Argentine whiting. But for the lower priced whittings in the fillet market there were no substitute products; this was especially true in the market for H&G product. The lower priced whiting products in the U.S. market had no easily identifiable seafood substitute, that is, the fish were generally considered the cheapest products in the market. At one time Argentine sea trout and Argentine sea bass had been considered substitutes but the prices for these products have increased during the last five years as a result of quality improvements and development of new market opportunities.

Handling and Labeling

This was considered one of the most critical issues affecting the success of whiting products. Due to their intrinsic characteristics, many whiting species must be handled more carefully than other seafood during capture, processing, storage, and even cooking. Improvements in the quality of a number of the South American whittings was a direct result of improvements in

handling. Many of the firms which handle large volumes of whiting emphasized that given the problems characterizing Pacific whiting, the production and distribution system would have to be improved in order to successfully develop alternative product forms. A number of distributors and wholesalers doubted whether a system based on a shore-based processing facility could in fact produce an acceptable product other than H&G. There were suggestions that at-sea processors could do a better job at improving product quality than shore-based plants. Most of the individuals offering these opinions, however, did not have inside knowledge of the details related to this issue - their opinions were based primarily on the quality of at-sea frozen product and concern about product handling characteristics. Their pre-conceptions, however, must be considered by shore-based producers competing with at-sea processors.

Labeling was also considered an important issue. For the headed and gutted market, retailers are increasingly demanding a grade A label from federal inspectors. This label would be conspicuously placed as part of the box design in order to encourage consumer acceptance. Labeling was also considered important as part of the entire marketing concept. While this issue is discussed in more detail in Chapter IV and Chapter V, part of the success in development of the Pacific whiting headed and gutted product was attributable to the retail oriented package and label design.

During the course of these interviews, it was found that Oregon does not have an unfavorable image in the national seafood industry; on average, respondents ranked Oregon "above average" in terms of product quality. It was also found that the one West coast seafood product which is identified by the modifier "Oregon" was shrimp which generally had a positive market image. However, a number of respondents suggested that before using the "Oregon" label or image, the industry must ensure that the product be consistently high in quality, and that a mechanism be developed to prevent low quality firms from exploiting the image to make short term gains. An identifiable label symbolizing a product quality combined with a government grade would be extremely valuable in keeping buyers "lazy" by reducing uncertainties about quality problems, and as a tool for product promotion, acceptance, and customer loyalty.

Product Forms

While specific issues regarding individual types of product forms are discussed in the chapters which follow, a number of issues regarding product forms are of general importance. Whiting comes in a variety of product forms besides fillets and H&G. It is sold canned and smoked (primarily in urban ethnic markets in the Northeast). It is also sold in the round as fresh product in the

Northeast. While fillets are sold primarily as frozen product either individually or as blocks, they are occasionally sold fresh. The configuration of fillet product attributes can become complex and depends on final use and final market destination: e.g., pin bone in, pin bone out; skin-on, skin-off; not defatted, partially defatted, completely defatted. In addition many buyers like to buy a combination of product forms so that a truckload (approximately 40,000 lbs) might contain for example, 3/4 fillets and 1/4 headed and gutted.

Figure 3.15 and Figure 3.16 demonstrate the potential for various products as perceived by firms which predominantly handle H&G and fillet products. Firms were asked to rank the potential for these products on a scale from 0 to 6 with 0 = no potential and 6 = high potential. These figures demonstrate that firms which primarily handle H&G product perceive Pacific whiting to have a moderately good potential for continued production of H&G product while members of the fillet industry did not agree. H&G firms did not rate value added forms as highly as firms which predominantly handle fillets. On the other hand, the fillet firms did not rate the more basic product forms as highly as H&G firms. Both types of firms believed that Pacific whiting has relatively high potential as a surimi product.

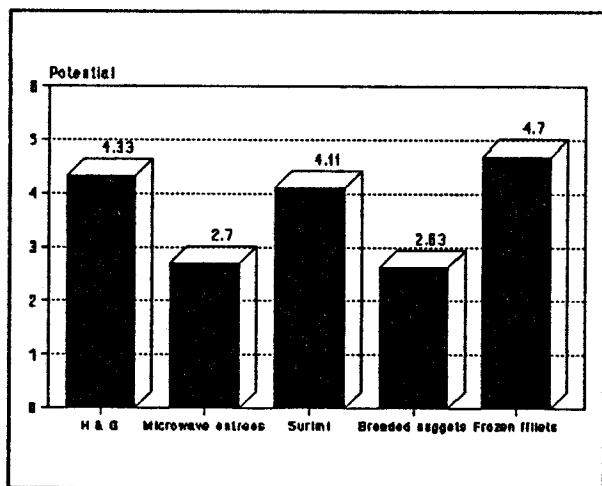


Figure 3.15 Perceived potential for various Pacific whiting products by firms which predominantly handle H&G product. (0=no potential, 6=high potential).

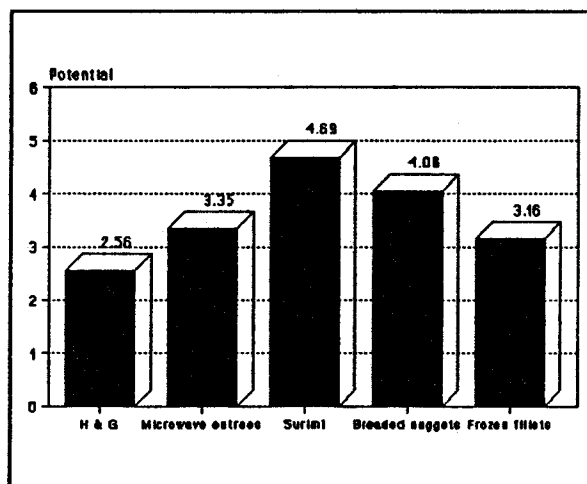


Figure 3.16 Perceived potential of various Pacific whiting products by firms which predominantly handle whiting fillets. (0=no potential, 6=high potential).

Figure 3.17 and Figure 3.18 demonstrate the products which are typically handled by the responding H&G and fillet firms. Many of the H&G firms specialize in headed and gutted whiting and it is their primary whiting product form. Most firms which handle whiting fillets did not handle H&G whiting, but did handle other trawl fish products. Most of the respondents which handle whiting fillets typically handle skinless fillets. Most of these skinless fillets are not deep skinned in order to remove the fat layer. Skin-on fillets still represents the predominant portion of the whiting fillet market.

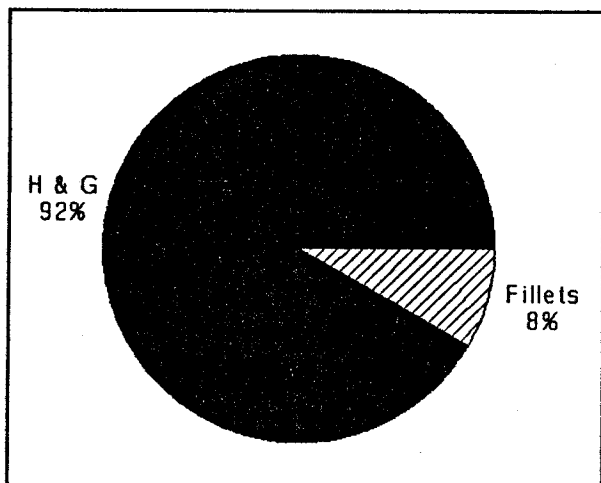


Figure 3.17 Product forms handled by firms which predominantly handle H&G whiting.

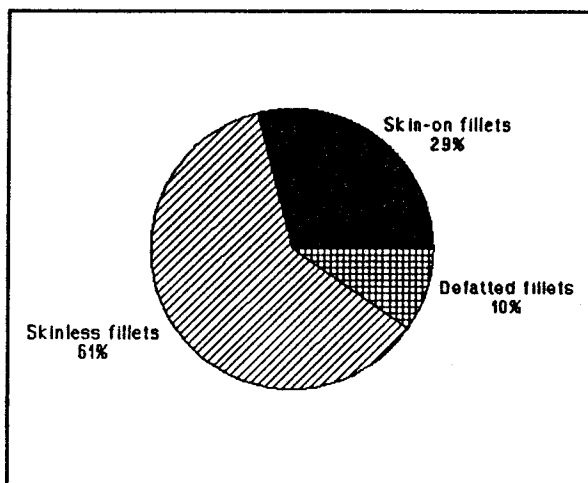


Figure 3.18 Product forms handled by firms which predominantly handle whiting fillets.

Market Segmentation, Geographical and Seasonal Markets

Whiting markets are relatively complex due to the number of species, product forms, and market segments. While these issues are discussed in more detail in the chapters describing product forms, whiting firms involved in promotion and marketing can take advantage of product and market related variability in formulating of new marketing strategies. For example, while the demand for 7-9 oz. H&G product is primarily in retail markets by low income ethnic households, potential markets may exist for 4-7 oz skinless product in certain areas in the midwest and in urban Oriental markets where the use of chop-sticks or fingers encumbers the use of relatively small, bony products.

Figure 3.19 and 3.20 show the geographic location of responding firms for H&G and fillets. Survey respondents were relatively evenly distributed across the U.S.

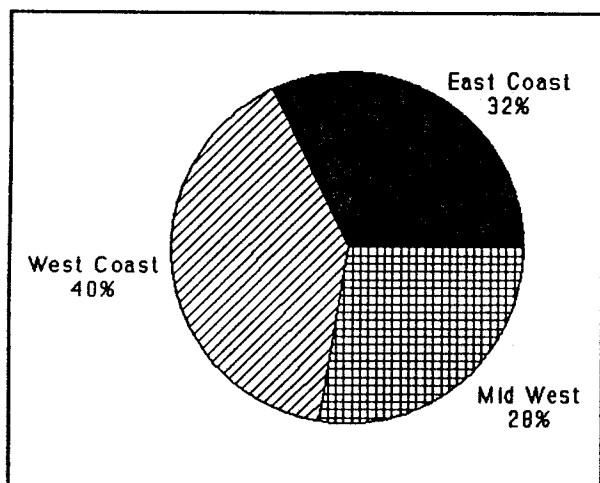


Figure 3.19 Geographic area of responding firms which predominantly handle H&G product.

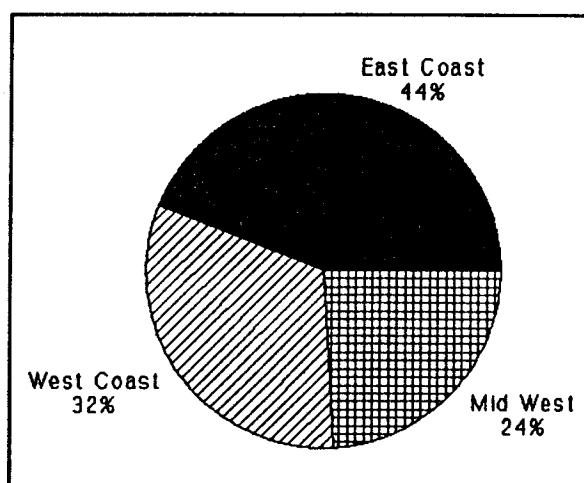


Figure 3.20 Geographic area of responding firms which predominantly handle whiting fillets.

Overall demand for whiting products tends to be higher in the winter than during the summer. Hot weather was said to "kill demand". Demand during the fall and winter increases as schools go back to session and Lenten season begins. In order to plan for this demand many whiting fish buyers forward contract (while at the same time carefully evaluating the cost of cold storage at \$.025/lb fixed and \$.015/lb. per month as quoted by one cold storage facility) in preparing for these seasonal demand shifts.

Protease Enzymes and the Enzyme Inhibitor

While knowledgeable industry professionals were aware of the protease enzyme related problems in Pacific whiting, many individuals, including some which handle a large amount of H&G, were unaware of the problem. It appears that given the relatively low expectations of consumers toward headed and gutted whiting product quality and given the style of cooking (primarily breaded and deep fried), consumers were not affected by enzyme related problems. However, this problem would become more severe if Pacific whiting were developed as fillet products which experience a much wider variety of uses and cooking styles, including thawing and slow cooking which would activate the protease enzymes. Clearly, production and marketing management strategies must come to terms with this issue, or in the long run, feedback from

dissatisfied consumers will set-back attempts at market development. This issue will be discussed in more detail in later chapters of this report.

An additional concern was voiced about the use of enzyme inhibitors. While some industry members believed that inhibitors could open up new market opportunities, others were more skeptical. Many concerns were voiced over effectiveness, cost, delivery systems, labelling, and sensory characteristics. A number of those surveyed were aware of the consideration by processors to use inhibitors, not only for Pacific whiting but also arrowtooth flounder (Atheresthes stomias).

European and Other Markets

The European market, which represents in aggregate the world's largest whiting market is discussed in detail in chapter VIII of this report and in the NRC (1990a) whiting report. Respondents in our interviews, however, expressed considerable interest and concern about the European markets, especially over how these markets were impacting supplies and prices in the U.S. whiting market and how these markets may provide new opportunities.

Most respondents argued that recent changes in the European markets were increasingly affecting the U.S. domestic market. The opening up of Eastern Europe, the diminishing supplies of European ground fish stocks, the relatively high demand for fish in Europe, the reduction of Pacific whiting products in Eastern European markets (from joint venture fisheries), and the 1992 consolidation of the European Economic Community were expected to significantly impact global fish and ground fish markets. Most importers noted that the Europeans were becoming more active in South America and were bidding up prices for South American whiting species.

Many respondents argued that the European markets could potentially provide market opportunities for Pacific whiting. The European whiting market is more complex than the U.S. whiting market and offers more opportunities for alternative forms and species. The market more readily accepts larger fillets, products with scales and skin, and head and gutted product. However, since skin and bones appreciably increases shipping and storage costs, product forms which reduce weight (for example, pre-cooked fillets) could ultimately prove to provide the best opportunities.

Very few of the firms surveyed were exporters or, in fact, had any detailed knowledge about European whiting markets. A number of firms mentioned that they knew that existing West coast firms producing Pacific whiting had been approached by not only European buyers, but buyers representing Japan and China.

Figures 3.21, 3.22, 3.23 and 3.24 summarize the perceptions of the respondents regarding the potential for the trawl fish and the whiting market over the next two years. The average firm believed that the prices for both trawl fish and whiting would increase by ten percent over the next few years, (however, in real terms, given the rate of inflation of approximately 5 percent, this results in no gain). Conversely, the respondents believed that the quantity of trawl fish products available to the U.S. market will decrease by an average of ten percent while the supplies of whiting will remain unchanged. Whiting and other trawl fish species are partial substitutes and the expectations about increases in whiting prices may be related to decreases in supplies of trawl fish.

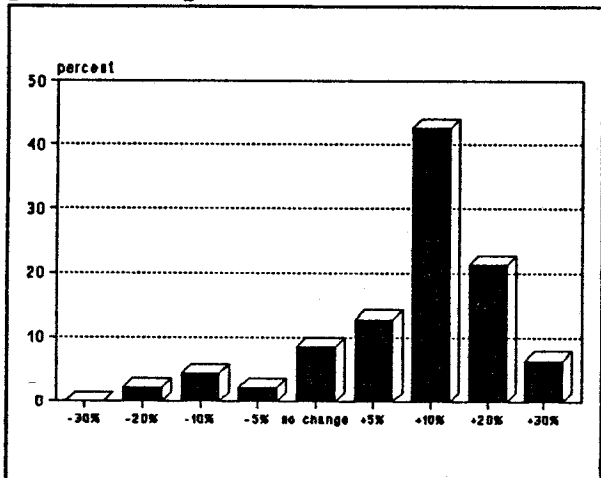


Figure 3.21 Expectation for changes in trawl fish prices over the next two years.

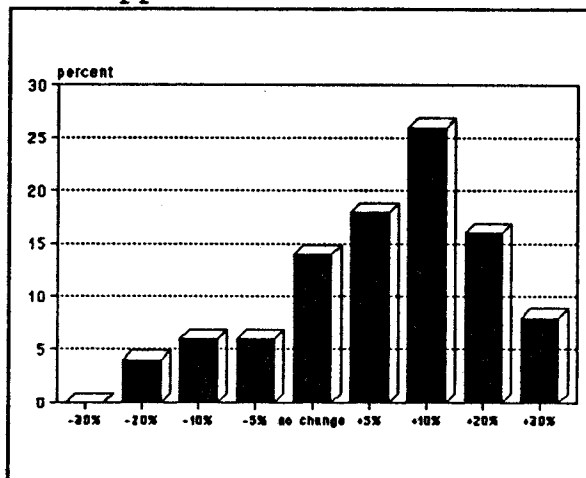


Figure 3.22 Expectation for changes in whiting prices over the next two years.

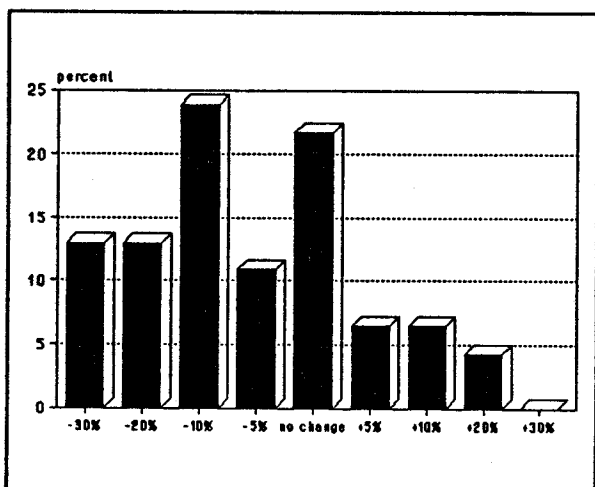


Figure 3.23 Expectation for changes in trawl fish supplies over the next two years.

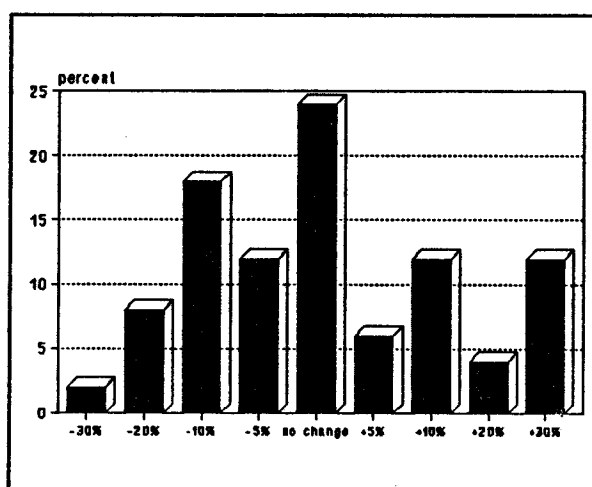


Figure 3.24 Expectations for changes in whiting supplies over the next two years.

Summary of General Issues

There were a number of issues and insights about the structure and behavior of whiting markets expressed during the course of these interviews that could have an important bearing on the development of the domestic whiting resource. Many of these issues were discussed during the general discussion sections of the market surveys. These issues are summarized as follows:

1. Cooperation and Risk Sharing - Probably the most pervasive theme among those interviews which we had subjectively classified as "quality" interviews, was the need for cooperation and risk sharing among all sectors of the whiting industry. Downstream sectors of the industry (brokers, wholesalers, distributors) felt that their marketing knowledge was often not effectively used. The general feeling was that given the difficult problems related to the product attributes of Pacific whiting, especially texture, shelf life, and related enzyme problems, that fishermen, processors, marketing middlemen, and distributors must cooperate to ensure that market information flows effectively between each market sector. Rather than the contentious feelings which often characterize the working relationships of the vertical sectors of the seafood industry, many respondents believed that partnerships need to be formed with an appropriate set of incentives and an equitable sharing of risks. Given the potentially complex logistics, the perception was that only Pacific whiting ventures which were cooperatively planned and executed would have a high probability of success.

2. Long term marketing commitment - The dual theme of cooperation was marketing commitment -- good marketing plans would take time to work, and successful working relationships time to build. A common complaint was that too many individuals and firms in the industry (including the Pacific whiting industry), take the short run view -- they rationalize that "it's only the fish business" and dissolve marketing relationships in order to take advantage of what are often short-lived market phenomena. Supply disruptions and a lack of cooperative marketing efforts provide opportunities for exploitive behavior which breeds distrust and weakens the industry. Firms which work cooperatively, establish foundations build on trust, and develop good working relationships, are in a better position to weather the downswings in the industry and increase their long run opportunities.

3. The global seafood industry - Domestic seafood whiting markets are part of a global marketplace. This marketplace provides new opportunities but more intense competition. To understand market developments and improve marketing decisions requires good

information about domestic and global market developments. Good working relationships function to expedite the flow of information about these developments and opportunities (often in the form of new incentives and prices) to the upstream sectors (processors, fishermen) which are more removed from end users and retail markets.

4. Market developments and forecasts - Many, but not all, respondents believed that prices for both the overall seafood market and whiting markets would, in general, trend upwards during the next two years. Conversely, supplies were not expected to keep up with demand. Many respondents claimed that this phenomena was now impacting an industry already in a process of re-consolidation (meaning fewer but stronger surviving firms). Some respondents felt that the general tendency would be increasingly larger and more integrated seafood industries; firms which, because they were large in size and scale, could deal effectively with the forces of competitive globalization and the increasing scale of industrial and market developments. Conversely, others felt that this thinking was a rationalization to "cut out the middleman". These respondents argued that the industry is becoming more complex and diverse, and that middlemen are becoming increasingly important in the search for, and development of, new domestic and global market opportunities.

Chapter IV

HEADED AND GUTTED

Introduction

The primary product form processed from the 6,000-10,000 metric tons of Pacific whiting delivered to domestic shore based processors annually is headed and gutted. The majority of this product is marketed as a relatively inexpensive item positioned for sales to low income, ethnic households. The product is primarily sold retail and is prepared at home using quick frying methods. This is a critical issue; by using these cooking methods H&G Pacific whiting does not undergo the enzyme-related texture degradation that would occur with slow cooking techniques such as baking and broiling. It is this feature of the H&G market which has allowed the domestic industry to experience even limited success.

Opportunities for considerably expanding the profitable sales and marketing of headed and gutted product, however, are generally considered to be limited. H&G is generally perceived to be a low quality item sold mainly as sustenance for lower income households. Generally, as disposable income increases, households switch to different meat products or different product forms, such as fillets, which are boneless and easier to consume. However, the exact potential for H&G will depend on a number of supply and demand factors including the rate of population growth for U.S. ethnic groups, the health of the U.S. economy, the behavior of whiting processors and exporters in South America, and prices for other relatively inexpensive whitefish products.

The final market destination for a large portion of H&G Pacific whiting is the retail sector. In general, packaging and marketing of products sold at retail become relatively more important than for products directed to other market sectors. For example, the majority of whiting fillets are sold to food service and institutional markets where packaging is not considered relatively important.

The majority of the headed and gutted product is directed to urban areas and the rural South where it is distributed to large chain stores and sold to the consumer through retail outlets. The major markets for the product are inner-city areas in the Northeast, Midwest, and West and both urban and rural areas in the South. Some market areas have become less important overtime. The area around St. Louis, Missouri, for example, was once an important market for H & G whiting where it was sold as "jack salmon"; sales have, however, dwindled in recent years. One respondent claimed that the reason for the decline was not necessarily due to the lack

of product demand, but rather the inability of sellers to consistently supply small (4-6 oz.) skinless headed and gutted product.

Many regions of the United States and Mexico have especially strong market potentials during the Lenten season (February, March). Unfortunately, the harvest season (April-October) proceeds Lent and cold storage fees make it difficult to profitably exploit these seasonal demand shifts. For example, cold storage costs, as quoted by one respondent, include an up front fee of \$0.025/lb. in addition to a monthly fee of \$0.015 per pound. However, depending on public policy, it could be possible to forward contract with buyers but delay harvests till late in the season in order to avoid cold storage fees. Pacific whiting could be "inventoried" as live product while still producing additional biological growth and possibly improved intrinsic product qualities by delaying harvests long after the winter spawning season.

It was found during the course of our surveys that there are many important issues related to the H&G Pacific whiting market. These issues are explored in detail under the appropriate topic headings below.

Overall Importance of Headed and Gutted Whiting Attributes.

In order to successfully market seafood products, producers must understand the characteristics of the product and the value of alternative contractual arrangements which may be valued by potential buyers. This can allow the producer to determine which attributes may be worth improving, and which contractual arrangements may be worth developing in order to maximize market and profit opportunities.

Results from the self explicated portions of the mail and personal surveys (see Chapter II for an explanation of survey methods) demonstrate that a number of product attributes and contractual arrangements were found to be at least moderately to highly important in the marketing of Pacific whiting. The importance of these attributes are summarized in Figure 4.1 where individual respondents were asked to rate the importance of each attribute using a scale ranging from 0 "not important" to 10 "very important".

Statistical tests were conducted in order to determine which attributes were relatively most important. Fisher's group means test was used to determine whether the means of the attributes were significantly different from each other at a 95% confidence level. An F test was first conducted to determine whether, in fact, there was any difference among at least two of the means. If the F was not significant, an alternative group means test known as Scheffe's group means test was performed. In the Fisher's test, the least

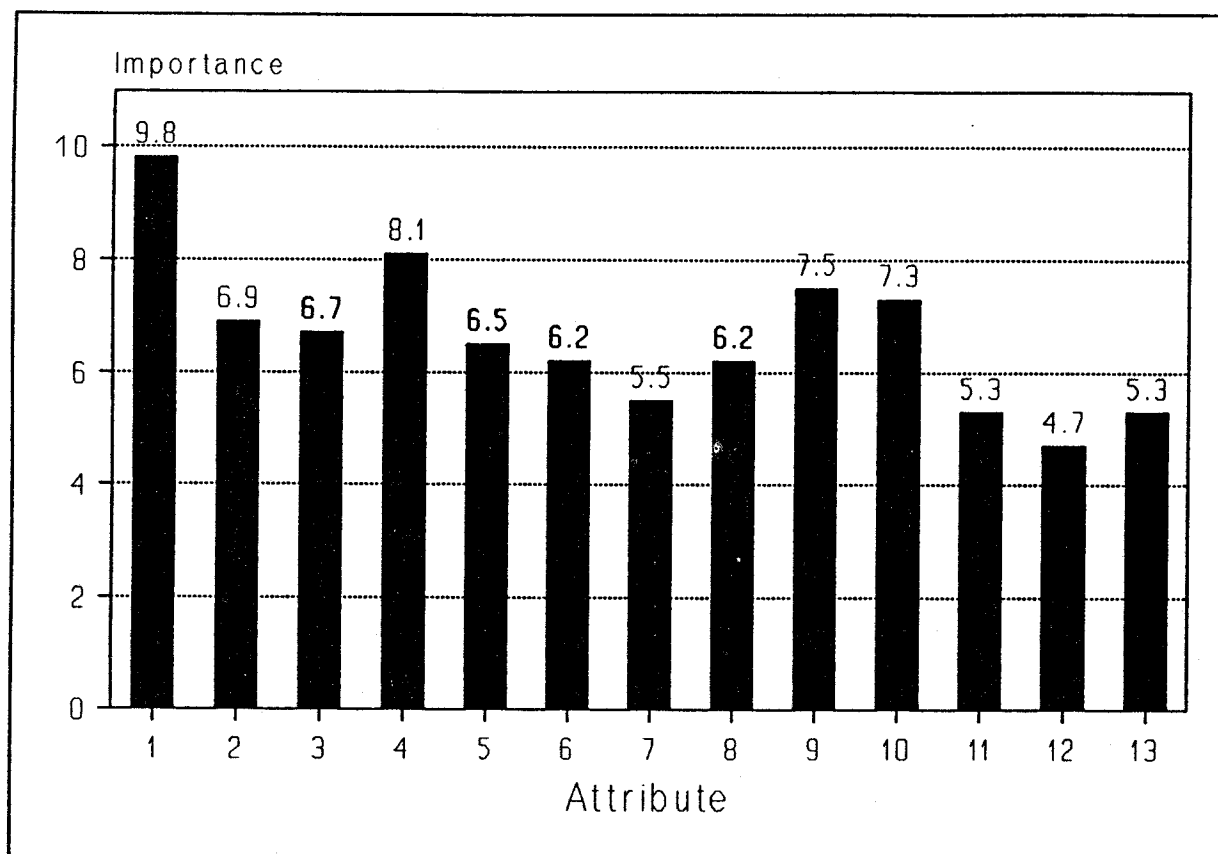


Figure 4.1 Relative importance of H&G whiting attributes. 10=highly important, 5=moderately important, 0=not important.

LSD_{.05}=1.40

F=7.71***

***Significant 99 percent

- | | | |
|-------------------|------------------|------------------------|
| 1. Price | 2. Product size | 3. Species |
| 4. Texture | 5. Shelf life | 6. Flesh color |
| 7. Percent enzyme | 8. Package size | 9. Supply availability |
| 10. Uniformity | 11. Product line | 12. Marketing support |
| 13. Payment terms | | |

significant difference (LSD) was the minimum difference between means that, given the number of respondents and the variation in responses, would represent a significant difference between means at a 95% confidence level. Minimum significant difference (MSD) was the minimum difference between means at a 95% significance level for Scheffe's Comparison of Means Test.

Figure 4.1 demonstrates that the most important characteristic of headed and gutted whiting was price. All other attributes had means less than 8.40 (9.8 minus 1.40(LSD)) and was, therefore, significantly less important (Compare Figure 4.1 to Figure 5.1 in

Chapter V for whiting fillets). In turn, texture, supply availability and product uniformity were significantly more important than the remaining product attributes.

In order to more fully explore causal relationships and evaluate survey results, the importance of product attributes may be more fully evaluated according to the characteristics of the respondents. These characteristics would include market sector, geographic location, date of survey, years of respondent experience, primary species of whiting handled, and size of company. Table 4.1 shows the F statistic for each respondent characteristic when considering the various product attributes using Analysis of Variance (ANOVA). Any F statistic larger than 2.88 demonstrates that at a 95% confidence level, the respondent characteristics were important in impacting the product attribute scores.

Table 4.1 F-statistics demonstrating significance of respondent characteristics on impacting respondents scores for attribute importance for headed and gutted whiting.

Product attribute	Market Sector	East coast	West coast	Mail survey	Years experience	Argentine whiting	Peruvian whiting	Chilean whiting	Pacific whiting	Company size
Price	31.7	2.13	2.16	0.83	1.94	1.13	2.47	1.14	1.67	2.08
Product size	0.69	1.67	1.51	0.96	0.91	1.84	1.13	0.57	1.62	1.87
Species	0.93	2.47	2.63	0.87	0.73	2.87	2.31	2.28	2.57	1.73
Texture of flesh	2.27	0.53	0.57	0.51	1.03	0.56	0.64	0.61	0.59	1.73
Shelf life	3.91	0.61	0.58	0.83	0.67	0.61	0.53	0.44	0.55	0.77
Flesh color	1.14	0.91	1.03	0.66	0.91	0.49	0.43	0.62	0.53	0.91
Package size	0.61	0.72	0.68	0.59	0.43	0.53	0.61	0.74	0.66	2.11
Supply availability	2.97	1.08	0.96	0.73	1.08	0.87	0.67	0.66	0.71	0.72
Product uniformity	2.63	0.87	0.94	1.17	1.23	1.13	1.03	0.71	1.06	0.62
Product range	0.77	0.68	0.73	1.31	2.11	0.82	0.69	0.61	0.71	0.63
Marketing support	3.14	1.34	1.52	0.73	1.36	1.61	1.14	1.03	1.42	1.27

A score equal to or greater than 2.88 is 95 percent significant.

An analysis of Table 4.1 demonstrates that the percentage of fish affected by the enzyme, and most contractual attributes (including size of product line, marketing support, and payment terms) were the least important attribute categories. Market sector significantly impacted scoring levels for at least some of the attributes including price, shelf life, supply availability, and marketing support.

The potential reasons for these differences are examined in the next sections in this chapter. In these sections, the scores for the levels of the attribute categories were determined from asking the respondents to rank the relative importance of the attribute levels on a scale ranging from -5 "very undesirable", to +5 "very desirable". These scores were then multiplied by the importance of the attribute as shown in Figure 4.1 to develop a weighted overall score for each attribute characteristic. By weighting the scores, each attribute could be directly compared in terms of its overall relative desirability in impacting the marketability of the H&G product.

Preferred H&G Whiting Characteristics

Price

Figure 4.2 summarizes the relative degree of desirability of various prices for headed and gutted whiting for primary and secondary buyers (primary buyer or receiver is defined as a buyer who purchases from the processor, the secondary buyer as a buyer who purchases from the first receiver).

There were significant differences in overall desirability for each price level (i.e. the difference between the means of adjacent price levels were greater than 1.42 units of desirability). As expected, \$0.30/lb. was highly desirable with a score of 4.66; conversely, a score for \$0.60/lb. was -4.86, i.e. a price level "highly undesirable". The price level of \$0.40/lb. for both sectors was closest to the "indifference" score of zero.

As expected, first receivers tended to score lower than second buyers across most of the price categories. The Fisher group means test indicates, however, that the difference between first and secondary buyers was not significant.

When comparing attributes based on the weighted score, the desirability score is multiplied by the relative importance (Figure 4.1). A top score of 50 indicates a "very desirable" attribute level, 0 indicates "indifference", and -50 demonstrates a "highly undesirable" attribute level. The importance of price for H&G is reflected in the extremely high weighted score shown in Figure 4.2. The weighted desirability score almost reaches the highest possible score of 50.

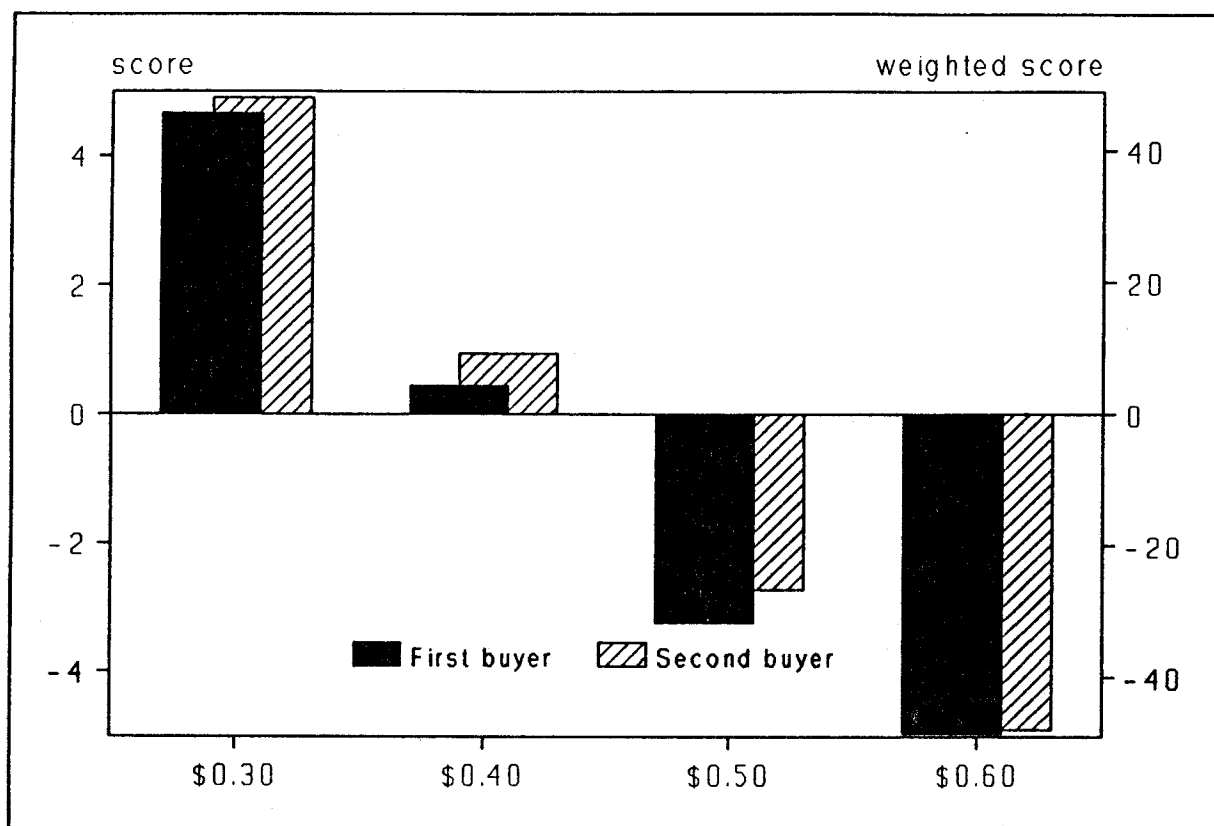


Figure 4.2 Relative desirability of price for H&G whiting.
 Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

price	\$0.30/lb.	\$0.40/lb.	\$0.50/lb.	\$0.60/lb.
first buyer	4.66	0.45	-3.25	-4.95
second buyer	4.9	0.94	-2.73	-4.89

LSD_{.05}=1.42

F=73.2***

***Significant 99 percent

Another method which was used for determining whether market sector influenced the degree of desirability is regression analysis. A simple linear regression is summarized as follows (t statistics are in parentheses):

$$\text{Score} = 13.90 - 33.16 \cdot \text{Price} + 1.37 \cdot \text{Sector} + .36 \cdot \text{Sector} \cdot \text{Price}$$

(15.04***) (-15.89***) (2.98***) (1.12)

F=87.66*** Adjusted R squared=.82 ***Significant 99 percent

The analysis demonstrates that overall, the second buyer scored significantly higher for alternative price levels than the first buyer. The equation also shows the effect of price on score; everything else being equal, a one dollar increase in price, or more appropriately, a one cent increase in price would decrease the relative desirability of the whiting product by 0.33 units.

The "break-even" prices for each market sector for whiting products may be calculated from the equation by setting the score to zero ("indifference") and solving for the price levels for each sector:

Break-even price for primary buyer = \$0.40

Break-even price for secondary buyer = \$0.47.

These prices are in general agreement with the average purchase and sales prices that respondents claimed they paid for various H&G whiting products (Table 4.2). The difference of \$0.07 between the primary and secondary buyers (approximately 18 percent of purchase price) may be interpreted as the average margin for the primary buyer under competitive conditions.

Some respondents noted that there is a seasonal variation in purchase prices which start high (between \$0.40-\$0.50/lb.) early in the season but, as the season progresses, may drop as low as \$0.25 per pound for first buyers near the end of the season (July-Oct.). Some respondents suggested that price decreases may be associated with increased experience of poor quality product during the course of the season. Other respondents argued that price decreases were due to forward contracting, i.e. that most buyers had contracted to purchase all necessary product during the winter and early spring or had purchased products which were being held in frozen inventory. (The implication is that the market for H&G whiting is relatively specialized and alternative market opportunities in the short run are limited). A few others made an even stronger argument: the low wholesale prices for H&G whiting were due to the disorganized marketing efforts by primary processors. Using an appropriate metaphor developed by one major buyer of Pacific whiting products, some buyers exploit the processors "like the warrior Indian picking off stragglers in a wagon train" (Williams, 1990).

The distribution chain may also include a tertiary buyer, usually the retailer, who will offer the product to consumers at prices ranging from \$0.80 to \$1.00 per pound, typically in five pound boxes.

Table 4.2. Quoted purchases and sales prices from primary and secondary buyers of headed and gutted whiting.

Species	First buyer		Second buyer	
	Purchase price	Sales price	Purchase price	Sales price
Argentine	\$0.40-\$0.55	\$0.46-\$0.60	\$0.45-\$0.50	\$0.65-\$0.70
Chilean	\$0.38-\$0.42	\$0.40-\$0.45	\$0.40-\$0.45	\$0.45-\$0.52
Pacific	\$0.35-\$0.44	\$0.47-\$0.59	\$0.45-\$0.60	\$0.50-\$0.55
Atlantic	\$0.40-\$0.42	\$0.42-\$0.46	\$0.40-\$0.45	\$0.45-\$0.49
Peruvian	\$0.35-\$0.40	\$0.38-\$0.43	\$0.35-\$0.45	\$0.40-\$0.46

Texture

Texture is an important consideration for whiting products due to the relatively soft texture of many whiting species and the inability of the product to stand up to rough handling. This is especially true for Pacific whiting in which the texture problem is compounded by the presence of protease enzyme(s). If the fish is not handled carefully and kept at relatively cold temperatures during all phases of capture, handling, processing, distribution, and cooking preparation, the flesh may turn extremely soft and, in extreme cases, may have a gelatinous consistency.

Figure 4.3 demonstrates the relative desirability of various levels of texture for H&G whiting. The figure, and accompanying statistics, clearly demonstrate that, while firm texture is "highly desirable", moderate texture whiting is also positively desirable, while soft textured whiting is "highly undesirable." There appears to be little difference in the relative desirability of the texture by the different market sectors.

Surprisingly, many of the survey respondents claimed that texture for H&G whiting was not a problem and that there were relatively few complaints from consumers. Many respondents were unaware of enzyme-related texture problems and believed that individuals purchasing this low priced product either did not experience mushy texture, or if they did, may have felt it was expected given the product's low price. Alternatively, the perception that the product has a relatively firm texture may, in

fact, reflect that the product is handled relatively well by fishermen and processors, that it is stored properly, and that it is prepared by consumers using quick cooking methods (primarily frying).

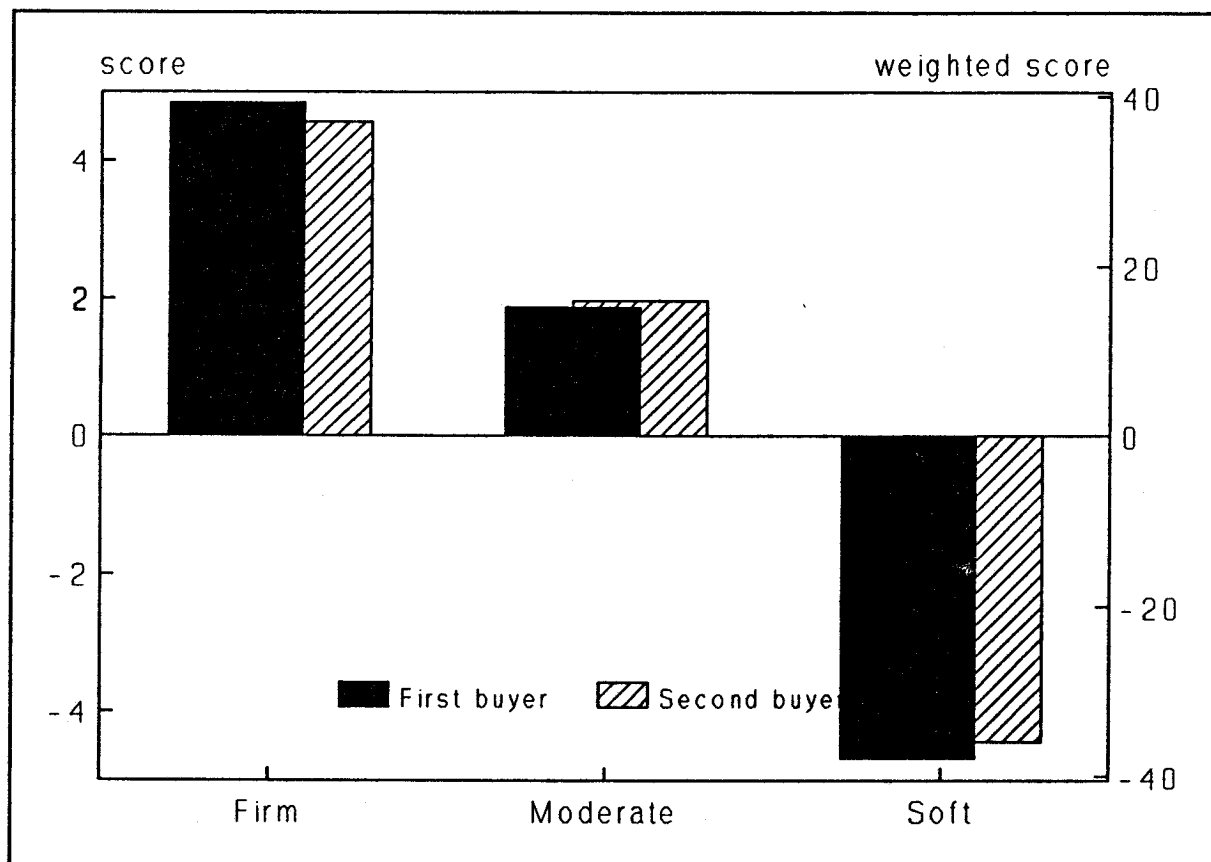


Figure 4.3 Relative desirability of texture for H & G whiting.
Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

texture	firm	moderate	soft
first buyer	4.85	1.88	-4.67
second buyer	4.57	1.97	-4.43

LSD_{.05}=.71

F=363***

***Significant 99 percent

Marketing Support

Marketing support may be defined in many ways: in general it can be thought of as the degree to which a processor works with the downstream sectors of industry to support marketing and sales of the product. Such support would include packages, brochures, recipes, posters, etc. which help improve sales and understanding of the characteristics and value of the product. Many of the respondents argued that it was important for processing firms to work closely with other intermediary market sectors (wholesalers, brokers, distributors) in order to develop an integrated marketing plan which would enable all sectors to improve their margins and profits. A few firms mentioned that marketing support for H&G should include cooking demonstrations and videos for display at retail outlets.

The box should be designed so that it is easily recognized and that it encourage brand loyalty. One respondent claimed that brand recognition was worth an additional \$0.01 to \$0.05 per pound for the wholesalers. There is a large number of different types of box designs in the U.S. market. Some boxes are relatively plain; others display appealing (and not so appealing) photographs of the product. A number of respondents claimed that what was inside the box was not as important as the box itself. Other respondents, however, believed that the differentiation of prices was due to the qualities of the product, and the box merely allowed consumers to recognize the product and develop brand loyalty. A partial list of alternative brands of headed and gutted whiting includes: Starboard Light, Castle Rock, Vicman, Captain Chuck's, Sea Diamond, Floresca, and Terrific Pacific.

Figure 4.4 shows the desirability of various degrees of marketing assistance desired by the two different market levels for H&G product. The statistical analysis clearly demonstrates that there is a distinct difference in the desirability of marketing support by the different sectors. Firms which were primary buyers would rather not have marketing support provided by the processor. Second buyers, however, would rather have more, than less, marketing support. One explanation for these strongly different attitudes is that first buyers provide marketing support themselves to downstream sectors but only when demanded. In general, however, marketing support becomes more important as one moves downstream toward the final market sector, especially if it is a product destined for the retail sector. Alternatively, since the box has become such a fundamental characteristic of H&G whiting, respondents may have interpreted this question to exclude box design as a component of marketing support. They may have been concerned that paying extra for additional types of marketing support (including coupon rebates, live demonstrations, and videos) may increase their costs without improving future marketing opportunities.

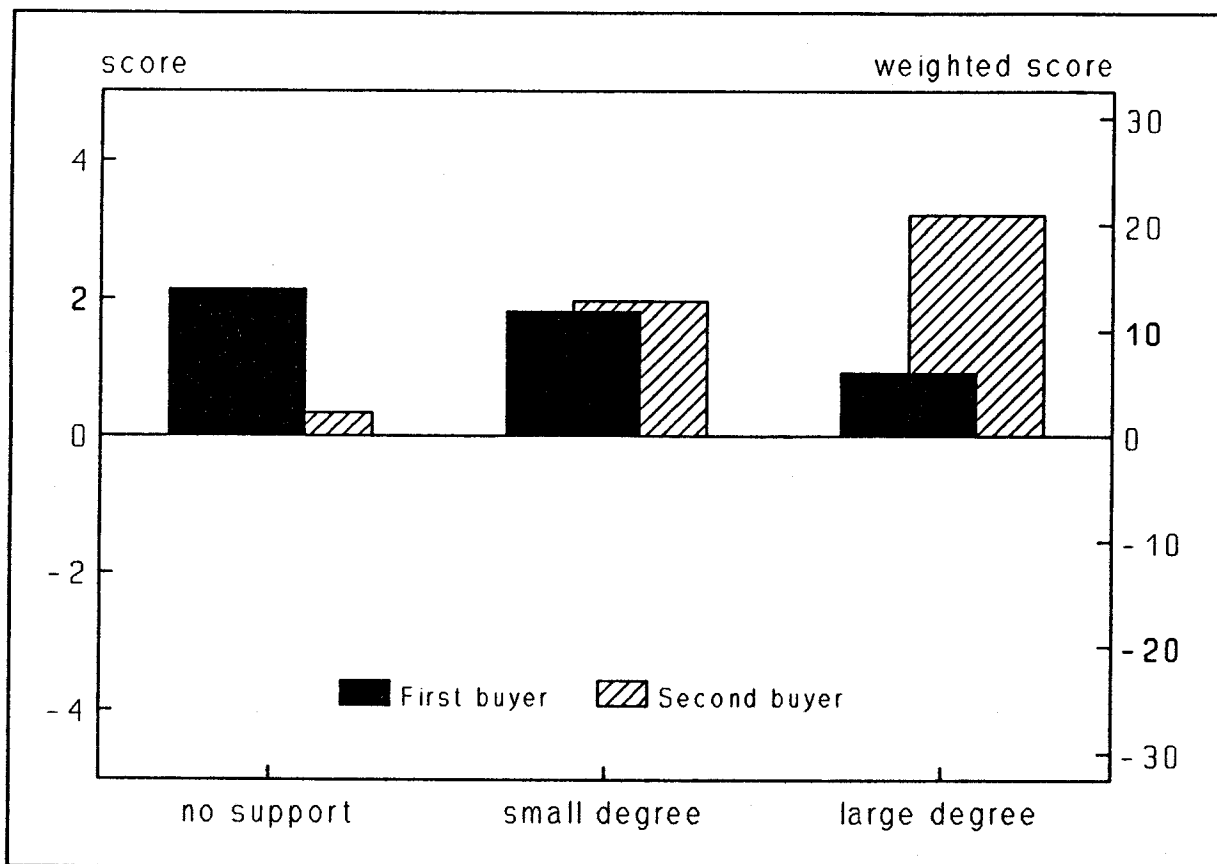


Figure 4.4 Relative desirability of marketing support for H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

marketing support	no support	small degree	large degree
first buyer	2.13	1.81	0.92
second buyer	0.34	1.96	3.21

LSD_{.05}=1.13

F=35.24***

***Significant 99 percent

Some respondents asserted that the box was the most critical component in the marketing of Pacific whiting and that the price for a box was worth the extra cost compared to lower priced alternatives, such as polybags. It was emphasized that the box should be relatively high quality, including a waxed, milk carton type cardboard stock. A number of respondents noted that packaging on the West coast is relatively good although there were good-natured disagreements over which brand had the best package design.

A few respondents emphasized that the box should truthfully represent the contents. Some brands were reported to use misleading pictures and information. For example, most products claiming to be "pan ready" hadn't been thoroughly gutted or scaled and often had fins still remaining.

Many of the different brands have boxes which list recipes and instructions on cooking techniques. Surprisingly, however, many boxes list recipes using broiling and baking techniques (i.e. slow cooking).

The weighted score for marketing support was about half of what the weighted scores were for price and texture. This demonstrates the relative importance of the different attributes; price and texture are overall more important to buyers than marketing support. However, in certain situations such as efforts to develop new markets, marketing support may be extremely important.

Payment Terms

Figure 4.5 shows the relative desirability of various payment terms toward the decision of the respondents to purchase "typical" H&G whiting product. The industry standard is net 30 days. Under terms of consignment, which are generally more beneficial to the buyer than all other terms, the buyer is not required to compensate the seller until the product is sold. Some larger and more experienced buyers, especially importers, noted that consignment terms were generally part of a bigger package including loans and other arrangements designed to spread risk. These other type of arrangements, however, are generally not used in the sale and marketing of Pacific whiting.

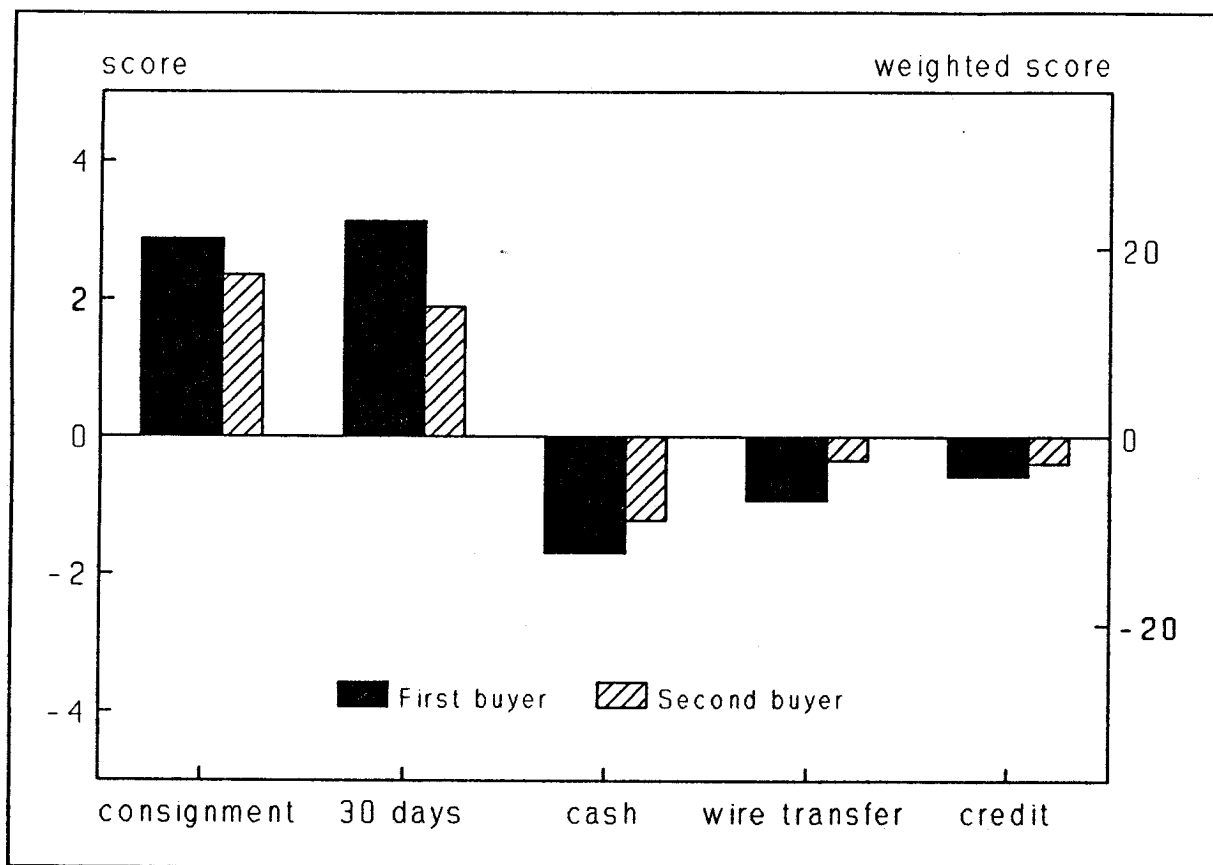


Figure 4.5 Relative desirability of alternative methods of payment for H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

payment terms	consignment	net 30 days	cash	wire transfer	credit letter
first buyer	2.87	3.13	-1.69	-0.92	-0.57
second buyer	2.35	1.89	-1.22	-0.34	-0.39

LSD_{.05}=3.12

F=2.96***

***Significant 99 percent

In general, the level of unweighted and weighted desirability of payment terms were relatively low compared to scores for previous attributes, including price and texture. There was no statistical difference between market sectors in their scoring for payment terms, although first buyers tended to score lower than secondary buyers in degree of desirability of various payment

terms. Consignment and net 30 days were preferred over the other three types of payment terms which all scored in the undesirable range. However, alternative arrangements for payments other than net 30 days are used, especially when introducing products into new markets.

Product Size

H&G whiting is marketed in a variety of sizes ranging from 4-8 oz. to 16-20 oz. The most typical sizes are 8-12 oz. and 12-16 oz. (i.e. 1 to 2 lbs. in the round). Since the majority of the product is sold in 5 pound boxes, these more popular sizes allow between 6 and 10 pieces per box.

Figure 4.6 summarizes the relative desirability of various sizes of H&G whiting. The most desirable size was 8-12 oz. (.75 to 1.15 lbs. round weight; $H\&G\ weight = 0.65 \times round\ weight$) which would be smaller than the average size Pacific whiting captured off the Oregon coast. Some respondents suggested that larger sizes were not desired because it was relatively difficult to round off the weight of boxed and bagged product near its listed weight. H&G product over one pound was generally undesirable in the U.S. and the majority of the fish captured off the Oregon coast would yield product of greater than one pound if processed using conventional methods. It is possible, however, to process any reasonable size fish into the optimal H&G size by simply measuring the length from the tail and cutting the fish to the appropriate size. The upper portion of the fish could then be filleted and put into blocks, surimi, minced, or breaded product.

Some of the H&G survey respondents noted that different regions of the country have different size preferences. The St. Louis area, for example, demands small (4-7 oz.) skinless product. Southern regions more readily accept larger product. Relatively large South American H&G product (greater than 16 oz.) is sold in Europe. It is worth emphasizing that the demand for various sizes is not homogenous and, depending on the size distribution of the new product, it may be optimal to develop more than one H&G whiting market.

Firms that use whiting to produce smoked product prefer larger sizes but the smoked market is limited to only certain urban locations (developing a smoked H&G product for Pacific whiting is probably impossible due to the effect of the protease enzymes).

The overall low unweighted and weighted scores demonstrate that product size is not a relatively important attribute. Statistically, only the 16-20 oz. size was preferred less than the other size categories. There was also no statistical difference between the market sectors regarding their size preference (this is not surprising since the fish undergoes no further processing).

Also, there was no significant differences due to other respondent characteristics such as company size, geographic location, date of survey, and years of respondent experience.

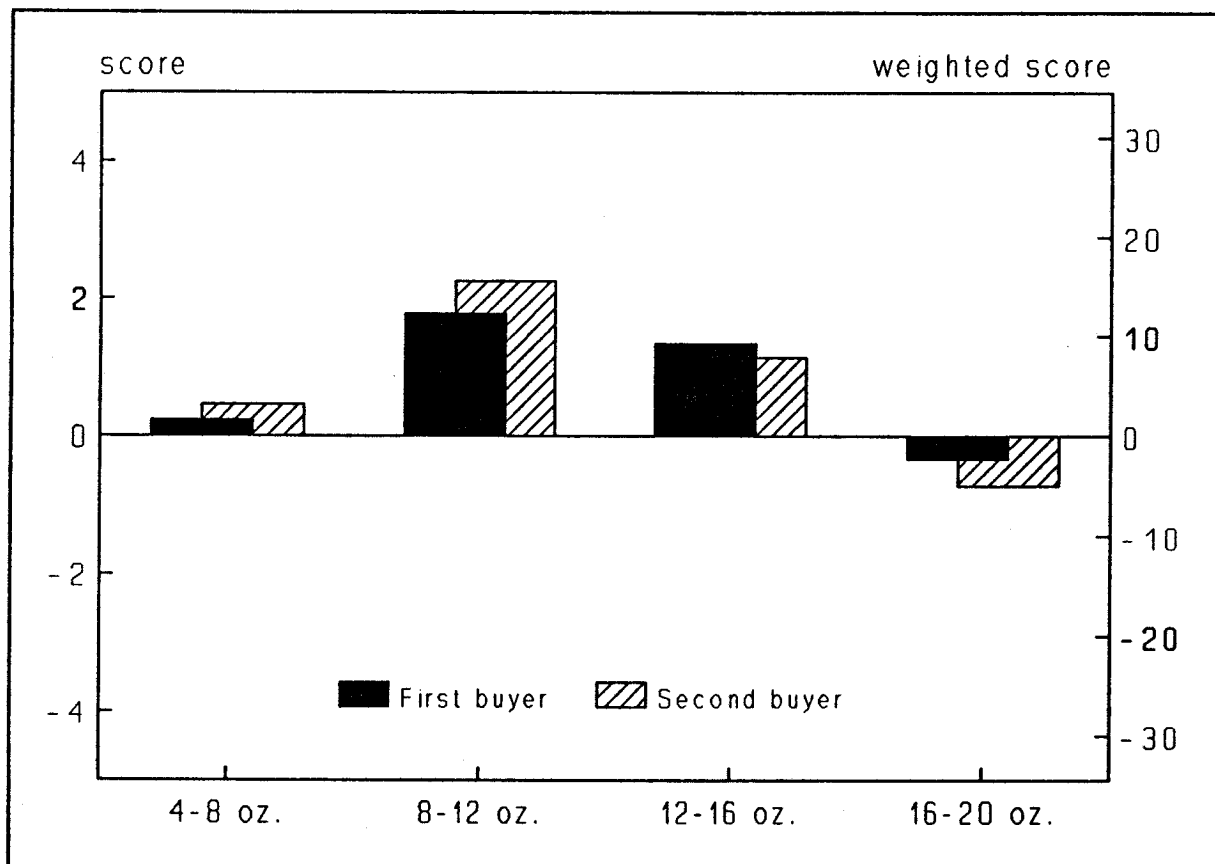


Figure 4.6 The relative desirability of various product sizes for H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product size	4-8 oz.	8-12 oz.	12-16 oz.	16-20 oz.
first buyer	0.23	1.78	1.34	-0.33
second buyer	0.46	2.25	1.13	-0.72

MSD=2.61

A regression was performed on the product size data in order to explore, in more detail, the behavior of the buying sectors relative to product size. The results of that regression are summarized as follows:

$$\text{Score} = -4.82 + 1.20*\text{Size} + 0.19*\text{Sector} - 0.05*\text{Size}^2$$

(3.04***) (2.43**) (1.76*) (1.69*)

F=27.36*** Adjusted R squared=.59 *Significant 90 percent
 ***Significant 99 percent

The analysis demonstrates that there was a significant difference between the primary and secondary sectors; the second buyer generally found smaller sizes more desirable than first buyers. There was also a statistically significant quadratic pattern to the regression; that is, middle sizes were more desired than the larger and smaller product sizes by both sectors.

