NOT FOR QUOTATION

THE FOREIGN-BUILT FISHING VESSEL EMBARGO:

A PRELIMINARY ANALYSIS OF

INVESTMENT AND OTHER ECONOMIC PERFORMANCE EFFECTS

By

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U.S NATIONAL MARINE FISHERIES SERVICE
ECONOMIC RESEARCH DIVISION

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Summary

This report provides information that may be useful in understanding possible effects of removing the embargo on the use of foreign-built vessels by U. S. commercial fishermen, but an estimate of the impact is not provided in economic terms, because of the complexity of the problem and because of the limitations imposed primarily by lack of information and data. It is understood that this embargo is the effect of 1793 law, as amended and related regulations, but this report is cast in economic terms and does not include a legal analysis or interpretation of the effect and legislative history of the statutes involved. There is no intent to suggest NMFS, fishing industry or other official or unofficial views or positions on the embargo.

Removing the embargo could affect the economic performance of the fish harvesting and shipbuilding industries. Available information suggests that vessel prices at least for some fisheries would decrease. Any decrease would be less than in the past, owing to currency realignments and relative international rates of general price inflation.

Even if we assume a vessel price decrease would occur for purposes of discussion, any statement about the impact on the fish harvesting sector's product prices (exvessel prices) and employment is probably closer to being the result of speculation than deliberation. In this vein it is felt that effects on employment and prices would be minimal and hard to isolate. If it is further assumed that exclusive use of U. S.-built vessels would slow the process of substituting capital for labor compared to what would be possible with foreign-built vessels, then it may be inferred that this substitution process and labor outmigration could quicken with removal of the embargo, although these changes have

been underway for several years (see 1940-70 data in Appendix Table D).

So far as the shipbuilding industry is concerned, the effects of embargo removal on business firms, sales, employment and other variables would be even more difficult to estimate than for the fish harvesting industry, because of the constraining effect of litigated, administrative or other controls on the use of foreign materials. Thus, without further information on this industry, it is not possible to say whether removal of the embargo would worsen, improve or not change employment, sales, profits and other variables and trends.

Briefly, major topics in this report may be summarized as follows.

Since 1940 there have been two periods of relatively rapid gross and net investment, one in the late 1940's and another in the late 1960's and early 1970's with negative net investment in some other years. During the 1960's there has been an increasing number and proportion of newer vessels. Yet, between 1964 and 1970 there was an increase in proportion of both 1-10 year old and over-20 year old vessels. All fisheries account for some investment, but higher rates of investment and return on investment have occurred in some fisheries.

A simplified investment decision-making model is presented to show the relationship among several variables that are relevant. Estimated rate of return on investment (ROI) varies among fisheries, and the average appears to be above that in U.S. manufacturing, allowing for definitional differences. Higher investor risk in fish harvesting could explain this apparent numerical superiority.

With respect to shipbuilding industry performance, consideration is given to product price and quality, and the degree of protection provided by the embargo and other trade constraints.

The effect of the embargo removal on investment and fishery capitalization is discussed, but the retention of the embargo and vessel price controls have not been studied as fishery management devices in terms of efficacy and efficiency. Thus, embargo removal is not opposed on the basis of possible aggravation of fishery management and capitalization problems.

Introduction

The embargo on the use of foreign-built vessels by U. S. commercial fishermen is one of several factors that should be considered in trying to analyse fish harvesting industry economic performance. Such factors are listed as follows, but not all of them are discussed in this report nor are all of them necessarily of equal importance throughout the fish harvesting industry which is rather diverse.

Trade restraints: Trade restraints on items that compete with fish harvesting sector products have been reduced to zero or nominal levels so far as tariffs and/or quotas are concerned. Remaining significant trade restraints of this kind are mainly on fish processor products. The embargo on the landing of fish by foreign-flag vessels is analysed in a companion report. Harvesting sector factor (input or material) trade restraints include the one analysed in this report, the embargo on the use of foreign-built vessels. Tariff and/or quota restraints on synthetic-fiber fishing nets and netting, synthetic-fiber rope and cordage, certain navigational equipment, electronic gear, winches and other items have been enumerated and evaluated in other reports.

Common property, limited, renewable, natural resources: The postwar rapid increase in world landings and fishery capitalization problems are discussed later in this paper. Growth in landings has been accompanied by generally uncontrolled access to both national fisheries (not generally fished by foreign-flag vessels) and international fisheries the world over, in many of which the United States has an interest. Increasing attention is being given to the annual yield rates various stocks of fish can sustain and to the effect of various rates of catch. Target yield rates may include the maximum sustainable yield (MSY), and lesser rates where economic optimum (maximum rent rather than maximum physical yield), sport fishing, biological stock recovery or other fishery management objectives dictate. When stocks are being harvested at or near their biological maximum rate, increasing product demand (price) may make increased harvesting effort financially attractive, even though total catch can not be increased on a sustainable basis and may even be reduced. Long before reaching effort levels that could force a reduction in total catch in some (not all) fisheries, physical quantity of catch per unit of fishing effort begins to decline. Fishing costs increase. Yet, the value of additional effort may exceed its cost. Some management schemes are more effective and efficient than others in controlling the economic forces that tend to increase effort, without introducing low-productivity technology and other costly and debatable constraints into the harvesting system.

<u>Competition</u>: It is possible that many fish harvestors sell their products and buy their inputs in markets in which they operate as competitors and their counterparts operate otherwise, specifically in such a way as to affect price and other conditions of market transactions, perhaps to the harvestors' economic disadvantage.

<u>Lay system and returns to capital ("profits")</u>: The lay system is intended to share the gains, losses and uncertainties of fishing among labor, capital and management. In the accounting of fishing costs and returns, the share going to capital owners as an investment signal is determined as a residual.

Net business income, before taxes, from fishing may be negative in some cases. As indicated later in this report, computed returns to capital include net income and interest expense (when computing return on investment, ROI, as in Table 7). Depreciation is added to form what is called owner's share for use in other conceptual constucts (when computing the internal rate of return, net present value or other investment decision rule data). Fish harvesting involves mostly small, non-corporate firms (as shown in Appendix Table C), and their net income is not necessarily the equivalent of profit, such as is reported for large, corporate-dominated industries, because owner, operator or family labor and management services may not have been costed properly in an economic sense, not implying incorrectness in the accounting sense or tax liability sense.

Economically fixed assets: The term economically fixed assets does not refer to the division of business assets into fixed, current and other categories on an accounting balance sheet, but rather to the immobility imposed on some factors of production by certain conditions. Elaborating, a factor becomes fixed in the production process when it earns less than acquisition costs dictate and more than salvage or alternative uses would provide. This is a rough explanation of an important, but technical economic concept. Labor resources in some fisheries are a good example. An interesting result of the phenomenon of economically fixed labor assets is that owner-operators (vessel owner-captains) may invest in capital expansion of their business, such as in a larger or more powerful vessel, even though return on investment is low or below what could be earned on funds in other uses.

Price and income elasticity of product demand: The demand for fish harvesting sector products is derived more or less directly from consumer demand for food and other products. Since World War II major changes have occurred, particularly with respect to frozen, breaded and otherwise prepared or processed foods, for which the domestic and foreign fish harvesting sector may be responsible for a small and decreasing share of consumer or final product value. Harvesting firms operate mostly as product market competitors that can individually increase business revenue by increasing output, but they generally do not act to control their total (industry or fishery) output in such a way as to affect revenue and price. Given a certain level of demand for most fisheries, available information indicates that reducing output would increase total revenue, and that increasing output would reduce total revenue, meaning the revenue which is shared among the fish harvesting firms. Demand is generally growing through time with population and per capita incomes, but the growth rate varies among products, and the growth may relate to portions of final product value added by other than the fish harvesting firms.

Status Characteristics of the U. S. Commercial Fishing Vessel Fleet

The status of the U. S. commercial fishing vessel fleet is reflected to some extent by data on the physical characteristics of the fleet and fleet additions, but some element of incongruity must be recognized in this representation. The kind of fleet data we have, such as numbers of vessels, gross tons and horsepower, are the physical inventory data which represent stock variables, not flow variables. There is no associated measure of used and unused (excess) productive capacity, such as is available in other industries. From a social point of view the degree of capacity utilization would be useful. The following discussion will concentrate on the variables, age, vessel changes and vessel additions. Inferences can be made about the status of the fleet from these variables, but caution must also be exercised; particularly in trying to suggest the possible impact of allowing or compensating for not allowing the purchase of foreign-built vessels Either is generally interpreted to mean a reduction in delivery price at least for some kinds of vessels.

