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## Hybrid striped bass aquaculture survey and the market potential

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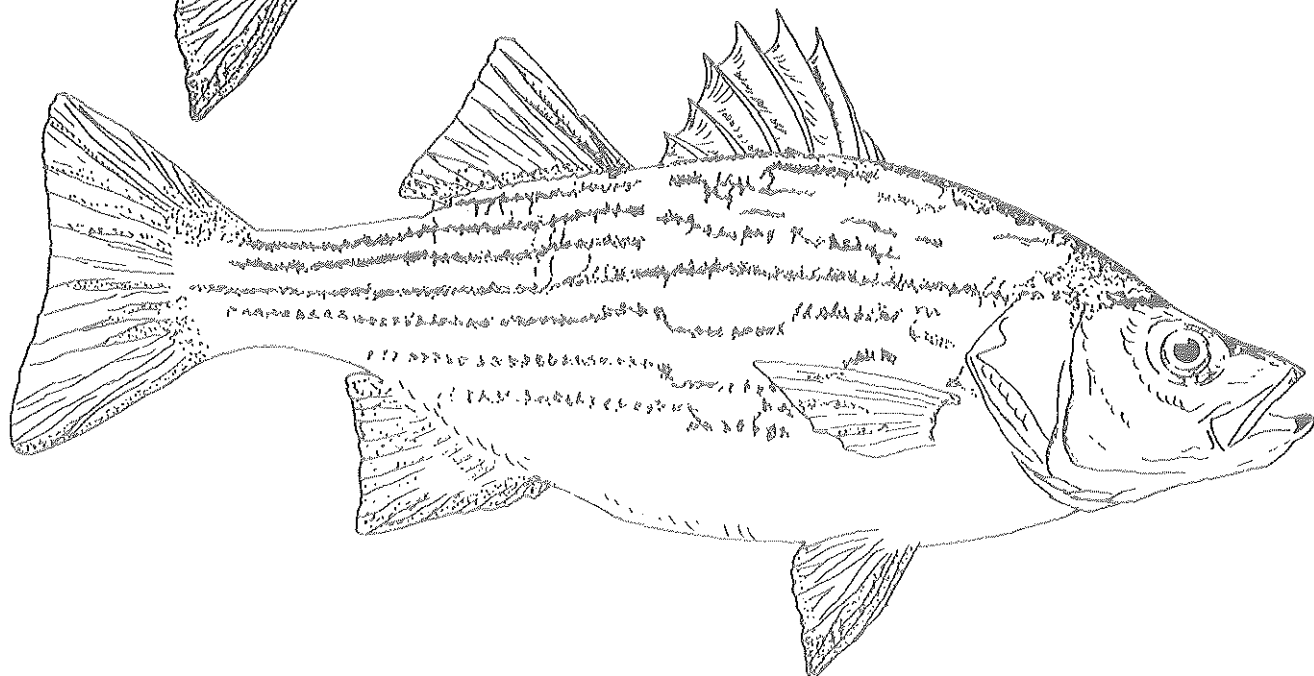
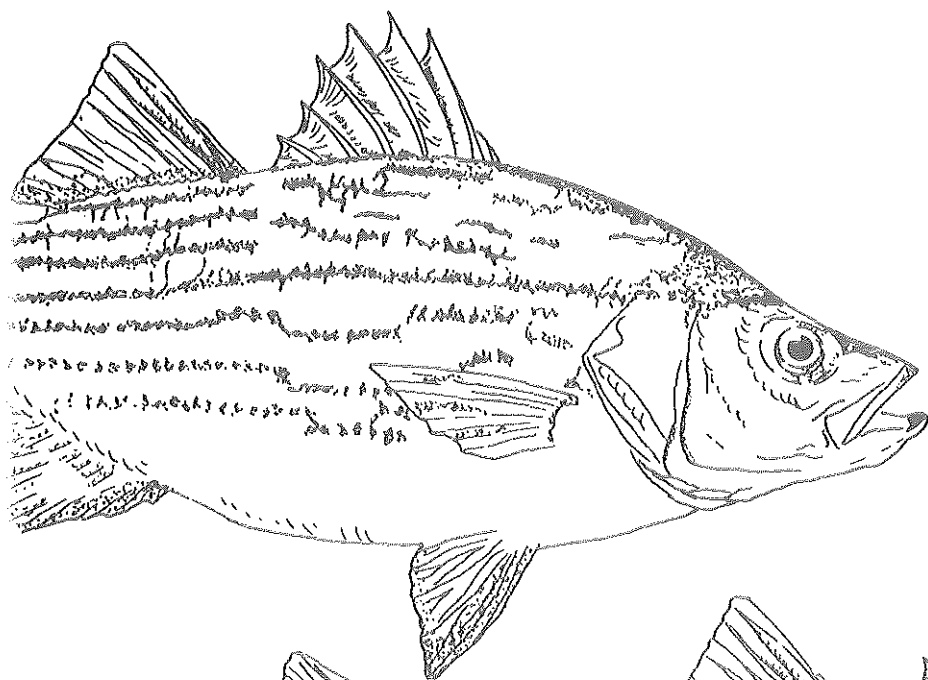
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# Hybrid Striped Bass Aquaculture Survey And Market Potential

Patricia A. Harvey, James E. Kirkley,  
Lisa M. Richardson, John J. Sanko

January 1990



Virginia Department of Agriculture and Consumer Services, Division of Marketing  
College of William and Mary, School of Marine Science, Virginia Institute of Marine Science  
Bureau of Business Research, Graduate School of Business Administration

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HYBRID STRIPED BASS AQUACULTURE SURVEY  
AND THE MARKET POTENTIAL

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JANUARY 1990

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## INTRODUCTION

Raising hybrid striped bass provides a potential source of income and employment for the Commonwealth of Virginia. This is especially appropriate given Virginia's diminishing natural resources and agricultural production, and increasing levels of pollution. Aquaculture offers one approach to diversifying and developing Virginia's rural economy.

The Commonwealth's decision to emphasize hybrid striped bass appears to be based upon the widely held assumption that the demand for wild striped bass that existed prior to reduced stocks will continue into the future and can be satisfied by farm-raised hybrid striped bass. Moreover, hybrid striped bass exhibit a high growth and survival rate over a wide range of environments. Thus, they are believed to be particularly well suited to Virginia's climate.

The following study was conducted to explore and assess the extent to which a market for hybrid striped bass could be developed and to recommend appropriate marketing strategies. The study was primarily directed towards the use of aquaculture to grow hybrid striped bass. It was concerned, however, with determining the market acceptability of aquacultured seafood products. The study was primarily marketing oriented but also addressed problems on the economics of

production and capital financing encountered for start-up operations. Information was obtained from two sources:

- wholesalers in Virginia, Maryland, Washington, D.C., New York, and Pennsylvania
- white linen tablecloth restaurants in New York, Pennsylvania, New Jersey, Virginia, Massachusetts, Maryland, Connecticut, Washington, D.C., Rhode Island, and Delaware.

Research was performed by the Virginia Institute of Marine Science and the Bureau of Business Research at the College of William and Mary in Williamsburg, Virginia, using a combination of surveys and personal interviews.

The final report is organized into the following seven major sections:

<u>Background Review</u>	Provide a brief review of hybrid striped bass and the concept of aquaculture.
<u>Methodology</u>	Describe methodologies used to conduct the research and analyze the findings.
<u>Survey Results</u>	Present and discuss survey results.
<u>Economics of Production</u>	Provide preliminary research on the economics of production for hybrid striped bass aquaculture facilities.
<u>Capital Financing</u>	Provide preliminary results on capital financing for a hybrid striped bass aquaculture facility.
<u>Analysis and Conclusions</u>	Combine survey results with interview findings. Compare against previous research findings, when applicable.
<u>Recommendations</u>	Conclude with recommendations on market potential and feasibility of raising hybrid striped bass.

## BACKGROUND REVIEW

The concept of fish culture (aquaculture) is one that has been practiced for thousands of years. It is based upon the assumption that proper management and artificial control of some or all portions of a fish's environment can provide greater yield than is possible in unmanaged natural systems.<sup>1</sup>

Seven-hundred million tons of aquacultured seafood are currently being supplied yearly by the aquaculture industry, and some experts believe that fish farmers will supply nearly 25% of the world supply by the year 2000.<sup>2</sup> During 1980 to 1988, U.S. aquaculture production increased approximately 290%.

Renewed interest in aquaculture as an economically sound business venture has recently been brought about by the continued decline of capture fishery production, continued increase in seafood consumption, and growing concern over contaminated finfish environments. In addition, it is seen as a means of supplying a reliable and wholesome fish supply

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<sup>1</sup>The Aquaculture of Striped Bass: A Proceedings, "Overview of Legal Constraints on Aquaculture", Wypyszinski, Alex W., University of Maryland, Cooperative Extension Service, 1984.

<sup>2</sup>NCRI News, "Hybrid Striped Bass...A National First", Page 1, Volume 4, No. 2, June 1989.

into the next century, particularly in the case of the striped bass that once thrived along the Eastern Seaboard.

In 1973, the commercial catch of striped bass (also called rockfish or stripers) was 15 million pounds. By 1988 it had dropped to less than one million pounds--a decline attributed to over fishing, pollution, and fishing regulations.<sup>3</sup> To protect the species, many East Coast states (including Virginia) initiated legislation and moratoriums restricting wild harvests and sport fishing.

To fill the gap caused by the loss of this popular foodfish (primarily in restaurants throughout the Mid-Atlantic Coastal states) and to capitalize on the success of farm-raised catfish in Mississippi, the hybrid striped bass has been advocated as a prime candidate for commercial fish farming.

The more common hybrid striped bass is a cross between striped bass and white bass. It is a hardy fish with high growth and survival rates and can be raised in a variety of waters (fresh, marine or brackish) over a wide range of temperatures. Its increased body depth results in less waste and more edible flesh per fish, and it is readily identifiable from striped bass.<sup>4</sup> It is well suited for aquaculture or

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<sup>3</sup>NCRI News, "Hybrid Striped Bass...A National First", Page 1, Volume 4, No. 2, June 1989.

<sup>4</sup>Cal-Neva Wildlife Transactions, "Commercial and Recreational Potential of the Striped Bass X White Bass Hybrid", Massingill, Michael J., Hovanec, Timothy A., Van Olst, Jon C., Carlberg, James M., 1983.

mariculture in a variety of systems including closed-system tank culture, net pen culture, raceway culture, and open pond culture.<sup>5</sup>

To date, the major growers of aquacultured hybrid striped bass are in Florida and California, with strong interest growing in Virginia, Maryland, and North Carolina.

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<sup>5</sup>Hybrid Striped Bass Farming: A Review of Research and Development Opportunities, Research Series No.2, Helfrich, Louis A., Libey, George S., Neves, Richard J., Department of Fisheries & Wildlife Sciences, Virginia Tech University, September 1988.

## METHODOLOGY

In the past, wild striped bass held a strong niche in the Mid-Atlantic restaurant market until diminished stocks and increased regulations reduced the catch. The current emphasis on hybrid striped bass has been driven by the assumption that the hybrid provides a strong substitute for wild striped bass. It has also been thought that until a significant wild fishery reappears or until market conditions force wholesalers to purchase directly from growers, farmers will have to market directly to restaurants, rather than sharing profits with "middlemen". Therefore, two distinct market segments--restaurants and wholesalers--were targeted across the Mid-Atlantic region. Major emphasis, however, was given to restaurants.

The restaurant survey (Appendix I) was designed to obtain specific information about the restaurant market with respect to classification, finfish offerings, aquaculture familiarity and current offerings, hybrid striped bass familiarity and present and future use, product form, size, and price. The wholesaler survey (Appendix II) was designed to gather data to determine the potential fish growers' wholesale market and the existing and future demand for hybrid striped bass perceived by the wholesalers. In addition, the survey

included questions on potential pricing and product form--thus permitting a comparison of pricing differences between what wholesalers are prepared to pay versus what restaurants are prepared to pay.

Preliminary research indicated that the most viable initial market for hybrid striped bass was the white linen tablecloth restaurant. To restrict the sample response error to those restaurants perceived as white linen tablecloth, restaurants were selected on the basis of accepting Diners Club.<sup>6</sup> The names and addresses of thirteen thousand four hundred sixty (13,460) restaurants affiliated with Diners Club were obtained for a ten-state area (New York, Pennsylvania, New Jersey, Virginia, Massachusetts, Maryland, Connecticut, Washington, D.C., Rhode Island, and Delaware). Similarly, the names and addresses for eight hundred ninety-four (894) wholesalers were obtained over a five-state area (Virginia, Maryland, Washington, D.C., New York, and Pennsylvania). These names and addresses were purchased from the Fred Wolf List Company of White Plains, New York.

