Survey of Wholesale and Retail Buyers in the Six Southern States of the North Central Region

by

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Introduction

Technology has improved production of aquaculture products and reduced unit costs such that reasonably dependable supplies of fish and seafood are available to the markets. This study describes current distribution channels at the wholesale and retail levels for farm-raised and wild-caught species in the North Central Region (NCR), and evaluates both buyer attitudes towards farm-raised products and interest in specific species.

Suppliers of fish and seafood products are experiencing a growth in consumer demand. United States per capita consumption of edible fish and seafood increased from 12.8 pounds in 1980 to 15.9 pounds in 1989, and is expected to reach more than 20 pounds per capita by the year 2000 (U.S. Department of Commerce 1990). This is attributed to increased average income, changing consumer demographics, and the present wave of health consciousness (Blaylock et al. 1987). As "Baby Boomers" approach middle age and the number of senior citizens increase, the health benefits derived from eating fish are becoming important issues.

Prices have been increasing as well. Fish and seafood supplies are relatively inelastic because fishermen are harvesting wild stocks of popular species beyond species natural ability to replenish the population. Therefore, fishermen are unable to provide significantly larger quantities of many species regardless of the effort expended or the quantity demanded (U.S. Department of Commerce 1989). For example, although fishing effort was at a record high, commercial landings at New England ports decreased by 20 percent between 1984 and 1986 (Swinton et al. 1987).

When consumer demand, prices, and fishing effort are increasing and landings are either constant or decreasing, significant economic opportunities emerge for the development of alternative sources of fish and seafood. Aquaculture and imports are the current major alternative sources. Traditionally, imports served as a buffer for domestic supplies. But because of global wild stock depletion, imports are less able to increase supply and level prices. Even so, the United States has incurred a nearly $7 billion trade deficit in 1989 for fish and shellfish products, a number that has increased since 1985 (United States Department of Commerce 1990).

Though aquaculture often has not been economically feasible due to low production and corresponding high per-unit costs of feed and technology, advancements in fish nutrition and environmental control systems have increased yields. With increasing seafood prices, aquaculture operations can earn profits. In essence, aquaculture technology is pushing production costs down while fish and seafood prices are going up.

With increased production, penetration into large, established markets could occur. Undeveloped aquaculture industries typically are composed of many small operations producing small, variable, seasonal supplies of fish and seafood products (Johnson and Talhelm 1978; Skurla et al. 1988). Marketing usually consists of direct local sales to consumers, restaurants, specialty meat markets, and to live haulers for resale to processors and/or pond owners (Johnson and Talhelm 1978; Stern and Ure 1984; Skurla et al. 1988). At this point, these relatively small producers are competing for markets already established and developed by the capture fish and seafood industry. As production levels increase it is necessary to find larger markets (Johnson and Talhelm 1978).

Many aspects of marketing are considered constraints on the development of aquaculture industries. Existing distribution channels are a muddle of marketing confusion. Redmayne (1990) summed up the complexity of fish and seafood distribution quite nicely. "In fact, seafood distribution is more a maze than ever. There are distributors selling distributors that sell other distributors. There are brokers that import and importers that broker. There are processors that distribute and distributors that process. There are traders that sell processors and processors that sell traders. There are meat distributors selling fish and fish distributors selling meat. The only rule of seafood distribution these days is that there are no rules. There is only opportunity."

Stamell (1990) supports these claims by suggesting that no clear differences exist between the intermediaries in terms of the products sold. "The distinctions between the various levels have become blurred. Buyers will tell me of calls from primary processors, value added processors, traders, and distributors all in one week and for the same product."

Distribution Channels

The *processor* (sometimes called a *packer*) generally buys from primary producers (fishermen or farmers) and/or may act as his own producer depending on the level of vertical integration. For example, Miller et al. (1981) report that processor controlled culture operations accounted for 28 percent of catfish processed in 1979. Processing includes some combination of gutting, heading, canning, filleting, steaking, and freezing. A secondary processor may buy these products at some point in the processing and add value to them by, *e.g.*, smoking, salting, or breading.

Importers arrange for transportation and delivery of fish and seafood from other countries, and may act as a processor, broker or trader. They may or may not take title to the products.

Brokers serve wide geographic areas and sell on commission, acting as an independent sales force. They represent several companies and do not take title to the product or physical possession of it. The typical customers of brokers are wholesale distributors, but brokers also sell to retailers and restaurant chains. They may contact wholesalers, make sales, coordinate shipments, handle complaints, provide information to both supplier and wholesaler, conduct credit checks, and collect accounts.

Traders are middlemen who buy from and sell to anybody within the distribution channel. They usually perform "back to back" deals in which a customer is found before the product is bought.

Wholesalers and/or *distributors* buy from everyone (including each other) and sell to other wholesalers and retail outlets. They take title and physical possession of the products and may perform repacking, processing, and/or warehousing functions as well. The size of these companies ranges from large "broadliners" to small "jobbers."

Broadliners distribute dry, refrigerated, and frozen products (not just fish and seafood) in one truck. *Jobbers* are one- or two-man operations with a refrigerated pick-up truck that deal strictly in fish and seafood. A trend is developing within the industry toward the growth of broadliners that provide everything a store needs in one stop, which reduces costs through economies of scale.

Formal in-depth study of distribution channels is just beginning. The extent to which this information can be generalized is limited, at best, to high volume cultured species currently in local markets. The recent emphasis on regional aquaculture development has presented new problems for species not currently cultured. Before making investments in research and development on new species, viability of existing distribution channels must be studied.

Objectives

The general objective of this study is to define the functional and attitudinal characteristics of the fish and seafood distribution channel members in the NCR as they relate to farm-raised and wild caught species. This general objective is accomplished through four specific objectives.

- *To describe the marketing channels currently used for distributing farm-raised and wild-caught fish and seafood in the NCR.*

Meeting this objective will provide for a general description of the current NCR fish and seafood distribution channels. The flow of products from one step before the wholesaler to one step beyond the retailer (not always the consumer) is reported. Descriptions of this channel segment provide information to help bridge the gap between producers and consumer studies.