Definitions

Available data on the U. S. commercial fishing fleet is compiled using rather specific definitions, which will be given briefly to help avoid possible misunderstanding.1/

1/ For further details see Bureau of Commercial Fisheries (BCF now NMFS), Statistics of the Vessels Documented as Fishing Craft, 1957-66, Fishery Leaflet 610 (Washington, D. C.: BCF, December 1967), pp.1 and 60-62.

Vessel: A commercial fishing craft having a capacity of 5 net tons or more. These craft must be documented by the U. S. Coast Guard and have an official number assigned. This documentation requires ownership by a U. S. citizen and U. S. construction.2/

Boat: A commercial fishing craft having a capacity of less than 5 net tons. U. S. Coast Guard documentation and U. S. construction are not required, although in some limited situations, foreign-built boats can not be used.3/

It is understood that NMFS port agents will only count craft that are actually engaged in commercial fishing during the year.

Sport fishing vessels may have dual services listed in their documents (1) coastwise trade, allowing them to carry passengers or cargo such as sport fishermen (who buy craft, crew and other services or goods), and (2) fisheries allowing them to sell fish. The fish sold may be caught on a sport fishing voyage, retained by the vessel

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2/ Besides other useful information, Mr. Joe Yglesias, U. S. Coast Guard vessel documentation section, provided a non-technical interpretation of the term "U. S. built," although it should be understood that this relates to court and other legal decisions (phone interview, December 7, 1973). To be documented, a vessel must be U. S. contructed. The hull and superstructure must be of U. S. manufactured materials. Imported steel plate could be used, for example, so long as it was not prefabricated specifically for ship-hull use. Regarding portions of the vessel that are not integral parts of the hull and superstructure (such as the engine, electronic equipment or fishing gear), foreign-made items can not exceed 50 percent of the value of materials (referring to ship-builder cost basis).

3/ Foreign-built "boats" (fishing craft under 5 net tons) can be used in U. S. fisheries, with the exception introduced into law in 1972. Under the provisions of Public Law 92-601 (passed October 27, 1972 and operative for 5 years; 16 U.S.C. 1100-1100a-3) a foreign-built boat can not be used if it was used in the same kind of fishery and subsequently prohibited from such foreign fishery, all with respect to one country.

and later sold, or obtained on a strictly "commercial" fishing voyage (without sport or recreational fishermen aboard). 4/

All fishing craft must obtain a state number and otherwise comply with state and federal laws.

In terms of NMFS data (craft engaged in commercial fishing), the numbers of commercial fishing vessels vary among years, but have increased roughly speaking from about 11,500-12,000 to about 12,500 -13,500 over the period 1950-1970. In addition there were some 75,000 commercial fishing boats in 1970.

Some Imperfect Proxies for Investment: National Fleet Changes and Additions

It would be useful to have monetary measures of the capital stock, gross investment, and net investment, as well as percent-of-capacity utilization in the fish harvesting industry. Unfortunately, we do not. However, we do have physical inventory data on the number and tonnage of vessels used annually. Changes in the inventory totals suggest themselves as crude, non-monetary proxies for net investment (net capital formation), which may be negative or positive in any one year. Tonnage changes are a preferable measure to vessel number changes, because construction cost of a vessel is roughly proportional to tonnage. Similarly, vessel additions to the fleet may be suggested as crude, non-monetary measures of gross

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4/ To engage in the service designated as coastwise trade for documentation purposes a vessel must be U. S.-built and owned by a U. S. citizen, as for service in the "American fisheries," and can have been neither owned by an alien nor operated under foreign flag, according to Mr. Joe Yglesias, as cited in footnote 2.

investment (which allows for replacement, as well as net capital formation). Note that the term vessel additions will be used interchangeably with the term vessels documented for fishing, referring to the number of vessels documented in a year by the U. S. Coast Guard, with fishing listed as among the services.

For reasons of completeness, the following discussion will focus on the 1956-70 data in Table 1, but it may be useful initially to consider changes over the entire 1940-70 period. The most rapid increase in vessel numbers occurred between the early 1940's and early 1950's, and the large number of annual additions in 1946-49 was not approached until 1971 when 1,016 vessels were documented for fishing. The average tonnage of vessels appears to have remained relatively stable until about the mid or early 1960's. After a period of decline, 1957-60, the annual gross tonnage of vessels documented for fishing increased rather rapidly. Annual tonnage additions in 1966-71 were 3-4 times the 1960 level. The number of vessels added did not quite double over these years, meaning that large vessels were being documented for fishing in the late 1960's and early 1970's. To summarize, two high investment periods have occurred since 1940, one in the late 1940's and another in the late 1960's and early 1970's.

Vessel Number Changes: Using the 1956-70 data in Table 1, we can discuss at least three concepts of vessel number changes, which rank behind tonnage changes as crude, non-monetary measures of net investment, as follows:

Table 1.--U.S. Commcerical Fishing Vessels, Number and Tonnage Data, 1940-70 1/

Year	Number of Vessels			Vessel Tonnage 2/			
	Total	Change	Documented	Total	Change	Documented	Average
1940	5,562	-----	320	112,752	------	------	20.3
1941	5,597	35	354	112,043	-709	------	20.0
1942	5,383	-214	358	99,723	-12,320	------	18.5
1943	5,506	123	358	94,486	-5,237	------	17.2
1944	5,931	425	635	103,913	9,427	------	17.5
1945	6,929	998	741	131,390	27,477	------	19.0
1946	7,207	278	1,085	134,854	3,464	------	18.7
1947	8,661	1,454	1,300	169,474	34,620	------	19.6
1948	9,632	971	1,184	189,687	20,213	------	19.7
1949	10,273	641	1,002	205,188	15,501	------	20.0
1950	11,496	1,223	812	220,405	15,217	------	19.2
1951	11,242	-254	780	223,174	2,769	------	19.9
1952	11,065	-177	675	220,202	-2,972	------	20.0
1953	10,621	-444	729	203,423	-16,779	------	19.2
1954	11,179	558	717	221,270	17,847	------	19.8
1955	11,796	617	418	232,479	11,209	------	19.7
1956	11,458	-338	521	243,488	11,009	------	21.3
1957	11,671	213	619	245,195	1,707	22,754	21.0
1958	11,496	-175	713	239,258	-5,937	25,815	20.8
1959	12,109	613	507	246,445	7,187	15,164	20.4
1960	12,018	-91	449	402,212	------	14,401	33.5
1961	11,964	-54	427	400,935	-1,277	17,035	33.5
1962	11,511	-453	367	395,164	-5,771	16,267	34.3
1963	11,928	417	589	408,778	13,614	25,020	34.3
1964	11,808	-120	503	415,338	6,560	23,412	35.2
1965	12,311	503	663	435,308	19,970	36,474	35.4
1966	12,677	366	816	456,458	21,150	46,194	36.0
1967	12,874	197	869	486,273	29,815	58,262	37.8
1968	13,150	276	856	522,556	36,283	55,193	39.7
1969	13,187	37	783	534,146	11,590	52,982	40.5
1970	13,591	404	829	554,785	20,639	44,962	40.8

1/ Includes commercial fishing vessels 5 net tons and over; includes Alaska.

2/ Net tons, 1940-59; gross tons, 1960-70 and documented, all years.

Sources: BCF (now NMFS) or NMFS, Fishery Statistics of the United States, annual issues for 1940-69 and draft for 1970; Fisheries of the United States, annual issues for 1967-71; Statistics of Vessels Documented as Fishing Craft, 1957-66, Fishery Leaflet 610 (December 1967).

(1) The total inventory increased by 2,133 vessels or 19 percent from 1956 to 1970, an average of 152 annually over 14 years. This ignores what happened between end years of the period.

(2) A simple linear regression uses all the inventory numbers for the years 1956-70, and indicates a lower annual average change of 137 vessels, or 1.1 percent per year, moving along the regression line.5/

(3) Some pattern of change other than a linear one may be suggested by the several years with negative changes, followed by several years of generally large positive changes.

Vessel Tonnage Changes: As for the changes in vessel numbers and again using 1956-70 data from Table 1, we can discuss at least three concepts of vessel tonnage changes, which are preferable as non-monetary, crude measures of net investment:

(1) Total tonnage increased an estimated 162,834 gross tons or 42 percent from 1956 to 1970; this is an average of about 11,361 gross tons or 3 percent per year (simple average over 14 years).