A pretest survey was sent to 30 restaurants and 30 wholesalers in mid-July. Despite written and telephone followups, the initial survey had an extremely low return rate. Therefore, to augment the data and test the survey

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<sup>6</sup>Diner's Club was chosen because restaurant data by other credit card companies were not available through list brokers.

instrument, personal interviews of six restaurants and institutions were conducted in the Williamsburg area (Appendix III).

Final surveys were mailed to 13,420 restaurants and 864 wholesalers the last week of July, and a cut-off date of mid-October was imposed. Nine hundred seventy-nine (979) restaurants and 65 wholesalers responded. Response rates were lower than desired, but the results coincided with those of previous research conducted by other institutions and individuals [Wirth, 1989; Lipton and Swartz, 1988; Helfrich, Libey, and Neves, 1988]. Results from this study were compared against results of other studies to draw additional conclusions or show significant differences. It is important to realize that the low wholesaler response rate (although a problem common to other similar studies) limits making broad inferences about wholesalers.

Survey results were obtained using The Survey System, a marketing research analysis package developed by Creative Research Systems (1983, 1988). Additional programs were developed in dBase3 Plus, Version 1.1 (1985, 1986) to record specific comments and other information that could not otherwise be processed.

Information on the economics of production was developed at the Virginia Institute of Marine Science. Research on capital financing was conducted by personal telephone interviews with various financial and governmental institutions.



## RESTAURANT SURVEY RESULTS

This questionnaire was designed to obtain exploratory information on the proposed aquaculture of hybrid striped bass in Virginia. The questions were broad in scope to gather a variety of data regarding market availability, type, location, competition, and product requirements.

In order to provide a comprehensive overview of these findings, restaurant responses were divided into four segments:

1. Overview. Provide an overview of overall response rate and geographic breakdown of the respondents.
2. Classification. Discuss the characteristics of those restaurants responding to the questionnaire.
3. Aquaculture. Discuss the familiarity of restaurants surveyed with aquacultured seafood, experience in offering aquacultured seafood entrees, and willingness to offer aquacultured seafood entrees in the future.
4. Hybrid Striped Bass. Discuss the familiarity of restaurants surveyed with hybrid striped bass, willingness to offer it in the future, and the requirements contingent upon future hybrid striped bass offerings.

## OVERVIEW

A total of 979 restaurants from the ten-state region responded to the survey [Table 1]. These areas were selected as being representative of the Eastern Coastal states in which hybrid striped bass farms might establish initial sales networks.

Table 1. Geographic Location

<u>State</u>	<u>No. of Respondents</u>
New York	357
Pennsylvania	142
New Jersey	111
Virginia	95
Massachusetts	85
Maryland	68
Connecticut	47
Washington, D.C.	34
Rhode Island	22
Delaware	13
No Zip Included	7
Total	979

## RESTAURANT CLASSIFICATION

Out of 961 restaurants responding to the question of classification, over 34% offered a wide variety of entrees and preferred to be classified as "Other" [Table 2]. This included Steak & Seafood, American, Continental, Variety, and regional cuisine restaurants, as well as foreign foods restaurants not included under the "Ethnic" classification. Restaurants considered to be primarily seafood--the second largest group--accounted for 28%. Interestingly, a plurality of all types of restaurants offered finfish year round. Less than 8% of the restaurants did not offer finfish.

Responses to the question of ownership indicated that over 66% of the restaurants were independently owned, 24% were family owned, and the remaining 10% were chain-owned.

Table 2. Restaurant Classification<sup>a</sup>

	Is your restaurant primarily...? <u>No. of Respondents</u>	Do you offer finfish?		Are your finfish entrees primarily...?	
		<u>Yes</u>	<u>No</u>	<u>Year Round</u>	<u>Seasonal</u>
Other	328	280	20	282	15
Seafood	258	255	8	228	28
Ethnic	173	148	22	141	6
Specialty	99	91	8	90	3
Steak	95	87	8	82	4
Totals	981	871	71	823	58

<sup>a</sup>Since respondents did not consistently answer every question, the number of respondents per question is not consistent.

### Finfish Offerings

Two hundred fifty-four (254) seafood restaurants responded to the question "...what do you primarily offer?". Nearly 60% (152) indicated they primarily offered finfish, and 40% (102) indicated shellfish. Although this question was geared to seafood restaurants, 153 non-seafood restaurants responded-- 44% indicating shellfish and 56% indicating finfish. "Steak" and "Ethnic" restaurants indicated their primary fish offering was shellfish, and "Specialty" and "Other" indicated finfish.

When asked to indicate the methods by which their restaurants obtained finfish, the overwhelming response appeared to be wholesalers. Retailers and direct purchases from the boat were second and third.

The majority of the 940 restaurants responding to a question on major finfish types offered chose salmon (81%) and flounder (77%) [Table 3]. Restaurants selecting the category "Other" indicated several species of finfish which

included swordfish, shark, tuna, mahi mahi, grouper, halibut, and sole. Rankings were relatively consistent across the ten states surveyed.

Table 3. Finfish Offered

Type of finfish offered? <sup>a</sup>	<u>% of those Responding</u>	<u>Seafood</u>	<u>Steak</u>	<u>Ethnic</u>	<u>Specialty</u>	<u>Other</u>	<u>Total</u>
N = 940							
Salmon	81.4%	234	71	119	80	265	765
Flounder	77.6%	234	71	107	74	240	726
Cod/Haddock							
Pollock	64.8%	185	80	85	63	205	609
Fresh Water							
Trout	53.0%	158	46	63	52	188	507
Bluefish/ Sea Trout	47.7%	168	33	58	44	145	448
Other	40.3%	117	28	68	41	124	379
Catfish	40.0%	139	33	24	46	134	376
Red Fish (Red Drum)	30.5%	106	18	24	32	107	287
Wild Striped							
Bass	15.4%	46	6	20	17	47	145
Hybrid Striped							
Bass (Sunshine)							
Bass	6.0%	20	0	13	10	20	65

<sup>a</sup>In multiple choice questions, the sum of the totals exceeds the number of respondents; and the percentages used will not add up to 100%.

To obtain information on the size of the existing finfish market, respondents were asked to approximate the annual volume of finfish purchased by their restaurants in both dollars and pounds. The 520 restaurants that responded to the question of dollar volume represented a total of nearly \$40 million annually, while the 514 responding to poundage volume represented an annual total of nearly 13 million pounds.

A breakdown of those responding to questions of restaurant classification and volume indicated that although restaurants classified as "Other" had the highest survey response rate, those classified as "Seafood" accounted for over 61% of annual dollar volume and nearly 80% of annual poundage volume [Table 4].

Table 4. Annual Dollar and Poundage Volumes

	No.	Annual Volume (in Dollars)	% of Total	No.	Annual Volume (in Pounds)	% of Total
Other	176	\$ 7,830,240	10.0%	170	1,300,816	10.5%
Seafood	146	24,240,840	61.4%	135	9,934,880	79.9%
Ethnic	77	3,130,868	7.9%	80	484,525	3.7%
Specialty	63	2,182,830	5.5%	59	410,031	3.4%
Steak	54	2,089,080	5.3%	54	311,570	2.5%
Totals	520	\$39,470,745	100.0%	514	12,430,822	100.0%

Despite the low response rate, a broad range of sizes within the potential finfish market were represented [Table 5]. Annual dollar volume ranged from \$100 to \$10,000,000, and annual poundage ranged from less than 100 pounds to 7,000,000 pounds. Average annual dollar values were over \$76,000, and average annual poundage was over 24,000 pounds per restaurant.

Table 5. Ranges for Dollar and Poundage<sup>a</sup>

Annual Dollar Volume	No. Included	Annual Poundage Volume	No. Included
\$ 100 - 800	12	10 - 65	6
1,000 - 9,800	129	100 - 980	87
10,000 - 24,000	135	1,000 - 2,000	111
25,000 - 45,000	90	2,080 - 7,800	170
50,000 - 100,000	95	8,000 - 35,000	103
105,000 - 500,000	53	40,000 - 78,000	23
700,000 - 1,578,800	5	80,000 - 300,000	13
10,000,000	1	7,000,000	1
Totals	520	Totals	514

<sup>a</sup>Discontinuous interval indicates no response in selected range.

## AQUACULTURE

Product familiarity is of major concern when developing markets for any product. In this study, restaurants were first asked if they were familiar with aquaculture and second whether or not they were familiar with specific aquacultured products.

## Familiarity

Nearly 70% (657) of those responding to the question of aquaculture familiarity indicated they were familiar with aquacultured seafood, and 58% (552) indicated they have served aquacultured seafood [Table 6]. Although 58% (384) of the restaurants that responded to the question of offering aquacultured seafood in the future indicated they would, 39% (262) indicated they did not know. Nearly 19% of the latter responses were classified as "Other".

Table 6. Aquaculture Familiarity

	N = 940		N = 653			N = 667		
	Are you familiar with aquacultured seafood?		Have you ever served aquacultured seafood?			Would you offer aquacultured seafood in the future?		
	Yes	No	Yes	No	UNK	Yes	No	UNK
Other	218	106	176	93	58	126	8	103
Seafood	206	59	182	49	32	108	6	55
Ethnic	104	65	83	58	30	65	2	56
Specialty	77	20	65	22	11	44	3	19
Steak	52	41	46	30	18	41	2	29
Total	657	291	552	252	149	384	21	262

Additional analysis indicated that restaurants which had not served aquacultured seafood had the greatest response to "Do Not Know", regarding offering aquacultured products in the future. The highest degree of aquaculture familiarity and willingness to offer aquacultured products in the future was for restaurants that offered year-round finfish entrees.

## Products Offered

Restaurants offering aquacultured products offered a wide range of products [Table 7]. The top three aquacultured

products offered were shrimp, salmon, and catfish. Additional aquacultured products included trout, clams, mussels, oysters, soft shell crabs, crayfish, and prawns; trout, clams, mussels, and oysters were the most popular. Rankings were consistent across all 10 states. Hybrid striped bass offerings were reported to be offered in New York, New Jersey, Massachusetts, and Washington, D.C.

Table 7. Aquacultured Seafood Offerings

	What type of aquacultured seafood did you offer?				
	<u>Shrimp</u>	<u>Salmon</u>	<u>Catfish</u>	<u>Hybrid Striped Bass</u>	<u>Other</u>
Other	37	50	60	2	25
Seafood	71	47	40	0	25
Ethnic	28	27	13	3	16
Specialty	23	16	17	2	9
Steak	<u>15</u>	<u>6</u>	<u>15</u>	<u>0</u>	<u>7</u>
Total	174	146	145	7	82

### HYBRID STRIPED BASS

A primary objective of the survey was to determine whether or not hybrid striped bass could occupy a niche market. This section provides a more in-depth analysis of the responses to questions geared towards hybrid striped bass.

#### Familiarity

Of the 948 restaurants responding to the question on hybrid striped bass familiarity, only 22% (211) responded positively [Table 8]. However, nearly 40% (376) indicated they would offer it in the future; 54% (510) would consider offering it given more information. Over 70% (619) indicated they would contract to buy hybrid striped bass directly from the grower.

Table 8. Hybrid Striped Bass (HSB) Familiarity

	N = 948		N = 947			N = 881		
	Are you familiar with HSB?		Would you offer HSB in the future?			Would (do) you contract direct?		
	Yes	No	Yes	Would Consider	No	Do	Would	Would Not
Other	80	258	110	180	24	7	207	86
Seafood	66	197	121	130	13	3	191	57
Ethnic	27	142	58	95	15	7	98	48
Specialty	28	89	45	48	4	5	61	25
Steak	21	73	33	57	5	2	62	22
Totals	211	737	378	510	61	24	618	238

Areas of highest familiarity on a state-by-state basis ("Yes" responses divided by total state response) were Delaware (30%), New Jersey (28%), Washington, D.C. (27%), and Maryland (26%). Connecticut (13%) and Rhode Island (14%) had the lowest [Table 9]. All states responded positively to offering aquacultured products in the future and contracting directly from the grower.

