Value Added, Margins, and Consumer Expenditures for Edible Fishery Products in the United States, 1976-78

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Introduction

Sales and consumption of fish can be expressed in quantity or value. However, to add the round weight quantities of different types of fishery products (fish and shellfish) is not recommended. It would be like adding quantities of apples and oranges. The result would not make much economic sense for certain comparisons and calculations. To express sales and consumption in value terms, which is the purpose of this study, would be more meaningful when comparisons are made with gross national product (GNP) and total food consumption.

This study develops estimates of margins and value added for all fisheries at every level of production and marketing and also the consumer expenditures for all fishery products from the sea. From these estimates can be derived other values and information, such as the percentage of personal income spent on fishery products, per capita expenditures for fish, fisherman's share of the consumer dollar for fish, in addition to the food fish share of total food consumption and contribution of the U.S. fishing industry from

different levels of production and marketing to GNP.

Each year, beginning with the 1978 issue, a table presenting margins, value added, and consumer expenditures for fishery products (similar to Table 1) will appear in the "Fisheries of the United States," published by the National Marine Fisheries Service (NMFS), NOAA. Since that publication is a statistical report, no detailed discussion about the table is presented. This article was prepared to present such a discussion so that users of the table will be better able to interpret the meaning and use of the information contained therein.

Data used in the analysis of this study are from various sources. Price data at the harvesting, processing, wholesale, and retail levels are principally collected by NMFS and appear in various publications. Data on costs and earnings of fishing vessels and processing plants are drawn from information provided by various government and private agencies. Appendix A describes source materials.

Definition and Relationship of Terms

The terms used in this analysis and their relationship require some definition and clarification. Margins, value added, and consumer expenditures are interrelated. Value added is part of the operating costs interpreted as the margin between selling and purchase values at either a production or a marketing level. The sum of margins at different production and marketing levels and

harvesting costs, after deducting the export value, is the total consumer expenditures for fishery products. To calculate these values one has to start from the actual production or sales value and the cost of purchases (or purchase value) at the production levels. For fisheries, production has two levels, harvesting and processing; and distribution has four levels; wholesale, retail, public eating places, and institutions that serve food.

The difference between the sales value (V_s) and the purchase value (V_p) is the "margin" (M). There is no margin value, however, that can be realized at the harvesting level, because fishermen catch their fish without paying any purchase price. At the harvesting level, fishermen incur what is termed the "harvesting bill," which includes fishing costs, taxes, and profit or loss. From the purchase values and margin information at other levels, a factor called the "markup rate" (R_m) is derived that is used in this study at every step of the calculation.

The selling price at the harvesting level is the purchase price paid by processors. The purchase price at the wholesale level is the selling price quoted by processors, etc. A markup

ABSTRACT–The presentation in value terms of the basic estimates in this study makes it possible to produce analogous figures that can be compared with gross national product value of other industries, and total and per capita expenditures for other food products.

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Table 1.—Value added, margins, and consumer expenditures for edible fishery products in the United States, 1976-78.