Species

Within the H&G whiting market, Pacific whiting is not only one of the most dominant species, but in fact is relatively strongly desired compared to competitive products (although to some degree, these results may reflect bias on the part of the respondents, many of whom were buyers and brokers for this product).

The relative desirability of various species of whiting as a H&G product is shown in Figure 4.7. Peruvian whiting is significantly less desirable than the other species due a number of factors including poor intrinsic qualities, a "blue belly" (literally a blue discoloration of the flesh), and overall poor handling by fishermen and processors. The most desired species were Argentine whiting and Pacific whiting. This finding was surprising given the relatively poor reputation of Pacific whiting especially compared to Argentine which, in the fillet market, has a much better reputation. One possible explanation is that buyers are most accustomed to seeing Pacific whiting in the headed and gutted form in the U.S market. Alternatively, Pacific whiting may have relatively high qualities compared to the H&G forms of other species.

There was no significant difference between market sectors regarding species desirability.

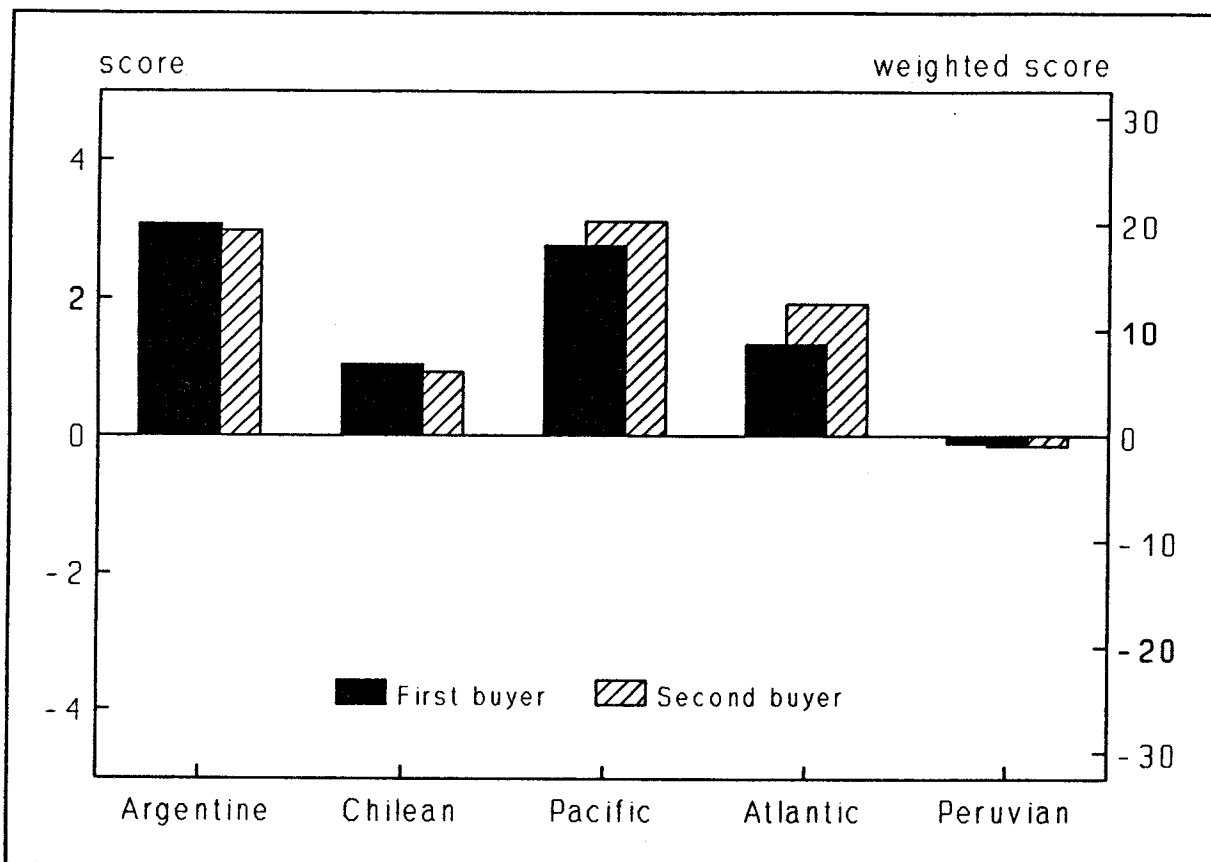


Figure 4.7 Relative desirability of alternative species of H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

species	Argentine	Chilean	Pacific	Atlantic	Peruvian
first buyer	3.07	1.03	2.76	1.33	-0.11
second buyer	2.97	0.92	3.11	1.92	-0.15

MSD_{.05}=2.11

Shelf Life

The shelf life is the length of time that frozen H&G product may be stored before losing product qualities (i.e. turning rancid, becoming soft, developing off flavors or colors). The relative desirability of alternative degrees of shelf life for H&G product is shown in Figure 4.8. As expected, the longer the product shelf life, the greater its desirability. The desirability of shelf life, however, remained positive unless shelf life is less than

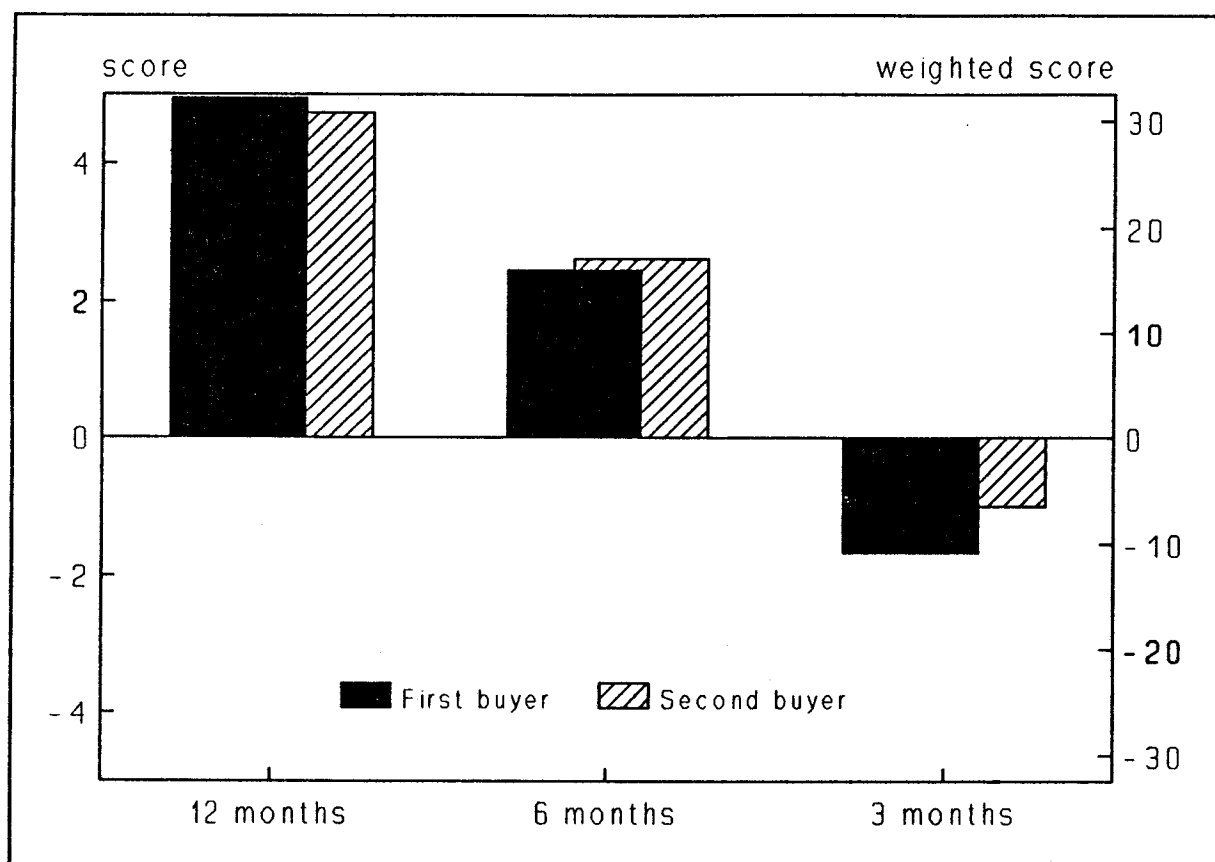


Figure 4.8 Relative desirability of H&G whiting at alternative lengths of shelf life. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

shelf life	12 month	6 month	3 month
first buyer	4.95	2.46	-1.67
second buyer	4.73	2.63	-0.99

LSD_{.05}=1.52

F=35.18***

***Significant 99 percent

approximately 4 months. Based on discussions with survey respondents, shelf life did not present a problem in the H&G form. Most of the product is not stored for long periods of time because of the high inventory costs. For example, keeping the product in inventory for six months can increase the cost for the product by 25%. In a market where "a few pennies makes all the difference", it pays to reduce costs. However, respondents who had maintained H&G Pacific whiting product in inventory for over one year reported few problems or complaints from retailers or consumers. In

addition, due to the expected low attribute qualities associated with this product, a decrease in sensory qualities inversely proportional to shelf life would not strongly impact demand relative to a decrease in sensory properties of higher priced products such as fillets and breaded portions.

Fisher's LSD test showed no statistical difference between market sectors in respect to shelf life. Twelve month shelf life was highly desirable and significantly preferred to both six and three months.

The following regression equation summarizes the impact of shelf life on the desirability of a "typical" H&G whiting product. The results are summarized as follows:

$$\text{Score} = -2.54 + 0.55 * \text{Shelf life} + 0.12 * \text{Sector} + 0.13 * \text{Shelf} * \text{Sector}$$

(-3.51***)
(2.94***)
(2.41**)
(2.59**)

F=53.27*** Adjusted R squared=.81 **Significant 95 percent
 ***Significant 99 percent

The regression demonstrates that a one month increase in shelf life increases desirability by 0.65 units. A shelf life of four and a half months for the primary sector and three and a half months for the secondary sector would leave the respondent "indifferent" to handling the product.

Flesh Color

Color is not as important for H&G as it is for other product forms such as fillets. This is due to two facts: 1) the product occupies a relatively low market position with respect to product attributes and 2) the flesh, prior to purchase, is not observed because it is covered by skin and is packed in opaque boxes.

Figure 4.9 shows the relative desirability of H&G whiting given various flesh colors ranging from white to a "slight pink tinge." Consistent with expectations, a "white" color was found to be highly desirable. For all market sectors, an "off white" color was in a positively desirable range; however, a "slight pink tinge" was significantly undesirable for downstream market sectors. Conversely, first buyers were only "indifferent" to pink colored product. This is intriguing since if the first buyer purchases a "pink" product, he could possibly have a difficult time selling to downstream sectors. One possible explanation for these different attitudes is that the primary buyers may have an alternative market

sector in which to sell a "pink" product. For example, very few of the firms interviewed were institutional buyers, which may be a market sector which handles this type of product. Alternatively, first buyers may work more closely with processors and the raw product and understand that a fair portion of product has, in fact, a pinkish tinge which does not affect the post-cooking color of the H&G product (which is relatively white).

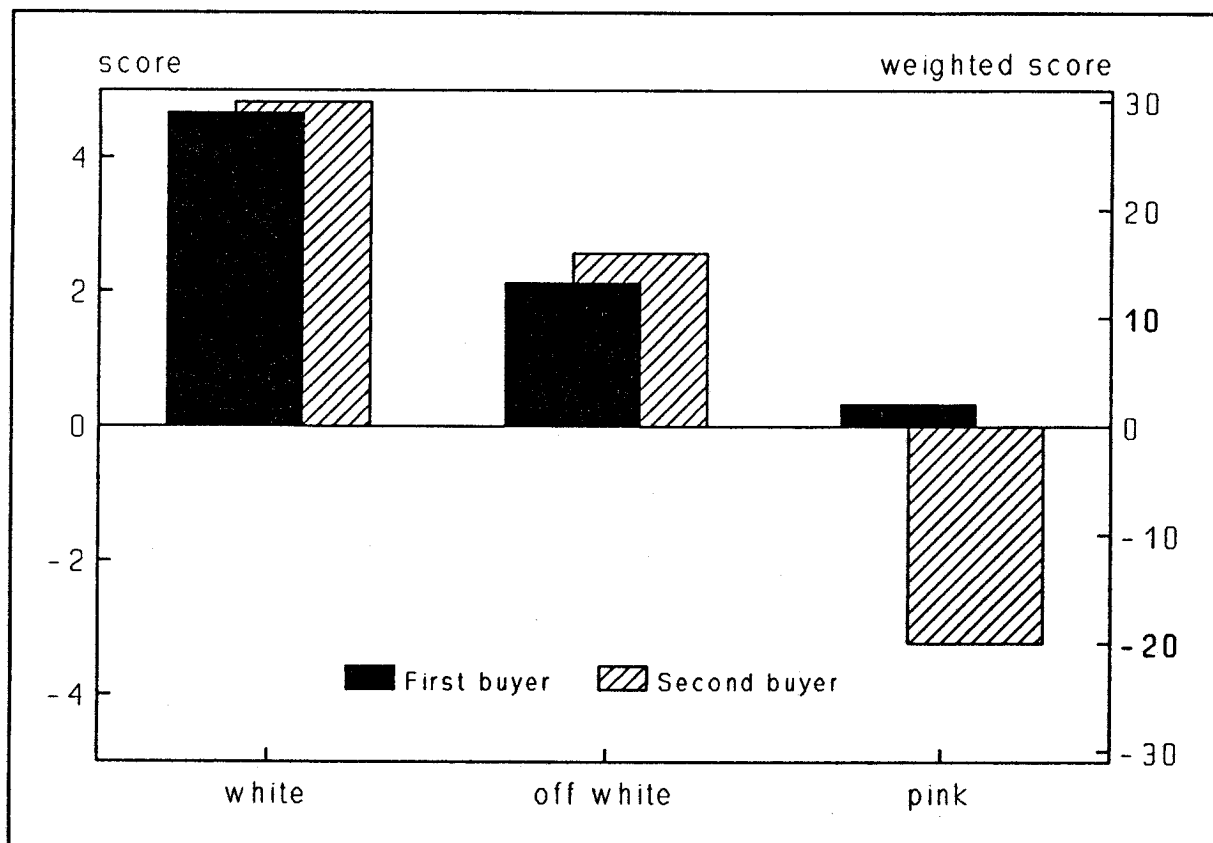


Figure 4.9 Relative desirability of H&G whiting with alternative flesh colors. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

flesh color	white	off-white	slight pink
first buyer	4.66	2.13	0.33
second buyer	4.82	2.56	-3.23

LSD_{.05}=1.52

F=34.09***

***Significant 99 percent

Product line

The range of the total product line offered by processors will vary. Some firms may specialize in whiting or offer a limited line of other products. Other firms may handle a wider variety of products. Each type of firm may have comparative advantages: the specialist can more easily standardize and control product quality; the generalist may be able to limit transaction costs of buyers looking for "one stop buying".

The relative desirability of the various ranges of product lines is demonstrated in Figure 4.10.

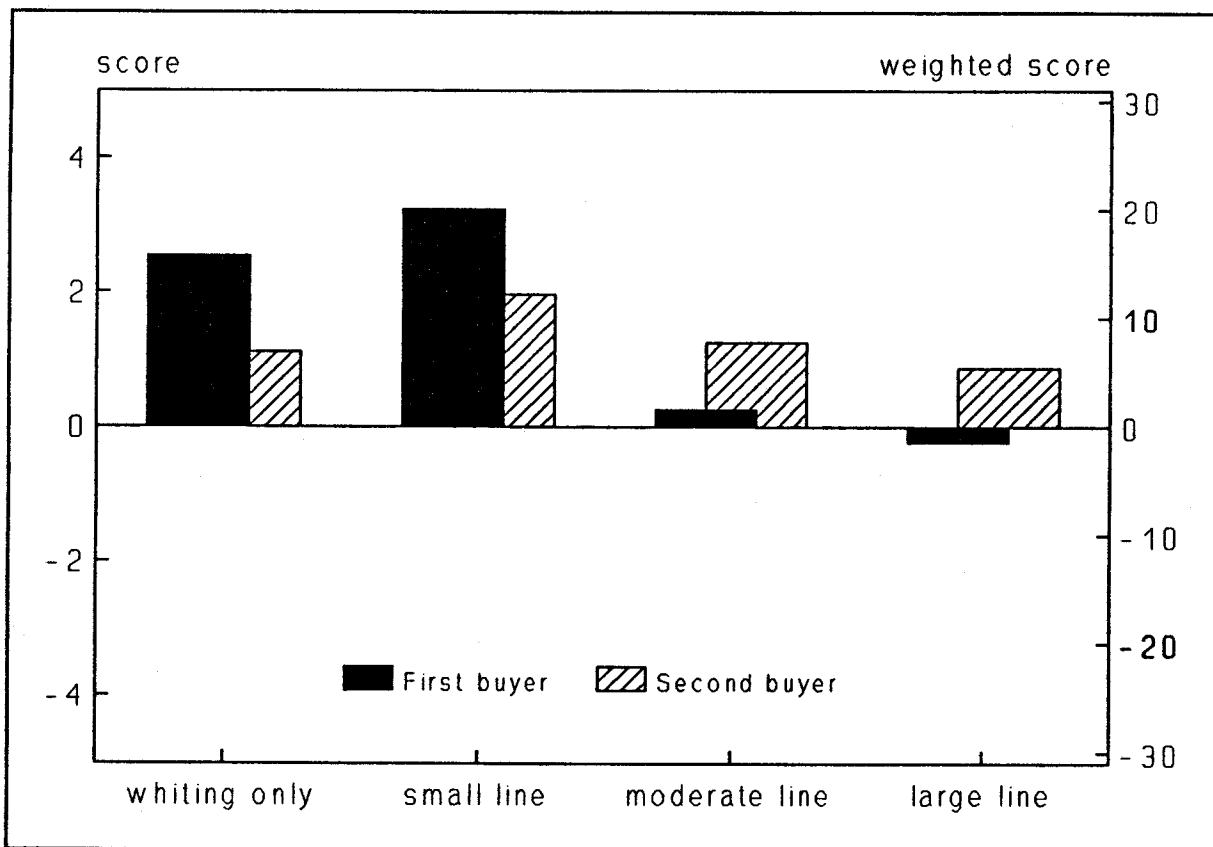


Figure 4.10 Relative desirability of alternative ranges of product line for H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product line	whiting only	small line	moderate	large line
first buyer	2.54	3.23	0.25	-0.23
second buyer	1.11	1.96	1.25	0.87

MSD_{.05}=3.82

Although there is not a statistical difference between the means at the 95% level, a firm that produces only a few products tends to be desired over firms that handle many multiple products. The greater the number of products a plant handles, the relatively less the desirability. This is especially true for first receivers. In general, however, the lack of statistical significance indicates that downstream sectors have a high degree of variation in their needs with respect to this contractual arrangement. There is no consistent significant difference resulting from the range of product line or the position of the buyer. This is not a highly important variable as indicated by the relatively low weighted scores.

Enzyme Affected Fish

As emphasized throughout this report, some percentage of Pacific whiting may have problems resulting from the presence of a parasite related protease enzyme that causes the flesh to break down and become soft if the fish is not handled properly. This is not as serious a problem for the H&G product, however, as it might be for alternative product forms.

Figure 4.11 shows the relative desirability of headed and gutted whiting products given various proportions of enzyme affected fish. Fish with no enzyme were highly preferred over affected fish, especially by second buyers. During the course of these interviews, it was found that less than half the respondents were knowledgeable about the potential problem affecting Pacific whiting. Many respondents stated that this was the first time they had heard of this particular problem and that there were few complaints about mushy texture. While this may be viewed as a compliment to the way that the Pacific Northwest whiting industry has handled the product, overall these results should be interpreted cautiously (see Chapter V for further discussion).

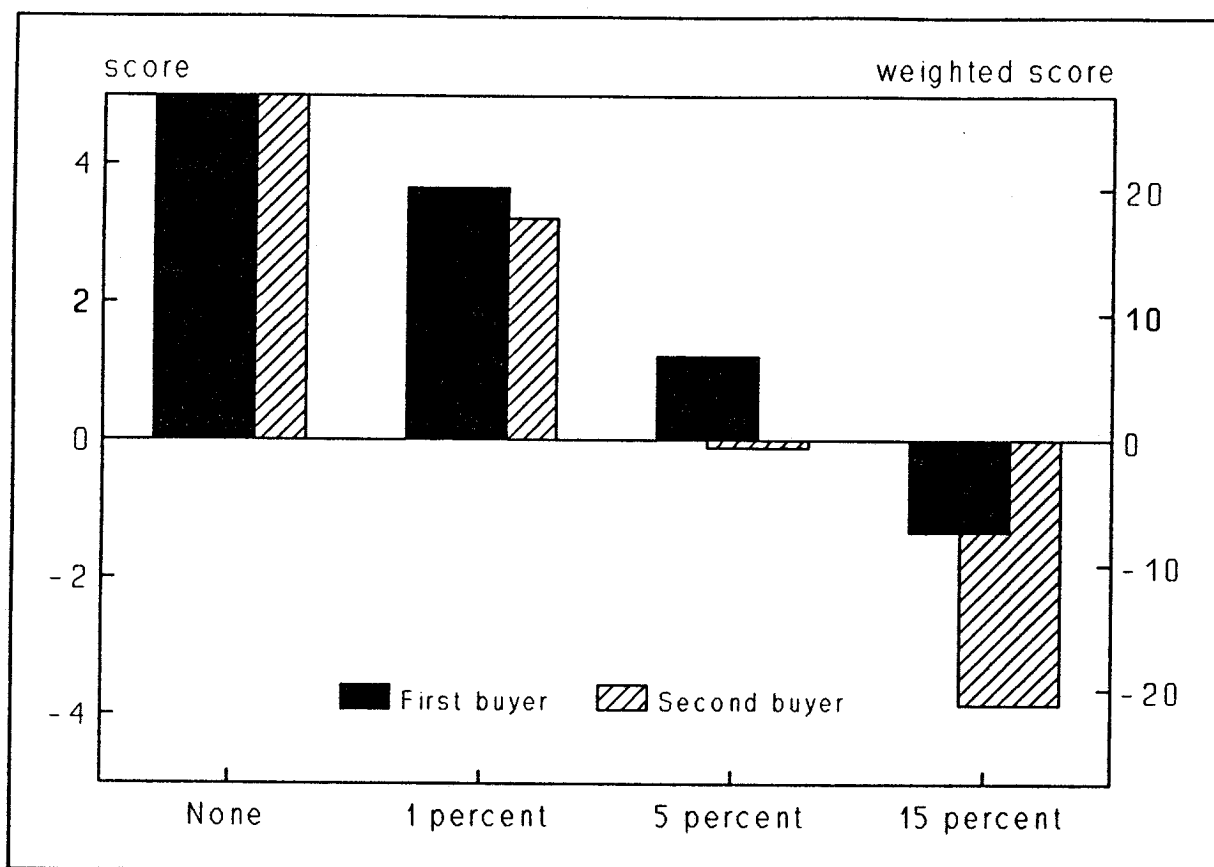


Figure 4.11 Relative desirability for H&G whitening at alternative levels of protease enzyme. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

percent enzyme	none	1 percent	5 percent	15 %
first buyer	5.00	3.65	1.21	-1.33
second buyer	5.00	3.21	-0.11	-3.86

LSD_{.05}=1.61

F=35.24***

***Significant 99 percent

Package Size

Package size is an important component in the marketing and promotional concept developed for H&G whitening. It is especially important for H&G whitening since the product is packaged primarily for retail sales; the container size needs to match the product use by consumers.

Some respondents, for example, suggested that since the product is sold primarily to the retail sector, it should be sold in package sizes that can be consumed by an average size family in one meal; or designed so that individual pieces can be easily removed with the remainder left for consumption at a later time.

The majority of H&G whiting marketed in the U.S. is sold in five pound boxes, a size consistent with the needs of low income, but large family households. This is consistent with the responses

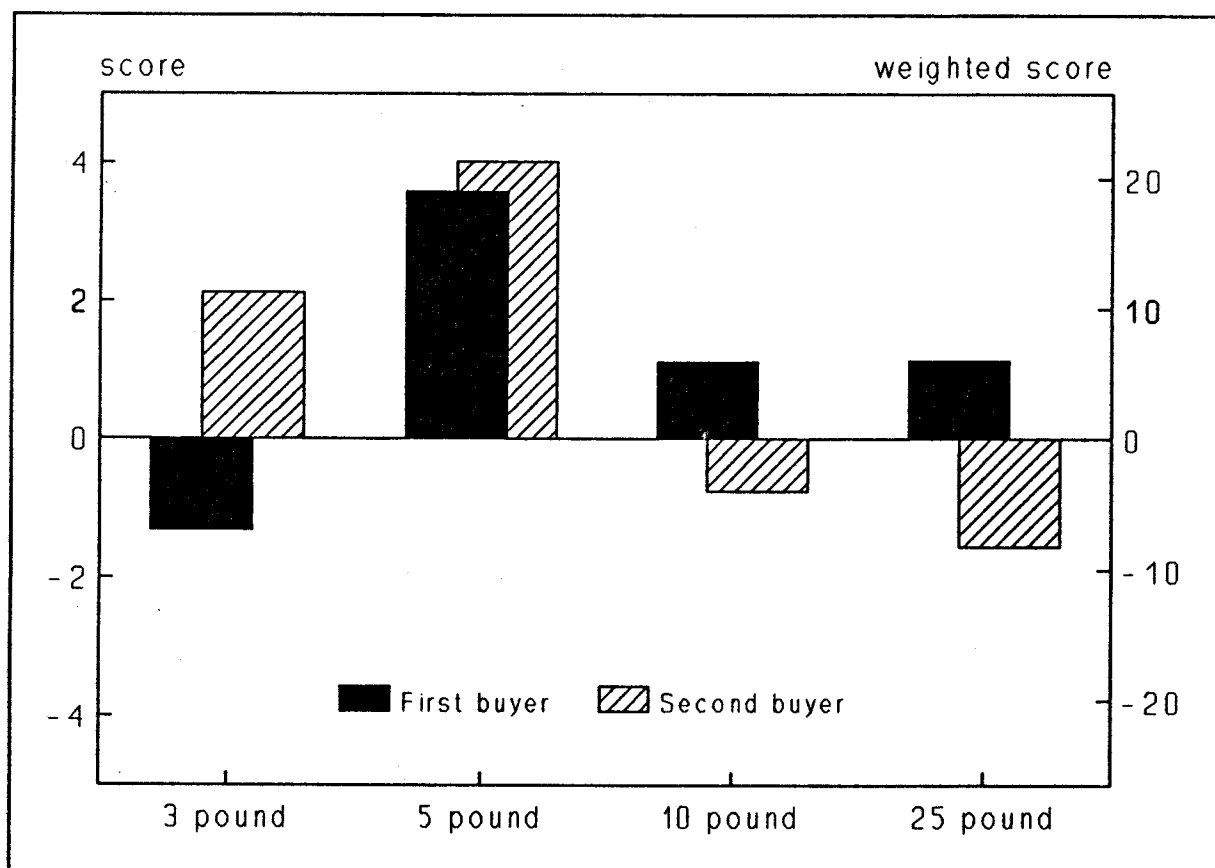


Figure 4.12 Relative desirability of alternative package sizes for H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

package size	3 pound	5 pound	10 pound	25 pound
first buyer	-1.32	3.58	1.12	1.13
second buyer	2.12	4.02	-0.76	-1.56

MSD_{.05}=3.47

of the H&G firms which overall preferred the five pound box size (Figure 4.12).

One profit opportunity for first buyers is to sell large blocks directly to institutional users which then break up large blocks into smaller packaged blocks for redistribution to retail. While there was a large degree of variation among respondents, this analysis demonstrates an important trend in which downstream sectors desire relatively smaller size packages than upstream sectors. This finding is consistent with expectations; the closer one gets to the retail sector, the greater the desirability for a smaller package size.

Product Uniformity

Product uniformity is generally regarded as the percentage of product which falls within the bounds explicitly specified in the contractual arrangement (or meets standard characteristics of that particular market). Figure 4.13 demonstrates the relative desirability for various degrees of uniformity in the H&G product; the greater the uniformity of product, the greater the degree of desirability. While products with 95 percent uniformity were highly desired, product as low as 70 percent uniformity were still positively desired. A number of respondents claimed that the scale used for product uniformity was too high, and that given the definition used in the survey, most products in the business would average, at best, 70 to 80 percent uniformity (this is the overall industry standard). Industry respondents primarily thought of product uniformity in terms of size (e.g., 80% of the boxed H & G product would fall between 8-12 oz.).

There was no significant difference in desirability between first and second buyers, although secondary buyers tended to desire higher levels of uniformity. In general first buyers need to meet the demands of the secondary buyers, and if the downstream sectors demand high uniformity, and assuming an efficient distribution process, then upstream sectors should demand high uniformity as well.

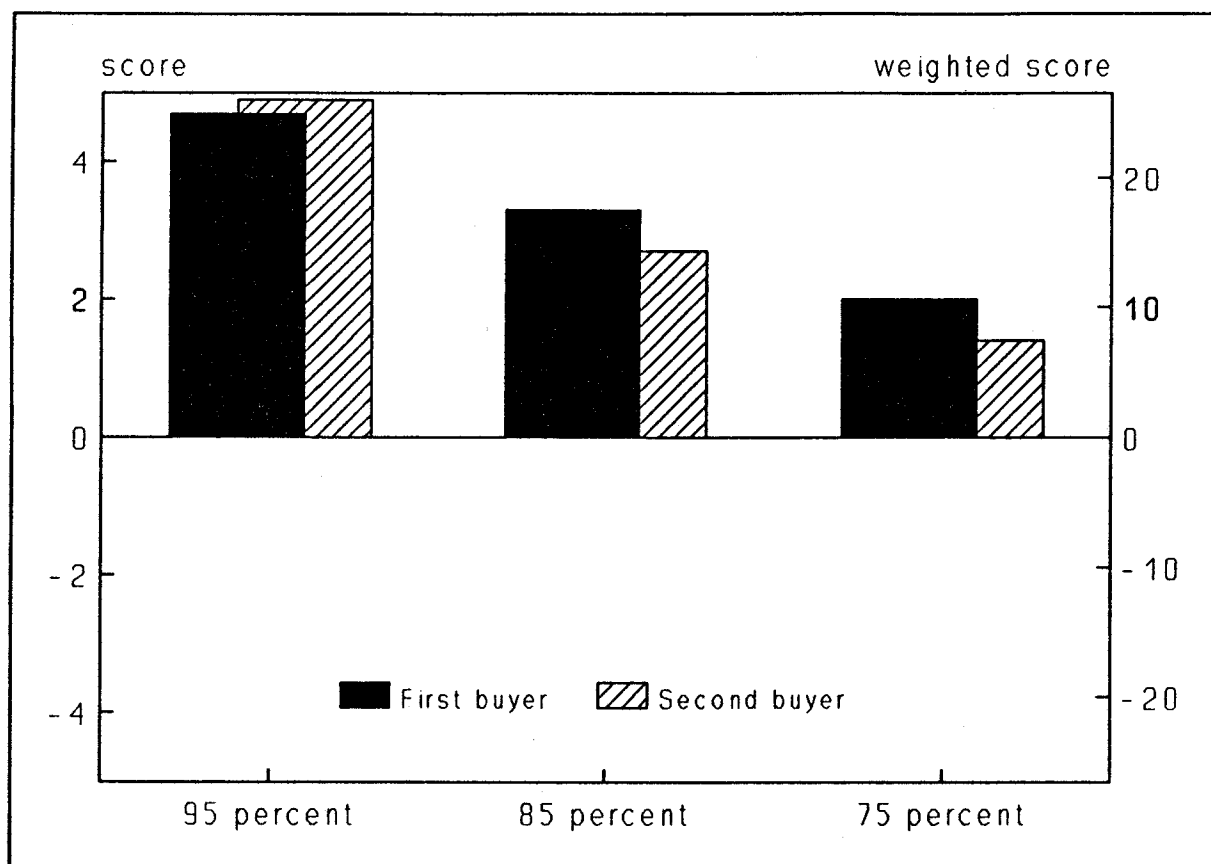


Figure 4.13 Relative desirability of alternative levels of product uniformity for H&G whiting. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product uniformity	95% uniform	85% uniform	70% uniform
first buyer	4.69	3.27	1.96
second buyer	4.9	2.68	1.43

LSD_{.05}=.90

F=26.72***

***Significant 99 percent

Supply Availability

Supply availability is defined as the number of months per year that a processor can offer a product for sale; a concept related to biological availability, regulatory controls, and processor inventory management. Figure 4.14 shows the relative desirability of alternative periods of available supply. On

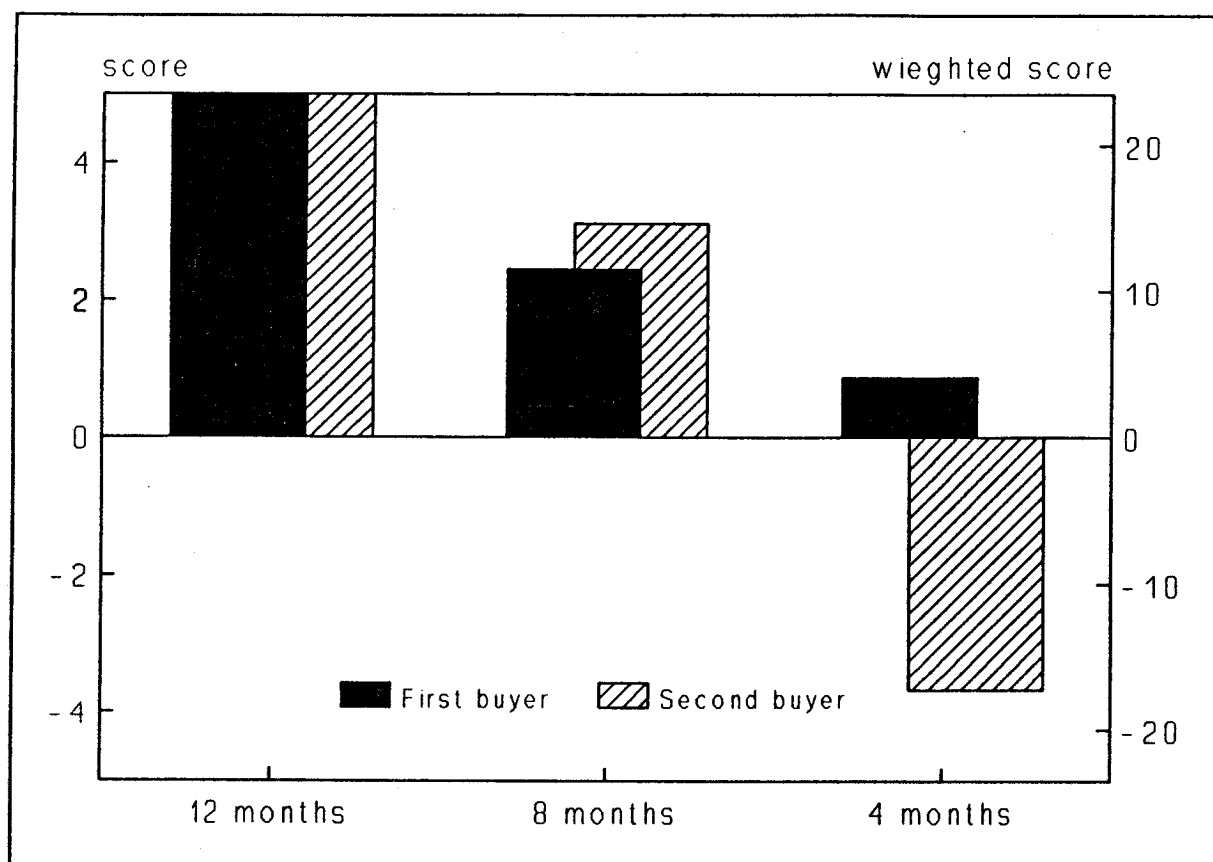


Figure 4.14 Relative desirability for H&G whitening at alternative lengths of supply availability. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

supply availability	12 months	8 months	4 months
first buyer	5	2.45	0.87
second buyer	5	3.12	-3.67

LSD_{.05}=.79

F=56.78***

***Significant 99 percent

average, the greater the period of availability, the more desirable the product. One important reason the availability of supply is important is that a consistent amount of product may be needed throughout the year. If the product is available for only a short annual season or period, the product must be kept in inventory, which increases costs and reduces margins.

In general, the product should be available for at least four months per year. There were some respondents, however, that preferred to purchase seafood products which were available for only a limited time. With few exceptions, these individuals were speculators employed by firms with large cold storage facilities. They would purchase at times of excess supply and low prices, and then sell at a later time when prices had increased.

Limited product availability, high cold storage costs, and the increased demand for low cost fish products during the Lenten season cause the retail prices for whiting to be higher during February and March. Pacific whiting, however, is harvested from April-October. In order to exploit this seasonal demand shift, it is necessary to keep the product in cold storage for at least 6-8 months given traditional harvest seasons for Pacific whiting. The increased cost incurred by keeping the product in inventory may be relatively high compared to the corresponding price increase during the winter season. Inventory costs can eat up margins especially when a large portion of the product is bones, skin, and fins.

Figure 4.14 also demonstrates that there is a significant difference in desirability between market sectors. Downstream sectors find short shelf life particularly undesirable. This is consistent with speculative markets, i.e. that first buyers distribute supplies and product from alternative sources in order to meet the demand of downstream sectors desiring continuous supplies.

The following regression equation illustrates the impact of season length and sector on desirability of supply availability of H&G whiting:

$$\text{Score} = -2.12 + 0.91*\text{Supply} + 0.24*\text{Sector} - 0.59*\text{Supply}*\text{Sector}$$

(-3.24***)
(2.63***)
(1.27)
(2.26**)

F=26.23*** Adjusted R squared=.63 **Significant 95 percent
 ***Significant 99 percent

The regression equation demonstrates that a supply availability of two months for the primary sector and six months for the secondary sector would leave the respondent "indifferent" to handling the product. The significantly negative coefficient on supply*sector indicates that the second buyer is more sensitive to shelf life than first buyers.

Typical H&G Whiting Characteristics

The discussion through most of this chapter has focused on the importance of alternative product attributes and contractual arrangements and their effect on the marketing and profit opportunities for H&G whiting. In order to place this discussion in context, one must understand the product characteristics which most firms typically experience. The following discussion centers on the typical products and typical product attributes that the responding firms characterize the experience of the firms which were interviewed. Readers should be warned that these statistics reflect the choices and behavior of the firms which were surveyed and may not necessarily be the consistent with the attitudes of all.

Price

The prices of H&G whiting which is typically handled by responding firms are shown in Figure 4.15. As expected, most of the product was purchased in the \$0.35-\$0.45 range. None of the firms interviewed typically purchase H&G whiting at a price greater than \$0.55, including Argentine H&G. Note that this data was collected during late Summer, Fall, and early Winter, 1990 and prices today may vary.

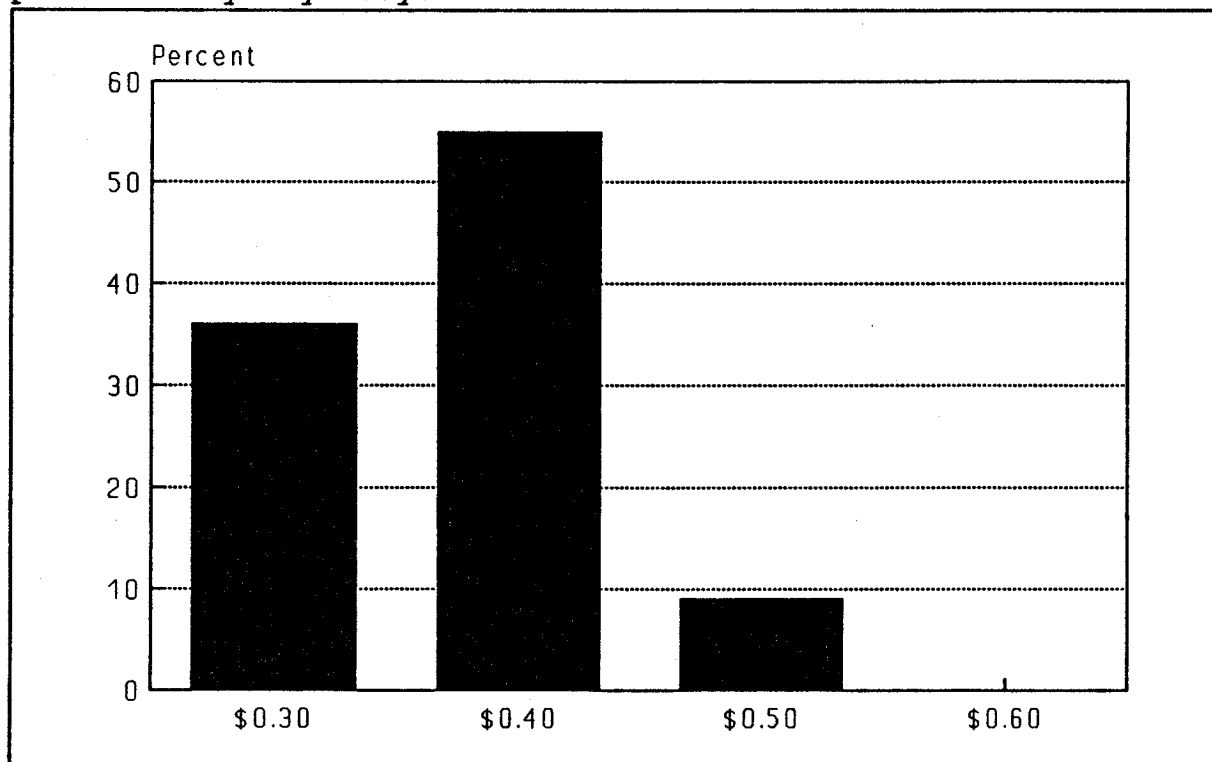


Figure 4.15 The percentage of firms handling H&G product at alternative prices.

Product Size

The typical size of H&G whiting product handled by responding H&G firms is shown in Figure 4.16. The distribution is consistent with size desirability experienced in Figure 4.6. None of the product which is typically handled is larger than 16 oz. (equivalent to approximately 24 oz. in the round). This issue is important in the marketing of H&G Pacific whiting. Pacific whiting is a relatively large whiting species that could, on average, yield large (up to two pounds) product. It may not only be difficult to find profitable market opportunities for larger H&G products, but the large variability in age class composition for whiting suggests that it may not always be possible for a single processor to supply consistent sized product from year to year.

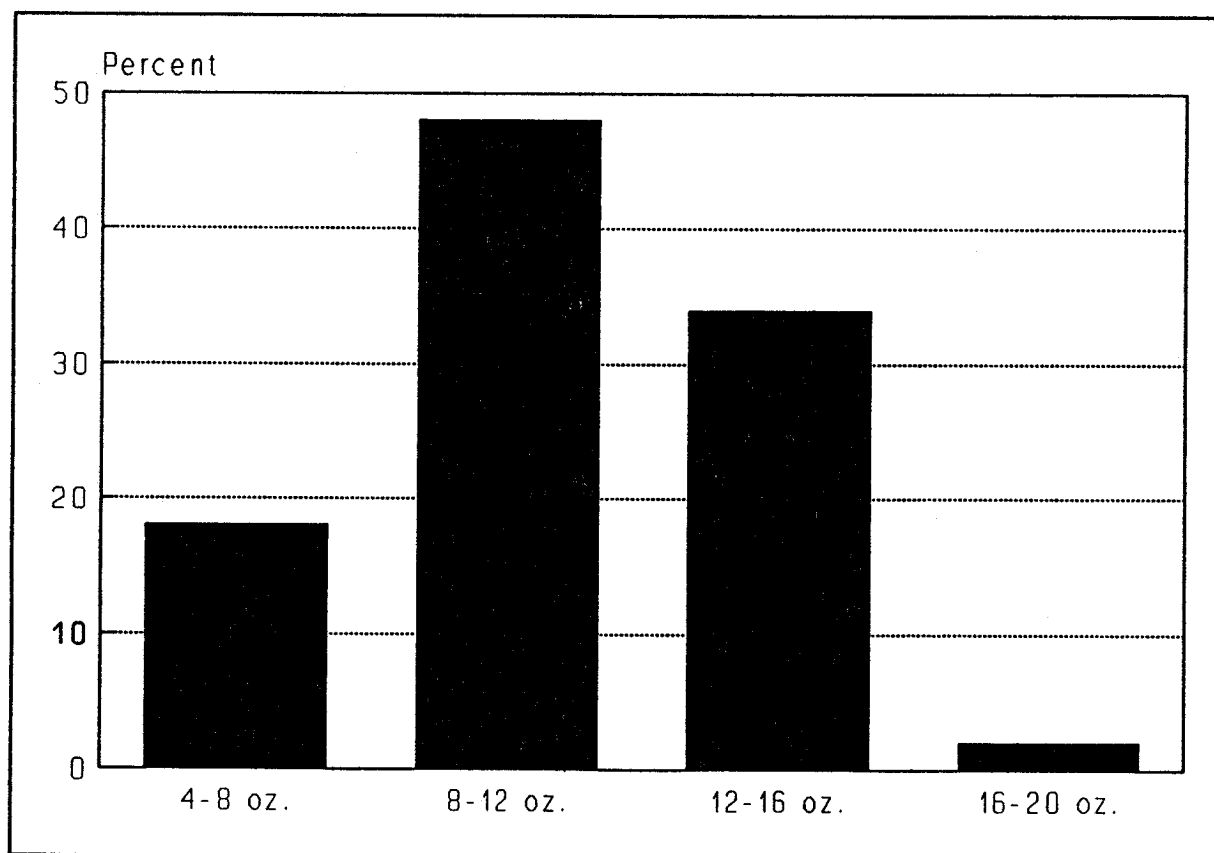


Figure 4.16 The percentage of firms handling alternative sizes of H&G product.

Species

The typical species of whiting handled by responding H&G firms is shown in figure 4.17. Not surprisingly, the largest proportion of H&G product is Pacific whiting. This is relatively important since attributes are reflections of the typical species handled by the responding firms.

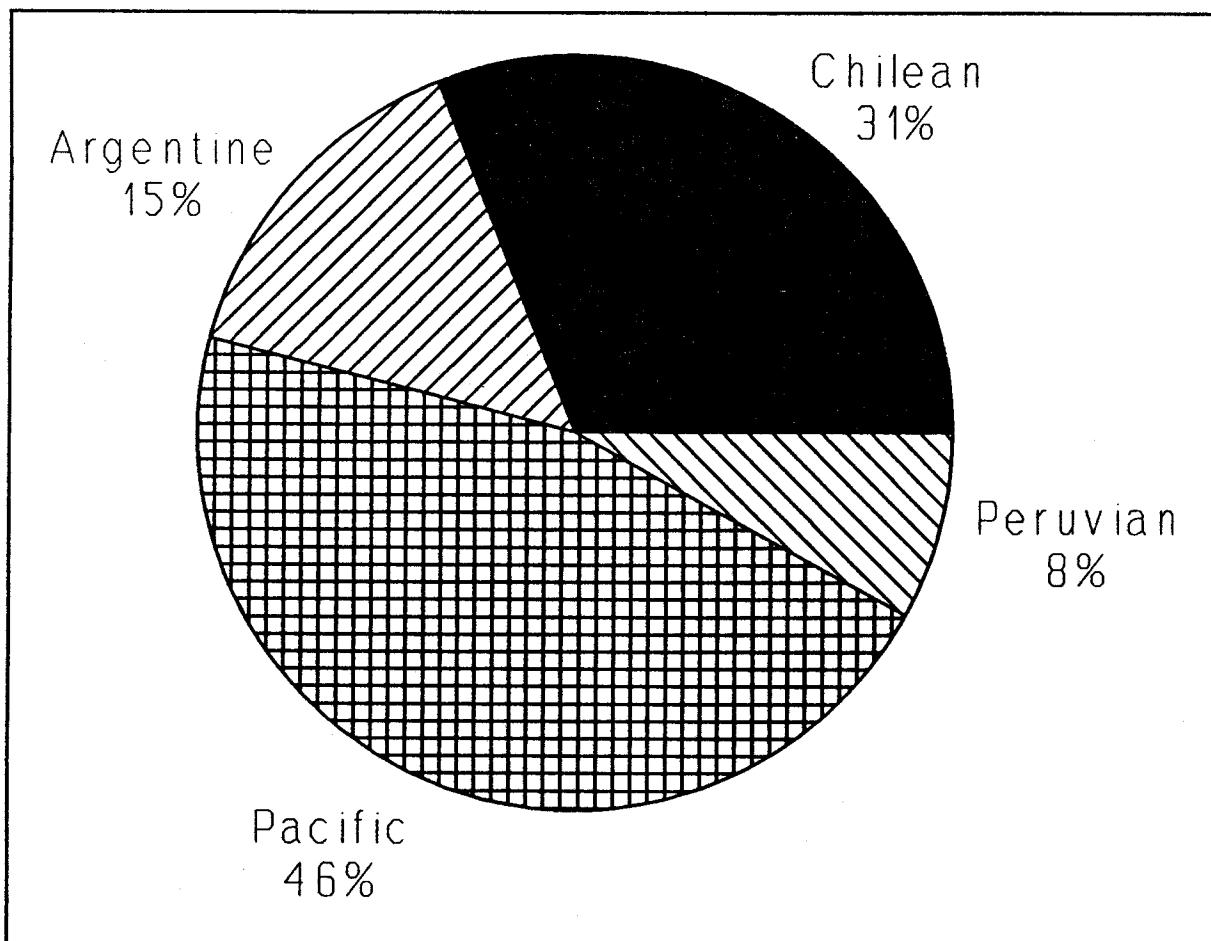


Figure 4.17 The percentage of firms handling alternative species of H&G whiting.

Texture

Figure 4.18 demonstrates the typical texture of H&G whiting. Most of the responding firms handle product which they believe is moderate in texture. The results of this graph were analyzed to determine if firms which handled different species rated the texture differently. The analysis demonstrated that there is no significant difference between firms which handled various species of H&G whiting.

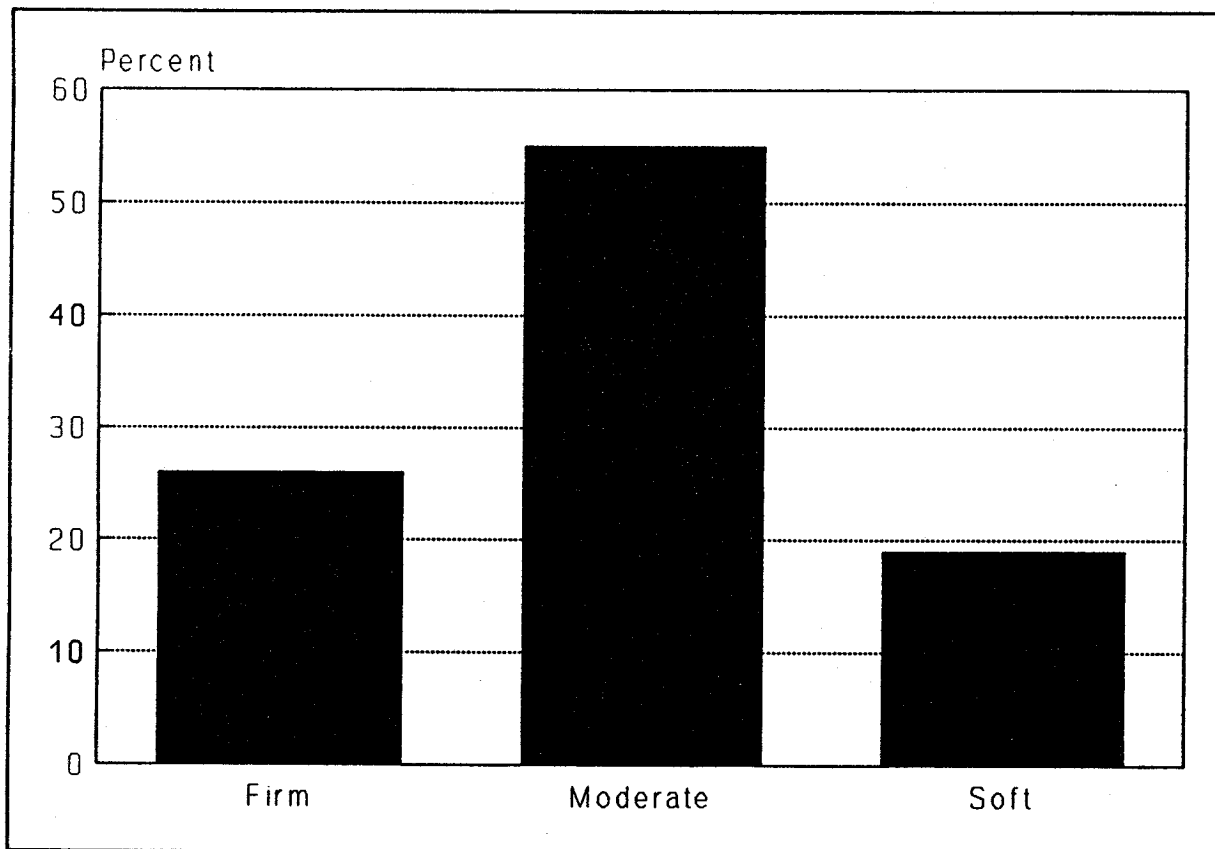


Figure 4.18 The percentage of firms handling H&G product at alternative levels of texture.

Shelf Life

The shelf life of the typical H&G whiting product handled by responding firms is demonstrated in Figure 4.19. Ninety percent of the surveyed firms believe that the typical product which they handle has a shelf life of at least nine months, and 30 percent of firms believe that shelf life is at least 15 months. This is consistent with the analysis of shelf life summarized in Figure 4.8 which showed that shelf life is generally not perceived as a problem for most H&G whiting products.

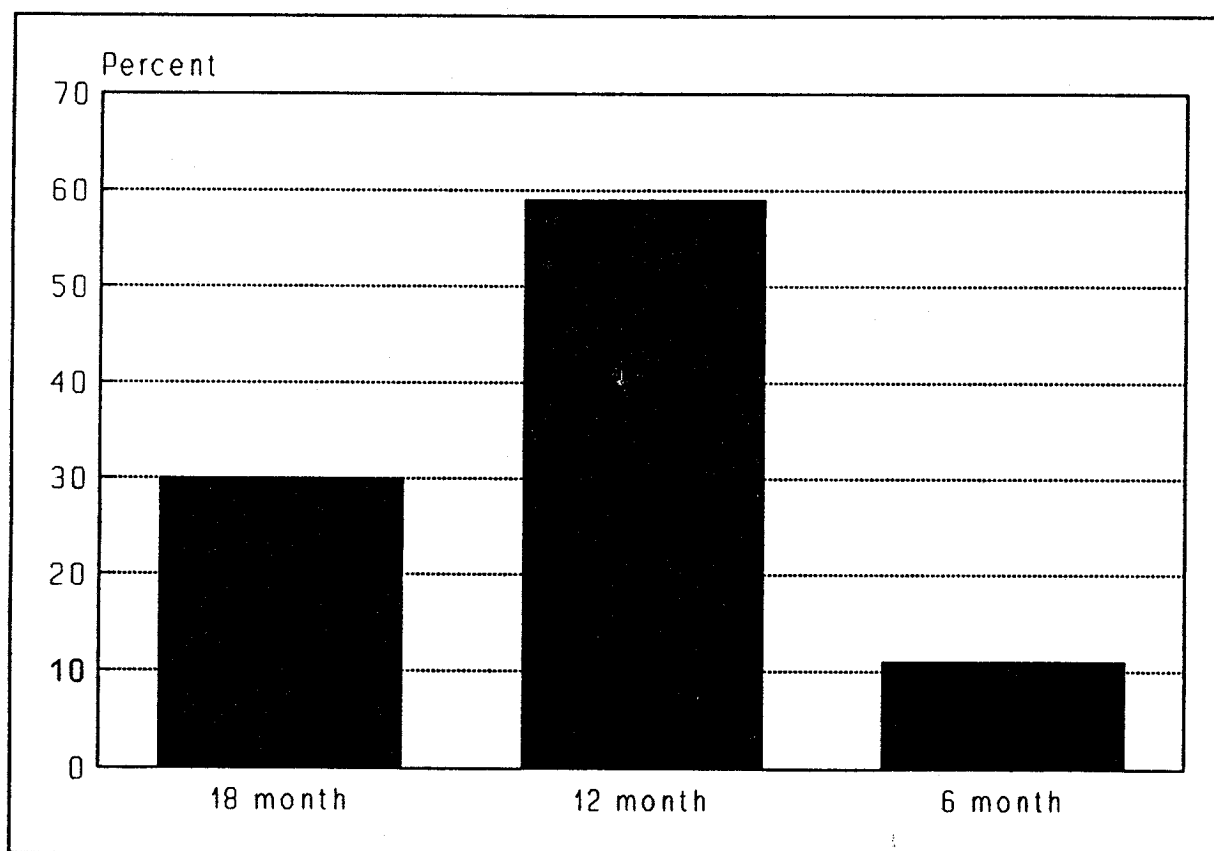


Figure 4.19 The percentage of firms handling H&G product with alternative lengths of shelf life.

Flesh Color

Figure 4.20 shows the flesh color for H&G product which responding firms believe is typical of their predominant H&G product. Surprisingly, almost 50 percent of respondents stated the typical product had a white color. This characterization can be compared with the results in Figure 5.22 (Chapter V) which shows the more expected result; that is, that most firms which handle fillets believe the product is off-white. Since H&G whiting is sold with the skin and in opaque boxes, H&G firms may not have a very objective perspective regarding this particular attribute. In addition, evaluation of color may be relative: for example, H&G firms may use a different product for the color comparison (e.g. fillet firms may use Orange Roughy as a comparison, H&G firms may use Argentine whiting).

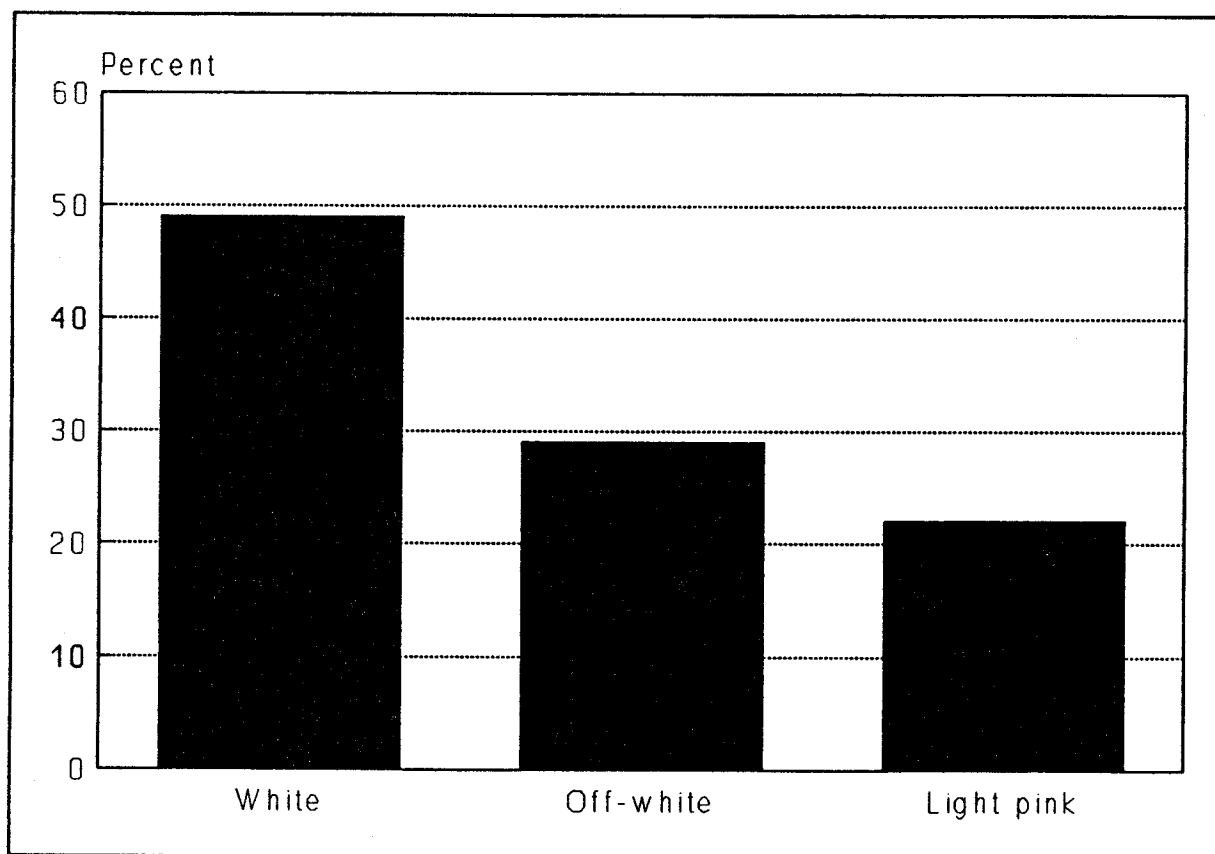


Figure 4.20 The percentage of firms handling H&G product of various colors.