Table 9. Future Hybrid Striped Bass Offerings

	N = 959			N = 959			N = 891		
	Are you familiar with HSB?			Would you offer HSB in the future?			Would (do) you contract direct?		
	Yes	No	%	Yes	Would Consider	No	Do	Would	Would Not
New York	76	279	21%	150	186	16	10	237	81
Pennsylvania	32	109	23%	45	85	10	1	96	36
New Jersey	30	79	28%	42	57	11	5	62	31
Virginia	22	70	24%	25	54	14	2	53	28
Massachusetts	15	69	18%	37	44	3	2	55	26
Maryland	17	48	26%	28	35	2	1	46	12
Connecticut	6	40	13%	21	24	2	1	33	9
Washington, D.C.	9	24	27%	15	18	3	3	21	9
Rhode Island	3	18	14%	7	13	1	0	15	5
Delaware	3	10	30%	9	5	0	0	6	5
Totals	213	746		378	518	62	25	624	242

For respondents having served aquacultured seafood, 29% indicated hybrid striped bass familiarity. Nearly 95% would offer or consider offering it. Sixty-seven percent (67%) do or would contract directly from the grower. Of the 885 restaurants indicating they offered finfish, 23% were familiar with hybrid striped bass. Nearly 94% would offer or consider offering it. Sixty-seven percent (67%) would contract directly from the grower.



## Factors

High margin and guaranteed supply were the top factors that would encourage restaurants to offer hybrid striped bass. Customer requests, however, also appeared to be important in encouraging new finfish offerings [Table 10]. The same ranking characterized those restaurants offering finfish.

Table 10. Factors Encouraging Use of Hybrid Striped Bass

	What are the top two factors that would encourage your restaurant to offer HSB?									
	<u>High</u> <u>Mar</u>	<u>Guar</u> <u>Supp</u>	<u>Fish</u> <u>Size</u>	<u>Seas</u> <u>Avail</u>	<u>High</u> <u>Sales</u>	<u>Cust</u> <u>Req</u>	<u>Promo</u>	<u>Poll</u> <u>Cont</u>	<u>Other</u>	
Other	110	50	9	22	23	50	2	21	18	
Seafood	84	57	7	22	18	25	2	17	12	
Ethnic	48	30	8	12	12	24	1	12	10	
Specialty	24	31	0	3	5	13	2	5	10	
Steak	<u>38</u>	<u>17</u>	<u>5</u>	<u>5</u>	<u>10</u>	<u>10</u>	<u>1</u>	<u>1</u>	<u>6</u>	
Totals	302	185	29	64	88	122	8	56	56	

## Competition

When asked to list three species offering the greatest competition to hybrid striped bass, the clear-cut favorites were salmon and flounder. Wild striped bass and cod/haddock/pollock were third and fourth [Table 11]. On an individual state basis, salmon was the preferred species for all states except Maryland. Flounder was thought to be the second major competitor to hybrid striped bass for most states.

Table 11. Hybrid Striped Bass Competition

	What three species offer the greatest competition to hybrid striped bass?									
	Wild Strpd Bass	Salmon	Catfish	Redfish (Red Drum)	Flounder	Cod/Had/ Pollock	Hybrid Strpd Bass	Fresh Wtr Trout	Bluefish/ Sea Trout	Other
New York	31	121	5	6	41	32	0	15	7	23
Pennsylvania	9	44	4	4	25	7	0	12	1	5
New Jersey	7	28	5	5	22	4	1	3	2	4
Virginia	10	26	4	2	15	2	0	8	1	5
Massachusetts	9	25	0	2	8	18	0	4	2	3
Maryland	8	6	3	2	16	4	0	3	5	5
Connecticut	4	14	1	1	3	3	0	2	1	5
Washington, D.C.	6	11	0	2	2	0	0	2	0	1
Rhode Island	1	6	0	0	4	5	0	1	0	0
Delaware	<u>1</u>	<u>4</u>	<u>0</u>	<u>0</u>	<u>4</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>
Total	84	285	22	24	140	76	1	50	19	52

Product Size

Product size was of concern to potential hybrid striped bass producers. If they are to be successful, they must know what the customer desires. Product size was assessed in this study by asking restaurants to first specify the sizes of hybrid striped bass they would prefer to buy and secondly to narrow those selections to the one size they preferred. Respondents offering finfish indicated a preference for hybrid striped bass under two pounds. The second and third choices were three pounds and over three pounds, respectively [Table 12].

Table 12. General Size Preferences

	N = 870	N = 832
	What size HSB would you PREFER to buy?	What size would you MOST prefer to buy?
Under 2 lbs	426	358
3 lbs	263	187
Over 3 lbs	273	207
Other	89	70

Similar preferences were found for responses summarized by primary restaurant category [Table 13]. Under two pounds was first, and three pounds and over three pounds were second and third.

Table 13. Preferred Size vs Classification

	N = 860				N = 824			
	What size HSB would you PREFER to buy?				What size would you MOST prefer to buy?			
	Under 2 lbs	3 lbs	Over 3 lbs	Other	Under 2 lbs	3 lbs	Over 3 lbs	Other
Other	140	72	47	27	116	74	55	29
Seafood	108	67	58	11	86	81	86	17
Ethnic	87	25	30	12	77	24	36	9
Specialty	39	21	23	8	34	21	27	7
Steak	30	15	18	4	42	15	21	7
Totals	422	200	176	62	355	195	205	69

It is interesting to note that when asked to stipulate preferred size, the trend towards larger-sized hybrid striped bass became more pronounced. Under two pounds was the second most preferred size. These preferences were consistent over the 10-state sample [Table 14].

Table 14. Preferred Size vs Geographic Location<sup>a</sup>

	N = 866				N = 828			
	What size HSB would you PREFER to buy?				What size would you MOST prefer to buy?			
	Under 2 lbs	3 lbs	Over 3 lbs	Other	Under 2 lbs	3 lbs	Over 3 lbs	Other
New York	158	69	67	27	132	69	75	26
Pennsylvania	61	35	20	10	55	32	28	11
New Jersey	53	17	16	5	42	18	23	7
Virginia	47	15	14	5	38	15	14	7
Massachusetts	32	21	22	2	26	17	28	4
Maryland	28	15	11	4	25	17	10	5
Connecticut	19	12	12	2	18	11	13	3
Washington, D.C.	13	10	8	1	10	11	9	2
Rhode Island	10	6	2	3	8	4	4	3
Delaware	4	1	5	2	3	1	5	1
Totals	425	201	179	61	357	195	207	69

<sup>a</sup>Since respondents did not consistently answer every question, inconsistencies exist among the final totals.

### Product Form

When asked to identify preferred product forms for hybrid striped bass, 53% of 881 restaurants responding to the question selected filleted. The second and third preferred product forms were whole (22%) and headed and gutted (17%). Steaked, headed only and other (scaled and gutted, head on/gutted, gutted only, slab-bone in) made up the other 8%.

Similar preferences characterized restaurants regardless of classification [Table 15]. All groupings of restaurants indicated a preference for filleted (58%), whole (22%), and headed and gutted (17%), respectively.

Table 15. Preferred Product Form vs Classification

	N = 871					
	What is your preferred product form for hybrid striped bass?					
	<u>Whole</u>	<u>Headed Only</u>	<u>Headed &amp; Gutted</u>	<u>Fillet</u>	<u>Steak</u>	<u>Other</u>
Other	57	5	34	182	13	1
Seafood	52	1	45	136	15	2
Ethnic	48	1	25	61	10	3
Specialty	19	2	18	48	2	3
Steak	<u>18</u>	<u>1</u>	<u>9</u>	<u>51</u>	<u>11</u>	<u>0</u>
Totals	192	10	151	458	51	9

A greater degree of difference was found when product form and size were jointly examined [Table 16]. Those preferring fillets or whole fish indicated a preference for fish weighing under two pounds and equaling three pounds, respectively. The third preferred size were fish weighing over three pounds. Those preferring to have their product headed and gutted, steaked, headed only, or other picked over three pounds as their second choice.

An examination of product form and most preferred size indicated that 42% (822) preferred under two pound fish, followed by over three pound fish with 25%. Three pound fish dropped to third place with 23%. Results were consistent across the 10-state sample, except for Virginia, Maryland, and Delaware--where headed and gutted were slightly preferred over whole.

Table 16. Preferred Size vs Product Form

	N = 843				N = 822			
	What size HSB would you PREFER to buy?	What size would you MOST prefer to buy?						
	Under 2 lbs	3 lbs	Over 3 lbs	Other	Under 2 lbs	3 lbs	Over 3 lbs	Other
Filleted	214	104	81	38	176	104	93	47
Whole	88	51	44	8	77	47	50	9
Headed and Gutted	77	29	35	6	68	28	42	7
Steaked	24	11	12	3	20	14	10	3
Headed Only	7	1	1	0	5	0	3	1
Other	3	1	3	2	3	0	4	2
Totals	413	197	176	57	348	193	202	69

### Price

Information on potential hybrid striped bass prices available to growers was obtained by asking two pricing questions regarding what respondents would pay per pound for hybrid striped bass and how those prices would be determined.

On a per pound basis, restaurants indicated a willingness to pay \$2.51-\$3.00 and \$3.01-\$4.00 respectively [Table 17]. In comparison, Carlbert and Van Olst 1987, Smith 1988, found a price range of \$2.00-\$5.00 per pound, while Lipton and Swartz, 1988, found prices on the order of \$4.00 per pound. Results of the willingness to pay question, however, may be misleading because no quantities were implied; and respondents likely had a specified quantity in mind when responding to the question. Alternatively, the available information is inadequate for assessing demand; however, it does provide a range of possible prices restaurants will pay to producers.

Table 17. Price

N = 761		
What would you pay per pound for hybrid striped bass?		
No. of Respondents	%	\$ Range
243	32%	\$2.51-\$3.00
203	27%	\$3.01-\$4.00
152	20%	\$2.01-\$2.50
104	14%	\$1.50-\$2.00
59	7%	\$4.01-\$5.00

Restaurants responding to the question of market price determination indicated a preference for individual negotiation (51%); the second choice was the New York/Fulton Market (26%) [Table 18]. "Other Central market" and "Other" (bid system, price comparison, local market, weekly quotes from different vendors, corporate determination, etc.) were third and fourth. This ranking was consistent across the ten states, except for New York and New Jersey, where the New York/Fulton Market was first, followed by individual negotiation.

Table 18. Price Determination

N = 830		
How would the price you pay for hybrid striped bass be determined?		
	<u>No. of Respondents</u>	<u>%</u>
Individual Negotiation	424	51%
New York/Fulton Market	214	26%
Other Central Market	109	13%
Other	83	10%

Pricing across all restaurant classifications indicated a preferred price range of \$2.51-\$3.00. The second preferred price range was \$3.01-\$4.00 [Table 19]. An exception was the "Specialty" category where this order was reversed.

Table 19. Price vs Classification

N = 756					
What would you pay per pound for hybrid striped bass?					
	<u>\$1.50-\$2.00</u>	<u>\$2.01-\$2.50</u>	<u>\$2.51-\$3.00</u>	<u>\$3.01-\$4.00</u>	<u>\$4.01-\$5.00</u>
Other	40	50	74	70	21
Seafood	31	48	70	60	10
Ethnic	17	25	50	28	10
Specialty	7	15	22	24	11
Steak	<u>9</u>	<u>13</u>	<u>27</u>	<u>18</u>	<u>6</u>
Totals	104	151	243	200	58

In general, these ranges were selected regardless of preferred fish size. Although restaurants preferring fish

under two pounds picked \$2.51-\$3.00 as their first choice, their second choice was \$2.01-\$2.50 [Table 20].

Table 20. Price vs Size

	N = 736				
	What would you pay per pound for hybrid striped bass?				
	<u>\$1.50-\$2.00</u>	<u>\$2.01-\$2.50</u>	<u>\$2.51-\$3.00</u>	<u>\$3.01-\$4.00</u>	<u>\$4.01-\$5.00</u>
Under 2 Pounds	61	86	106	84	24
3 Pounds	22	49	97	74	11
Over 3 Pounds	14	35	79	74	30
Other	<u>13</u>	<u>13</u>	<u>18</u>	<u>17</u>	<u>5</u>
Totals	110	183	300	249	70

These results were consistent when comparing preferred product form against price [Table 21]. However, an exception was found for those choosing "Headed Only" and "Other", in which \$2.01-\$2.50 and \$4.01-\$5.00 were the second place choices.

Table 21. Price vs Product Form

	N = 751				
	What would you pay per pound for hybrid striped bass?				
	<u>\$1.50-\$2.00</u>	<u>\$2.01-\$2.50</u>	<u>\$2.51-\$3.00</u>	<u>\$3.01-\$4.00</u>	<u>\$4.01-\$5.00</u>
Filletted	46	77	133	113	25
Whole	28	38	46	43	17
Headed and Gutted	22	24	37	32	10
Steaked	4	10	18	10	3
Headed Only	1	2	3	1	1
Other	<u>1</u>	<u>0</u>	<u>3</u>	<u>1</u>	<u>2</u>
Totals	102	151	240	200	56

Analysis suggested that the price ranges preferred in Tables 17, 19, 20, and 21 were not affected by price determination method [Table 22]. Those choosing the New York/Fulton Market were an exception, with the top two choices being reversed.