5/ Regressions:

Linear: $N = 11155.2 + \underset{(7.38)}{136.9}\,T$, where $R^2 = 0.80$, $\bar{R}^2 = 0.79$, D. W. = 0.89.

where: N = number of vessels engaged in commercial fishing
T = time, 1956-70

Semi-log linear:
$N = 4.049205 + \underset{(7.41)}{0.004789}\,T$, where $R^2 = 0.80$, $\bar{R}^2 = 0.78$, D. W. = 0.96

where: N = logarithm (base 10) of the number of vessels
T = time, 1956-70

Note: numbers in parentheses below time coefficients are t values. The Durban-Watson statistics (D.W.) indicate positive serial correlation of the regression residuals. Hence, the estimated regression coefficients may have underestimated sampling variances. One possible solution is to reduce the degrees of freedom, such as in judging the significance of the t statistics. The computer print-out of residuals suggests the possibility of some curvilineary pattern of vessel number growth. Further fits were not attempted, because it is believed that growth relates more to fisheries on an individual rather than aggregate basis.

The computations are based on end-year data and ignore what happened between end years (See Table 1).6/

(2) A simple linear regression uses all the tonnage numbers for 1956-70, and indicates a higher annual average tonnage change, 11,659 gross tons. The annual percentage change, 2.6 percent is lower, since the average total-inventory tonnage among years (438,443) is used in the computation rather than the first-year total (an estimated 391,951 gross tons for 1956).7/

(3) As for vessel numbers, some other pattern of change than a linear one, as assumed in the regression, may have occured.

Data Limitations: Vessel number and tonnage changes among years do not represent good physical-data proxies for net investment (net capital formation), in part because these changes represent both capital stock and utilization changes.8/ To reduce the amount of change due purely to whether or not some vessels engage in fishing,

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6/ Comparison of the fleet average tonnage for 1956-59 (20.85 net tons) and 1960-61 (33.49 gross tons) suggested a conversion factor of 1.61 which is assumed here and in the regression.

7/ Regression (see comments in footnote 5 on vessel number regressions, especially regarding the Durban-Watson statistics, which indicates positive serial correlation here as well):

$$(1)\ GRT = 345171 + \underset{(7.69)}{11659}\,T, \text{ where } R^2 = .81,\ \bar{R}^2 = .78,\ D.W. = .25.$$

$$(2)\ GRT = 5.54975 + \underset{(8.19)}{0.01111}\,T, \text{ where } R^2 = .83,\ \bar{R}^2 = .81,\ D.W. = .27.$$

where: GRT = gross registered tons for (1); in logarithms to base 10 for (2).

T = time

8/ Besides failing to reflect the degree of utilization, these physical inventory measures, and computed annual changes or trends therein, make no allowance for differences among vessels in age, level and recentness of technology, state of repair, ability to produce returns to capital and other factors.

it would seem that the Bureau of Census' enumeration definition would have been preferable to that of NMFS. The NMFS enumeration definition (vessels engaging in commercial fishing) allows for a 8-12 percent higher number of vessels than the Census' definition (vessels with receipts primarily derived from commercial fishing).9/

Vessel Additions: Vessel number additions are more readily compared with other data, but they rank behind vessel tonnage additions as crude, non-monetary measures of gross investment in the U. S. commercial fishing vessel fleet. The 1957-70 additions averaged 642 annually. Yet, a larger number of vessels is added to the fleet than will engage in fishing for any given year of construction. Data in Appendix Tables A and B suggest that the number engaging in fishing may be about 60 percent of the number added for recent contruction years. Thus, we have an extremely crude, non-monetary measure of gross investment in fishing vessels, a critical variable in estimating the demand for commercial fishing vessels, including both the elements of net capital formation (net investment or net addition of capital) and replacement.

To summarize, it has been suggested that changes in the gross tonnage of the U. S. fishing fleet are crude, non-monetary proxies for net investment, and that tonnage changes are preferable to changes in the

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9/ The NMFS (then BCF) to Census numerical ratios are as follows:
For 1967: 12,874 / 11,974 = 1.075 or 7.5% higher for NMFS.
For 1963: 11,928 / 10,666 = 1.118 or 11.8% higher for NMFS.
See U. S. Bureau of Census, 1967 Census of Commercial Fisheries, (Washington, D. C.: U. S. Government Printing Office, 1970), p. 2.

number of vessels, because construction cost is roughly proportional to tonnage. Similarly, additions to the fleet, preferably in terms of tons rather than numbers of vessels, are crude, non-monetary proxies for gross investment. However, neither changes nor additions are really good proxy measures of the stock and flow variables involved, because no measure of the degree of capacity utilization is available for the fleet as a whole, and because of definitional problems.

Fleet Age

Published information on the age of the U. S. commercial fishing vessel fleet and age of additions to the fleet may be used in several ways to suggest something about investment rates, replacement rates and the demand for commercial fishing vessels. Published frequency distributions for the fleet by year of construction are available for fishing years 1961-70. The discussion will focus on four topics: an estimated replacement rate, the proportion of 1-5 year old vessels operating in fishing years 1961-70, a simplified age distribution of vessels operating in statistical fishing regions in 1964 and 1970, and a simplified age distribution of vessels operating in major fisheries in 1967.

The physical proxy for gross investment, additions to the fleet, may be compared to fleet size to obtain a replacement rate, as follows:

$$19 \text{ years} = \frac{\text{(12,250 vessels, 1956-70 fleet average size)}}{\text{(642 vessels added per year, 1957-70 average)}}$$

That is, if the fleet remained at the static size of 12,250 vessels, with 642 vessels being both added and withdrawn each year, it would take 19 years to replace the fleet. However, the data do not allow such a statement. Data in Appendix Tables A and B suggest that perhaps only 60 percent of the vessels "added" to the fleet (i.e., documented for fishing) for any year of construction will ever engage in fishing. Also, the added vessels have a frequency distribution with respect to age, although most are relatively new; for example, of the 829 vessels added in 1970, 537 were constructed in 1970, 86 in 1969, and the rest in the years 1900-1968.

<u>The Proportion of 1-5 Year Old Vessels</u>: Comparing the number of vessels 1-5 years old to the number of vessels in the fleet for fishing years 1961-70, we find generally speaking, both an increasing number and proportion of these vessels, as shown in Table 2. This suggests increasing replacement and investment rates, but recall that gross-tonnage data would be preferable to vessel-number data as a crude, non-monetary proxy for investment.

<u>Fleet Age Distribution Changes</u>: The age distribution of the fleet is shown in Table 3 for 1961 and 1970, along with the 1961-70 change. The median vessel age increased from 15 years (year built, 1947) in 1961 to 21 years (year built, 1950) in 1970. In both 1961 and 1970 the decade 1940-49 accounts for the largest number of vessels. To show the number of vessels constructed since 1961 and operating in 1970, the last two categories do not follow the decade pattern. The construction years 1960-70 account for the net increases between 1961 and 1970, although both additions and losses may have occurred for any construction year. As expected, the percentage of vessels operating in 1961 and not operating in 1970 increases with age from 13 percent for vessels constructed in

Table 2. -- Proportion of U. S. Commercial Fishing Vessels 1-5 Years Old in Fishing Years 1961-70.

Fishing Year	Numbers of Vessels		Percentage
	1-5 Years Old	Fleet Total	1-5 Years Old
1961	1,422	11,964	11.88
1962	1,124	11,511	9.76
1963	1,037	11,928	8.69
1964	1,056	11,808	8.94
1965	1,258	12,311	10.21
1966	1,500	12,677	11.83
1967	1,790	12,874	13.90
1968	2,107	13,150	16.02
1969	2,269	13,187	17.20
1970	2,265	13,591	16.66

Sources: BCF (now NMFS) or NMFS, Fishery Statistics of the United States, annual issues for 1961-69 and draft copy for 1970 (Washington, D. C.).

Table 3. -- Age Distribution of the U. S. Commercial Fishing Vessel Fleet, 1961, 1970, and 1961-70 Change.

	Fishing Year 1961		Fishing Year 1970		Change, 1961-70 1/	
Year Built	Number	Percent 2/	Number	Percent 2/	Number	Percent
Before 1900	72	0.6	32	0.2	-40	-56
1900-1909	210	1.8	124	0.9	-86	-41
1910-1919	654	5.5	488	3.6	-166	-25
1920-1929	1,239	10.3	975	7.2	-264	-21
1930-1939	1,455	12.1	1,175	8.6	-280	-19
1940-1949	4,215	35.2	3,672	27.0	-543	-13
1950-1959	3,744	31.3	3,002	22.1	-742	-20
1960-1961	276	2.3	417	3.1	+141	+51
1962-1970	--	--	3,533	26.0	+3,533	--
Unknown	99	0.8	173	1.3	+74	+75
Total	11,964	100	13,591	100	+1,627	+ 8

1/ The net change in the fleet total between 1961 and 1970, 1,627 vessels, resulted from an increase of 3,748 (sum of positive numbers in change column) and a decrease of 2,121 vessels (sum of negative numbers in change column). The percentage change, 1961-70 is computed as the difference in vessel numbers by category between the two years divided by the number in the same category in 1961; e.g., for vessels built before 1900, we have (-40)/72 = -0.556 or a decrease of 56 percent.