Value	Domestic		Imports[1]		Total margin	Value-added rate[2] (%)	Value added[3] (contribution to the economy as GNP)	
	Sales	Margin	Sales	Margin			Total ($ million)	Percentage of total
			—————Million dollars—————					
1976								
Domestic landings	1,353	—	—	—	—	—	—	—
Industrial fish[4]	− 89	—	—	—	—	—	—	—
Edible fish (harvesting bill)	1,264	—	—	—	1,264	66.07	835	16.43
Exports (unprocessed)[5]	− 64	—	—	—	—	—	—	—
Total domestic sales	1,200	1,200	—	—	—	—	—	—
Imports	—	—	1,917	1,917	—	—	—	—
To be processed	—	—	484	—	—	—	—	—
To trade dealers	—	—	1,433	—	—	—	—	—
Processing level[6]	2,535	1,335	799	315	1,650	61.80	1,020	20.07
Exports (processed)[7]	238	—	—	—	—	—	—	—
Domestic sales	2,297	—	—	—	—	—	—	—
Wholesale level[8]	2,735	437	2,592	360	797	61.70	492	9.68
Channels to consumers								
Retail stores[9]	1,294	282	1,657	362	644	79.20	510	10.03
Public eating places[10]	3,569	1,983	2,566	1,425	3,408	62.29	2,123	41.76
Institutions[11]	228	92	260	104	196	52.50	103	2.03
Consumer expenditures[12]								
Sales through three channels	5,091	—	4,483	—	—	—	—	—
Landings (or imports) plus margins at five levels minus exports	—	5,091	—	4,483	—	—	—	—
Fisherman's share of a consumer's dollar for fish	—	(23.6%)	—	—	—	—	—	—
Total consumer expenditures	(53.2%)		9,574	(46.8%)	—	—	—	—
Total value added (contribution to the economy as GNP)	—	—	—	—	—	—	5,083	100.00
1977								
Domestic landings	1,515	—	—	—	—	—	—	—
Industrial fish[4]	−111	—	—	—	—	—	—	—
Edible fish (harvesting bill)	1,404	—	—	—	1,404	67.66	950	17.09
Exports (unprocessed)[5]	−107	—	—	—	—	—	—	—
Total domestic sales	1,297	1,297	—	—	—	—	—	—
Imports	—	—	2,078	2,078	—	—	—	—
To be processed	—	—	567	—	—	—	—	—
To trade dealers	—	—	1,511	—	—	—	—	—
Processing level[6]	2,781	1,484	920	353	1,837	62.23	1,143	20.57
Exports (processed)[7]	319	—	—	—	—	—	—	—
Domestic sales	2,462	—	—	—	—	—	—	—
Wholesale level[8]	2,971	509	2,841	409	918	62.85	577	10.38
Channels to consumers								
Retail stores[9]	1,410	329	1,815	424	753	80.21	604	10.87
Public eating places[10]	3,782	2,041	2,776	1,498	3,539	61.49	2,176	39.15
Institutions[11]	245	96	281	110	206	52.50	108	1.94
Consumer expenditures[12]								
Sales through three channels	5,437	—	4,872	—	—	—	—	—
Landings (or imports) plus margins at five levels minus exports	—	5,437	—	4,872	—	—	—	—
Fisherman's share of a consumer's dollar for fish	—	(23.9%)	—	—	—	—	—	—
Total consumer expenditures	(52.7%)		10,309	(47.3%)	—	—	—	—
Total value added (contribution to the economy as GNP)	—	—	—	—	—	—	5,558	100.00
1978								
Domestic landings	1,854	—	—	—	—	—	—	—
Industrial fish[4]	− 121	—	—	—	—	—	—	—
Edible fish (harvesting bill)	1,733	—	—	—	1,733	68.40	1,185	18.58
Exports (unprocessed)[5]	− 221	—	—	—	—	—	—	—
Total domestic sales	1,512	1,512	—	—	—	—	—	—
Imports	—	—	2,275	2,275	—	—	—	—
To be processed	—	—	677	—	—	—	—	—
To trade dealers	—	—	1,598	—	—	—	—	—

Table 1.—Continued

| Value | Domestic | | Imports[1] | | Total margin | Value-added rate[2] (%) | Value added[3] (contribution to the economy as GNP) | |
	Sales	Margin	Sales	Margin			Total ($ million)	Percentage of total
			— Million dollars —					
Processing level[6]	3,215	1,703	1,116	440	2,143	62.70	1,344	21.07
Exports (processed)[7]	514	—	—	—	—	—	—	—
Domestic sales	2,701	—	—	—	—	—	—	—
Wholesale level[8]	3,263	561	3,170	455	1,016	63.65	647	10.14
Channels to consumers								
Retail stores[9]	1,595	356	2,040	455	811	81.10	658	10.32
Public eating places[10]	4,129	2,269	3,096	1,701	3,970	61.00	2,422	37.98
Institutions[11]	270	107	315	125	232	52.40	122	1.91
Consumer expenditures[12]								
Sales through three channels	5,994	—	5,451	—	—	—	—	—
Landings (or imports) plus margins at five levels minus exports	—	5,994	—	5,451	—	—	—	—
Fisherman's share of a consumer's dollar for fish	—	(25.2 %)	—	—	—	—	—	—
Total consumer expenditures	(52.4%)		11,445	(47.6%)	—	—	—	—
Total value added (contribution to the economy as GNP)	—	—	—	—\	—	—	6,378	100.00

[1]For imported fishery products, the margin and sales values at different levels are calculated in the same manner as they are for the domestic production column, except that the markup rate at the processor level is 0.6515 in 1976, 0.6232 in 1977, and 0.6495 in 1978; at the wholesale level the markup rate is 0.1612 in 1976, 0.1681 in 1977, and 0.1678 in 1978. The distribution rate is 50 percent in 1976, 49 percent in 1977, and 50 percent in 1978 at retail stores; 44 percent in 1976, 45 percent in 1977, and 44 percent in 1978 at eating places; and 6 percent at institutions in 1976, 1977, and 1978.

[2]Value-added rate at each level is the weighted average of all fishery products, expressed as a percentage of its corresponding margin.