Package Size

The typical package size for H&G whiting is shown in Figure 4.21. Sixty percent of firms claimed that their typical product is sold in 5 pound boxes. A significant portion of the typical product, however, is also sold in three and 10 pound packages. Refer to the "Package Size" section earlier in this chapter for a more detailed discussion regarding package size.

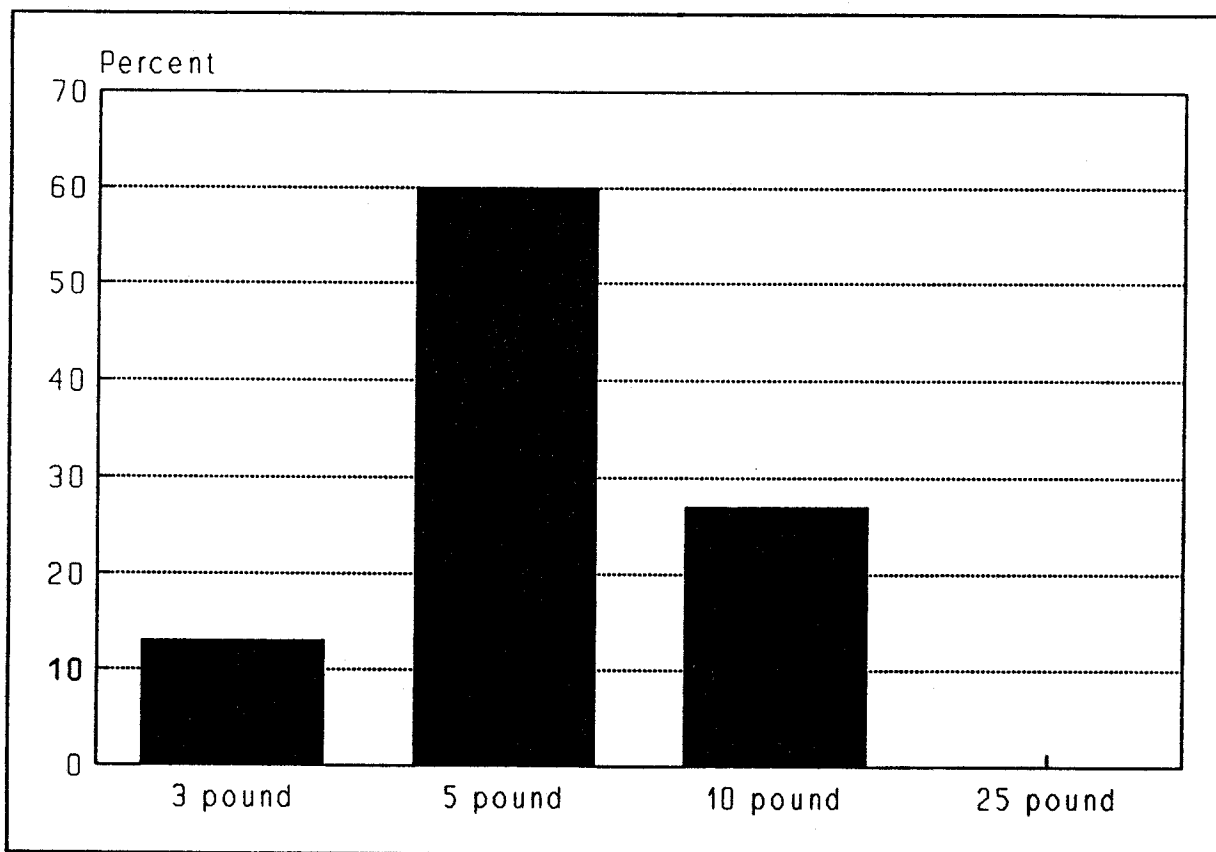


Figure 4.21 The percentage of firms handling alternative sizes of H&G whiting.

Supply Availability

The supply availability of typical H&G product handled by responding firms is demonstrated in Figure 4.22. Somewhat surprisingly, most of the H&G product is available for at least 8 months during the year. The results of this graph were analyzed to determine if the typical supply availability for primary firms was different than typical supply for firms of the secondary market sector. The analysis resulted in no significant difference between primary and secondary firms which handle H&G whiting products. The implication is that supply availability is thought of in terms other than length of capture season, and includes availability of product from inventory and alternative sources of similar products.

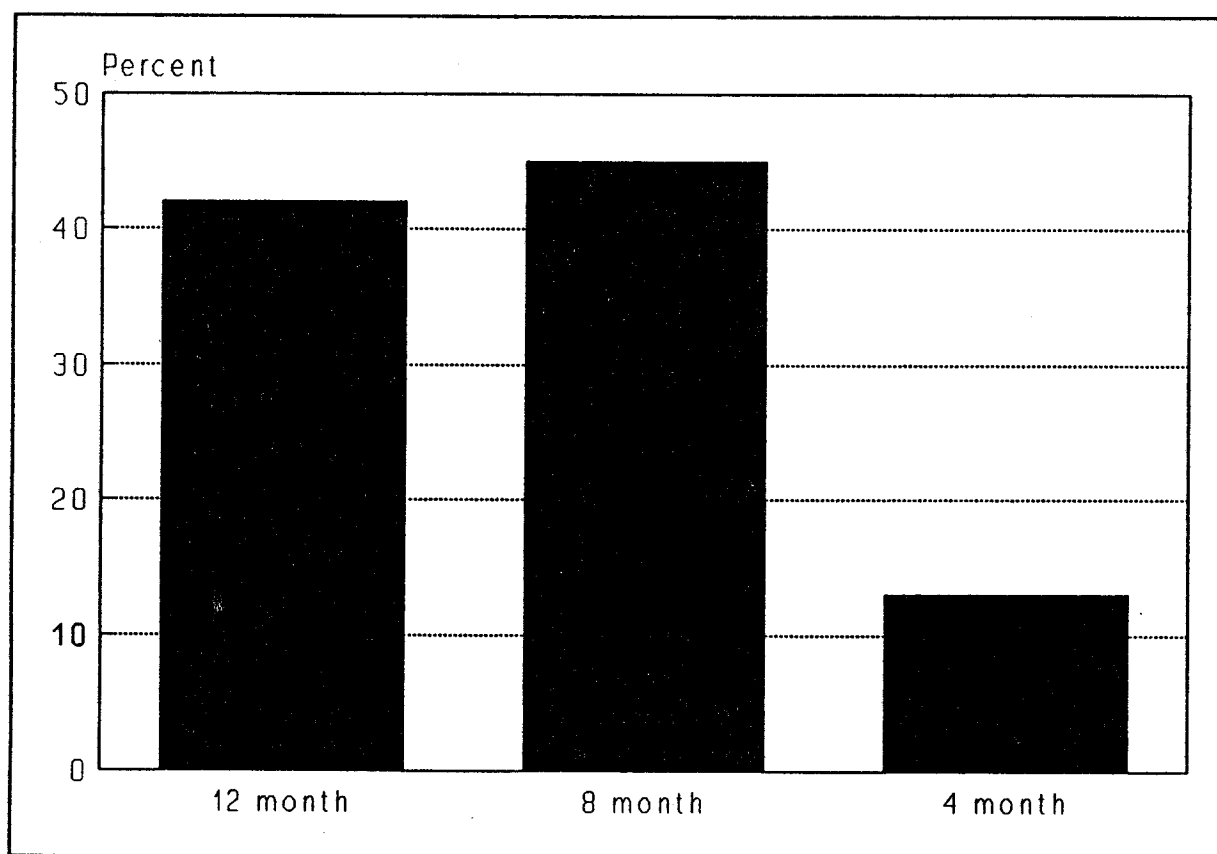


Figure 4.22 The percentage of firms handling H&G product at alternative lengths of supply availability.

Product Uniformity

Most of the responding firms which handle H&G whiting handle a product which typically has a product uniformity greater than 80 percent as shown in Figure 4.23. These subjective descriptions, however, may be misleading because of the difficulty in determining product uniformity due to the nature of the H&G market and the packaging and cooking techniques. Overall, 75 percent of firms receive product within generally acceptable bounds of product consistency (i.e. 80% consistent).

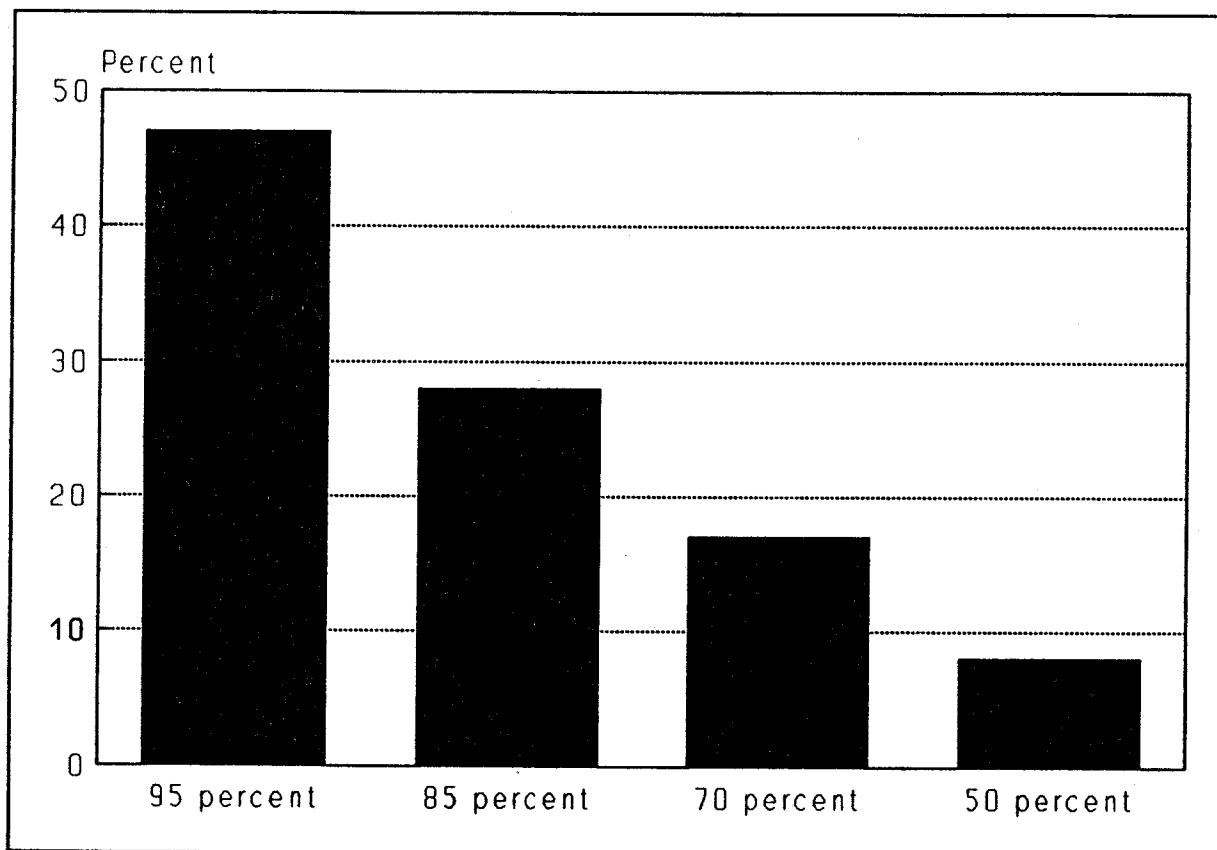


Figure 4.23 The percentage of firms handling H&G product with alternative degrees of product uniformity.

Range of Product Line

Figure 4.24 summarizes the range of product lines typical of firms which handle H&G whiting product. Most of the product is purchased from firms that either specialize in whiting or offer whiting separate from other products. A significant portion of this product is purchased from Northern California and South America processing plants which specialize in whiting.

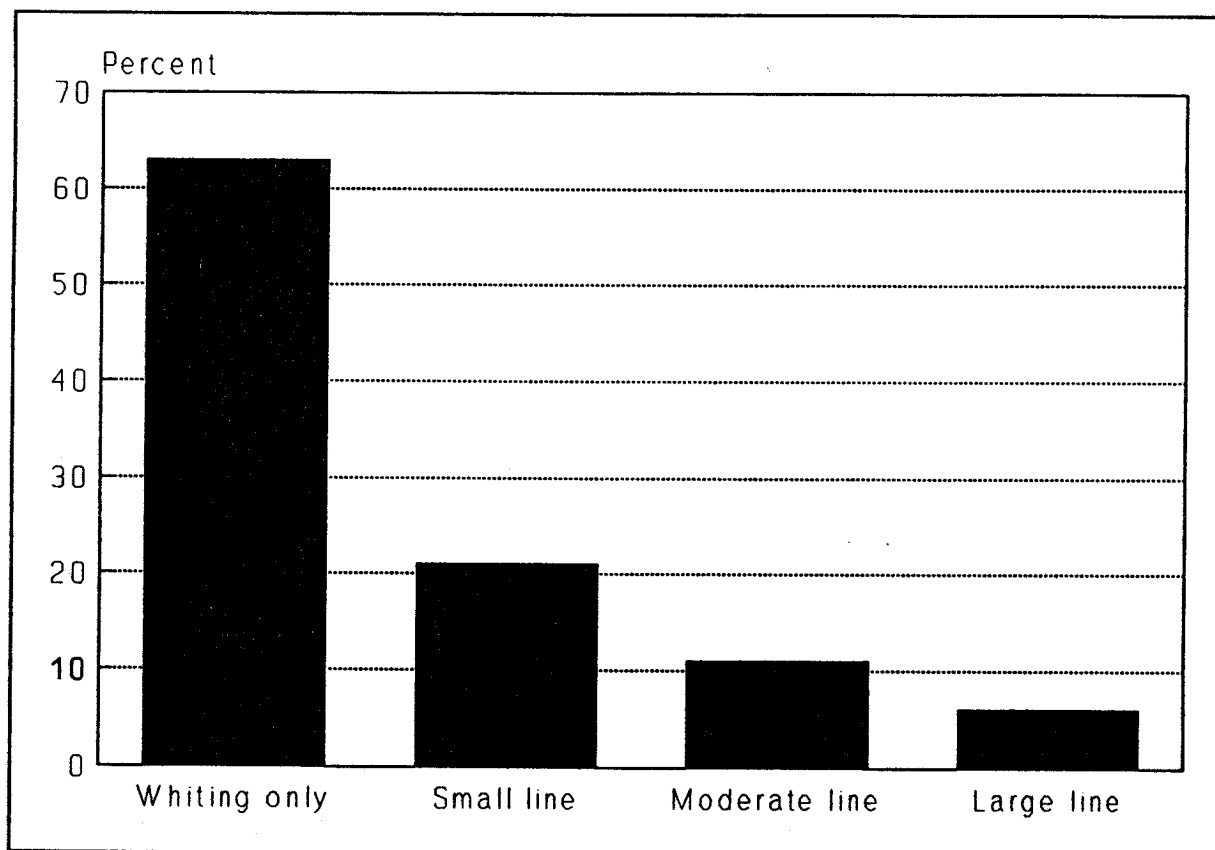


Figure 4.24 The percentage of firms handling alternative ranges of product lines.

Marketing Support

Most of the H&G whiting is purchased from firms which supply a significant degree of marketing support (primarily as box design and recipes) as demonstrated in Figure 4.25. H&G whiting is primarily considered a commodity seafood product, yet a large proportion is sold at retail. The result is that more is done in terms of package design and advertising in order to differentiate products and encourage brand loyalty.

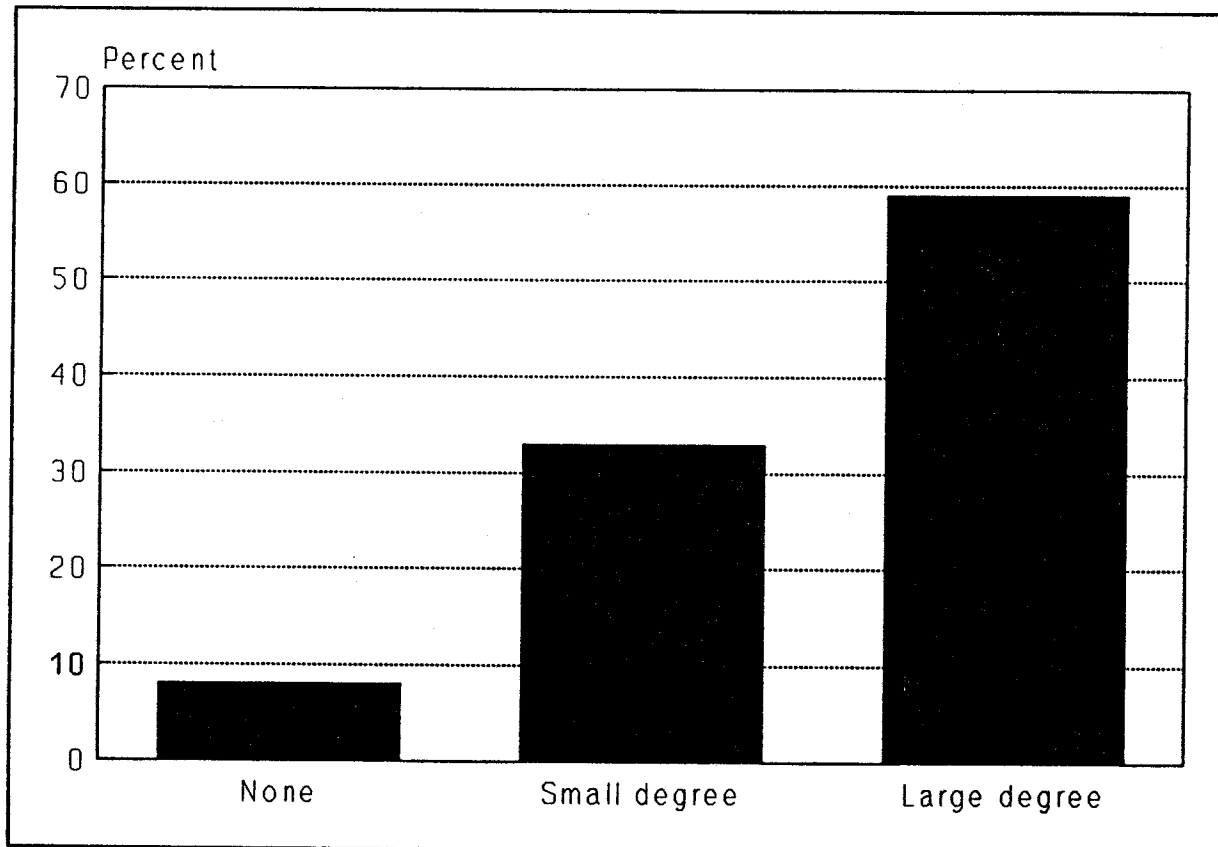


Figure 4.25 The percentage of firms desiring alternative levels of marketing support.

Characteristics of Typical Species

The weighted scores developed for the self-explicated utility analysis were used to collectively compare the "typical" and the "ideal" H&G products (Table 4.4). The mean weighted values (i.e., the "importance" score of the attribute multiplied by the "desirability" score) were assigned to various product attributes for both the most ideal product and the typical products given the alternative choices of attribute levels. The total scores for different combinations of product attributes may be used to make relative comparisons of the desirability and demand for the different whiting H&G products.

Table 4.4. Typical and ideal H&G attribute characteristics.

Attribute	<u>Argentine</u>		<u>Chilean</u>		<u>Pacific</u>		<u>Peruvian</u>		<u>Ideal</u>	
	Typical charac.	Score	Typical charac.	Score	Typical charac.	Score	Typical charac.	Score	charac.	Score
Price	\$0.40/lb.	7	\$0.40/lb.	7	\$0.40/lb.	7	\$0.40/lb.	7	\$0.30/lb.	48
Product size	8-12 oz.	13	8-12 oz.	13	8-12 oz.	13	8-12 oz.	13	8-12 oz.	13
Texture	Firm	39	Firm	39	Firm	39	Moderate	18	Firm	39
Shelf life	12 months	32	12 months	32	12 months	32	6 months	15	12 months	32
Flesh color	White	29	Off-white	13	White	29	White	29	White	29
Enzyme percent	None	28	None	28	None	28	5 percent	5	None	28
Product range	Whit. only	20	Whit. only	20	Whit. only	20	Whit. only	20	Whit. only	20
Marketing supt.	Large	17	Small	14	Large	17	Small	14	Large	17
Payment terms	Net 30 days	17	Net 30 days	17	Net 30 days	17	Net 30 days	17	Net 30	17
Package size	5 pound	19	5 pound	19	5 pound	19	5 pound	19	5 pound	19
Supply avail.	12 months	23	8 months	13	8 months	13	8 months	13	12 months	23
Uniformity	95 percent	25	85 percent	15	85 percent	15	85 percent	15	95 percent	25
Total Score	269		230		249		185		310	

Argentine whiting scored highest at 269 out of a possible 310 points. Pacific whiting, however, scored second with 230 points, only 20 points below Argentine. Peruvian whiting scored lowest at only 185 points. The primary difference between the Argentine and Pacific whiting H&G was in product uniformity (95% vs. 85%) and supply availability (12 months vs. 8 months). Respondents assumed that H&G whiting had a white flesh color, no enzyme problem, and firm texture; attributes which, in fact, do not characterize Pacific whiting (compare Table 4.4 with Table 5.2 in Chapter V). Since H&G is considered a "commodity" product, handlers fail to pay

attention to product characteristics to the same degree as fillet, because the attributes are not as important in impacting profitability. Handlers, therefore, remain "rationally ignorant" (i.e., benefits associated with becoming educated are not worth the cost). This has significant implications for developing strategies to improve product qualities.

Demand for H&G Whiting

Conjoint Analysis

Table 4.5 summarizes the results from the survey methodology called conjoint analysis. As summarized in chapter II, each respondent was provided a series of eight cards, with each card representing a different H&G whiting product composed of alternative sets of product attributes (see Appendix A). All eight products shared the following set of characteristics which were considered relatively typical of H&G Pacific whiting:

Shelf life:	12 months
Color:	Slightly off-white
Texture:	Moderately firm
Product uniformity:	95% uniform in product attributes
Package form and size:	Ideal
Payment terms:	Net 30 days

Each of the eight products, however, varied in the following characteristics which, for purposes of marketing and public policy, were considered relatively important (various choices are in parentheses):

Product size	(8-12, or 12-16 oz.)
Supply availability	(3, 5, or 7 months)
Price	(\$0.30, \$0.45, or \$0.60/lb)
Degree of marketing support	(No, or yes)

Respondents were then asked to rank these cards in order of preference and to give each card a score ranging from -10 (very unprofitable) to +10 (very profitable).

Results of these experiments were analyzed using regression techniques showing the effect of the varying characteristics on ranking and scoring. The regressions are summarized in Table 4.5.

Table 4.5. The relative profitability of H&G whiting using conjoint analysis.

Variable	Rank		Score	
	Coefficient	t-value	Coefficient	t-value
Constant (Relative profitability)	9.37	8.58***	14.13	3.97***
Product size (Ounces)	0.01	0.15	0.15	0.77
Supply availability (Months)	0.05	0.87	0.05	0.30
Price (Cents)	-0.12	-10.74***	-0.35	-7.31***
Marketing Support (1 if included, 0 otherwise)	0.51	2.05**	1.01	0.96
Sector (1 if second buyer, 0 otherwise)	-	-	-5.15	-2.28**
Sector*Price	1.07	1.37	0.16	2.46**
Sector*Marketing Support	0.65	2.12**	0.91	0.65
Sector*Supply Availability	0.46	1.66*	1.22	0.93
Equation Statistics	N=288	F=29.35*** Adjusted R-squared=.33	F= 9.62*** Adjusted R-squared=.23	

*Significant 90 percent
 **Significant 95 percent
 ***Significant 99 percent

The two regressions measure the importance of the product characteristics which affect profitability in different ways. The rank regression shows the importance of a unit change in each product characteristic (i.e. the coefficient value) in improving the relative ranking of the eight products in terms of their subjective profitability to a buyer. For example, the inclusion of marketing support would increase the ranking of an H&G whiting product relative to other products by 0.51 places, (assuming everything else is equal); in terms of price, a one cent increase would decrease the rank by 0.12 units. The scoring regression demonstrates how a one unit change in the product characteristic would affect the profitability scoring. For example, a one cent increase in H&G price would reduce the relative profitability of an H&G product by 0.35 profitability units, (compare this to the price coefficient for fillets in Table 5.5 which is only -0.22 which is significantly smaller).

The overall equation statistics are reasonably good for this type of cross-sectional analysis, especially for the rank model. This is a typical result for most conjoint analysis research since it is generally easier for respondents to rank their desirability for different products rather than score them. In addition, since each respondent may measure profitability somewhat differently, there is greater variation across respondents. This tends to

reduce the statistical significance of the scoring equation; however, the scoring equation produces more relevant information regarding relative profitability, break-even points, and sector margins (rank equations may be more valuable in predicting market share).

A number of the coefficients on certain attributes in both equations were not statistically significant (i.e. the coefficients were not significantly different than zero). In the rank equation, product size, supply availability, market sector, and certain sector interaction variables including price and supply availability were not significant. In the score equation, product size, supply availability, marketing support, and certain sector interactions including supply availability and marketing support were not significant. This does not necessarily indicate that these variables were not relatively important, but rather that they were not significant given the range over which the variables were selected for testing. For example, both product size and supply availability were selected with relatively narrow ranges (4-8 oz. or 8-12 oz., and 3, 5, or 7 months) in order to be consistent with the expectations about the conditions which shore-based processors experience, and to keep the conjoint analysis experiment relatively simple given the conditions under which this research was conducted (i.e., a relatively low number of observations, use of mail surveys, and the hurried, noisy atmosphere which characterized the respondent's working environment). If a wider range of attributes was used in the experiment, patterns similar to that in the self-explicated portion of the survey would be expected. The trade-off, however, is that the coefficients developed within this analysis would not be as accurate over the relevant range of characteristics.

Overall, price is the most significant variable in the equations, and in the score equation, it is the only significant attribute across both sectors. The intercept (constant) term is significant and is important in representing the profitability impacts of the product attributes which were not included in the experiment. In the rank equation, marketing support is significant, although it is not significant in the score equation. Although the interactive variable, sector*marketing support (which shows the increase in profitability for the secondary sector) is not significant, the magnitude and sign of the coefficient appears reasonable (i.e., by including marketing support the relative profitability of second buyers would increase by 0.91 profitability units). This is consistent with the results of the self explicated analysis which showed that second buyers prefer more than less marketing support. However, given that there was a relatively low number of H&G respondents (46), not all respondents completed each section, and respondents varied widely in age and experience, may explain why the coefficients of these attributes are not highly significant.

The score equation is especially valuable for determining the relative acceptance and profitability of different H&G whiting products to different market sectors. For example, suppose that a processor was contemplating selling the following H&G whiting product to a primary market sector:

Shelf life:	12 months
Flesh color:	Slightly off white
Texture:	Moderately firm
Product uniformity:	95 percent uniform
Package form:	Ideal
Payment terms:	Net 30 days
Product size:	8-12 ounces
Supply availability:	6 months
Marketing support:	Provided

Given these product attributes, how would price impact the relative profitability (i.e. the desirability to purchase) of the buyer?

In fact, this can be calculated by plugging in the variable characteristics and solving the regression equation. For example, suppose we were interested in the break-even prices for each sector. Including only those regressors consistent with the findings of the self explicated analysis (i.e., excluding product size and marketing support) and solving the regression yields the following break-even price for the first buyers:

First Buyer Price(profit=0) = \$0.41/lb.

This is one cent higher than the break-even price calculated from the self explicated information summarized in Figure 4.2 and Table 4.2. These values are remarkably close, but this is not necessarily surprising given that Pacific whiting dominates the H&G market. Based on this regression, every cent decrease for the H&G product would increase the relative profitability to the primary buyer by 0.35 units; and a moderately profitable H&G whiting product (a score of "+5") would be priced at \$0.27 per pound (a price which some respondents claim can occur late in the season although this price would not even cover variable costs for the processor- see Chapter IX for more details). This analysis indicates that even at the lowest wholesale prices which the West coast Pacific whiting processors experience, downstream buyers may be making only "moderately high" profits. Conversely, any wholesale price greater than \$0.41/lb., assuming other conditions remain equal, would not provide profits for the first buyers and would therefore reduce probabilities of sale. The break even price for secondary buyers may also be calculated by including the sector coefficients.

Analysis of the interaction term of sector and price shows the impact of price to the second buyer relative to the first buyer. The coefficient of .16 (which is statistically significant) indicates that a unit decrease of one cent in price is less important in impacting the profitability of secondary buyers than primary buyers. If this price effect is added to the price effect for the overall equation, the secondary sectors' price coefficient may be calculated as -0.19. The break-even point for the second buyer may then be determined:

Second Buyer Price(profit=0) = \$0.49/lb.

This price is \$0.02 higher than the break-even price for the secondary buyer calculated in Table 4.2 and Figure 4.2. The margin for the first buyer (under highly competitive economic conditions) may then be approximated by subtracting the secondary buyer's break-even price from the first buyer's break-even price:

\$0.49/lb. - \$0.41/lb. = \$0.08/lb.

Therefore, under competitive conditions, approximately a 20 percent margin is necessary to cover all fixed and variable costs (shipping costs, inventory costs, transaction costs, overhead, etc.).

Bidding Game and H&G Product Demand

Another method used to reveal the preferences and demands of firms for H&G product was a bidding game. In this technique, each respondent was provided one H&G product characterized by a specific set of attributes. In order to measure the impact of variables which may not have been analyzed in the conjoint analysis, the following attributes were varied across respondents:

Product size:	4-8, or 8-12 ounces
Texture:	Firm, or moderately firm
Flesh color:	White, or off-white
Supply availability:	3, 5, or 7 months
Marketing support:	Yes, or no

Variables which were fixed across respondents included:

Shelf life:	12 months
Product Uniformity:	95 percent uniform
Package size:	Ideal
Package form:	Ideal
Payment terms:	Net 30 days

The respondent was asked to score both the profitability of the product for eight alternative prices, and to estimate the amount of product which they would purchase at each price. By varying the product attributes across respondents, a "demand curve" could be

estimated for H&G firms for H&G products at alternative prices. (It should be noted that this is not a completely specified demand curve, i.e. it is a function only of the product characteristics, and does not include other relevant variables such as income and substitute product price--this regression, therefore, should not be used to measure long run or aggregate demand).

A regression was performed using data collected during the "bidding" section of the survey which included only data for positive (non-zero) purchases. The results of that regression are summarized in Table 4.6.

Table 4.6. Conditional^a firm level demand for H&G whiting (units of 1,000 pounds.)

Variable	Coefficient	t-value
Constant	1214.0	5.17***
Product size (ounces)	-27.4	1.26
Texture (1 if firm, 0 otherwise)	118.2	1.61*
Flesh color (1 if white, 0 otherwise)	127.9	0.91
Supply availability (months)	15.9	1.21
Price (cents)	-17.9	-7.14***
Marketing Support (1 if included)	29.9	1.59*
Sector (1 if second buyer, 0 otherwise)	193.0	2.13**
Company size (1 if large, 0 otherwise)	1027.0	3.11***
Sector*Price	1.4	2.26**
Sector*Marketing Support	49.1	1.31
Sector*Supply Availability	13.8	0.91

Equation Statistics:

Adjusted R-squared=0.28	*Significant 90 percent
F = 38.11***	**Significant 95 percent
N = 179	***Significant 99 percent

a. Conditional- includes data for only non-zero quantities.

For this experiment and regression, additional variables not tested in the conjoint game were included such as texture, flesh color, and company size (gross sales/yr.). The regression analysis demonstrates the change in quantity demanded as a function of changes in product characteristics. For example, large firms (firms with gross sales over \$10 million/yr.) demand an additional 1,012,000 pounds of product relative to smaller firms. Second buyers demand an additional 196,000 pounds relative to first buyers, but the positive coefficient on the sector*price variable demonstrates that they were less sensitive in response to changes in price.

An example of an estimated demand curve for first and second buyers and for large and small firms is shown in Figure 4.26. The curves were generated by solving the regression for the following characteristics:

Flesh color:	Slightly off white
Texture:	Moderately firm
Product size:	8-12 ounces
Supply availability:	6 months
Marketing support:	Provided

Figure 4.26 should be interpreted carefully. It appears, from Figure 4.26, that firms would purchase similar quantities of product regardless of price. In actuality, this is only true over the range of prices which were acceptable for that firm: that is, there are conditional or threshold prices over which they would purchase zero quantity of product. These prices would be very close to the break-even prices calculated from the conjoint equation and are indicated by the junction of the dotted and solid lines for each of the four demand curves. Price-quantity combinations above the break-even prices should be disregarded.

The demand curves for all sectors are relatively inelastic (a large change in price results in only a slight change in quantity demanded). This indicates opportunities to expand sales are relatively limited, at least in the short run due to the constraints faced by each buyer and the limited specialized nature of the H&G market.

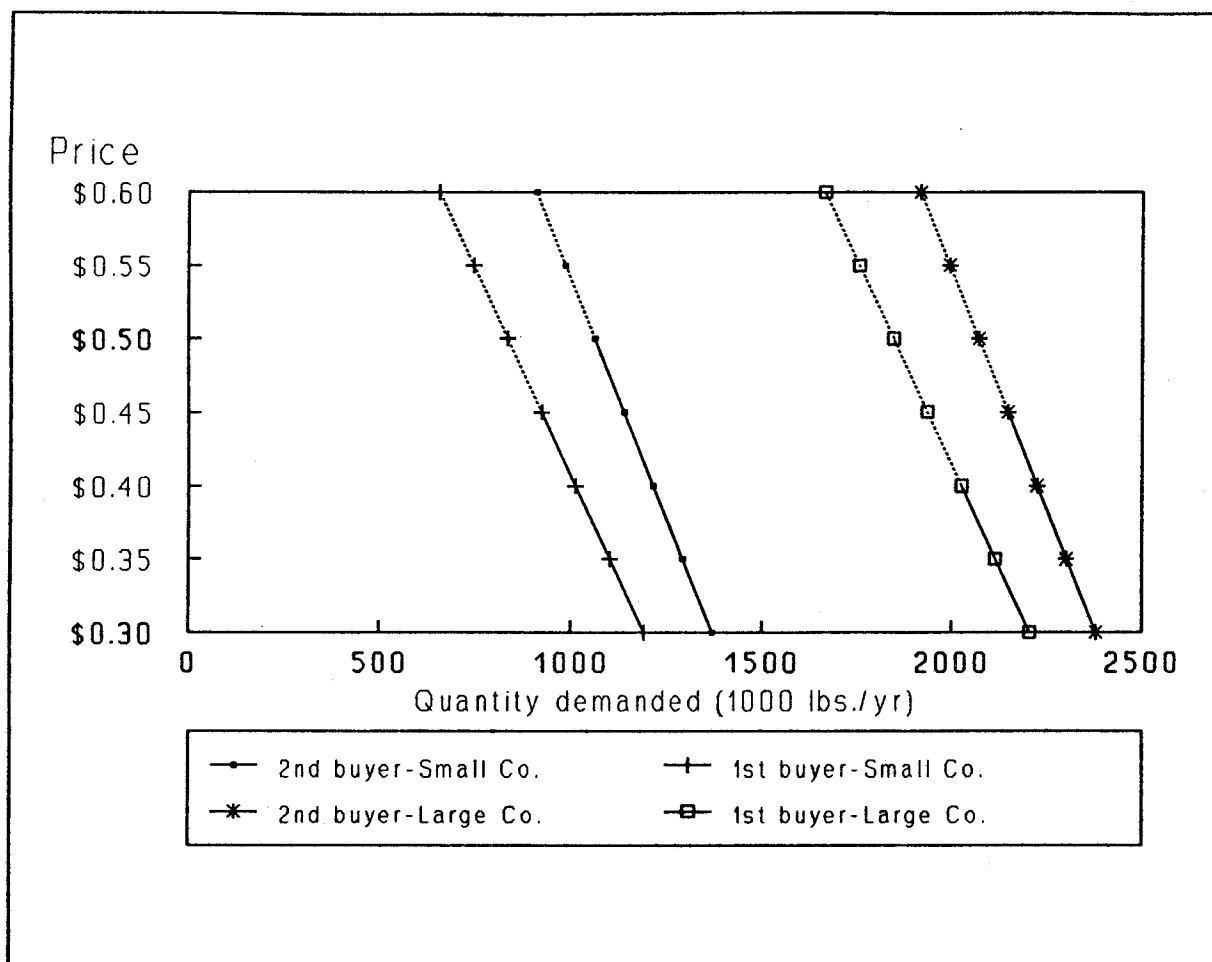


Figure 4.26 Estimated firm level demand for H&G whiting.

Probability of Purchase

Using multinomial regression techniques (logit regression analysis), probability of purchase could be determined given alternative product and contractual characteristics. The regression from this analysis is summarized in Table 4.7

Table 4.7. Probability of purchase for H&G whiting for first and second sector, and for large and small firms.

Variable	Coefficient	t-value
Constant	7.941	7.17***
Product size (ounces)	-0.060	-1.33
Texture (1 if firm, 0 otherwise)	0.131	1.37
Flesh color (1 if white, 0 otherwise)	0.221	0.89
Supply availability (months)	0.109	1.21
Price (cents)	-0.219	-10.91***
Marketing Support (1 if included)	0.271	1.54
Sector (1 if second buyer, 0 otherwise)	0.490	2.09**
Company size (1 if large, 0 otherwise)	-0.710	-4.16***
Sector*Price	0.004	2.38**
Sector*Marketing Support	0.091	1.12
Sector*Supply Availability	0.029	0.74

Equation statistics:

N=472

F=52.27***

Adjusted R-squared=0.35

**Significant 95 percent

***Significant 99 percent

Similar to the findings throughout this entire chapter, price, company size, and market sector were the most important variables in determining whether a firm would purchase an H&G product. This is demonstrated in Figure 4.27 for the same H&G product (i.e., the same level of attributes) represented in Figure 4.26. The probability curves demonstrate that first buyers and larger firms are less likely to purchase H&G product than second buyers or smaller firms given the same set of prices. At the 50% probability level for this particular whiting H&G product, the corresponding prices for each type of firm is: \$0.35 for large first buyers, \$0.38 for small first buyers, \$0.39 for large second buyers, and \$0.44 for small second buyers.

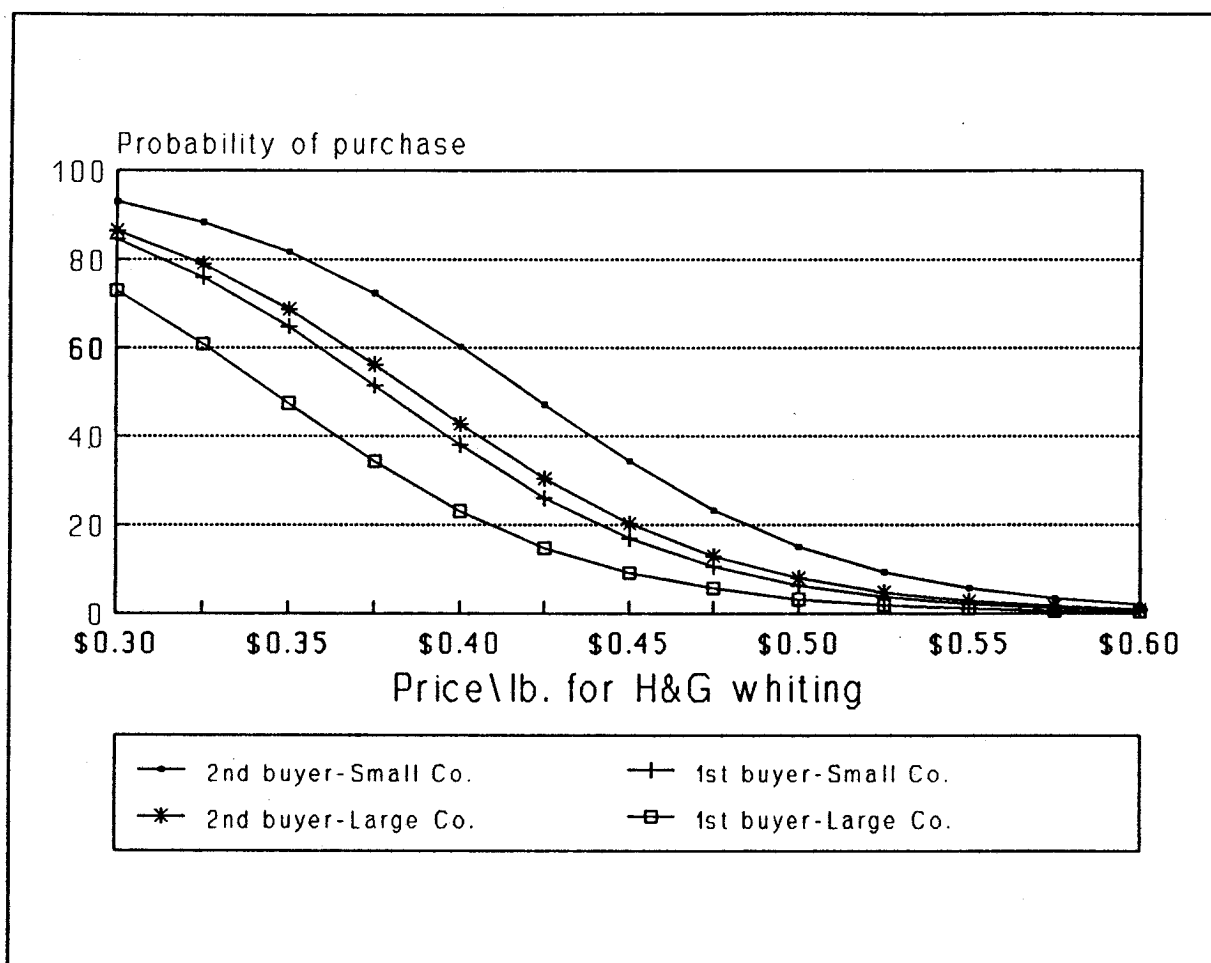


Figure 4.27 Probability of purchase for H&G whiting.

Expected Demand for H&G Product

By multiplying the conditional quantity demanded (Table 4.6) by the probability of purchase (Table 4.7) curves can be generated showing the expected quantity demanded at various prices for small and large firms and first and second buyers. These expected demand curves are graphed in Figure 4.28.

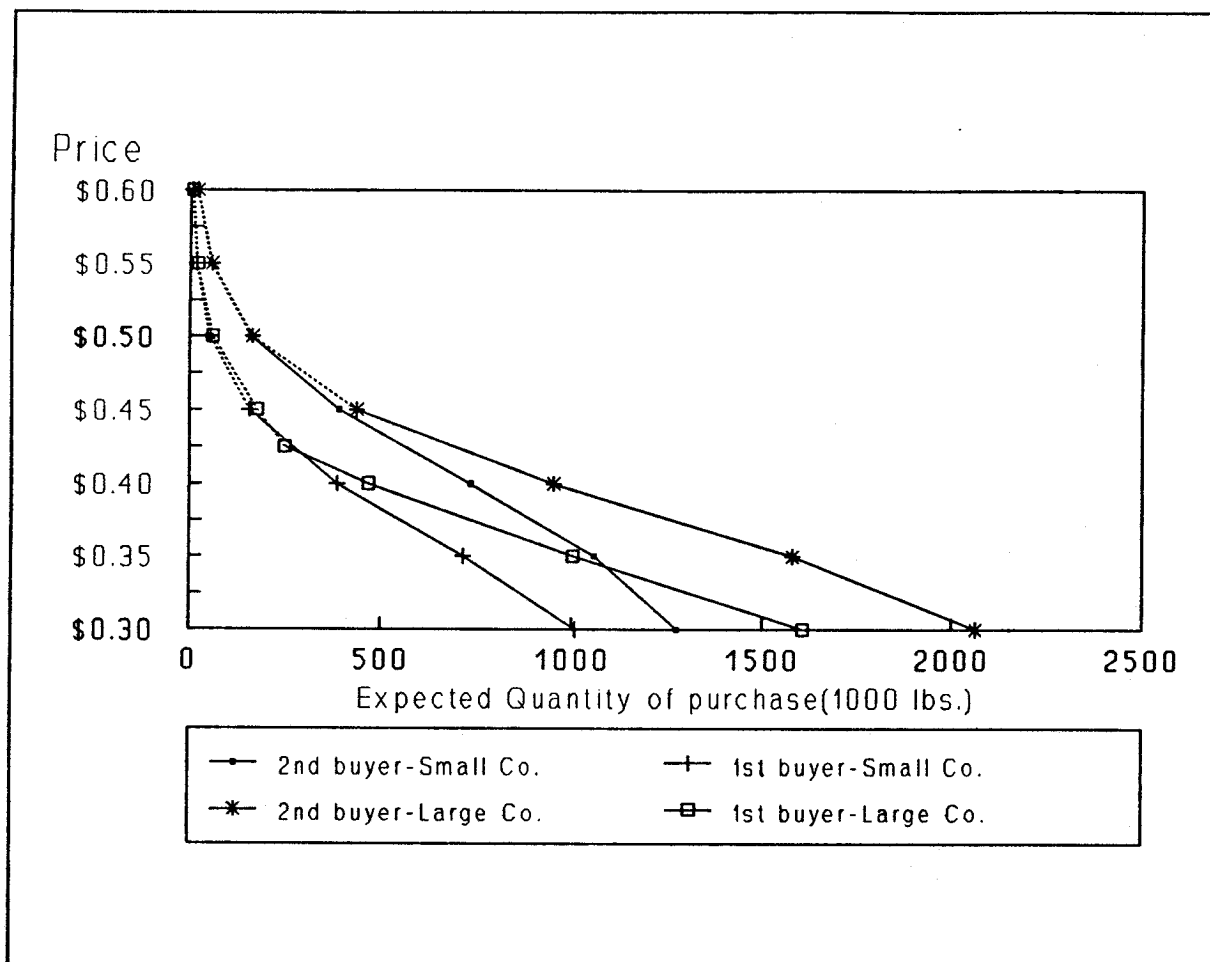


Figure 4.28 Expected demand for H&G whiting.

Figure 4.28 demonstrates that second buyers would purchase larger quantities than first buyers at the same price. The demand curves also demonstrated that at high prices for each intermediate buying level, the expected purchases of H&G are similar across small and large firms, but that as prices decrease larger firms would purchase considerable more product than smaller companies. This is because small firms have greater constraints such as less storage capacity for holding inventory, less working capital for procuring product, and a more limited range of product outlets. For example, at prices of \$0.42 per pound, small and large first buyers would be expected to purchase approximately 300 thousand pounds of H&G product. At \$0.35 per pound, however, large buyers would purchase approximately 500 thousand more pounds of product than small buyers.

Figure 4.28 should be evaluated very carefully however. The juncture of the dotted and solid lines for each demand curve indicated the average break-even prices for each of the four firms. For prices above this juncture, the actual quantities demanded may be much closer to zero than that indicated on this graph.

This demand analysis provides information useful about the H&G industry for developing sales strategies for processors and brokers. For example, transaction costs may be reduced by selling to fewer but larger firms. The trade-off, however, is that sales price would be higher if this same amount of product was sold to smaller firms. The analysis also demonstrates that at the same prices, second buyers would demand more product. This is not surprising since second buyers have a higher price than first buyers since margins are added to first buyer prices. While processors may be tempted to "cut out" the first buyer or a broker in order to take advantage of higher prices and profits, they would have to supply a product which met the higher standards of second buyers including supply availability and marketing support. Such factors as the regulations controlling the fishery, and the natural availability of the resource would most likely make the probability of this strategy being successful relatively low.

Summary

A significant amount of information has been developed in the preceding analysis of the domestic market for H&G whiting. The analysis has been designed to reveal information useful for the West coast fishing industry in evaluating and improving marketing opportunities for H&G Pacific whiting. The analysis was based on the premise that demand for this product form is related to product attributes, contractual arrangements, and industry behavior and experience.

The most significant findings, especially in reference to market opportunities for Pacific whiting, are summarized as follows:

1. H&G whiting is generally perceived and treated as a cheap commodity item where "pennies matter" and where the design of the box may be more important than the contents.
2. Price is significantly more important than other attributes for H&G whiting (this is not the case for fillets-see Chapter V).

3. Second buyers (buyers from wholesalers) are more demanding than first buyers in terms of product quality and marketing support. Also, second buyers do not objectively recognize product attributes, such as texture and color, as readily as firms which primarily handle whiting fillets (see Chapter V).

4. Overall, H&G Pacific whiting is considered to have good quality relative to other species of H&G whiting.

5. Break-even prices for first and second buyers are \$0.41 and \$0.49 per pound respectively; margins for first buyers are approximately 20 percent.

6. At a fifty percent probability of purchase, the prices range, on average, from \$0.35 for large first buyers to \$0.44 for small second buyers.

7. At break-even prices (no profit for buyers), large first buyers would demand approximately 300 thousand pounds (\$0.42); small first buyers 200 thousand pounds (\$0.45); large second buyers 500 thousand pounds (\$0.45); and small second buyers 200 thousand pounds (\$0.50).

While overall, H&G Pacific whiting is considered relatively good quality, market opportunities for expanding production appear limited. Profit margins for most producers and distributors are relatively low, and handling costs relatively high due to high inventory and high shipping costs. Opportunities in Europe are also limited due to high shipping costs. In general, H&G whiting is positioned at the low end of the entire spectrum of seafood products. Even if it was possible, there is no evidence that an appreciable increase in product quality would improve prices and profit. The nature of the product and the fact that it is not boneless limits opportunities to a relatively small segment of the U.S. seafood market. Unless this segment were to appreciably grow (due, for example, to an increase in immigration) then this segment is expected to remain relatively small.

A large increase in H&G Pacific whiting production could lead to a reduction in price. Market opportunities may depend on the market for South American whiting. If this product is directed increasingly toward the European market, or if South American whiting stocks become over-fished, the reduced imports into the U.S. could help to strengthen the opportunities for H&G Pacific whiting. However, even if processors plan to direct only a small percentage of total Pacific whiting landings into the H&G market (especially for product less than 1 1/2 pounds in the round which may be too small for fillet production), this could appreciably increase H&G production. For example, if total harvests average 200,000 metric tons per year, and ten percent of this was used for production of H&G then total H&G production could increase up to 13,000 metric tons of final processed product (assuming 60 percent

conversion). This would be a considerable increase in supplies and could negatively impact prices unless other substitute supplies had decreased or demand had increased (e.g., through promotional efforts or increase in size of ethnic consumers). Processors, therefore, need to carefully consider the expected total production of H&G product and if supplies look large relative to expected demand, they should consider alternative uses for whiting which may be too small for individual fillets. The uses might include fillet blocks, minced blocks, or value added products such as portions, sticks, or nuggets.

While the potential opportunities for expanding production of H&G Pacific whiting may be limited, the development of this shore-based industry has laid the foundation for expanding production into alternative product forms. The success of the H&G shore-based industry, although limited, was founded on principles of marketing management. The industry developed a product and marketing concept consistent with intrinsic product qualities. Buyers, processors, and fishermen cooperated to improve product quality. Marketing support, including box design and recipes, were key for promotion and sales. Most importantly, however, the industry developed a market approach consistent with minimizing the product's major limitation, the presence of protease enzymes. The final consumer group to which the product was directed--low income ethnic households--predominantly use fast cooking techniques and a frozen product. Improved handling techniques on board the vessels and in the plants, combined with appropriate methods of preparation have minimized texture related problems. Overall, H&G Pacific whiting enjoys a relatively good reputation with relatively few complaints about shelf life or texture, two attributes which would be problematic if the product had not been properly handled.

This marketing management concept, while relatively successful for individual firms, however, may have been less successful in the long run development of the west coast H&G industry. For example, each west coast processor developed its own product image, label, and box design. This strategy, however, focused energies on out-competing other H&G whiting producers. This competition allowed downstream buyers to gain bargaining leverage and industry power, and increased the confusion among consumers confronted with different labels, but similar product. More than once during these interviews, wholesalers and brokers admitted that the disorganization of the west coast H&G industry allowed first buyers to increase their comparative bargaining advantage resulting in lower prices to processors, and therefore lower ex-vessel prices to fishermen.

There are, however, alternative strategies. For example, the entire west coast Pacific whiting industry could develop cooperative association(s). Cooperative arrangements could lead to generic marketing strategies with the advantage of: increasing bargaining leverage; smoothing out supplies; increasing and standardizing product quality; reducing inventory costs; and increasing the effectiveness of promotional strategies. These strategies could also be potentially valuable not only to producers of H&G product, but producers of other Pacific whiting product forms including fillets, surimi, and value added products.

Chapter V

FILLETS

Introduction

Pacific whiting has been processed by U.S. shore-based plants primarily as a headed and gutted product. Very little Pacific whiting is sold as fillets although the industry has periodically attempted to increase sales of fillets and breaded product. Overall, the industry has found it difficult to sell Pacific whiting as fillets rather than H&G, primarily due to problems with shelf life and texture. As emphasized throughout this report, a percentage of products processed from Pacific whiting may undergo a degradation of texture caused by the presence of protease enzymes if the product is not handled or cooked carefully. In order to avoid this degradation it is necessary to maintain the temperature of the product near 32 degrees F and to use either quick cooking techniques or, if feasible, enzyme inhibitors.

Most of the whiting fillets in the U.S. are sold to the institutional and food service sectors unlike H&G product which is sold primarily to the retail market. However, because prices for trawl fish including whiting have been rapidly increasing, there may be opportunities for fillet production of Pacific whiting if product quality can be controlled and market development made consistent with minimizing texture and shelf life problems related to protease enzymes. It should be emphasized that many of the issues discussed by survey respondents in this chapter are primarily based on their experiences with other species of whiting; these opinions may not necessarily be relevant, or have the same degree of importance, for Pacific whiting. The specific issues related to this market are summarized under the appropriate topic headings below.

Overall Importance of Whiting Fillet Attributes.

In order to successfully market a whiting fillet product, it is important to understand the attributes which play a role in product demand. Figure 5.1 shows the relative importance of various product and contractual characteristics that may influence the demand for whiting fillets. The data for this analysis was obtained from the self-explicated portion of the fillet survey (see chapter II and Appendix B). Individual respondents were asked to rate the importance of each attribute using a scale ranging from 0 (not important) to 10 (very important).

As Figure 5.1 demonstrates, the most important characteristic of whiting fillets was price, but not to the same absolute or relative degree as for headed and gutted (Figure 4.1). The LSD or "Least Significant Difference" statistic demonstrates that other attributes may be as important as price in influencing demand including product size, texture, shelf life, flesh color, supply availability, product uniformity, and product form (defatted fillets, skin-on, skinless).

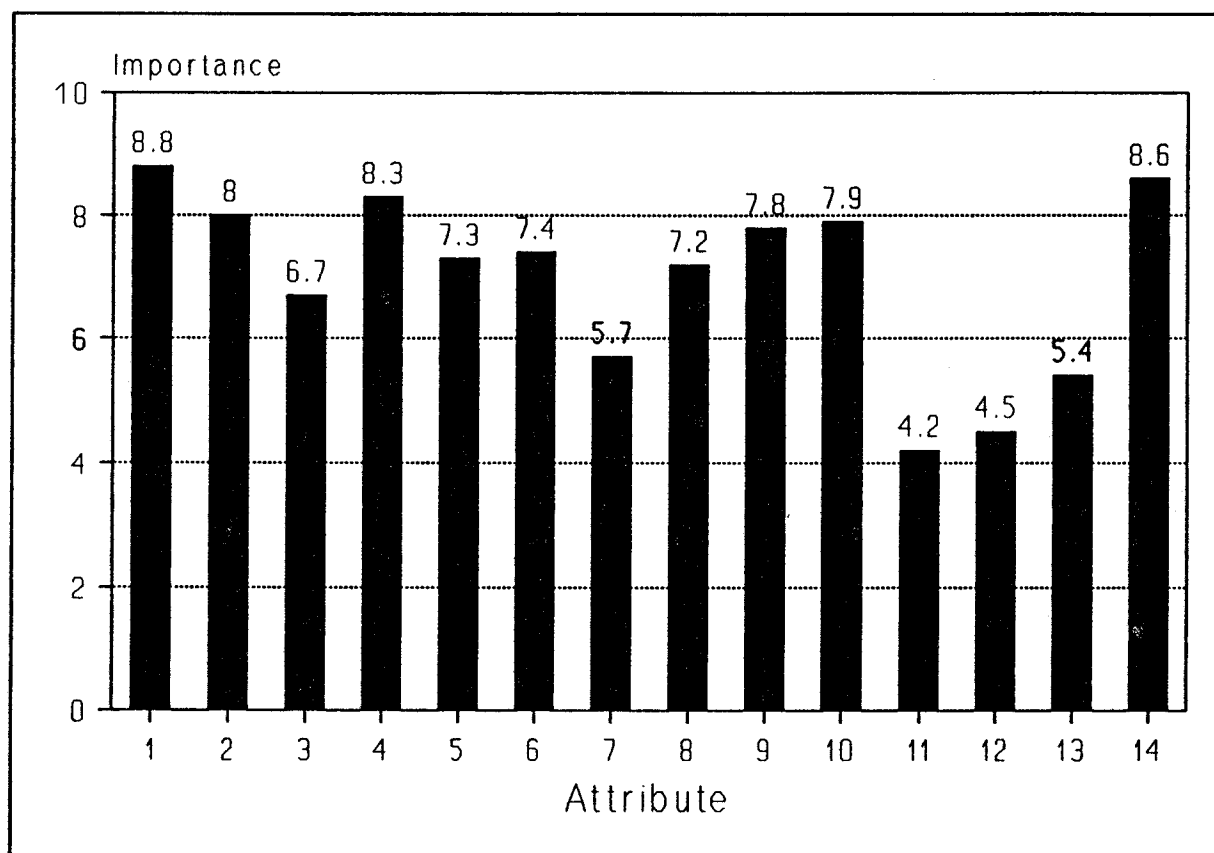


Figure 5.1 Overall attribute importance for whiting fillets.
10=Highly Important, 5=Moderately Important, 0=Unimportant.

LSD_{.05}=1.53

F=7.21***

***Significant 99 percent

- | | | |
|-------------------|------------------|------------------------|
| 1. Price | 2. Product size | 3. Species |
| 4. Texture | 5. Shelf life | 6. Flesh color |
| 7. Percent enzyme | 8. Package size | 9. Supply availability |
| 10. Uniformity | 11. Product line | 12. Marketing support |
| 13. Payment terms | 14. Product form | |

The fact that price is not clearly more important than other attributes (as it was with H&G in Chapter IV) demonstrates that quality attributes are relatively more important for fillets. Because these attributes are appreciably more important, producers may be able to substantially increase the value of their product by improving certain product characteristics. In addition, by understanding the relative importance of these attributes, the cost of improving attributes can be compared to the expected benefits (higher prices) to determine if revenue and profit can be increased (see chapter IX, "Product Selection", for more details).

In order to more fully evaluate what factors influence the importance scores for these attributes, it is useful to separately evaluate the responses based on the characteristics of the respondents. These characteristics included market sector, geographic location of the firm, date of survey, years of respondent experience, species of whiting handled, and company size. Table 5.1 summarizes the significance for each respondent characteristic for product attribute importance using ANOVA (analysis of variance). Any F statistic larger than 2.88 indicates that, at a 95 percent significance level, the industry characteristic may be significant in influencing the importance score for the individual product attribute.

Table 5.1 F statistics showing significance of respondent characteristics in affecting attribute importance for whiting fillets.