Table 22. Price vs Method of Determination

	N = 723				
	What would you pay per pound for hybrid striped bass?				
	<u>\$1.50-\$2.00</u>	<u>\$2.01-\$2.50</u>	<u>\$2.51-\$3.00</u>	<u>\$3.01-\$4.00</u>	<u>\$4.01-\$5.00</u>
Individual Negotiation	63	88	113	92	23
New York/Fulton Market	17	31	55	63	17
Other Central Market	8	20	32	24	10
Other	<u>10</u>	<u>6</u>	<u>30</u>	<u>13</u>	<u>6</u>
Totals	98	147	230	192	56

## Miscellaneous

In order to formulate a well-reasoned, far-reaching proposal for future action on finfish and shellfish, respondents were asked specific questions about their clientele and to provide observations on the finfish/shellfish markets.

In response to the question "Are customers more diet and health conscious than five years ago?", 885 of 964 responding said "Yes". When asked what their customers would most prefer, 63% of the 954 respondents indicated broiled/baked fish. Twenty-three percent (23%) indicated specialty recipes; and health-related recipes and fried fish were third and fourth with 10% and 4%, respectively.

Information on changes in seafood sales over time was obtained by asking restaurants to rate their seafood sales over the last five years. Of 949 responses received, 50% (473) indicated their sales had substantially increased; 34% (319) indicated they had slightly increased. "Remained the Same", "Slightly Decreased", and "Substantially Decreased" comprised the remaining 13%, 3% and 1%.

When asked to rate finfish sales over the past five years, 410 of the 923 responses (44%) indicated a substantial increase; and 346 (37%) indicated that sales had slightly increased. "Remained the Same", "Slightly Decreased", and "Substantially Decreased" accounted for 14%, 4%, and 1% of the remaining responses, respectively. A similar question of



shellfish sales had 280 of the 934 respondents indicating their sales had substantially increased, and 341 (37%) said they had slightly increased. "Remained the Same", "Slightly Decreased", and "Substantially Decreased" were 22%, 10%, and 1%, respectively.

Last, the sample was asked "Over the next five years, in which category do you expect seafood sales to grow the most?". Of the 920 restaurants responding, 80% indicated finfish; and 20% indicated shellfish.

## WHOLESALE SURVEY RESULTS

The wholesaler questionnaire was designed to obtain data on the existing wholesale markets in a ten-state area (including the District of Columbia). Questions were developed to determine sales, purchases and aquaculture familiarity and usage, and specific information about hybrid striped bass. In order to provide a comprehensive overview of these findings, responses were divided into four segments:

1. Overview. Discuss overall response rate and geographic breakdown of the respondents.
2. Classification. Discuss in general the characteristics of those wholesalers responding to the survey instrument.
3. Aquaculture. Discuss the familiarity of this sample with aquacultured seafood, experience in offering aquacultured products, and future intent to sell.
4. Hybrid Striped Bass. Discuss the familiarity of this sample with hybrid striped bass, their willingness to offer it in the future, and the factors that would predicate future hybrid striped bass sales.

## WHOLESALE OVERVIEW

Out of 920 wholesalers, only 65 responded to this survey [Table 23]. Since the response rate was low, general conclusions about wholesalers cannot be made using the survey results. When appropriate or applicable, findings were compared in the Analysis section against other comparable studies.

Table 23. Geographic Location

<u>State</u>	<u>No. of Respondents</u>
New York	27
Pennsylvania	17
Virginia	18
Maryland	5
Total	65

## WHOLESALE CLASSIFICATION

Respondents indicated they primarily sold finfish products (63%) as opposed to shellfish (37%) on a year-round basis (91%). Of those indicating seasonal finfish sales, 70% preferred to sell year round.

### Finfish

Wholesalers responding to the question of finfish sales sold finfish directly to restaurants or hotels (33%), in-house retail (27%), and other wholesalers (22%). The remaining 18% included other retailers and other (institutions).

Wholesalers surveyed indicated they purchased their finfish primarily in-state (39%), nationally (36%) and internationally

(25%). Aside from the ten surveyed states, national purchases were primarily from Florida, the Carolinas, Maine, Georgia, Louisiana, Washington, and California. Other states mentioned were Texas, Oregon, Idaho, and Connecticut.

International purchases were primarily from Norway, Canada, Chile, New Zealand, Mexico, Iceland, and Ecuador. Other areas mentioned were Jamaica, England, Peru, Panama, Scotland, and Ireland. Finfish species and products were primarily obtained from other wholesalers (45%). The second and third sources of product were indirect aquaculture (18%) and other fleet (19%).

Information on the existing wholesale market was obtained by asking respondents to indicate their approximate annual dollar and poundage volume. Twenty-eight (28) wholesalers responded to the question of annual dollar volume for a combined total of approximately \$58,046,000--an average of \$2,073,071 per company. Dollar responses ranged from \$11,000 to \$24 million annually. Thirty-two (32) wholesalers responded to the question of annual poundage volume for a combined total of 25,075,500 pounds--an average of 783,609 per company. Poundage values ranged from 2,250 pounds to 12 million pounds annually.

#### AQUACULTURE

A secondary intent of this research was to gain information on the existing aquaculture market and its overall potential.

Familiarity, use, and potential use of aquacultured products are discussed in this section.

### Familiarity

Eighty-four percent (84%) of the wholesalers responding to the question of aquaculture familiarity indicated they were familiar with aquacultured products. This degree of familiarity was evenly distributed among wholesalers that sold finfish and/or shellfish.

### Products Offered

When asked to list aquacultured products sold, respondents chose catfish (27%), salmon (25%), and shrimp (20%). These selections were followed by "Other" (shellfish, mussels, oysters, clams, trout, talipia), and hybrid striped bass (10%). When asked which species or product accounted for the most sales, three species - salmon, shrimp, other, and catfish - were given as the preferred choices. When asked what percent of total sales volume was aquacultured products, 38% said "Up to 10%". Twenty-one percent (21%) indicated they did not sell aquacultured products, and 16% indicated "Greater than 30%" (16%) [Table 24].

Table 24 - Primary and Secondary Aquacultured Products

	<u>Response Rate</u>	<u>Primary Product</u>	<u>Secondary Product</u>
0%	21%	N/A	N/A
Up to 10%	38%	Aquacultured Catfish	Aquacultured Salmon
11-20%	14%	Aquacultured Salmon	Aquacultured Catfish
21-30%	12%	Aquacultured Catfish	Aquacultured Salmon
Greater than 30%	16%	Other	Aquacultured Salmon/Shrimp

In response to the question "If you do not sell aquacultured products, do you plan to sell them in the future?", 45% of those responding indicated they would, while 41% did not know.

#### HYBRID STRIPED BASS

##### Familiarity

Sixty-three percent (63%) of the wholesalers responding indicated they were familiar with hybrid striped bass, and 61% indicated they considered hybrid striped bass to be a year-round product. Twenty-five percent (25%) of those responding to the question of hybrid striped bass sales indicated they sold hybrid striped bass. The primary sales area was New York, followed by Maryland and Other (Pennsylvania, Ohio, and Connecticut).

Fifty-one percent (51%) responded to the question of contract sales by indicating they would consider buying a specific quantity of hybrid striped bass on a continuing basis, and 47% said they would not. Reasons cited against buying on contract were low profit margin, unknown sales potential, inadequate demand, high price, poor sales against porgy, croaker, and perch, and dislike of buying on contract.

### Factors

When asked to indicate the top two factors that would encourage offering hybrid striped bass, 28% of the wholesalers said guaranteed and predictable supply, and 22% noted high margin. Seasonal availability and high expected sales were third and fourth with 17% and 10%, respectively.

### Competition

Wholesalers indicated that wild striped bass was the major competitor for hybrid striped bass, with the second major competitor being bluefish/sea trout. Cod/haddock/pollock and fresh water trout tied for third.

### Product Size

When asked to indicate the preferred purchase size of hybrid striped bass, 42% of those responding chose two pound fish, followed by 22% for three pound fish, and 17% for fish over three pounds. Additional responses (11%) indicated the preferred size to be anything from "legal size" to up to ten pounds. Sixty-nine percent (69%) of those responding to the question of size versus price indicated they would not pay more for larger sized hybrid striped bass.

## Price and Quantity

When asked the minimum quantity and selling price of hybrid striped bass they would be willing to purchase weekly, average prices cited ranged from \$2.08 to \$9.10 per pound [Table 25]. Corresponding minimum amounts in pounds ranged from an average of 419 pounds to an average of 568 pounds, in varying order.

Table 25. Average Sales Price and Average Minimum Purchase Quantity

<u>Purchase Price</u>	<u>Avg. Sales Price (\$/lb)</u>	<u>% of Respondents</u>	<u>Avg. Min. Quantity (Pounds)</u>	<u>% of Respondents</u>
\$1.00	\$2.08	13%	568 pounds	34%
2.00	3.38	18%	405 pounds	24%
3.00	4.82	20%	550 pounds	19%
4.00	6.08	18%	419 pounds	11%
5.00	7.47	14%	516 pounds	7%
6.00	9.10	17%	389 pounds	5%

Individual responses indicated a range of sales prices from \$1.25 to \$12.00 and quantities between 20 and 5,000 pounds per week [Table 26]. While values given for the top end of the sales price range were designated by some respondents as being the price paid for fillets, the ranges were relatively consistent across the sample.

Table 26. Price/Quantity Ranges

<u>Purchase Price</u>	<u>Sales Price Range (\$/lb)</u>	<u>Quantity Range (Pounds)</u>
\$1.00	\$1.25 - 4.99	20 - 5,000
2.00	2.50 - 6.00	20 - 4,000
3.00	3.50 - 9.00	20 - 3,000
4.00	4.50 - 8.00	20 - 2,000
5.00	5.50 - 10.00	20 - 1,000
6.00	7.00 - 12.00	20 - 1,000

Fifty-five percent (55%) of those responding to the question of price determination indicated they would use individual negotiation, followed by 23% for the New York/Fulton Market, 14% for other central market, and 9% for other (Baltimore Market, cost, yield, margin, preparation loss, form).



## ECONOMICS OF PRODUCTION: POND-RAISED HYBRID STRIPED BASS

Assessing the economic and commercial feasibility of raising hybrid striped bass in Virginia was not within the realm of available data. Information of costs and earnings was inadequate. Economics of scale and scope and returns to size have not been determined. Optimal pond design and construction characteristics are unknown. Previous studies have apparently recognized these limitations and examined the economics of production for a standard 2.5-acre Phase I growth pond and a 7.5-acre Phase II grow-out pond (Brown et al. 1988; Strand et al. 1989).

This particular arrangement permits a combination of 2.5-acre and 7.5-acre ponds to be used for growing Phase I fingerlings (2-4 inch fish) to Phase II fingerlings (6-8 inch fish). After one year of growth, the Phase II fingerlings are transferred to 7.5-acre ponds. This design assumes that 3 times the size of a growth pond is necessary for final grow out. It is not known if this design is biologically and economically optimal (i.e., maximum poundage and minimum cost).

The size relationship could be varied or changed in accordance with air temperature, stocking density, feed rations, aquatic plant life, shape, water depth, aeration,

pond liners and construction material, and several other factors. Nevertheless, existing studies indicate that hybrid striped bass may be profitably raised using the 2.5/7.5-acre design. Strand et al. (1989) estimated production costs per pound in Maryland to be between \$1.96 and \$2.88.

If farm price received is \$2.50 per pound or higher and production costs are \$1.96 per pound, the operation appears profitable. For the high production cost scenario (\$2.88 per pound), farm prices received must be \$2.89 per pound or higher to realize profits. For both scenarios, supervisory services and labor costs were estimated to account for approximately 30% of total costs; cost savings could be possibly realized by the use of owner-operator and family labor.

In comparison, Brown et al. (1988) estimated costs per pound in North Carolina to be between \$1.68 and \$2.05 for a 30-water-acre farm using the 2.5- and 7.5-acre design. Given current expected farm prices of \$2.50 plus per pound for whole fish of 1.5 pounds or larger, raising hybrid striped bass would appear to be profitable.

A major concern to the prospective fish farmer involves required start-up costs and annual operating costs. Brown et al. indicate that the initial investment for farmers who already own the land and much of the general farm machinery would be approximately \$166,616 for a 30-water-acre farm. Alternatively, the initial investment would be approximately \$240,616 for a 30-water-acre farm using the 2.5/7.5-acre pond

design in which land and all machinery had to be obtained [Table 27].