2/ Percentages may not add to total shown due to rounding.

Source: BCF (now NMFS) or NMFS, Fishery Statistics of the United States, annual issue for 1963 and 1970 draft copy.

1940-49 to 56 percent for vessels constructed before 1900. Surprisingly, the number of vessels constructed in 1950-59 still fishing in 1970 was 20 percent lower than in 1961, and not say 10 percent, as might be suggested by previous construction years. Viewing these changes another way, "drop-outs" decrease with age numerically (by category in Table 3), because there are fewer older vessels, even though the proportion of older vessel drop-outs is higher and increases with age.

Interpreting Regional Age-Distribution Variations: Tables 4 and 5 show both the number and percentage of vessels in selected, arbitrary age categories (1-10, 11-20 and over-20 years), as well as information on total, average and median-class tonnage for NMFS statistical regions for 1964 and 1970. The Gulf of Mexico and Pacific regions account for the largest number and tonnage of vessels, with the Pacific having a greater variation in size of vessels, as indicated by the greater difference between the average tonnage and median-class tonnage in 1970.[10/] Since we do not have a published frequency distribution of vessel tonnage according to age, but only a frequency distribution of vessel numbers according to age, inferences about the differences in age among region according to vessel numbers must be tempered by information on tonnage. Again, this is because we are concerned about the ability of different physical measures to act as proxies for gross and net investment, which are measured in dollars. For example, on the basis of vessel numbers

10/ NMFS published frequency distributions of vessel tonnage involve the use of tonnage classes (e.g., the 10-19 ton class), so it is possible to specify the tonnage class containing the median tonnage, but not the median tonnage (compared to which half of the number of vessels have a lower tonnage, and half, a higher tonnage).

alone, we would rank age changes in New England fifth among regions, but higher on the basis of tonnage (third in 1964 and fourth in 1970), the tonnage of vessels offering a far better crude, non-monetary proxy for cost and investment than the number of vessels.

Regional Age-Distribution Variations: Given the qualifications just mentioned, we can indicate the national change in age-distribution for comparison with regional changes: between 1964 and 1970, the proportions of 1-10 year old and over-20 year old vessels increased, and the proportion of 11-20 year old vessels declined. The Gulf of Mexico operates with the lowest proportion of older vessels and has the highest number and proportion of 1-10 year old vessels. Excluding Hawaii, the South Atlantic statistical region has the next highest proportion of 1-10 year old vessels, and next lowest proportion of over-20 year old vessels. Perhaps both more rapid hull (wood)[11/] deterioration and the dominance of the relatively profitable shrimp harvesting industry in the Gulf and South Atlantic regions account for the lower age of vessels. While the Pacific region had a lower percentage of 1-10 year old vessels than the two southern regions, it had a substantial numerical increase in this age group between 1964 and 1970. Contrary to what one might expect on the basis of the still dominant and relatively low profit groundfish harvesting industry, the New England region had a substantial 1964-70 percentage increase in the 1-10 year old age group. The Gulf, South Atlantic, Pacific and New England

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11/ About 92 percent of the U. S. Commercial fishing vessel fleet operating in 1967 had wood hulls. See U. S. Bureau of the Census, 1967 Census of Commercial Fisheries (Washington, D. C.: U. S. Government Printing Office, 1970), p.8. The 1968 percentage was 88; the 1969, 87; see NMFS Fishery Statistics of the United States, annual issues for 1968 and 1969.

Table 4. -- Regional Age Distribution and Tonnage of U. S. Commercial Fishing Vessels in 1964. 1/

Age (Years)	New England	Middle Atlantic	Chesa-peake	South Atlantic	Gulf of Mexico	Pacific	Great Lakes	Hawaii	Total, exclusiv of duplication
				Number of vessels					
over 20	410	313	510	319	794	2,275	186	21	4,689
11-20	218	210	394	426	1,447	1,614	174	32	4,348
1-10	89	81	324	344	1,322	642	30	4	2,672
unknown	4	4	17	19	19	36	--	--	99
TOTAL	721	608	1,245	1,108	3,582	4,567	390	57	11,808
				Percentages					
over 20	57	51	41	29	22	50	47	37	39
11-20	30	35	32	38	40	35	45	56	37
1-10	12	13	26	31	37	14	8	7	23
unknown	1	1	1	2	1	1	--	--	1
TOTAL	100	100	100	100	100	100	100	100	100
				Gross Tonnage					
Total	47,084	33,293	28,509	42,230	151,665	141,188	7,154	1,722	415,338
Average	65	55	23	38	42	31	18	30	35
Median class	40-49	30-39	5-9	20-29	30-39	10-19	10-19	20-29	10-19

1/ Correspondence between age and construction year: over-20 years, before 1945; 11-20 years, 1945-54; 1-10 years, 1955-64.

Source: BCF (now NMFS), Fishery Statistics of the United States, 1964 (Washington, D. C.: 1966).

Table 5. -- Regional Age Distribution and Tonnage of U. S. Commercial Fishing Vessels in 1970. 1/

Age (years)	New England	Middle Atlantic	Chesa-peake	South Atlantic	Gulf of Mexico	Pacific	Great Lakes	Hawaii	Total, exclusi of duplicatio
				Number of Vessels					
over 20	442	310	764	447	1,206	3,476	190	48	6,739
11-20	108	71	475	337	1,158	844	40	6	2,926
1-10	135	70	313	344	1,937	1,073	1	26	3,753
Unknown	1	4	14	83	19	53	--	--	173
TOTAL	686	455	1,566	1,211	4,320	5,446	231	80	13,591
				Percentages					
over 20	64	68	49	37	28	64	83	60	49
11-20	16	16	30	28	27	15	17	8	22
1-10	20	15	20	28	45	20	0	32	28
Unknown	0	1	1	7	0	1	--	--	1
TOTAL	100	100	100	100	100	100	100	100	100
				Gross Tonnage					
Total	43,789	21,511	26,763	53,564	238,003	195,999	4,702	2,278	554,785
Average	64	47	17	44	55	36	20	28	41
Median class	40-49	30-39	5-9	30-39	40-49	10-19	10-19	20-29	20-29

1/ Correspondence between age and construction year: over-20 years, before 1951; 11-20 years, 1951-60; 1-10 years, 1961-70.

Source: NMFS, Fishery Statistics of the United States, 1970, unpublished draft copy.

regions account for most of the 1964-70 percentage and numerical increase in 1-10 year old vessels. Even to retain a given numerical or percentage level of 1-10 year old vessels requires investment. Only the Chesapeake and Great Lakes regions suffered 1964-70 percentage and numerical declines in the 1-10 year age group. To summarize, most regions account for some investment activity, with vessel percentage and numerical dominance falling to the Pacific, Gulf and South Atlantic regions.