- *To describe the internal functions of wholesale and retail channel members with respect to specific species handled and general processing functions.*

Meeting this objective will provide internal information on the channel members. Since many firms are performing functions typical of other intermediaries, the degree of vertical integration exhibited will aid in accurate description of the distribution channel. In addition, the processing functions performed by each member will aid business and industry planners in establishing penetration points within the distribution channel construct.

- *To describe the attitudes and preferences of NCR buyers regarding product quality attributes of farm-raised versus wild-caught fish and seafood.*

Meeting this objective will suggest potential problems and/or inroads in the acceptance of farm-raised fish and seafood products. The attitudes and preferences of buyers may be useful in generic aquaculture marketing strategies — product, price, promotion, and distribution.

- *To develop a comprehensive list of species that may or may not be currently cultured on a commercial scale in the NCR, but show potential to be marketed*

Meeting this objective represents the first step in evaluating a list of species for further study. This study will cull the species exhibiting little or no market potential based on wholesale and retail buyer perceptions. Further evaluation of the remaining species is necessary with respect to production economies and consumer preference until the optimally profitable subset remains. It is then possible to answer questions concerning substitutability, species specific quality and forms, niche market strategies, and profit potential in an efficient and comprehensive manner.

Literature

The focus of the few studies generated from the NCR are in the area of assessing the status of the aquaculture industry with respect to a specific species and/or state (Johnson and Talhelm 1978; Peterson and Hennagir 1980; Skurla et al. 1988; Wisconsin Aquaculture Study Committee 1988; Mayo, E.L. 1989). These studies suggest that the current orientation of the NCR aquaculture industry is toward the production and marketing of live fish for stocking purposes. This is due to the industry's low degree of development and the importance of extensive (low input) culture techniques. Any subsequent development of food fish markets will occur when there is excess production beyond that for live sales. Such producers cannot compete with the large intensive (high input) operations in states with more advanced aquaculture industries (Johnson and Talhelm 1978). Little discussion within the literature focuses on the construct or function of distribution channels. What exists is peripheral in nature and focuses on transactions initiated by the producer. To aid in the development of food fish aquaculture as a viable industry, it is necessary to look beyond the "farm gate" transactions into the traditional fish and seafood channels.

But current descriptions of fish and seafood distribution channels are not readily applicable to the NCR. Area and/or species specialization, little or no industry development, and focus on producer, processor, and consumer relationships are the factors underlying these limitations. Aquaculture is a relatively new industry encompassing many disciplines. At present, little information exists on any single topic with a high degree of focus.

Methods

Telephone directories (Yellow Pages, wholesale and retail fish and seafood advertisers) from "major" cities (pop. ≥ 100,000) and *Who's Who in the Fish Industry (1990),* were the sources of names and addresses needed for mailing list compilation. A single-stage cluster sample of 430 survey units from the six southernmost NCR states was drawn out. The states represented and the corresponding number of sample units identified included Ohio (117), Indiana (50), Illinois (156), Missouri (45), Kansas (38), and Nebraska (24).

The sample size was determined by the total number of addresses on the list (430). A mailing list service publication reported 565 fish and seafood retailers and 264 wholesalers totaling 829 firms within the six NCR states under study. Therefore, this study's mailing list contained at least 52% of the universe. Pretest mailings resulted in a 33% response rate. Therefore, 129 responses representing 15.6% of the universe were expected. No subsample of the mailing list was drawn and all survey units (wholesale and retail fish and seafood buyers) in all the clusters ("major" cities of the selected six states) were included in the final sample to maximize the potential response rate. (Jolliffe 1986). Of the 430 survey units, 362 were deliverable and 103 usable responses were received, for a response rate of 28 percent.

Questionnaire Design

Dillman's total design method was used as a guide in the physical design of the questionnaire. The questionnaire was segmented into sections pertaining to demographics and the four objectives. To obtain demographic data needed to classify the firm(s), respondents were asked in Section I to establish their company's functional position within the industry, relative size (number of units and annual sales), and the geographic location(s). The degree to which multiple functions are performed within the industry would not allow pre-classification of the respondents by directory

published classes. Therefore, allowing multiple answers to classification questions was necessary to fully describe the industry players. For example, a firm may advertise in the business directory as a fish and seafood wholesaler, but may function as a retailer and a broker as well.

Section II of the survey was designed to obtain data that describes company activities once the fish and seafood reaches the firm's inventory, and what may be done to add value to the products. Also included are questions related to determining the respondent's customer base and potentially sensitive data such as annual sales.

Section III explored the firms' past and present activities and beliefs concerning farm-raised and wild-caught fish and seafood. The species sold, respondents' suppliers, attribute rankings, desired species, as well as past, present, and future impressions of farm-raised fish were topics investigated.

The 103 respondents recorded a total of 198 affirmative responses to the industry relationship selections (Table 4). On average, each respondent indicated approximately 2 functions. Seven functions were the maximum performed

Table 1. Location of respondents by state.

State	Frequency (n= 103)	Affirmative response (%)[a]
Ohio	41	39.8
Illinois	37	35.9
Missouri	15	14.6
Indiana	12	11.7
Kansas	9	8.7
Nebraska	4	3.9
Other	8	7.8
Total	126	

[a]Percentages are the quotients of each state's frequency value as the numerator divided by the number of respondents (n=103) as the denominator. The sum of percent values does not equal 100% due to respondents indicating multiple answers.

Results

To gain an overall perspective of the population, Tables 1-4 present frequency data with respect to the respondents geographic location; relationship to the industry; number of units; and gross annual sales of fish and seafood products. Location data reflect the density of survey units within each state. Ohio- and Illinois-based respondents represent 39.8% and 35.9% respectively of the business locations. Missouri, Indiana, Kansas, and Nebraska each represents less than 15%. Twelve of the 103 respondents reported having additional stores and/or units in 2 to 5 of the states listed.

Table 2. Number of units or stores for which respondents reported by frequency and percent.

Number of units	Frequency	Respondents (%)
1	75	72.8
2-5	10	9.7
6-9	4	3.9
10 or more	7	6.8
no response	7	6.8
Total	103	100.0

Single unit operations were reported by 72.8% of the respondents (Table 2). Slightly more than 82% of the respondents indicated at most 5 units or stores for which they were reporting.