Table 27. Start-Up Costs for 30-Water-Acre Farm on 40 Acres of Land Using the 2.5/7.5-Acre Design<sup>a</sup>

	Costs Independent of Pond Size	Construction and Equipment Costs
Land	\$ 32,000	
Wells	40,000	
Buildings	12,000	
Feed Storage	11,000	
Nets	4,000	
Test Equipment	1,800	
Trucks	12,000	
Tractors	15,000	
Feeders	2,500	
Misc. Equipment	10,000	
PTO-Drive Pumps	3,600	
<b>Total</b>	<b>\$ 152,800</b>	
Levees		\$ 47,000
Water Pipes		4,400
Valves		2,000
Drainage Structure		7,800
Aerators		17,500
Electrical Service		6,210
<b>Total</b>		<b>\$ 87,710</b>
<b>Total Costs of Construction and Equipment</b>		<b>\$ 238,610</b>

<sup>a</sup>Information on costs of construction and equipment obtained from Brown et al. (1988).

Brown et al. also provide a summary of total fixed and variable costs likely to be incurred by the third year or expected year of harvest [Table 28]. Production for 30 water acres using a 2.5- and 7.5-acre pond design was 109,133 pounds, and total costs per pound were between \$1.69 and \$2.00. Major cost items included salaries, depreciation, acquisition of fingerlings, feed, and sales costs. These items accounted for approximately 53% of total costs in the harvest year.

Table 28. Fixed and Variable Cost for 30-Acre Water Farm,  
Using 2.5/7.5 Acre Pond Design  
(Third Year of Operation)

Fixed and Variable Costs	Dollar Amounts	
<b>Fixed Costs:</b>		
Salaries	\$	30,000
Hourly Wages (1/2 person per 30 acres)		1,500
Property and Payroll Taxes		6,548
Insurance		1,500
Maintenance		9,398
Depreciation		16,848
<b>Total Fixed Costs</b>	<b>\$</b>	<b>71,793</b>
<b>Variable Costs:</b>		
	<b>Fingerlings</b>	<b>Growout</b>
Fingerlings	\$ 16,805	\$
Feed	15,843	48,914
Chemicals	150	450
Fuel	1,899	5,086
Electricity	578	1,733
Harvesting		5,457
Sales Costs		16,370
<b>Total Variable Costs</b>	<b>\$ 34,985</b>	<b>\$ 78,020</b>
<b>Combined Variable Costs (Fingerlings + Growout)</b>		<b>\$ 112,985</b>
<b>Total Costs (Fixed + Variable)</b>		<b>\$ 184,778</b>
<b>Per Acre</b>		<b>\$ 6,159</b>
<b>Per Pound of Fish</b>		<b>\$ 1.69</b>

Source of fixed and variable costs information:  
Brown, J.W., J.E. Easley Jr., and R. G. Hodson (1988), "Investment and  
Production Costs for the Hybrid Striped Bass X White Bass in North Carolina",  
Working Paper 88-2, UNC Sea Grant College Program, Box 8605, North Carolina  
State University, Raleigh, N.C. 27695.

It is unlikely that production costs in Virginia would be the same as the costs presented in Strand et al. or Brown et al. Land acquisition and construction costs and salaries would likely be quite different. A reasonable scenario for Virginia is that total production costs per pound would be between the levels estimated in Strand et al. and Brown et al. For one thing, land acquisition costs and construction costs in Virginia would likely be lower than Maryland but higher than North Carolina. Production costs less than \$2.50 per pound would appear possible for Virginia.

Unfortunately, the production economics of raising hybrid striped bass involve more than the determination and assessment of production costs. Additional issues include determination of optimum size of fish, rate of removal, and timing of harvest.

Current commercial practices typically result in the harvest of an entire crop of one age-class or size (usually 1-1.5 pound fish). This practice makes available a large quantity of fish to the market at one period of the year. The net results are difficulty in marketing the total production and lower pond prices than would be realized by spreading production over a year. Moreover, restaurants have indicated a preference for a year-round supply. In Virginia, staggered production scheduling would likely mitigate the marketing and pricing problems.

A possible way to stagger production is to use smaller pond designs (e.g., 1.25- rather than 2.5- and 3.75- vs. 7.5-acre ponds) and delay Phase I and II activities.

Unfortunately, the smaller design increases production costs. Brown et al. estimated that production costs for the smaller pond design would increase costs by approximately 2.5% per pound. The smaller design, however, does permit the production and harvesting of different sizes and quantities of fish. The ability to spread production over a year and provide different sized fish would permit greater flexibility by producers to respond to market conditions.

A related production problem is the apparent preferred product form. Dealers and wholesalers will purchase whole fish but not usually at prices deemed adequate by growers. In the near future, dealers will have even less incentive to pay a premium price for hybrid striped bass; 5-7 pound salmon are currently selling at \$3-3.35 per pound on the Fulton market, and restaurants have indicated a consumer preference for salmon over hybrid striped bass. Restaurants have indicated they will buy direct from the pond but prefer fillets.

The combination of widely available low-priced salmon and a preference for fillets suggest that fish farmers may have to process the fish and be competitive with salmon. This need will be increasingly important if producers follow a single age-class or size production strategy.

In general, the production economics of raising hybrid striped bass in Virginia cannot be adequately determined from available information. Previous studies for Maryland and North Carolina, however, provide reasonable limits on likely production costs in Virginia using current technology and commercial practices.

The costs of production in Virginia would likely be between \$1.86 and \$2.88 per pound. Current prices received at the production site are between \$2.50 and \$3.50 per pound for whole fish. However, it appears likely that harvesting of wild striped bass will be permitted in 1990 or 1991. If this

occurs, the expected commercial harvest will be low but should provide a significant substitute for farm-raised hybrid striped bass.

The presence of high-volume, low-priced salmon is not expected to continue but will nevertheless affect the pond price of hybrid striped bass in the short-run. The various problems of production costs and competition from salmon and the wild fishery indicate that raising hybrid striped bass in Virginia will be risky. The successful producer will likely have to adopt a production strategy that reduces costs below \$2.88 per pound and staggers production of small quantities of fish over a year.

## CAPITAL FINANCING

A major problem for potential fish farmers will be obtaining funds for start-up costs. Therefore, a variety of banks and government institutions were contacted to determine the level of difficulty a farmer might encounter in obtaining initial funding for a hybrid striped bass aquaculture facility (Appendix IV).

In general, banks found the concept to be a high-risk venture that was out of character with their conservative history. They required collateral in the form of land, buildings, boats, etc., as well as knowledge of the customer. Banks that had branches in traditional marine resource areas such as Gloucester, Virginia, were more prepared to discuss financing an aquaculture venture. A representative of one bank indicated their Capital Markets Department would be willing to discuss a private equity placement. Prior to considering a loan, banks indicated they would need information on the following:

- 1) product demand
- 2) level of production
- 3) prevalence of disease and average survival rates
- 4) type of government guarantees, if any

Bankers generally believed that a start-up venture might best be financed through the use of venture capital. Venture



capitalists can be contacted through local banking officers, CPA firms, and law firms. Their biggest concern would be equity appreciation, farmer experience, and product demand. As speculators, they are less risk averse than conventional lending institutions but would likely require a higher rate of return from successful ventures.

Regardless of the financing method chosen, the farmer must be prepared to provide the following information:

- 1) proforma income statements
- 2) defined business plans
- 3) listings of personal assets
- 4) business returns from the past three years (if applicable)
- 5) demand and yield projections (particularly for venture capitalists)

In addition, the Small Business and Financial Services division of the Virginia Department of Economic Development is prepared to assist potential aquaculture farmers with advice and counseling. They sponsor a growing number of small business development centers throughout the Commonwealth that will assist prospective farmers in preparing the required statements, business plans, and projections. These offices will conduct weekend training seminars on a variety of financial topics (how to start a business, financial and economic considerations, etc.) should a number of potential aquaculture farmers require this service.

Small business development centers are located in South Boston, Farmville, Richmond, Harrisonburg, and Charlottesville, with new ones opening in Norfolk and Newport

News. Two additional centers are scheduled to open in western Virginia at a later date. Residents in Northern Virginia should use the small business development center at George Mason University.

## ANALYSIS AND CONCLUSIONS

One of the more significant responses to the restaurant survey was the strong indication of overall finfish sales growth over the next five years. This trend has been noted in recent marketing studies (Lipton and Swartz, 1988; Strand and Lipton, 1988), seafood journals (Seafood Business, 1989; NCRI News, 1989) and research papers (Helfrich, Libey and Neves, 1988). This appears to coincide with the perceptions of restaurants surveyed of increasingly health conscious customers who are consuming substantially more fish as broiled/baked entrees. It also is believed to reflect a reduction in consumer demand for shellfish, which could partly be the result of increased publicity of contaminated shellfish.

To emphasize this possible tendency towards healthier eating, a discussion of dietary guidelines from the 1988 Surgeon General's Report and their potential impact on finfish consumption has been provided at Appendix V.

If this trend continues and the demand for finfish escalates as wild harvests diminish, aquacultured seafood will become an important means of supplying growing consumer needs. Faced with an increasing supply of imported aquacultured seafood and dwindling agricultural production, America's

farmers should be looking to fill this growing demand with domestically aquacultured products.

Study results indicate that restaurants and wholesalers share a high aquaculture familiarity rate and are already using a variety of aquacultured seafood products--primarily shrimp, salmon, and catfish. Over 94% of the restaurants and 91% of the wholesalers responding indicated a preference for year-round finfish availability. Since one of aquaculture's strong points is the ability to offer previously seasonalized seafood throughout the year, hybrid striped bass farmers could be in a position to capitalize on the opportunity to fulfill this year-round demand for finfish. In general, selling the concept of aquacultured seafood to potential buyers should not pose a major problem to seafood growers.

Unfortunately, selling hybrid striped bass specifically may pose a problem since only 22% of the restaurants responding indicated they were familiar with hybrid striped bass. This low familiarity rate was also found in a recent University of Delaware study (Wirth, 1989). Despite this low rate, restaurants indicated a strong willingness to offer the product, particularly given more information. On the other hand, wholesalers appeared to feel the market demand was not strong enough to merit their interest at this point--a possible factor leading to their poor survey response. Thus, growers facing a market familiar with the concept of aquaculture and its inherent benefits will have to penetrate

that market by convincing individual buyers to purchase aquacultured hybrid striped bass. To do so will require a greater degree of marketing skills and resources than the average fish farmer possesses.

Despite the indication that restaurants purchase the bulk of their seafood products from wholesalers, 70% appeared to prefer the option of buying hybrid striped bass directly from the grower. This willingness on the part of restaurants to purchase directly from the grower agreed with findings by Wirth (1988) and with personal interviews conducted in the Williamsburg area (Appendix III).

Restaurant comments indicate that buyers feel they can obtain a greater degree of control over finfish quality and establish purchase prices by contracting directly with the grower. Since high margin is a major factor that would encourage restaurants to offer hybrid striped bass, eliminating the middleman in establishing purchase prices would be to the advantage of both buyer and seller.

While restaurants indicated that guaranteed supply would be the second major factor encouraging them to purchase hybrid striped bass, it was also the factor that caused them the most concern in contracting with a single grower. For example, a restaurant that might contract with a grower for 10,000 pounds of bass annually would actually require shipment in small lots on a weekly basis. Restaurants primarily want fresh (not frozen) fish; and even if they did serve frozen, most lack the

facilities to store large quantities of any one product. They want to be assured that the individual grower with whom they contract can guarantee weekly shipments of the size and quantity demanded. As a result, potential hybrid striped bass growers will have to weigh their farm limitations against customer requirements before embarking on any direct contracts. Growers should be prepared to meet requirements once they enter the contract.

Survey results indicate the existence of two distinct size markets for hybrid striped bass, one for fish under two pounds and the second for fish weighing three pounds and over. Size appears to be dependent upon the preferred purchase form: fillet, panfish or steaked. This is particularly true of those restaurants that could not give a precise size because they lacked familiarity with the species--indicating instead "Whatever size will guarantee a fillet in the 8-10 ounce range." This means that potential hybrid striped bass farmers must be prepared to supply a variety of sizes. Farmers will not only have to decide whether to grow hybrid striped bass using tank or pond structures (or both), but they will also have to determine how to stagger harvests. In the latter case, larger fish require a longer growing cycle, causing an initial delay of profits.

Preferred restaurant form indicates that hybrid striped bass growers must contend with the preprocessing requirements of their clients. This will involve the added overhead of

additional employees and/or machines designed specifically for the fish industry or will require that processing be done on a contractual basis.