[3]Multiply each item under the total margin column by its corresponding value under the value-added rate column to get the actual value added as contribution to the economy from all production and distribution levels of the U.S. fishing industry in the food fish sector.

[4]Value of landings of fish for industrial purposes is deducted.

[5]Exports of unprocessed fish are deducted from the value of the landings after being converted to an equivalent value for domestic landings.

[6]Processor's purchase value (or domestic sales at the harvesting level) times the processor's markup rate (weighted average for all fishery products is 1.1128 in 1976, 1.1447 in 1977, and 1.1262 in 1978) equals the margin at the processor's level.

[7]Exports of processed products are deducted at their export value from this level.

[8]Wholesale purchase value (processors' domestic sales) times the weighted average of markup rates (0.1904 for 1976, 0.2068 for 1977, and 0.2080 for 1978).

[9]37.0 percent of wholesale sales value is distributed in 1976 to retailers, 36.4 percent in 1977, and 38.0 percent in 1978. This value times the weighted average of markup rates (0.2790 in 1976, 0.3043 in 1977, and 0.2870 in 1978) at the retail level equals the margin at retail.

[10]58.0 percent of wholesale sales value is distributed in 1976 to eating places, 58.6 percent in 1977, and 57.0 percent in 1978. The margin and sales value at this level are obtained at a markup rate of 1.2499 for 1976, 1.1720 for 1977, and 1.2200 for 1978.

[11]A wholesale sales value of 5.0 percent is distributed to institutions with a markup rate of 0.6699 in 1976, 0.6472 in 1977, and 0.6550 in 1978; the margin and sales value at this level are then calculated.

[12]Consumer expenditures are the total sales value at retail stores, eating places, and institutions. This total is also the sum of margins of five marketing levels and the landings value after export value is deducted.

Note: The procedure for calculating the data in this table is based on two comprehensive reports, "Cost Analyses of U.S. Fish Price Margins, 1972-1977, at Different Production and Distribution Levels" and "Marketing Bill of U.S. Fish-Food Products", both prepared by E. S. Penn.

rate is the percentage increase over the purchase price to cover operating costs and profit to arrive at a selling price acceptable to the current market. If $R_m = 0.34$, it means that the margin is 34 percent of, and the selling price is 34 percent above, the purchase price.

The relationship of all the above-mentioned variables can be expressed as follows:

$$P_s \times Q_s = V_s$$

where P_s = selling price and
Q_s = selling quantity.

Also

$$V_s - V_p = M, \qquad M/V_p = R_m,$$
$$R_m \times V_p = M.$$
$$\therefore V_s = (R_m \times V_p) + V_p$$
$$= V_p (1 + R_m).$$

From the margin, a component called "value added" is derived. It has special characteristics. Value added is that part of the margin that excludes costs of materials, supplies, and services purchased, but includes payments to various production factors. For example, "wages and salaries" are paid to labor; "rent," for the use of

land and building; "interest," for borrowed capital; "depreciation," to write off current wear and tear of machines and equipment; "profit," to management; and "taxes," to government. The total of these payments represents the contribution of an industry to the economy known as value added of the industry, while the cost of materials, supplies, and services are contributions to the economy from other industries. The latter group of costs is a value not added by, but transferred to, the industry in question (Buzzell, 1959). Each fishery has a value added different from

that of another. Each production or marketing level has a value added different from that of another level. The range of difference depends on how much is spent on each of the above-mentioned payments in relation to other costs. These payments (less taxes and depreciation), after they are injected into the cash flow of the economy, tend to generate income in other sectors of the economy and cause a multiplier effect. Payments under the value-added category, therefore, have a unique function distinguishable from other costs. The total value added of different fisheries at one production or marketing level is the fishing industry's contribution from that level to the national economy incorporated as part of GNP[1].

Value added at one level of the fishery can be expressed as a percentage of the margin of that level and is then called the value-added rate of the fishery at that level. It changes from year to year. A weighted average of value-added rates for all fishery products at each level is calculated for the period 1972-77 and projected to 1982 for this study.

Procedures of Calculation

To arrive at a net sales value at the harvesting level for domestic fish consumption, the catch of industrial fish and exports of unprocessed fish should be deducted from the total landings value. Some of the landings may be sold directly to consumers. They are mostly not reported as landings in the first place. We do not attempt to make any adjustment of this kind here, because the quantity involved is negligible compared with total landings and would not affect the total value added we intend to calculate.