Annual sales of fish and seafood products, for the reporting firms, range from less than $50,000 to nearly $100 million annually (Table 3). Sales of up to $1 million were reported by 41.6% of the sample whereas 52.5% indicated between $1 million and $100 million annual gross sales. The highest respondent percent for any category was 22.3% for sales from $1 million to just under $5 million. Six respondents (5.8%) declined to reveal sales information.

Table 3. Annual sales of fish and seafood products by respondent frequency and percent.

Annual sales	Frequency	Respondent (%)
$1 - $49,999	9	8.7
$50,000 - $99,999	10	9.7
$100, 000 - $199,999	6	5.8
$200,000 - $499,999	9	8.7
$500,000 - $999,999	9	8.7
$1 million - $4,999,999	23	22.3
$5 million - $9,999,999	19	18.5
$10 million or more	12	11.7
no response	6	5.8
	103	100.0

Table 4. Functional relationship(s) to the industry by respondent frequency and percent.

Relationship	Frequency	Percent (%)[a]
Specialty retailer	50	48.5
Wholesaler	53	51.5
Distributor	37	35.9
Retail grocer with seafood counter	16	15.5
Processor	15	14.6
Warehouser	9	8.7
Broker	8	7.8
Producer	3	2.9
Other	7	6.8
Total	198	

[a] Percent values calculated from total number of respondents (n=103).

by any one respondent. Retailers (specialty) and wholesalers represent 48.5% and 51.5% of the respondents respectively. Retail grocer function was indicated by 15.5% of the respondents.

Relationship To The Industry

Table 5 lists the percent and frequency values for distribution channel functions performed by the respondents, based on the classification variables. Overall, most wholesalers and retailers (specialty and grocery) reported a relationship to the industry through not only their respective variable classifications, but also through any combination of the remaining functions. The primary functions include production, processing, brokering, warehousing, distribution, retailing (both specialty and grocery), but may include others such as importing and trading. It is therefore impossible to institutionalize the functions to develop a specific "map" of product movement on the multi-species and regional level. However, it is possible to compare classification types by respondent percent values such that relative difference in activities can be determined.

Compared across classification variables, respondent percent values for specific functions decrease. This is most likely due to the relative positions of classification groups within the marketing channel. Wholesalers occupy the innermost position because a larger percentage of them perform other functions. The relatively low percentages of wholesalers performing retailing functions (66.0% = 9.4% + 56.6%) demonstrate that few wholesalers sell to final consumers. Specialty retailers are positioned between wholesalers and grocery retailers because of the intermediate respondent percentages and multiple function nature. Retail grocers with seafood counters are positioned furthest toward the end of the channel since few perform additional functions.

Buying Relationships and Practices

All respondents indicated that they buy wild-caught and farm-raised fish and seafood products primarily from producers, processors, and wholesalers (Tables 6 & 7). Other sources, reported by few respondents, include traders, importers, and brokers. Data indicate that wholesalers tend to distribute buying relatively evenly across suppliers for both wild-caught and farm-raised products. Specialty and grocery retailers tend to rely more heavily on wholesalers for both product types.

Table 5. Marketing functions performed by wholesalers and retailers of fish and seafood products. (% = respondent percent[a]; λ = frequency of response[b])

	Classification					
	Wholesaler (n=53)		Specialty retailer (n=50)		Grocery retailer (n=16)	
Functions	%	(λ)	%	(λ)	%	(λ)
Production	3.8	(2)	4.0	(2)	6.3	(1)
Processing	26.4	(14)	22.0	(11)	6.3	(1)
Brokering	5.7	(3)	2.0	(1)	0	
Wholesaling	100	(53)	56.0	(28)	31.3	(5)
Warehousing	17.0	(9)	10.0	(5)	0	
Distribution	45.3	(24)	22.0	(11)	12.5	(2)
Grocery retail	9.4	(5)	0		100	(16)
Specialty retail	56.6	(30)	100	(50)	0	
Other	5.7	(3)	6.0	(3)	0	
		(∑λ=143)		(∑λ=111)		(∑λ=25)

[a]Column percent totals do not sum to 100% due to respondents reporting multiple answers.
[b]Column frequency totals are greater than (n) values for each category due to respondents reporting multiple answers.

Table 6. Percent and (frequency) of wholesalers, specialty retailers, and grocery retailers buying wild-caught (WC) fish and seafood products from various suppliers. (% = respondent percent[a]; λ = frequency of response[b])

Sellers	Classifications: Wholesaler (n=49) %	(λ)	Specialty Retail (n=48) %	(λ)	Grocery Retail (n=14) %	(λ)
Producers (WC)	65.3	(32)	45.8	(22)	14.3	(2)
Processors (WC)	49.0	(24)	25.0	(12)	14.3	(2)
Wholesalers (WC)	59.2	(29)	79.2	(38)	85.7	(12)
Other (WC)	4.1	(2)	2.0	(1)	2.0	(1)
Totals(WC)	177.6	(87)	152.0	(73)	121.4	(17)

[a]Respondent percent totals are greater than 100% and response frequencies are greater than (n) values due to multiple responses.
[b]Column frequency totals are greater than (n) values for each category due to respondents reporting multiple answers.

Table 7. Percent and (frequency) of wholesalers, specialty retailers, and grocery retailers buying farm-raised (FR) fish and seafood products from various suppliers. (% = respondent percent[a]; λ = frequency of response[b])

Sellers	Classifications: Wholesaler (n=43) %	(λ)	Specialty Retail (n=42) %	(λ)	Grocery Retail (n=14) %	(λ)
Producers (FR)	62.8	(27)	42.9	(18)	14.3	(2)
Processors (FR)	39.5	(17)	19.0	(8)	14.3	(2)
Wholesalers (FR)	55.8	(24)	69.0	(29)	85.7	(12)
Other (FR)	0.	(0)	0.	(0)	0.	(0)
Totals (FR)	158.1	(68)	137.2	(55)	114.3	(16)

[a]Respondent percent totals are greater than 100% and response frequencies are greater than (n) values due to multiple responses.
[b]Column frequency totals are greater than (n) values for each category due to respondents reporting multiple answers.