Once again, farmers must know their market and be prepared to satisfy its needs on a continuing basis.

A distinct difference between wholesaler and restaurant responses was found in the perception of market competition. Wholesalers listed wild striped bass and bluefish/sea trout as the top two competitors, and restaurants listed salmon and flounder--coincidentally their top two finfish offerings.

With seafood markets facing a potentially restricted or limited supply of flounder, substitution of hybrid striped bass for flounder could be a logical choice given comparable pricing and guaranteed supply. However, with the growing number of aquacultured salmon farms, substitution of hybrid striped bass for salmon should become less dependent upon supply and more dependent upon price and customer perceptions.

In essence, if hybrid striped bass are perceived as being the traditional bland, flaky finfish consumers are accustomed to and if restaurants can generate a high profit margin, hybrid striped bass growers should meet with acceptance of their product. On the other hand, long-term acceptance of hybrid striped bass by wholesalers could be adversely affected if the capture of wild striped bass once again becomes feasible.

Price and volume pose yet another problem for the prospective hybrid striped bass farmer. As indicated earlier, a restaurant may contract directly with a grower for a large amount of fish but will not want all of the product at one time--preferring to receive it weekly in small lots.

Restaurants indicated that they purchase from 1,000 to 35,000 pounds of finfish per year. The overall average was 24,000 pounds per restaurant per year. Sales of hybrid striped bass would not be expected to exceed 5,000 pounds per year per restaurant, particularly given the low awareness levels for hybrid striped bass. Available information indicates a price of \$1.76-\$2.88 must be received to break even for a farm producing 109,000 pounds of hybrid striped bass. At that rate and assuming annual contracts of 5,000 pounds per restaurant, a grower should plan on marketing to 22 restaurants. Given a price of \$3.00 and production cost of \$2.88 per pound, annual sales of nearly 105,000 pounds would be required to break even.

Fortunately for prospective hybrid striped bass growers, study results indicate that seafood sales should not be limited strictly to seafood restaurants. Although these restaurants quite naturally have the highest overall seafood purchase volume, a significant market appears to exist outside the seafood realm--particularly in those restaurants offering nouveau cuisine. Thus, potential hybrid striped bass farmers should have the option to market their product to more than



one segment of the restaurant industry--provided they can meet a variety of size, form, and shipping requirements.

In general, the successful finfish farmer will be one who can target a market, study its needs, and be flexible enough to meet those needs with reliability and a consistently high quality product.

## RECOMMENDATIONS AND SUGGESTED RESEARCH

Prior to discussing any recommendations, two issues need to be discussed. These involve:

- 1) seed stock availability and cost
- 2) existing laws and regulations<sup>7</sup>

A successful hybrid striped bass facility requires a guaranteed and consistent supply of high quality, reasonably priced seed stock and an atmosphere conducive to sales. At present, a reliable supply of seed stock is not available, primarily because its development is a highly regulated procedure. In addition, laws and regulations governing the aquaculture and sale of hybrid striped bass are inconsistent and vary from state to state.

If the Commonwealth is serious in its commitment to providing alternate crops for farmers and in encouraging new industries, it must help insure that Virginia's aquaculture farmers are guaranteed adequate, competitively priced seed stock and unrestricted interstate sales markets.

Initial recommendations have been based on one question: "Is there a market for hybrid striped bass?". The answer is

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<sup>7</sup>Aquaculture Magazine, "Aquaculture of Striped Bass and Its Hybrids in North America", Smith, Theodore I.J., 1988.

"Yes"; however, there are qualifications.

At one time, wild striped bass were a staple in restaurants along the Eastern Seaboard. Unfortunately, that was over ten years ago. The restaurant industry is noted for its high turnover rate. It is not unreasonable to assume that many of today's restaurant owners and chefs have never heard of, eaten, prepared, or served striped bass. This translates into low customer awareness.

Thus, while research indicates there is a potential market for hybrid striped bass, it also indicates that this market will require extensive, arduous work on the part of potential growers and state officials. All recommendations are, therefore, based upon that premise.

1. **Provide Information.** Potential growers should have access to a wide variety of current data prior to committing time and money to a start-up venture. The State should develop a comprehensive information packet including current data on: start-up costs; comparisons of pond structures; environmental issues; "How To" brochures on raising hybrid striped bass, building appropriate structures, and developing appropriate markets; financial and economic information including business development, financial assistance, training assistance; available research articles/publications; and lists of individuals, institutions, or government offices that can assist prospective farmers. A sample layout of this packet has been furnished to the Department of Agriculture.
2. **Provide Incentives.** Research indicates that offering financial assistance in the form of state backed loans, etc., does not always provide the impetus necessary to develop a financially successful business. Since it is important for the Commonwealth to show their support for aquaculture farmers, the State might supply the initial start-up supply of fingerlings once a prospective farmer has built the appropriate facility. In addition, the Commonwealth could offer backing of the type offered under the

Virginia's Finest Program. Research indicates that buyers would respond positively to this sign of good faith and that Virginia is contemplating such backing for aquacultured catfish. A pamphlet explaining the Virginia's Finest Program should be included in the information packet discussed in Recommendation 1.

3. **Target a Market.** Study results and research indicate that restaurants and retail sales outlets offer the most feasible markets at present. Restaurants anticipate long-term finfish sales growth, are familiar with aquacultured products, and are interested in offering hybrid striped bass. Restaurants in New York, Pennsylvania, New Jersey, and Virginia evinced the highest degree of hybrid striped bass familiarity and the most willingness to offer hybrid striped bass in the future. These four states should be considered as strong, initial targets for potential growers, if shipping and processing arrangements for out-of-state are not prohibitive. In addition, retail sales outlets must be considered as a market even though they were not surveyed in this study.
4. **Create a Demand.** Given the low awareness level for hybrid striped bass, consumer demand will have to be piqued before the product begins to "sell itself". To this end, the Commonwealth, research institutions, and current hybrid striped bass growers should work together to bring the product to the public's attention. This involves getting media interest, advertising in trade magazines, providing taste tests and sample testing of the product, and offering price incentives to restaurants and retail establishments on a first-time purchase basis.
5. **Develop a Market Strategy.** To do this, the grower must establish a reasonable geographic servicing area and then determine the needs of the restaurants and/or retail establishments within that area. Once these needs are established, the grower must determine which of them (if any) his or her facility can support and then prepare to fill those needs consistently and reliably.
6. **Provide Additional Research.** As in any start-up venture, the amount of current information available is limited and often contradictory. Additional areas that merit further research involve the following:
  - a) Price and Cost Effectiveness. As discussed earlier, a small scale production bass facility must

sell 109,000 pounds of product yearly at a price of \$1.76-\$2.88 per pound to break even. Since the purpose of having a business is to make a profit, and since it is highly unlikely that growers will get more than \$3.00 per pound on their initial sales, researchers and growers should work together to discover a more cost effective method of designing a facility that will lower production costs.

b) Additional Markets. It is not unreasonable to assume that with an increased number of hybrid striped bass growers, capturing significant market share will become increasingly difficult. Therefore, research on potential sales markets in the Midwest should be conducted. California growers are apparently already marketing Sunshine Bass through the Chicago markets, and initial research indicates midwesterners are enthusiastic consumers of seafood, particularly in restaurants. Exploring the wholesale market in this region could give Virginia growers the chance to create demand among an another group of seafood users.

c) Alternative Products. Although this study dealt primarily with hybrid striped bass, it is apparent that the issue of aquaculture in general will become increasingly important in the future. Successful aquaculture ventures will be found in a variety of areas, and the Commonwealth should continue their work on determining which of these will be most beneficial to Virginia farmers.

APPENDIX I

COLLEGE OF WILLIAM AND MARY  
 VIRGINIA INSTITUTE OF MARINE SCIENCE  
 AND  
 BUREAU OF BUSINESS RESEARCH  
 SCHOOL OF BUSINESS ADMINISTRATION

(1-4)  
 Please Do Not  
 Write in This  
 Space

1) Is your restaurant primarily...? (Please check only one response)

- a) Seafood\_\_\_\_\_ d) Specialty\_\_\_\_\_
- b) Steak\_\_\_\_\_ e) Other (Please specify)\_\_\_\_\_
- c) Ethnic\_\_\_\_\_

5 \_\_\_\_\_

If you checked seafood, what do you primarily offer? (Please check only one response)

- a) Finfish\_\_\_\_\_ b) Shellfish\_\_\_\_\_

6 \_\_\_\_\_

2) Which best describes your restaurant? (Please check only one response)

- a) Independently Owned \_\_\_\_\_
- b) Family Owned \_\_\_\_\_
- c) Chain (Local) \_\_\_\_\_
- d) Chain (Regional) \_\_\_\_\_
- e) Chain (National) \_\_\_\_\_

7 \_\_\_\_\_

3) Do you offer finfish in your restaurant?

Yes\_\_\_\_\_ No\_\_\_\_\_ If no, please skip to Question 6

8 \_\_\_\_\_

4) From which of the following does your restaurant obtain finfish? (Check all that apply)

- a) Direct from boat \_\_\_\_\_
- b) Direct Aquaculture \_\_\_\_\_
- c) Direct Other (Please specify)\_\_\_\_\_
- d) Retailer \_\_\_\_\_
- e) Wholesaler \_\_\_\_\_
- f) Own Facilities (Please specify)\_\_\_\_\_
- g) Other (Please specify)\_\_\_\_\_

9 \_\_\_\_\_  
 10 \_\_\_\_\_  
 11 \_\_\_\_\_  
 12 \_\_\_\_\_  
 13 \_\_\_\_\_  
 14 \_\_\_\_\_  
 15 \_\_\_\_\_

Of the above, list by letter the one you consider to be your primary finfish source?\_\_\_\_\_

16 \_\_\_\_\_

5) Are your finfish entrees primarily...? (Please check only one)

- a) Year Round\_\_\_\_\_ b) Seasonal (indicate months)\_\_\_\_\_

17 \_\_\_\_\_

6) Are you familiar with aquacultured (farm raised/controlled) seafood?

Yes\_\_\_\_\_ No\_\_\_\_\_

18 \_\_\_\_\_

7) Have you ever served aquacultured seafood?

Yes\_\_\_\_\_ No\_\_\_\_\_ Do Not Know\_\_\_\_\_

19 \_\_\_\_\_

If yes, what type of aquacultured seafood did you offer? (Please check all that apply)

- a) Aquacultured Shrimp \_\_\_\_\_
- b) Aquacultured Salmon \_\_\_\_\_
- c) Aquacultured Catfish \_\_\_\_\_
- d) Aquacultured Hybrid Striped Bass (Sunshine Bass) \_\_\_\_\_
- e) Other (Please specify)\_\_\_\_\_

20 \_\_\_\_\_  
 21 \_\_\_\_\_  
 22 \_\_\_\_\_  
 23 \_\_\_\_\_  
 24 \_\_\_\_\_