Vessel Age Variations Among Major Fisheries, 1967: Table 6 shows the number of vessels for major fisheries in 1967 categorized according to year built. The largest number are operated in the shrimp fisheries, which are predominantly southern, and which have one of the largest percentages of newer vessels (built in 1960-67), as already suggested. The salmon, tuna and Atlantic groundfish harvesting operations account for smaller numbers and percentages of vessels built in 1960-67, with salmon having both the larger percentages of newer vessels (built in 1960-67) and older vessels (built in 1900-29). Singling out a few other major fisheries, the oyster dredge, clam and halibut fisheries operate with relatively large proportions of older vessels (built 1900-29). Yet, it is important to realize that all fisheries, even those with relatively high proportions of older vessels, account for some new vessels (built in 1960-67). Interestingly, the menhaden fishery accounts for a relatively high percentage of vessels built in 1960-67 (30.4 percent), well above the national average (18.7 percent), as do the shrimp (29.9 percent), spiny lobster (29.6 percent) and scallop (35.7 percent) fisheries. It may be useful to note that the new (not reconstructed) tuna super seiners, which are among the largest U. S. fishing vessels, were added to the fleet beginning in the late 1960's. Despite their size, they would probably not have much

Table 6. -- Distribution of U. S. Commercial Fishing Vessels by Fishery and Year Built, 1967. 1/

Fishery	1900-1919	1920-1929	1930-1939	1940-1949	1950-1959	1960-1967	Total
	- - - - -	Number of vessels	or percentages	- - - - -	- - - - -	- - - - -	- - - - -
Shrimp	70	114	234	847	1,385	1,132	3,782
	1.8%	3.7%	6.2%	22.4%	36.6%	29.9%	100%
Salmon	323	373	307	780	640	372	2,795
	11.6%	13.3%	11.0%	27.9%	22.9%	13.3%	100%
Tuna	90	129	129	668	191	149	1,356
	6.6%	9.5%	9.5%	49.2%	14.1%	11.0%	100%
Groundfish, Otter trawl:							
N. & Mid Atlantic	53	89	105	350	131	79	807
	6.6%	11.0%	13.0%	43.4%	16.2%	9.8%	100%
Pacific	23	37	27	69	7	9	172
	13.4%	21.5%	15.7%	40.1%	4.1%	5.2%	100%
Oysters:							
Dredge	85	42	54	111	80	84	456
	18.6%	9.2%	11.8%	24.3%	17.5%	18.4%	100%
Tongs & Grabs	11	17	36	67	86	42	259
Lobster:							
Northern	1	4	18	12	7	11	53
Spiny	11	6	19	37	27	42	142
Clams	53	32	16	63	51	26	241
	27.0%	13.3%	6.6%	26.1%	21.2%	10.8%	100%
Menhaden	11	3	1	39	42	42	138
Scallops	1	0	2	17	7	15	42
Halibut	37	66	38	82	41	27	291
	12.7%	22.7%	13.0%	28.2%	14.1%	9.3%	100%
Crab:							
Blue	43	49	63	142	182	99	578
Dungeness	6	6	3	21	8	8	52
King	24	28	29	93	20	41	235
Other	48	85	206	498	365	221	1,423
U. S. Total	890	1,080	1,287	3,896	3,270	2,399	12,822
	6.9%	8.4%	10.0%	30.47%	25.5%	18.7%	100%

1/ Based on tabulation of 1967 vessel type provided by NMFS Statistics and Market News Division; tabulation by NMFS Economic Research Division in 1971. The official published vessel total, 12,874, is larger than the total shown here. The differenc 52 vessels, may be explained by construction before 1900 (45 vessels) or other reasons. Percentages shown may not add to 100 percent due to rounding.

effect on a more recent frequency distribution of vessel, unless an age-tonnage rather than an age-number distribution were used. To reiterate, tonnage data is preferable when the concern is with investment or fleet cost in dollars, because of the approximately proportional relationship between cost and vessel tonnage.

Fishermen and Vessel Owners and Increased Investment

The vessel is one of several factors that affect the income and welfare of the fishermen employees and owners of a fish harvesting business. In this section, three topics will be considered: (1) the complex set of variables involved in a vessel investment decision, (2) estimated rates of return for vessel-based fish harvesting, and (3) a discussion of possible investment effects of a decrease in vessel prices.

Fishing Income, Costs and Individual Firm Investment Decision Models

While it is beyond the scope of this paper to consider the relationship between fishing income, costs and investments in detail, the rudiments of a simplified model will be indicated.

An investment in a new or replacement vessel is worth considering if the discounted sum of annual owner-share amounts for a period of years equals or exceeds the price of the vessel, with certain adjustments and assumptions. Stated more mathematically, investment may be in order when:

$$K \leq \left[\sum_{t=1}^{T} A_t / (1+r)^{t-1}\right] + S_T / (1+r)^{T-1} - S_0$$

Where:
K: cost of new or replacement vessel.
A: owner's share for any year t, plus interest expense.
r: yield of owner's funds in alternative use, e.g., 8%.
S_T: salvage value of the vessel at the end of the evaluation period, e.g., 20 years.
t: time variable, years, 1 to T, e.g., T=20 years.
S_0: salvage value of the present vessel if sold or value in use in the business.

The following typical outline of fishing costs and income indicates that the owner's share is obtained as a residual in accord with accepted accounting practice:

1. Gross revenue (price x quantity of fish landed),
2. less trip expenses (food, fuel and lube, ice and icing),
3. equals amount to share between boat and crew.
4. Amount to share x lay percentage,
5. equals labor share (dividing by number in crew gives crew share per man, including captain).
6. Amount to share less labor share,
7. equals boat share (to cover repairs and maintenance, captain's commission and insurance, employee taxes, administrative and other cash expenses, as well as net return and depreciation).
8. Boat share less repairs and maintenance, captain's commission and fixed cash charges,
9. equals owner's share (depreciation plus net return before taxes).

This simplified model ignores many things. The investor must formulate expectations of future events, about which there may be varying degrees of speculation, but no certain state of knowledge. The business owner must typically secure partial financing of the investment from sources external to the firm, given the high incidence of the proprietorship form of business in the fish harvesting industry (Appendix Table C). The present value model for investment decision-making does not consider financial cash flows, but the business owner must be able to make payments on the principal and interest of debt. Allowing for business and living expenses, the single proprietor (captain owner) has several sources of income in the preceding outline of fishing costs and income (captain's labor share and commission, and owner's share).

To summarize, there is a complex relationship among fishing income, costs and vessel investments, and the decision to invest affects not only the business owner, but the fishermen employees via the lay system.

Estimated Rate of Return on Investment

Estimated rate of return data for major fisheries are shown in Table 7, with the number of vessels serving as a weighting device to obtain a fleet average of 8.5 percent. Rate of return on investment (ROI) is defined as follows (before taxes):

$$\text{ROI} = \frac{\text{(net return plus interest expense)}}{\text{(undepreciated vessel asset value)}}$$

The ROI data appear to suggest single-fishery operations, but many vessels catch more than one species of fish.

Using the average ROI of 8.5 percent would give an estimated 1967 undepreciated asset value of the vessel fleet of $0.8 billion (1967 net returns and interest expense, $68.4 million divided by 0.085). The related capital output ratio would be 2.7 (undepreciated fleet asset value divided by the value of catch for vessels, $0.8 billion/$0.3 billion).12/ There are many other concepts of rate of return that could be used.

Estimated depreciated asset value would increase the apparent ROI:

$$\text{ROI} = \frac{\text{(net returns plus interest expense)}}{\text{(depreciated asset value)}}$$

$$= \frac{\$68.4\text{ million}}{\$400\text{ million}} = 0.17 \text{ or } 17 \text{ percent}$$

12/ Net return and value of catch data for 1967 from U. S. Bureau of the Census, 1967 Census of Commercial Fisheries, (Washington, D. C.: U. S. Government Printing Office, October 1970).

Table 7.--Estimated Profitability of Vessel Operations in Selected U.S. Fisheries, 1967-69.

	1967 Vessels 1/ Number	ROI Rate 2/ Percentage
A. Higher profit fisheries		
Shrimp - Gulf of Mexico	2,936	13.4
Yellowfin and skipjack tuna	124	9.8
King crab and tanner crab	287	9.1
Scallops	42	8.2
Salmon	2,795	7.4
Albacore	1,232	7.4
Anchovy and jack mackerel	42	7.1
B. Lower profit fisheries		
Groundfish - North Atlantic	751	4.5
Herring - Atlantic and Pacific	10	6.0
Menhaden - Atlantic and Gulf	138	6.6
Northern Lobster	53	6.1
Oyster	715	5.8
Blue crab - Gulf and Atlantic	433	5.0
Clams	241	5.1
Spiny Lobster	142	5.5
Groundfish - Pacific	172	6.0
Shrimp - Alaska	52	5.5
Shrimp - North Atlantic	-	4.7
Mackerel - North Atlantic	-	6.1
Pollock	-	5.4
Halibut	291	4.4
Total	10,456	
Average		8.5

1/ Vessels in the fleet totaled 12,874 in 1967. The numbers in this table may differ from those shown in others for reasons of data applicability to various portions of the fleet.

2/ Return on investment (ROI) is computed as follows (before taxes):

$$ROI = \frac{\text{(net return plus interest expense)}}{\text{(undepreciated vessel asset value)}}$$

The ROI data are based on information in NMFS Economic Research Division files for about 1967-69, vary in representativeness for those years, and do not reflect changes since then.

Of the two presented, the ROI based on undepreciated asset value (asset acquisition cost) is probably closer to an expected value for future, new-vessel investments, but it is imperfect and open to criticism.

