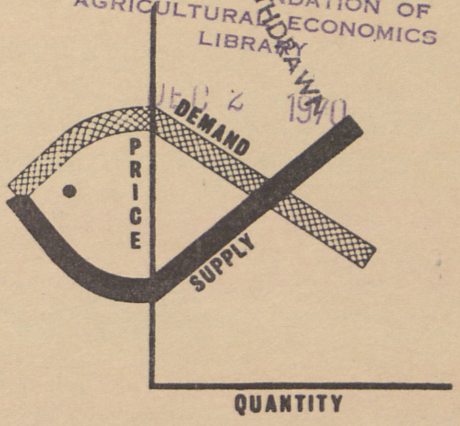

PROJECTIONS OF CERTAIN FISHERY PRODUCTS OF COMMERCIAL IMPORTANCE IN LOUISIANA

By

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US BUREAU OF COMMERCIAL FISHERIES
DIVISION OF ECONOMIC RESEARCH

Projections of Certain Fishery Products
of Commercial Importance in Louisiana

ABSTRACT

Demand for fish products in the U.S. is steadily increasing as population and consumer income expands. Further consumption increases are projected resulting from these same forces. This is particularly true of the highly valued fish and shellfish as well as for fish meal, in which case the demand is derived from the expansion in broiler production. Fish products landed in Louisiana, that is shrimp, crabs, oysters, and menhaden, will make contributions to this national market and it is therefore important to maintain these fisheries. Other finfish species landed in Louisiana will experience increasing demand if they are offered to the consumer in the highly processed forms similar to the fish products now experiencing significant demand increases.

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The Division of Economic Research, Bureau of Commercial Fisheries, is nearing completion of a study to project prices and consumption of fishery products for the remainder of the century. This has been done for the ten most important product classes used in the U.S. by volume and value with the exception of menhaden (fish meal). This study forms the basis of the projections of fishery products of interest to Louisiana.

The procedure of the projection study was to determine the factors affecting the demand for fish products in the U.S. and in the other major fish consuming countries. In addition, the supply of fish products likely to be available was taken into account by restricting world catch at no greater than maximum sustainable yield and by accounting for the increase in cost of catching as MSY is approached.

Projected U.S. prices and consumption is determined by how strong the factors affecting consumption (population and income increase) are in the U.S. relative to other countries.

Demand equations for three products of interest here have been derived as follows:

Shrimp

$$\log \frac{C}{N} = \underset{(-12.0400)}{-4.8075} - \underset{(-2.7001)}{0.3099} \log\left(\frac{P}{CPI}\right) + \underset{(11.5558)}{1.6999} \log\left(\frac{Y}{CPI}\right)$$

D.W. = 0.8007 R^2 = 0.9069

Crab

$$\log \frac{C}{N}^{*} = -5.9941 - 0.1487 \log\left(\frac{P}{CPI}\right) + 1.8789 \log\left(\frac{Y}{CPI}\right)$$

Oysters

$$\log \frac{C}{N}^{*} = 0.9639 - 0.6729 \log\left(\frac{P}{CPI}\right) + 0 \log\left(\frac{Y}{CPI}\right)$$

where: log = "logarithm of"

C = consumption in pounds live weight

N = the U.S. civilian population

P = ex vessel price in live weight

Y = per capita personal disposable income in the U.S.

CPI = the U.S. consumer price index included for the purpose of taking into account inflation

D.W. = Durbin-Watson statistic

R^2 = coefficient of determination

The values in parentheses (t-values) under the shrimp equation measure the confidence in the estimate.

D.W., R^2, and t-value are used to measure the statistical acceptability of the estimates.

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* Statistical estimates were adjusted to make the equation closer to historical trends.

The data used to obtain these estimating equations are as follows:

	Shrimp		Crabs		Oysters		
Year	Per capita consumption lb.	Ex vessel price $/lb.	Per capita consumption lb.	Ex vessel price $/lb.	Per capita consumption lb.	Ex vessel price $/lb.	Per capita personal disposable income $
1950	1.469	27.06	0.720	6.92	4.267	5.44	1,628
1951	1.714	25.52	0.792	7.29	4.038	5.19	1,622
1952	1.816	26.22	0.729	7.28	4.437	5.00	1,641
1953	1.816	31.56	0.806	7.59	4.242	4.60	1,697
1954	1.856	24.21	0.765	7.38	4.318	5.04	1,693
1955	1.938	27.11	0.770	7.97	4.020	4.95	1,786
1956	1.836	33.82	0.824	8.63	3.842	5.11	1,841
1957	1.652	36.60	0.963	7.29	3.630	4.93	1,838
1958	1.775	33.86	0.927	7.39	3.442	5.35	1,818
1959	2.142	23.83	0.986	8.35	3.332	5.28	1,877
1960	2.224	26.02	1.076	7.47	3.111	5.56	1,879
1961	2.142	28.38	1.094	7.18	3.204	6.01	1,903
1962	2.123	36.34	1.071	7.57	2.882	5.80	1,958
1963	2.366	27.29	1.143	7.93	2.984	5.12	2,002
1964	2.407	30.75	1.170	8.14	3.043	5.02	2,109
1965	2.591	30.78	1.485	8.36	2.814	5.49	2,213
1966	2.550	35.57	1.629	7.84	2.678	5.55	2,297
1967	2.754	32.56	1.485	7.37	3.272	5.54	2,359
Conversion Factor to edible wt.	(2.04)		(4.5)		(8.5)		

All dollar figures are divided by the consumer price index, 1957-59 = 1.0

The equations were then used to make the demand projections. U.S. population and income projections were "plugged into" the equations to obtain the projections of demand for fish. The following shows the population and income projections used:

	U.S. population projections[1]	Projection of U.S. personal per capita disposable income[2]
	Millions	Dollars
1970	206.0	2,642
1975	219.4	3,036
1980	235.2	3,555
1985	252.9	4,049
1990	270.8	4,574
2000	307.8	6,091

1/ Series C, U.S. Department of Commerce, Bureau of the Census

2/ National Planning Association Center for Economic Projections, with extrapolation for later years.

Finally, the projections for these three product groups are as follows:

U.S. price and quantity projections
for shrimp, crabs, and oysters, 1970-2000
(live weight)

	Shrimp		Crabs		Oysters	
Year	Ex vessel price $/lb.	Billion pounds	Ex vessel price $/lb.	Billion pounds	Ex vessel price $/lb.	Billion pounds
1970	.45	.686	.10	.413	.07	.60
1975	.48	.860	.12	.518	.07	.639
1980	.52	1.050	.16	.620	.07	.684
1985	.65	1.145	.21	.672 1/	.07	.736
1990	.77	1.207	.41	.694 1/	.07	.788
2000	1.03	1.325	2/	2/	.07	.896

1/ Assuming a managment program to prevent catch from exceeding world MSY

2/ Not estimated

The projections are made on the basis of current conditions, among which are (1) no significant changes in harvesting techniques; (2) no significant changes in aquaculture, except in the case of oysters where it is assumed that man can expand the production of oysters by cultural means at a rate equal to increases in demand so that prices do not rise; (3) no significant changes in the environment, that is, pollution etc.; and (4) no significant changes in the legal-political framework in which fishing operations are carried out except as noted in the case of crabs. Obviously, changes in any of these assumptions will alter the actual consumption and prices.

Projections were made in the context of product groups which may not be sufficiently detailed in all cases. Shrimp and oysters from all sources are probably similar enough to use in determining the part Louisiana can play in providing future supplies. Crabs, on the other hand, are a composite of blue crabs and other crabs, primarily the eastern Pacific species of dungeness and king crab. Therefore, the overall category is probably not sufficient to project blue crabs alone. Nevertheless, there is a rather definite means of projecting catch of blue crabs. This is from the standpoint of restrictions on the resource. According to Longhurst[1/] the maximum sustainable yield of blue crabs in the West-Central Atlantic (including the Gulf of Mexico) is 76.0 thousand metric tons, whereas current landings are 73.0 thousand metric tons. Therefore, given the assumptions above, catch cannot increase. Price however is projected to increase at the rate shown in the table on projections. It is important to emphasize that the restriction on catch is not a demand factor, but rather a resource restriction. There is no question that consumption would be much higher if the resource permitted.

The other products of interest have less analytical foundation than the foregoing. However, we have a fairly firm basis for

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1/ Longhurst, Alan R. "Survey of Crustacean Resources," Area Reviews on Living Resources of the Ocean, FAO Indicative World Plan for Agricultural Development, BCF, La Jolla, California, 1969.

projecting the utilization of menhaden, if the resource is available. The procedure is to forecast use of fish meal which in turn can be used to estimate the demand for the raw material (menhaden).