Comparisons between suppliers of wild-caught and farm-raised products and classification variables show that overall respondent percentages are higher for captured products with respect to wholesalers and retailers. The difference is due to the potential for respondents to indicate multiple sources of products which could possibly (but not likely) result in cell percents of 100 for all cases. Since it is possible for column percentages to total 400%, lower column percent totals represent lower respondent percent values within a specific classification and across product types indicating less use of multiple suppliers. Column percent totals for all classification types that buy farm-raised products are lower than the corresponding wild-caught percentages. Therefore, respondents use fewer suppliers for cultured than wild-caught products.

In almost all cases, fewer respondents use processors as suppliers of fish and seafood products. This is due to the magnitude of divergence of wholesale and retail respondent percentages from processor supplied products. The difference is greater for cultured than captured forms. These results may be due to producers performing on-site processing functions; hence providing fewer supplier types from which to buy farm-raised species.

Selling Practices

Respondents selling to final consumers tend to commit a large relative percentage of their total fish and seafood sales to these buyers (Table 8). Those selling to other channel members generally sell a smaller percentage of their total output to a larger number of functional types including grocery stores, wholesalers, restaurants, warehousers, and distributors. Sales to final consumers represent an outlet for 72.8% of the respondents (n=103). The high relative number of respondents not reporting restaurant and warehouser data may bias the results significantly.

With respect to respondent type, more wholesalers sell directly to the other outlet types listed than do specialty or grocer retailers (Table 9). Restaurants represent the clientele of 92.5% (n=53) of the wholesalers responding. Restaurants also represents secondary customers of as many as 68.0% and 50.0% of specialty (n=50) and grocery retailers (n=16) respectively. However, lower respondent percent values across customer variables for both types of retailers indicate that they are less apt to utilize multiple outlets than are wholesalers.

Table 8. Percent distribution of respondents selling directly to buyer types, by volume of total sales categories.

		Volume of total sales			
Customer	n	1% - 50%	> 50%	no response	Total %
Final consumer	75	29.3	60.0	10.7	100
Grocery stores	49	69.4	14.3	16.3	100
Wholesalers	45	75.4	6.8	17.8	100
Restaurants	71	56.3	31.0	12.7	100
Warehousers	8	37.5	12.5	50.0	100
Distributors	30	80.0	3.3	16.7	100

Table 9 data also indicate "forward", "lateral", and "backward" product movement between classification and response variables. "Forward" transactions are indicated by relatively large respondent percents within classification columns. As the relative percentage decreases, the transaction appears to be more "lateral" or "backward" in nature. A lower respondent percent with respect to a "forward" transaction may indicate that such exchanges are skipping over one or more channel members.

Table 9. Percent[a] and frequency[b] of respondents within classification variable categories, by customers to whom they directly sell products (% = respondent percent; λ = frequency of response).

	Independent Variables					
	Wholesaler (n=53)		Specialty Retail (n=5O)		Grocery Retail (n=16)	
Direct customer	%	(λ)	%	(λ)	%	(λ)
Final consumer	67.9	(36)	98.0	(49)	100	(16)
Grocery stores	71.7	(38)	40.0	(20)	25.0	(4)
Wholesalers	64.2	(34)	28.0	(14)	37.5	(6)
Restaurants	92.5	(49)	68.0	(34)	50.0	(8)
Warehousers	11.3	(6)	4.0	(2)	6.3	(1)
Distributors	45.3	(24)	14.0	(7)	25.0	(4)

[a]Column percent values are greater than 100% due to respondents reporting multiple answers.
[b]Column frequency totals are greater than (n) values due to respondents indicating multiple answers.

Wholesalers participate in forward exchanges with restaurants (92.5%), grocery stores (71.7%), and final consumers (67.9%). "Lateral" transactions with other wholesalers are performed by 64.2% of the wholesalers responding. Due to the wholesalers relative position, within the portion of the distribution channel under study, it is difficult to conjecture the warehousers' and distributors' positions and therefore what the low response percentages represent.

The specialty retailers initiate "forward" transactions with final consumers (98.0%), restaurants (68.0%), and grocery stores (40.0%). "Backward" sales to wholesalers are performed by 28.0% of the specialty retail respondents. Since no response variable for "lateral" movement was included, no data is available for such transactions.

"Forward" product sales to consumers and restaurants by retail grocers are performed by 100% and 50% of the respondents respectively. "Lateral" sales to other retail grocers are indicated by 25.0% of the respondents whereas 37.5% recorded "backward" exchanges with wholesalers. Restaurants assume a "down stream" position to the retail types since it is logical to assume that little or no additional functions are performed.

With respect to objective 1, analysis indicates that the respondents within the three classifications buy inventory from multiple sources, perform multiple functions, and sell to multiple customer types. However, the extent to which these various activities are performed differ across the classification types.

Farm-raised products are generally bought from fewer sources relative to wild-caught. Both product forms are purchased by more wholesalers from producers, whereas wholesalers are used by more retailers (both specialty and grocery). Processors are direct suppliers to the least number of respondents.

Respondents indicate sales transactions with other channel members which may be classified as "forward", lateral", and "backward". The net direction of product flow through channel members is "forward" or "downstream". However, direct transactions occur between channel members at similar order, lower order ("backward"), and higher order ("forward") levels in the distribution channel.

Internal Functions: Species and Processing

The 10 freshwater species most frequently sold by respondents include walleye, *stizostedion vitreum,* ((74.8%), trout, (67.0%), salmon, *Oncorhynchus spp.,*(66.0%), channel catfish, *Ictalurus punctatus,* (63.1%), yellow perch, *Perca*

flavescens, (53.4%), white perch, *Morone americana,* (43.7%), frogs, *Rana spp.,* (47.6%), white bass *Morone chrysops,* (42.7%), buffalofish, *Ictiobus spp.,*((41.7%) and crawfish, *Cambarus spp., Orconectes spp.,* and/or *Procambaris spp.,* (40.8) (Table 10). When analyzed with respect to wholesale, retail, and retail grocery functions, changes in the relative species rankings within the list occur. Nevertheless, walleye, salmon, trout and channel catfish remain the four species most frequently sold by all respondents.