Product attribute	Market Sector	East coast	West coast	Mail survey	Years experience	Argentine whiting	Peruvian whiting	Chilean whiting	Pacific whiting	Company size
Price	68.2	2.61	2.46	2.03	2.19	3.84	2.81	1.64	1.89	3.48
Product size	1.92	2.47	2.38	0.64	1.13	1.34	0.81	0.91	0.89	1.47
Species	1.17	3.14	2.94	0.73	1.89	4.36	2.47	2.62	2.81	2.36
Texture of flesh	2.46	0.61	0.68	1.13	0.51	2.11	0.91	0.66	0.83	1.19
Product form	1.63	2.33	2.48	1.87	0.83	2.61	2.33	1.83	2.17	2.36
Package form	3.94	0.92	1.13	1.09	0.77	2.31	1.63	1.41	1.51	1.13
Shelf life	4.11	0.53	0.59	0.96	0.92	1.37	0.73	0.91	0.88	0.93
Flesh color	1.73	1.07	0.93	0.43	1.44	1.06	0.91	0.83	0.87	1.41
Package size	2.48	2.09	2.17	0.63	2.01	0.83	0.46	0.76	0.57	2.31
Supply availability	3.19	1.36	1.18	0.91	1.46	0.91	0.59	1.03	0.72	2.17
Product uniformity	2.84	0.92	1.14	1.13	0.93	0.66	0.43	0.64	0.52	0.68
Product range	0.56	0.47	0.53	0.66	1.23	0.79	0.82	0.71	0.74	0.91
Marketing support	2.66	1.88	1.46	0.92	2.14	1.18	0.87	0.91	0.77	2.13
Total-all attributes	13.6	2.41	2.37	0.51	1.13	2.89	2.22	2.07	2.19	3.15

An F statistic greater than 2.88 is significant at the 95 percent level.

The F scores in Table 5.1 demonstrate that buying sector (i.e. that first and second buyers) may not score the same level of importance for certain product characteristics including price, package form, shelf life, and supply availability. East coast and West coast firms scored differently on relative desirability of species. Firms which primarily handle Argentine whiting scored significantly differently for price and species and firms of different sizes scored differently for price. This information is valuable for evaluating the desirability of the individual attributes and product demand relative to characteristics of the individual firms.

Preferred Whiting Fillet Characteristics

Price

The scores on the following graphs were obtained by asking respondents to score the relative importance of individual attributes using a scale ranging from -5 "very undesirable" to +5 "very desirable", with 0 being "indifferent." These scores were then multiplied by the importance of the attribute to develop a weighted score for each attribute characteristic. By weighting the scores, the overall desirability of each attribute could be compared.

Figure 5.2 summarizes the relative degree of desirability of alternative prices for whiting fillets. The "typical" whiting fillet was desired if its price was less than \$0.75-\$0.80 per pound. Second buyers did not find prices above \$0.80 as undesirable as first buyers. The weighted score, which did not exceed 40 or -40 (out of a possible 50 or -50) demonstrates that while the price attribute is relatively important, it is not as important as H&G prices which scored close to 50 and -50 in overall weighted desirability.

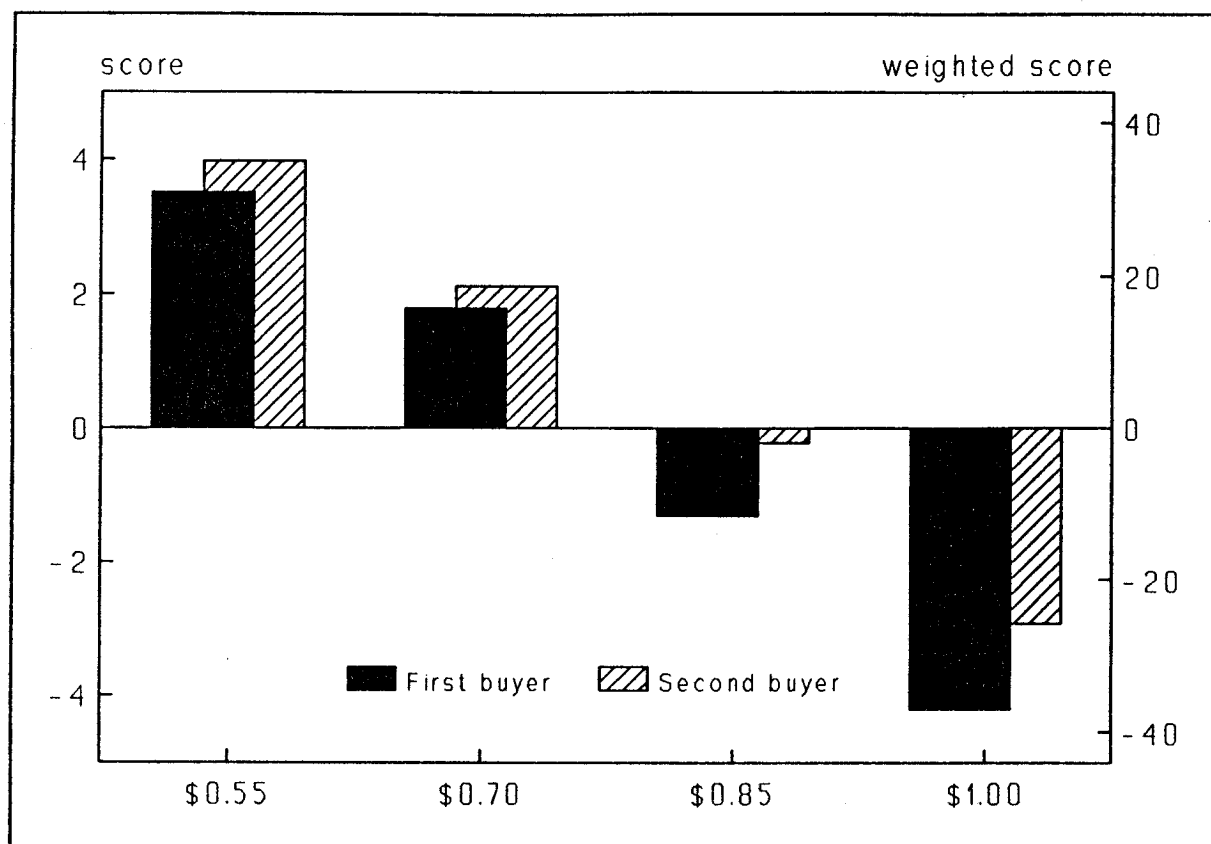


Figure 5.2 Relative desirability of alternative prices for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

price	\$0.55/lb.	\$0.70/lb.	\$0.85/lb.	\$1.00/lb.
first buyer	3.52	1.78	-1.32	-4.21
second buyer	3.97	2.12	-0.22	-2.92

LSD_{.05}=1.51

F=66.3***

***Significant 99 percent

Using regression analysis of score vs. price, the average break-even price for Pacific whiting fillets (aggregated across the first and second buyers) was found to be \$0.77/pound, a price similar to the average market price for whiting of all species during the period of this survey. A more completely specified regression is summarized in Table 5.2.

Table 5.2. Influence of buyer characteristic on desirability of price for whiting fillets.

	Coefficient	T-value
Constant	11.213	9.554***
Price	-15.428	-8.866***
Sector	2.713	5.926***
Argentine	2.134	2.114**
Company Size	-1.114	-1.364
Sector*Price	1.233	4.253***
Argentine*Price	1.113	2.044**
Company Size*Price	-0.683	-1.368

Equation statistics:

N=356

F= 122.4***

Adjusted R squared = 0.65

**Significant 95 percent
***Significant 99 percent

With algebraic manipulation, the equation was used to demonstrate the approximate break-even price for various market sectors. The break-even price of whiting fillets for the primary and secondary market sectors were calculated to be \$0.72 and \$0.96 per pound respectively for non-Argentine fillets. These prices were in general agreement with the actual prices summarized on Table 5.2.

There is more variation in prices for fillets than for headed and gutted product. Different species and product qualities have relatively small impacts on the demand for H&G. In contrast, fillets have prices which more closely reflect the variations in quality.

Table 5.3 Primary and secondary purchasing price of whiting fillets in the U.S.

Species	Primary buyer		Secondary buyer	
	Purchase price	Sales price	Purchase price	Sales price
Argentine	\$0.76-\$0.92	\$0.87-\$1.10	\$0.85-\$1.07	\$1.02-\$1.24
Peruvian	\$0.55-\$0.64	\$0.57-\$0.67	\$0.56-\$0.72	\$0.80-\$0.99
Chilean	\$0.80-\$0.85	\$0.84-\$1.06	\$0.85-\$1.05	\$0.99-\$1.15
Pacific	\$0.42-\$0.75	\$0.77-\$0.90	\$0.75-\$0.90	\$0.85-\$1.09
Antarctic	\$1.20-\$1.30	\$1.50-\$1.75	\$1.45-\$1.75	\$1.75-\$2.00
Atlantic	\$0.70-\$0.75	\$0.79-\$0.90	\$0.80-\$0.90	\$0.85-\$1.00

Product and Package form

There are many different attributes which can characterize various whiting fillet product forms. The fillet may retain the skin or be skinless, defatted or not defatted, pin-bones in or out; there are several combinations that can result from a grouping of these and other attributes.

Figure 5.3 and Figure 5.4 demonstrates the relative degree of desirability of various product and package forms. The overall finding suggests the most desired fillet product form is skin-off fillets. This product represents the largest portion of the fillet market. A skinless fillet, however, has a lower recovery rate than skin-on fillets which has a corresponding influence on the cost of the product. Notice, however, that the MSD of 2.73 demonstrates that, overall there is no statistically significant difference in desirability of these different product forms, suggesting that different forms have a broad range of potential uses depending on geographic area and market sector.

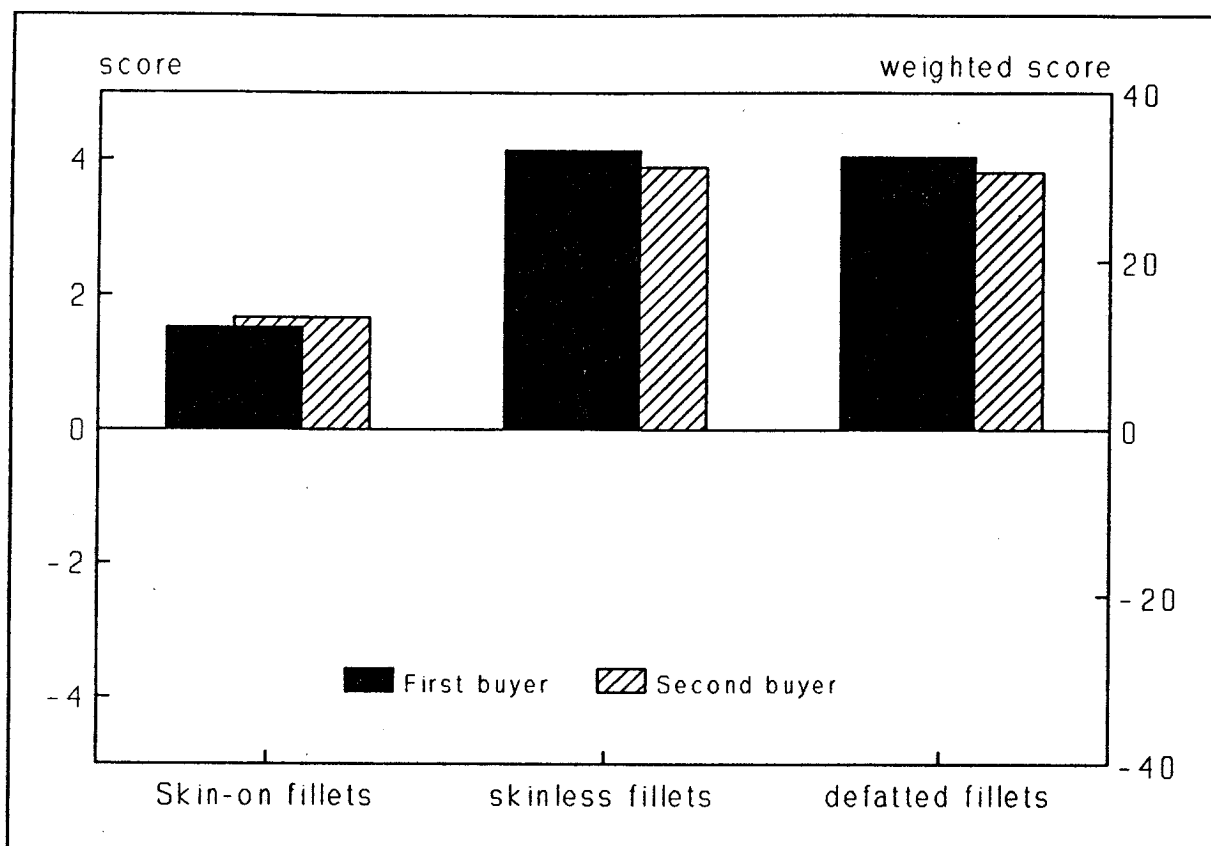


Figure 5.3 Relative desirability of alternative forms of whiting fillet product. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product form	skin-on	skinless	defatted
first buyer	1.52	4.13	4.04
second buyer	1.66	3.89	3.81

MSD_{.05}=2.73

Skinless defatted fillets were nearly as desired but recovery rate on defatted fillets is even lower than that of skinless, non-defatted fillets. A number of respondents suggested that a defatted fillet can not be achieved by deep skinning Pacific whiting without causing the product to fall apart. Others felt it was possible to create a quality product by removing the fat layer. Defatting a fillet would also make the fillet more expensive to produce (from 5 to 50%) because of the additional labor or equipment costs (e.g. computerized jet-stream defatters) and the loss in recoverable product. While estimates vary, defatting can reduce recovery from 30% to as low as 15% as a proportion of round product depending on quality and depth of fat removal. Many

respondents thought it would be unprofitable and unnecessary to defat, but others believed it could be necessary, depending on product use and market destination. The European market for whiting fillets more readily accepts skin-on fillets and the recovery rate is 2-5% higher if the skin is not removed. There was no difference in preference of type of fillets for upstream and downstream market sectors.

A number of buyers noted that pin bones must be removed in whiting in order to substitute for pollock for use in food service and military procurement. In general, however, it was found that there is no difference in the price between whiting with the pin bones removed and whiting with the pin bones in (i.e. the gain in value for bone removal is off-set by lost value of flesh removed). The recovery rate is lower when the fish must have pin bones removed. Retailers and institutional buyers are less concerned with pin bone removal since during cooking the bones become soft. End use determines the need for pin-bone removal.

Figure 5.4 demonstrates that IQF and shatterpack are the most desired package forms. Both forms are preferred to blocks (among the respondents interviewed; some major U.S. block importers did not respond to this survey), and second buyers found blocks to be slightly undesirable. For the retail sector, it may be favorable to use resealable polybags to reduce freezer burn, decrease package costs, and encourage retail use.

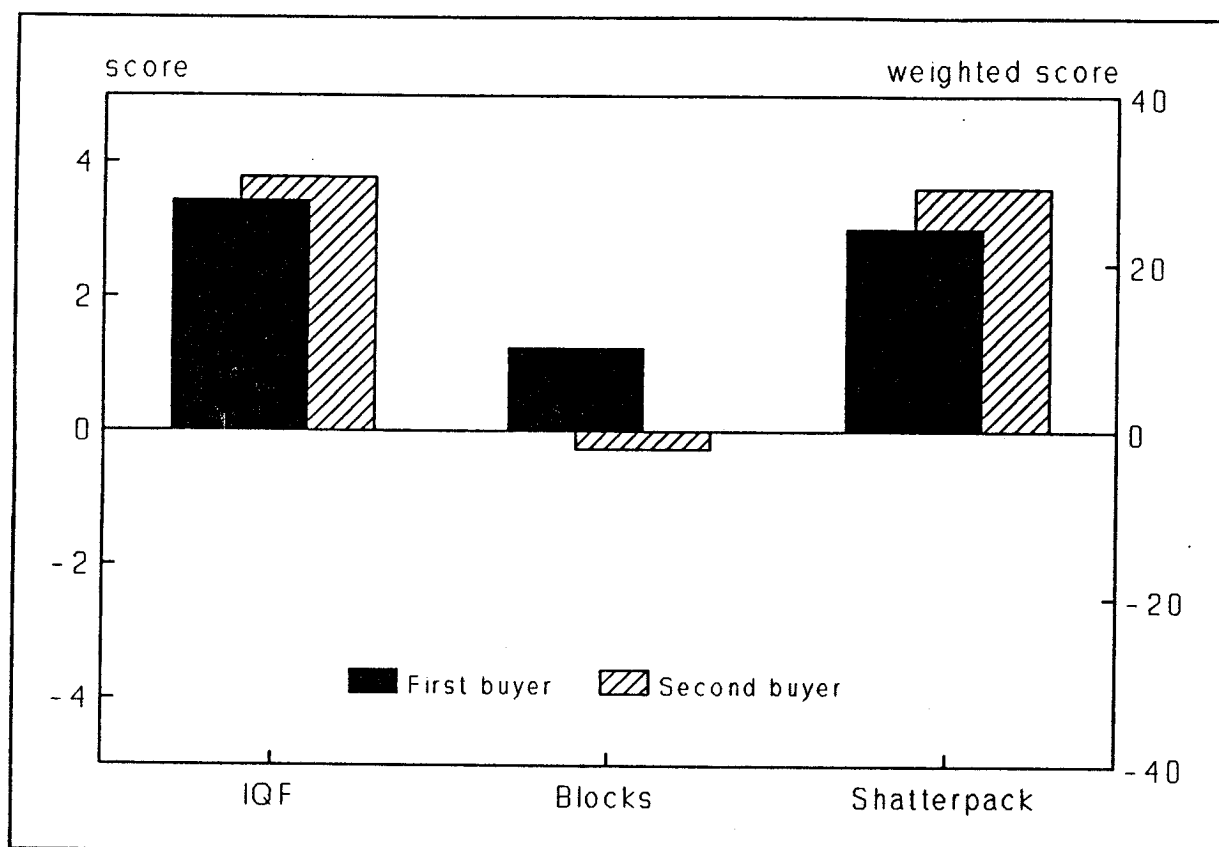


Figure 5.4 Relative desirability of alternative package form for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

package form	IQF	Blocks	Shatterpack
first buyer	3.42	1.23	3.02
second buyer	3.71	-0.27	3.62

LSD_{.05}=1.87

F=29.62***

***Significant 99 percent

Texture

One of the most significant issues related to processing Pacific whiting into fillets is the issue of texture. A certain proportion of the fish (5-50 percent) may have a high enough level of protease enzyme to impact texture if the product is not handled carefully. For other product forms, such as H&G, texture is not as important an issue. Quick cooking techniques, such as frying, inhibit texture degradation and, in fact, destroy the protease enzymes.

Some firms have begun to investigate the possibility of injecting enzyme inhibitors into the flesh of Pacific whiting fillets to inhibit chemical action of the protease enzyme. However, the high molecular weight of the inhibitors makes it difficult for the product to diffuse throughout the entire fillet. One respondent noted that it may be possible for the diffusion to occur if the fillets are placed in a vacuum tumbler. The major problem with this technique is the cost--over \$0.50 per pound of fillet.

Figure 5.5 demonstrates the relative degree of desirability of various texture categories for whiting fillets. The analysis shows that each texture level is significantly different in terms of relative desirability. Soft texture was highly undesirable. There was no difference in desired texture between first and second buyers. Many respondents were curious about the potential texture for Pacific whiting fillets since their perceptions were that the flesh may be too soft, or that the enzyme problem too serious, to allow Pacific whiting to be successfully marketed as fillets.

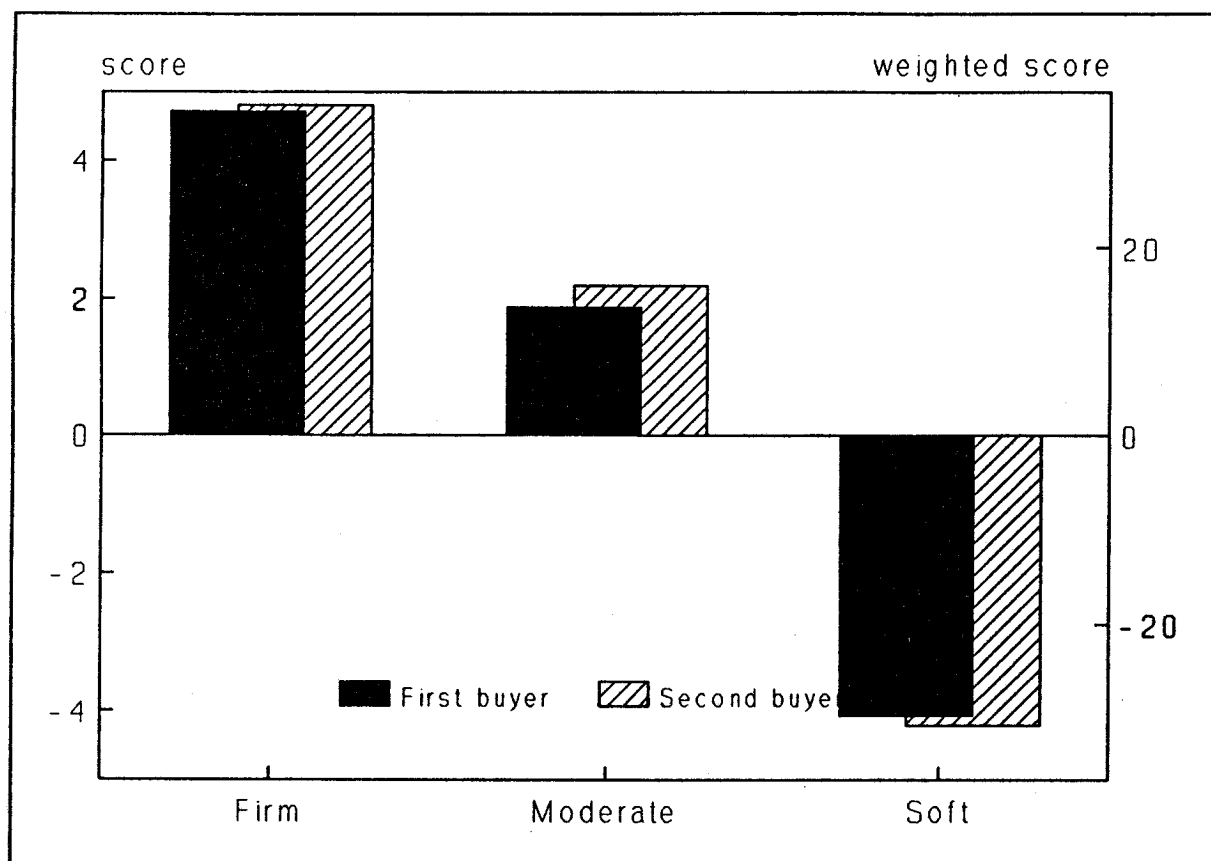


Figure 5.5 Relative desirability for whiting fillets of alternative textures. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product texture	firm	moderate	soft
first buyer	4.72	1.88	-4.07
second buyer	4.81	2.19	-4.21

LSD_{.05}=.68

F=369***

***Significant 99 percent

Product Uniformity

Product uniformity is the degree to which the product meets the general guidelines of the sales contract. Figure 5.6 shows the relative desirability for various degrees of uniformity. Similar to what was found for H&G, the higher the uniformity of the product, the greater the desirability. However, uniformity may be as low as 70 percent and still not enter the undesirable range. In general, the market standard is approximately 80 percent uniformity. Some respondents noted that in the whiting fillet market, uniformity may be as low as 50 percent before down-stream sectors begin to complain.

The overall weighted scores are relatively high for highly uniform product indicating that this product characteristic may be important in impacting sales, market opportunities, and ultimately profit.

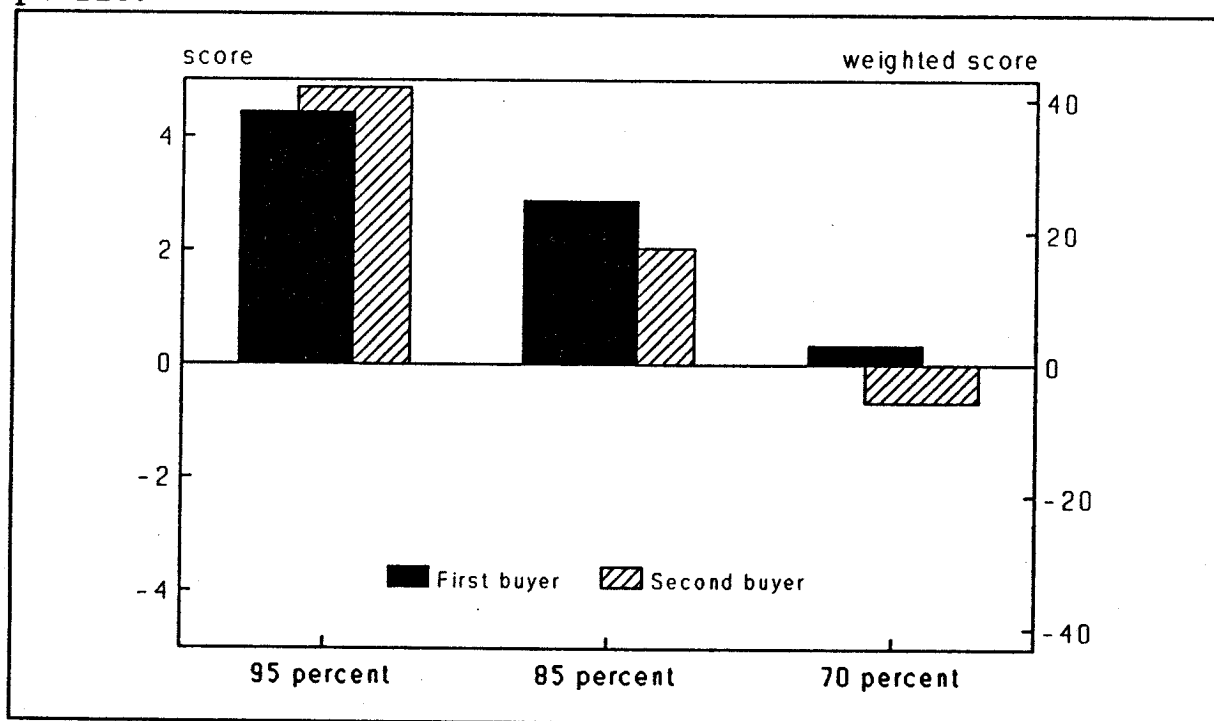


Figure 5.6 Relative desirability of whiting fillets with alternative degrees of product uniformity. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product uniformity	95% uniform	85% uniform	70% uniform
first buyer	4.43	2.88	0.33
second buyer	4.87	2.05	-0.67

LSD_{.05}=.88

F=27.22***

***Significant 99 percent

Supply Availability

The desirability for a consistent supply for fillets is similar to that for H&G (Chapter IV). Figure 5.7 demonstrates the relative desirability for various periods of supply availability. On average, the greater the availability, the more desirable the product. Twelve months is highly desirable, eight months is somewhat less desirable and four months is relatively undesirable.

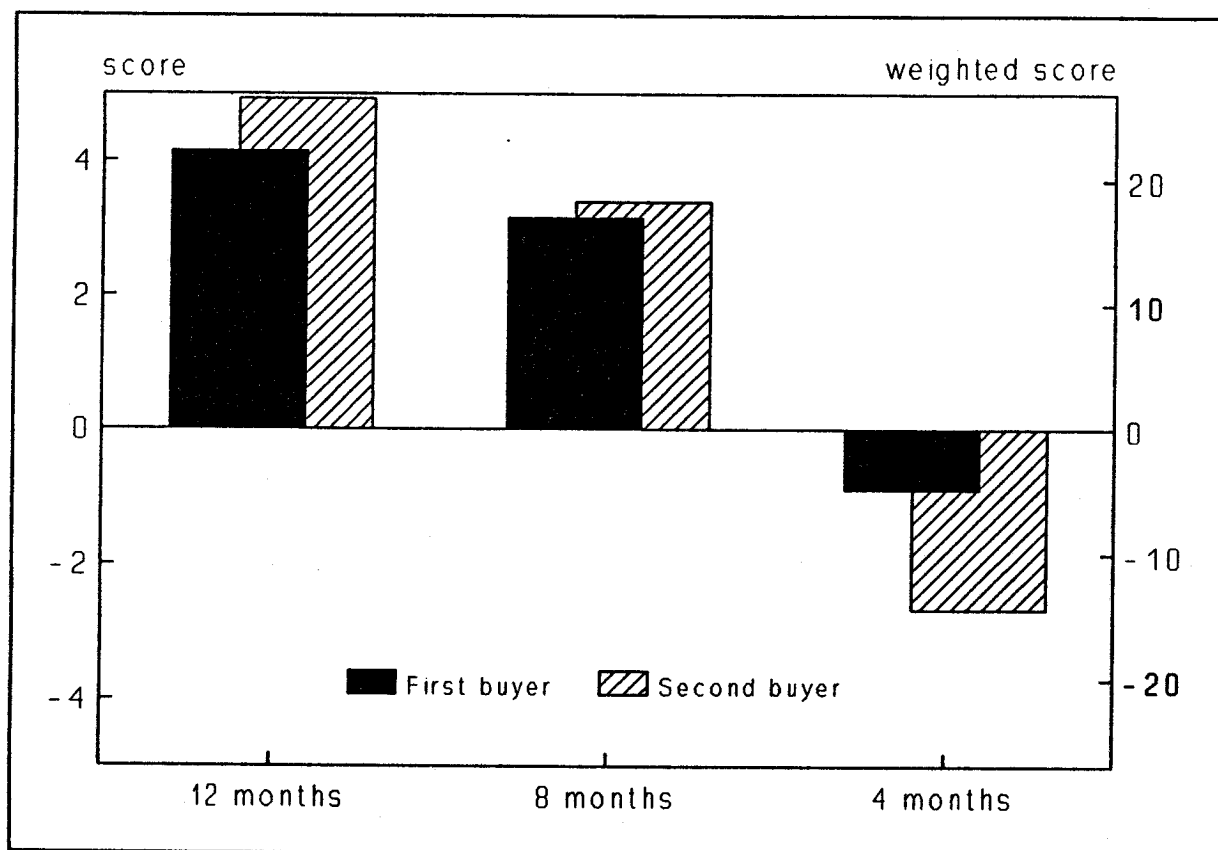


Figure 5.7 Relative desirability of alternative lengths of product

availability for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

availability	12 months	8 months	4 months
first buyer	4.14	3.15	-0.89
second buyer	4.92	3.39	-2.67

LSD_{.05} = .74

F=72.3***

***Significant 99 percent

There were some respondents, however that preferred to purchase seafood products which were available for only a limited time. With few exceptions, these individuals were speculators employed by firms with large cold storage facilities. They would purchase at times of excess supply availability and low prices, and then sell at a later time when prices had increased.

Speculation and storage play a larger role in the fillet than the H&G market. The cold storage cost, although the same price per pound, represent a much smaller percentage increase in cost for the fillet product than H&G (H&G costs include storing bones and skin). Holding fillets in inventory for six months increases the product cost only 10 to 15% versus 25 to 30% for H&G product.

Downstream market sectors find a decrease in availability of fillet product significantly more undesirable than upstream buyers (first receivers). Similar to H&G, upstream market sectors purchase product from many suppliers; when product from one supplier is no longer available they increase purchases from other suppliers. This behavior is consistent with one of their market functions which is to even out supplies for downstream sectors.

Product size

Figure 5.8 shows the relative desirability for various sizes of whiting fillets. The most desirable size for the product was 6-8 oz. with moderate desirability for 4-6 and 8-10 oz. fillets. Statistically, however, 4-6, 6-8, and 8-10 oz fillets were not significantly different for first buyers; 4-6 and 6-8 oz. were significantly preferred over both 2-4 and 8-10 oz. Fillets 2-4 oz. were found to be undesirable by both sectors. A number of respondents noted that when a product size is listed as a range, as, for example, 2-4 oz., up to 80% of the fillets may be at the lower end of the size range. A number of firms noted that South American processors are inconsistent in keeping the fillet sizes uniform and within the boundaries established by contractual arrangements.

Presently, there is a large market demand for fillets between 6 and 10 ounces in the United States. Whiting fillets larger than 10 ounces, however, have a relatively higher demand in Europe.

It should be emphasized that Pacific whiting is a year class driven species. This means a particular age class can dominate the population of harvestable fish for many years. This is important because if the dominant year class is younger and smaller in size, it will produce smaller fillets, and therefore, it may be more

suitable for production as an alternate product. In other years, the stock may be dominated by older and larger cohorts which would be more suitable for fillets. This variability reinforces the need for producer flexibility, i.e. ability to convert to alternate product forms given different circumstances in annual harvest and market conditions.

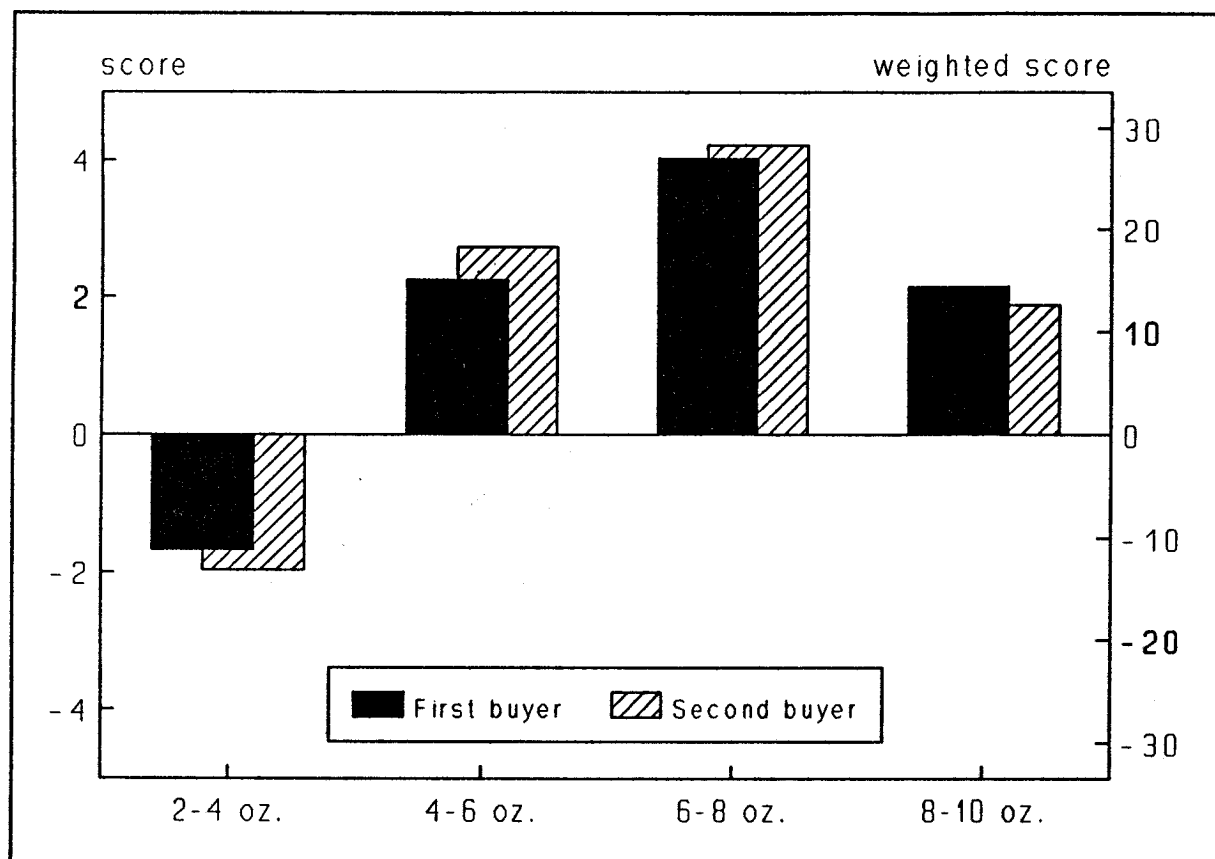


Figure 5.8 Relative desirability of alternative sizes for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product size	2-4 oz.	4-6 oz.	6-8 oz.	8-10 oz.
first buyer	-1.67	2.25	4.03	2.15
second buyer	-1.96	2.72	4.22	1.88

MSD_{.05}=2.13

Package size

Figure 5.9 shows the relative desirability of various package sizes for whiting fillets. Both five and ten pound packages are equally desired by whiting fillet buyers in the U.S. These two sizes are relatively standard in the industry and will fit into larger lots of 50 pound boxes. Package size is not as important with fillets as with headed and gutted. Fillet products have a broad range of uses including restaurants, retail outlets, and food service. This broad range of uses allows the packaging to be more variable but, the size of the package should match the use. Upstream market sectors appear to prefer larger sized packages than the downstream market sectors. One explanation is that some primary buyers break bulk from larger sized containers into smaller packages for resale. This is another function of primary buyers.

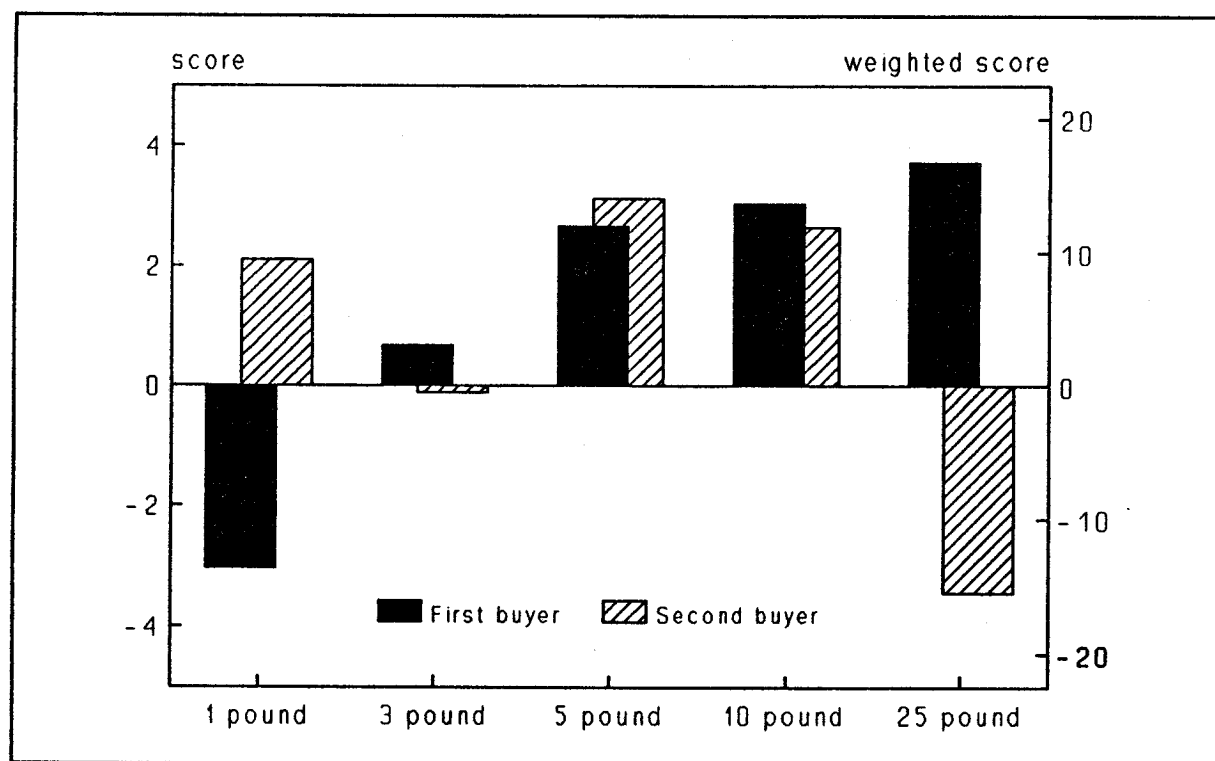


Figure 5.9 Relative desirability of alternative package sizes for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

package size	1 pound	3 pound	5 pound	10 pound	25 pound
first buyer	-3.04	0.67	2.67	3.04	3.72
second buyer	2.11	-0.12	3.13	2.65	-3.44

MSD_{.05}=3.71

Shelf life

Shelf life may be different for different product forms. In general the more processing a whiting product undergoes, the shorter the shelf life. Minced whiting, for example, may have only a six month shelf life without addition of anti-oxidant chemicals, but the shelf life for H&G may be as high as a year or longer. It is important to consider, not only the shelf life of the product, but the rate at which the product, when in inventory, loses some of its desirable attributes. In a Pacific whiting fillet shelf life experiment, Crawford et al., (1979), showed that sensory perceptions of the quality of the fillet not only did not decline, but, in fact, increased with time. Crawford suggested that the result may have been due to the drying of the fillets which caused them to firm up as time passed. (Crawford, 1990).

Figure 5.10 shows the relative desirability of whiting fillets given various lengths of shelf life. As expected, the longer the shelf life, the greater the desirability of the product. Given the linear relationships of desirability and shelf life, the shelf life appears to become undesirable (negative range) as it approaches six months. This is the one attribute in which downstream buyers are less concerned than upstream buyers since they move the product faster and don't maintain it in inventory as long as first receivers.

Some of the individuals interviewed believe shelf life may be a problem in Pacific whiting fillets because of the oxidation problems related to the darker flesh of the fish. Many respondents noted that the strongest market for Pacific whiting may be during Lent. The shelf life, therefore, must be long enough to carry the product for sale in February and March. The actual shelf life for most whiting appears to be between six months and a year.

Research by a number of academic and government food technologists, however, have demonstrated that if the product is carefully handled, Pacific whiting products (including fillets) can have a shelf life from 12-18 months. Some of the measures that can be taken to improve shelf life include: short trips, small tows, immediate cooling of the round fish in refrigerated sea water or slush ice, proper freezing methods including quick freezing and efficient freezers, and efficient methods of transferring fish from one user to the next.

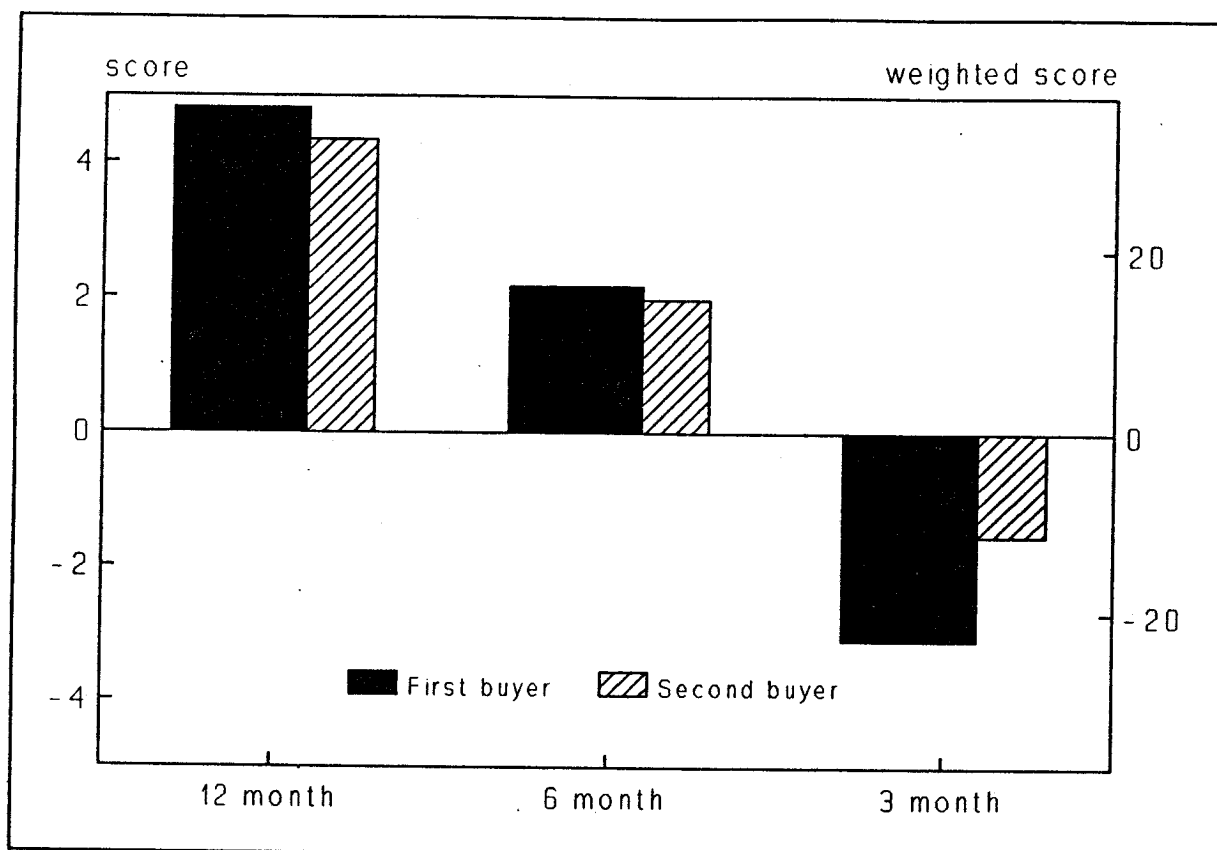


Figure 5.10 Relative desirability of alternative lengths of shelf life for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

shelf life	12 months	6 months	3 months
first buyer	4.82	2.17	-3.11
second buyer	4.34	1.97	-1.55

LSD_{.05}=1.51

F=34.68***

***Significant 99 percent

Flesh color

The flesh color of Pacific whiting ranges from off-white to light pink with darker mottling. The flesh of a fillet is exposed which enables buyers of that product, especially if sold retail, to view the color of the product which is contrary to headed and gutted where the product is processed with the skin on and packaged in opaque boxes. It is important to understand how the color influence the desirability of buyers and consumer because fillets of similar colors could be grouped together if one color is strongly desired over another. For example, whitest fillets could be directed to retailers, less desirable colored fillets to institutional or food service buyers.

Figure 5.11 shows the relative desirability of whiting fillets given various flesh colors including "white", "off-white", and a "slight pink tinge". The whiter the flesh the greater the desirability. An off white color is acceptable, but significantly less desirable than a white fillet. A slight pink tinge, however, negatively affects the desirability. Some respondents noted, however, that the market is recognizing that light pink and off-white colored fish cook up relatively white.

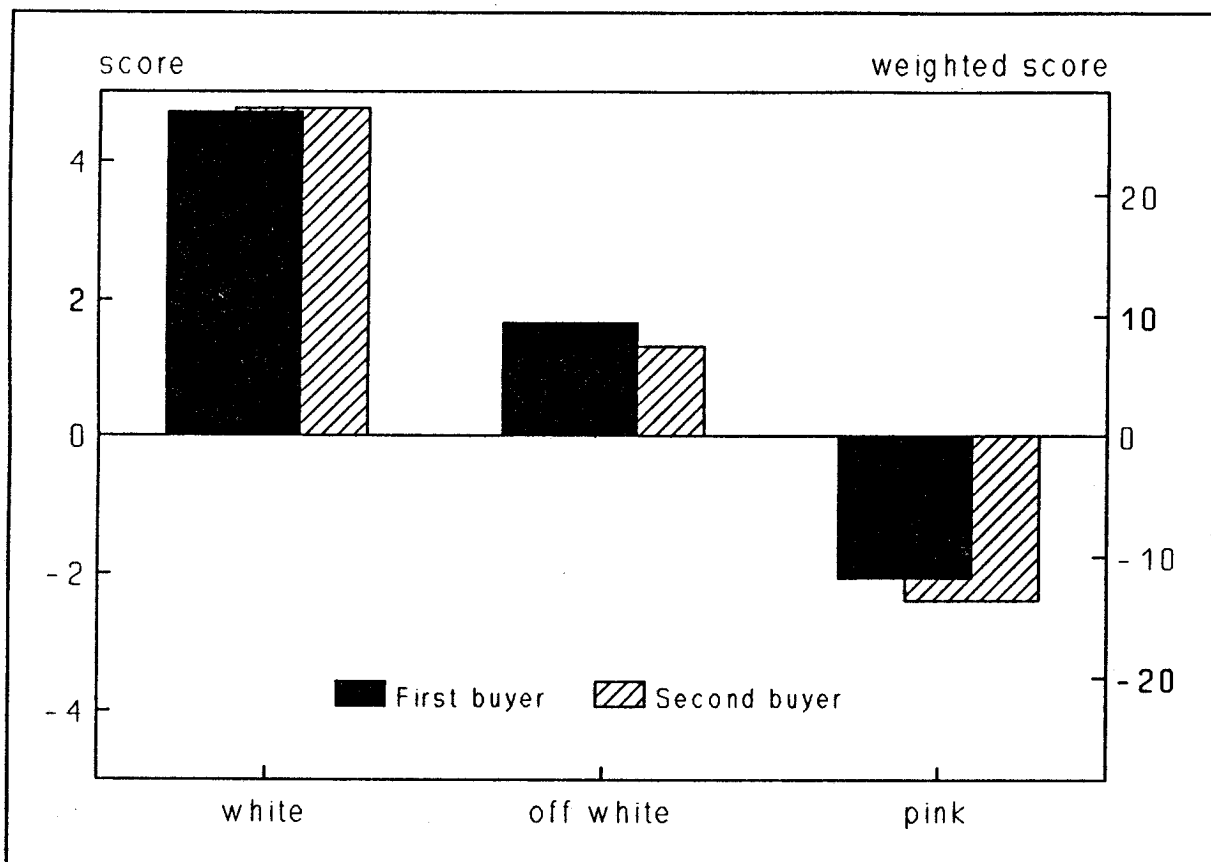


Figure 5.11 Relative desirability of flesh color for whiting fillets.

Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

flesh color	white	off-white	slight pink
first buyer	4.71	1.65	-2.07
second buyer	4.76	1.31	-2.39

LSD_{.05}=1.44

F=24.65***

***Significant 99 percent

Species

The most widely handled whiting species in the U.S. fillet market is Argentine because of its relatively firm texture compared to other species of whiting. Other South American species from Chile and Peru are also widely handled in the U.S. but at a lower price, especially Peruvian whiting which is considered the lowest quality product in the market.

The relative desirability of fillet firms for various species of whiting is demonstrated by Figure 5.12. Argentine fillets are significantly the most desired species for whiting fillets. Chilean, Pacific, and Atlantic whiting have only low positive desirabilities and only Peruvian fillets fall into the undesirable range. Some buyers noted they have had problems with the Peruvian fillets drying up and curling. Respondents also noted that Peruvian whiting has a soft flesh and sometimes has a bluish colored flesh (blue-belly) which is considered a negative characteristic.

Antarctic queen (Merluccius australis) is an excellent quality whiting and is used as a substitute for pollock. This is probably the best of the whiting species imported into the U.S. and the product commands a relatively high price in the U.S. market (see Table 5.2).

Supply and availability of relatively low cost seafood products are decreasing as other species, such as pollock, become more widely demanded. The void left as these products increase in value and move into higher valued uses can be partially filled with species such as Pacific whiting. As demonstrate in Figure 5.12, Pacific whiting fillets are perceived as no less desirable than Chilean whiting, and more desirable than Peruvian (at least among primary buyers). The product does not have an undesirable reputation in the H&G market and with careful handling and carefully crafted marketing and promotional strategies, the reputation of Pacific whiting fillets may be improved. This is critical since, given the relatively high weighted score, species is a very important characteristic in the whiting fillet market.

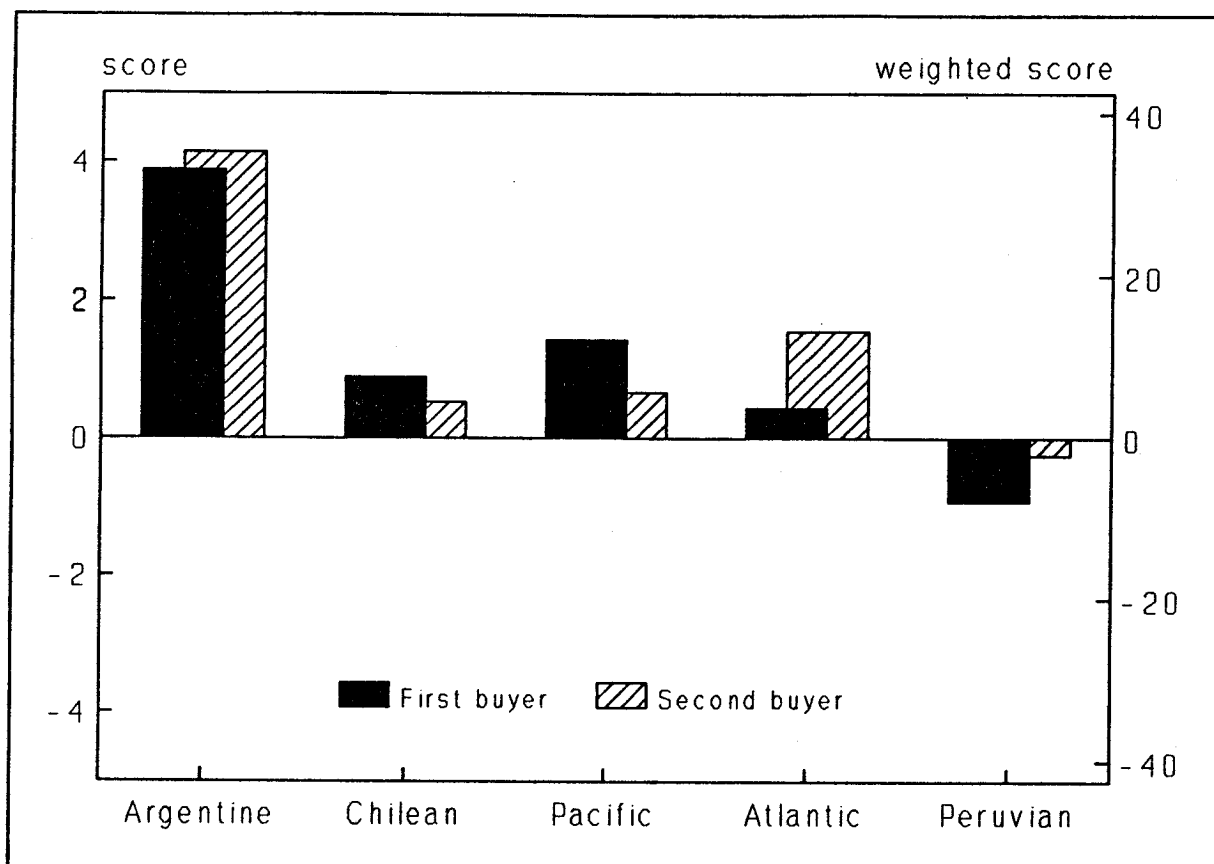


Figure 5.12 Relative desirability of alternative species of whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

species	Argentine	Chilean	Pacific	Atlantic	Peruvian
first buyer	3.88	0.89	1.43	0.45	-0.92
second buyer	4.14	0.53	0.67	1.55	-0.25

LSD_{.05}=1.88

F=3.07**

***Significant 99 percent

Enzyme Affected Fish

Figure 5.13 shows the relative desirability of whiting fillets for various rates of enzyme affected fish. The smaller the amount of affected fish the greater the desirability of purchase. On average, up to five percent of fish may be affected before the product is considered undesirable (it should be noted, however,

that many respondents were not familiar with the enzyme problem and, to some extent, may have confused this issue with more typical macro-parasite problems). The market opportunity for Pacific whiting fillets may be considerable if the enzyme problem can be solved.

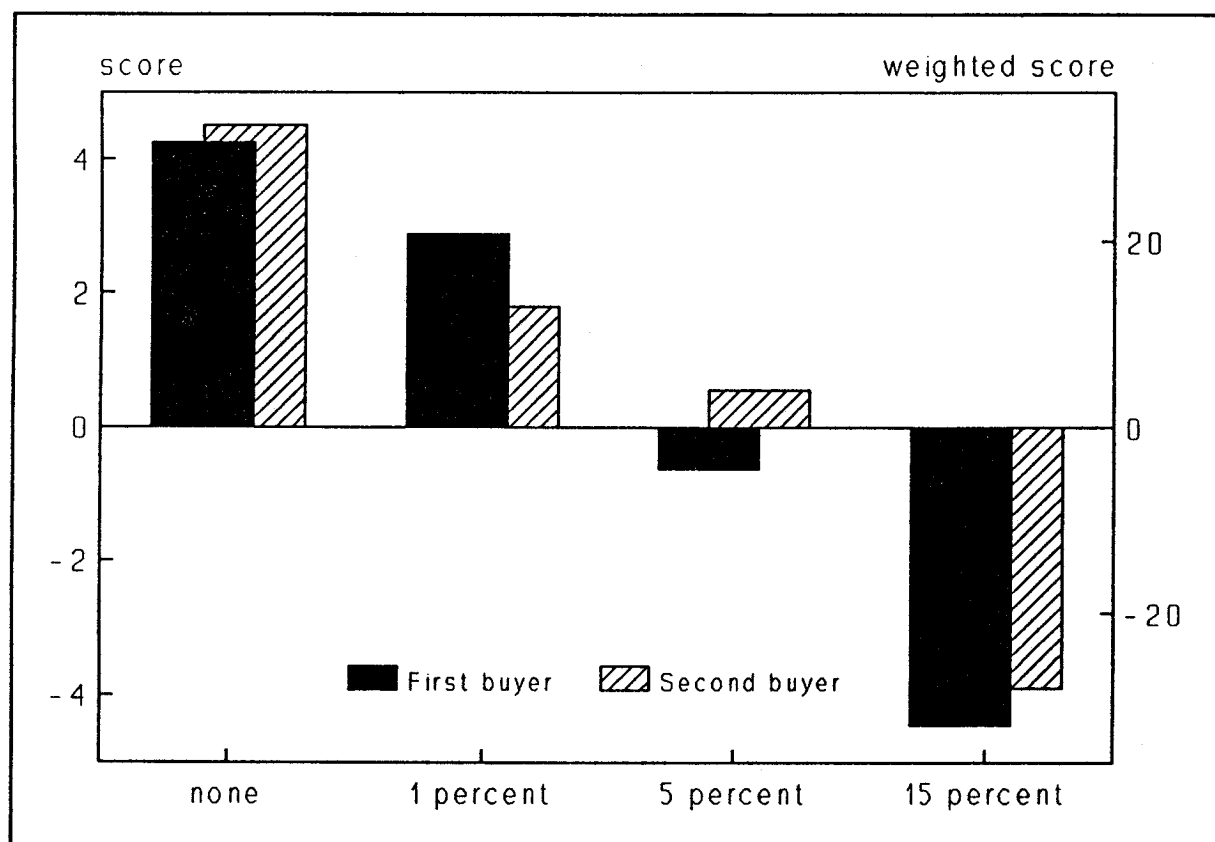


Figure 5.13 Relative desirability of alternative levels of protease enzyme for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

percent enzyme	none	1 percent	5 percent	15 percent
first buyer	4.25	2.88	-0.64	-4.45
second buyer	4.5	1.79	0.56	-3.89

LSD_{.05}=1.43

F=39.1***

Techniques for inhibiting the effect of the enzyme on the texture of the fish are costly (see "Texture", this chapter). Aside from being costly, some respondents felt that the addition of enzyme inhibitors may create problems in labeling of product ingredients. The enzyme issue is more important with fillets than with H&G because H&G product is typically cooked quickly which deactivates the enzyme before it can affect the muscle proteins. Fillets, on the other hand, are not generally prepared using a wide range of cooking methods.

Terms of Payment

Figure 5.14 shows the relative desirability of various payment terms toward the decision to purchase whiting fillets. There are two favorable alternatives; net-30 days and consignment. All the other terms were considered relatively undesirable. This is consistent with the findings for H&G product (for more information on payment terms see "Terms of Payment", Chapter IV). Note however that respondents showed a very large variance (indicated by the very large MSD) and that special circumstances may require alternative terms. This may be especially true when dealing with new customers, entering new markets, or when dealing in international markets.