The following demand equation was fit:

$$C = \underset{}{-377} - \underset{(1.42)}{3.460}\,P + \underset{(3.90)}{10.809}\,P_s + \underset{(9.44)}{.196}F$$

$$D.W. = 1.76 \quad R^2 = .89$$

where: C = the utilization of fish meal in millions of pounds

P = the price of fish meal in dollars per ton

P_s = the price of soybean meal in dollars per ton

F = the per capita consumption of chicken, million pounds ready-to-cook weight

The data used to estimate this equation are as follows:

Year	Fish meal used in the U.S. mil. lb.	Soybean meal price in the U.S. $/T	Fish meal price in the U.S. $/T	Consumption of chicken mil. lb.
1950	607.6	74.60	124	3,097
1951	676.5	76.90	120	3,275
1952	849.9	96.25	124	3,384
1953	740.6	80.05	124	3,424
1954	805.5	89.80	130	3,629
1955	725.0	71.50	133	3,456
1956	772.4	63.50	130	4,039
1957	690.6	58.85	126	4,296
1958	697.0	64.90	131	4,827
1959	879.0	65.00	118	5,038
1960	843.4	64.55	88	4,983
1961	1,058.2	68.80	104	5,431
1962	1,129.1	72.00	118	5,501
1963	1,264.6	79.70	121	5,727
1964	1,349.8	79.70	125	5,879
1965	1,049.4	79.10	147	6,394
1966	1,343.4	90.30	152	6,985
1967	1,725.4	87.65	128	7,258

For making the projections, price of fish meal and soybean meal was held constant; fish meal at $130 per ton and soybeans at $69 per ton. Therefore future increases are expected to result from increasing use of chicken.

The projections of chicken consumption over the interval is as follows:

	Chicken consumption mil. lb. ready-to-cook
1970	8,291
1975	9,741
1980	11,407
1985	13,277

Given this expansion in the consumption of chicken, the above equation gives us the following projections of fish meal use.

	Projected fish meal use in the U.S. million lbs.
1970	1,441
1975	1,828
1980	2,155
1985	2,521

These project the use of fish meal. To obtain an estimate of utilization of live weight of fish the figures are multiplied by 5, or perhaps a slightly greater figure. The probable outcome of the use of menhaden will be similar to crabs, in that there

will be a supply restriction, rather than a lack of market for the product. We can conclude that with the growth in demand for fish meal as much menhaden will be used as is available.

There remains the problem of projecting other species of interest to the Louisiana coastal zone. These species are croaker, redfish or red drum, spotted and white sea trout, spot, catfish, and bullheads. Unfortunately there is little in the way of analytical background to project the consumption of these species. The best that can be done is to estimate that the demand will depend primarily upon the product form and upon market expansion activities. Tremendous changes have taken place in the preservation and processed form of fishery products over time. Those products that appeal to modern consumer preferences have experienced considerable growth, while those that do not appeal to this demand have remained constant or declined. Farm catfish producers are recognizing the importance of these marketing aspects.

Currently the best suggestion for projecting these low volume species is to study the trends of other fish products by product and preservation form. This is contained in "Elements Crucial to the Future of Alaskan Commercial Fisheries," Working Paper No. 24, Bureau of Commercial Fisheries, Division of Economic Research, August 1969. Section 3, beginning on page 19 shows these data. This section is reproduced here for use in projecting these species.

Section 3 of Working Paper No. 24, Elements Crucial to the Future of Alaskan Commercial Fisheries

3. Trends in preservation and product forms

Tremendous changes have taken place in fish processing and preservation. These changes are not so much related to species as to changes in marketing by types of products, therefore, trends in the type of processing and preservation regardless of species, seems to be more important. Of course, choice of preservation and processing is not independent of species. What this means is that expansion in production will find a wider market if species which can be subjected to the more popular market forms are fished.

The growth category of frozen fish and shellfish is phenomenal especially since most or all of the increase in "fresh and frozen unspecified" can be also allocated to frozen (see tables 5 and 6). For information on processing and preservation by species see Fishery Statistics of the United States, U. S. Department of the Interior. Of the major canned fish and shellfish, only tuna shows an expanding demand. The manufacturers' value per pound of frozen fish products has also expanded somewhat more rapidly than canned, the former increasing from $0.22 to $0.54 per pound from 1946 to 1966, while canned increased from $0.33 to $0.61 during this period. These factors point clearly toward a shift in market preference from one form to the other.

Table 5. Fish and shellfish by method of preservation, U. S. manufacturing (In thousands of pounds).