What is landed is sold either to processors or other dealers. If the fish are sold to dealers other than processors, some processing work like cleaning, eviscerating, heading, sorting, and packing would be carried out before

the fish are sold to consumers. In this case, some processing costs are added to increase the product value regardless of whether the processor does the work. As the end users, consumers would eventually bear these added costs. They should be classified as processing costs according to the function performed and allocated to the processing level as part of its value added, although workers at some other levels have done the job in its behalf.

All landings for domestic consumption are theoretically assumed to go through the processing level. Therefore, the processors' annual purchase value will be the domestic sales value at dockside for the same year. By the same token, the annual purchase value of wholesalers will be the annual sales value of the processors assuming that beginning and ending inventories at both levels would cancel each other.

The processors' sales value is calculated from the weighted average of markup rates of different fishery products at that level. The difference of their sales value and the purchase value paid to fishermen is the marketing bill of the processors. For the sake of convenience, "marketing bill" is shortened to "margin" from now on.

In the same manner, the weighted average of markup rates of wholesalers for different fishery products is applied to the wholesale level to get the margin and the sales value at this level. Not all fishery products are distributed to retailers and public eating places by wholesalers. Wholesale prices of canned tuna, canned salmon, and some canned shrimp are reported by cannery representatives or quoted as FOB canner's terminal. In this instance, canners are themselves wholesalers at the same time. A combined level called the processor/wholesaler level is created.

In this study, we break the combined level into two separate levels according to their functions by taking a fraction of the margin from canners and allocating it to the wholesale level. In this manner the canner/wholesaler level is eliminated on paper for the convenience of our level-by-level calculation. The combined operation of processing and wholesaling functions is encouraged,

however, in that the net markup rate would be lower than if the two functions are operated separately.

From wholesalers, fishery products are distributed to consumers through three channels: Retail stores, public eating places, and institutions that serve food as a secondary function. Examples of the last channel include hospitals, military bases, prisons, school lunches, and train and airline food catering. Quantites and values of fishery products distributed through the three outlets change during different phases of the business cycle from recession to prosperity and vice versa. Consumers are likely to eat more at home in recession years than in prosperity years. Different products are disposed of in different proportions from three outlets in the consumer market. For example, more canned and frozen products are sold by retailers, whereas more shellfish and fresh fish are handled by eating places. In this study, a distribution pattern is established for each form of fishery product from a detailed survey of the U.S. food service industry published by the U.S. Department of Agriculture (1973). A weighted average of the ratios of distribution for all forms of products through each distribution outlet is estimated in each phase of the business cycle. Composition of domestic and imported fishery products is different, and, therefore, they assume different distribution patterns and ratios.

After different distribution ratios are applied to their corresponding outlets, purchase values are estimated for the three outlets. Margins and sales value are calculated when the markup rate for each outlet is provided. The total sales by the three outlets in the consumer market constitute the consumer expenditures for domestic fishery products ($5.99 billion in 1978). The same result is obtained by adding the margins of five marketing levels to the landing value after deducting exports (Table 1).

From imports, the semiprocessed and raw products are shipped to processors for reprocessing, whereas processed products (mostly frozen and canned) are distributed to trade channels. The sales and margin values are calculated in a similar manner as they

are done for domestic products, except that markup rates and ratios of the distribution pattern are not the same. Appendix Tables 2, 3, and 6 give these rates and ratios. Consumers' expenditures for imported fishery products were $5.45 billion in 1978.

A value-added rate is calculated for each major fishery product at each level from harvesting to public eating places for each year. For the purpose of this study, a weighted average of value-added rates of all fishery products at each level is calculated for each year from 1972 to 1977 and projected to 1982 (Appendix Table 4).

Multiplying the harvesting bill at the harvesting level and the margins of domestic and imported products at five marketing levels by their corresponding value-added rates will give an estimate of value added for each of the six levels in dollar terms. The total value added of the six levels is the contribution of the U.S. fishing industry from the food fish sector to the national economy in terms of GNP. In 1978, this sector contributed $6.38 billion as GNP to the national economy.

Consumer Expenditures for Seafoods

Estimates have been made to determine what percent of edible fishery products in the United States was imported. According to annual statistical data on the U.S. supply (landings and imports), imports were 56-60 percent by value and 61-63 percent by quantity (round weight) in 1976-78. Statistics in earlier years show that the percentage of imports was even higher. The assertion that over 60 percent of fishery products in the U.S. market is imported appears misleading, because the method of its estimation is too simplistic. Fish and shellfish are not identical in form nor equivalent in weight. They cannot be added by quantity in round weight. Because domestic landings and imported products differ in their proportions of fish and shellfish, the total round weight of one group cannot be compared with that of the other. The two groups of products are not equivalent in value either, because imports are mostly processed before entering the United States and priced higher than domestic landings yet to be processed.