Table 10. Percent[a] of wholesaler and retailer respondents indicating that they sell a particular species as farm-raised or wild-caught.

Species	Total % (n=103)	Wholesalers (n=53)	S. Retail (n=50)	G. Retail (n=16)
Walleye	74.8	83.0	80.0	75.0
Trout	67.0	71.7	68.0	75.0
Salmon	66.0	75.5	66.0	75.0
Channel catfish	63.1	69.8	74.0	68.8
Yellow perch	53.4	62.3	56.0	56.3
White perch	43.7	52.8	48.0	56.3
Frogs	47.6	50.9	46.0	31.3
White bass	42.7	52.8	54.0	56.3
Buffalofish	41.7	47.2	54.0	56.3
Crawfish	40.8	43.3	36.0	43.8
F.W. Shrimp	38.8	34.0	38.0	25.0
Common carp	23.3	28.3	22.0	50.0
Tilapia	17.5	22.6	20.0	12.5
Sturgeon	14.6	22.6	16.0	12.5
F.W.Mussels	13.6	15.1	12.0	25.0

[a]Column percent totals are greater than 100% due to respondents reporting multiple answers.

Most of the freshwater species of fish and shellfish sold by the survey respondents are sold in fresh, frozen, and live forms (Table 11). The greatest percentage of the respondents, however, sell fresh products. With respect to the species that grocers sell, 73.3% (n=15) of the listed species are sold by 100% of the grocers as fresh products. Exceptions include freshwater shrimp *(Macrobranchium spp.),* crawfish, and frog products that are typically sold in frozen form.

Processed forms of specific species sold show little variation across classification variables; however, processed forms in some cases vary across species (Table 12). Walleye, channel catfish, and trout, for example, are sold by more respondents as fillets than in any other form. Buffalofish and common carp *(cyprinus capio),* however, are generally sold as whole (in round) unprocessed fish (Table 12).

Fish and seafood products are altered or otherwise processed by 68.9% of all respondents. With respect to the classification variables 74.1% of the wholesalers (n=40), 85.2% of the retailers (n=45), and 81.3% of the retail grocery respondents (n=14) indicated performing processing or value adding activities as an internal function of the firm.

Classification types exhibit differences in respondent percents with respect to processing and value adding activities (Table 13). Products are bought live, in round, and dressed and further processed by a larger percentage of wholesalers than retail types. Live and in round forms are essentially unprocessed or "as harvested" whereas dressed products are only gutted. However, on average, processing "as harvested" and dressed fish and seafood is performed by 55.0% of the wholesalers, 47.8% of the specialty retailers, and 38.4% of the retail grocers. This demonstrates that processing occurs

Table 11. Percent[a] of respondents[b] selling a specified species in a specified form.

Species	n	Fresh %	Frozen %	Live %
Walleye	76	81.6	53.9	0
Trout	67	79.1	43.3	1.5
Salmon	67	83.6	65.7	0
Channel catfish	36	83.3	66.7	16.7
Yellow perch	51	80.4	58.8	0
White perch	42	81.0	50.0	0
Frogs	49	12.2	95.9	0
White bass	43	95.4	32.6	2.3
Buffalofish	43	100	11.6	9.3
Crawfish	42	50.0	69.1	16.7
F.W. Shrimp	40	37.5	77.5	0
Common carp	23	100	8.7	13.0
Tilapia	21	90.5	14.3	0
Sturgeon	17	94.1	17.7	0
F.W.Mussels	14	78.6	21.4	7.1

[a]Row percent totals are greater than 100% due to respondents reporting multiple answers.
[b]N values represent the number of respondents reporting for each species. Percentages are calculated from these values.

Table 12. Percent[a] of respondents[b] selling a specified species in a specified processed form.

Species	n	Filet %	Whole %	Gutted %	Steaks %	Breaded %
Walleye	77	90.9	61.3	39.0	5.2	13.0
Trout	69	69.6	50.7	56.5	5.8	7.2
Salmon	68	76.5	57.4	57.4	64.7	0
Channel catfish	65	78.5	50.8	63.1	36.9	35.4
Yellow perch	55	87.3	36.4	18.2	0	18.2
White perch	45	73.3	51.1	24.4	0	2.2
Frogs[c]	45	88.9	11.1	0	0	15.6
White bass	44	68.2	77.3	47.7	4.5	2.3
Buffalofish	43	32.6	81.4	72.1	30.2	4.7
Crawfish[d]	37	0	97.3	10.8	0	0
F.W. Shrimp[e]	30	0	80.0	16.7	0	26.7
Common carp	24	25.0	87.5	20.8	0	0
Tilapia	18	88.9	27.8	22.2	0	0
Sturgeon	15	66.7	46.7	33.3	6.7	6.7
F.W.Mussels	12	0	100	0	0	0

[a]Row percent totals are greater than 100% due to respondents reporting multiple answers.
[b]N values represent the number of respondents reporting for each species. Percentages are calculated from these values.
[c]Filet and breaded forms of frogs represent "legs" only.
[d]Gutted forms of crawfish represent "tail" section only.
[e]Gutted and breaded forms of freshwater shrimp represent "tail" section only.

Attitudes and Preferences

The number of respondents indicating beliefs about the relative comparability between farm-raised and wild-caught products with respect to specific attributes ranged from 81 to 88 (Table 14). From 15 to 22 survey units did not respond to some or all of the attribute comparisons. Several of these non-respondents indicated no opinion due to lack of experience with farm-raised products or an unwillingness to generalize across species. Nevertheless, attributes for cultured products, generally, were rated better than the wild-caught products (Table 14). Additionally, the market potential for cultured products is also good due to the current and future excess demand perceived by the respondents.

at all levels under study. Therefore, it is reasonable to assume that the facilities required to process fish received in "as harvested" or dressed forms are possessed by more wholesalers than retailers.