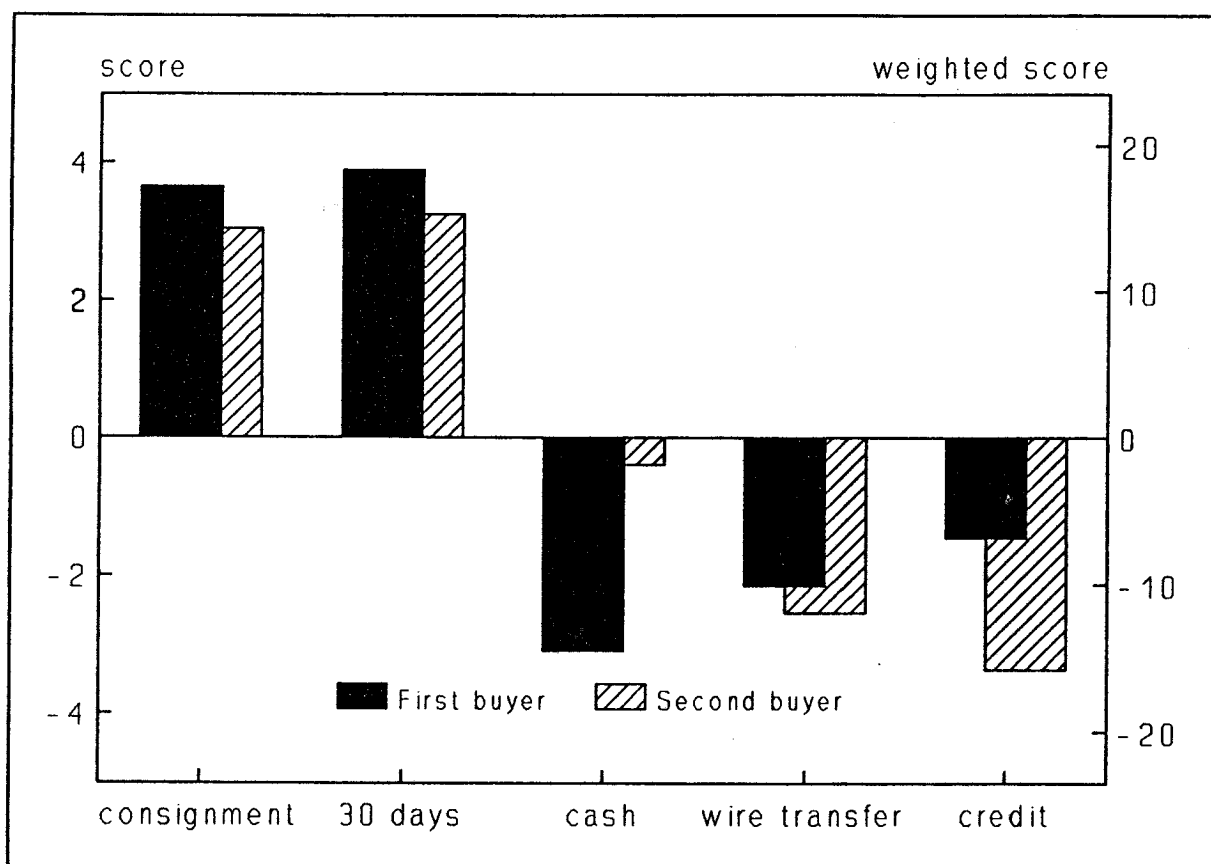


Figure 5.14 Relative desirability of alternative payment terms for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

payment terms	consignment	net 30 days	cash	wire transfer	letter of credit
first buyer	3.65	3.89	-3.1	-2.15	-1.45
second buyer	3.04	3.25	-0.4	-2.54	-3.37

MSD_{.05}=3.37

Product Line

Figure 5.15 shows the relative desirability for various ranges of product lines. Analysis indicates that firms which handle a small number of different products is preferred over others. Statistically, however, there is no difference in the relative desirability among the four choices or across sectors. To some

extent, this stands in contrast to what is desired for H&G product where specialized firms and producers of a small range of product were significantly preferred (for more information see "Product Line", Chapter IV).

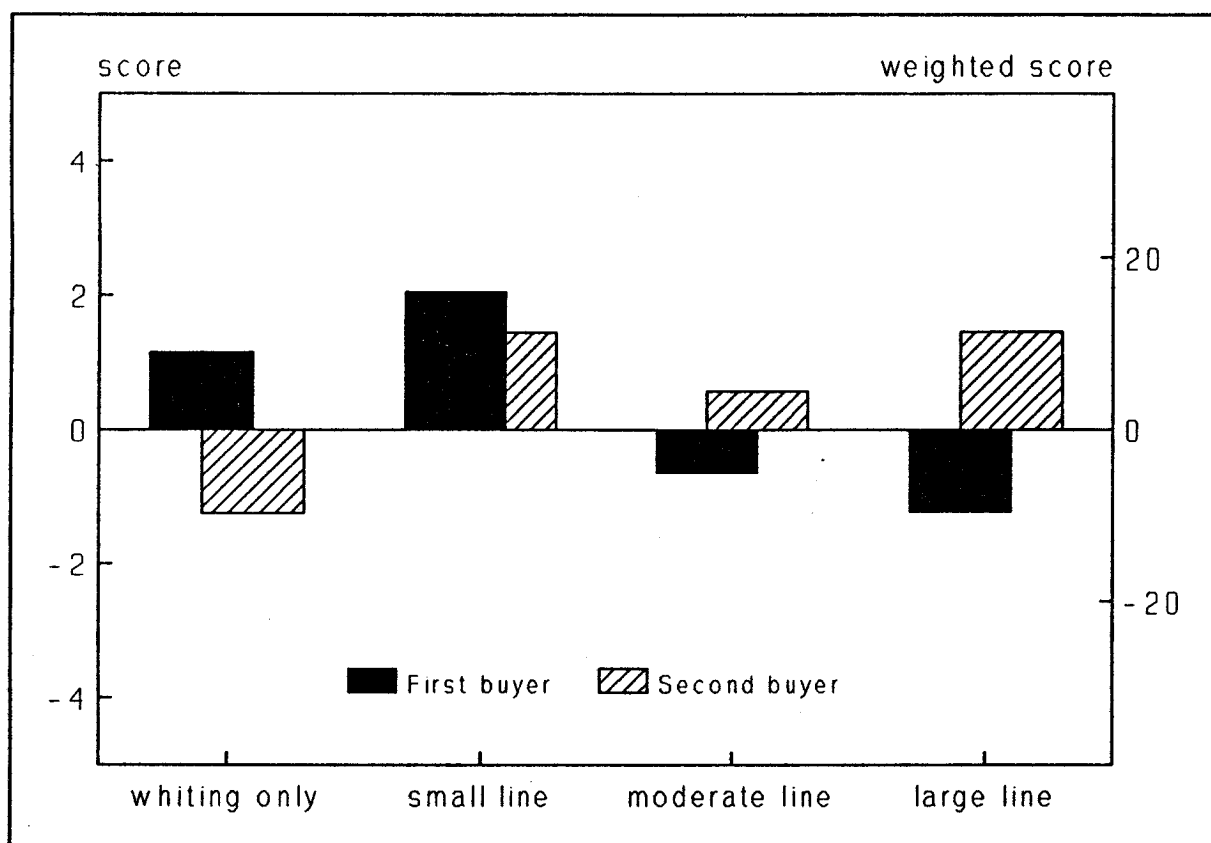


Figure 5.15 Relative desirability for alternative ranges of product line for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

product line	whiting only	small line	moderate	large line
first buyer	1.15	2.05	-0.65	-1.23
second buyer	-1.25	1.44	0.57	1.45

MSD_{.05}=4.13

Marketing Support

Both first and second buyers found more marketing support more desirable than less marketing support (Figure 5.16). This was especially true for second buyers. To some extent, this is in contrast to H&G where primary buyers preferred less marketing support from processors (see "Marketing Support", Chapter IV). Most respondents considered it important to offer a broad range of marketing services for fillets, but for H & G, the concentration was mainly on box design.

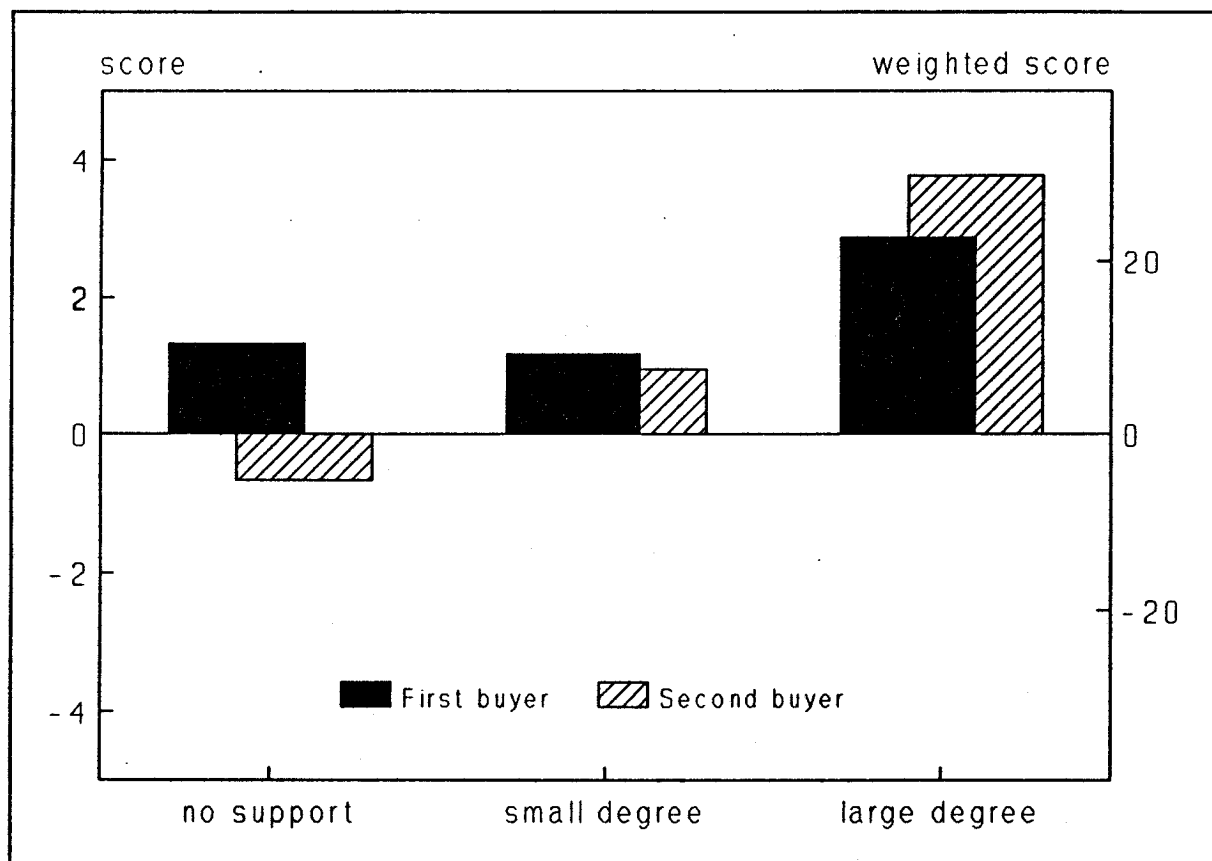


Figure 5.16 Relative desirability of alternative levels of marketing support for whiting fillets. Score: 5=highly desirable, 0=indifferent, -5=highly undesirable.

marketing support	no support	small degree	large degree
first buyer	1.32	1.17	2.87
second buyer	-0.67	0.95	3.77

MSD_{.05}=1.08

Typical Whiting Fillet Characteristics

The scores provided above measured the degree of desirability of different product attributes. The following discussion focuses on the attributes which characterize the typical or predominant product which the responding firms handle. Each figure demonstrates a different product attribute and shows the percentage of the responding whiting fillet firms which claim that their typical product is characterized by that particular level of product attribute.

Price

The prices of whiting fillets typical for responding firms are shown in Figure 5.17. Most of the whiting fillet product is sold in the \$0.55 to \$0.85 range. This relatively wide variation in price is due to variation in species and sector. For example, some firms handle primarily Argentine and others purchase primarily Chilean. These prices are consistent with prices quoted in wholesale price lists during the time of the survey (August-December, 1990). Prices since December have increased, on average, approximately 10-40 percent depending on species and market sector.

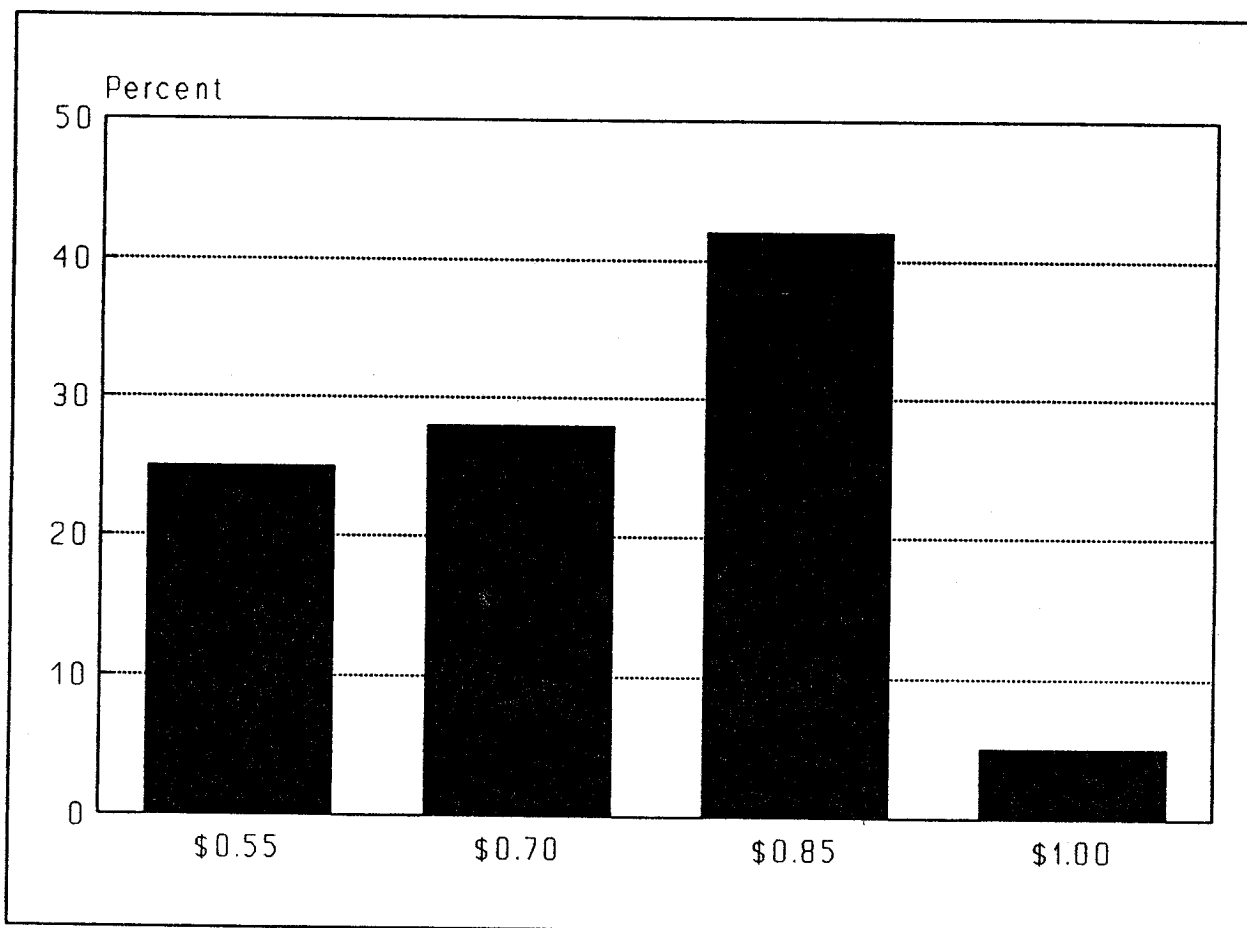


Figure 5.17 The percentage of firms handling whiting fillets at alternative prices.

Product Size

The typical size of whiting fillet product handled by responding firms is shown in Figure 5.18. Most product falls into the 4-6 ounce range, although 6-8 ounces is desired as highly as 4-6 ounce product.

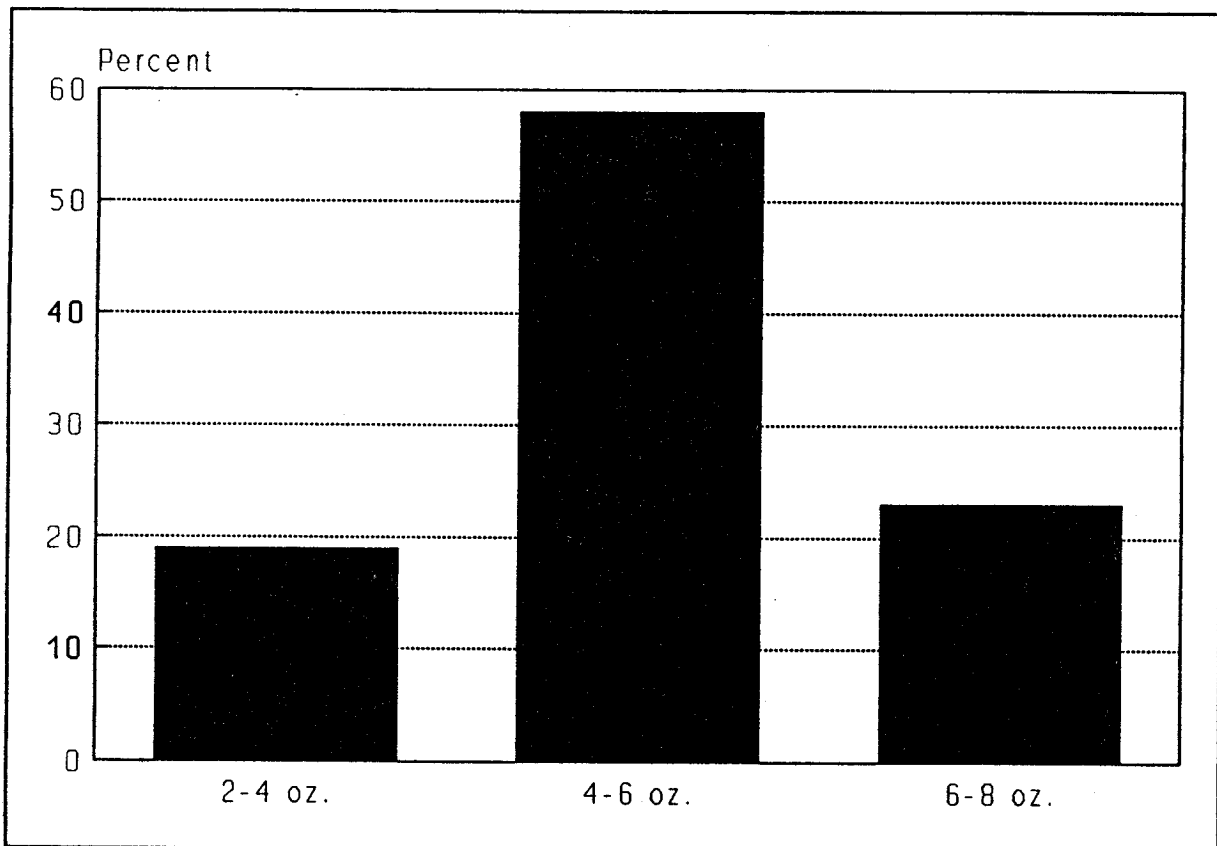


Figure 5.18 The percentage of firms handling whiting product of alternative sizes.

Species

The species of whiting which is predominantly handled by responding fillet firms is shown in figure 5.19. The majority of the fillets are South American species such as Chilean and Argentine whiting which stands in contrast to H&G where the typical product is dominated by Pacific whiting. This should be kept in mind when reviewing other typical product attributes. Some of these attributes primarily characterize South American whiting species.

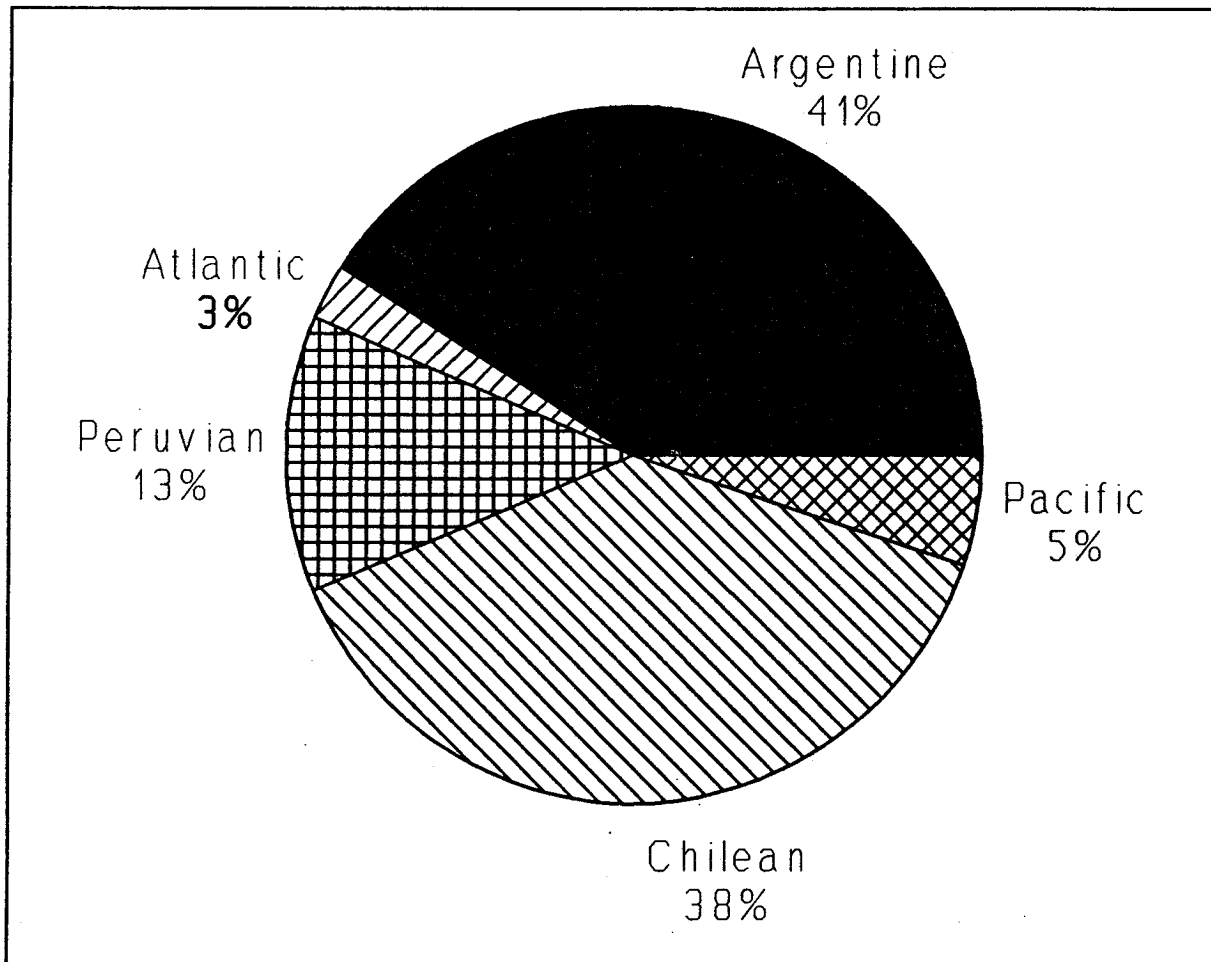


Figure 5.19 The percentage of firms handling whiting fillets of alternative species.

Texture

Figure 5.20 shows the typical texture of whiting fillets handled by fillet firms. Most of the responding firms claim to handle product which they consider to be firm in texture. It is unclear what texture Pacific whiting would be considered to have if it is handled and cooked properly. Clearly, however, if it does have a softer texture than other whittings, this will pose a problem for marketing and promotion.

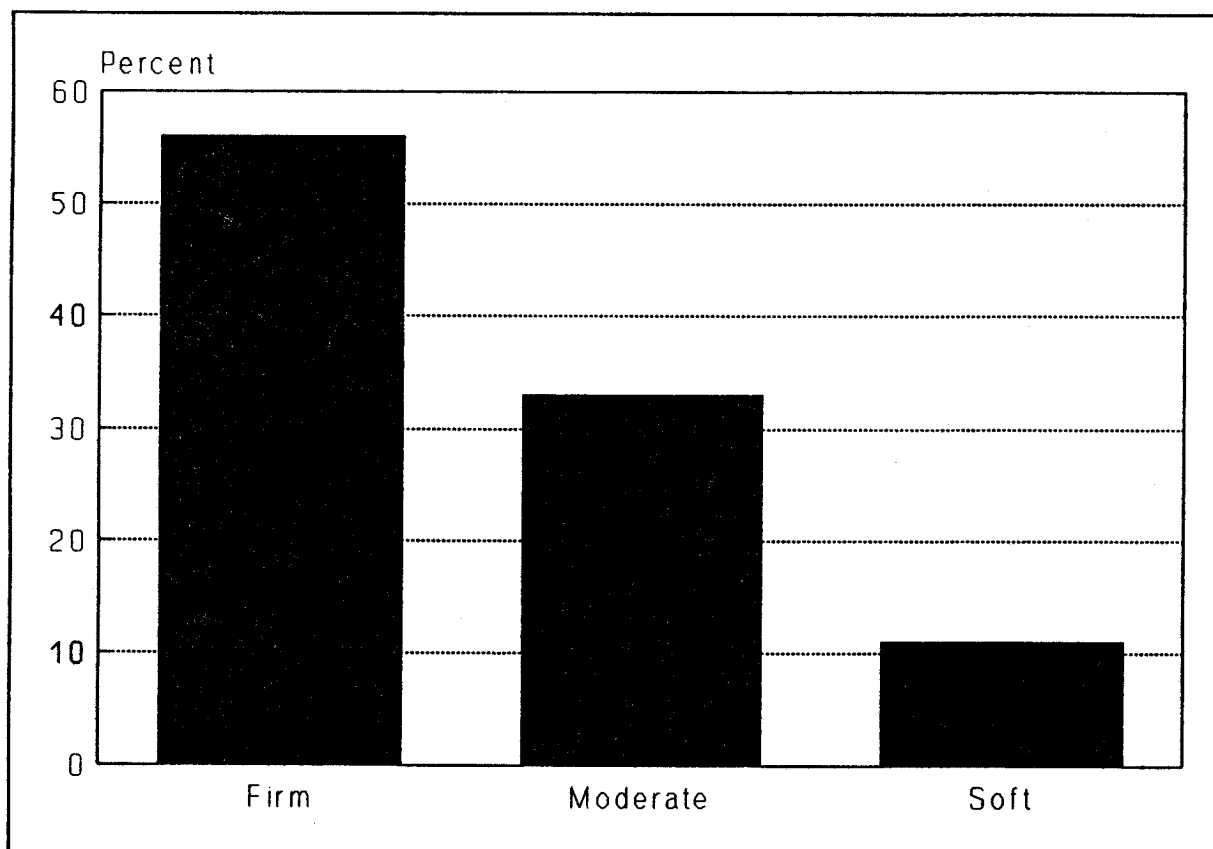


Figure 5.20 The percentage of firms handling whiting fillets at the alternative levels of texture.

Product Form

The most typical forms of fillet product are shown in Figure 5.21. The most common product form is skinless, non-defatted fillets. Pacific whiting has a "fat layer" under the skin and whether some portion of this layer will need to be removed (by deep skinning) in order to achieve an attractive skinless fillet for some market uses (retail sales) is yet unknown. This may prove to be a problem in marketing Pacific whiting fillets. Skin-on fillets are processed for some market uses with limited success but skinless fillets dominant the market.

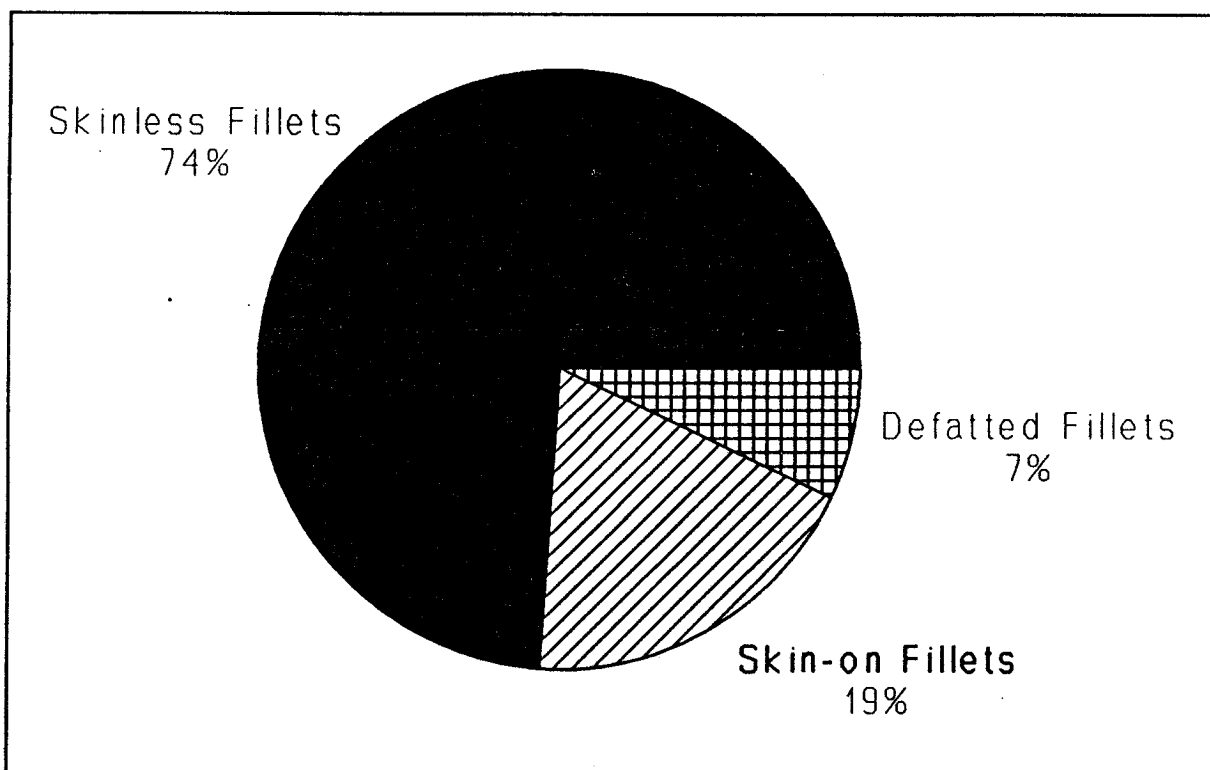


Figure 5.21 The percentage of firms handling whiting fillets of alternative product forms.

Package Form

Most fillets handled by responding firms were packaged in shatterpacks (Figure 5.22). The next most common method of packaging was IQF (Individual Quick Frozen). This corresponds to what package forms are most desired by responding firms as shown earlier in this chapter. The packaging style would be part of the sales agreement between buyers and processors.

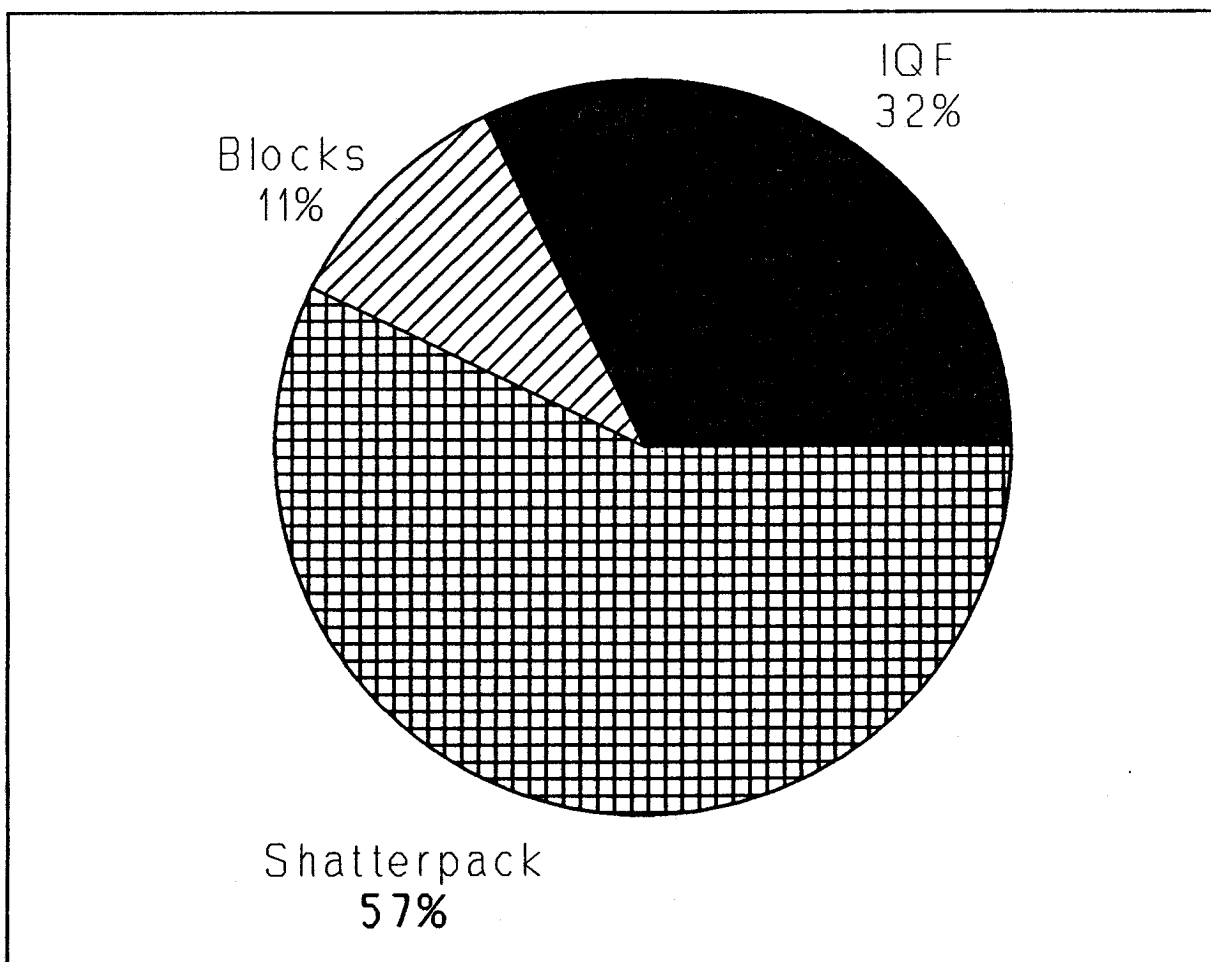


Figure 5.22 The percentage of firms handling whiting fillets in alternative package forms.

Shelf Life

The average typical shelf life of whiting fillets for responding firms is demonstrated in Figure 5.23. Most of the product was considered to have a shelf life between 12 and 18 months. Evidence indicates that with proper handling and storage, a relatively long shelf life may be possible for Pacific whiting.

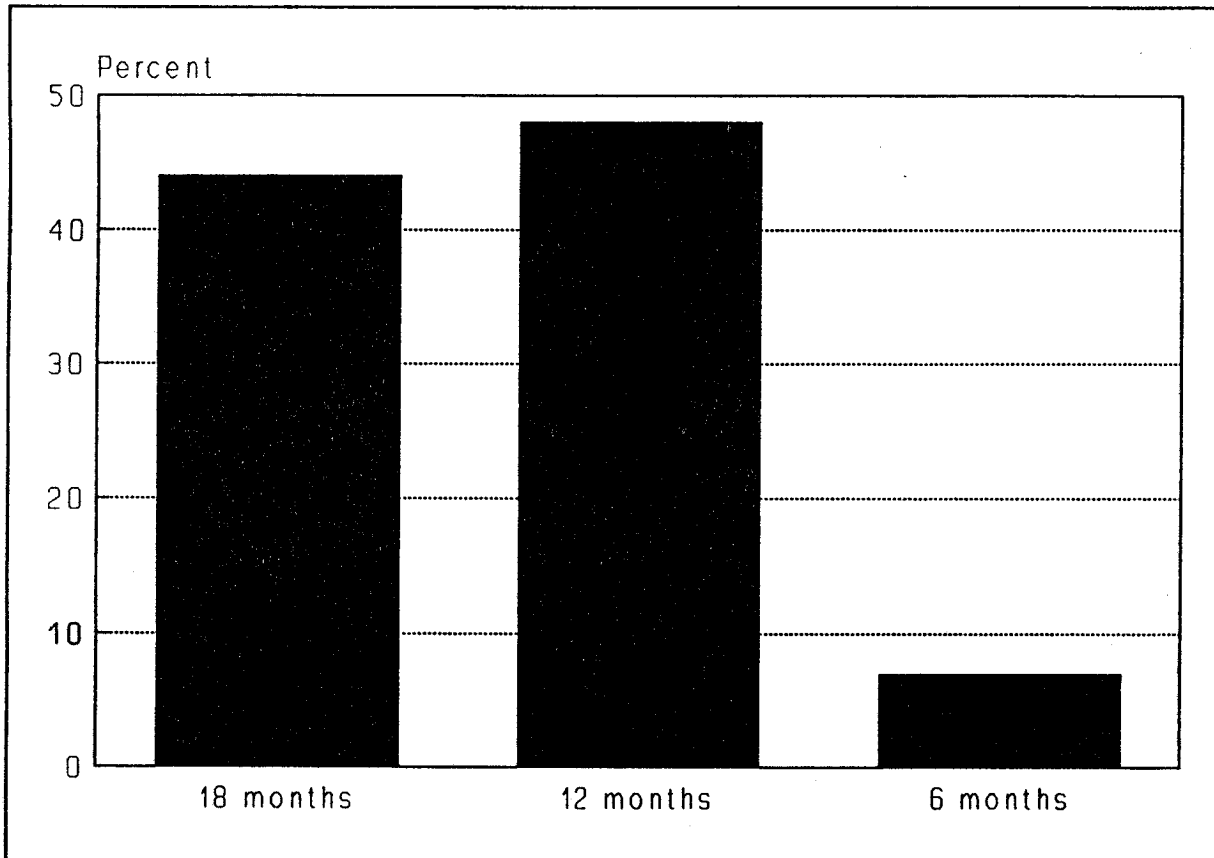


Figure 5.23 The percentage of firms handling whiting fillets of alternative lengths of shelf life.

Flesh Color

Figure 5.24 shows the typical flesh color for whiting fillets which were handled by responding firms. More respondents stated the typical flesh color (uncooked) was white or off-white. Very few respondents stated their typical product was pink and, in fact, pink is undesirable as demonstrated earlier in this chapter. Some Pacific whiting has a "pink tinge" color and it might be wise to use whiting with this coloration for alternative uses such as H&G or minced product where colors can be added.

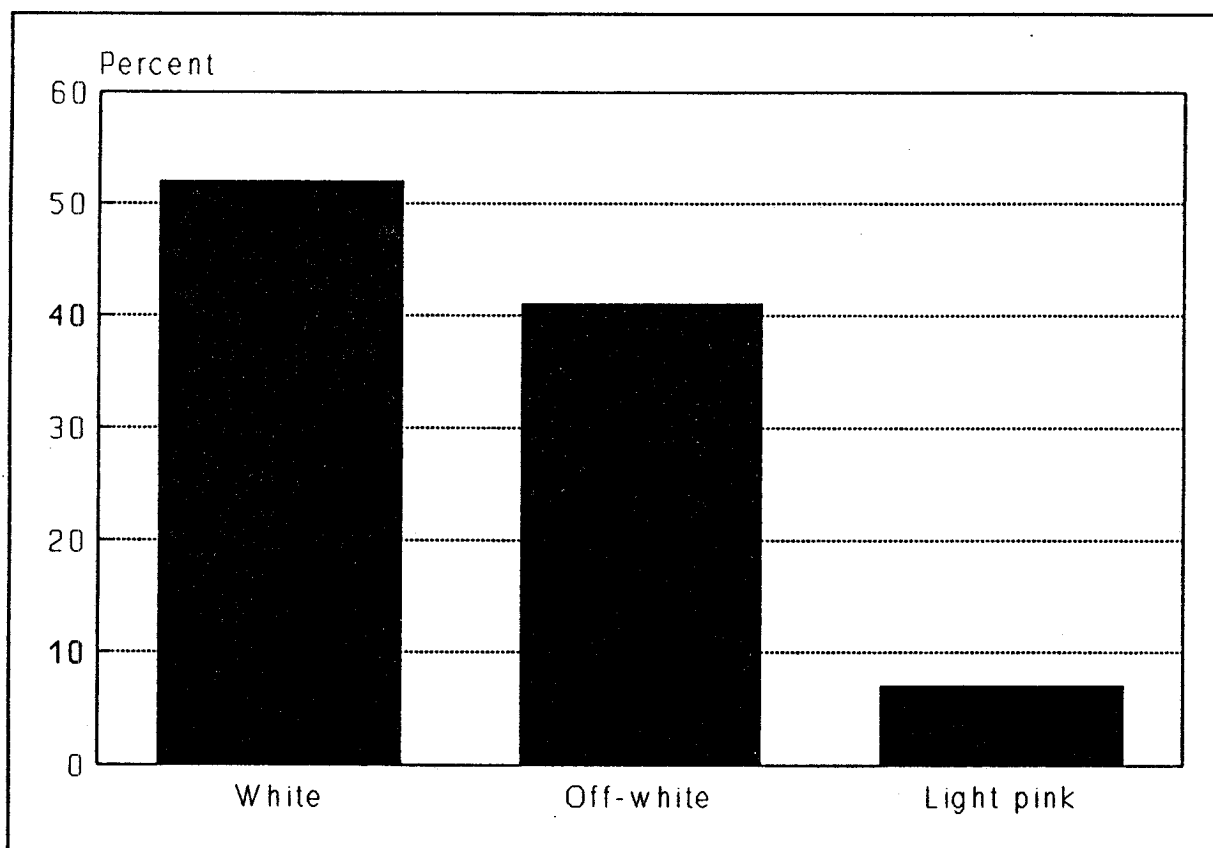


Figure 5.24 The percentage of firms handling whiting fillets of alternative colors.

Package Size

The typical package size for whiting fillets is shown in Figure 5.25. The majority of the fillets are sold in 5 and 10 pound packages. Refer to the "Package Size" section earlier in this chapter for a more detailed discussion.

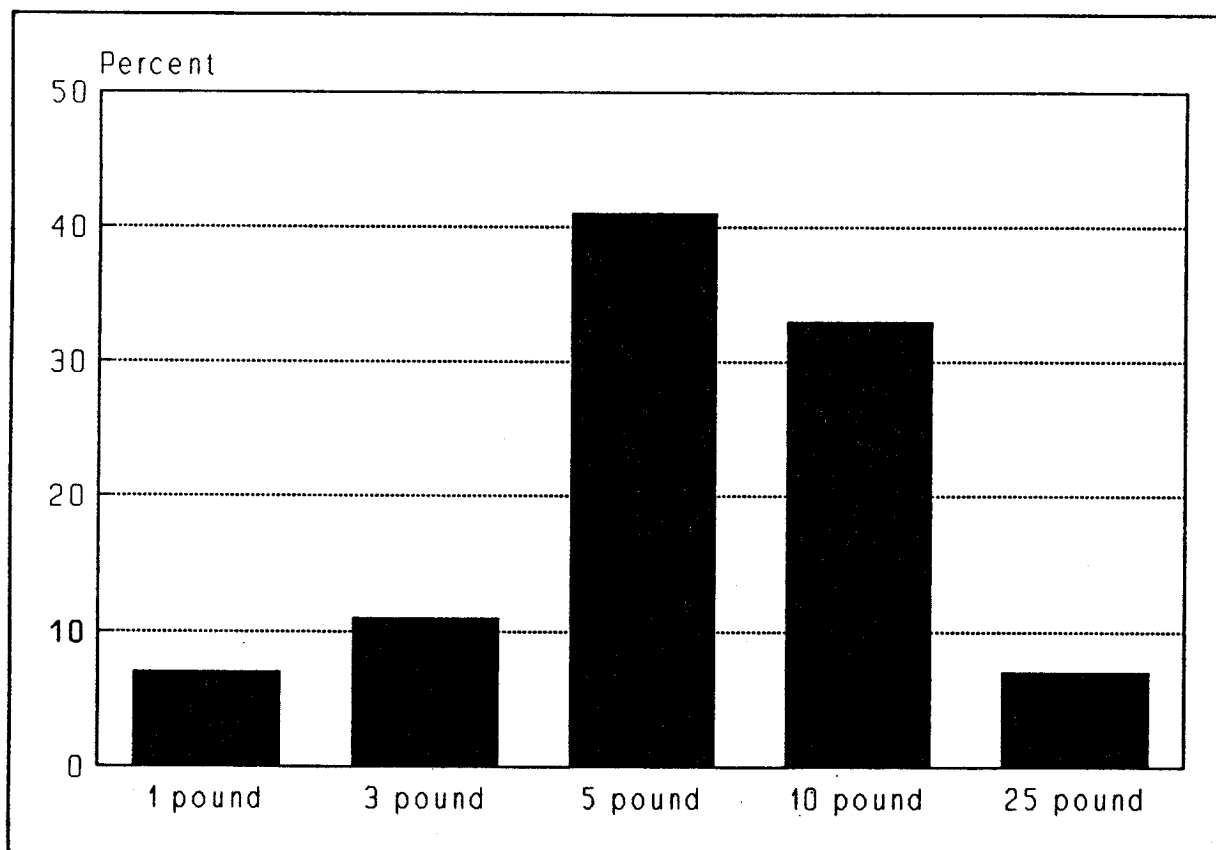


Figure 5.25 The percentage of firms handling whiting fillets in alternative sizes of packages.

Supply Availability

The typical supply availability of whiting fillets which were handled by responding firms is demonstrated in Figure 5.26. Most product is considered available for 12 months.

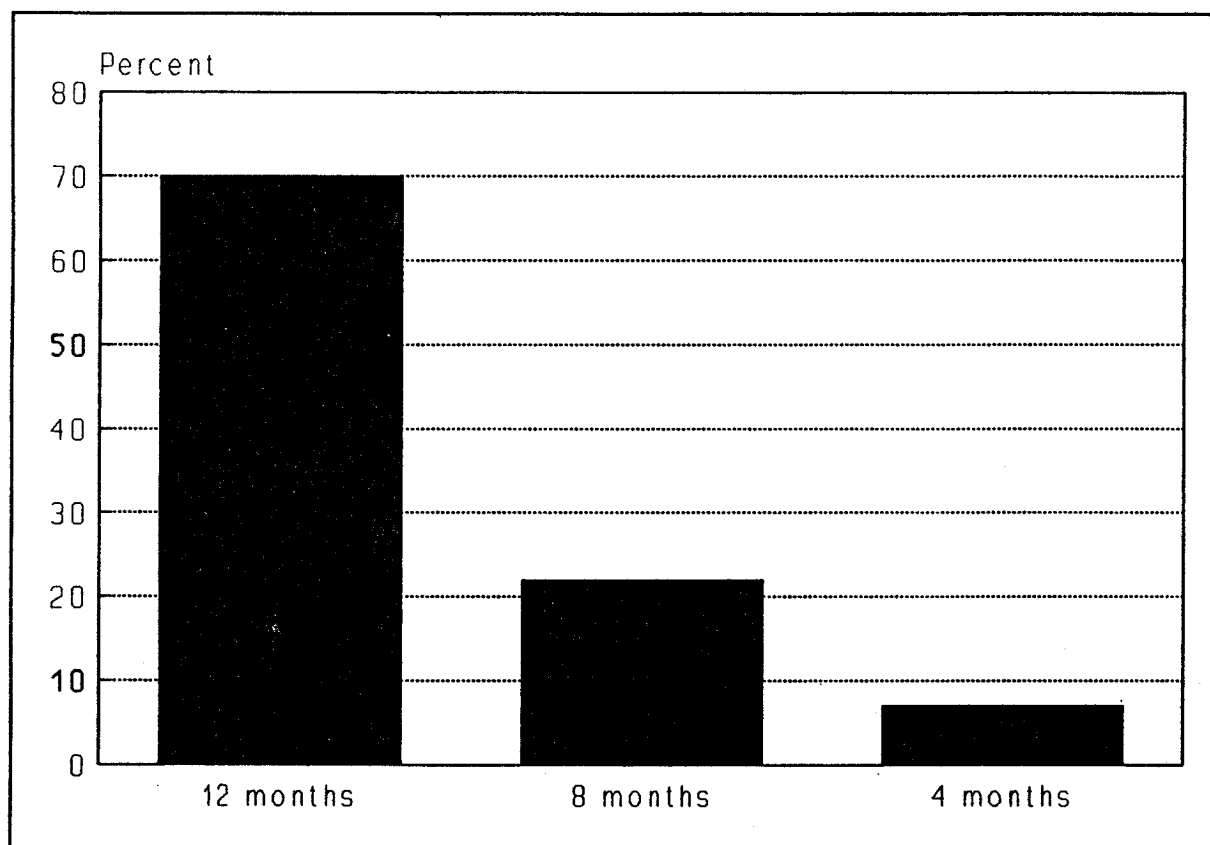


Figure 5.26 The percentage of firms handling whiting fillets at alternative lengths of supply availability.

Product Uniformity

Fifty percent of the responding firms which handle whiting fillets claim to have a product uniformity of 95% or greater as shown in Figure 5.27. As the percentage of uniformity decreases, so does the number of firms which claim to handle product with these lower uniformities. This finding, however, may be misleading because uniformity may have different meanings for different respondents. Some respondents consider uniformity to include all attributes; others think primarily in terms of product size.

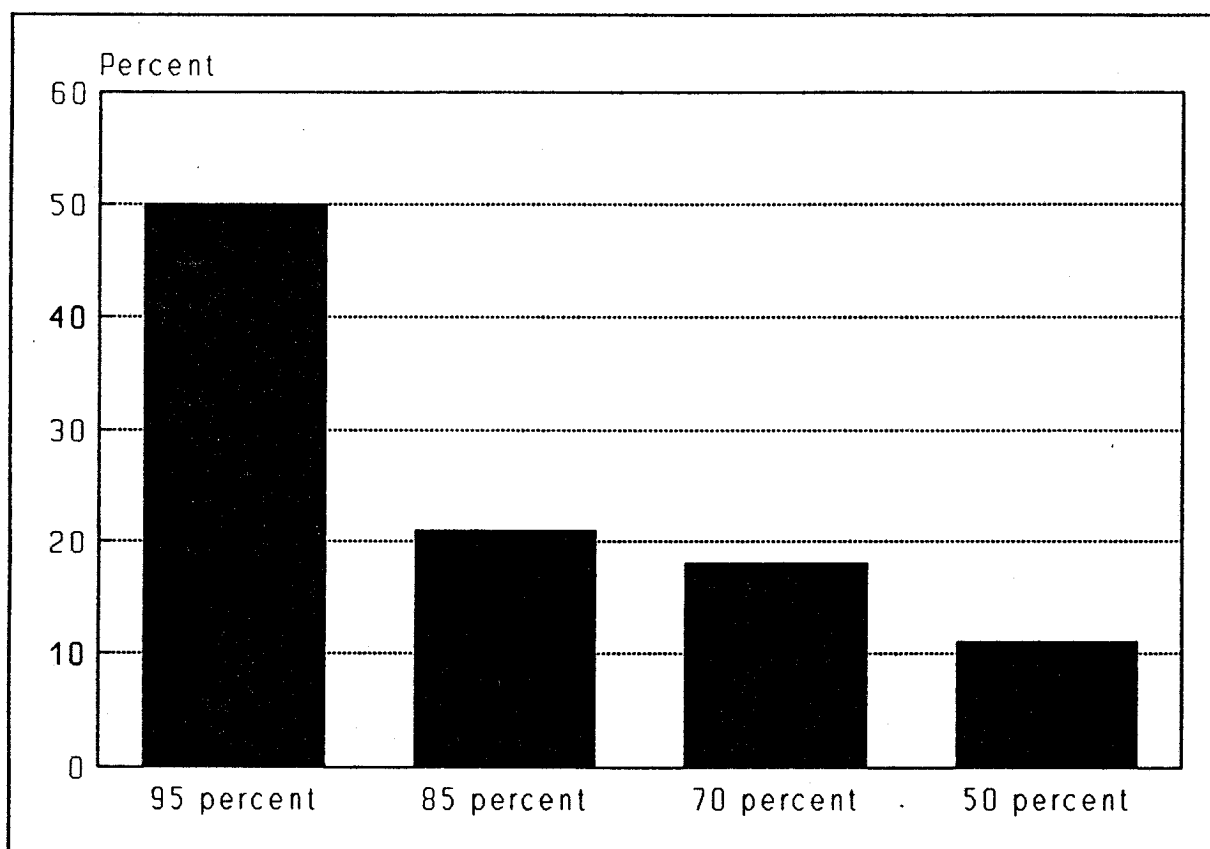


Figure 5.27 The percentage of firms handling whiting fillets with alternative degrees of product uniformity.

Range of Product Line

Figure 5.28 shows the range of product line typical of firms from which whiting fillets are purchased. Fillets are purchased from companies with a relatively wide range of product lines although firms with relatively small lines, or whiting only, dominate.

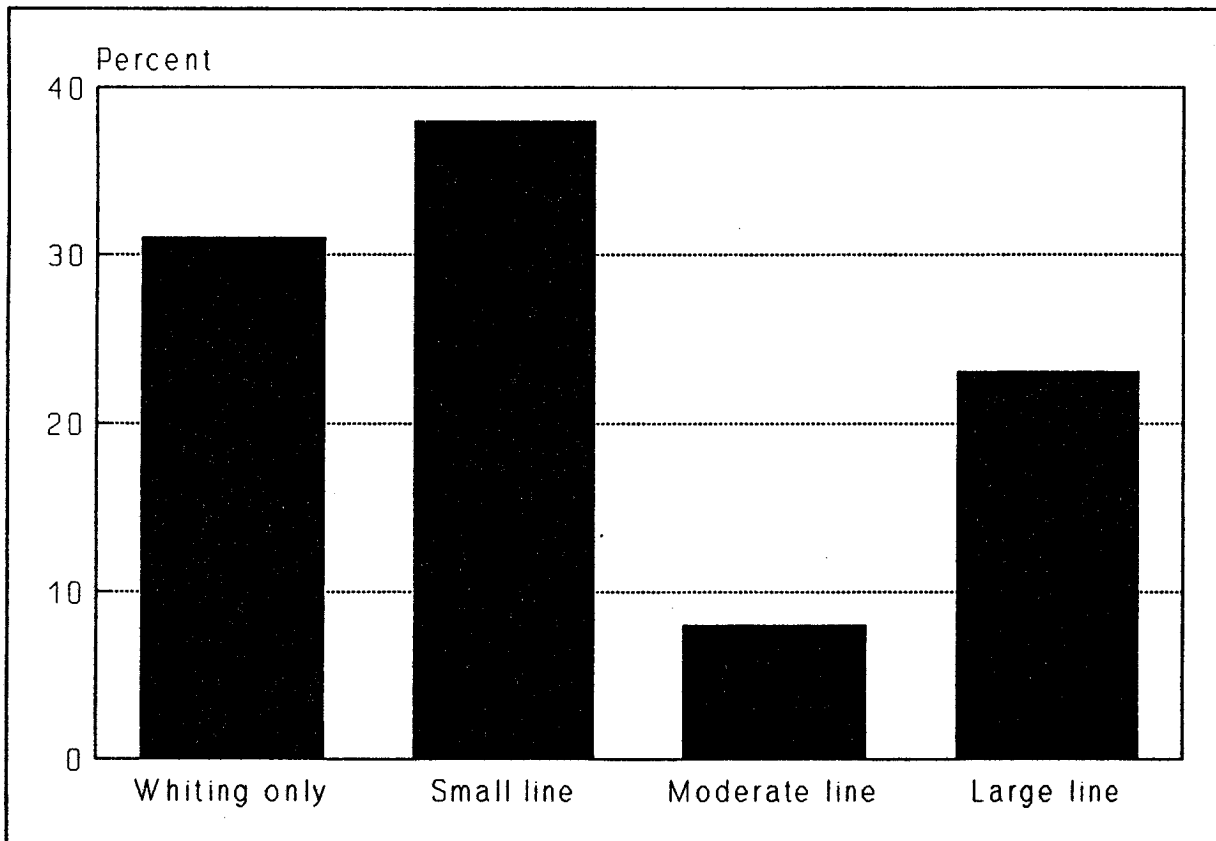


Figure 5.28 The percentage of firms handling whiting fillets that desire alternative ranges of product lines.

Marketing Support

As demonstrated in Figure 5.29, most of the whiting fillets are purchased from firms which offer no marketing support. This is opposite from headed and gutted where the typical product was provided with a large degree of marketing support. This is also different from what is desired by fillet firms, especially second buyers, as demonstrated earlier in this chapter. There is a demand for marketing support which may not be currently filled.

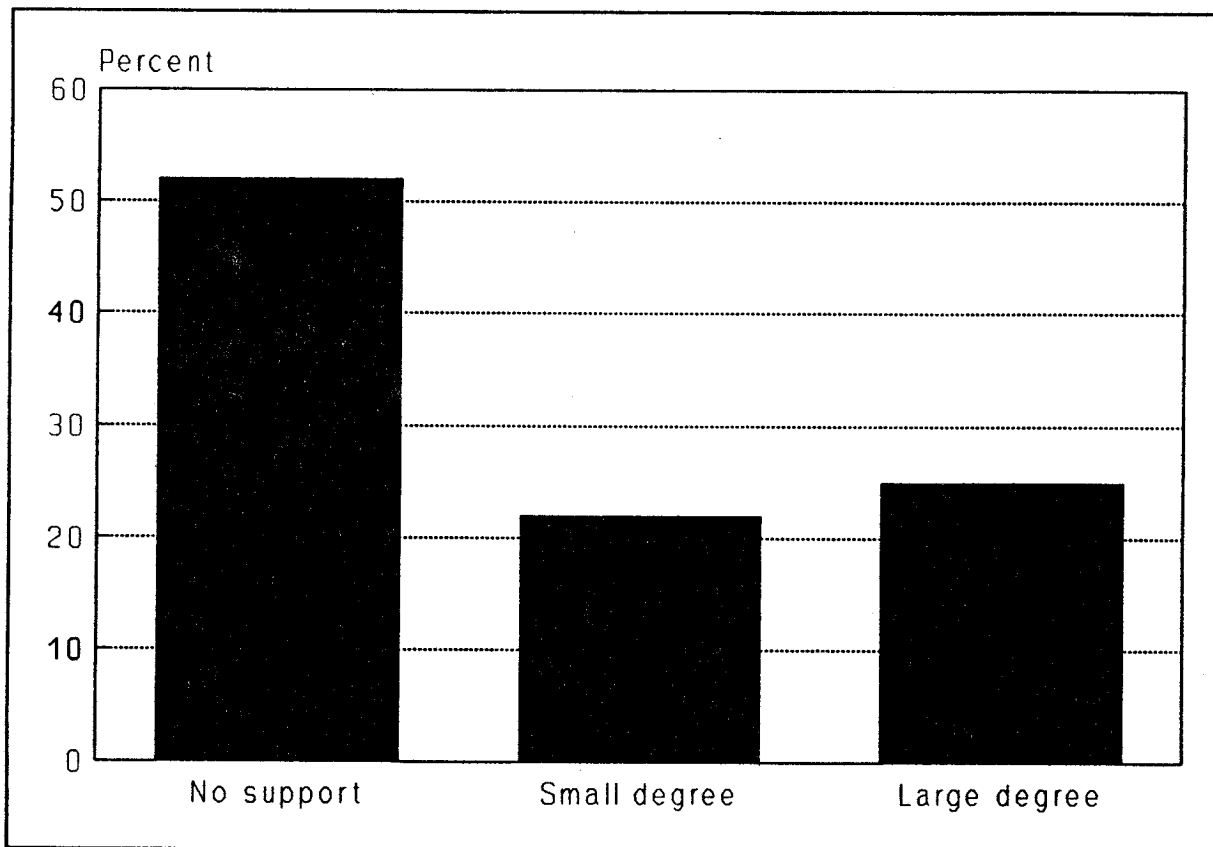


Figure 5.29 The percentage of firms handling whiting fillets which desire alternative degrees of marketing support.

Characteristics of Typical Species

The scores from the previous analysis (self-explicated utility analysis) may be used to compare the "typical" and the "ideal" products (Table 5.4). This table demonstrates the mean weighted values (i.e., the "importance" score of the attribute multiplied by the "desirability" score) assigned to the various product attributes for both the most ideal and the typical product(s). The relative scores for different combinations of product attributes can be used to compare the change in demand relative to changes in product attributes.

Table 5.4 Typical and Ideal Fillet Attribute Characteristics.

Attribute	<u>Argentine</u>		<u>Chilean</u>		<u>Pacific</u>		<u>Peruvian</u>		<u>Ideal</u>	
	Typical charac.	Score	Typical charac.	Score	Typical charac.	Score	Typical charac.	Score	charac.	Score
Price	\$0.85/lb.	7	\$0.70/lb.	18	\$0.55/lb.	32	\$0.55/lb.	32	\$0.55/lb.	32
Product form	Skinless	35	Skinless	35	Skinless	35	Skinless	35	Skinless	35
Product size	6-8 oz.	35	6-8 oz.	35	6-8 oz.	35	6-8 oz.	35	6-8 oz.	35
Texture	Firm	40	Firm	40	Moderate	18	Moderate	18	Firm	40
Shelf life	12 months	32	12 months	32	12 months	32	6 months	14	12 months	32
Flesh color	White	34	White	34	Off-white	10	Off-white	10	White	34
Enzyme percent	None	25	None	25	5 percent	1	5 percent	1	None	25
Product range	Whit. only	2	Small	8	Small	8	Small	8	Small	8
Marketing supt.	Small	5	None	7	None	7	None	7	Large	15
Payment terms	Net 30 days	19	Net 30 days	19	Net 30 days	19	Net 30 days	19	Net 30 days	19
Package size	5 pound	22	5 pound	22	5 pound	22	5 pound	22	5 pound	22
Supply avail.	12 months	37	12 months	37	8 months	27	8 months	27	12 months	37
Uniformity	95 percent	38	85 percent	20	85 percent	20	85 percent	20	95 percent	38
Total Score	331		332		266		248		372	

Surprisingly, Chilean product scored as high as Argentine even though it was ranked significantly lower in desirability in Figure 5.12. Chilean whiting may be demanded less (as indicated by the lower price) but, except for product uniformity, it was equal to Argentine in attribute qualities. Pacific whiting fillets scored 248 points (only 18 more than Peruvian) even though Pacific whiting fillets are typically priced at only \$0.55 per pound. Pacific whiting scored low due to texture(only moderate), color(off-white), enzyme problems(5 percent), supply availability(8 months), and product uniformity(85 percent). These product attributes will have to be improved if demand and price levels for Pacific whiting fillets are expected to be increased.