The measurement that can produce more meaningful results for comparison purposes between domestic landings and imports is one to be made in value terms at the consumer market level. At this level, consumers, as final users, pay for the domestic and imported products that are all processed to the final desirable degree to meet the demand of consumers. Measured at this level, imported fishery products are found to be only 47.6 percent of the total sales value in 1978, 46.8 percent in 1976, and 47.3 percent in 1977, according to this study (Table 2).

U.S. consumers spent $11.45 billion on domestic and imported edible fish or $52.50 per capita in 1978. This was an increase in both total value and quantity from 1976 and 1977. Of the total expenditures for fish, consumers spend considerably more in public eating places than they do at home. According to the findings of this study, 68-70 percent of a consumer's seafood dollar is spent away from home (Table 2).

Disposable personal income (DPI) is the net amount of income per year available for private individuals and families to spend after depreciation and taxes are deducted from the gross national income (see Table 5). About 19.06 percent of DPI was spent on all foods in 1976 (Table 3). This rate dropped to 18.82 percent in 1977 and to 18.55 percent in 1978. Consumers spent only 0.8 percent of DPI on fish food in the last 3 years. Compared with 0.6 percent in 1974 and 0.73 percent in 1975 (Penn[2]), spending on fish consumption has been rising although the amount is insignificant compared with

[2] Penn, E. S. 1979. Marketing bill of U.S. fish-food products, 1972-77. National Marine Fisheries Service office document, 49 p. Office of Policy and Planning, National Marine Fisheries Service, NOAA, Washington, DC 20235.

Table 2.—Sales of domestic and imported fish products at the consumer market level, 1976-78.

Item	1976 Domestic	1976 Imports	1976 Total	1976 Percentage of total	1977 Domestic	1977 Imports	1977 Total	1977 Percentage of total	1978 Domestic	1978 Imports	1978 Total	1978 Percentage of total
	_ _ _ Million dollars _ _ _				_ _ _ Million dollars _ _ _				_ _ _ Million dollars _ _ _			
Retail	1,294	1,657	2,951	30.8	1,410	1,815	3,225	31.3	1,595	2,040	3,635	31.8
Public eating places	3,569	2,566	6,135	64.1	3,782	2,776	6,558	63.6	4,129	3,096	7,225	63.1
Institutions	228	260	488	5.1	245	281	526	5.1	270	315	585	5.1
Total	5,091	4,483	9,574	100.0	5,437	4,872	10,309	100.0	5,994	5,451	11,445	100.0
Percentage of total	53.2	46.8	100.0		52.7	47.3	100.0		52.4	47.6	100.0	
Per capita consumption Value (dollars)	44.59				47.66				52.50			
Quantity (pounds, edible weight)	13.0				12.0				13.4			
Resident population July 1 (million)	214.7				216.3				218.0			
Exports (million dollars)	329.8				473.4				831.7			

expenditures for meat or dairy products.

A direct comparison with total food consumption shows that fish consumption's share increased from 4.20 percent in 1977 to 4.25 percent in 1978. As a result of a more rapid increase in fish prices coupled with a steady increase in total quantity sold, fish consumption has gained some ground from other foodstuffs in competing for the consumer's food dollar in 1978 (Table 3).

Contribution to the National Economy

Every industry, manufacturing or service, has its contribution to the economy expressed as a part of GNP and derived from value added by all levels of activities from extraction through distribution. For fisheries, each of the six levels from harvesting to eating places has contributed to GNP in various amounts.

Table 3.—Seafood's share of total food expenditures and disposable personal income in the United States, 1976-78.

Year	Fish consumption ($ billion)	Total food consumption[1] ($ billion)	Fish consumption as percentage of total food consumption	Disposable personal income (DPI)[1] ($ billion)	Fish consumption as percentage of DPI	Total food consumption as percentage of DPI
1976	9.57	225.80	4.23	1,184.40	0.81	19.06
1977	10.31	245.20	4.20	1,303.00	0.79	18.82
1978	11.45	269.20	4.25	1,451.20	0.79	18.55

[1]U.S. Department of Commerce, Bureau of Economic Analysis.

Table 4.—Contribution to GNP by the U.S. fishing industry compared with selected major industry groups, 1976-78.