- 8) If you do not offer aquacultured products now, would you offer them in the future?  
 Yes\_\_\_\_\_ No\_\_\_\_\_ Do Not Know\_\_\_\_\_ 25 \_\_\_\_\_
- 9) Are you familiar with hybrid striped bass (a fresh-water white bass and wild striped bass cross)?  
 Yes\_\_\_\_\_ No\_\_\_\_\_ 26 \_\_\_\_\_
- 10) Would you consider offering hybrid striped bass in the future?  
 Yes\_\_\_\_\_ Would Consider (Need More Information)\_\_\_\_\_ No\_\_\_\_\_ 27 \_\_\_\_\_
- 11) What factors would encourage your restaurant to offer hybrid striped bass? (Please check all that apply)
- a) High Margin (difference between prices received and prices paid) \_\_\_\_\_ 28 \_\_\_\_\_
  - b) Guaranteed and predictable supply \_\_\_\_\_ 29 \_\_\_\_\_
  - c) Size of Fish \_\_\_\_\_ 30 \_\_\_\_\_
  - d) Available in all seasons \_\_\_\_\_ 31 \_\_\_\_\_
  - e) High Expected Sales \_\_\_\_\_ 32 \_\_\_\_\_
  - f) Customer Requests \_\_\_\_\_ 33 \_\_\_\_\_
  - g) State/Government/Industry Sales Promotion \_\_\_\_\_ 34 \_\_\_\_\_
  - h) Pollution Content Control \_\_\_\_\_ 35 \_\_\_\_\_
  - i) Other (Please specify)\_\_\_\_\_ 36 \_\_\_\_\_
- 12) Of the above, please list by letter your top two factors.  
 1) \_\_\_\_\_ 37 \_\_\_\_\_  
 2) \_\_\_\_\_ 38 \_\_\_\_\_
- 13) If you offer finfish, what type do you offer? (Please check all that apply)
- a) Wild Striped Bass \_\_\_\_\_ 39 \_\_\_\_\_
  - b) Salmon \_\_\_\_\_ 40 \_\_\_\_\_
  - c) Catfish \_\_\_\_\_ 41 \_\_\_\_\_
  - d) Redfish (Red Drum) \_\_\_\_\_ 42 \_\_\_\_\_
  - e) Flounder \_\_\_\_\_ 43 \_\_\_\_\_
  - f) Cod/Haddock/Pollock \_\_\_\_\_ 44 \_\_\_\_\_
  - g) Hybrid Striped Bass (Sunshine Bass) \_\_\_\_\_ 45 \_\_\_\_\_
  - h) Fresh Water Trout \_\_\_\_\_ 46 \_\_\_\_\_
  - i) Bluefish and/or Sea Trout \_\_\_\_\_ 47 \_\_\_\_\_
  - j) Other (Please specify)\_\_\_\_\_ 48 \_\_\_\_\_
- Of the above, list by letter the one you consider to be your primary finfish offering?\_\_\_\_\_ 49 \_\_\_\_\_
- 14) Of the above selections, please indicate by letter the three (3) species that you feel offer the greatest competition to hybrid striped bass.  
 1) \_\_\_\_\_ 50 \_\_\_\_\_  
 2) \_\_\_\_\_ 51 \_\_\_\_\_  
 3) \_\_\_\_\_ 52 \_\_\_\_\_
- 15) Do you (or would you) contract to buy hybrid striped bass directly from the grower?  
 Do\_\_\_\_\_ Would\_\_\_\_\_ Would Not (If not, why not?)\_\_\_\_\_ 53 \_\_\_\_\_

PLEASE CONTINUE ON NEXT PAGE



- 16) What size of hybrid striped bass would you prefer to buy? (Check all that apply)
- a) Under 2 Pounds \_\_\_\_\_ 54 \_\_\_\_\_
  - b) 3 Pounds \_\_\_\_\_ 55 \_\_\_\_\_
  - c) Over 3 Pounds \_\_\_\_\_ 56 \_\_\_\_\_
  - d) Other (Please specify) \_\_\_\_\_ 57 \_\_\_\_\_

Of the above choices, list by letter the **one** you would most prefer? \_\_\_\_\_ 58 \_\_\_\_\_

- 17) What is your preferred product form for hybrid striped bass? (Please check **only one**)
- a) Whole \_\_\_\_\_ c) Headed and Guttled \_\_\_\_\_ e) Steaked \_\_\_\_\_ 59 \_\_\_\_\_
  - b) Headed Only \_\_\_\_\_ d) Filleted \_\_\_\_\_ f) Other (Please specify) \_\_\_\_\_

- 18) What would you pay per pound for hybrid striped bass? (Please check **only one**)
- a) \$1.50-\$2.00 \_\_\_\_\_ c) \$2.51-\$3.00 \_\_\_\_\_ e) \$4.01-\$5.00 \_\_\_\_\_ 60 \_\_\_\_\_
  - b) \$2.01-\$2.50 \_\_\_\_\_ d) \$3.01-\$4.00 \_\_\_\_\_

- 19) How would the price you pay for hybrid striped bass be determined? (Please check **only one**)
- a) Individual Negotiation \_\_\_\_\_ 61 \_\_\_\_\_
  - b) New York/Fulton Market \_\_\_\_\_
  - c) Other Central Market \_\_\_\_\_
  - d) Other (Please specify) \_\_\_\_\_

20) Please indicate the approximate annual volume of finfish purchased by your restaurant.

\$ \_\_\_\_\_ Pounds \_\_\_\_\_

**\*\*\*\*\*CUSTOMER DEMOGRAPHICS\*\*\*\*\***

- 21) What is the average age of your customers? (Please check **only one**)
- a) 18-25 \_\_\_\_\_ c) 35-44 \_\_\_\_\_ e) 55-64 \_\_\_\_\_ 62 \_\_\_\_\_
  - b) 26-34 \_\_\_\_\_ d) 45-54 \_\_\_\_\_ f) 65+ \_\_\_\_\_

- 22) What is the average income bracket of your customers? (Please check **only one**)
- a) \$0-\$14,999 \_\_\_\_\_ c) \$25,000-\$34,999 \_\_\_\_\_ e) \$50,000-\$64,999 \_\_\_\_\_ 63 \_\_\_\_\_
  - b) \$15,000-\$24,999 \_\_\_\_\_ d) \$35,000-\$49,999 \_\_\_\_\_ f) \$65,000+ \_\_\_\_\_

- 23) Are your customers primarily...? (Please check **only one**.)
- a) Single Female \_\_\_\_\_ b) Single Male \_\_\_\_\_ c) Couples \_\_\_\_\_ d) Families \_\_\_\_\_ 64 \_\_\_\_\_

- 24) Which of the following consumer groups do you actively target? (Please check all that apply)
- a) Singles \_\_\_\_\_ 65 \_\_\_\_\_
  - b) Married \_\_\_\_\_ 66 \_\_\_\_\_
  - c) Families \_\_\_\_\_ 67 \_\_\_\_\_
  - d) Groups \_\_\_\_\_ 68 \_\_\_\_\_
  - e) Tourists \_\_\_\_\_ 69 \_\_\_\_\_
  - f) Local Residents \_\_\_\_\_ 70 \_\_\_\_\_
  - g) Senior Citizens \_\_\_\_\_ 71 \_\_\_\_\_
  - h) Other (Please specify) \_\_\_\_\_ 72 \_\_\_\_\_

Of the above, list by letter the **one** you consider to be your primary target? \_\_\_\_\_ 73 \_\_\_\_\_

- 25) Which adjective(s) would best categorize your customers? (Please check all that apply)
- a) Price Conscious \_\_\_\_\_ 74 \_\_\_\_\_
  - b) Status Conscious \_\_\_\_\_ 75 \_\_\_\_\_
  - c) Weight Conscious \_\_\_\_\_ 76 \_\_\_\_\_
  - d) Health Conscious \_\_\_\_\_ 77 \_\_\_\_\_
  - e) Other (Please Specify) \_\_\_\_\_ 78 \_\_\_\_\_
- Which one of the above would you consider to be your primary categorization? \_\_\_\_\_ 79 \_\_\_\_\_
- 26) Given a choice, my customers would rather have.... (Please check only one response)
- a) Commercially captured finfish (wild catch) \_\_\_\_\_ 80 \_\_\_\_\_
  - b) Aquaculturally produced finfish (farm raised) \_\_\_\_\_
  - c) Do not know or is not applicable \_\_\_\_\_
- 27) Do your customers today appear to be more diet and health conscious than they were five years ago?
- Yes \_\_\_\_\_ No \_\_\_\_\_ Do Not Know \_\_\_\_\_ 81 \_\_\_\_\_
- 28) Your customers would most prefer...? (Please check only one response)
- a) Fried Fish \_\_\_\_\_ 82 \_\_\_\_\_
  - b) Broiled or Baked Fish \_\_\_\_\_
  - c) Health-Related Recipes (low cholesterol, low/reduced calorie, low sodium) \_\_\_\_\_
  - d) Specialty Recipes (nouveau cuisine, Cajun, mesquite grilling) \_\_\_\_\_
- 29) In the last five years, have your sales of seafood...? (Please check only one response)
- a) Substantially Increased \_\_\_\_\_ d) Slightly Decreased \_\_\_\_\_ 83 \_\_\_\_\_
  - b) Slightly Increased \_\_\_\_\_ e) Substantially Decreased \_\_\_\_\_
  - c) Remained the Same \_\_\_\_\_
- 30) In the last five years, have your sales of finfish...? (Please check only one response)
- a) Substantially Increased \_\_\_\_\_ d) Slightly Decreased \_\_\_\_\_ 84 \_\_\_\_\_
  - b) Slightly Increased \_\_\_\_\_ e) Substantially Decreased \_\_\_\_\_
  - c) Remained the Same \_\_\_\_\_
- 31) In the last five years, have your sales of shellfish...? (Please check only one response)
- a) Substantially Increased \_\_\_\_\_ d) Slightly Decreased \_\_\_\_\_ 85 \_\_\_\_\_
  - b) Slightly Increased \_\_\_\_\_ e) Substantially Decreased \_\_\_\_\_
  - c) Remained the Same \_\_\_\_\_
- 32) Over the next five years, in which of the below listed categories do you expect your seafood sales to grow the most? (Please check only one)
- a) Finfish \_\_\_\_\_ b) Shellfish \_\_\_\_\_ 86 \_\_\_\_\_
- 33) What is your Zip Code? \_\_\_\_\_

**THIS CONCLUDES OUR SURVEY**

*Please place your completed questionnaire in the enclosed self-addressed, postage-paid envelope and return it to the Bureau of Business Research as indicated.*

**THANK YOU FOR YOUR TIME AND COOPERATION.**

APPENDIX II



- 9) What percent of your total sales volume is accounted for by aquacultured products?  
(Please check **only one**)
- a) 0 \_\_\_\_\_ c) 11-20% \_\_\_\_\_ e) Greater than 30% \_\_\_\_\_ 31 \_\_\_\_\_  
b) Up to 10% \_\_\_\_\_ d) 21-30% \_\_\_\_\_
- 10) If you **do not sell** aquacultured products, do you plan to sell them in the future?  
Yes \_\_\_\_\_ No \_\_\_\_\_ Do Not Know \_\_\_\_\_ 32 \_\_\_\_\_
- 11) Are you familiar with hybrid striped bass (a fresh-water white bass and wild striped bass cross)?  
Yes \_\_\_\_\_ No \_\_\_\_\_ 33 \_\_\_\_\_
- 12) Do you sell hybrid striped bass?  
Yes \_\_\_\_\_ No \_\_\_\_\_ 34 \_\_\_\_\_
- 13) If you **do sell** hybrid striped bass, where do you sell them (Check **all** that apply)?
- a) Delaware \_\_\_\_\_ 35 \_\_\_\_\_  
b) Maryland \_\_\_\_\_ 36 \_\_\_\_\_  
c) Virginia \_\_\_\_\_ 37 \_\_\_\_\_  
d) New York \_\_\_\_\_ 38 \_\_\_\_\_  
e) New Jersey \_\_\_\_\_ 39 \_\_\_\_\_  
f) District of Columbia \_\_\_\_\_ 40 \_\_\_\_\_  
g) Internationally (Please indicate where) \_\_\_\_\_ 41 \_\_\_\_\_  
h) Other (Please specify) \_\_\_\_\_ 42 \_\_\_\_\_
- Of the above selections list by letter the **one** area that accounts for the **most** sales? \_\_\_\_\_ 43 \_\_\_\_\_
- 14) What factors would encourage your company to do so? (Please check **all** that apply)
- a) High Margin (difference between prices received and prices paid) \_\_\_\_\_ 44 \_\_\_\_\_  
b) Guaranteed and predictable supply \_\_\_\_\_ 45 \_\_\_\_\_  
c) Size of Fish \_\_\_\_\_ 46 \_\_\_\_\_  
d) Available in all seasons \_\_\_\_\_ 47 \_\_\_\_\_  
d) High Expected Sales \_\_\_\_\_ 48 \_\_\_\_\_  
e) Customer Request \_\_\_\_\_ 49 \_\_\_\_\_  
f) State/Government/Industry Sales Promotion \_\_\_\_\_ 50 \_\_\_\_\_  
g) Pollution Content Control \_\_\_\_\_ 51 \_\_\_\_\_  
g) Other (Please specify) \_\_\_\_\_ 52 \_\_\_\_\_
- 15) Of the above, list by letter your top **two** factors. 1) \_\_\_\_\_ 53 \_\_\_\_\_  
2) \_\_\_\_\_ 54 \_\_\_\_\_
- 16) Do you consider hybrid striped bass to be primarily.... (Please check **only one**)  
Seasonal \_\_\_\_\_ Year round \_\_\_\_\_ 55 \_\_\_\_\_
- 17) Which of the following species would you consider as competitors for hybrid striped bass?  
(Please check **all** that apply)
- a) None \_\_\_\_\_ 56 \_\_\_\_\_  
b) Wild Striped Bass \_\_\_\_\_ 57 \_\_\_\_\_  
c) Salmon \_\_\_\_\_ 58 \_\_\_\_\_  
d) Catfish \_\_\_\_\_ 59 \_\_\_\_\_  
e) Redfish (Red Drum) \_\_\_\_\_ 60 \_\_\_\_\_  
f) Flounder \_\_\_\_\_ 61 \_\_\_\_\_  
g) Cod/Haddock/Pollock \_\_\_\_\_ 62 \_\_\_\_\_  
h) Fresh Water Trout \_\_\_\_\_ 63 \_\_\_\_\_  
i) Bluefish and/or Sea Trout \_\_\_\_\_ 64 \_\_\_\_\_  
j) Other Finfish (Please specify) \_\_\_\_\_ 65 \_\_\_\_\_

PLEASE CONTINUE ON NEXT PAGE

18) Of the selections in Question 17, please indicate by letter the three (3) species you feel offer the greatest competition to hybrid striped bass.