Demand for Whiting Fillets

Conjoint Analysis

Conjoint analysis was used to determine the relative profitability and demand for whiting fillets as a function of various product attributes especially those attributes which would most likely characterize Pacific whiting. Respondents were presented with eight different whiting fillet products and asked to score each product using a scale from -10("highly unprofitable") to +10("highly profitable") with the mid point(0) labelled "break-even." All eight products were characterized by the following set of fixed attributes:

Shelf Life:	12 months
Flesh Color:	Slightly off-white
Texture:	Moderately firm
Product Uniformity:	95% uniform in product attributes
Package Form and Size:	Ideal
Payment Terms:	Net 30 days

Each of the eight products, however, varied in the following characteristics:

Product Form:	(Skin-on, or Skinless, defatted)
Product Size:	(2-4, or 4-6 oz.)
Supply Availability:	(3, or 7 months)
Price:	(\$0.60, \$0.80, or \$1.00)
Marketing Support:	(yes, or no)

The variation in these attributes were selected in order to realistically characterize the choices for the Pacific whiting industry and to more thoroughly explore policy and market issues related to developing a shore-based Pacific whiting industry. For more details about conjoint analysis, see Chapter II and to view the conjoint questionnaire section of the whiting fillet survey, see Appendix B.

Table 5.5. The relative profitability of whiting fillet products using conjoint analysis.

Variable	Rank		Score	
	Coefficient	t-value	Coefficient	t-value
Constant (Relative profitability)	11.04	11.04***	14.74	5.49***
Product form (1 if skin-on, 0 otherwise)	-1.03	-5.54***	-2.18	-4.56***
Product size (ounces)	0.11	1.23	0.51	2.23**
Supply availability (months)	0.04	1.08	0.18	1.72*
Price (cents)	-0.09	-12.82***	-0.22	-7.69***
Marketing Support (1 if included, 0 otherwise)	0.71	3.81***	1.31	1.79*
Sector (1 if second buyer, 0 otherwise)	-	-	-2.56	-1.59*
Species (1 if Argentine, 0 otherwise)	0.57	1.87*	1.04	1.61*
Company Size (1 if large, 0 otherwise)	-0.16	-1.63*	-0.89	-3.22***
Sector*Price	0.02	1.14	0.07	2.73***
Species*Price	0.06	2.01**	0.06	0.61
Company size*Price	-0.11	-1.71*	-0.04	-1.52
Sector*Supply Availability	0.03	1.37	0.12	0.81

Equation Statistics:

N=472

F=27.38***
Adjusted R-squared=.35

F= 18.95***
Adjusted R-squared=.27

*Significant 90 percent
**Significant 95 percent
***Significant 99 percent

The two regressions measure the importance of the product characteristics affecting profitability in different ways. The rank regression shows the importance of a unit change in each product characteristic (i.e. the coefficient value) in improving the relative ranking of the eight products in terms of their subjective profitability to a buyer. For example, the inclusion of marketing support would increase the ranking of a whiting fillet product relative to other products by 0.71 units (assuming everything else is equal); in terms of price, a one cent increase would decrease the rank by 0.09 units. The scoring regression shows how a one unit change in the product characteristic would affect the profitability scoring. For example, a one cent increase in the price of fillets would reduce the relative profitability of handling the fillet product by 0.22 units (assuming everything else remains equal).

The overall equation statistics are reasonably good for this type of cross-sectional analysis. The signs and magnitudes of the coefficients conform to prior expectations. Most of the coefficients are also significant at a level of 90 percent or greater. The score equation demonstrates that, everything else being equal;

- 1) on average a skin-on fillet would significantly reduce profitability to downstream buyers, but a skinless fillet would be worth an additional \$0.10/lb. in order to maintain the same level of profitability as a skin-on fillet;
- 2) handling 4-6 ounce fillets would significantly increase profitability relative to 2-4 ounce fillets;
- 3) lengthening the period of supply availability would significantly increase product demand;
- 4) every cent increase for the product would decrease profitability by 0.22 units for first buyers but only by 0.15 units for second buyers;
- 5) the inclusion of marketing support would increase profitability at a rate comparable to decreasing price by \$0.05;
- 6) the second buyer found the entire range of product less profitable than the first buyer (probably due to price);
- 7) firms which purchase Argentine product found the product more profitable than firms which handle other species.
- 8) larger firms found these products significantly less profitable than smaller firms (probably due to price-this is same finding as H&G).

A number of the coefficients on certain attributes in both equations were not statistically significant (i.e. the coefficients were not significantly different than zero). In the rank equation, product size, supply availability, market sector, and certain sector interactions including price and supply availability were not significant. In the score equation, interaction variables including sector*supply availability, company size*price, and species*price were not significant. This does not necessarily indicate that these variables were not relatively important, but rather that they were not significant given the range of the variables which were selected for testing. For example, both product size and supply availability were selected with relatively narrow ranges (2-4 oz. or 4-6 oz., and 3, or 7 months) in order to be consistent with the expectations about the conditions which shore-based processors may experience and to keep the conjoint

analysis experiment relatively simple given the conditions under which this research was conducted (relatively low number of observations, the use of mail surveys, and the hurried, noisy atmosphere which characterizes the respondents working environment). If a wider range of attributes was used in the experiment, patterns similar to that in the self-explicated portion of the survey would be expected. The trade-off, however, is that the coefficients developed in this analysis would not be as accurate.

Overall, price, sector, and product form are the most important variables in the equation. The intercept (constant) term is significant and represents the profitability impacts of the product attributes which were not included in the experiment.

The score equation is especially useful in determining the relative acceptance and profitability of different whiting fillet products to different intermediary market buyers. For example, suppose that a processor was contemplating selling the following product to a buyer from a large company that predominantly handles Chilean whiting:

Product size:	4-6 ounces
Product form:	Skinless fillet
Supply availability:	6 months
Marketing support:	None

Given these product attributes, how would price impact the relative profitability (i.e. the desirability to purchase) of the buyer?

In fact, this can be calculated by plugging in the variable characteristics and solving the regression equation. For example, suppose we were interested in the break-even prices for each sector. Including only those regressors consistent with the findings of the self explicated analysis (i.e., excluding product size) and solving the regression yields the following break-even price for the first buyers:

First Small Firm Buyer Price(profit=0) = \$0.80/lb.

First Large Firm Buyer Price(profit=0) = \$0.72/lb.

These is one cent higher (for larger firms) than the break-even price calculated from the self explicated information summarized in Figure 4.2. These values are remarkably close. Based on this regression, every cent decrease for the fillet product would increase the relative profitability to the large first receiver by 0.22 units. The break even price for secondary buyers may also be calculated by including the sector coefficients.

Analysis of the interaction term of sector and price shows the impact of price to the second buyer relative to the first buyer. If this price effect is added to the price effect for the overall equation, the secondary sectors' price coefficient may be calculated and the break-even point for the second buyer may then be determined:

Second Small Firm Buyer Price(profit=0) = \$1.04/lb.

Second Large Firm Buyer Price(profit=0) = \$0.86/lb.

The margin for the first buyer (under highly competitive economic conditions) may then be approximated by subtracting the secondary buyer's break-even price from the first buyer's break-even price:

$\$0.86/\text{lb.} - \$0.72/\text{lb.} = \$0.14/\text{lb.}$ (Large Firm)

$\$1.14/\text{lb.} - \$0.80/\text{lb.} = \$0.24/\text{lb.}$ (Small Firm)

Therefore, approximately a 20 percent margin for large firms and up to a 30 percent margin for small firms may be necessary to cover all fixed and variable costs.

Bidding Game and Fillet Product Demand

Another method used to reveal the preferences and demands of firms for fillet product was a "bidding game." Using this technique, each respondent was provided one fillet product characterized by a specific set of attributes. The respondent was then asked to score the product as before, for eight alternative prices and also to estimate the amount of product which they would purchase for each price. By alternating a subset of product attributes across respondents, a "demand curve" could be estimated for alternative H&G products at various prices.

In order to develop this information, a conditional regression was performed on the data collected during the "bidding" section of the survey. The data only included observations for some positive (non-zero) level of quantity. The results of that regression are summarized in Table 5.6.

Table 5.6. Conditional^a firm level demand for whiting fillets for first and second sector, and for large and small firms (Thousands of pounds).

Variable	Coefficient	t-value
Constant	807.9	5.38***
Product form (1 if skin-on, 0 otherwise)	-138.2	-1.59*
Product size (ounces)	73.9	1.61*
Texture (1 if firm, 0 otherwise)	171.9	2.02**
Flesh color (1 if white, 0 otherwise)	91.8	0.49
Supply availability (months)	87.3	1.28
Price (cents)	-13.1	-8.72***
Marketing Support (1 if included)	51.7	1.96**
Sector (1 if second buyer, 0 otherwise)	90.3	2.16**
Species (1 if Argentine, 0 otherwise)	68.2	1.22
Company size (1 if large. 0 otherwise)	1232.0	2.89***
Sector*Price	1.7	1.98**
Species*Price	1.0	1.05
Company size*Price	1.1	2.71***
Sector*Supply Availability	7.6	0.77

Equation Statistics:

N=332

F=34.17***

Adjusted R-squared=0.29

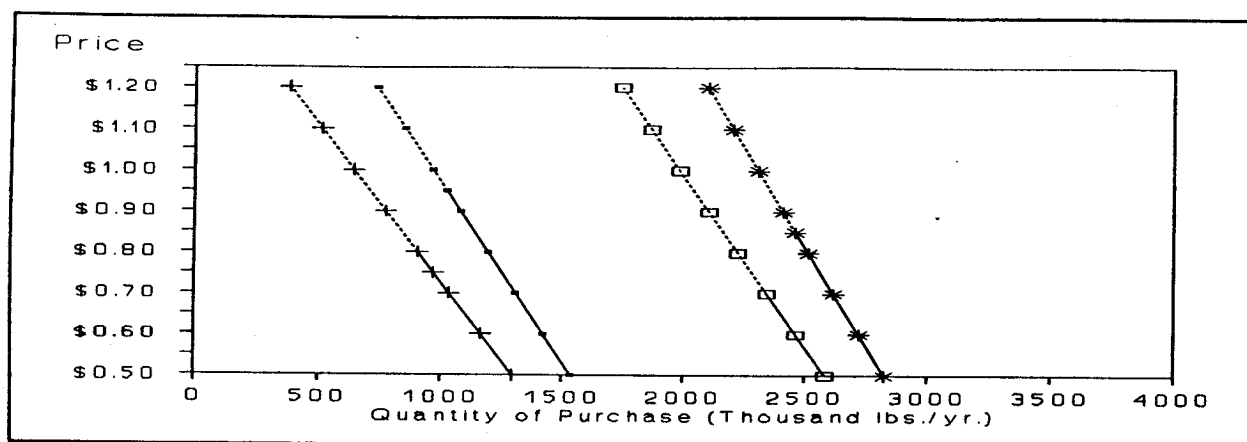
*Significant 90 percent

**Significant 95 percent

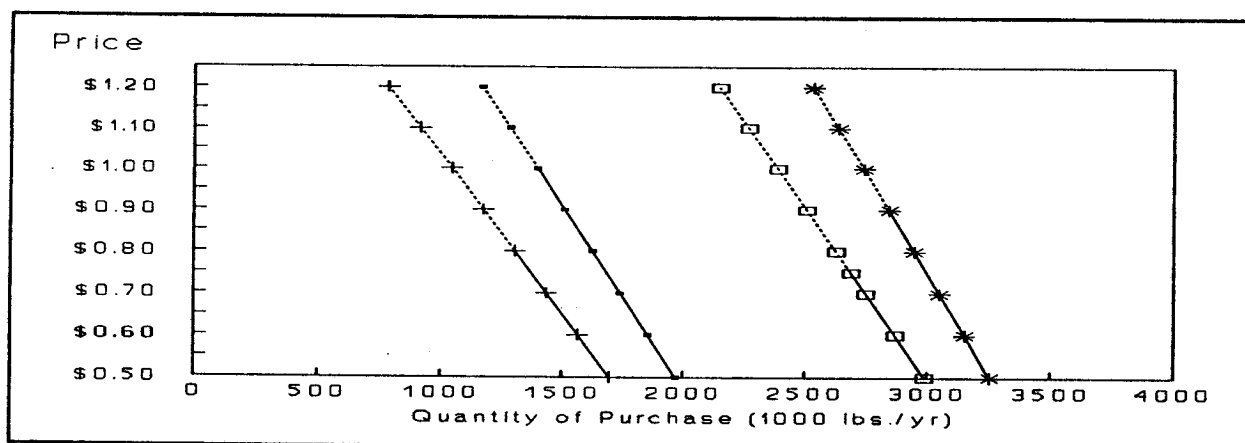
***Significant 99 percent

a. Includes only observations for positive (non-zero) quantities.

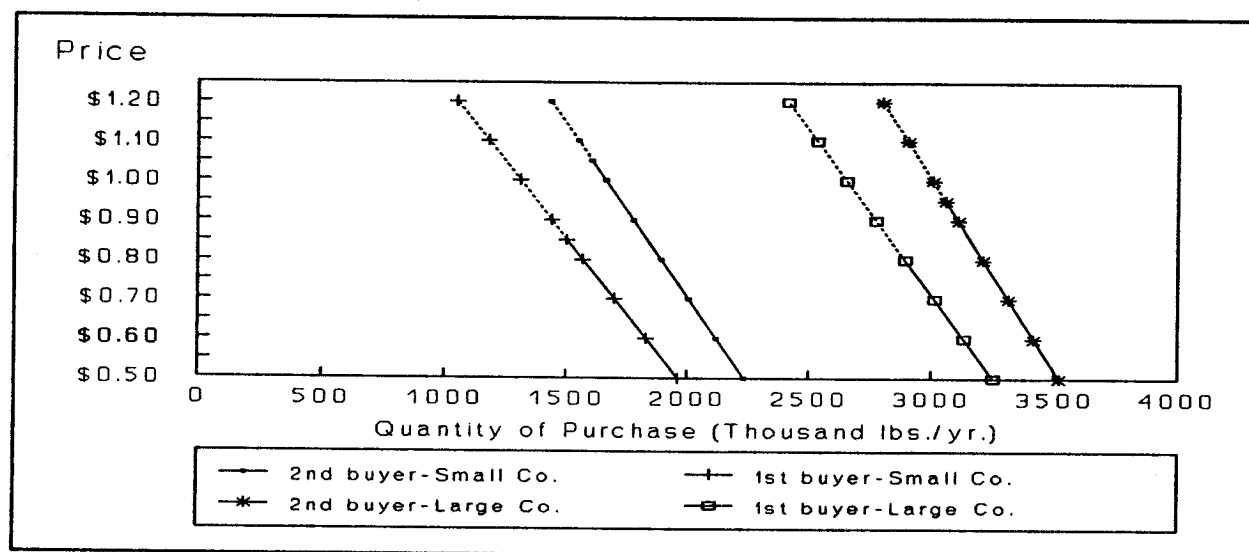
Using the coefficients generated from this regression (excluding species) three sets of demand curves were generated (Figure 5.30). The first set represents attributes which would characterize the industry's perception of a "typical" Pacific whiting fillet (see Table 5.4). The second graph summarizes demand for an improved Pacific whiting fillet. The improved attributes



"Typical" Pacific Whiting Fillets



"Improved" Pacific Whiting Fillets



"Ideal" Whiting Fillets (any species)

Figure 5.30 Estimated firm level demand for alternative whiting fillets.

included the addition of marketing support and increasing supply availability to 12 months (percent enzyme was not considered in this demand analysis). Texture remained moderate and color remained off-white. The third graph shows conditional demand for the "ideal" whiting fillet characterized by the attributes in Table 5.4 under the heading "Ideal."

Conditional demand for each type of firm for each of the three whiting products is shown by two line segments, one solid and one broken. The junction of these line segments represents the break-even price, i.e. the average firm would not purchase product at prices above this junction. Quantity demanded for prices much above this junction, therefore, would drop to zero far more rapidly than that indicated by the linear demand curve, and for all practical purposes, the brokers' line segment should be ignored.

Analysis of the three graphs in Figure 5.30 demonstrates that the break-even price for a large first buyer is only \$0.70/lb. and \$0.79/lb. for small buyers. Large first buyers at break-even prices, however, would purchase approximately 2,300,000 pounds per year; small firms would purchase only 800,000 pounds per year. Second buyers at break-even prices would purchase approximately 1,100,000 pounds (\$0.95) and 2,500,000 pounds (\$0.90) for small and large firms respectively. For improved Pacific whiting, the demand curves shift out and break-even prices increase approximately \$0.05 per pound and quantities demanded at these new break-even prices are approximately 500,000 pounds higher than for the typical Pacific whiting fillet product. For the ideal product which has relatively white flesh and firm texture, the demand curves shift again. The break-even prices increase approximately \$0.05 per pound and quantity demanded at break-even prices increases approximately 250,000 pounds.

Overall, Figure 5.30 demonstrates that larger firms demand significantly larger quantities of fillets than smaller companies and that at the same prices, second buyers demand more product than first buyers. Similar to the demand curves for H&G, the slopes of the curves are relatively steep, i.e., the demand curves are relatively inelastic meaning that significant changes in price do not significantly change the quantity demanded: the slopes, however, are not as steep as the H&G product curves. The demand curves are short run demand curves because dealers are constrained by factors which can not be quickly relaxed including inventory constraints, and limits on potential market outlets. Long run demand curves would be more elastic (i.e., they would be characterized by a flatter slope) and would show that a unit change in price would lead to significantly greater quantity demanded compared to the short run demand curves.

The curves also demonstrate that improvements in attributes shift out the demand curves for the product and increase break-even prices. The implication for producers and processors is that improving product attributes could significantly increase product demand, total revenue and possibly profits depending on the costs to improve product characteristics. Table 5.6 and Figure 5.30 also demonstrate that, relative to H&G, demand for whiting fillets is, to a relatively significantly greater degree, a function of product characteristics.

Probability of Purchase

Using a multinomial regression technique known as logit analysis, the probability of purchase, given alternative product and contractual characteristics, can be calculated for alternative prices. The logit regression is summarized in Table 5.7.

Table 5.7. Probability of purchase for whiting fillets.

Variable	Coefficient	t-value
Constant	9.81	5.15***
Product form (a 1, if skin-on)	-1.13	-1.36
Product size (Ounces)	0.18	1.61*
Texture (a 1, if firm)	0.53	2.03**
Flesh color (a 1, if white)	0.39	1.15
Supply availability (Months)	0.03	1.26
Price (Cents)	-0.14	-11.27***
Marketing Support (a 1, if included)	0.41	1.88*
Sector (a 1, if second buyer)	1.94	2.38**
Species (a 1, if Argentine)	1.07	1.16
Company size (a 1, if large)	-1.46	2.91***
Sector*Price	0.02	1.79*
Species*Price	0.01	0.93
Company size*Price	0.01	1.79*
Sector*Supply Availability	0.06	0.71

Equation statistics:

N=476

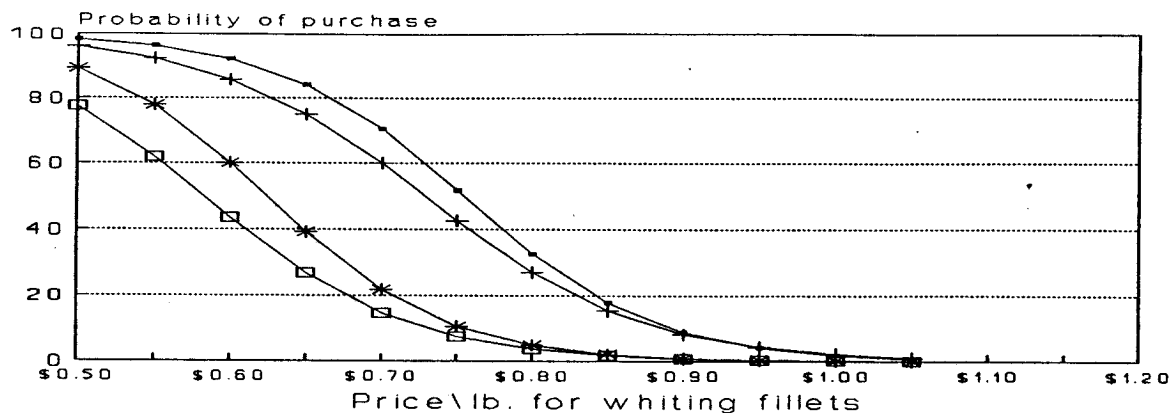
F=42.65***

Adjusted R-squared=0.32

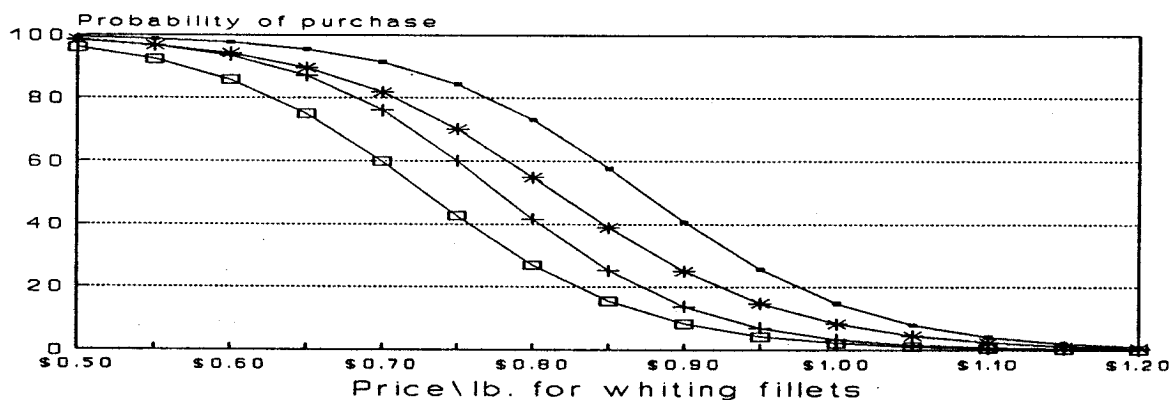
*Significant 90 percent

**Significant 95 percent

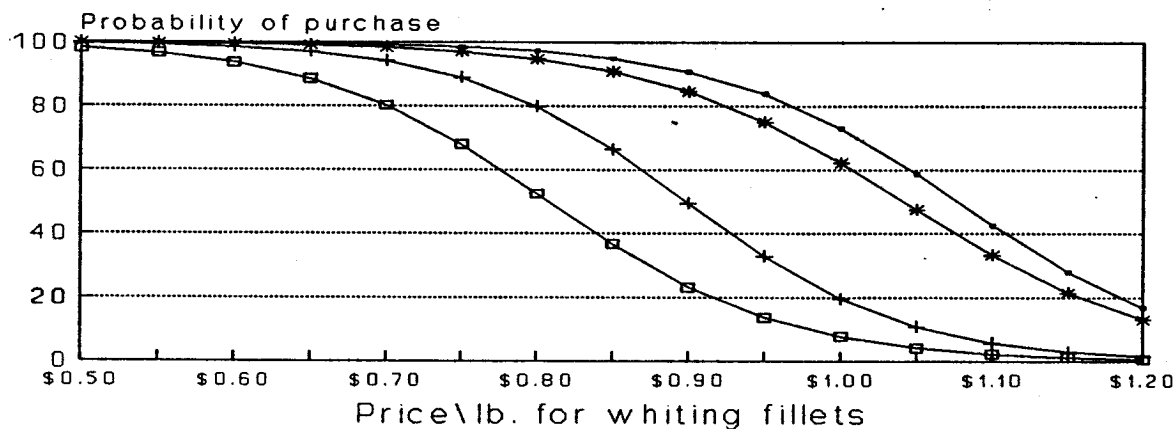
***Significant 99 percent



"Typical" Pacific Whiting Fillets



"Improved" Pacific Whiting Fillets



—◆— 2nd buyer-Small Co.	—+— 1st buyer-Small Co.
—*— 2nd buyer-Large Co.	—□— 1st buyer-Large Co.

"Ideal" Whiting Fillets (any species)

Figure 5.31 Probability of purchase for alternative whiting fillet products.

The probabilities of purchase is graphed in Figure 5.31 for the same three sets of whiting fillet products as Figure 5.30. The graphs demonstrate that the company size plays a significant role in impacting the probability of purchase. Larger companies, on average, have a lower probability of purchase than smaller companies for the same price level (this was the same finding as H&G product). Second buyers demonstrate a higher probability of purchase relative to first buyers which is also consistent with H&G findings. Both of the results demonstrate two fundamental facts emphasized throughout this section; buyers expect to pay higher prices for product as it moves along the distribution chain; and larger firms expect to pay smaller prices in exchange for larger purchases.

Figure 5.31 also demonstrates that as attributes improve, the probability that a firm will purchase the whiting fillet product will increase. For example, the probability that a large first buyer would purchase the "typical" whiting fillet product at \$0.70 is only 17 percent; the probability that a small company would purchase the product is approximately 60 percent. As product qualities improve, the probability for buying at \$0.70 for a large buyer increases to 50 percent for an "improved" Pacific whiting fillet product and to 80 percent for the "ideal" whiting fillet product.

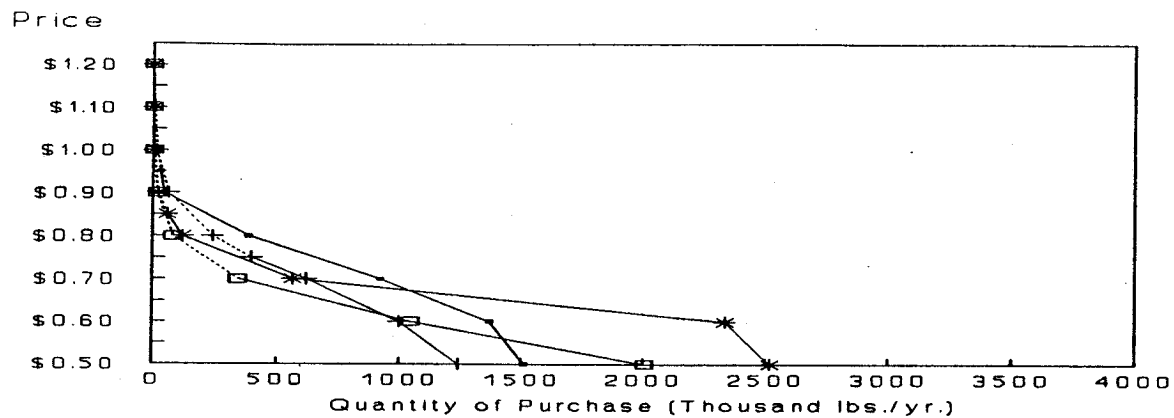
Expected Demand for Fillet Product

The "expected" quantity demanded (in thousands of pounds per year) can be estimated by multiplying the quantity demanded equation (Table 5.6) by the probability of purchase equation (Table 5.7). The result is an expected demand curve as shown in Figure 5.32.

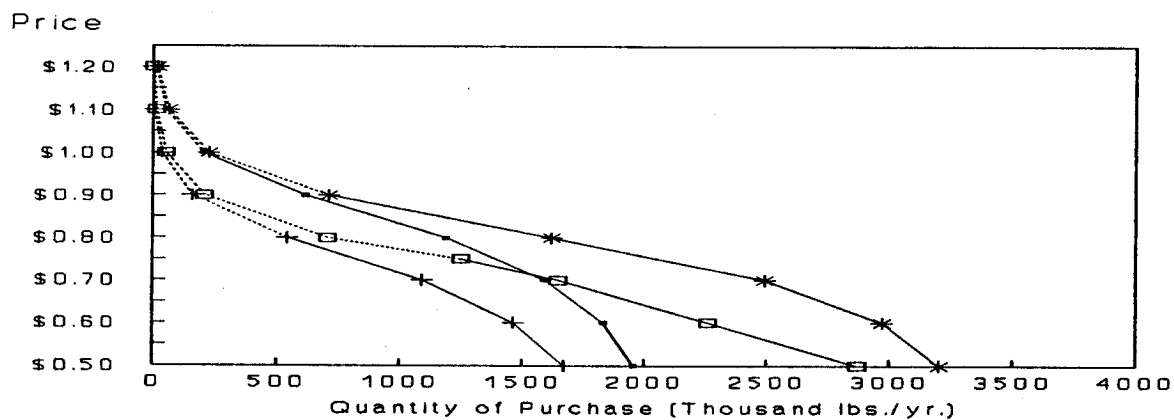
Figure 5.32 demonstrates the interaction effect of company size and market sector on expected quantity of purchase for whiting fillets. At relatively low prices, large companies are willing to purchase significantly more product than smaller companies; conversely, at higher prices, smaller companies are willing to purchase significantly more product than large companies.

In addition, the three graphs demonstrate that the average expected demand for firms which handle whiting fillets increases substantially as product attributes improve. Demand for large first buyers at a break-even price of \$0.70 for typical fillet product is approximately 300,000 pounds; demand at \$0.55 (prevailing price at time of survey for Pacific whiting fillets) is 1,700,000 pounds. But for improved Pacific whiting fillets, a break-even price for large first buyers increases to \$0.77/lb. and quantity demanded at this price is approximately 1,300,000 pounds. Demand continues to shift out for the product labeled "ideal fillet whiting product."

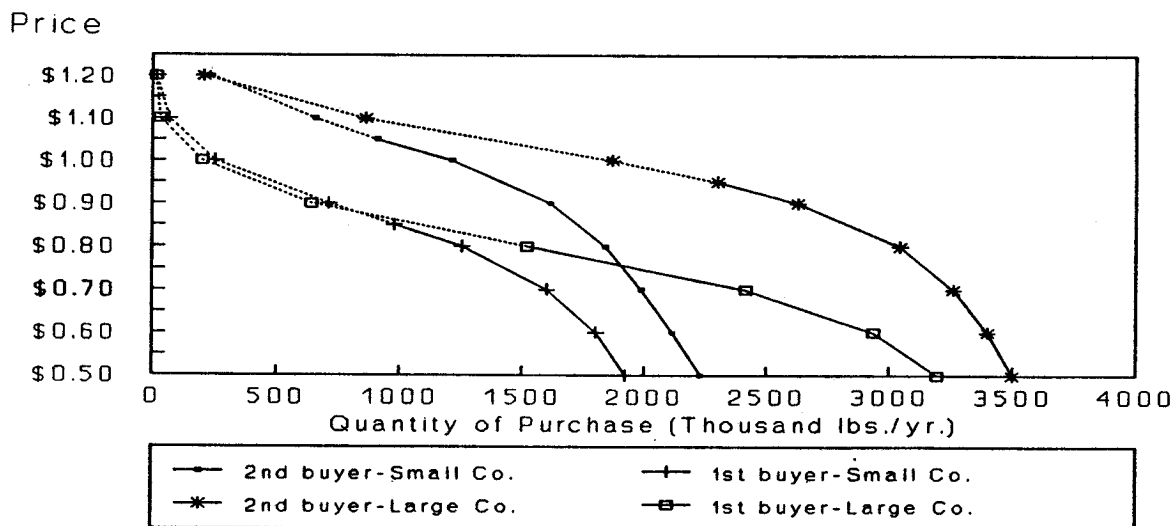
This information is useful for helping processors develop production, sales, and marketing strategies. For example, small buyers may pay higher prices, but transaction costs to line up



"Typical" Pacific Whiting Fillets



"Improved" Pacific Whiting Fillets



"Ideal" Whiting Fillets (any species)

Figure 5.32 Expected demand for alternative whiting fillets.

additional buyers may be significantly high relative to transacting with fewer buyers. In addition, the information on price, probabilities of purchase, and expected quantity demanded can be used to compare the cost of improving attributes to expected price increases in order to evaluate the net potential benefits of upgrading the quality of the product (for example, paying fishermen a bonus to handle the product more carefully-see Chapter IX for a simple example).

Summary

Whiting fillets are becoming more accepted in the U.S. market. With limited supplies of other cod-like species of fish and relatively strong demand in both the U.S. and Europe, whiting fillet prices have been steadily climbing in recent months. In the U.S., most of the product is sold to institutional and food service customers but some product is also sold to retail buyers.

Firms entering the whiting fillet market for the first time must be particularly careful. If they fail to educate downstream sectors about enzyme related problems and special handling and food preparation techniques for Pacific whiting, market opportunities may be short lived. Pacific whiting fillets could be quickly branded as a trash product; it could take years for the industry to recover, especially if whiting markets begin to soften. Pacific whiting fillets have potential but firms should be cautioned to proceed slowly, methodically, and honestly, and not treat this as an opportunity to make only short run gains. It would be especially important for "high quality" processing firms and fishermen to ensure that high product standards are upheld across the entire industry - especially to prevent low quality producers from reducing the image and price for the product which is now labelled "Pacific whiting."

The relatively detailed analysis in this chapter has been designed to explore the effects of alternative product attributes and contractual arrangements on product demand for Pacific whiting fillets. While a significant amount of information has been developed, the most important findings are summarized as follows:

1. The national seafood industry has limited experience with Pacific whiting fillets. Presently, they consider Pacific whiting fillets as only slightly better than Peruvian fillets in overall product qualities.
2. Unlike H&G product, price is not significantly more important than some other product characteristics. Demand for whiting fillets is a function of a significantly greater number of product characteristics than H&G product.
3. With the exception of shelf life, second buyers are more demanding than first buyers with regard to product qualities (same finding as with H&G).

4. Analysis of product demand demonstrates that small buyers pay significantly more for whiting fillets than larger buyers for both first and second receivers.

5. Demand at break-even prices for typical Pacific whiting fillet firms equal 300,000 pounds for large first buyers, 200,000 for small first buyers, and over 100,000 pounds for second buyers of both small and large firms.

6. Probabilities of purchase for the typical Pacific whiting fillet product is relatively low at break-even prices of \$0.70/lb. for large first buyers. As product characteristics improve, firms increase in size, as product moves downstream, probabilities of purchase increase.

7. Expected demand at break-even prices for typical Pacific whiting fillet product at \$0.70/lb. is low at 300,000 pounds per firm for large first buyers. As attributes increase, break-even prices for large first buyers increase to \$0.82/lb. and 1,500,000 pounds per firm.

The development of the shore-based industry for production of H&G Pacific whiting has laid the foundation for expanding production into alternative product forms, including fillets. The success of H&G, although limited, was based on principles of marketing management, i.e., development of a product and marketing concept consistent with intrinsic product qualities. Distributors, processors, and fishermen cooperated to improve handling at sea and in the plant. Most importantly, however, the industry developed a market approach consistent with minimizing the product's major liability, the presence of protease enzymes. For fillets, continued improvements in handling techniques on board the vessels and in the plants, combined with appropriate methods of preparation can minimize problems. However, unless the product is "treated" to inhibit or destroy the protease enzymes (or affected fish are removed), receivers including retailers and home consumers will have to be educated about product preparation in order to minimize protease problems. Fillet production directed at market segments which use fast cooking techniques such as food service would be the most logical market outlets.

The industry should also consider the advantage of developing product standards and generic marketing strategies. Such strategies would improve prices and margins by: 1) preventing low quality producers from destroying product image and reducing prices, 2) extending supply availability, 3) reducing transaction costs for buyers, and 4) sharing promotional and advertising costs. Using a generic label such as "Oregon Cold Water Whiting", while establishing and enforcing high quality standards, could help the industry improve its marketing opportunities.

Chapter VI

SURIMI

Introduction

The development of protease enzyme inhibitors has been one of the prime factors for re-evaluating the potential opportunities for domestic processing of Pacific whiting. Research conducted by the National Marine Fisheries Service and academic institutions including the Astoria Seafood Laboratory of Oregon State University have demonstrated that a broad range of inhibitors can be used to effectively suppress the potentially damaging effects of the protease enzymes found in Pacific whiting. The use of these inhibitors allows a surimi product to be manufactured with the necessary characteristics in terms of gel strength, taste, color, and moisture content so that it is suitable as an ingredient in analog fish products. In addition, a number of Japanese fishing companies including Nippon Suisan have been producing and marketing surimi for years from their allocation of Pacific whiting in the joint venture fishery. The Japanese also use protease inhibitors including egg-white and bovine serum based inhibitors. And as demonstrated by Jensen (1988), given the right set of conditions including prices, public policies, technologies, and infrastructure arrangements, a shore based surimi plant could be potentially highly profitable.

Many of the issues affecting the development of the U.S. surimi market are summarized in the study by NRC (1990b). This report emphasizes that while most of the world's surimi is produced from Alaskan pollock, the increasingly higher prices for pollock fillets (over \$1.70 per pound as of April 15, 1991) and other pollock-based products have motivated suppliers to divert pollock away from the surimi market and toward the fillet and block markets. In addition, the closures of the Alaskan pollock seasons in the Bering Sea and Gulf of Alaska in order to protect the stocks during spawning season and conserve stocks in response to continually increasing fishing effort, have begun to severely disrupt surimi supplies. Inventories which recently have been at high levels due to a record U.S. surimi production in 1990 of over 176,000 mt are now being rapidly worked down.

Total U.S. surimi production in 1991 is expected to be at least 30 percent below 1990 production. As a result surimi prices have increased dramatically during the last seven months. Figure 6.1 shows that prices (FOB Seattle) for grade #2 surimi (FA grade), since bottoming out at historically low levels in September 1990, have now increased 80 percent. Record prices, however, are the result of supply shortages and not shifts in demand. Non-vertically integrated producers will have difficulties obtaining

supplies -- the expectation is that the consolidation now occurring in the U.S. surimi industry will continue and that there will be fewer but larger surviving players. A second expectation is that the surimi industry will more aggressively explore the use of alternative species such as arrowtooth flounder and Pacific whiting.

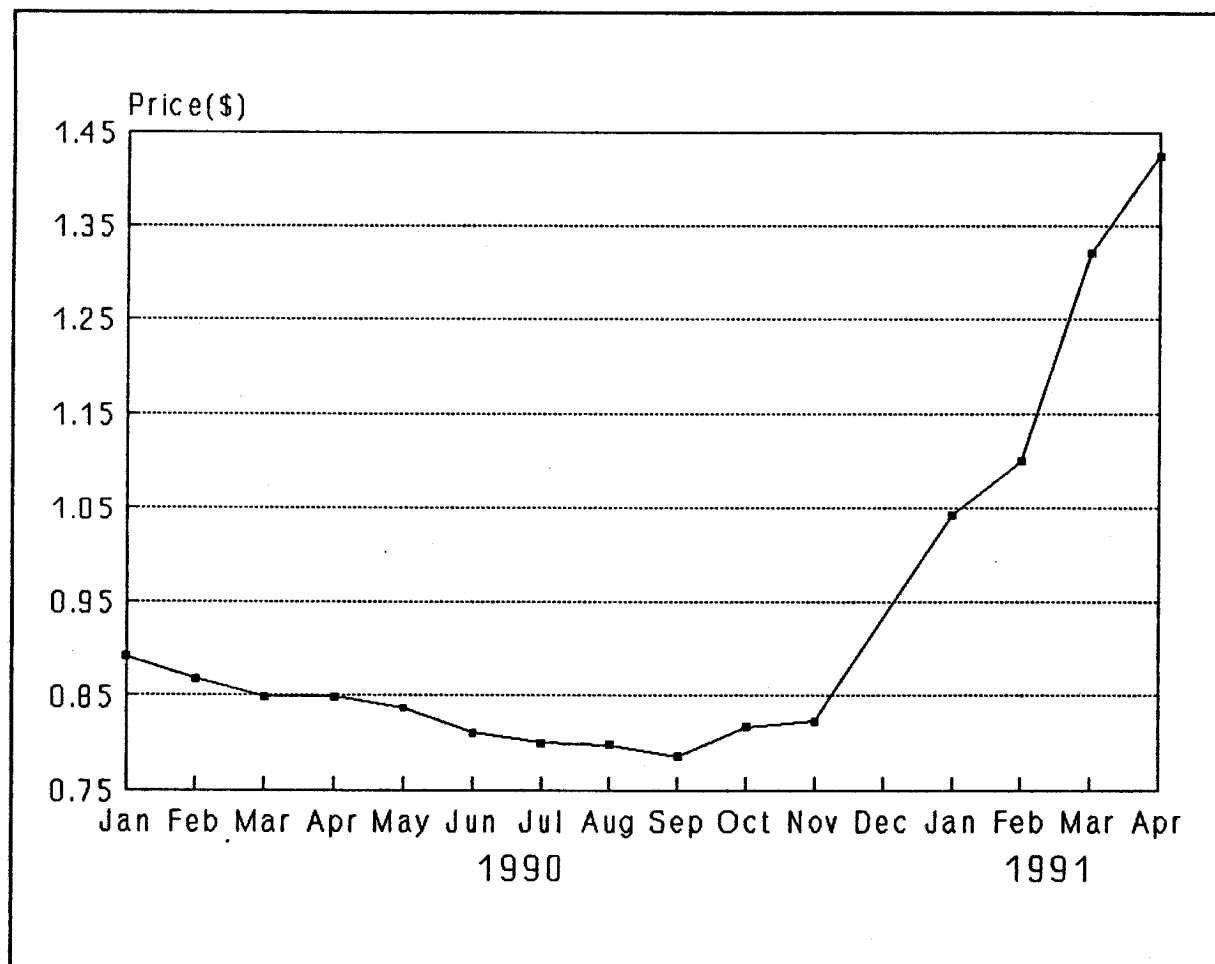


Figure 6.1 Price trends for FA grade surimi (grade 2).

Source: Urner Barry: Seafood Price Current (1/3/90 - 4/5/91)

The following chapter explores a number of market-related issues relevant for understanding the opportunities and problems in developing a shore-based surimi plant for Pacific whiting. A significant portion of this information was developed through the course of personal interviews with sales/marketing representatives, and mail surveys with buyers and production managers. Respondents

included a relatively broad range of surimi/analogue based firms in the Los Angeles and Seattle areas (see Appendix C for survey). This information is summarized under the appropriate market and attribute headings below.

The Surimi Industry

The U.S. surimi industry can be broken down into three segments: (1) firms which produce only the raw surimi product; (2) firms which produce only the secondary or analog products; 3) and firms which produce both type of products and sell excess surimi to analog producers. A number of the third class of firms are large, vertically integrated companies which also own catcher and catcher/processor vessels. Most of these companies are less than ten years old, although their parent companies, primarily Japanese firms, may be much older. In terms of respective revenue and production these firms varied from \$10,000,000 to \$100,000,000, and from 3,000 to 100,000 metric tons annually. As summarized in the NRC (1990b) report, the development of the domestic based industry began as a result of the establishment of the U.S. Exclusive Economic Zone (E.E.Z. -- the 200 mile limit) which induced the Japanese to invest in U.S. plants since their access to pollock supplies within these expanded territorial waters would ultimately be terminated.

A brief review of the U.S. development of this industry shows that in the mid to late 1970's the Japanese were exporting relatively high quality surimi and analog products to the United States for relatively high market prices. At the same time, Korea began to become a player in the world surimi market. As a result of the establishment of the U.S. E.E.Z, Japan began establishing industries in the United States, primarily in Alaska and Seattle. Statistics indicate that at least 175,000 M.T. of surimi was produced in the United States in 1990. Most of the higher grades of this product, approximately 125-135,000 M.T. was exported to Japan; the rest was processed domestically into analog products. In addition Japan still exports some analog product into the United States.

Surimi Grades

Surimi is graded according to a number of product attributes including gel strength and moisture content (see discussion below and the survey in Appendix C for details). Different grades result as a function of the manufacturing process and the intrinsic properties of the raw input fish product. Two to three grades generally result from a single production run (for a well written and comprehensive review of this process see: Alaska Development Fisheries Development Foundation (AFDF) 1987). Grades are designed not necessarily to characterize product quality, as much as to

categorize certain attribute characteristics. The end use for analogues or other surimi products determine which grades or combination of grades will be used to produce the end-use product. For example, the Japanese prefer a more rubbery, firmer texture than U.S. consumers. Higher grades, which tend to have higher gel strengths are therefore exported to Japan. Grades are a complex and sometimes controversial issue because grade labels and grading categories may vary from company to company. In many cases, this variation characterizes the wide range of grades which have evolved in Japan as a response to the wide variation in surimi-based products (hundreds of different products are produced from surimi in Japan).

The survey results indicate that many of the surimi processors are producing 75% of their product as a S/A or number 1 grade (gel strength near or over 1000 g/cm as measured by a rheometer) and 25% as lower grades with gel strengths measuring approximately 800-1000 g/cm for B grade (number 2 grade or FA grade) and 600-800 g/cm for grade C (number 3 grade or KA grade). For U.S. analog producers all three grades are often used within the same product in order to develop the right mix of product characteristics and to minimize production costs. The mix may vary for each firm and for each type of product but, in general, proportions used by the industry average approximately 30-40% grade 1, 30-50% grade 2, and 20% grade 3 for many analog products.

Because of the confusion about grades and the incompatibility of surimi grading systems with standards and labelling procedures developed for other segments of the U.S. food industry, there has been a movement to standardize product grades according to objective standards developed by the U.S. meat industry (AFDF 1987). Survey respondents unanimously agreed that consistent standards need to be developed, especially in order to reduce market confusion and to expedite development of alternative uses for surimi in the U.S. food market. Many respondents, however, also agreed that while support for this concept may grow in the U.S., that the more diversified and tradition bound Japanese industry may resist efforts to standardize grading systems.

Prices vary for different grades of surimi (e.g., as of October 15, 1990 A grade was \$.82 per pound, B grade \$.78, and C grade \$.76 F.O.B. Seattle; as of April 15, 1991, B grade was \$1.40-\$1.45; A and C prices were not reported (Seafood Price Current, April 15 1991). In order to accurately calculate production costs and profit potential for on-shore Pacific whiting based surimi plants, it is necessary to know what proportions the product will ultimately be graded. This information is not yet known, although it has been suggested that 75% of the surimi produced from Pacific whiting by Nippon Suisan is an SA grade product (see discussion below on the Japanese evaluation of Pacific whiting based surimi). However, even if a large proportion of Pacific whiting based surimi

does not meet the highest grade standard, the proportions of other grades and the overall product quality may be adequate for use in analog products both in Japan and the United States.

Table 6.1 shows the characteristics of the highest, second highest, and third highest grades of surimi for the typical products handled by the survey respondents. Higher grade products command higher prices; these prices reflect the different levels of product characteristics which are found in the different grade products. The highest grade surimi had the highest level of product characteristics: higher water holding capacity, higher gel strength, lower moisture content (a positive characteristic), higher protein levels, whiter color, no flavor (a positive characteristic since flavors are added according to product use), and a longer period of supply availability.

Table 6.1 Surimi grades and their characteristics.

	Highest Grade	Second highest Grade	Third highest Grade
water holding capacity	high	medium	low
Gel strength	1200g/cc	800g/cc	600g/cc
Moisture content	74%	75%	75%
Protein content	15%	14%	14%
Color	very white	off white	light gray
Fish flavors	none	slight	moderate
Other flavors	none	slight	moderate
Contamination	none	none	none
Source	Pollock	Pollock	Pollock
Price (Oct. 1991)	\$0.95	\$0.85	\$0.65
Supply availability	12 months	6 months	9 months
Product uniformity	95%	95%	95%

Analog Product Forms

While hundreds of products are produced out of surimi in Japan, products in the United States have been limited to only a few forms, primarily as imitation shellfish products. At least 90 percent of the products formed developed from surimi for the U.S. market are some form of crab analog. Attempts at other analogs and product forms including shrimp, scallops and lobsters have so far met with at best mixed results. Based on personal experience, a number of respondents argued that before developing a surimi based analog, the demand for, and the substitutability between, the actual and imitation product must be thoroughly evaluated. Some respondents suggested that scallop and shrimp analogs have been relatively unsuccessful because the price differential between the real product and imitation product have remained relatively low. Other respondents though, thought it may be too early to measure the success of these alternative analog forms.

Product development has proven more difficult than many early industry analyst had predicted. While new analogs and product forms have been continually developed and market tested, the general consensus was that industry marketing and promotional efforts have leveled off. Some respondents voiced the opinion that unless the a second and third generation of new surimi based products are developed surimi demand in the United States will remain relatively flat. A few respondents questioned why the surimi/analog producers which were subsidiaries of larger food-based conglomerates had not been able to use their considerable resources to produce, for example, surimi based sandwich meats and sausages. Others, however, argued that quality surimi based hybrid products have in fact been produced but that the high cost of the surimi-based proteins relative to vegetable-based binders and extenders had limited potential marketing opportunities.

Surimi and Analog Product Quality

There was almost unanimous agreement that surimi quality, at least for domestic use, is now reasonably good. This was not the case during the early part of the decade when surimi product quality was low -- analog firms were forced to work closely with surimi producers in order to solve product quality problems. Some seasonal problems still exist due to a drop in product quality during pollock spawning season (April-June in the Bering Sea), although this will now be less of a problem due to seasonal closures. Problems in product variability were also thought to be occasionally a function of spatial variation in intrinsic variations among different stocks of pollock. Respondents which produced quality analog products for the Japanese markets argued that while the average quality of U.S. based surimi isn't too bad, the product demonstrates too much variability.

There was less consensus about the quality of the analog product. Most respondents voiced the opinion that many U.S analog firms produce relatively poor quality products. In some cases companies have different grades of analog products and offer retail vendors a range depending on quality and usage. Because the product is used primarily as an ingredient in salads or other mixed food products, quality characteristics can be masked. A number of respondents argued that because of the intense competition within the industry, analog producers had been focusing their attention on minimizing costs, prices, and ultimately quality in order to maximize sales or maintain market share. This same cost/quality minimization approach was argued to be an extension of strategies developed during the mid-eighties when the industry discovered that the proportion of real crab mixed with artificial crab could not be detected by sensory analysis. At least some firms, while claiming some percentage of real crab, were actually under-cutting these percentages in order to reduce costs.

A number of respondents suggested that product quality would eventually level off and begin to increase as retailers and consumers gained more experience. Some respondents argued that once the industry consolidated it would turn more of its attention toward renewed marketing efforts and improvements in product quality.

Fresh Surimi

One potential advantage in establishing a shore based plant relative to at-sea production is the potential to produce a fresh, unfrozen surimi product. Japan has a number of smaller producers selling fresh surimi ("nama") which reportedly can earn a price 10-15% above that of frozen products. If the surimi did not have to be frozen it could open up marketing and cost savings due to: (1) reduced costs for freezing and inventory; (2) reduced costs for cryo-protectants; (3) reduced sugar (sorbitol) and sodium; (4) opportunities to exploit a market demanding fresh, high quality, low chemical products.

While a number of respondents were intrigued by this concept many believed that it would be a risky due to the following problems:

1. Coordinating supplies would be extremely difficult. Having only a six month availability would limit the opportunities to develop a reliable market base;
2. Shrink could be significant;
3. Stabilizers would have to be added;
4. Shelf life would be limited relative to previously frozen product (thawed frozen analogues have a reported shelf life of 45 days).
5. Consumers may not pay more for a fresh product.

A few firms stated that unfrozen product might have different and possibly more favorable characteristics especially flavor and color. A general recommendation was that there may be an advantage to producing a fresh product but production and marketing efforts should be pursued cautiously -- and only after a successful frozen product had been developed.

Retail Sector

Retail prices for surimi products over the last few years had been decreasing at the distributor, wholesale, and retail sales levels. At one time, sales prices to retailers were reported as high as three dollars per pound for certain surimi products. More recently, however, sales prices were reported to range from \$1.30-\$2.00 with some products sold as low as \$1.16. With average margins of approximately 35%, retail prices range from as low as \$1.69 to almost three dollars per pound.

Over half the analog product is ultimately consumed as part of a salad. In many retail stores the analogs can be found at the deli bar, salad bar, frozen bulk, the seafood case (thawed and rewrapped), and as ingredients in entrees in frozen prepared foods. Over half the product is sold at the retail level during the summer months. A few respondents suggested that in order to expand sales retailers need marketing support in order to teach themselves and their customers new and more imaginative uses for analog products.

Product Attributes

Figure 6.1 demonstrates the relative importance for various surimi characteristics according to survey respondents. Water holding capacity, gel strength, price, supply availability, and product uniformity were significantly more important than the other seven product characteristics. These five characteristics also demonstrated high variability among the surimi grades in Table 1.

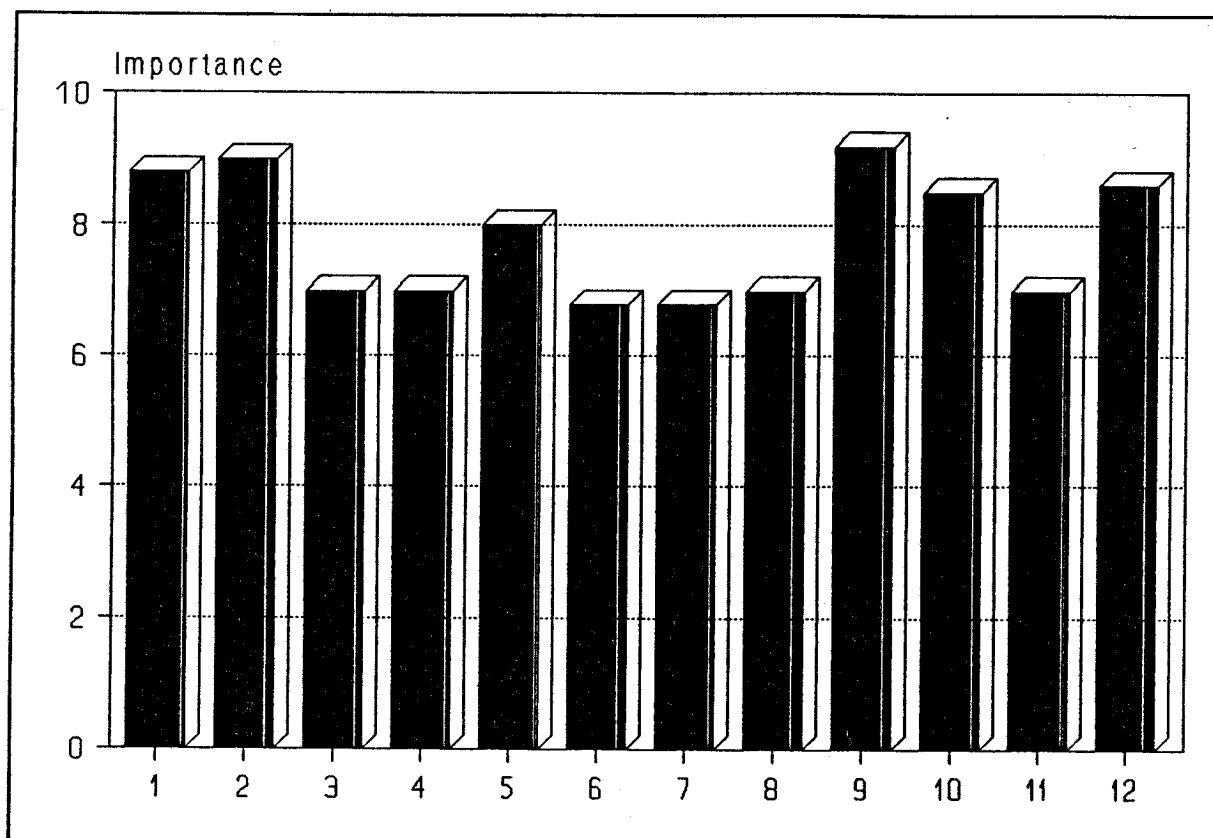


Figure 6.2 Relative Importance of surimi characteristics (0="not important", 10="highly important.")

LSD_{.05}=1.92

- | | | |
|---------------------------|---------------------|------------------------|
| 1. Water holding capacity | 2. Gel strength | 3. Moisture content |
| 4. Protein content | 5. Color | 6. Flavor |
| 7. Contamination | 8. Source | 9. Price |
| 10. Supply availability | 11. Delivery volume | 12. Product uniformity |

Pacific Whiting-Based Surimi in Japan

Due to the efforts of Mike Shadbolt of the Oregon Department of Economic Development, Mr. Mikio Kawasaki, Japanese Trade Representative for the Oregon Department of Economic Development, and Tom Asakawa, Fisheries Trade Specialist with the American Embassy in Tokyo, information was collected which described the Japanese market experience with respect to Pacific whiting-based surimi. This information is summarized below. While it is preliminary in nature, it does address a number of important issues regarding prices, market acceptance, and product quality of surimi based Pacific whiting.

At least three Japanese fishing companies which conducted joint fishing ventures for Pacific whiting in 1990, including Nippon Suisan, Kanai Fisheries, and Taiyo Fisheries Co. produced surimi based Pacific whiting totalling approximately 13,800 mt. Most of this product was sold and distributed to secondary processors in Japan and used in a wide variety of product forms including kamaboko.

According to Tokai Denpun, one of Japan's leading producers of kamaboko and other surimi based products, the entire supply of Pacific whiting was used to produce either special grade (SA) (the highest grade surimi) or fish meal. This stands in contrast to pollock based surimi which is usually produced in at least two or three grades. Overall, the quality of Pacific whiting-based surimi was considered comparable to the highest grades of pollock based surimi produced on at-sea processors. The surimi produced from Pacific whiting was reported to be used alone or combined with other surimi products to produce a wide range of kamaboko products. Kamaboko manufacturers, however, complained that surimi made from Pacific whiting loses its gel strength during storage at a faster rate than pollock-based surimi. As a result, kamaboko manufacturers were forced to increase their use of starch and other food additives in order to improve secondary product characteristics. It was also reported that secondary surimi producers in western Japan use Pacific whiting-based surimi as a substitute for the surimi produced from local species (conger eel and croaker) in order to produce fried kamaboko and chikuwa.

As of December 1990, the price of Pacific-whiting based surimi in Japan (F.O.B. Tokyo) was reported to average between 330-340 yen/kilo or approximately \$1.17 per pound (at a conversion of 130 yen/dollar). Given shipping costs of approximately \$.15 per pound this price is comparable to the highest grades of pollock-based surimi produced in Alaska. However, it was cautioned that these reported prices are only averages and that actual prices are determined by supply and demand conditions prevailing at the time of transaction, the quality of the particular product, and the particular needs of the individual buyer. It was also noted that these prices reflected demand for surimi produced from Pacific whiting which was processed at-sea. Japanese surimi and kamaboko producers believe that surimi produced from fish processed at-sea is a higher quality than surimi produced from shore-based plants. Some U.S. analysts, however, argue that this perception is not necessarily objective but rather is a legacy of past experiences when poorly preserved fish were used for on-shore surimi production. Whatever the merits of this debate, this perception still impacts market behavior and influences prices for shore-based surimi products.

Stabilized Mince For Surimi Production

Food technologists in New Zealand have been grappling with problems similar to those faced by shore-based processors on the west coast of the U.S - how to profitably produce surimi from whiting species which are only seasonally available to near-shore catcher vessels (in New Zealand the whiting species of interest is Hoki). These researchers have been exploring alternative ideas aimed at transferring what is now an at-sea surimi processing venture with the Japanese to a nationally controlled on-shore industry. Research by MacDonald (1989) and MacDonald et.al (1990) indicate that surimi made from Hoki (a species of whiting found in southern oceans) can be successfully produced from frozen unwashed and stabilized minced product which is processed at sea on-board specially equipped trawlers. The product can then be frozen up to at least six months and then thawed and processed in an on-shore plant into relatively high quality surimi or other fish products. Such an arrangement can allow on-shore processing to be conducted on practically a year round basis.

It appears that relatively small fishing vessels can be outfitted in order to process and store the unwashed minced product. Waste products can be disposed at-sea or delivered to floating meal plants, thereby eliminating problems resulting from on-shore disposal. Since the product is unwashed there is no need for large volumes of fresh water. If this method was adopted for Pacific whiting enzyme inhibitors and anti-oxidants could be added to the product at-sea immediately after harvests during the mincing process. Product quality could be maintained by processing and freezing immediately after harvest.

Freezing and inventory costs, however, could be appreciably higher using this method as compared to strategies aimed at delivering unprocessed products to shore based processors. Additional technological and economic analysis is needed in order to determine whether this technique has practical and profitable application for shore-side processing of Pacific whiting. The methodology holds promise, however, and research into application to Pacific whiting processing could be potentially rewarding.