	At the harvesting level			At the processing level			At all levels from production to consumption				
		Fisheries			Fishery products		(A)	(B)		Fishery products	
Year	Agriculture, forestry, and fisheries	Con-tri-bution	Percentage of group total	Non-durable goods	Con-tri-bution	Percentage of group total	All in-dus-tries	Food prod-ucts	Con-tri-bution	Percentage of (A)	Percentage of (B)
	Billion dollars			Billion dollars			— — —Billion dollars — — —				
1976	48.20	0.84	1.74	167.2	1.02	0.61	1,700.1	225.8	5.08	0.30	2.25
1977	54.20	0.95	1.75	186.2	1.14	0.61	1,887.2	245.2	5.56	0.29	2.27
1978	NA[1]	1.19	—	NA[1]	1.34	—	2,106.6	269.2	6.38	0.30	2.37

[1]NA=not available.
Source: Department of Commerce: Bureau of Economic Analysis and National Marine Fisheries Service.

Table 5.—Income generated for the national economy by the U.S. fishing industry, 1976-78, in millions of dollars.

Steps of calculation	1976	1977	1978
1. Value added (GNP)	$5,083	$5,558	$6,378
Less: Capital consumption (1976:10.64%; 1977:10.34%; 1978:10.30%)[1]	−541	−575	−657
2. Equals: Net national product (NNP)	4,542	4,983	5,721
Less: Indirect business taxes and transfer payments (1976:8.90%; 1977:8.95%; 1978:8.46%)[1]	−452	−497	−540
3. Equals: National income	4,090	4,486	5,181
Less: Corporate profit (1976:19.79%; 1977:20.13%; 1978:20.43%)[1]	−1,006	−1,119	−1,303
Plus: Government transfer payments, personal interest income, and dividend (1976:20.58%; 1977:20.35%; 1978:20.10%)[1]	+1,046	+1,131	+1,282
4. Equals: Personal income	4,130	4,498	5,160
Less: Personal taxes (1976:11.56%; 1977:11.98%; 1978:12.16%)[1]	−588	−666	−776
5. Equals: Disposable personal income	3,542	3,832	4,384
6. Times: Multiplier coefficient[1]	2.12	2.51	2.68
7. Equals: Generated income to the national economy	7,509	9,618	11,749
8. Ratio between value added and generated income	1:1.48	1:1.73	1:1.84

[1]Ratios and coefficients are derived from actual figures given in tables for GNP, national and personal income, savings and investment, and import and export values, prepared by the Bureau of Economic Analysis, U.S. Department of Commerce 1976-78. Ratios are expressed as percentages of value added for each year.

Comparisons of such contributions can be made between different levels of the fishing industry and between the total of all levels of the fishing industry and the total of another industry. Contribution to GNP by all levels of the U.S. fishing industry was $6.38 billion in 1978, 14.8 percent higher than in 1977 and 25.5 percent higher than in 1976. Its actual rate of increase was about the same as that of the total GNP for all industries, but faster than that of GNP from food products (last column of Table 4). At the harvesting level, the growth rate of GNP for fisheries was more or less on a par with that for the combined industry group of agriculture, fisheries, and forestry. At the processing level, fisheries' contribution to GNP is increasing at a slightly faster rate than the contribution of nondurable goods (first two columns of Table 4).

In 1978, as in earlier years, fish processors contributed more to the national economy in terms of GNP than fishermen and vessel owners, after imported raw products are added to the production lines of processing plants. At the consumer market level, the food service industry sold twice as much fish food as retailers did in 1978, and its contribution to GNP was almost four times greater. Similar rates are found at the two corresponding levels in the earlier 2 years. This is conceivable, because eating places handled greater volumes of fish and required more labor, capital, and management costs to prepare and serve cooked fish than retail stores needed to retail uncooked fish products (Table 1).

GNP created by an industry is only the initial contribution to the economy. After deducting taxes, profits, and depreciation from GNP, the net will be the disposable personal income, the spending of which will touch off a chain reaction to generate employment and income in other sectors of the economy several times over within a year. This generated income can be calculated from the personal income flow created by the fishing industry and the multiplier coefficient of the national economy as demonstrated in Table 5. The multiplier coefficient is the reciprocal of the sum of the marginal propensity to save and the marginal propensity to import (Kindleberger, 1958).

Out of a total value added (or GNP) of $6.38 billion created by the U.S. fishing industry in 1978, $4.38 billion is netted as the disposable personal income for those employed by the industry and $11.75 billion is generated at the end of the year as income to other sectors of the economy (Table 5). This generated income is 22.2 percent higher than in 1977 and 56.5 percent higher than in 1976. The high rate of increase is influenced by a higher multiplier coefficient value in 1978. The percentage of income saved and that spent on imports of all commodities, as leakages of income, were highest in 1976 and lowest in 1978 among the 3 years. The lower the percentage of leakages of income, the more it will enhance the factors that tend to induce investment. As a consequence, the higher multiplier coefficient in 1978 will generate a greater income in proportion to the initial contribution of value added (line 8, Table 5).