Something further may be suggested about the fish harvesting industry by comparing the ROI data in Table 7 with similar economic performance measures for other industries. The estimated average ROI in Table 7, 8.5 percent, is close to the average 8.65 percent return to total assets for U. S. manufacturing firms, allowing for definitional, computational and investment risk differences.13/ Despite definitional differences, the estimated average ROI for the U. S. fish harvesting industry, 8.5 percent, is probably above the percentage return to total assets for Canadian fishing and trapping corporations, 1.8 percent

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13/ Taxes are not counted as costs, and accumulated depreciation was deducted from total assets. If both are either deducted or not deducted, one might expect percentage returns to total assets numerically close to the ROI data in Table 7, even though the two are definitionally different. Of course, for any industry, computations of ROI or return to total assets could be numerically different for the two different definitions. See Frederick J. Smith, Economic Conditions of Selected Pacific Seafood Firms, Special Report 327, Studies in Marine Economics (Corvallis: Oregon State University, Agricultural Experiment Station, September 1971). Data cited are from Annual Statement Studies, Robert Morris Associates, Philadelphia National Bank Building, Pennsylvania, 19107 (no date indicated). Ms. Kelly Robert Morris Associates (January 23, 1974) verified the correctness of the definition used here, although Smith's presentation did not appear to be specific.

in 1969 and 6.3 percent in 1970.14/

Despite problems of comparability and reliability, the estimated ROI data in Table 7 are at least proximate measures of economic performance in the U. S. fish harvesting industry. There is at least some degree of consistency with the vessel age data shown in Table 6, although a high proportion of newer vessels (built in 1960-67) is not a complete non-monetary measure of investment, since reconstruction, major overhauls, documentation of older vessels for fishing and other factors are not considered. That is, both Tables 6 and 7 suggest in a rough way which fisheries have had firms with economic performance to support higher and lower rates of investment on the average.

14/ For the Canadian firms, return includes after-tax profits plus all categories of interest expense. After-tax profit is the amount of income remaining after deducting all expenses and provisions, including interest on debt, depreciation and income taxes from sales. Total assets are all current fixed and other assets, less accumulated depreciation, as used in corporation balance sheets. See Canadian Imperial Bank of Commerce (Toronto) Commercial Letter, May-June 1972 and July-August 1973.

Shipbuilding Industry Performance

Shipyards supplying vessels (craft 5 net tons and over) to the U. S. commercial fishing industry have complete product market protection from foreign suppliers. What would happen to this shipbuilding industry, and its economic performance and prices if this protected market were opened to foreign competition? The answer to this question is critical in the context of the present report, but a definitive answer will not be provided here. Rather, some relevant economic concepts and cursory observations about this shipbuilding industry will be provided. More helpful, but probably not definitive answers could be provided via review of foreign and domestic agencies reports, consultation with these agencies, surveys of the fishing and shipbuilding industries and other means. However, this additional work is considered to be outside of the scope of this initial effort.

The kinds of things of interest in trying to answer the question posed are suggested by previous economic studies of other industries. Marketing studies consider such things as market structure, conduct and performance; studies of international comparative advantage, degrees of protection, wage rates, factor price ratios, factor proportions, and technology; and other studies, measures of financial and economic performance.

Product Price

There are a variety of reasons for believing or suspecting that foreign-built vessels would generally cost less than U.S.-built vessels for some fisheries, but not as much less as in the past.

Important exceptions have been suggested for shrimp and tuna vessels, builders of which have faced strong domestic and foreign (U.S. export) demand. Export demand may relate to factors other than price. Like most other kinds of vessels, tuna seiners received and shrimp trawlers were apparently eligible to receive construction-cost-differential subsidies under the no-longer funded legislative authorities of 1960 and 1964. Since the 1960's two major currency realignments, differential degrees of inflation and real price change have occurred, so that it is possible that U.S. shipyards supplying these tuna and shrimp vessels are now price competitive, whereas they may not have been in the past, as suggested by past client use of or eligibility to use construction-cost-differential subsidies. A recent force of undetermined importance in these comparisons, the international fuel crisis, may cause currency realignments in the opposite direction, due to the relatively lower U.S. dependence on imported fuel among major industrial countries. Hence, some of the former price gap between U.S. and foreign built vessels may be restored.

The fact that segments of the U.S. commercial fishing vessel building industry are exporting vessels is worthy of further consideration with respect to shipbuilding industry performance comparisons.

The proper basis of price comparison between U.S. and foreign built vessels is the delivered price to the prospective vessel owner, presumably for a given vessel design. Transportation costs may be significant. However, there may be some question about restricting price comparisons to given designs, because of possible differences in price advantage among builders according to design.

How Protective is the Import Prohibition?

Complete product market protection from foreign competition for U.S. shipyards supplying vessels to the U.S. commercial fishing industry is a strong prima facie reason for suspecting that the U.S.-built vessels generally cost more than foreign-built design equivalents. In such a closed product market, the competitive ability and economic performance of the U.S. vessel-based fishing industry would depend on the structure of the market, and the market conduct and performance of the firms selling vessels.

Product market protection via import prohibitions (as in the case of fishing vessels), quotas, tariffs and other devices does not guarantee an industry complete protection from foreign competition nor does it necessarily assure high profits and the ability to exploit product buyers.

The usual discussion of nominal versus effective protection from foreign competition relates to tariffs, but may be used to suggest the impact of an import prohibition or quota. In essence we are concerned about the degree of protection given to domestic production activities. The import embargo is the equivalent of a prohibitive nominal tariff on fishing vessels. Any duties or trade restraints on imported construction materials (inputs) decreases this degree of nominal protection when measured in terms of effective protection. Without attempting to reflect the definitional precision resulting from court litigation and other legal decisions (see footnote 2, page 9), it is understood that U.S.-built commercial fishing vessels must have a hull and superstructure made of U.S. manufactured materials, and portions of the vessel not integral with the hull and superstructure may consist of not more than 50 percent imported materials (on the basis of shipbuilder's cost). Furthermore, there are duties on imported materials used in vessel construction, the highest being for synthetic-fiber (man-made fiber) fishing nets, cordage and ropes, with lower ones applying to electronic gear, engines and other items. Thus, the degree of effective protection provided the shipbuilding industry is less than is implied by the import prohibition for vessels used in commercial fishing.15/

15/ Quoting Kreinin (but omitting his footnotes):

> In essence, the effective protective rate measures the degree of protection given to domestic production activities. It is defined as the percentage increase in domestic value added made possible by the tariff structure compared to a situation under free trade, or alternatively as the percentage increase in the price of primary factor inputs resulting from the tariff. The latter definition indicates the ability of the protected producer to pay more for the productive factors he uses.
>
> Although the [fishing vessel buyer] reacts to changes in the [vessel] price that reflect nominal rates, the [shipbuilder] reacts to changes in the cost of his production processes, and these are affected by the effective rate. Thus it is the effective rate that indicates the degree of resource misallocation caused by the tariff structure. The effective protection on a final product increases as the nominal rate imposed on it increases, and as the nominal rate imposed on imported materials used in the production process decreases. It also varies with the proportion of imported inputs that comprise the final value of the product (a proportion that may itself change as the situation changes from free trade to tariff). (Items bracketed denote word or term substitutions useful in the present context).

For further information, see Mordechai E. Kreinin, International Economics, A Policy Approach (New York: Harcourt Brace Jovanovich, Inc., 1971), pp. 252-258, quoting from pp. 253-254.

One of the forces that weakens the ability of product sellers to exploit a market with limited competition is the ability of buyers to use substitute products. The commercial fishing industry could use boats as opposed to vessels, but only to a limited extent. Some degree of factor substitution may be possible in selecting vessel designs; that is, vessel designs that minimize the effect of higher vessel costs.

So far as the fishing industry is concerned, any vessel price effects that cause the existence of relatively high capital-labor price ratios may dictate adoption of less capital-intensive technology than is characteristic of the U.S. economy in general. This would occur to the extent that the vessel supplying industry is not domestically competitive with respect to price or is not innovative in reducing construction costs. Relative factor prices between capital and labor determine differences in factor proportions among countries. Generally , it is believed that the U. S. economy has high labor-capital price ratios compared to other countries; hence, higher capital-labor factor use ratios. The results of vessel price or other disparities are less efficient allocation of resources than would obtain otherwise, more costly and less competitive U.S. harvesting operations, and reduced labor productivity advances in fish harvesting compared to other U.S. industries to the extent that labor productivity advances are a function of capital (as opposed to labor) investment and technological improvements. 16/

16/ Increasing fishing effort, whether due to efficiency resulting from technology change, investment or a combination (since the two may be inseparable), tends to reduce catch per unit of effort, as

Industry Market Structure and Sales

The shipyards constructing fishing vessels are thought to be relatively small, and not subsidiaries or parts of the firms building larger military and merchant marine vessels. Their annual sales are not known, but may be estimated, as follows. Owners' shares for the U.S. commercial fishing vessel fleet totaled $89.7 million in 1967, and part of this could have been used to acquire vessels.[17/] Owner's share consists of net returns plus depreciation, as computed for Federal income tax purposes. It is a source of working capital, living expenses, and net worth enhancement (such as in making down-payments and servicing long-term debt on vessels). Sometimes, capital consumption or depreciation is suggested as a rough, rule-of-thumb

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effort approaches that necessary to harvest the maximum sustainable yield (MSY).