End user convenience processing is primarily performed by grocery retailers. Specific activities and the percentage of grocery retail respondents performing them are precooking (71.4%), marinating and/or seasoning (42.9%), breading fillets (28.6%), and processing to nuggets (28.6%). Although performed by a relatively small percent of respondents, stuffing products and processing to patties are performed by more specialty retailers (8.9%) and wholesalers (10.0%), respectively. The intermediate positioning of the specialty retailers within the distribution channel under study is reflected in the intermediate respondent percents for the majority of all the processing activities.

Table 13. Percent of respondents whose firms perform various processing or value added activities, by overall and classification variable category.

Activities	Overall % (n=71)[a]	Wholesale % (n=40)	Specialty Retail % (n=41)	Grocery Retail % (n=14)
Process dressed products to fillets	56.3	65.0	53.3	57.1
Process dressed products to steaks	54.9	67.5	53.5	57.1
Process "in round" products to fillets	54.9	60.0	55.6	35.7
Process "in round" products to steaks	53.5	67.5	57.8	42.9
Repackage large shipments into smaller subunits	53.2	65.0	42.2	50.0
Process "in round" to dressed products	50.7	62.5	57.8	28.6
Dress and debone	46.5	55.0	48.9	42.9
Cook/steam/fry/boil/etc.	46.5	14.0	55.6	71.4
Thaw frozen products for sale as "previously frozen" products	36.6	30.0	35.6	64.3
Freeze fresh products for sale as frozen	31.0	42.5	37.8	14.3
Fillet live fish	21.1	30.0	28.9	28.6
Bread fillets	21.1	12.5	26.7	28.6
Dress live fish	19.7	32.5	26.6	21.4
Marinate or season products	19.7	10.0	17.8	42.9
Process products into nuggets	19.7	8.0	24.4	28.6
Stuff products	7.0	5.0	8.9	0
Process products into patties	5.6	10.0	6.7	7.1

[a]The overall (n) value is less than the sum of the classification variable (n) values since the wholesale and specialty retail categories are not mutually exclusive.

Table 14. Percent[a] of (n) respondent rankings[b] of farm-raised products as compared to wild-caught, by specific attributes.

Attribute	n[c]	Somewhat better or superior (%)	The same (%)	Somewhat worse or much worse (%)
Availability	88	85.2	14.8	0.0
Uniformity (size)	87	85.0	14.9	0.0
Seasonality (supply)	86	80.2	18.6	1.2
Freshness	88	75.0	25.0	0.0
Quality	84	72.6	26.2	1.2
Appearance	87	71.2	28.7	0.0
Contaminant Content	84	70.2	29.8	0.0
Scent	86	69.8	30.2	0.0
Flavor	86	69.8	24.5	5.8
Shelf Life	87	67.8	31.0	1.1
Price stability	86	67.5	23.3	9.3
Seasonality (demand)	81	61.7	37.0	1.2
Delivery methods	85	60.0	40.0	0.0
Customer preference	85	60.0	37.6	2.4
Packaging	84	59.5	39.3	1.2
Supplier credibility	83	57.8	39.8	2.4
Ease of handling	85	57.7	42.3	0.0
Turnover	85	55.3	42.4	2.4
Texture	87	55.2	33.3	11.5
Value	85	54.1	35.3	10.6
Health benefits	83	49.4	48.2	2.4
Shipment accuracy	85	48.3	50.5	1.2

[a]Row percent totals are equal to 100% due to respondents providing only one answer per category.
[b]Data was initially obtained via a 5 point Likert scale. Results are reported by combining the "somewhat better" with "superior" and "somewhat worse" with "much worse" as positive and negative categories respectively.
[c]N values reflect selective response by survey units.

Table 15. Overall ranking[a] of farm-raised versus wild-caught fish and seafood products, by respondents.

n	Somewhat better or superior (%)	The same (%)	Somewhat worse or much worse (%)
93	72.1	20.4	7.6

[a]Data was initially obtained via a 5 point Likert scale. Results are reported by combining the "somewhat better" with "superior" and "somewhat worse" with "much worse" as positive and negative categories respectively.

Somewhat better and superior to wild-caught products were categories selected most often for availability ((85.2%, n=88), uniformity of size (85.0%, n=87), seasonality of supply (or lack thereof) (80.2%, n=86), freshness (75.0%, n=88) and quality (72.6%, n=84), with respect to all attributes listed (Table 14). Five attributes scored least often as somewhat better and superior to captured species were; shipment accuracy (48.3%, n=85), health benefits (49.4%, n=83), value (54.1%, n=85), texture (55.2%, n=87), and turnover (55.3%, n=85). Farm-raised products were believed to be somewhat worse or much worse by a small percentage (from 1.2% to 11.5%) of the respondents for 14 of the 22 attributes. Texture, value, and price stability were the only three characteristics with relatively large "worse than" response percents and should be considered for future studies. When asked to use the same scale to provide an overall comparison of farm-raised to wild-caught fish and seafood products, 72.1% of the respondents (n=93) felt cultured products were at least somewhat better, 20.4% perceived no difference, and 7.6% felt farm-raised were somewhat or much worse (Table 15).

Current demand for farm-raised products in relation to their supply is seen as higher by 53.4% of the respondents (n=103), 31.9% believed the situation is balanced, 6.8% felt demand is lower, and 8.7% had no opinion (Table 16). A forecasted increased in the demand for farm-raised products is made by 80.6% of the survey units (Table 17). Almost 10% expect demand will remain the same whereas 1.9% predict a decrease in demand is imminent. Slightly under 8% of the respondents had no opinion as to future demand for cultured products.

Market Presence and Species Demand

Respondents were asked to indicate, from a list of freshwater fish and shellfish species, all species they would like to sell (that they currently do not sell as cultured) if available as farm-raised products. Walleye, yellow perch, hybrid striped bass *(Morone chrysops x M. saxatilis),* largemouth bass *(Micropterus salmoides),* and bluegill sunfish *(Lepomis*

Table 16. Impression of the current demand, in relation to supply, for farm-raised fish and seafood, by respondents.

n	Higher (%)	About the same (%)	Lower (%)	No opinion (%)
103	53.4	31.1	6.8	8.7

Table 17. Projection of the future demand trends for farm-raised fish and seafood, by respondents.

n	Increasing (%)	Remain the same (%)	Decreasing (%)	No opinion (%)
103	80.6	9.7	1.9	7.8

macrochirus spp.) are desired by 46.9% (n=96), 38.2% (n=102), 28.2% (n=103), 26.2% (n=103), and 25.2% (n=103) of the respondents (Table 18). The five species desired by the least number of respondents include common carp (5.9%, n=102), sturgeon *(Acipencser spp.)*(7.1%, n=98), crawfish (9.5%, n=84), tilapia (10.3%, n=87), and salmon (14.0%, n=50).