Surimi/Analog Market Development and Forecasts

Most of the survey respondents believe that the U.S. surimi industry is in the process of consolidation as a result of the low prices (below production costs) experienced during the last two years. (It was even hinted that these low prices were the result of deliberate strategies by large producers to force out smaller players and gain oligopoly power). Surimi production is expected to decrease until new supplies of raw product can be found. Analog firms without direct access to supplies are expected to be absorbed by larger and more vertically integrated surimi companies.

Increasingly shortened seasons will only reinforce this trend. In the short run, prices are expected to continue to rise. Long term price trends are more difficult to forecast but will depend on a number of supply and demand factors including the market's long term response to high surimi and analog prices, the future supplies and prices of cod and other trawl fish, surimi demand in Europe, and technological innovations for using under-utilized fish species for surimi.

In Japan demand is expected to decrease as consumers turn their attention away from traditional foods and toward imported meat products. Demand in Korea is expected to level off. Conversely, demand in other parts of Asia is expected to show a rapid increase. New surimi and analog plants are being built in Europe but input product supply constraints and higher input costs may ultimately limit production.

Summary

The potentials for successfully establishing surimi plant(s) along the coast of Oregon depends not only on the course of market developments described above but on the ability of the private and public sectors to realistically evaluate, and then effectively manage those factors most critical to industry success. Development, however, remains risky due to the number of unresolved issues including regulatory policy and the rapid change taking place in the U.S surimi industry and global seafood markets. However, new technologies (e.g., enzyme inhibitors and technologies for producing stabilized unwashed minced products) combined with higher prices increase the chances for success.

Very few of the firms we surveyed expressed opinions about the possibilities of success for a shore-based surimi whiting plant. Many knew little to nothing about Pacific whiting and its characteristics. Most, however were skeptical that a shore based surimi plant running only six months per year could recover its costs (in retrospect this argument is ironic given that season closures in Alaska will force Alaskan based surimi plants to operate possibly less than six months per year.)

One individual with over four decades of experience in the surimi/analog business offered the following ideas for increasing the potential success of a shore based whiting plant:

1. Combine a surimi and analog plant.
2. Produce a single high quality product.
3. Label the product using an Oregon label and image.
4. Carve out market opportunities - do not compete directly with major producers.
5. Produce frozen and fresh product.
6. Invite firms experienced in Pacific whiting- based surimi production as joint venture partners.

Chapter VII

Other Product Forms

Introduction

Fillets, H&G, and surimi were identified early in this study as being potentially important product forms in the development of a shore-based Pacific whiting processing industry. Other product forms, however, may also provide investment and marketing opportunities, especially for value-added products. The following chapter summarizes issues related to additional products including breaded, minced, and meal.

Breaded

Pacific whiting may have profit potential as a breaded product. Research by Crawford (1979) and Babbit (personal communication November 1990) demonstrate the potentials for developing a breaded product from Pacific whiting. Babbit, in particular, was involved with applied research and development projects dedicated to producing new product forms from Pacific whiting during the 1970's at the Astoria Seafood Laboratory (Oregon State University, Astoria, Oregon). Much of this research focused on exploring the potentials of fillets, breaded, and minced products. Formal research explored product quality issues; extensive but less formal was directed at exploring potential market opportunities for frozen whiting fillets, frozen breaded product, and breaded mixtures of minced whiting and shrimp discards (marketed under the name "shrimbo"). This experience provided sufficient evidence to these researchers that Pacific whiting, if carefully handled and stored under proper conditions, could be manufactured into acceptable quality value added products. The eventual failure of private industry to successfully produce and market these products was considered primarily related to the industry's limited capital, processing, and marketing experience rather than any limitation of the products themselves.

Because of rapidly rising fish prices, there is now an opportunity for fish which were previously considered low quality, to be breaded and sold to food service and institutions including schools, prisons, nursing homes, and the military. The U.S. population is continuously aging and the number of nursing homes is rapidly increasing. Budgets for school systems, prisons, and the military are being reduced. Yet all of these groups need healthy, nutritious meals that are affordable within their limited budgets. Breaded products produced from more expensive fish including pollock are selling for close to \$.40 a portion (2 oz. cooked fish and 2 oz. of breading) which according to an industry rule of thumb

is the upper threshold for institutional price resistance. Whiting is a low cost fish that could fit the nutritional needs for these various groups, while providing reasonable rates of return to producers and processors.

Most institutions require at least two oz. of post-cooked fish protein per portion with varying percentages of breading (many of these standards and guidelines have been established by the Federal Food and Nutrition Program - see the WCFDFA 1986 summary of federal procurement standards for details). A 2.67 oz. portion of pre-cooked fish is equal to two oz. of post-cooked fish. The fish is then mixed with approximately 30 to 50 percent breading, which may or may not be precooked, to produce a portion that currently sells for \$.27 to \$.40 per portion. The portion weighs approximately 4 ounces. At \$.30/portion, the product would yield a gross revenue of approximately \$1.20/lb. The costs to contract with a firm to bread the product would break down as follows:

Labor and machinery cost	\$0.30 to \$0.40/lb. finished product
Cost of bread	\$0.10 to \$0.12/lb. finished product
Federal inspection	\$0.02/lb. finished product
Freight	\$0.03 to \$0.14/lb. finished product depending on destination
Broker fees	\$0.03 to \$0.05/lb. finished product
Raw material cost	\$0.40/lb. Assuming a fillet cost of \$0.75/lb. and a 40% bread recipe
Total cost	\$0.88 to \$1.03/lb. finished product
Sales price	\$1.08 to \$1.60/lb.
Total net revenue	\$0.05 to \$0.72 per pound

By designing the processing plant to include a breading line, the cost of breading could be reduced. Also, by keeping the cost of producing the fillets below \$0.75 per pound, the profitability could also be increased.

There are several advantages of breadding over other product forms. Pacific whiting ranges in flesh color from off white to light pink with darker mottling. Breadding helps mask this color variation. Breadding also covers the darker outer muscle tissue (what has previously has been referred to as the "fatty layer"). The product can be pre-cooked to avoid some of the texture degradation that can occur if not handled correctly. Pacific whiting, by nature, is not a firm textured fish. By mixing bread with the product, it becomes firmer and holds together more strongly.

The term "pre-cooked breaded product" does not signify that the fish itself has been pre-cooked, but instead that the bread has been blanched and baked. It is possible to genuinely pre-cook the breaded product. At least one firm on the east coast is now producing a pre-cooked breaded product. In general, however, pre-cooking the fish is not a common practice. Pre-cooking can decrease the final weight by as much as 50% by driving off the moisture. This would increase the cost of the product to the buyer but would decrease the transportation costs. It would also solve the enzyme related problems of potential softening due to mis-handling, thawing, or the use of slow cooking techniques (most institutions bake their fish products). More market research is needed to explore this option. Some of the firms interviewed, however, would be willing to offer assistance in test marketing of breaded products in the retail, wholesale, and food service market sectors. Processors are also willing to help by producing test lots of product (see appendix E for a listing of potential cooperators).

Minced Product

As demonstrated by researchers including Crawford et al (1979), minced Pacific whiting product has a relatively short shelf life due to oxidation induced rancidity. This problem not only characterizes Pacific whiting but other whittings including the South American whittings. This problem has precluded the more extensive use of whiting as a minced product. This is unfortunate since demand for minced products for use in fish sticks and portions is reportedly increasing (one firm reported a demand for minced blocks of 15 million pounds per year).

The rapid rise in cod and pollock prices and the projected shortages which these high prices reflect, is causing major users of minced blocks to re-evaluate whiting species. Anti-oxidants are being applied to minced blocks of Argentine whiting and successfully extending shelf life from six to 12 months. Given prices for minced whiting blocks at \$.50-.55 per pound compared to \$.60 per pound for pollock, (prices as of November 1990) the potentials for meeting demand and creating new opportunities are significant.

Natural and artificial anti-oxidants may be used. Natural antioxidants, while avoiding certain labelling problems, can add unwanted flavor and color to the final product. Artificial anti-oxidants can be designed not to impact flavor or color. These chemicals, while approved for human use, increase the addition of chemicals to the label. However, it has been argued that this is of little concern since the label for these types of products already lists numerous other ingredients and chemicals.

Besides providing a potential opportunity for processing Pacific whiting, the use of minced products could be combined with added value production in the processing of fish sticks and portions. One intriguing idea is that high pressure extrusion processing techniques could be adapted to use with fresh minced, unfrozen whiting product. This would provide a number of advantages over traditional stick and portion products which are carved off of frozen blocks. Computer controlled extrusion portion and stick designs would allow the addition of extenders, binders, anti-oxidants, inhibitors, flavors, colors, and the controlled use of texturing devices in order to produce a wide variety of potentially marketable fish-based products. Products could then be frozen and breaded, or possibly sold as fresh product. One positive by-product of this process might be the denaturing of the protease enzymes as a result of the applied heat and pressure.

Meal

Meal offers one potential opportunity for utilizing the entire product or carcass waste. Whitefish based meal prices, however, have fallen from approximately \$725 per short ton two years ago to \$340 as of November 1990. While meal prices have historically shown wide variation because of variation in production of soybeans which are a substitute product, the expectation for a future price increase does not appear promising. Not only is soybean production impacting prices, but production of fish meal is rising faster than the increase in demand. This is the result of recent construction of meal plants in South America and Asia.

Given that fixed and variable costs to operate a meal plant are calculated somewhere in the 500-\$700 range depending on productivity and seasonality, a meal plant would operate at a loss. Given problems related to waste disposal, however, it could prove to be the most cost effective disposal method.

Chapter VIII

EUROPEAN MARKET OPPORTUNITIES

Overview of European Economic Community

France, Spain, Portugal, Italy, Germany and the United Kingdom are the focus of this preliminary report. These markets lead the EEC in seafood research, technology, market distribution and consumption. The information and data for this report was collected from the French Ministry of Agriculture, the IFREMER in Nantes which is charged to conceive and carry out research / development programs to improve national industries and better use marine resources, the ADISUR in Nantes which develops industrial, commercial, scientific and technical activities related to surimi, and several French companies involved in seafood value added products.

The twelve countries of the European Economic Community total a staggering 323 million consumers with the annual buying power estimated at \$4 trillion. This is the world's largest Seafood market for fresh and frozen cod and whiting products. The EEC market consumed 1.8 million metric tons of trawl fish in 1987. Consumption is expanding in most EEC countries. For perspective on the size of the EEC whiting market, the total 1991 Pacific whiting quota in the US is only 10% of the total EEC whiting consumption. The most significant recent development in the market has been the growing importance of whiting products. According to the French Ministry of Agriculture whiting is expected to replace cod in the next decade as the most widely consumed EEC fish product.

Market of European Economic Community

In terms of tonnage and total consumption whiting is the second most important fish species in the EEC market. Important markets for whiting are in Spain, France, Portugal, Italian and Germany. Whiting consumption in all of these markets has increased significantly in recent years probably due to stock availability and favorable prices relative to other trawl fish species. Whiting is the only major cod-like trawl fish in the EEC market which is not harvested primarily in the North Atlantic. European consumers are familiar with European whiting species and this facilitates the acceptance of other imported whiting species.

Whiting is imported and distributed through major wholesale distribution centers in Spain, France and the United Kingdom. The French distribution center RUNGIS located in Paris trades an average of 2,000 Metric Tons a week of fisheries products and whiting represents about 25% of the quantity. MERCA MADRID in Madrid and BILLINGSGATE in London also trade large amounts of whiting.

Spain is the principal EEC market for whiting. In 1987, it consumed over 261 thousand metric tons of whiting. Spanish whiting consumption totaled 6.7 Kilograms per capita in 1987. This was nearly half of the total EEC consumption. It is a very popular species among Spanish consumers and not just a cod substitute. The country is still increasing whiting imports from Chile and Argentina to meet the domestic demand. Whole whiting represents approximately 60% of the market and 30% are fillets. Frozen whiting was introduced to the Spanish market in the 1960s, and is growing in market and consumer acceptance due to large scale consumer advertising programs in Spain.

France is the second largest EEC market for whiting. The European whiting (Merluccius merluccius) is the most popular in the market and is marketed Whole Fresh, head-on and gutted. The French market is oriented towards quality fish products. This explains the popularity of the higher quality European whiting. For the past few years, France has been increasing whiting imports but not to the extent of other EEC countries. Frozen whiting is imported from Argentina and Chile. French consumers regard frozen whiting as a low quality fish and prices are also relatively low. The French processing industries look at frozen whiting, primarily as an ingredient in value-added products, or for surimi.

Portugal is the third largest EEC market for whiting, despite the country's small population. The country has expanded its whiting imports dramatically since 1983 from 3,000 MT to 25,000 MT in 1987 and they are still growing. Whiting accounts for over half of all the trawl fish consumed in Portugal. Almost all of the imported whiting is whole fish, either head-on or headed and gutted. The major supplier is Spain which provides nearly half of total shipments.

Italy has also seen increases in whole whiting imports. Argentina and South Africa appear to be the major suppliers with Argentina being the primary supplier. Whiting is the major trawl fish species available in Italy.

In Germany, whiting is an important fish processing ingredient. It is seldom used in an unprocessed form by consumers. Processing companies have significantly increased whiting imports to substitute for a shortage of other trawl fish particularly cod. Germany imports primarily block Frozen Hake.

The United Kingdom is essentially a cod market but is growing for whiting products as cod becomes scarce and expensive. European whiting is well received at the consumer level, both in fillets and headed & gutted.

European Economic Community Whiting Supplies

European whiting (Merluccius merluccius) is harvested in the Northeast Atlantic, primarily in Iceland and Norway. It is a relatively large species, from 1 to 5 Kilograms, and is considered a premium quality fish by European consumers. It is marketed fresh head-on & gutted, and only small quantities are frozen. The frozen whiting is processed in fillets skin off. This whiting species commands the highest value in the EEC market.

Cape whiting (Merluccius capensis & Merluccius paradoxus) are harvested in the Southeast Atlantic. They are good quality fish. They are imported headed & gutted. Both species sell as a moderate priced fish in the EEC market.

Argentine whiting (Merluccius hubbsi) is harvested in the Southwest Atlantic especially along the Northern Argentina coast. This is the other major world whiting fishery. Almost all the catches are exported to Spain and Italy headed & gutted, frozen in blocks and interleaved fillets. It is considered lower quality than the Cape whiting and the European whiting.

Chilean whiting (Merluccius gayi) is harvested in the Southeast Pacific from the coasts of Chile and Peru. This is a lower quality than the Argentine whiting. Spain is the most important importer. Very little goes to the French market.

New Uses of Whiting in Europe Economic Community

Whiting has always enjoyed good market acceptance in traditional forms. Consumption of these products have seen solid growth in all EEC markets.

Product form such as surimi also represents fast growing markets in the E.E.C. surimi products are used primarily by manufacturers in the food processing industry (caterers, curing plants, etc..) . Gel strengths and emulsifying properties are especially valuable characteristics in the production of terrines, mousses, sausages, puff-pastry fillings, and as a main or added ingredient. These products can be flavored in bulk and adapted to the end users specific formulation. The texturizing

qualities of surimi-base and its low fat content make it an ideal ingredient for low-calorie preparations. Its versatility and easy use opens the door to the creation of new products, serving the imagination of professionals in the food processing field.

In France, surimi-base is made from whiting, Alaska pollack, Atlantic cod, black rock fish, carp, grey trout, haddock, herring, bastard halibut, blue shark, blue whiting and flounder.

French processing industries and government research centers currently are focussing on new technologies to improve the use of whiting in surimi and value added products. A range of three hundred new products have been already created in France from whiting surimi base. Whiting as a fillet is now being used in frozen and vacuum packed meals, for restaurant and household uses. The processing industry uses imported blocks, interleaved fillets and headed & gutted whiting for value-added products and surimi.

In Spain, small head-on whiting are referred to as "carioca" and are very popular. Frozen imported whiting are often thawed and sold by retailers as a substitute for small fresh European whiting. Small headed & gutted whiting (up to 350 grams) usually with the tails removed are retailed as "tronquito". Larger headed & gutted Hake (800 grams) may be cut in slices. Fillets with skin on are generally sold to consumers at the retail level. Substantial quantities of skinless fillets are sold to processors as raw material for an increasingly wide range of products from packed fillets to a variety of breaded and seasoned dishes with different garnishes.

About half of the headed & gutted whiting in Portugal (up to 300 grams) are filleted in various forms, with or without skin and pin-bones. Medium size whiting (350 to 800 grams) are often cut in steaks. Larger whiting (over 800 grams) are normally sold whole to retailers and restaurants.

Most of the imported fillets in Italy are for direct consumption and only small amounts are processed. whiting is the most common species generally found in the frozen counters of supermarkets. It is generally available as fillets, sliced/trimmed trunks and breaded portion.

In Germany, whiting imports are used to produce various coated, breaded and precooked products such as fish fingers, trapezoidal shaped fillets and fillet pieces. Smaller quantities of higher priced Cape whiting are imported for frozen entree preparations. These value added products include precooked gourmet fillets with a variety of sauces.

European Economic Community Tariffs and Quotas

Tariffs for whiting vary between EEC countries. Generally the tariff is based on the relative value of the whiting product to be imported. Thus a lower-value headed and gutted product would have a lower tariff than a higher-value filleted whiting product. Currently Import duties for whiting range from 8% to 15%. The twelve EEC member countries have not yet harmonized tariff regulations. This harmonization is expected to take place following final unification of the EEC January 1, 1993.

At the present time the EEC countries do not have quotas or reference prices for whiting imports, including U.S. origin whiting products.

Summary

The EEC represents a significant new market for pacific whiting. There is an existing consumer awareness of similar products, and shortages of traditional ground-fish such as cod should ease the way for pacific whiting imports. However, this market is very particular about quality and like most markets is extremely price sensitive. West coast processors will need to produce whiting products, either fillet or surimi, to world production standards. This will require investment in new automated processing machinery and a long-term commitment to building market share in the EEC. At the same time adequate resources should be made available to properly promote and market pacific whiting in this highly competitive market.

Chapter IX

Product Selection

The results from chapter IV and chapter V were combined with processing cost data for fillets and headed and gutted product in order to determine the effects of alternative combinations of product attributes and contractual arrangements on sales' price and firm decision-making behavior. A preliminary and relatively simple product optimization model was developed (see Appendix D) using non-linear optimization techniques (Gams/Minos). This method was used in order to conduct preliminary analysis in exploring the impacts of product qualities on sales' price for H&G and fillet products.

Product Selection

The following desk-top experiment was designed to explore the following question:

Given annual landings of 4,000,000 pounds of round product composed of 2,000,000 pounds of one pound fish and 2,000,000 pounds of two pound fish, what product form should processors produce, in order to maximize profits (or minimize losses), H&G or fillets? The experiment was repeated for three sets of product attributes including a low level, a moderate level, and a high level of attributes. Certain attributes were held fixed across the three scenarios: product size (fillets - 2 oz for one lb fish and 4 oz for two lb fish; H&G 10 oz and 14 oz for one and two pound fish respectively), color (off-white), texture (moderate). Seasonality, shelf life, and product uniformity varied in each scenario. The results for the three sensitivity experiments are summarized below:

PRODUCT OPTIMIZATION SCENARIO I - Moderate level of attributes:

Supply Availability - 6 Months
Shelf life - 6 Months
Product Uniformity - 85 Percent

	<u>One lb fish</u>	<u>Two lb fish</u>	<u>Total</u>
Total Harvest	2,000,000 lbs	2,000,000 lbs	4,000,000 lbs
Production of Fillets	500,000 lbs	500,000 lbs	1,000,000 lbs
Production of H&G	0 lbs	0 lbs	0 lbs
Sales Price	\$.71/lb	\$.74/lb	
Total Revenue	\$352,985	\$369,960	\$722,945
Total Variable Costs	<u>\$310,000</u>	<u>\$310,000</u>	<u>\$620,000</u>
Contribution to Margin	\$42,980	\$59,963	\$102,943

PRODUCT OPTIMIZATION SCENARIO II - Low level of attributes:

Supply Availability - 2 Months
 Shelf life - 3 Months
 Product Uniformity - 70 Percent

	<u>One lb fish</u>	<u>Two lb fish</u>	<u>Total</u>
Total Harvest	2,000,000 lbs	2,000,000 lbs	4,000,000 lbs
Production of Fillets	0 lbs	0 lbs	0 lbs
Production of H&G	1,200,000 lbs	1,200,000 lbs	2,400,000 lbs
Sales Price	\$.24/lb	\$.23/lb	
Total Revenue	\$282,320	\$266,960	\$549,280
Total Variable Costs	<u>\$392,040</u>	<u>\$392,040</u>	<u>\$784,080</u>
Contribution to Margin	-109,700	- \$126,080	-\$235,780

PRODUCT OPTIMIZATION SCENARIO III - High level of attributes:

Supply Availability - 12 Months
 Shelf life - 12 Months
 Product Uniformity - 95 Percent

	<u>One lb fish</u>	<u>Two lb fish</u>	<u>Total</u>
Total Harvest	2,000,000 lbs	2,000,000 lbs	4,000,000 lbs
Production of Fillets	500,000 lbs	500,000 lbs	1,000,000 lbs
Production of H&G	0 lbs	0 lbs	0 lbs
Sales Price	\$.991/lb	\$1.025/lb	
Total Revenue	\$495,310	\$512,300	\$1,007,610
Total Variable Costs	<u>\$310,000</u>	<u>\$310,000</u>	<u>\$620,000</u>
Contribution to Margin	\$185,310	\$202,300	\$387,610

The results from these sensitivity experiments demonstrates the relatively wide range of prices and contributions to margins which can result from different levels of product attributes. While it may usually pay to produce fillets rather than H&G, this was not true in Scenario II. This result illustrates a fundamental issue emphasized throughout this entire study which is that demand for H&G product is less sensitive to changes in product attributes than demand for whiting fillets. Therefore, while improving product attributes can boost prices and profits for fillet

production, a lack of product control can result in significant losses (which explains why the producer in scenario II would elect to produce H&G rather than suffer even greater losses producing a fillet product).

Summary

These desk-top experiments, while very preliminary in nature, demonstrate the sensitivity of the market to changes in product characteristics. They also demonstrate the potentials for improving profit opportunities by controlling and improving product attributes. As additional information about the whiting industry is developed during the course of the next year this preliminary model will be expanded in order to more realistically explore the costs and benefits of controlling and improving product attributes. The model will also prove useful for understanding the implications of alternative contractual arrangements between fishermen and processors in their attempts to improve and standardize product quality and maximize profit potentials.

Chapter X

SUMMARY

Recent events have led most analysts to believe that a substantially greater volume of Pacific whiting could be profitably processed by the U.S. seafood industry. These events include global price increases for whiting and other trawl fish species, expansion of whiting markets in Europe, shortages of other West coast trawl fish supplies relative to West coast fishing capacity, and development of methods for counteracting parasite and texture related quality problems.

Presently the Pacific whiting fishery is operated primarily as a joint venture fishery involving American harvesters and foreign processing vessels from Poland, the Soviet Union, Korea, and Japan. The raw product is processed into fillets, headed and gutted (H&G) product, and surimi, and distributed to markets in Eastern Europe and Asia (fish meal is also produced from the wastes as a by-product). U.S. shore-based firms process approximately 6,000-10,000 MT annually which is less than 5% of the total allowable catch. Most of this product is processed into H&G which is positioned for sale to low-income ethnic households in the domestic retail market.

Past efforts by the U.S. industry to produce other Pacific whiting-based products such as fillets and breaded portions have been relatively unsuccessful. These failures have occurred despite research by seafood technologists demonstrating that if Pacific whiting is handled properly during capture, processing, and distribution, and if it is prepared and cooked in a manner which prevents the activation of protease enzymes, that a reasonable quality product could be developed comparable to other moderately priced whiting species. Preliminary analysis suggests that the industry's poor success has resulted from the adoption of production and marketing efforts too limited and too disorderly to effectively address product quality issues.

In order to explore the potential market opportunities for expanded domestic production of Pacific whiting, a national market survey was conducted of firms which handle whiting or handle product forms which could be processed from whiting. The survey objectives included developing marketing information on (1) optimal product forms, (2) the relative importance of product attributes, (3) and the effects of alternative contractual arrangements.

The survey results revealed that the industry is relatively confident that a wide variety of product forms could be profitably processed from Pacific whiting, but only if product quality is

improved. There was consensus that given the difficult issues related to product quality, a significant degree of cooperation, risk sharing, and marketing commitment would be essential among industry sectors. While the industry expects trawl fish prices to increase during the next few years they also believe there will be trawl fish shortages. The industry also expects prices for whiting products to increase but are uncertain as to whether there will be growth in supplies.

Profitable opportunities for expanding the production of H&G were considered limited. The domestic market for H&G is relatively specialized and margins relatively low. Pacific whiting already dominates this market, and increasing H&G supplies could result in significant price decreases. High transportation costs for H&G product would limit opportunities in European markets. Fillets or minced products would provide better potential but only if the product has at least a moderately firm texture and reasonably long shelf life.

Market research also indicated that the opportunities for secondary processing into breaded products positioned for the food service and institutional markets looks promising. With the rapid increase in cod and pollock prices, institutions including the military, school systems, prisons, and nursing homes are looking for reasonably priced substitute products. Breeding may help improve product qualities and provides an opportunity for developing value-added products.

The U.S. based surimi industry is expected to consolidate and become increasingly market oriented. Prices are rapidly increasing as a result of the diversion of pollock away from surimi production and toward the more profitable fillet market. In addition, evidence from Japan indicates that Pacific whiting-based surimi is a relatively high priced product comparable in quality to the highest grades of surimi produced from Alaskan pollock. As a result the potentials for a shore-based surimi plant or a secondary plant to produce surimi-based analogs looks promising if problems related to infrastructure, waste disposal, and supply availability can be solved. Production of fresh compared to frozen surimi may provide a comparative advantage to shore-based plants relative to at-sea processors. Potential opportunities may be enhanced by inviting Japanese investors with experience in producing surimi from Pacific whiting, or by purchasing the rights to Pacific whiting-based surimi formulations. At least one Oregon firm will be producing significant amounts of surimi-based analog products within the next three years and is interested in securing supplies of high quality Pacific whiting.

For most primary and secondary product forms, a relatively large scale of operation and cooperation will be necessary in production, processing, and marketing. Besides supporting the necessary infrastructure, local and state governments will need to

provide the incentives necessary to increase investment. Four key areas of support include (1) encouraging the industry to control product quality and develop product standards, (2) solving waste disposal problems, (3) obtaining favorable shore-side allocation, and (4) developing regulatory policies that would allow the industry to secure a level of raw product large enough, and sustainable enough to justify long-term large-scale investment.

In final summary, it appears that a "portfolio" of product forms could be successfully processed from Pacific whiting including H&G, fillets, surimi, minced, and breaded products. Given variations in both market conditions and intrinsic product characteristics, strategies based on diversified products might prove optimal for sustaining development and reducing risks. The industry, however, must solve product quality problems especially those related to texture degrading protease enzymes. Besides careful handling of the product at sea and in the plant, strategies must be adopted to minimize the effects of the enzyme after the product leaves the processor. Alternative strategies, each appropriate for different product forms, are summarized in Table 10.1.

Table 10.1 Alternative marketing strategies for minimizing texture and enzyme related problems for Pacific whiting.

Strategy	Sector	Product forms
Marketing for end users which use quick cooking techniques.	Food Service	Fillets, breaded
	Retail	H&G
Pre-cooking after primary processing	Institutional	Breaded minced portions, and breaded fillets.
Using enzyme inhibitors	Various sectors	Surimi, minced blocks, extruded sticks and portions.
Culling enzyme-affected product (cost-effective technology not yet developed)	Various sectors	Various products

In order to promote these strategies and maximize marketing opportunities, the industry should be encouraged to develop formal association(s) of Pacific whiting fishermen, processors, and distributors. Such organization(s) could be particularly effective in promoting cooperation and risk sharing, improving information flows, and supporting rational policies for managing the Pacific whiting fishery. Allocation is only a first step -- if regulatory strategies are developed without effectively limiting effort or explicitly considering marketing issues, the industry will realize only a portion of the potential resource benefits.

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APPENDIX A

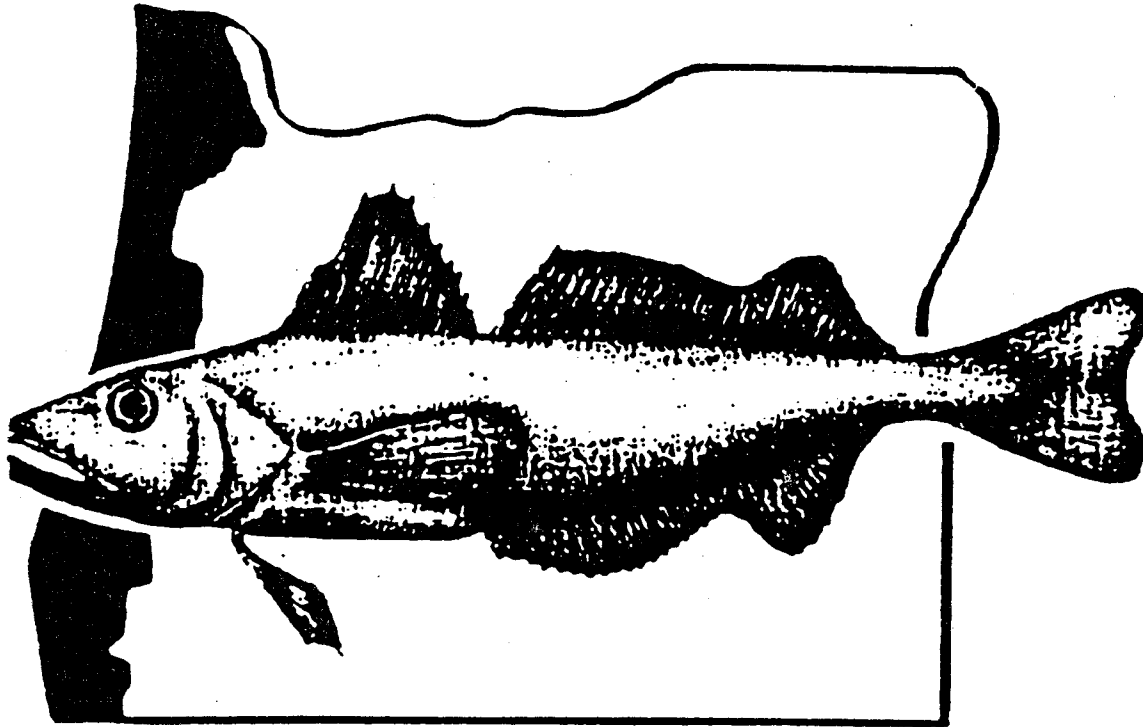
H&G Whiting National Market Survey

PACIFIC WHITING FACT SHEET

<u>LOCATION:</u>	Pacific whiting is located off the West coast of the U.S. and Canada; from Baha, CA to Vancouver, B.C.
<u>HARVEST POTENTIAL:</u>	Pacific whiting has a variable allowable biological catch but averages approximately 440,000,000 pounds per year. (this would fill about 2500 rail cars with headed & gutted product.)
<u>DOMESTIC UTILIZATION:</u>	Currently, only about 10,000,000 pounds of Pacific whiting are being used domestically; primarily as 5 pound boxes of headed and gutted product.
<u>FOREIGN UTILIZATION:</u>	Foreign factory ships process an average of approximately 400,000,000 pounds/year into fillets, H & G, and surimi based products.
<u>FISH SIZE:</u>	Pacific whiting range in weight from 1 to 4 pounds, and 12 to 24 inches in length. The average weight is 2.2 pounds. Average length, 20 inches.
<u>HARVEST METHOD:</u>	Pacific whiting is harvested by mid-water trawl nets; usually within 20 miles from shore.
<u>TEXTURE:</u>	Typically, the texture is moderately firm, although if not properly handled, it can become soft.
<u>COLOR:</u>	Flesh color ranges from slightly off-white to white with a slight tinge of pink.
<u>FROZEN SHELF LIFE:</u>	With the present technology, between 3 to 6 months depending on handling and freezing technique.
<u>FAT LAYER:</u>	There is a fat layer next to the skin that can be removed with deep skinning techniques.
<u>HANDLING:</u>	Pacific whiting bruises easily and must be handled carefully. Refrigerated seawater storage on vessels and careful handling by processors can minimize damage and loss of quality.
<u>ENZYME PROBLEMS:</u>	Some of the fish are infected by a microscopic parasite that releases an enzyme into the flesh. The enzyme causes the flesh to become soft if the fish is not handled properly or if cooked using slow cooking techniques such as broiling or baking.
<u>NEW TECHNOLOGIES:</u>	New technologies may alleviate many of the problems that have limited domestic market expansion. These technologies include new refrigerating and freezing techniques, more efficient handling and processing systems, and development of enzyme inhibitors.

HEADED AND GUTTED WHITING

PACIFIC WHITING: A NATIONAL SURVEY OF THE SEAFOOD INDUSTRY



These surveys are designed to help Oregon seafood industries and West Coast fisheries agencies develop production and management plans for Pacific whiting which are consistent with market needs and opportunities. Please answer all questions. If you wish to comment on any questions or qualify your answers, please feel free to use the space in the margins. You are being asked to complete only one of the three enclosed questionnaires, depending on your market experience:

If you handle a greater volume of headed and gutted whiting than whiting fillets, complete only this questionnaire.

If you handle more whiting fillets than headed and gutted whiting, complete only the questionnaire titled "Whiting Fillets".

If you do not handle whiting products, complete only the questionnaire titled "Trawl Fish".

Thank you for your help.

Coastal Oregon Marine Experiment Station
Hatfield Marine Science Center
Oregon State University
Newport, Oregon 97365

INSTRUCTIONS: UNLESS OTHERWISE INSTRUCTED, PLEASE CIRCLE THE APPROPRIATE RESPONSE FOR EACH QUESTION.

1. Have you ever handled fresh or frozen headed and gutted whiting products?

a) yes b) no

If you answered yes, and you handle more headed and gutted than whiting fillet products, then please continue with the remainder of this questionnaire and discard the other two.

If you answered no, but you handle whiting fillet products, then discard this questionnaire and please complete only the questionnaire titled "WHITING FILLETS". If you do not handle whiting products, then please complete only the questionnaire titled "TRAWL FISH".

2. Please indicate your overall experience with whiting products as they compare to other fish products which you have handled. (Circle only one choice per category.)

Quality: a) very poor b) poor c) average d) good e) very good

Price: a) very poor b) poor c) average d) good e) very good

Availability: a) very poor b) poor c) average d) good e) very good

3. Please select that species of whiting that represents the largest volume of your whiting purchases. (Circle only one response.)

a) Argentine whiting (<u>Merluccius hubbsi</u>)	b) Chilean whiting (<u>Merluccius gayi</u>)	c) Pacific whiting (<u>Merluccius productus</u>)
d) Atlantic whiting (<u>Merluccius bilinearis</u>)	e) Peruvian whiting (<u>Merluccius peruanus</u>)	f) Other _____

4. Please choose that product form which is most typical of the whiting species selected in question three above. (Circle only one response.)

a) Headed and gutted	b) Skin-on fillets	c) Skin-off fillets
d) Defatted fillets	e) Value added products	f) Smoked
g) Surimi	h) Fish meal/oil	i) Other _____

5. Have you ever handled Pacific whiting products? a) yes b) no

6. If you have handled Pacific whiting, please indicate your overall experience with this product as it compares to other fish products which you have handled. (Circle only one choice per category.)

Quality: a) very poor b) poor c) average d) good e) very good

Price: a) very poor b) poor c) average d) good e) very good

Availability: a) very poor b) poor c) average d) good e) very good

7. Select the response for each of the statements below which you believe will be true of the overall U.S. trawl fish market in the next two years. (Circle only one choice per statement.)

Prices for trawl fish will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

Trawl fish supplies will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

8. Select the response for each of the statements below which you believe will be true of the U.S. headed and gutted whiting market in the next two years. (Circle only one choice per statement.)

Prices for headed and gutted whiting products will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

Headed and gutted whiting supplies will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

9. Select the statement below that most closely represents your opinion of the foreign market potential for U.S. made Pacific whiting products. (Circle only one statement.)

- a) Excellent market potential for many products
- b) Some market potential for some products
- c) Little market potential for any product
- d) No opinion

10. Given the adoption of new technologies that would improve Pacific whiting characteristics, including firmness and consistency of quality, please score the following products given your opinion of their market and profit potential. (Circle one score per product. If you have no opinion circle "N/A").

	<u>Low Potential</u>					<u>High Potential</u>		
Frozen headed and gutted	N/A	0	1	2	3	4	5	6
Surimi/Analog	N/A	0	1	2	3	4	5	6
Frozen fillets	N/A	0	1	2	3	4	5	6
Breaded nuggets	N/A	0	1	2	3	4	5	6
Microwave entrees	N/A	0	1	2	3	4	5	6
Fresh fillets	N/A	0	1	2	3	4	5	6

1. Below is a list of attributes that may be of concern when purchasing headed and gutted whiting products. Please indicate how important each attribute is to you by circling one score for each attribute. If the category is unknown or does not apply, be sure to circle "N/A".

		NOT IMPORTANT					VERY IMPORTANT						
Price	N/A	0	1	2	3	4	5	6	7	8	9	10	
Size of product (4 oz., 6 oz., etc.)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Species/Type (Argentine, Peruvian, etc.)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Texture of flesh	N/A	0	1	2	3	4	5	6	7	8	9	10	
Shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10	
Flesh color	N/A	0	1	2	3	4	5	6	7	8	9	10	
Package size	N/A	0	1	2	3	4	5	6	7	8	9	10	
Supply availability (months per year)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Product uniformity (uniformity of product attributes)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Range of product line provided by seller	N/A	0	1	2	3	4	5	6	7	8	9	10	
Degree of marketing support (brochures, recipes, package design)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Payment terms	N/A	0	1	2	3	4	5	6	7	8	9	10	

12. Listed below are the attributes in the previous question broken down into specific characteristics. Please circle one score per characteristic to indicate how desirable each characteristic is in your decision to purchase or handle headed and gutted whiting given the whiting species you most typically handle. (This is the same species you indicated in question three above.)

		HIGHLY UNDESIRABLE					INDIFFERENT					HIGHLY DESIRABLE		
Price (F.O.B. West Coast):														
a) \$0.30 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) \$0.40 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) \$0.50 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10		
d) \$0.60 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10		
Product size:														
a) 4-8 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) 8-12 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) 12-16 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10		
d) 16-20 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10		
Species:														
a) Argentine whiting (<u>Merluccius hubbsi</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) Chilean whiting (<u>Merluccius gayi</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) Pacific whiting (<u>Merluccius productus</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
d) Atlantic whiting (<u>Merluccius bilinearis</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
e) Peruvian whiting (<u>Merluccius peruanus</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
Texture:														
a) Firm (rebounds to original shape quickly when pressed)	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) Moderately firm (regains original shape slowly when pressed)	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) Soft (does not regain original shape when pressed)	N/A	0	1	2	3	4	5	6	7	8	9	10		

12. Continued.

		<u>HIGHLY UNDESIRABLE</u>				<u>INDIFFERENT</u>				<u>HIGHLY DESIRABLE</u>			
Frozen shelf life:													
a) 18 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 12 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 6 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) 3 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10	
Flesh color:													
(before cooking)													
a) White	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) Slightly off-white	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) Light pink	N/A	0	1	2	3	4	5	6	7	8	9	10	
Package size:													
a) 3 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 5 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 10 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) 25 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
Supply availability:													
a) 12 months/year	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 8 months/year	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 4 months/year	N/A	0	1	2	3	4	5	6	7	8	9	10	
Product uniformity:													
(uniformity of size, texture, color, etc.)													
a) More than 95% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 85% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 70% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) 50% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
Range of products offered by seller:													
a) Whiting only	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) Small line (1-10 products)	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) Moderate line (10-20 products)	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) Large line (more than 20 products)	N/A	0	1	2	3	4	5	6	7	8	9	10	

12. Continued.

Degree of marketing support:
(brochures, recipes,
attractive packaging, etc.)

a) None	N/A	0	1	2	3	4	5	6	7	8	9	10
b) Small degree	N/A	0	1	2	3	4	5	6	7	8	9	10
c) Large degree	N/A	0	1	2	3	4	5	6	7	8	9	10

13. Below is a list of the attributes from question 12. Please indicate which characteristic of each attribute category best describes the typical product you receive today. (Place the appropriate letter from question 12 in each space provided. For example, if your typical price is \$0.40/lb., you would choose the letter "b" for the "Price" attribute, or if your typical product size is 12-16 oz., then you would select "c" for "Product size", etc.)

Price	_____	Product size	_____
Species	_____	Texture	_____
Shelf life	_____	Flesh color	_____
Package size	_____		
Product uniformity	_____	Range of product line	_____
Degree of marketing support .	_____		

14. On the following two pages are eight descriptions of frozen headed and gutted whiting products. Each product shares the following characteristics:

Shelf life:	12 months
Color:	Slightly off-white
Texture:	Moderately firm
Product uniformity:	95% uniform in product attributes
Package form and size:	Ideal
Payment terms:	Net 30 days

Each of the eight products, however, varies in the following characteristics:

Product size
Supply availability
Price
Degree of marketing support

Please select a single score from the scale found beneath each product. Each scale ranges from -10 to +10:

-10 represents a product that would yield a relatively large loss
0 is the break-even point
+10 represents a product that would yield a relatively large profit

Circle only one score for each product. Do not give any two products the same score. You may wish to review all eight products before beginning your scoring.

14. Continued.

P R O D U C T 1

Product size: 12-16 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.30
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 2

Product size: 8-12 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$0.30
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 3

Product size: 12-16 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.45
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 4

Product size: 8-12 oz.
 Supply availability: May-September (5 months)
 Price (F.O.B. West Coast): \$0.45
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

14. Continued.

P R O D U C T 5

Product size: 8-12 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.60
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 6

Product size: 12-16 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$0.60
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 7

Product size: 8-12 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$0.45
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 8

Product size: 12-16 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.45
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

15. The following is a set of characteristics describing a frozen headed and gutted whiting product:

Shelf life: 6 months
 Color: Slightly off-white
 Texture: Moderately firm
 Size of fillets: 8-12 oz.
 Package form and size: Ideal
 Product uniformity: 75% uniform
 Supply availability: April through October (7 months per year)
 Payment terms: Net 30 days
 Marketing support: Yes

- a) Please score the relative profitability to your firm if you were to handle the product described above at each of the six prices (F.O.B. West Coast) listed below. (Circle one score for each price.)

	VERY UNPROFITABLE										BREAK-EVEN										VERY PROFITABLE									
\$0.60/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.55/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.50/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.45/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.40/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.35/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

- b) For the same product and prices, please select the quantity of product which your firm might handle. (Circle one quantity for each price.)

	<u>POUNDS OF PRODUCT PER YEAR</u>							
\$0.60/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.55/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.50/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.45/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.40/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.35/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more

A

16. Select the industry sector from which you purchase the largest share of your whiting products. (Circle only one response.)

- | | | |
|---------------------------|--------------|-------------|
| a) Producer | b) Processor | c) Broker |
| d) Wholesaler/Distributor | e) Importer | f) Exporter |

17. Select the industry sector to which you currently sell the majority of your whiting products. (Circle only one response.)

- | | | |
|---------------------------|------------------|-----------------|
| a) Producer | b) Processor | c) Broker |
| d) Wholesaler/Distributor | e) Importer | f) Exporter |
| g) Retailer | h) Restaurant | i) Food Service |
| j) Military | k) Institutional | l) Other _____ |

18. Please indicate your position at this firm.

- | | | |
|----------|----------------|-------------------|
| a) Owner | b) President | c) Vice president |
| d) Buyer | e) Other _____ | |

19. Please indicate how long you have worked in the seafood industry.

- | | | |
|-----------------------|------------------|-----------------------|
| a) Less than one year | b) 1 - 2 years | c) 2 - 5 years |
| d) 5 - 10 years | e) 10 - 15 years | f) More than 15 years |

20. Please indicate the volume that most closely represents the total annual volume of whiting products which you handle. (Circle only one response.)

- | | | |
|-------------------------------|-----------------------------------|------------------------|
| a) less than 50,000 lbs./year | b) 100,000 lbs./year | c) 200,000 lbs./year |
| d) 500,000 lbs./year | e) 1 million lbs./year | f) 2 million lbs./year |
| g) 5 million lbs./year | h) more than 10 million lbs./year | |

21. Please select the category that most closely corresponds to your company's total gross sales volume.

- | | | |
|-----------------------|---------------------------|-----------------------------|
| a) Under \$100,000 | b) \$100,000 to \$500,000 | c) \$500,000 to \$1 million |
| d) \$1 to \$2 million | e) \$2 to \$5 million | f) \$5 to \$10 million |
| g) \$10 to 20 million | h) \$20 to \$35 million | i) \$35 to \$55 million |

22. Please indicate the primary function(s) that are performed by your company. Select no more than three functions and rate them as to importance with "1" being the most important, "2" the second most important, and "3" the third most important.

- | | | |
|---------------------------------|---------------------|-------------------|
| a) Producer _____ | b) Processor _____ | c) Broker _____ |
| d) Distributor/Wholesaler _____ | e) Importer _____ | f) Exporter _____ |
| g) Retailer _____ | h) Restaurant _____ | |
| j) over \$55 million | | |

23. If you have ever purchased Oregon seafood products, please rate your experience relative to other product origins using the scale below. (Circle only one response.)

- | | | | | |
|--------------|---------|------------|---------|--------------|
| a) very poor | b) poor | c) average | d) good | e) very good |
|--------------|---------|------------|---------|--------------|

Is there anything else you would like to tell us regarding your experience with Pacific whiting or other whiting or trawl fish products? If so, please use this space for that purpose.

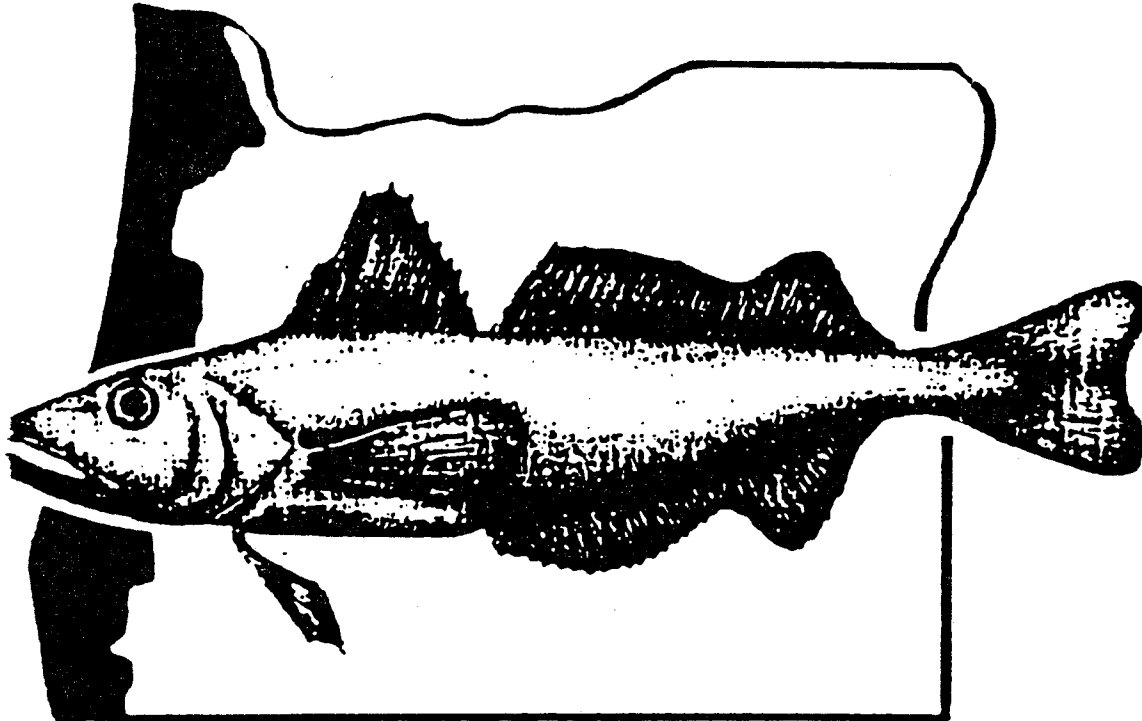
Also, any comments you wish to make regarding future development of this resource from the perspective of the Oregon seafood industry or the federal and state fisheries management agencies will be appreciated, either here or in a separate letter.

Your contribution to this effort is very greatly appreciated. If you would like a summary of these results and also the global whiting report, please print your name and address on the back of the return envelope (NOT on this questionnaire). We will see that you get them.

APPENDIX B

Whiting Fillet National Market Survey

PACIFIC WHITING: A NATIONAL SURVEY OF THE SEAFOOD INDUSTRY



These surveys are designed to help Oregon seafood industries and West Coast fisheries agencies develop production and management plans for Pacific whiting which are consistent with market needs and opportunities. Please answer all questions. If you wish to comment on any questions or qualify your answers, please feel free to use the space in the margins. You are being asked to complete only one of the three enclosed questionnaires, depending on your market experience:

If you handle a greater volume of whiting fillets than headed and gutted whiting, complete only this questionnaire.

If you handle more headed and gutted whiting than whiting fillets, complete only the questionnaire titled "Headed and Gutted Whiting".

If you do not handle whiting products, complete only the questionnaire titled "Trawl Fish".

Thank you for your help.

INSTRUCTIONS: UNLESS OTHERWISE INSTRUCTED, PLEASE CIRCLE THE APPROPRIATE RESPONSE FOR EACH QUESTION.

1. Have you ever handled fresh or frozen whiting fillets? a) yes b) no

If you answered yes, and you handle more whiting fillet products than headed and gutted whiting products, then please continue with the remainder of this questionnaire and discard the other two.

If you answered no, but you handle headed and gutted whiting products, then discard this questionnaire and please complete only the questionnaire titled "HEADED AND GUTTED WHITING". If you do not handle whiting products, then please complete only the questionnaire titled "TRAWL FISH".

2. Please indicate your overall experience with whiting products as they compare to other finfish products which you have handled. (Circle only one choice per category.)

Quality: a) very poor b) poor c) average d) good e) very good

Price: a) very poor b) poor c) average d) good e) very good

Availability: a) very poor b) poor c) average d) good e) very good

3. Please select that species of whiting that represents the largest volume of your whiting purchases. (Circle only one response.)

a) Argentine whiting
(Merluccius hubbsi)

b) Chilean whiting
(Merluccius gayi)

c) Pacific whiting
(Merluccius productus)

d) Atlantic whiting
(Merluccius bilinearis)

e) Peruvian whiting
(Merluccius peruanus)

f) Other _____

4. Please choose that product form which is most typical of the whiting species selected in question three above. (Circle only one response.)

a) Headed and gutted

b) Skin-on fillets

c) Skin-off fillets

d) Defatted fillets

e) Value added products

f) Smoked

g) Surimi

h) Fish meal/oil

i) Other _____

5. Have you ever handled Pacific whiting products? a) yes b) no

6. If you have handled Pacific whiting, please indicate your overall experience with this product as it compares to other fish products which you have handled. (Circle only one choice per category.)

Quality: a) very poor b) poor c) average d) good e) very good

Price: a) very poor b) poor c) average d) good e) very good

Availability: a) very poor b) poor c) average d) good e) very good

7. Select the response for each of the statements below which you believe will be true of the overall U.S. trawl fish market in the next two years. (Circle only one choice per statement.)

Prices for trawl fish will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

Trawl fish supplies will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

8. Select the response for each of the statements below which you believe will be true of the U.S. whiting fillet market in the next two years. (Circle only one choice per statement.)

Prices for whiting fillets will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

Whiting fillet supplies will:

- | | | |
|----------------------------|--------------------|----------------------------|
| a) decrease by 30% or more | b) decrease by 20% | c) decrease by 10% |
| d) decrease by 5% | e) not change | f) increase by 5% |
| g) increase by 10% | h) increase by 20% | i) increase by 30% or more |

- Select the statement below that most closely represents your opinion of the foreign market potential for U.S. made Pacific whiting products. (Circle only one statement.)

- a) Excellent market potential for many products
- b) Some market potential for some products
- c) Little market potential for any product
- d) No opinion

10. Given the adoption of new technologies that would improve Pacific whiting characteristics, including firmness and consistency of quality, please score the following products given your opinion of their market and profit potential. (Circle one score per product. If you have no opinion circle "N/A").

		<u>Low Potential</u>					<u>High Potential</u>			
Frozen headed and gutted	N/A	0	1	2	3	4	5	6		
Surimi/Analog	N/A	0	1	2	3	4	5	6		
Frozen fillets	N/A	0	1	2	3	4	5	6		
Breaded frozen portions	N/A	0	1	2	3	4	5	6		
Microwave entrees	N/A	0	1	2	3	4	5	6		
Fresh fillets	N/A	0	1	2	3	4	5	6		

11. Below is a list of attributes that may be of concern when purchasing whiting fillets. Please indicate how important each attribute is to you by circling one score for each attribute. If the category is unknown or does not apply, be sure to circle "N/A".

		<u>NOT IMPORTANT</u>										<u>VERY</u>	
Price	N/A	0	1	2	3	4	5	6	7	8	9	10	
Product form (skin-on, skin-off, etc.)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Package form (IQF, blocks, etc.)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Size of fillet (4 oz., 6 oz., etc.)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Species/Type (Argentine, Peruvian, etc.)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Texture of flesh	N/A	0	1	2	3	4	5	6	7	8	9	10	
Shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10	
Flesh color	N/A	0	1	2	3	4	5	6	7	8	9	10	
Package size	N/A	0	1	2	3	4	5	6	7	8	9	10	
Supply availability (months per year)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Product uniformity (uniformity of product attributes)	N/A	0	1	2	3	4	5	6	7	8	9	10	
Range of product line provided by seller	N/A	0	1	2	3	4	5	6	7	8	9	10	

11. Continued.

		NOT IMPORTANT										VERY
Degree of marketing support (brochures, recipes, package design)	N/A	0	1	2	3	4	5	6	7	8	9	10
Payment terms	N/A	0	1	2	3	4	5	6	7	8	9	10

12. Listed below are the attributes in the previous question broken down into specific characteristics. Circle one score for each characteristic to indicate how desirable each characteristic is in your decision to purchase or handle whiting fillets given the whiting species you most typically handle. (This is the same species you indicated in question three above.)

		HIGHLY UNDESIRABLE					INDIFFERENT					DESIRABLE	
Price (F.O.B. West Coast)													
a) \$0.55 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) \$0.70 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) \$0.85 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) \$1.00 per lb.	N/A	0	1	2	3	4	5	6	7	8	9	10	
Product form													
a) Fillets (skin-on)	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) Fillets (skin-off)	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) Defatted fillets	N/A	0	1	2	3	4	5	6	7	8	9	10	
Package form													
a) IQF	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) Blocks	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) Shatterpack	N/A	0	1	2	3	4	5	6	7	8	9	10	
Fillet size													
a) 2-4 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 4-6 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 6-8 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) 8-10 oz.	N/A	0	1	2	3	4	5	6	7	8	9	10	

12. Continued.

Species	HIGHLY UNDESIRABLE					INDIFFERENT					DESIRABLE			
a) Argentine whiting (<u>Merluccius hubbsi</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) Chilean whiting (<u>Merluccius gayi</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) Pacific whiting (<u>Merluccius productus</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
d) Atlantic whiting (<u>Merluccius bilinearis</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
e) Peruvian whiting (<u>Merluccius peruanus</u>)	N/A	0	1	2	3	4	5	6	7	8	9	10		
Texture														
a) Firm (rebounds to original shape quickly when pressed)	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) Moderately firm (regains original shape slowly when pressed)	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) Soft (does not regain original shape when pressed)	N/A	0	1	2	3	4	5	6	7	8	9	10		
Shelf life														
Frozen:														
a) 18 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		
a) 12 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) 6 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) 3 month shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		
Fresh:														
d) 9 day shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		
e) 6 day shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		
f) 3 day shelf life	N/A	0	1	2	3	4	5	6	7	8	9	10		

12. Continued.

Flesh color (before cooking)	<u>HIGHLY UNDESIRABLE</u>					<u>INDIFFERENT</u>					<u>DESIRABLE</u>		
a) White	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) Slightly off-white	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) Light pink	N/A	0	1	2	3	4	5	6	7	8	9	10	
Package size													
a) 1 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 3 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 5 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) 10 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
e) 25 pound	N/A	0	1	2	3	4	5	6	7	8	9	10	
Supply availability													
a) 12 months/year	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 8 months/year	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 4 months/year	N/A	0	1	2	3	4	5	6	7	8	9	10	
Product uniformity (uniformity of size, texture, color, etc.)													
a) More than 95% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) 85% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) 70% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) 50% uniform	N/A	0	1	2	3	4	5	6	7	8	9	10	
Range of products offered by seller													
a) Whiting only	N/A	0	1	2	3	4	5	6	7	8	9	10	
b) Small line (1-10 products)	N/A	0	1	2	3	4	5	6	7	8	9	10	
c) Moderate line (10-20 products)	N/A	0	1	2	3	4	5	6	7	8	9	10	
d) Large line (more than 20 products)	N/A	0	1	2	3	4	5	6	7	8	9	10	

12. Continued.

Degree of marketing support (brochures, recipes, attractive packaging, etc.)	HIGHLY <u>UNDESIRABLE</u>					<u>INDIFFERENT</u>					<u>DESIRABLE</u>			
a) None	N/A	0	1	2	3	4	5	6	7	8	9	10		
b) Small degree	N/A	0	1	2	3	4	5	6	7	8	9	10		
c) Large degree	N/A	0	1	2	3	4	5	6	7	8	9	10		

13. Below is a list of the attributes from question 12. Please indicate which characteristic of each attribute category best describes the typical product you receive today. (Place the appropriate letter from question 12 in each space provided. For example, if your typical price is \$0.70/lb., you would choose the letter "b" for the "Price" attribute, or if you handle mostly skin-on fillets, then you would select "a" for "Product form", etc.)

Price _____

Product form _____

Package form _____

Fillet size _____

Species _____

Texture _____

Shelf life _____

Flesh color _____

Package size _____

Supply availability _____

Product uniformity _____

Range of product line _____

Degree of marketing support _____

14. On the following two pages are eight descriptions of frozen whiting fillet products. Each product shares the following characteristics:

Shelf life:	12 months
Color:	Slightly off-white
Texture:	Moderately firm
Product uniformity:	95% uniform in product attributes
Package form and size:	Ideal
Payment terms:	Net 30 days

Each of the eight products, however, varies in the following characteristics:

- Product form
- Product size
- Supply availability
- Price
- Degree of marketing support

Please select a single score from the scale found beneath each product. Each scale ranges from -10 to +10:

- 10 represents a product that would yield a relatively large loss
- 0 is the break-even point
- +10 represents a product that would yield a relatively large profit

Circle only one score for each product. Do not give any two products the same score. You may wish to review all eight products before beginning your scoring.

14. Continued.

P R O D U C T 1

Product form: Skin-on fillets
 Product size: 2-4 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$0.60
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 2

Product form: Skinless, defatted fillets
 Product size: 4-6 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.60
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 3

Product form: Skin-on fillets
 Product size: 4-6 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$0.80
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 4

Product form: Skinless, defatted fillets
 Product size: 4-6 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.80
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

14. Continued.

P R O D U C T 5

Product form: Skin-on fillets
 Product size: 4-6 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$1.00
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>									<u>BREAK-EVEN</u>											<u>VERY PROFITABLE</u>	
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	

P R O D U C T 6

Product form: Skin-off, defatted fillets
 Product size: 2-4 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$1.00
 Marketing support: No

<u>VERY UNPROFITABLE</u>										<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

P R O D U C T 7

Product form: Skin-on fillets
 Product size: 2-4 oz.
 Supply availability: April-June (3 months)
 Price (F.O.B. West Coast): \$0.80
 Marketing support: No

<u>VERY UNPROFITABLE</u>									<u>BREAK-EVEN</u>											<u>VERY PROFITABLE</u>	
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	

P R O D U C T 8

Product form: Skin-off, defatted fillets
 Product size: 4-6 oz.
 Supply availability: April-October (7 months)
 Price (F.O.B. West Coast): \$0.80
 Marketing support: Yes

<u>VERY UNPROFITABLE</u>									<u>BREAK-EVEN</u>										<u>VERY PROFITABLE</u>	
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10

15. The following is a set of characteristics describing a frozen whiting fillet product:

Product form: Skin-on fillets
 Shelf life: 12 months
 Color: Slightly off-white
 Texture: Moderately firm
 Size of fillets: 2-4 oz.
 Package form and size: Ideal
 Product uniformity: 95% uniform
 Supply availability: April through October (7 months per year)
 Payment terms: Net 30 days
 Marketing support: Yes

a) Please score the relative profitability to your firm if you were to handle the product described above at each of the six prices listed below. (Circle one score per price.)