Bell and Kinoshita studied 17 major U.S. fisheries, of which 11 showed positive trends in output (landings) per fisherman for the 20 year period 1950-69. An aggregated index was constructed for the entire harvesting sector of the U.S. fishing industry and it indicated a 2.5 percent average annual increase, compared to 3 percent for the entire U.S. economy. But the rate for agriculture was about twice that for the economy as a whole. The annual growth rate in fish harvesting declined from 4.7 percent in 1950-59 to 0.5 percent in 1960-69. Increasing fishing pressure in major fisheries appears to account for the decline. The fixed biological maximum of production tends to decrease harvesting labor productivity, while the increase in effort (gear, vessels and labor) per unit of labor increases labor productivity. Of these two factors, change in the amount of effort per unit of labor is a measure of the substitution of capital for labor in the context of main discussion here.

For further discussion, see Frederick W. Bell and Richard K. Kinoshita, "Productivity Gains in U.S. Fisheries," Fishery Bulletin, vol. 71, no. 4, 1973.

17/ U.S. Bureau of Census, 1967 Census of Commercial Fisheries (Washington, D.C.: U.S. Government Printing Office, 1970).

basis for estimating capital expenditures (gross capital investment). Depreciation amounted to $21.2 million for the U.S. commercial vessel fishing fleet in 1967. Allowing for increases in general price level, real vessel prices and real investment, this or a larger expenditure would appear consistent with and contained in the $90-130 million range for a category including fishing and other vessel construction and repairs.18/

Product Quality

For complex products, such as commercial fishing vessels, price comparisons are difficult, even where domestic and/or foreign shipyards submit bids on a given vessel plan. This is because different shipyards may have a competitive advantage in some other vessel design. Product quality is one measure of industry performance that may be of interest in evaluating the U.S. shipbuilding industry. So far as the fishing industry is concerned this might refer to the ability of shipbuilders to provide optimum-design vessels.

18/ Some early 1972 estimates by the Shipbuilders Council of America include annual average values based on a 5-year, 1972-77 forecast of private U.S. shipyard revenue, as follows (partial itemization only):

Item	$ million Low	High
Merchant fleet construction and repairs	1,195	2,175
Naval fleet construction and repairs	1,690	2,030
Other shipwork, of which the total for U.S. Coast Guard, Corps of Engineers, fisheries, etc., is	90	130
Total (based on full itemization)	3,175	4,635

Product quality implies the existence of sufficiently large firms, markets and profits to support product-related research and development. This is necessary to the process of technology change and international technology transfer. It may be ostensibly presumed, but not assured via having naval architects prepare vessel designs. Of course, vessel buyers may have certain preferences, traditions or ideas to incorporate into vessel specifications, so movement toward or away from optimal designs may not be a criterion with which to judge shipbuilders alone.

Investment and Fishery Capitalization

World fish landings virtually doubled between 1950 and 1960, and did not quite double between 1960 and 1970 (73 percent increase), indicating a fairly rapid rate of net capital formation. Growing world demand is expected to lead to increased world landings, but the supply constraint imposed by limited natural stocks will hopefully without too much delay cause management authorities to control investment and the rate of increase in fishing pressure. The topics U. S. dependence on imports, trends in world demand and supply constraints will be considered to indicate the seriousness of the fishery capitalization problem. First, a few points will be made about investment, fishery capitalization and fishery management.

Investment, Fishery Capitalization and Fishery Management

Investment in fishing vessels may be expected to occur when the return on investment exceeds that in alternative uses for funds generated inside and outside of the fishing industry. Gross investment may be made for purposes of replacing existing vessels or to add fishing capacity, meaning in the latter situation net investment or net capital formation. Owing to lack of investment information in dollar terms, additions to the fleet (vessels documented by the U. S. Coast Guard, with fishing as the service or among other services), preferably in terms of tonnage, because cost is roughly proportional to tonnage, but also in terms of numbers of vessels, have been suggested as crude, non-monetary proxies for gross investment. Similarly, changes in the fleet tonnage (or less preferably, changes in fleet vessel numbers) have been suggested as crude, non-monetary proxies for net investment, or net capital formation. Definitional inconsistencies between the two crude measures do not allow even estimation of replacement investment in physical terms (tons or vessel numbers). The kind of capital (productive equipment) stock data available for the U. S. fishing industry does not allow a statement about the degree of utilization of productive capacity.

Fishery capitalization refers to the relationship between the fishing effort being expended on a given biological stock or group of stocks to obtain what is being landed and the amount of effort necessary to obtain maximum sustainable yield (MSY) or some other yield level. Fishing effort is a function of capital and labor inputs. A joint project by NMFS economists and biologists classified over 100 U. S. fisheries as being under, fully or over capitalized, or of undetermined capitalization.

Fishery management authorities, laws and institutions, have the basic task of limiting fishing effort or more properly "excessive" capitalization in an increasing number of U. S. and world fisheries. Some of these management vehicles have had the effect of introducing operating inefficiencies, such as with respect to gear, season and other aspects of fishing. There is the further problem of jurisdiction among sub-national, national and international fisheries and agencies. With respect to dealing with problems of fishery capitalization and efficiency, present management vehicles have had some successes and some failures.

"Do Two Wrongs Make a Right?"--Inefficiency of the Embargo and Excessive Fishery Capitalization

To recapitulate, investment may increase if the return on investment rises. More U. S. and international fisheries in which there is U. S. interest are becoming fully or over-capitalized, but fishery management efforts have so far had only limited and partial success in dealing with capitalization and efficiency problems.

Therefore, should we argue against removal of the embargo on the use of foreign-built vessels by U. S. commercial fishermen, because it is presumed that the price of vessels would fall, thereby encouraging net investment (net capital formation, that part of gross investment not for replacement to the extent that the two can be separated)? Not necessarily, for reasons which follow.

Depending on the performance of the shipbuilding industry, the embargo may or may not have distorted labor-capital price ratios, impeded growth in productivity, constrained the rates of technology change and investment, and otherwise adversely affected the economic performance of the fish industry compared to what it could have been without the embargo. To the extent that these adverse effects have occurred, the embargo is a wrong policy. Allowing fishery capitalization to proceed to the point where inefficiencies occur is also a wrong policy choice. But allowing one wrong to continue does not correct the other and make the situation right.

Surely, increasing or not decreasing the price of capital could be used as a kind of management device, but its efficiency and efficacy must be questioned. This is especially true, since the price of capital is but one variable in the complex formula that determines rate of return on investment, which is quite variable among U. S. fisheries (Table 7). Whether or not the embargo on the use of foreign-built vessels by U. S. commercial fishermen is removed, other forces will continue to increase the degree of capitalization among national and international fisheries in which the United States has an interest. The degree of capitalization, even in U. S. national fisheries (which are not fished by foreign-flag vessels), may or may not be affected if the embargo is lifted.

Here, we have assumed that the effect of removing the embargo on the use of foreign-built vessels would be to reduce the price of at least some vessels. But this is merely a plausible, not necessarily valid assumption. More generally, the concern is about the performance of the shipbuilding industry so far as the fishing industry is affected. Price is not the only consideration.

Increasing U. S. Dependence on Imports[19/]

The United States is a net importer of fishery products, and it has become increasingly dependent on imports according to several possible measures.[20/] Imports are essential, for although waters adjacent to the United States are abundant in fish stocks of commercial importance, landings

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19/ Information on projections in the following sections is based on F. Bell, D. Nash, E. Carlson, F. Waugh, R. Kinoshita and R. Fullenbaum, "The Future of the World's Fishery Resources: Forecasts of Demand, Supply and Prices to the Year 2000," unpublished file manuscript (Washington, D. C.: NMFS Economic Research Division, December 1970).