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Appendix A: Source of Data

The "markup" rate of a fishery product is simply calculated from its selling and purchase prices at a production or marketing level. The National Marine Fisheries Service collects prices at all levels from ex-vessel, processing, wholesale, to retail. Some retail prices are gathered by the Bureau of Labor Statistics and a few by marketing service offices of different State Government agencies as supplementary sources. Price margins and markup rates are calculated for each fishery product through price analysis at each level. In this study, we calculate and use the weighted average of all fishery products at each level.

In an aggregate study, it is the sales value (price × quantity) at each level that should be considered. The Resource Statistics Division of NMFS publishes annual sales of fishery products at the harvesting and processing levels; however, the current or annual sales from the outlets of retail stores, eating places, and institutions are nowhere to be found. Estimates of sales from the above outlets can be made, however, based on a comprehensive survey of sales of the U. S. food service establishments through the channels of retail stores, various public eating places, and institutions to consumers (U. S. Department of Agriculture, 1973). From this source of information, fishery products are grouped into fresh finfish, frozen finfish, canned fish, shrimp of various processed forms, and other shellfish. A distribution pattern of these groups of products from processors/wholesalers to different trade channels presented in ratios is established so that it can be applied in the calculation of sales for other years. These ratios differ from year to year as the composition of products to be sold varies annually. A study for the period 1972-77 (Penn, 1979) indicates that some cyclical movements took place between recession and prosperity years: Consumers ate less fish away-from-home during recession years and more during prosperity years.

Information on costs and earnings of

fishing vessels is relatively sparse. The NMFS economics staff and a few private institutes have made studies on cost and earnings. The data of earlier years are adjusted by composite cost indices compiled by the Economic Analysis Staff of NMFS to bring them up to date.

At processing and marketing levels (including wholesalers, retail stores, and public eating places), costs and earnings data related to fisheries or seafood are published by the "Census of Manufactures, Statistics of Income" by the Internal Revenue Service, "Supermarket Performance Statements" by the Supermarket Institute, and some related studies by the U.S. Department of Agriculture. An analysis of the above cost information produced an estimate of value added of each fishery at each level according to the concept of production factors' costs adopted also by the Bureau of Economic Analysis of the U.S. Department of Commerce.

The combined information from all the above sources provides us not only the sales and margin values in aggregate terms, but also value-added rates at each level for all fishery products. For this study the weighted averages of the above values are used.

The skeleton of this study and the trends of different rate changes are derived from two comprehensive reports: "Cost Analysis of U.S. Fish Price Margins, 1972-77, at Different Production and Distribution Levels" and "Marketing Bill of U.S. Fish Food Products," both prepared by E. S. Penn.

Appendix B: Tables of Different Rates and Ratios Used in Calculations

Following are tables of weighted average markup ratios and value-added rates of fishery products at different production and distribution levels, and tables of distribution patterns for trade channels in the handling of fishery products in the consumer market. Ratios presented in the distribution pattern tables are cyclical in trend; those in other tables are actual figures for 1972-77 and projected estimates for 1978-82.

Markup rates at processing and wholesale levels have been increasing faster than at other levels, because they involve more labor and fuel costs which increased at a faster rate than most other costs. The major outlay of wholesalers is for storage and trucking operations, which mainly involve labor and fuel costs.

Retail markup rates will increase only slightly, and those for public eating places and institutions will tend to drop gradually according to past trends. This drop is made possible by the rapid increase of fast food outlets and the simplification of services. Such a drop may be halted or reversed, if energy problems, especially the gas fuel supply, are not solved in the near future.

Value-added rates vary more or less in line with markup rates, except that the latter are more responsive to changes in the prices of fuel and other materials, whereas the former are affected more by wage rates.

Appendix Table 1.—Weighted average of markup rates of different fishery products at each production and distribution level of the U.S. fishing industry, 1972-77 (actual) and 1978-82 (projected).