Market presence index values (defined in Table 19) for matching species were calculated and compared to percentages of respondents who would "Liketo" sell the species. For purposes of classification in Figure 1, high "liketo" values are those greater than 20%. The values less than 20% are considered low "liketo" for analysis. MPI values are considered high if they are greater than .09. Low MPI values range from .02 to .09.

By virtue of the MPI and "liketo" values of .04 and 5.9% respectively, common carp was determined as the only species to be categorized type A. In addition, a relatively low percentage (23.3%) of the survey units sell the species in any form. Therefore, considering data generated from this study, common carp show little or no potential for development as an aquaculture species.

"Like to" Demand	Market Presence Index	
	Low	**High**
Low	Little or no potential for species development. Type Aspecies: Common carp	Species is currently satisfying demand as a cultured product. Type Bspecies: Salmon, channel catfish, frogs, freshwater shrimp, crawfish, freshwater mussels, sturgeon, tilapia.
High	Good potential provided other "environmental" variables check out. Type Cspecies: Walleye, yellow perch, white perch, white bass, buffalofish.	May occur if species is restricted to specific areas by "environmental" factors. Type Dspecies: Trout, largemouth & smallmouth bass, bluegill (sunfish), hybrid striped bass.

Figure 1. Market Presence Index versus "Liketo" demand matrix developed for the fish and shellfish species studied with species and corresponding types. Matrix is based on data from wholesale and retail fish and seafood buyers.

Table 18. Number of potential qualified[a] respondents (n), actual respondents, and "Liketo" percents, by species.

Species	n[b]	Frequency	"Liketo" %[c]
Walleye	96	45	46.9
Yellow perch	102	39	38.2
Hybrid Striped bass	103	29	28.2
Largemouth bass	103	27	26.2
Bluegill (sunfish)	103	26	25.2
White bass	100	24	24.0
White perch	102	22	21.6
Smallmouth bass	103	22	22.0
Trout	53	11	20.8
Buffalofish	99	20	20.2
F.W. Mussels	96	16	16.7
Frogs	84	15	17.9
F.W. Shrimp	81	14	17.3
Channel catfish	40	6	15.0
Salmon	50	7	14.0
Tilapia	87	9	10.3
Crawfish	84	8	9.5
Sturgeon	98	7	7.1
Common carp	102	6	5.9

[a]Qualified respondents are those which *do not* currently sell the particular species in question as a farm-raised product.
[b]N values represent the number of respondents *not* selling the corresponding species as a *farm-raised* product. However, the respondents *may* sell the *wild-caught* form of the species if available.
[c]"Liketo" is the variable name that represents the percent of the qualified respondents that indicated that they would like to sell the farm raised form of a species if it were available.

Table 19. Market Presence Index[a] ,"Liketo" %[b] and percent of respondents currently selling either farm-raised or wild-caught products[c] by species.

Species	MPI	"Liketo" % for each species	MPI denominator (%)
Walleye	.09	46.9	74.8
Yellow perch	.02	38.2	53.4
Hybrid Striped bass	—	28.2	—
Largemouth bass	—	26.2	—
Bluegill (sunfish)	—	25.2	—
White bass	.07	24.0	42.7
White perch	.02	21.6	43.7
Smallmouth bass	—	22.0	—
Trout	.72	20.8	67.0
Buffalofish	.09	20.2	41.7
F.W. Mussels	.50	16.7	13.6
Frogs	.39	17.9	47.6
F.W. Shrimp	.55	17.3	38.8
Channel catfish	.97	15.0	63.1
Salmon	.78	14.0	66.0
Tilapia	.89	10.3	17.5
Crawfish	.45	9.5	40.8
Sturgeon	.34	7.1	14.6
Common carp	.04	5.9	23.3

[a]Market Presence Index (MPI) indicates the relative amount of the total supply of a specific species that is present in the market as a farm-raised product.
[b]"Liketo" is the variable name that represents the percent of the *qualified* respondents that indicated that they would *like to* sell the farm raised form of a species if it were available.
[c]Represents the denominator in the MPI calculation.

Type B species include salmon, channel catfish, frogs, freshwater shrimp, crawfish, freshwater mussels (family Uniondae), sturgeon, and tilapia. These species are determined, due to high MPI and low "liketo" values, to be currently satisfying demand as cultured products. However, freshwater mussels, sturgeon, and tilapia are at present sold by relatively few respondents (Table 19) and are therefore classified as Type B scenario 2 species. The low "liketo" demand is most likely due to low levels of localized distribution and lack of a wild-caught form in the market. With increased marketing efforts aimed at increasing awareness, freshwater mussels, sturgeon, and tilapia may be the subjects of increased buyer demand.

The type B scenario 1 species include channel catfish, salmon, frogs, crawfish, and freshwater shrimp. These species are predominantly cultured and widely sold. Farm-raised catfish and salmon exhibit the greatest potential for market expansion from this group in the NCR. Fifteen (n=40) and fourteen percent (n=50) of the "qualified" respondents indicated that they would like to sell cultured catfish and salmon if the products were available to them (Table 19). If salmon and catfish culture facilities are operating at less than capacity, an increase in production can be absorbed by wholesale and retail buyers in the NCR. In addition, increased farm production of frogs, crawfish, and freshwater shrimp can be absorbed by NCR wholesale and retail fish and seafood buyers.

Type C species are found to include walleye, yellow perch, white perch, white bass, and buffalofish. These type C species are currently sold by 41.7% to 74.8% (Table 10) of the respondents as mostly wild-caught products. However, the relatively high "liketo" values indicate strong buyer demand for the farm-raised form. Therefore, the potential for aquaculture industry development focused on these Type C species is considered good. The limited scope of this study necessitates further research with respect to other marketing environmental variables. Nevertheless, these results establish a list on which to base continuing research.