Year	Canned	Cured	Fresh 1/	Frozen	Fresh and frozen unspec.	Unprocessed	Total
1931	503,642	98,969	118,919	15,341	5,023		
1934	685,443	98,141	111,670	33,437	5,486		
1937	723,842	104,339	133,140	64,748	3,915		
1940	673,877	97,326	134,355	96,248	6,096		
1943	620,658	91,754	165,272	108,022	1,409		
1946	699,376	87,108	137,233	138,462	4,852		
1949	762,291	4,714 2/	58,906	133,701	2,387		
1952	647,322	57,144	59,962	213,335	81,453		
1955	588,078	80,501	53,110	229,852	171,654		
1958	736,609	75,261	55,053	276,802	175,358		
1961	708,707	74,453	62,414	323,231	186,643		
1964	742,114	65,519	79,740	381,703	235,122		
1966	822,369	65,786	78,016	476,371	308,108		
1967	698,312	NA	NA	NA	NA		

Source: Fishery Statistics of the United States, Manufactured Fishery Products.

1/ Does not include unprocessed fish
2/ Incomplete

Table 6. Fish and shellfish by method of preservation, U. S. manufacturing (In thousands of dollars)

Year	Canned	Cured	Fresh[1]	Frozen	Fresh and Frozen Unspec.	Unprocessed	Total
1931	62,656	12,364	20,051	2,043	982		
1934	79,069	13,047	16,591	3,263	824		
1937	104,249	15,635	20,839	5,786	1,053		
1940	92,192	14,234	21,996	9,899	852		
1943	141,084	14,110	35,419	20,779	423		
1946	227,629	15,077	31,540	29,843	1,577		
1949	286,840	1,661[2]	17,330	30,967	787		
1952	290,161	26,717	21,940	89,575	51,090		
1955	274,967	37,684	17,676	96,607	116,336		
1958	344,737	41,657	21,221	129,729	131,903		
1961	382,809	52,396	22,908	157,145	140,901		
1964	391,026	47,783	31,664	178,679	192,338		
1966	507,841	52,499	35,120	256,205	247,463		
1967	455,240	NA	NA	NA	NA		

Source: Fishery Statistics of the United States, Manufactured Fishery Products.
1/ Does not include unprocessed fish
2/ Incomplete

Distinct trends are also shown in degree of processing, those products closest to the convenience food category experiencing strongest upward trends shown in tables 7 and 8. The trend in "shell removed," i.e., peeled, shucked, picked, etc., is mainly influenced by the increasing consumption of shrimp, however, demand for peeled and deveined shrimp (with the additions of further processing) almost completely dominates the shrimp market. Breaded products are made up of some of the products of the other three categories and show how rapidly all kinds of frozen fish products are entering this type of processing.

These tables should be related back to section 1 which analyzes potential by species. As stated in that section, the potential is great if fish products can be delivered in a frozen highly processed, convenience form, but the potential for increase is not bright without this value added.

Table 7. Fish and shellfish by method of processing, U.S manufacturing (In thousands of pounds)

Year	Filleted	Shell Removed	Breaded	Sticks and Portions
1931	70,414	98,079		
1934	68,707	112,884		
1937	115,620	138,153		
1940	113,538	146,747		
1943	135,565	145,564		
1946	164,931	155,073		
1949	184,746	53,066 1/		
1952	181,567	166,449	18,042	
1955	148,697	217,127	118,513	73,045
1958	143,649	264,280	161,944	82,801
1961	146,292	302,074	222,088	129,964
1964	149,672	355,412	286,317	179,887
1966	155,962	421,911	370,573	228,996
1967	144,377	NA	NA	NA

Source: Fishery Statistics of the United States, Manufactured Fishery Products

1/ Incomplete

Table 8. Fish and shellfish by method of processing, U. S. manufacturing (In thousands of dollars)

Year	Filleted	Shell Removed	Breaded	Sticks and Portions
1931	10,247	20,172		
1934	7,926	21,241		
1937	12,625	28,049		
1940	13,340	27,794		
1943	35,293	31,419		
1946	42,975	48,286		
1949	45,486	31,855 1/		
1952	51,630	107,566	13,614	
1955	40,579	139,738	65,429	33,046
1958	44,748	181,462	90,604	34,972
1961	45,795	212,498	120,316	50,629
1964	51,701	258,579	141,929	66,518
1966	63,446	347,144	213,449	93,800
1967	59,122	NA	NA	NA

Source: Fishery Statistics of the United States, Manufactured Fishery Products.

1/ Data incomplete

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