Year	Processing[1]	Wholesale	Retail	Public eating places	Institutions
			Ratio[2]		
1972	1.0557	0.1868	0.3441	1.2512	0.6802
1973	0.9931	0.1669	0.3283	1.1900	0.6200
1974	1.0627	0.1771	0.3906	1.2787	0.6700
1975	0.9780	0.2073	0.3405	1.2600	0.6700
1976	1.1128	0.1904	0.2790	1.2499	0.6699
1977	1.1447	0.2068	0.3043	1.1720	0.6472
1978	1.1262	0.2080	0.2870	1.2200	0.6550
1979	1.1320	0.2087	0.2872	1.2100	0.6530
1980	1.1378	0.2095	0.2878	1.2000	0.7520
1981	1.1401	0.2100	0.2882	1.2000	0.6510
1982	1.1413	0.2108	0.2885	1.2000	0.6510

[1]Purchase value at the processing level is based on landed weight at dockside with no adjustment made on a product weight basis. The markup rate is about 2.8 times higher, on the average, than if both purchase and selling values are adjusted on the same weight basis.

[2]A ratio between the margin and the purchase value. A ratio of 0.3441 at the retail level means that the costs and earnings margin of the retailer is 34.41 percent of his purchase value of the fishery product and the sales value is 1.3341 times higher than the purchase value.

Appendix Table 2.—Weighted average of markup rates of imported fishery products at processing and wholesale levels, 1977.

Product	Markup rates		Imported value	
	Processing	Wholesale	Unprocessed	Processed
	Ratio		Million dollars	
Blocks and slabs (to sticks and portions)	0.4133	0.1245	291.7	—
Halibut (to steaks)	0.3238	0.1252	9.1	—
Salmon (to steaks)	0.1481	0.4116	10.8	—
Tuna (to canned products)	0.8941	0.0785	255.3	—
Weight average ratio	0.6232 (=353.32/566.9)	0.1044	566.9	1,511.6

Note: When the four domestically processed imported raw products are distributed to wholesalers together with more than 30 varieties of other imports of processed products, the markup rate at the wholesale level is not the overall weighted average of 0.2068 for all products in 1977 (see Appendix Table 1), but a weighted average between 0.2068 and 0.1044 (the markup rate for four imported products of the same year), or 0.1681 arrived at as follows: $(1,511.6 \times 0.2068) + (920.5 \times 0.1044) = 408.70$, $408.70/2,432 = 0.1681$. (This is the rate used in Table 1 in the text referred to in footnote 1.)

Appendix Table 3.—Projection of markup rates for four imported fishery products at processing and wholesale levels, 1978-82.

Level and product	1978	1979	1980	1981	1982
			Ratio[1]		
Processing					
Blocks and slabs (to sticks and portions)	0.4200	0.4240	0.4290	0.4330	0.4380
Halibut (to steaks)	0.3120	0.3310	0.3520	0.3580	0.3600
Salmon (to steaks)	0.1400	0.1480	0.1500	0.1510	0.1520
Tuna (to canned product)	0.9100	0.9160	0.9270	0.9360	0.9400
Wholesale					
Sticks and portions	0.1290	0.1300	0.1320	0.1360	0.1390
Halibut steaks	0.1258	0.1330	0.1400	0.1440	0.1460
Salmon steaks	0.4000	0.4320	0.4500	0.4550	0.4600
Canned tuna	0.0792	0.0797	0.0806	0.0814	0.0818

[1]Ratio between the margin and the purchase price.

Appendix Table 4.—Weighted average of value-added rates of fishery products, expressed as a percentage of the margin at each production and distribution level of the U.S. fishing industry, actual for 1972-77 and projected for 1978-82.

Year	Harvesting	Processing	Wholesale	Retail	Eating places	Institu- tions
				Percent		
1972	62.23	59.10	52.17	74.42	66.29	54.90
1973	63.99	60.00	55.57	75.70	66.62	55.11
1974	60.63	61.00	58.55	77.00	63.96	52.24
1975	53.18	61.40	60.55	78.10	63.29	51.96
1976	66.07	61.80	61.70	79.20	62.29	52.50
1977	67.66	62.23	62.85	80.21	61.49	52.50
1978	68.40	62.70	63.65	81.10	61.00	52.40
1979	69.20	63.20	64.45	81.80	60.90	52.40
1980	70.00	63.70	65.25	82.60	60.80	52.30
1981	70.50	64.20	66.05	83.40	60.75	52.20
1982	71.30	64.70	66.50	84.20	60.75	52.20

Appendix Table 5.—Distribution pattern of domestic fishery products in different periods.

Period	Retail stores	Eating places	Institutions
		Percent	
Recession years	39.7	55.3	5.0
Recovery years	38.0	57.0	5.0
Prosperity years	36.4	58.6	5.0

Appendix Table 6. — Distribution pattern of imported fishery products in different periods.

Period	Retail stores	Eating places	Institutions
		Percent	
Recession years	51	43	6
Recovery years	50	44	6
Prosperity years	49	45	6