Trout is categorized as a Type D species. The Type D classification is based on the high MPI and "liketo" values calculated from the data. Trout is a popular product that is sold almost exclusively as cultured. However, the quantities produced are limited because of the scarcity of the specific environmental resources required for profitable culture. To date, the cost of artificial systems that mimic the necessary natural conditions is disproportionately high compared to the prices paid to the producer. Therefore, supply cannot yet meet the demand.

Hybrid striped bass, largemouth bass, bluegill, and smallmouth bass *(Micropterus dolomieui)* can also be classified as Type D species. Date for MPI calculation was not collected for these species. However, it is assumed that any "for food" sales are represented by cultured products. The MPI values would then be considered high. These species did receive high "liketo" values via the survey. The conditions for the Type D classification exists for these species because of wildlife restrictions preventing their culture and sales for food in many states. It is therefore hypothesized that if such restrictions are changed to designate the cultured form to be an agricultural product, these species might soon become Type C due to increased production.

Discussion

The general direction that products flow through the distribution chain is from producer to processor to wholesaler to retailer to consumer. However, the multiple functioning nature of the industry precludes the development of a reasonably specific "map" of institutional descriptions and pathways on the multi-species and/or regional level. Relative intensity with which products and types (wild-caught or farm-raised) are exchanged between channel members is perhaps the only measure that can be made at this level of industry focus.

Supplier relationships with wholesalers, specialty retailers, and grocery retailers demonstrate a progression toward the dependence on wholesalers as a source for both cultured and wild products. At the retail grocery level, dependence on the various suppliers is essentially identical for farmed and wild products.

At the wholesale and specialty retail levels the dependence shifts somewhat. The classification types appear to buy captured products from multiple sources more than cultured products. The overall trend is away from processors to producers and wholesalers. This phenomenon may be due to producers of farm-raised species performing processing functions, thus providing fewer supplier types from which to buy.

Not surprising, specialty and grocery retailers tend to commit a larger percentage (although not all) of their output to final consumers. Restaurants are primary customers of wholesalers whereas they are served as secondary customers by both retail types. Both retail member types serve the same outlets as do wholesalers albeit to a lesser extent.

Although net direction of product flow is "down stream" from wholesaler through retail grocer, direct "forward", "lateral", and "backward" sales are made by all respondent types. Transactions between two wholesalers are considered "lateral" exchanges. Specialty retailers selling directly to restaurants constitute "forward" transactions whereas grocery retail to wholesaler exchanges indicate "backward" sales. This multiple function/outlet nature is part of what is behind the inability to "map" out the fish and seafood movement through the distribution channels.

Walleye, salmon, trout, and channel catfish are the freshwater species, examined within this study, most frequently sold by wholesalers, specialty retailers, and grocery retailers. Product forms sold by the respondents include fresh, frozen, and live. All grocery retailers along with most of the other respondents sell the majority of fish species listed as fresh. Shellfish and frog products are typically sold frozen. Processed forms vary by species rather than by channel member. Fish species such as buffalofish and common carp are generally sold whole whereas walleye, salmon, and catfish are sold as fillets. Steaks and breaded products are sold by relatively few respondents .

Internal processing activities of channel members vary most strongly between wholesalers and grocery retailers. The processing of live, "in round", and "dressed" products, although performed by all members, are primarily a function of wholesalers. Processing activities performed mostly by grocery retailers include those for customer convenience such as marinating and precooking. It is most likely that retail grocer processing of "in round" and "dressed" products are custom services and performed on a limited basis.

In general, attitudes concerning farm-raised fish and seafood products are positive. Shipment accuracy was the only attribute for which farm-raised products were considered the same as wild-caught. All other attributes were ranked as somewhat better or superior with respect to cultured products. Availability, uniformity of size, seasonality of supply, freshness, and quality received high rankings by the largest percentage of the respondents. Texture, value, and price stability were found to be potential problem areas for which farm-raised products are ranked sub-standard by a small but significant number of respondents.

Beliefs about current demand and supply relationships of cultured products are also positive. Most believed that current demand is higher than supply and will increase in the future. Although fewer respondents hold the current demand belief, the future demand scenario is shared by virtually all the respondents.

Common carp (Type A species) was determined to have little or no potential for development as a cultured species due to low market presence and low demand. Type B species are generally satisfying demand as cultured products. However, demand for freshwater mussels, surgeon, and tilapia may increase if marketing efforts are aimed at product awareness within the NCR. Farm-raised salmon and catfish are currently sold by a considerable number of NCR wholesalers and retailers. However, 15% and 14% of those not selling cultured salmon and catfish, respectively, would like to sell the products if they were available to them. Increased production of catfish and salmon can be absorbed by NCR wholesale and retail buyers if producers use the appropriate marketing strategy. Although fewer additional buyers demand them, increased production of frogs,

crawfish, and freshwater shrimp will also be absorbed within the NCR.

Overall, Type C species including walleye, yellow perch, white bass (Morone chrysops), white perch, and buffalofish are indicated as the species with the highest potential for industry development based on market presence and buyer demand. These species received low MPI scores indicating that of the total market supply of that species, cultured products represent very little. The high "liketo" demand percents indicate that a considerable number of respondents wish to sell the farm-raised product of these species.

Trout, categorized as a Type D (high MPI and "liketo" values) species is a popular product that is sold almost exclusively as a cultured product. However, the quantities produced are limited because of the scarcity of the specific environmental resources required for profitable culture. To date, the cost of artificial systems that mimic the necessary natural conditions is disproportionately high compared to prices paid. Therefore, supply as yet cannot meet the demand.

Further study is required for Type D species including hybrid striped bass, largemouth bass, bluegill (sunfish), and smallmouth bass, since the design of this study did not allow for MPI calculation. However, the number of buyers indicating desire to sell cultured forms of these products is considerable. The most likely scenario occurring would be that these species may be classified under wildlife regulations as sport fish or exotic species and are unavailable for sale as food in some areas. Also, it may be cultured for food sales (but not harvested as wild) in other areas where regulations allow.

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