- 1) \_\_\_\_\_
- 2) \_\_\_\_\_
- 3) \_\_\_\_\_

66 \_\_\_\_\_  
 67 \_\_\_\_\_  
 68 \_\_\_\_\_

19) Do you (or would you) contract to buy a specific quantity of hybrid striped bass on a continuing basis?

Already Do \_\_\_\_\_ Would Consider \_\_\_\_\_ No \_\_\_\_\_ If no, why not? \_\_\_\_\_

69 \_\_\_\_\_

20) What size(s) of hybrid striped bass would you buy? (Check all that apply)

- a) Under 2 Pounds \_\_\_\_\_
- b) 2 Pounds \_\_\_\_\_
- c) 3 Pounds \_\_\_\_\_
- d) Over 3 Pounds \_\_\_\_\_
- e) Other (Please specify) \_\_\_\_\_

70 \_\_\_\_\_  
 71 \_\_\_\_\_  
 72 \_\_\_\_\_  
 73 \_\_\_\_\_  
 74 \_\_\_\_\_

Of the above choices, list by letter the one you would most prefer? \_\_\_\_\_

75 \_\_\_\_\_

21) Would you pay more per pound for larger sized hybrid striped bass?

Yes (Please specify size/price) \_\_\_\_\_ No \_\_\_\_\_

76 \_\_\_\_\_

22) Given the following purchase prices, indicate your minimum selling prices and the minimum quantity you would be willing to purchase per week.

<u>Purchase Price (\$/lb)</u>	<u>Sales Price (\$/lb)</u>	<u>Minimum Quantity (Pounds)</u>
1.00	_____	_____
2.00	_____	_____
3.00	_____	_____
4.00	_____	_____
5.00	_____	_____
6.00	_____	_____

23) How would the price you pay for hybrid striped bass be determined? (Please check only one)

- a) Individual Negotiation \_\_\_\_\_
- b) New York/Fulton Market \_\_\_\_\_
- c) Other Central Market \_\_\_\_\_
- d) Other (Please specify) \_\_\_\_\_

77 \_\_\_\_\_  
 78 \_\_\_\_\_  
 79 \_\_\_\_\_  
 80 \_\_\_\_\_

24) Please indicate the approximate annual volume of finfish sales for your company.

\$ \_\_\_\_\_ Pounds \_\_\_\_\_

25) What is your Zip Code? \_\_\_\_\_

*THIS CONCLUDES OUR SURVEY*

*PLEASE PLACE YOUR COMPLETED QUESTIONNAIRE IN THE ENCLOSED SELF-ADDRESSED, POSTAGE-PAID ENVELOPE AND RETURN IT TO THE BUREAU OF BUSINESS RESEARCH.*

*IF YOU ARE INTERESTED IN OBTAINING FURTHER INFORMATION ON AQUACULTURED HYBRID STRIPED BASS, PLEASE COMPLETE AND MAIL THE ENCLOSED POSTCARD.*

*THANK YOU FOR YOUR TIME AND COOPERATION.*

APPENDIX III

## RESTAURANT INTERVIEW SUMMARY

Preliminary research in the Williamsburg area was conducted to augment survey data by adding in-depth information via personal interviews. Restaurants were chosen on the basis of variety and target market and ranged from a college dining facility to a gourmet French restaurant. The interviews were conducted on-site with the buying agents for each restaurant. Buying agents varied from establishment owners to head chefs. (In some instances, these were synonymous.) In the case of the college facility, the buying power rested with a corporate headquarters whose resources were also used to locate wholesalers. Chain and privately owned restaurants, on the other hand, tended to let the buying power rest in the hands of the executive chef.

Interviewees were asked questions relating to their individual requirements for finfish purchasing, particularly finfish in the bland to moderate taste range. Responses to these questions were grouped into one of four specific categories:

- 1) need for preprocessing
- 2) preferred shipping form
- 3) price range, and
- 4) preferred weight



### Preprocessing

The need for preprocessing finfish was dependent upon restaurant type, menu variance, and customer demographics. The smaller restaurants had no need for preprocessing, preferring to prepare the fish themselves. Larger restaurants appeared to require some preprocessed fish primarily in the winter months, while the college dining facility and fast-food establishment required a breaded, frozen product. The issue of seasonality was raised in all of the interviews, and availability of fresh finfish was critical for all restaurants, except those buying the breaded, frozen product.

### Preferred Shipping Form

The requirements for shipping were less varied. With the exception of the fast food restaurant and college facility, all other interviewees wanted their finfish fresh, not frozen. Those that prefer fresh fish also prefer to have the fish either headed, gutted and scaled or filleted. Those preferring larger fish prefer them whole for steaks. One purchasing agent for a large restaurant network indicated a preference for head-on fish in order to check the age of the fish. Since the restaurants surveyed have limited storage space and prefer to offer a fresh, unfrozen product, purchases would be made on a weekly basis and not in volume.

### Price

The price range each restaurant would be willing to pay for hybrid striped bass appeared to be dependent upon restaurant type and size. For example, restaurants catering to high-income customers or those doing high volume business indicated they were willing to pay more than those catering to lower income customers or doing lower volume business. The average price range was between \$3.00 to \$8.00 per pound, with one interviewee going as high as \$10 per pound for fillets. Prices were contingent upon product quality and availability.

### Weight

The requirements in terms of preferred weight per fish were fairly homogeneous. In general, restaurants preferred a fish weighing between three and five pounds, with larger fish preferred for steaking purposes. Since few of those interviewed had used hybrid striped bass, this pound requirement was based upon similar bland tasting finfish and is the expected average weight for flounder, cod, haddock, pollock, and others.

### Comments

In general, those restaurants interviewed expressed an interest in trying hybrid striped bass, although some had limited to no experience with aquacultured seafood products. Without exception interviewees were in favor of buying directly from the grower, predicated upon receiving a

reliable supply of consistently high-quality product. Despite the fact that Williamsburg restaurants cater to tourists, many feel they derive their reputation from residents and are extremely conscious of offering consistently high-quality menu items throughout the year.

APPENDIX IV

## CAPITAL FINANCING FOR HYBRID STRIPED BASS

Initial research indicates two basic alternatives to secure financing for start-up costs for a Hybrid Striped Bass farm:

- 1) Banking/Savings loans
- 2) Venture Capital

### Banking and Savings Loans

Banks and savings and loan institutions are noted for being very conservative. Therefore, a start-up business will have to pass stringent tests to secure a bank or savings loan.

#### General Opinion:

The general opinion from the banking side is that a Hybrid Striped Bass venture is risky; no precedence has been set for a successful Hybrid Striped Bass farm. If financing is to be granted, most likely complete personal collateral would have to back the loan (ie. land, home).

Banks are concerned with the ability and the length of time it would take to repay a loan. Although the appreciation of equity is important, banks are not primarily interested in this. They want guarantees of repayment. Questions that banks are concerned with are the following:

- 1) Is there a demand for the product?
- 2) What are the yields?
- 3) Can disease wipe out the crop?
- 4) What, if any, are the government guarantees?

### Required Information:

In order to secure a loan from a bank or savings institution potential candidates should be prepared to provide the following information:

- 1) Proforma income statements
- 2) Defined business plan
- 3) Listing of personal assets
- 4) If applicable, the past three years of business returns
- 5) Demand and yield projections

A strong quick ratio, farmer's equity, cash flow, and a personal relationship with the bank are additional factors in increasing the probability of securing a bank loan.

### Comments:

One major banking institution showed interest in the project. Their concerns were appreciation and experience in the field. Negative cash flow at the start of the project would not end the chances for a loan. The farmer's background, selling experience, and business prowess could offset any weakness in the financial numbers. In addition, this particular bank had a Capital Markets Department that could possibly handle a private equity placement.

Another Bank conveyed the fact that they are a conservative institution. They would emphasize borrower relationship and related business as keys to securing a loan.

Another major bank would only finance as much as 50% of the total need on a \$100,000 loan. The loan would have to be fully secured.

Another major Virginia bank suggested the best chance for a loan would be through venture capital.

A fifth bank stressed the importance of collateral. One of their branches had a portfolio of water-loans.

**Conclusion:**

The best chance of securing a loan for the average person probably does not lie in the hands of the conservative banking establishments.

Venture Capital

At the venture capital level, the concerns were the appreciation of equity, farmer experience, and product demand.

A large emphasis is placed on equity appreciation.

**General Opinion:**

The large brokerage houses were not interested in financing the operations because the loan amounts were too small. They do have contacts, however, that could be interested if a concrete deal was put together.

More local venture capitalists can be contacted thru local banking officers, CPA firms, and law firms. These firms have clients who are potential sources of capital.

**Required Information:**

The same information that is needed by banks would be needed by the venture capitalists. Demand and expansion information are particularly important since the venture capitalists are mainly speculators.

**Comments:**

In general, the best possibility for financing appears to be the venture capitalists. They are less risk adverse, and would be more willing to lend money to start-up business, as opposed to banks. The cost, however, would be greater if the business is successful.

APPENDIX V



## NUTRITIONAL REPORT SUMMARY

Growing health awareness and an aging population have led to an increased emphasis on nutrition and diet in the United States. In general, the public is becoming increasingly educated and aware to the dangers of poor eating habits in terms of calories, sodium, cholesterol, saturated fat, and sugar.

As a result, Americans are beginning to change their eating habits towards maintenance and as a preventive measure against disease. To this end, the United State's Surgeon General's Report of 1988 addresses many of these issues and makes suggestions as to how to remedy health problems and maintain good health.

The major issue raised is health, and nutrition points in the direction of changing eating habits. For many people this means a move towards eating foods that are low in sodium, cholesterol, and saturated fat. For others it means heightened awareness of sugar and calorie levels in order to maintain desirable weight levels.

The finfish market is in a position capitalize on those sectors of the population that are becoming increasingly health conscious. The Dietary Guidelines for Americans, as outlined by the Surgeon General's Report, and their affects

on the market for finfish (where applicable) are as follows:

- 1) Eat a variety of foods.

The average American does not eat fish as a daily dietary staple. The factors contributing to this are problems with storage, preparation, and purchase availability. Consumption of fish adds versatility to the diet and reduces intake of those dietary components that can increase the risk of chronic disease.

- 2) Maintain a desirable weight.

Approximately 34 million people (25% of the American population) are obese. Finfish are a low calorie alternative to traditional high calorie entrees. This is important for those who lead a less active lifestyle, as well as for the older population whose physical well-being is contingent upon weight reduction or maintenance.

- 3) Avoid too much fat, saturated fat, and cholesterol.

The intake of fat and cholesterol is important when considering meats as a protein source in the daily diet. Finfish provide substantially lower levels of fat than those of other meats. Finfish usually have fat levels lower than 5% and no higher than 15% while other sources of protein are substantially higher (steak 37%, pork 21%).

Finfish are also lower in saturated fats than the cited protein sources. This is a crucial factor for those concerned with the risk of heart attack. More than 60 million Americans have blood cholesterol levels that are too high, and risk management of chronic heart disease is becoming increasingly important.

- 4) Eat adequate starch and fiber.

N/A to finfish.

- 5) Avoid too much sugar.

Finfish have low to no sugar levels. This is helpful to those who are trying to reduce their sugar intake or who are on sugar restricted diets.

- 6) Avoid too much sodium.

Most fresh fish contain low amounts of sodium, ranging from 60-100 milligrams per 100 grams (3.5 ounces) of

raw fish. Sodium levels are important to those with high blood pressure or water retention problems.

- 7) If you drink alcoholic beverages, do so in moderation.

#### Other Issues

- 1) High protein levels.

Finfish offers high protein and low calorie levels. A single serving of fish can provide a large portion of daily protein needs.

- 2) Vitamins and Minerals.

Finfish are a good source of B vitamins and minerals and contain high iron levels that are crucial to the proper health and growth of children, adolescents, and women of child-bearing years.

- 3) Digestibility.

High quantities of easily digestible food proteins are desirable for older consumers who are under dietary control or who suffer from digestive problems.

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