	VERY UNPROFITABLE										BREAK-EVEN										VERY PROFITABLE									
\$1.00/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.90/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.80/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.70/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.60/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									
\$0.50/lb.	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

b) For the same product and prices, please select the quantity of product which your firm might handle. (Circle one quantity per price.)

	<u>POUNDS OF PRODUCT PER YEAR</u>							
\$1.00/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.90/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.80/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.70/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.60/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more
\$0.50/lb.	0	50,000	100,000	200,000	500,000	1,000,000	2,000,000	or more

A

16. Select the industry sector from which you purchase the largest share of your whiting products. (Circle only one response.)
- | | | |
|---------------------------|--------------|-------------|
| a) Producer | b) Processor | c) Broker |
| d) Wholesaler/Distributor | e) Importer | f) Exporter |
17. Select the industry sector to which you currently sell the majority of your whiting products. (Circle only one response.)
- | | | |
|---------------------------|------------------|-----------------|
| a) Producer | b) Processor | c) Broker |
| d) Wholesaler/Distributor | e) Importer | f) Exporter |
| g) Retailer | h) Restaurant | i) Food Service |
| j) Military | k) Institutional | l) Other _____ |
18. Please indicate your position at this firm.
- | | | |
|----------|----------------|-------------------|
| a) Owner | b) President | c) Vice president |
| d) Buyer | e) Other _____ | |
19. Please indicate how long you have worked in the seafood industry.
- | | | |
|-----------------------|------------------|-----------------------|
| a) Less than one year | b) 1 - 2 years | c) 2 - 5 years |
| d) 5 - 10 years | e) 10 - 15 years | f) More than 15 years |
20. Please indicate the volume that most closely represents the total annual volume of whiting products which you handle. (Circle only one response.)
- | | | |
|-------------------------------|-----------------------------------|------------------------|
| a) less than 50,000 lbs./year | b) 100,000 lbs./year | c) 200,000 lbs./year |
| d) 500,000 lbs./year | e) 1 million lbs./year | f) 2 million lbs./year |
| g) 5 million lbs./year | h) more than 10 million lbs./year | |
21. Please select the category that most closely corresponds to your company's total gross sales volume.
- | | | |
|-----------------------|---------------------------|-----------------------------|
| a) Under \$100,000 | b) \$100,000 to \$500,000 | c) \$500,000 to \$1 million |
| d) \$1 to \$2 million | e) \$2 to \$5 million | f) \$5 to \$10 million |
| g) \$10 to 20 million | h) \$20 to \$35 million | i) \$35 to \$55 million |
| j) over \$55 million | | |

22. Please indicate the primary function(s) that are performed by your company. Select no more than three functions and rate them as to importance with "1" being the most important, "2" the second most important, and "3" the third most important.

- | | | |
|---------------------------------|---------------------|-------------------|
| a) Producer _____ | b) Processor _____ | c) Broker _____ |
| d) Distributor/Wholesaler _____ | e) Importer _____ | f) Exporter _____ |
| g) Retailer _____ | h) Restaurant _____ | |

23. If you have ever purchased seafood products from Oregon, please rate your experience relative to other product origins using the scale below. (Circle only one response.)

- | | | | | |
|--------------|---------|------------|---------|--------------|
| a) very poor | b) poor | c) average | d) good | e) very good |
|--------------|---------|------------|---------|--------------|

Is there anything else you would like to tell us regarding your experience with Pacific whiting or other whiting or trawl fish products? If so, please use this space for that purpose.

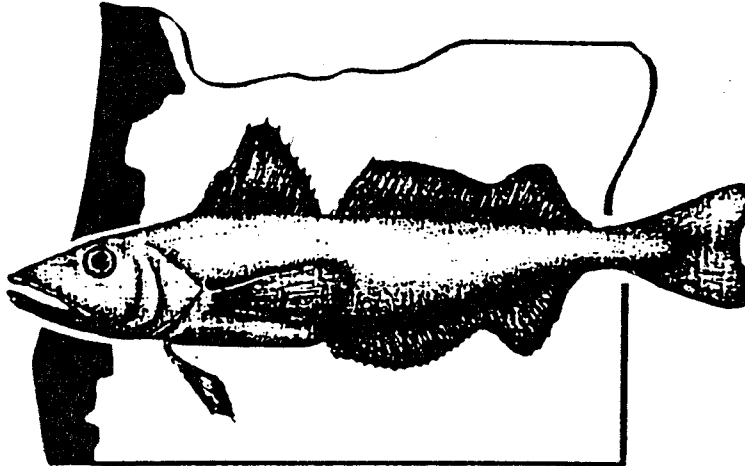
Also, any comments you wish to make regarding future development of this resource from the perspective of the Oregon seafood industry or the federal and state fisheries management agencies will be appreciated, either here or in a separate letter.

Your contribution to this effort is very greatly appreciated. If you would like a summary of these results and also the global whiting report, please print your name and address on the back of the return envelope (NOT on this questionnaire). We will see that you get them.

APPENDIX C

Surimi National Market Survey

POTENTIALS FOR PACIFIC WHITING



The state of Oregon is studying the potentials of increasing production of Pacific whiting in all possible product forms including surimi. The following questions pertain to issues which were discussed during my recent interview with your firm. Please answer all questions. You may be assured of complete confidentiality. Responses from over fifteen surimi/analog firms will be compiled and averaged to determine industry opinions and market behavior. In return for your cooperation your firm will receive a complete report of our findings. If you wish to comment on any question or qualify your answers, please feel free to use the space in the margins. Your comments will be read and taken into account. Please return the questionnaire in the self addressed envelope.

Thank you for your help.

Dr. Gilbert Sylvia
Oregon State University
Coastal Oregon Marine Branch Experiment Station
Hatfield Marine Science Center
Newport, Oregon 97365

SURIMI PART I.

1. Please indicate the volume that most closely represents the total annual volume of raw surimi which you produce, handle, or purchase. (Circle one response).

- | | | |
|-----------------------|----------------------------------|-----------------------|
| a) 50,000 lbs./yr. | b) 100,000 lbs./yr. | c) 200,000 lbs./yr. |
| d) 500,000 lbs./yr. | e) 1 million lbs./yr. | f) 2 million lbs./yr. |
| g) 5 million lbs./yr. | h) more than 10 million lbs./yr. | |

2. Select the industry sector from which you purchase the largest share of your raw surimi. (Circle one response)

- | | | |
|------------------------------|--------------|-------------|
| a) None-processed internally | b) Processor | c) Broker |
| d) Wholesaler/Distributor | e) Importer | f) Exporter |

3. Select the industry sector to which you currently sell the majority of your analog surimi based products. (Circle one response)

- | | | |
|-------------------------------------|---------------------------|------------------|
| a) Broker | b) Wholesaler/Distributor | c) Importer |
| d) Exporter | e) Retailer | f) Restaurant |
| g) Food service | h) Military | i) Institutional |
| j) Other _____
(please describe) | | |

SURIMI PART II

1. LISTED BELOW ARE SETS OF MARKET DESTINATIONS AND PRODUCT FORMS FOR SURIMI BASED PRODUCTS. USING A SCORING SYSTEM WHERE "1" INDICATES LARGEST QUANTITY, "2" INDICATES SECOND LARGEST QUANTITY, "3" INDICATES THIRD LARGEST QUANTITY, ETC., PLEASE RANK THE QUANTITIES OF RAW SURIMI WHICH YOU PRODUCE OR HANDLE ACCORDING TO THEIR MARKET DESTINATION AND FINAL PRODUCT FORM. (Place one number from "1" up to a possible "9" in each space; or if the market or product form does not apply to your firm then place the letter "N/A" ("Not Applicable") in the appropriate spaces).

Japan/Kamaboko.....	_____	U.S./Crab analogue.....	_____
Japan/Chikuwa.....	_____	U.S./Other shellfish analogue.....	_____
Japan/Satsumaage.....	_____	U.S./Other surimi based products..	_____
Japan/Fish ham and sausage...	_____	Other market/surimi products.....	_____
Korea/All surimi products....	_____		

2. LISTED BELOW IS A SET OF ATTRIBUTES THAT MAY BE OF CONCERN IN YOUR DECISION TO PURCHASE OR PRODUCE RAW SURIMI PRODUCTS. PLEASE INDICATE HOW IMPORTANT EACH ATTRIBUTE IS FOR THAT MARKET/PRODUCT FORM WHICH RECEIVED YOUR HIGHEST RANKING IN QUESTION 1 (THAT IS, THE MARKET/PRODUCT FORM WHICH RECEIVED A RANK OF "1"). CIRCLE ONE SCORE FOR EACH ATTRIBUTE. IF THE CATEGORY IS UNKNOWN OR DOES NOT APPLY, BE SURE TO CIRCLE "N/A" ("NOT APPLICABLE").

		<div> <div>NOT</div> <div>IMPORTANT</div> <div>MOST</div> </div>										
<u>IMPORTANT</u>												
I.	Water holding capacity	N/A	0	1	2	3	4	5	6	7	8	9
10												
II.	Gel strength	N/A	0	1	2	3	4	5	6	7	8	9
10												
III.	Moisture content	N/A	0	1	2	3	4	5	6	7	8	9
10												
IV.	Protein content	N/A	0	1	2	3	4	5	6	7	8	9
10												
V.	Color	N/A	0	1	2	3	4	5	6	7	8	9
10												
VI.	Flavor	N/A	0	1	2	3	4	5	6	7	8	9
10												
VII.	Contamination	N/A	0	1	2	3	4	5	6	7	8	9
10												
VIII.	Source	N/A	0	1	2	3	4	5	6	7	8	9
10	(pollock, whiting, etc.)											
IX.	Price	N/A	0	1	2	3	4	5	6	7	8	9
10												
X.	Supply availability	N/A	0	1	2	3	4	5	6	7	8	9
10	(months/year)											
XI.	Delivery volume	N/A	0	1	2	3	4	5	6	7	8	9
10	(lbs./month)											
XII.	Product uniformity	N/A	0	1	2	3	4	5	6	7	8	9
10	(uniformity of quality)											

3. LISTED BELOW ARE THE ATTRIBUTE CATEGORIES IN THE PREVIOUS QUESTION BROKEN DOWN INTO SPECIFIC CHARACTERISTICS. PLEASE INDICATE HOW DESIRABLE EACH CHARACTERISTIC IS IN YOUR DECISION TO PURCHASE OR PRODUCE RAW SURIMI PRODUCTS FOR THAT MARKET/PRODUCT FORM WHICH RECEIVED YOUR HIGHEST RANKING IN QUESTION 1. CIRCLE ONE SCORE FOR EACH CHARACTERISTIC. IF THE CATEGORY IS UNKNOWN OR DOES NOT APPLY, BE SURE TO CIRCLE "N/A" (NOT APPLICABLE).

HIGHLY DESIRABLE			HIGHLY UNDESIRABLE										INDIFFERENT			
I. WATER HOLDING CAPACITY																
5	a. High capacity	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	b. Medium capacity	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	c. Low capacity	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
II. GEL STRENGTH (no starch) (evaluated by rheometer)																
5	a. 1200 g/cm	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	b. 1000 g/cm	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	c. 800 g/cm	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	d. 600 g/cm	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	e. 400 g/cm	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
III. MOISTURE CONTENT (with cryoprotectants)																
5	a. 74 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	b. 75 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	c. 76 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				
5	d. 77 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4				

HIGHLY

HIGHLY

UNDESIRABLEINDIFFERENTDESIRABLE

IV. PROTEIN CONTENT

5	a. 13 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. 14 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. 15 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	d. 16 percent	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

V. COLOR

5	a. Very white (L value above 80)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. Slightly off white (L value 70-80)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. Light gray (L value 60-70)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

VI. FISH FLAVOR

5	a. None	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. Slight	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. Moderate	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	d. Strong	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

VII. OTHER FLAVORS

5	a. None	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. Slight	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. Moderate	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	d. Strong	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

HIGHLY		HIGHLY											
<u>DESIRABLE</u>		<u>UNDESIRABLE</u>						<u>INDIFFERENT</u>					
VIII. CONTAMINATION													
(Particles per 10 grams)													
5	a. No contaminants (Grade 10)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	b. 1-4 contaminants (Grade 8-9)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	c. 5-10 contaminants (Grade 6-7)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	d. 10-20 contaminants (Grade 4-5)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	e. 20-30 contaminants (Grade 2-3)	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
IX. SOURCE													
5	a. Alaskan Pollock	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	b. Pacific Whiting	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	c. Arrowtooth Flounder	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
X. PRICE													
5	a. \$0.65 / pound	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	b. \$0.75 / pound	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	c. \$0.85 / pound	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	d. \$0.95 / pound	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	e. \$1.05 / pound	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	
5	f. \$1.15 / pound	N/A	-5	-4	-3	-2	-1	0	1	2	3	4	

HIGHLY

HIGHLY

DESIRABLE

UNDESIRABLE

INDIFFERENT

XI. SUPPLY AVAILABILITY

5	a. 3 months / year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. 6 months / year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. 9 months / year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	d. 12 months / year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

XII. DELIVERY VOLUME

5	a. 250,000 pounds/year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. 500,000 pounds/year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. 1,000,000 pounds/year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	d. 2,000,000 pounds/year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	e. > 5,000,000 pounds/year	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

XIII. PRODUCT UNIFORMITY

5	a. More than 99% uniform	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	b. 95% uniform	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	c. 90% uniform	N/A	-5	-4	-3	-2	-1	0	1	2	3	4
5	d. Less than 85% uniform	N/A	-5	-4	-3	-2	-1	0	1	2	3	4

4. BELOW IS A LIST OF THE ATTRIBUTES FROM QUESTION THREE ABOVE. PLEASE INDICATE WHICH CHARACTERISTIC OF EACH ATTRIBUTE BEST DESCRIBES THE THREE HIGHEST GRADES OF SURIMI WHICH YOU PRODUCE, HANDLE, OR RECEIVE TODAY. (Place the appropriate letter from question 3 in each space provided; for example, if the typical gel strength for the highest grade surimi you use is 1200 g/cm then you would place the letter "a" under the column titled "Highest Grade Surimi", if the typical gel strength for second highest grade surimi is 800 g/cm then you would place the letter "c" under the heading "Second Highest Grade Surimi", etc. You may use the same letter more than once for any particular attribute for those characteristics which do not vary among your three highest surimi grades.

If a particular attribute is unknown or not applicable place "N/A" in the appropriate blank. In addition, if you produce, handle, or use only one or two grades leave the spaces in the second and/or third grade columns empty.

Grade	Highest Grade	Second Highest Grade	Third Highest
	<u>Surimi</u>	<u>Surimi</u>	<u>Surimi</u>
I. Water holding capacity..	_____	_____	_____
II. Gel Strength.....	_____	_____	_____
III. Moisture Content.....	_____	_____	_____
IV. Protein Content.....	_____	_____	_____
V. Color.....	_____	_____	_____
VI. Flavor.....	_____	_____	_____
VII. Contamination.....	_____	_____	_____
VIII. Source.....	_____	_____	_____
IX. Price.....	_____	_____	_____
X. Supply availability.....	_____	_____	_____
XI. Delivery volume.....	_____	_____	_____
XII. Product uniformity.....	_____	_____	_____

SURIMI PART III.

1. Listed on the next four pages is a set of eight raw surimi products each representing a different combination of five product characteristics.

All eight products share the following characteristics:

Protein content: 14%
Flavor: None
Contamination: 1-4 contaminants
Source: Whiting
Supply Availability: 12 months per year

Each of the eight products, however, varies in the following characteristics:

Gel Strength
Moisture Content
Color
Price
Product Uniformity

Please select a single score for each of the following eight products using a scale ranging from -10 to +10 where:

the extreme score -10 is a product that would yield a relatively large loss;
the extreme score +10 is a product that would yield a relatively large profit;
the mid point 0 is the point at which no profit or loss would be made.

Important: Do not give any two products the same score. Circle only one score for each product.

You may wish to review all eight products before beginning your scoring.

<u>Gel strength:</u>	600g/cm
<u>Moisture content:</u>	78%
<u>Color:</u>	Very white (L value > 80)
<u>Price:</u>	\$0.65
<u>Product Uniformity:</u>	99% uniform

VERY <u>UNPROFITABLE</u>										<u>Break-even</u>										VERY <u>PROFITABLE</u>									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

<u>Gel strength:</u>	1000g/cm
<u>Moisture content:</u>	76%
<u>Color:</u>	Off white (L value 70-80)
<u>Price:</u>	\$0.65
<u>Product Uniformity:</u>	90% uniform

VERY UNPROFITABLE										Break-even										VERY PROFITABLE									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

PRODUCT 3

<u>Gel strength:</u>	600g/cm .
<u>Moisture content:</u>	76%
<u>Color:</u>	Very white (L value >80)
<u>Price:</u>	\$0.80
<u>Product Uniformity:</u>	90% uniform

VERY UNPROFITABLE										Break-even										VERY PROFITABLE									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

PRODUCT 4

<u>Gel strength:</u>	1000g/cm
<u>Moisture content:</u>	78%
<u>Color:</u>	Off white (L value 70-80)
<u>Price:</u>	\$0.80
<u>Product Uniformity:</u>	99% uniform

VERY UNPROFITABLE										Break-even										VERY PROFITABLE									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

PRODUCT 5

<u>Gel strength:</u>	600g/cm
<u>Moisture content:</u>	76%
<u>Color:</u>	Off white (L value 70-80)
<u>Price:</u>	\$0.95
<u>Product Uniformity:</u>	99% uniform

VERY UNPROFITABLE										Break-even										VERY PROFITABLE									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

PRODUCT 6

<u>Gel strength:</u>	1000g/cm
<u>Moisture content:</u>	78%
<u>Color:</u>	Very white (L value >80)
<u>Price:</u>	\$0.95
<u>Product Uniformity:</u>	90% uniform

VERY UNPROFITABLE										Break-even										VERY PROFITABLE									
-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10									

PRODUCT 7

<u>Gel strength:</u>	600g/cm
<u>Moisture content:</u>	78%
<u>Color:</u>	Off white (L value 70-80)
<u>Price:</u>	\$0.80
<u>Product Uniformity:</u>	90% uniform

VERY UNPROFITABLE		<u>Break-even</u>		VERY PROFITABLE
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10				

PRODUCT 8

<u>Gel strength:</u>	1000g/cm
<u>Moisture content:</u>	76%
<u>Color:</u>	white (L value >80)
<u>Price:</u>	\$0.80
<u>Product Uniformity:</u>	99% uniform

VERY UNPROFITABLE		<u>Break-even</u>		VERY PROFITABLE
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10				

SURIMI PART IV.

1. For each of the two statements below, please select that response which you believe will be true of the overall U.S. seafood market over the next two years. (Circle one response per statement)

a) Prices for seafood will change by:

more than -30% -20% -10% -5% 0% +5% +10% +20% more than +30%

b) U.S. seafood supplies will change by:

more than -30% -20% -10% -5% 0% +5% +10% +20% more than +30%

2. For each of the two statements below, please select that response which you believe will be true of the U.S. raw surimi market over the next two years. (Circle one response per statement)

a) Prices for raw surimi products will change by:

more than -30% -20% -10% -5% 0% +5% +10% +20% more than +30%

b) Raw surimi supplies will change by:

more than -30% -20% -10% -5% 0% +5% +10% +20% more than +30%

3. For each of the two statements below, please select that response which you believe will be true of the Asian market for raw surimi over the next five years. (Circle one response per statement)

a) Prices for raw surimi products will change by:

more than -30% -20% -10% -5% 0% +5% +10% +20% more than +30%

b) Raw surimi supplies will increase/decrease by:

less than -30% -20% -10% -5% 0% +5% +10% +20% more than +30%

Given the three statements listed below, select the one statement that most closely represents your opinion on the European market potential for surimi based products. (Circle one response)

a) Excellent market potential for many products.

b) Some market potential for some products.

c) Little market potential for any product.

APPENDIX D

Product Selection Model

\$ TITLE WPO6

- * Whiting product optimization model
- * H&G and Fillets
- * Not Dynamic
- * Includes impacts on profits for H&G and fillets at moderate level of attributes (from WPO1 model)
- * Maximizes profits for fillets and H&G and selects proportions and prices subject to scoring constraint
- * One pound whole product

SCALARS

* Harvests

YHARVESTS IN POUNDS/2000000/

* Costs Fillets

EXPFEVessel PRICE FILLETS/.07/
FYLDFILLET YIELD/.25/
FYNC FILLET COSTS NET YIELD/.28/
FLCFILLET LABOR COSTS/.18/
FOVCFILLET OTHER VARIABLE COSTS/.16/

* Costs H&G

EXPHEVessel PRICE H&G/.07/
HYLDH&G YIELD/.60/
HYNCH&G COSTS NET YIELD/.10/
HLCH&G LABOR COSTS/.20/
HMCH&G DIREECT MATERIALS COSTS/.01/
HMOCH&G MANUFACTRING OVERHD COSTS /.01/
HFTXCH&G FISH TAXES/.00/
HBDFBAD DEBT FACTOR/.005/
HBDEBAD DEBT EXPENSE/.0017/

* Proportionality Index

PROPIPROPORTIONALITY INDEX/1/

Demand Factors Fillets-Derived from survey

FPPRICE FILLETS/.80/
HPPRICE H&G/.42/

FILLET CONJOINT FORM COEF /.93/
FILLET CONJOINT PRICE COEF/-32.46/
FILLET CONJOINT MKT SUP COEF/2.05/
FILLET CONJOINT MKT BUY COEF /-2.53/
FILLET CONJOINT CONSTANT COEF /28.59/
FILLET CONJOINT SIZE COEF/- .107/
FILLET CONJOINT SEASON COEF/.131/

FILLET CONJOINT FORM DUMMY/1/
FILLET CONJOINT MKT DUMMY/1/
FILLET CONJOINT SECTOR DUMMY/1/
FILLET SIZE LEVEL 1/3/
FILLET SIZE LEVEL 2/5/
FILLET SIZE LEVEL 3/7/
FILLET SIZE LEVEL 4/9/

FILLET EXPLIC CONJOINT WT/.073/
FILLET EXPLIC CONJOINT RATIO/.24/
FILLET EXPLIC CNJNT RAT UNFRM/.12/
FILLET EXPLIC SIZE WT/8/
FILLET EXPLIC SIZE INT /-1.8/
FILLET EXPLIC SIZE COEF/.6/
FILLET EXPLIC SIZE SQ COEF/.043/

FILLET EXPLIC SEASON WT/7.9/
FILLET EXPPLIC SEASON INT/-3.43/
FILLET EXPLICSEASON COEF/.71/
FILLET SEASONS IN MONTHS/6/
FILLET EXPLIC SHEFLIFE WT/7.20/
FILLET EXPLIC SHEFLIFE INT/-3.21/
FILLET EXPLIC SHEFLIFE COEF/.87/
FILLET SHEFLIFE IN MONTHS/6/
FILLET SHEFLIFE LEVEL 1/-2.2/
FILLET SHEFLIFE LEVEL 2/2.0/
FILLET SHEFLIFE LEVEL 3/4.6/

FILLET EXPLIC COLOR WT/7.30/
FILLET EXPLIC COLOR LEVEL 1/4.7/
FILLET EXPLIC COLOR LEVEL 2/1.3/
FILLET EXPLIC COLOR LEVEL 3/-2.6/
FILLET EXPLIC TEXTURE WT/8.5/
FILLET EXPLIC TEXTURE LEVEL 1/4.7/
FILLET EXPLIC TEXTURE LEVEL 2/2.0/
FILLET EXPLIC TEXTURE LEVEL 3/-4.2/
FILLET EXPLIC PROD UNIFORM WT/8.3/
FILLET EXPLIC UNIFORM LEVEL 1/4.7/
FILLET EXPLIC UNIFORM LEVEL 2/2.4/
FILLET EXPLIC UNIFORM LEVEL 3/-0.2/
FILLET EXPLIC PACKGE SIZE WT/7.4/
FILLET EXPLIC PKG SIZ LEVEL 1/-0.8/
FILLET EXPLIC PKG SIZ LEVEL 2/.3/
FILLET EXPLIC PKG SIZ LEVEL 4/2.8/
FILLET EXPLIC PAYMENT TERM WT/5.4/
FILLET EXPLIC PAYMENT LEVEL 1/3.4/

* Demand Factors H&G-Derived from survey

H&G CONJOINT PRICE COEF/-38.20/
H&G CONJOINT MKT SUP COEF/-.645/
H&G CONJOINT MKT BUY COEF /-3.09/
H&G CONJOINT CONSTANT COEF /18.92/
H&G CONJOINT SIZE COEF/-.125/
H&G CONJOINT SEASON COEF /.161/
H&G CONJOINT MKT DUMMY/1/
H&G CONJOINT SECTOR DUMMY/1/

H&G SIZE LEVEL 1 /6/
H&G SIZE LEVEL 2/10/
H&G SIZE LEVEL 3/14/
H&G SIZE LEVEL 4/18/

H&G EXPLIC CONJOINT WT/.11/
H&G EXPLIC CONJOINT RATIO/.19/
H&G EXPLIC CNJNT RAT UNFRM/.11/

H&G EXPLIC SIZE WT/7.2/
H&G EXPLIC SIZE LEVEL 1/0.2/
H&G EXPLIC SIZE LEVEL 2/1.8/
H&G EXPLIC SIZE LEVEL 3/1.2/
H&G EXPLIC SIZE LEVEL 4/- .50/

H&G EXPLIC SEASON WT/4.1/
H&G EXPLIC SEASON INT/-3.77/
H&G EXPLIC SEASON COEF/.76/
H&G SEASONS MONTHS/6/

H&G EXPLIC MKT SUPPORT WT/7.6/
H&G EXPLIC MKT SPRT LEVEL 1/2.0/
H&G EXPLIC MKT SPRT LEVEL 2/1.9/
H&G EXPLIC SHEFLIFE WT/6.70/
H&G EXPLIC SHEFLIFE INT/-2.95/
H&G EXPLIC SHEFLIFE COEF/0.69/
H&G SHEFLIFE IN MONTHS/6/
H&G SHEFLIFE LEVEL 1/-1.6/
H&G SHEFLIFE LEVEL 2/2.4/
H&G SHEFLIFE LEVEL 3/4.8/

H&G EXPLIC COLOR WT/6.20/
H&G EXPLIC COLOR LEVEL 1/4.8/
H&G EXPLIC COLOR LEVEL 2/2.2/
H&G EXPLIC COLOR LEVEL 3/-1.2/

H&G EXPLIC TEXTURE WT/8.1/
H&G EXPLIC TEXTURE LEVEL 1/4.6/
H&G EXPLIC TEXTURE LEVEL 2/2.0/
H&G EXPLIC TEXTURE LEVEL 3/-4.4/

H&G EXPLIC PROD UNIFORM WT/5.0/
H&G EXPLIC UNIFORM LEVEL 1/4.6/
H&G EXPLIC UNIFORM LEVEL 2/3.1/
H&G EXPLIC UNIFORM LEVEL 3/1.6/

H&G EXPLIC PACKAGE SIZE WT/5.1/
H&G EXPLIC PKG SIZ LEVEL 1/.4/
H&G EXPLIC PKG SIZ LEVEL 2/4.0/
H&G EXPLIC PKG SIZ LEVEL 4/- .4/
H&G EXPLIC PAYMENT TERM WT/7.5/
H&G EXPLIC PAYMENT LEVEL 1/2.3/

VARIABLES

PRODUCTION OF FILLETS

COSTS OF FILLETS
GROSS BENEFITS FILLETS SECTOR 1
GROSS BENEFITS FILLETS SECTOR 2
PROFIT FILLETS SECTOR 1
PROFIT FILLETS SECTOR 2

PRODUCTION OF H&G
COSTS OF H&G
GROSS BENEFITS H&G SECTOR 1
GROSS BENEFITS H&G SECTOR 2
PROFIT H&G SECTOR 1
PROFIT H&G SECTOR 2

PROFIT FILLET AND H&G SECTOR 1
PROFIT FILLET AND H&G SECTOR 2

PROPORTION RULE ALL SECTORS
PROPORTION OF FILLETS
PROPORTION OF H&G
PROPORTION RULE CONSTRAINED TO 1

PRICE FILLET VARIABLE SECTOR 1
PRICE FILLET VARIABLE SECTOR 2
PRICE H&G VARIABLE SECTOR 1
PRICE H&G VARIABLE SECTOR 2
PRICE FOR H&G SECTOR ONE
PRICE FOR H&G SECTOR TWO
PRICE FOR FILLETS SECTOR ONE
PRICE FOR FILLETS SECTOR TWO
SCORE FOR FILLETS SECTOR ONE
SCORE FOR FILLETS SECTOR TWO
SCORE FOR H&G SECTOR ONE
SCORE FOR H&G SECTOR TWO
TOTAL SCORE FILLETS AND H&G SECTOR ONE
TOTAL SCORE ALL SECTORS
SCORE FILLET FORM CONTRIBUTION CONJOINT
SCORE FILLET SIZE CONTRIBUTION CONJOINT
SCORE FILLET SIZE CONTRIBUTION EXPLIC
SCORE FILLET SEASONCONTRIBUTION CONJOINT
SCORE FILLET SEASON CONTRIBUTION EXPLIC
SCORE FILLET PRICE CONTRIBUTION CONJOINT 1
SCORE FILLET PRICE CONTRIBUTION CONJOINT 2
SCORE FILLET MARKETING CONTRIBUTION CONJOINT
SCORE FILLET SECTOR CONTRIBUTION CONJOINT
SCORE FILLET INTERCEPT CONTRIBUTION CONJOINT
SCORE FILLET SHEFLIFE CONTRIBUTION EXPLIC
SCORE FILLET COLOR CONTRIBUTION EXPLIC
SCORE FILLET TEXTURE CONTIBUTION EXPLIC
SCORE FILLET UNIFORMITY CONTRIBUTION EXPLIC
SCORE FILLET PACKAGE CONTRIBUTION EXPLIC

SCORE H&G SIZE CONTRIBUTION CONJOINT
SCORE H&G SIZE CONTRIBUTION EXPLIC
SCORE H&G SEASON CONTRIBUTION CONJOINT
SCORE H&G SEASON CONTRIBUTION EXPLIC
SCORE H&G PRICE CONTRIBUTION CONJOINT 1
SCORE H&G PRICE CONTRIBUTION CONJOINT 2
SCORE H&G MARKETING CONTRIBUTION CONJOINT

SCORE H&G MARKETING CONTRIBUTION EXPLIC
 SCORE H&G SECTOR CONTRIBUTION CONJOINT
 SCORE H&G INTERCEPT CONTRIBUTION CONJOINT
 SCORE H&G SHEFLIFE CONTRIBUTION EXPLIC
 SCORE H&G COLOR CONTRIBUTION EXPLIC
 SCORE H&G TEXTURE CONTIBUTION EXPLIC
 SCORE H&G UNIFORMITY CONTRIBUTION EXPLIC
 SCORE H&G PACKAGE CONTRIBUTION EXPLIC
 SCORE H&G TERMS EXPLIC;

EQUATIONS

PRODUCTION OF FILLETS
 COSTS OF FILLETS
 GROSS BENEFITS FILLETS SECTOR 1
 GROSS BENEFITS FILLETS SECTOR 2
 PROFIT FILLETS SECTOR 1
 PROFIT FILLETS SECTOR 2
 PROPORTION OF H&G IN SECTOR 1
 PROPORTION OF H&G IN SECTOR 2
 PRODUCTION OF H&G
 COSTS FOR H&G
 PROFIT FOR H&G SECTOR 1
 PROFIT FOR H&G SECTOR 2
 GROSS BENEFITS H&G SECTOR 1
 GROSS BENEFITS H&G SECTOR 2
 PROFIT FILLET AND H&G SECTOR 1
 PROFIT FILLET AND H&G SECTOR 2

SUM OF PROPORTIONS ALL SECTORS
 PROPORTION CONSTRAINT RULE ALL SECTORS

SCORE FOR FILLETS SECTOR ONE
 SCORE FOR FILLETS SECTOR TWO
 SCORE FOR H&G SECTOR ONE
 SCORE FOR H&G SECTOR TWO
 TOTAL SCORE FILLETS AND H&G SECTOR ONE
 TOTAL SCORE FILLETS AND H&G SECTOR TWO
 TOTAL SCORE COMBINED SECTORS

SCORE FILLET FORM CONTRIBUTION CONJOINT
 SCORE FILLET SIZE CONTRIBUTION CONJOINT
 SCORE FILLET SIZE CONTRIBUTION EXPLIC
 SCORE FILLET SEASONCONTRIBUTION CONJOINT
 SCORE FILLET SEASON CONTRIBUTION EXPLIC
 SCORE FILLET PRICE CONTRIBUTION CONJOINT 1
 SCORE FILLET PRICE CONTRIBUTION CONJOINT 2
 SCORE FILLET MARKETING CONTRIBUTION
 SCORE FILLET SECTOR CONTRIBUTION CONJOINT
 SCORE FILLET SHEFLIFE CONTRIBUTION EXPLIC
 SCORE FILLET COLOR CONTRIBUTION EXPLIC
 SCORE FILLET TEXTURE CONTIBUTION EXPLIC
 SCORE FILLET UNIFORMITY CONTRIBUTION EXPLIC
 SCORE FILLET PACKAGE CONTRIBUTION EXPLIC
 SCORE FILLET TERMS EXPLIC
 SCORE H&G SIZE CONTRIBUTION CONJOINT
 SCORE H&G SIZE CONTRIBUTION EXPLIC
 SCORE H&G SEASON CONTRIBUTION CONJOINT
 SCORE H&G SEASON CONTRIBUTION EXPLIC

SCORE H&G PRICE CONTRIBUTION CONJOINT 1
 SCORE H&G PRICE CONTRIBUTION CONJOINT 2
 SCORE H&G MARKETING CONTRIBUTION CONJOINT
 SCORE H&G MARKETING CONTRIBUTION EXPLIC
 SCORE H&G SECTOR CONTRIBUTION CONJOINT
 SCORE H&G SHELF LIFE CONTRIBUTION EXPLIC
 SCORE H&G COLOR CONTRIBUTION EXPLIC
 SCORE H&G TEXTURE CONTRIBUTION EXPLIC
 SCORE H&G UNIFORMITY CONTRIBUTION EXPLIC
 SCORE H&G PACKAGE CONTRIBUTION EXPLIC
 SCORE H&G TERMS EXPLIC
 PRICE FOR H&G SECTOR ONE
 PRICE FOR H&G SECTOR TWO
 PRICE FOR FILLETS SECTOR ONE
 PRICE FOR FILLETS SECTOR TWO;

* Aggregate equations

SSCOREF1..SCOREF1 =E= SFFC + SFZE + SFSE + SFPC1 +
 SFMC + SFLE + SFCE + SFTE + SFBC +
 SFUE + SFKE + SFAE;

SSCOREF2..SCOREF2 =E= SFFC + SFZE + SFSE + SFPC2 +
 SFMC + SFLE + SFCE + SFTE +
 SFUE + SFKE + SFAE;

SSCOREH1..SCOREH1 =E= SHZE + SHSE + SHPC1 +
 SHLE + SHCE + SHTE + SHBC +
 SHUE + SHKE + SHAE;

SSCOREH2..SCOREH2 =E= SHZE + SHSE + SHPC2 +
 SHLE + SHCE + SHTE +
 SHUE + SHKE + SHAE;

TTSCORE1..TSCORE1 =E= SCOREF1 + SCOREH1;
 TTSCORE2..TSCORE2 =E= SCOREF2 + SCOREH2;
 TTSCORE3..TSCORE3 =E= TSCORE1 + TSCORE2;

* Fillet equations

SSFFC.. SFFC =E= FCFB * FCFD;
 SSFZC.. SFZC =E= FCZB * FZL1;
 SSFZE.. SFZE =E= FECB * FEZW * (FEZI + (FEZB * FZL1)
 + FEZZB * (FZL1 ** 2));

SSFSC.. SFSC =E= FCSB * FSM;
 SSFSE.. SFSE =E= FECB * FESW * (FESI + (FESB * FSM));

SSFPC1.. SFPC1 =E= FCPB * PFV1;
 SSFPC2.. SFPC2 =E= FCPB * PFV2;

SSFMC.. SFMC =E= FCMB * FCMD;

SSFBC.. SFBC =E= FCBB * FCBD;

SSFLE.. SFLE =E= FECR * FELW * FELL2;

SSFCE.. SFCE =E= FECR*FECW*FECL2;
 SSFTE.. SFTE =E= FECR*FETW*FETL2;
 SSFUE.. SFUE =E= FECRU*FEUW*FEUL2;
 SSFKE.. SFKE =E= FECR*FEKW*FEKL3;
 SSFAE.. SFAE =E= FECR*FEAW*FEAL1;

*Headed and gutted equations

SSHZC.. SHZC =E= HCZB*HZL2;
 SSHZE.. SHZE =E= HECB*HEZW*HEZL2;
 SSHSC.. SHSC =E= HCSB*HSM;
 SSHSE.. SHSE =E= HECB*HESW*(HESI+(HESB*HSM));
 SSHPC1.. SHPC1 =E= HCPB*PHV1;
 SSHPC2.. SHPC2 =E= HCPB*PHV2;
 SSHMC.. SHMC =E= HCMB*HCMD;
 SSHME.. SHME =E= HECB*HEMW*HEML2;
 SSHBC.. SHBC =E= HCB*HCB;
 SSHLE.. SHLE =E= HECR*HELW*HELL2;
 SSHCE.. SHCE =E= HECR*HECW*HECL2;
 SSHTe.. SHTE =E= HECR*HETW*HETL2;
 SSHUE.. SHUE =E= HECRU*HEUW*HEUL2;
 SSHKE.. SHKE =E= HECR*HEKW*HEKL2;
 SSHAE.. SHAE =E= HECR*HEAW*HEAL1;

* Price equations

PPRF1.. PRF1 =E= (SCOREF1 - (SFFC + SFZE + SFSE + SFMC + SFLE + SFCE + SFTE + SFBC + SFUE + SFKE + SFAE))/FCPB;
 PPRF2.. PRF2 =E= (SCOREF2 - (SFFC + SFZE + SFSE + SFMC + SFLE + SFCE + SFTE + SFUE + SFKE + SFAE))/FCPB;
 PPRH1.. PRH1 =E= (SCOREH1 - (SHZE + SHSE + SHLE + SHCE + SHTE + SHBC + SHUE + SHKE + SHAE))/HCPB;
 PPRH2.. PRH2 =E= (SCOREH2 - (SHZE + SHSE + SHLE + SHCE + SHTE + SHUE + SHKE + SHAE))/HCPB;

* Production and Cost Equations

PPRODH... $PROD_H = E = Y * HYLD * PROPH;$

CCH... $CH = E = PROD_H * (HYNC + HLC + HMC + HMOC + HFTXC + HBDF + HBDE);$

PPRODF... $PRODF = E = Y * FYLD * PROPF;$

CCF... $CF = E = PRODF * (FLC + FYNC + FOVC);$

* Proportion constraints

PPROP... $PROP = E = PROPF + PROPH;$

PPROPR... $PROP = E = PROPI;$

* Gross Benefit Equations

GGBENH1... $GBENH_1 = E = PRH_1 * PROD_H;$

GGBENH2... $GBENH_2 = E = PRH_2 * PROD_H;$

GGBENF1... $GBENF_1 = E = PRF_1 * PRODF;$

GGBENF2... $GBENF_2 = E = PRF_2 * PRODF;$

* Profit Equations

PPROFH1... $PROFH_1 = E = GBENH_1 - CH;$

PPROFH2... $PROFH_2 = E = GBENH_2 - CH;$

PPROFF1... $PROFF_1 = E = GBENF_1 - CF;$

PPROFF2... $PROFF_2 = E = GBENF_2 - CF;$

PPRFFH1... $PRFFH_1 = E = PROFF_1 + PROFH_1;$

PPRFFH2... $PRFFH_2 = E = PROFF_2 + PROFH_2;$

MODEL WPO6 /SSCOREF1, SSCOREH1, SSCOREF2, SSCOREH2, TTSCORE1, TTSCORE2,
TTSCORE3, SSFPC, SSFZC, SSFZE, SSFSC, SSFSE, SSFPC1, SSFPC2, SSFMC,
SSFBC, SSFLE, SSFCE, SSFTE, SSFUE, SSFKE, SSFAE, SSHZC, SSHZE, SSHSC,
SSHSE, SSHPC1, SSHPC2, SSHMC, SSHME, SSHBC, SSHLE, SSHCE, SSSTE, SSHUE,
SSHKE, SSHAE, PPRF1, PPRF2, PPRH1, PPRH2, PPROD_H, CCH, GGBENH1,
GGBENH2, PPROFH1, PPROFH2, PPRODF, CCF, GGBENF1, GGBENF2, PPROFF1,
PPROFF2, PPRFFH1, PPRFFH2, PPROP, PPROPR/;

SCOREF1.LO = 0;

SCOREF1.UP = 10;

SCOREH1.LO = 0;

SCOREH1.UP = 10;

SCOREF2.LO = 0;

SCOREF2.UP = 10;

SCOREH2.LO = 0;
SCOREH2.UP = 10;
PROPF.LO = 0;
PROPF.UP = 1;
PROPH.LO = 0;
PROPH.UP = 1;

SOLVE WPO6 MAXIMIZING PRFFH1 USING NLP;

APPENDIX E

Respondents to National Market Survey

RESPONDENTS TO HEADED & GUTTED WHITING SURVEY

ACME Smoked Fish Corp. of New York
26-56 Gem St.
Brooklyn, NY 11222
(718) 383-8585
(718) 383-9115

AJC International, Inc.
4518 Roswell Road
Atlanta, GA 30342
(404) 252-9346
Mike Wisniewski, Manager

Ambassador Seafoods, Inc.
520 N.W. 165 Street, Suite 104
Miami, FL 33169
(305) 940-9133
Rick Saperstein, Buyer
Florida fish

American Fish & Seafood
550 Ceres Ave.
Los Angeles, CA 90013
(213) 612-0350
(213) 489-3891
Jim Smith

Andrews, B. H. Company
3443 S. Lawrence Street
Philadelphia, PA 19148
(215) 336-3020
Wayne, Buyer

Bayshore Seafood Brokers, Inc.
22 Fish Pier
Boston, MA 02210
(617) 542-5730
John Monahan, President
Other products: Surimi, trout, chowder

Respondents To Headed & Gutted Whiting Survey
Page Two

Bill Seals & Assoc.

11020 Audelia Rd., Suite C209

Dallas, TX 75243

(214) 503-1090

Bill Seals, President/Buyer

Century Sea Foods, Inc.

#1-3 Seafood Market

Food Distribution Center

Philadelphia, PA 19148

(800) 462-0874

Thomas Dougherty, Buyer

Other products: Crab meat, shrimp, clams, lobster, miscellaneous

Coastal Seafood, Inc.

3411 S. Lawrence Street

Philadelphia, PA 19148

(215) 336-0716

Harry Davis, Treasurer

Cost-Plus Seafood Brokers, Inc.

34-47 S. Lawrence St.

Philadelphia, PA 19148

(215) 336-1700

Mike Butterly, Buyer

Dorchester Bay Trading Corp.

One Popes Island

New Bedford, MA 02740

(508) 999-1338

(508) 994-8791

Ralph Linder Pope

Empire

350 N. Laflin St.

Chicago, IL 60607

(312) 243-1416

Leroy Captain, Sales Manager

Other products: Whiting, catfish, perch

Respondents To Headed & Gutted Whiting Survey
Page Three

Eureka Fisheries, Inc.
Foot of C Street
Fields Landing, CA 95537
(707) 443-1673
(707) 443-7952
Jerry Thomas

Florida Fish Distributors, Inc.
4501 Dignan Street
Jacksonville, FL 32203
(904) 388-0568
Ron Harrison, Vice President
Florida fish

Frohman & Sons, Inc.
1580 NW Hwy. 320
Park Ridge, IL 60068
(312) 635-6520
Arthur Frohman

Galletti Bros. Foods, Inc.
2900 Ayers Ave.
Los Angeles, CA
(800) 843-4729
Samuel Carr
Roughy, shrimp, scallops

Impact Marketing
P.O. Box 82013
Tampa, FL 33682
(813) 968-6331
Richard Hohman, Consultant

Kiawah Seabrook Seafood Co.
9317-C Monroe Rd.
Charlotte, NC 28226
(704) 645-5444
(704) 845-5446
J. Edward Rowell

Respondents To Headed & Gutted Whiting Survey
Page Four

Morley Sales Co., Inc.
309 W. Madison
Chicago, IL 60607
(312) 829-1125
Richard Slavik, President
Other products: Lobster, shrimp, Pacific Ocean perch

National Fish & Seafood
11-15 Parker Street
Gloucester, MA 02930
(508) 283-8907
Richard Pandolfo, Executive Vice President
Other products: Cod, pollock

Northwestern Fish Co.
P.O. Box 95165
Seattle, WA 98145
(206) 783-0062
Mike Barrow, President

Nova Fisheries, Inc.
507 Shilshale Ave. N.W.
Seattle, WA 98107
(206) 781-2100
Robert Simon, Repackager
Other products: Salmon, shrimp, halibut

O'Donnell Usen Fisheries Corp.
ConAgra, Inc.
One Fish Pier West
Boston, MA 02210
(617) 542-2700
Jeff Paine, Buyer
Other products: Cod, pollock, haddock, perch

Ocean Pride Seafoods
702 6th Ave. N.
Seattle, WA 98109
(206) 281-4490
Mark Palmer, General Manager

Respondents To Headed & Gutted Whiting Survey
Page Five

Ocean Pacific Seafoods, Inc.
P.O. Box 259
Burlington, WA 98223
(206) 755-0962
(206) 755-9839
Steve Pringle

R.M. Sloan Co.
732 W. 9th St., Suite 207
San Pedro, CA 90731
(213) 775-7555
Doug Harbison, Buyer
Other products: Salmon, swordfish

Rainbow Seafoods, Inc.
196 Maine Street, Suite B11
Gloucester, MA 01930
(508) 283-5103
(508) 283-3721
George Davidson

Red Chamber Co.
1912 E. Vernon Ave.
Vernon, CA
(213) 234-9000
Tony M. Neves, National Sales Manager
Other products: Shrimp

Russell Foods, Inc.
20760 Coolidge Hwy., Suite 101
Oak Park, MI 48237
(313) 542-6203
(313) 542-6213
Oscar Bank

Samuels & Sons Seafood Co.
3407 S. Lawrence Street, Stall 7
Philadelphia, PA 19148
(215) 336-7810
Joe, Buyer

Respondents To Headed & Gutted Whiting Survey
Page Six

Sandler Foods, Inc.
P.O. Box 396
Norfolk, VA 23501
(804) 464-3559
(804) 464-5155
Sam Sandler

Sea Shore Food Distributors
One Satt Boulevard
Rio Grande, NJ 08242
(609) 886-3100
(609) 886-7262
Henry Satt

Seafood Supply Co.
1500 E. Griffin St.
Dallas, TX 75215
(214) 565-1851
Victor Clark, Vice President

Seaside Fish Co. of Rhode Island, Inc.
9 Warren Ave.
East Providence, RI 02914
(401) 434-3283
Joseph Scavitti

Slade Gorton & Co., Inc.
295 A Street
Boston, MA 02210
(800) 225-1573
Jack Stanton, Head of Buyers
Other products: Squid, scallops, cod fillets

Smith Brothers Fisheries Food Services
P.O. Box 410
Port Washington, WI 53074
(414) 284-5577
(414) 284-5504

Respondents To Headed & Gutted Whiting Survey
Page Seven

Wrangell Fisheries, Inc.
P.O. Box 908
Wrangell, AK 99929-0908
(907) 874-3346
(907) 874-3035
Mike Epstein

RESPONDENTS TO WHITING FILLET SURVEY

ACME Markets

124 N. 15 Street

Philadelphia, PA 19102

(215) 568-3000

(215) 568-0238

Robert Neslund

Atlanta Provision

1400 West Marietta Street

Atlanta, GA 30318

(404) 799-0099

Barry Mitchell, Buyer

Other products: South American fish, green headless shrimp

Atlantic Seacove

402 C Street

Boston, MA 02210

(617) 357-9229

John Wojtoas, Owner/Manager

Bonanza Meat Co.

1300 E. Paisano St.

El Paso, TX 79901

(915) 544-5650

(915) 534-7687

David Ybanez

Chapman International Imports, Inc.

3000 Punder Rd., Suite 301

Northbrook, IL 60062

(312) 564-1201

(312) 564-1571

Todd Chapman

Cherokee Trading Co., Inc.

P.O. Box 1508

951 Peek Street

Conyers, GA 30207

(404) 922-9600

Jay Levy, Fish Buyer

Respondents To Whiting Fillet Survey
Page Two

Chicago Fish House
1250 W. Division Ave.
Chicago, IL
Jim Karanikolas, Frozen Food Buyer
Other products: Steakfish, salmon, squid

C.I.T. Corp.
2151 W. Hillsboro Blvd., Suite 307
Deerfield Beach, FL 33441
(305) 427-7047
(305) 481-1927
Edward DeClair

Coldwater Seafood Corporation
133 Rowayton Ave.
Rowaytonh, CT 06853
(203) 852-1600
(203) 866-4871
M. Gustafsson

Constellation Trading Corp.
5915 Ponce De Leon Boulevard, Suite 63
Miami, FL 33146
(305) 284-8210
Mr. Armstrong, President
Other products: Whiting

Crocker & Winsor Seafoods, Inc.
145 Northern Avenue
Boston, MA 02210
(617) 482-6648
John Parker, Buyer/Vice President Sales
Other products: Cod, shrimp, breaded portions

Empire Sea Food Co., Inc.
1116 Second Ave. N.
Birmingham, AL 35203
(205) 252-0344
Joe Madoni

Respondents To Whiting Fillet Survey
Page Three

Euclid Fish Co.
P.O. Box 180
Mentor, OH 44060
(216) 951-6448
(216) 951-1817
Charles Young

Flag Imports, Inc.
B. Kozloff, Inc.
8420 W. Bryn Mawr
Chicago, IL
Mary Russnak, Buyer
Other products: Shrimp, fillets, crustaceans

Garden Isle Seafood
P.O. Box 29388
Honolulu, HI 29388
(808) 833-6645
(808) 833-3634
Robert Fram

Glenn Sales Company
5520 Powers Ferry Road N.W.
Atlanta, GA 30327
(404) 952-9292
Cliff Cohen, Buyer
Other products: Whiting, sea trout

Globe Seafood, Inc.
3267 S. 1900 W.
Provo, UT 84401
(801) 731-5656
Garth Christensen

H & H Seafood Brokerage Corp.
P.O. Box 835872
Richardson, TX 75083
(214) 231-8261
Lou Hart

Respondents To Whiting Fillet Survey
Page Four

Hanna-West, Inc.
3527 Saddleback Lane
Lutz, FL 33549
(813) 968-9111
(813) 962-6721
Sharon Hanna

Holly Seafood Co.
410-14 Towne Ave.
Los Angeles, CA 90013
(213) 625-2513
(213) 620-9653
Carl Merry

Hutzler, C. Brokerage Company
7230 Pella
Houston, TX 77036
(713) 772-9536
(713) 772-3509
Charles Hutzler

Inland Seafood Corp.
1222 Menlo Drive
Atlanta, GA 30318
(404) 350-5850
Bill Demmond, Vice President/General Manager
Other products: Salmon, shrimp

Interstate Seafoods, Inc.
P.O. Box 69
Salem, NH 03079
(603) 893-3368
(603) 893-7757
Michael Kater

Jakes Famous Crawfish & Seafood, Inc.
4910 N. Basin Ave.
Portland, OR 97217
(503) 220-1886
(503) 285-1752
James Barklow

Respondents To Whiting Fillet Survey
Page Five

L.A. Fish & Oyster
2212 Signal Place
San Pedro, CA 90731
(213) 832-4249

Jack, President

Other products: Mackerel, tuna, oyster

Liberty Fish Co.
Food Distribution Center
3101 S. Lawrence Street
Philadelphia, PA 19148-5690
Jonathan Goldstein, President

Other products: Cold and warm lobster tails

M & S Distributing Co.
P.O. Box 2723
Harrisburg, PA 17105
(717) 238-7344
(717) 238-4075
Serell Wagner

Maloney Seafoods
235 Northern Avenue
Boston, MA 02210
Tom Maloney, Buyer/Owner
Other products: Cod, pollock, others

Mariner Sea Products, Ltd.
5 Pirate Lane
Gloucester, MA 01930
(508) 281-8110
Robert Jameson
Other products: Shrimp, swordfish, scallops

Miesel/Sysco Foods
5800 Grant Ave.
Cuyahoga Heights, OH 44105
(216) 641-7011
(216) 641-6168
Ron Scott

Respondents To Whiting Fillet Survey
Page Six

Milden & White, Inc.

1224 N. Ninth Street

Philadelphia, PA 19122

(215) 978-1450

Dick Walker, Treasurer

Other products: Shrimp, lobster tails, groundfish

Monfort/S.I.P.C.O.

P.O. Box G

Greeley, CO 80632

(303) 353-2311

Mike Long

Mrs. Paul's Kitchens, Inc.

5501 Tabor Road

Philadelphia, PA 19120

(215) 535-1151

Alan Samson, Director - Research & Development

Nautilus Trading Co.

2194 Sihnal Place

San Pedro, CA 90731

(213) 831-0682

Vanessa

New Atlantic Corp.

241 Main Street, Suit 510

Hackensack, NJ 07601

(201) 487-7202

(201) 487-7234

Todd Rushing

New Dawn Seafoods, Inc.

159 East Main Street P.O. Box 1308

Gloucester, MA 01930

(508) 281-4864

Tim Kennedy

Other products: Clams, cod, breaded

Respondents To Whiting Fillet Survey
Page Seven

North Hemisphere Trading Co.
5915 Ponce De Leon Blvd., Suite 63
Miami, FL 33146
(305) 284-8210
(305) 663-1358
William Armstrong

Northeast Seafood Sales Co.
166 Maple Street
Brooklyn, NY 11225
(718) 462-0600
(718) 284-9626
Hank Steinman

Pace Marketing, Inc.
9474 NW 48 Street
Sunrise, FL 33351
(305) 741-4361
(305) 741-2901
K. Bond Pace

Pacific Seafood Co.
P.O. Box 97
Clackamas, OR 97015
(503) 657-1101
(503) 655-0737
Mike Schuyler

Pierce, Harrison & Co., Inc.
300 Ludlow Street
Stamford, CT 06902
(800) 243-2030
(203) 964-9523
Harrison Pierce

Rainbow Food Brokers
P.O. Box 757
Pearl City, HI 96782
(808) 487-6455
(808) 487-0888
William Prideaux

Respondents To Whiting Fillet Survey
Page Eight

Renwill Seafoods
P.O. Box 570326
Miami, FL 33157-0326
(305) 253-0392
Gene Willner, Financier
Other products: Shrimp, lobster

Rohr Fish, Inc.
123 Wabash St.
Toledo, OH 43602
(419) 242-1100
Michael Riley

Sandler Foods, Inc.
P.O. Box 396
Norfolk, VA 23501
(804) 464-3559
(804) 464-5155
Sam Sandler

Seafood Resources, Ltd.
99 Humboldt Ave.
Providence, RI 02906
(401) 521-0600
(407) 351-9009
Michael Burke

Sernoff's Seafood
3501 Bethlehem Pike
Souderton, PA 18964
(800) 852-3939
(215) 721-7260
Norman Sernoff

Shore Trading Co., Inc.
145 Norcross Street
Roswell, GA 30075
(404) 998-0566
Ronald Williams, President
Other products: Headed and gutted whiting, shrimp

Respondents To Whiting Fillet Survey
Page Nine

Slade Gorton Co., Inc.
735 W. Lake St.
Chicago, IL 60606
(317) 782-4222
Paul Weber, Seafood Buyer
Other products: Shrimp, ocean perch, flatfish

Southwestern Brokerage, Inc.
4202 Eisenhower Rd.
San Antonio, TX 78218
(512) 655-1008
Orten Wilcoxon

Squeri Foods
P.O. Box 14180
Cincinnati, OH 45250
(513) 381-1106
(513) 381-3958
Steve Bender

Stavis Seafood
7 Channel Street
Boston, MA 02210
(617) 482-6349
Richard Starvis, Buyer
Other products: Shrimp, salmon, lobster

Superior Seafoods
P.O. Box 350
Grand Rapids, MI 49588
(616) 698-7700
(616) 698-6297
Bruce Osterhaven

The Fresh Fish Co..
8501 Page Blvd.
St. Louis, MI 63114
(314) 428-7777
Phil Krupa, Seafood Buyer

Respondents To Whiting Fillet Survey
Page Ten

The Finger Lakes Group
1560 Mount Hope Ave.
Rochester, NY 14620
(716) 461-5150
(716) 461-5513
James Klass

Top Quality Seafood, Inc.
5041 Corporate Woods Dr.
Virginia Beach, VA 23462
(804) 473-8445
(804) 499-7134
Scott Parker

Universal Fish of Boston
10 Tower Office Park, Suite 500
Woburn, MA 01801
(617) 939-1111
Bill Compare, Frozen Seafood Specialist
Other products: Flatfish, groundfish, scallops

V.P. Food Brokers
12605 E. Freeway, Suite 302
Houston, TX 77015
(713) 455-2307
Ed Pavelek, President
Other products: Catfish

Wanchese Fish Co., Inc.
P.O. Box 369
Wanchese, NC 27981
(919) 473-5001
(919) 473-5004
Joseph Daniels

West Winds Seafood Inter., Inc.
1515 Dexter Ave. N., Suite 404
Seattle, WA 98109
(206) 281-9262
Gail Rowland, President
Other products: Cod, pollock, whiting

RESPONDENTS TO SURIMI SURVEY

America Nichirei Foods Corp.
2033 6th Avenue, Suite 727
Seattle, WA 98121
(206) 441-1978
Joseph T. Zalke, Senior Vice President
Crab, scallops

Fishking Processors, Inc.
1324 East 15th Street
Los Angeles, CA 90021
(213) 746-1307
Gary Kawaguchi, Vice President - Production
Crab analog

Icicle Seafoods, Inc.
4019 21st Avenue West
Seattle, WA 98199
(206) 282-0988
Ken Franek, Director of Marketing & Sales
Imitation crab

JSL Foods, Inc.
6623 E. Washington Blvd.
Los Angeles, CA 90040
(213) 727-7100
Frank S. Kawana, President
Surimi analog

Nippon Suisan U.S.A., Inc.
900 Fourth Avenue
Seattle, WA 98164
(206) 624-7720
Yutaka Tabuchi, Sales Manager
Surimi

Nozaki America, Inc.
900 4th Avenue, Suite 1200
Seattle, WA 98164
(206) 625-9488
Kaoru (Kelly) Mita, Manager
Crab analog

Respondents To Surimi Survey
Page Two

Pacific Giant, Inc.

3440 Wilshire Blvd., Suite 1000

Los Angeles, CA 90010

(213) 381-7961

Bradley R. Knipp, Director of U.S. Sales & Marketing

Imitation crab

Peter Pan Seafoods, Inc.

2200 6th Avenue, Suite 1000

Seattle, WA 98121-1820

(206) 728-6000

Steve Chartier, National Sales Manager - Frozen

Imitation crab

SeaFest/JAC Creative Foods

3050 East 11th Street

Los Angeles, CA 90023

(213) 263-3344

Benjamin Torres, Assistant Manager of Purchasing

Surimi

Shining Ocean, Inc.

2440 West Commodore Way

Seattle, WA 98199-1228

(206) 284-2847

Roger Zimbelman, Director of Sales & Marketing

Imitation crab

Surimi, Inc.

3837 13th Avenue W., Suite 210

Seattle, WA 98119

(206) 282-8821

Luigi A. Turletti, Vice President

Surimi

Unisea Foods, Inc.

15110 N.E. 90th St., P.O. Box 97019

Redmond, WA 98073-9719

(206) 881-1919

Robert Leavengood, Vice President - Sales & Marketing

Imitation crab and scallops

Respondents To Surimi Survey
Page Three

Western Alaska Fisheries, Inc.

1111 Third Avenue Bldg., Suite 1210

Seattle, WA 98101

(206) 382-0640

Ryuji Oshimi, Vice President - Purchasing

Surimi

Whitney Foods

100 West Harrison Street, South Tower

Seattle, WA 98119

(206) 281-1262

Margarate Giddings, Sales Manager

Salmon, imitation crab, halibut

RESPONDENTS TO OTHER WHITING PRODUCT FORMS SURVEY

Fresh Atlantic whiting

John Nagle

306 Northern Avenue

Boston, MA 02210

(617) 542-9418

Michael Ducette, Broker

Other products: Salmon, swordfish, groundfish

Retail: Fresh Atlantic whiting

Purity Supreme

101 Billerica Avenue

North Billerica, MA 01862

(508) 663-0750

Brian Novak, Seafood Buyer

Smoked whiting

Rite Foods, Inc.

500 "E" Street

Boston, MA 02210

(617) 426-1144

Ira Seskin, Operations Manager/Smoked Fish

Other products: Herring, smoked fish