20/ Such measures include the comparison of landings and the round weight equivalent of imports, the comparison of the wholesale value of fishery products based on domestic landings and imports, the net trade deficit for fishery products, and the comparison of landings, exports and imports for various groups of fish.

from many of these stocks approximate their estimated maximum sustainable yield (MSY).

Trends in World Demand

Aggregate utilization for individual major edible fish groups and meal fish has been projected to the year 2000. The total has or is projected to increase at a reasonably stable rate of about 20 million metric tons per decade, 1950-80, from 20 to 80 million metric tons, after which stability is projected. Consider the effect of differences in projection assumptions used by FAO and NMFS economists. The utilization projections are:

	Bell, et al	FAO
	(million metric tons)	
Food fish	56.0	69.0
Fish meal	22.6	37.5
Total (food and meal)	78.6	106.5

Both projections are based on growth in population and per capita income, but lower rates of annual increase are assumed by Bell, et al, who also assume a declining rather than constant income elasticity through time. Finally, the FAO projections assume constant real prices; hence, they do not take account of the effect of supply constraints.

Projected rates of utilization for various fish have been summed and compared to estimated of world MSY. Biologists differ in their estimates of world MSY, although there appears to be a recent consensus of a total in the 80-200 million metric ton range, with 120 million metric tons being selected by NMFS economists for purposes of comparison.

Supply Constraints

Waters adjacent to the United States are abundant in fish stocks of commercial importance, but landings from many of these stocks approximate their estimated maximum sustainable yield (MSY). First, some qualifications will be considered. The biologist's estimates of MSY are tentative in many cases and refer to major world fishing areas employed by the Food and Agriculture Organization of the United Nations (FAO) for statistical purposes. U. S. and foreign fishermen operate in these areas. The ability of U. S. fishermen to operate in these areas on a profitable basis depends on foreign fishing activity (with respect to harvesting competition and its effect on catch rates), jurisdiction, management and other factors. Among the fish of major established commercial importance, landings in waters adjacent to the United States are close to MSY for Atlantic groundfish, Pacific tuna (excluding skipjack), Pacific salmon, halibut, shrimp (except Pacific and some Gulf species), American (northern) lobsters, Atlantic blue crabs, Northern Pacific crabs, and Atlantic scallops (excluding calico scallops). There appears to be unharvested potential for Pacific groundfish; skipjack tuna; sardines; certain kinds of shrimp, crabs, clams and scallops; and to a lesser extent for spiny lobsters.

Among the groups of fish of major commercial importance to the United States, world landings were projected to reach maximum sustainable supply (MSS, not necessarily the same as maximum sustainable yield, MSY), as follows: salmon, halibut, and groundfish in 1970; crabs, fish meal (species used for reduction) and lobsters in 1980-85; and tuna, shrimp, sardines, scallops and clams in 2000 or later.

A Technical Recapitulation

The Embargo and Economic Performance of Fishing and Shipbuilding

The embargo on the use of foreign-built vessels (fishing craft 5 net tons and over) by U. S. commercial fishermen may have affected the economic performance of the vessel-based portion of the fish harvesting industry and the vessel-supplying shipbuilding industry in comparison to what might have been without the embargo.

So far as the fishing industry is concerned and to the extent that vessel prices have been increased, rates of investment, technology change, productivity growth, wage increase, and substitution of capital for labor may have been adversely affected. It is believed that the United States has a relatively high labor-capital price ratio; hence, it generally has a relatively high capital-labor ratio of factor proportions in its production activities. If the vessel supplying industry has not improved its product quality and affected the process of international harvesting technology improvement and change, it has added to the adverse price effects of the embargo.

So far as the fishing vessel building industry is concerned, the embargo on the importation of foreign-built vessels must be considered along with trade restrictions on the use of imported materials in the construction process. It is understood that the hull and superstructure must be constructed with U. S. manufactured materials. Parts not integral with the hull and superstructure may consist of not more than 50 percent by value (at builder's cost) of imported items. There are relatively high import duties on synthetic-fiber fishing nets, rope and cordage, and generally lower duties on engines, electronic gear and other equipment. Thus, the effective protection provided by the embargo is reduced, because there are restrictions on the use of possibly lower-priced imported materials, and some of the imported materials that may be used have U. S. import duties and/or other price-affecting trade restraints. Trade restrictions have the effect of increasing not only import prices, but the prices of import-competing domestically produced substitutes.

Fishing Investment and Returns

A simplified economic model of the investment decision-making process indicates that investment in fishing vessels is worth considering from the individual firm's viewpoint when the return on investment exceeds that in alternative uses of funds, whether the funds are generated within or outside of the fishing industry. Estimated recent rates of return on investment (ROI data in Table 7) vary among U. S. fisheries. The average of 8.5 percent for the late 1960's is quite close to the average rate in U. S. manufacturing, but probably above that in Canadian fish harvesting, allowing for possible problems of definitional and computational comparability in both cases.

To reduce the cost of vessels is to increase the rate of return on <u>new</u> investment, other things being equal. If investors held supportive expectations, consequent gross investment (for replacement and net capital formation) and net investment (net capital formation only) would gradually reduce the rate of return on new investment, but especially on older, less productive vessels. This would occur primarily via downward pressure on income to capital (vessel owner's share, consisting of after-expense net income plus depreciation and vessel-related interest expenses), as catch per vessel declined in fisheries where landings are at or near the biological maximum sustainable yield (MSY) or other designated target yield.

Limited Fishery Management Success

Many national fisheries (which are not generally fished by foreign-flag vessels) and international fisheries in which there is U.S. interest are producing landings at or near the MSY rate, and fishery management vehicles (agencies, laws and institutions) at all levels of government have achieved only partial or limited success in controlling fishing effort. Landing decreases; restraints on gear, catch per vessel or country, fishing time, fishing season (sometimes), number of trips or catch per trip and other similar measures emanating from management vehicles may be taken as indications that fishing effort is at or above some target level.

Controlling Vessel Price as a Fishery Management Device

Since a reduction in vessel costs would probably stimulate investment and thereby increase fishing effort, should removal of the embargo be opposed on fishery management grounds for fisheries with effort at or near some target level? Not necessarily, for the following reasons.

(1) While not reducing, increasing or otherwise purposefully controlling the price of vessels may be a possible fishery management device, its efficacy and efficiency should be considered and compared with that of other devices in terms of impact on the fish harvesting sector of the fishing industry.

(2) Generally, controls on a single factor in the production process may be overcome to some extent by substituting other factors, but this introduces inefficient technology not in accord with the economy at large, as already indicated. Gear restrictions and some restraints on fishing time or season similarly affect fishing.

(3) Other control devices may be preferable. Controls on catch per vessel or country, transferable (marketable) fishing rights, grandfather rights, licences and various other devices are operative or have been proposed as management instruments.

(4) The vessel embargo would affect only U.S. commercial fishing vessel operations, but U.S. landings are often obtained in competition, and fishermen from other countries would not be affected directly.

(5) The vessel price is but one variable affecting return on investment, hence investment.

Investment in the U.S. Fish Harvesting Industry

Because time series data are not available on dollar investments in the U.S. fishing industry, published National Marine Fisheries Service (NMFS) or Bureau of Commerical Fisheries (BCF, now NMFS) annual physical inventory data are presented in this report as investment proxies. The changes in number and tonnage of vessels engaged in commerical fishing are used as crude, non-monetary proxies for net investment. The number and tonnage of vessels added to the fleet (documented by the U.S. Coast Guard, with fishing listed as a service) serve as crude, non-monetary proxies for gross investment. Unfortunately, the two physical proxies are definitionally inconsistent. Furthermore, there is no measure of degree of capacity utilization, such as number of days at sea, associated with the annual inventory of vessels engaged in commercial fishing. In this sense there is no measure of excess or unused fishing capacity, although various studies have attempted to measure excess capacity in another sense, that is in terms of the number of men, vessels or vessel tons that could be removed from certain fisheries without reducing catch according to specified assumptions.

Briefly, the data suggest the following (see Tables 1-6). Since 1940, two periods of rapid investment have occurred, one in the late 1940's and another in the late 1960's and early 1970's. Several years in the 1950's and early 1960's showed negative changes in the number of vessels compared to the previous year. This suggests negative net investment to the extent that the negative changes were not the result of decreased capacity utilization or change in vessel service.

Only by the late 1960's did average tonnage of vessels increase over the period 1940-70, although the change from net to gross tonnage in 1960 affects any comparison. The proportion of newer vessels in the fleet increased over the period 1961-70. Ironically, the proportions of both 1-10 year old and over-20 year old vessels increased between 1964 and 1970. Also, the median age of fleet vessels increased between 1961 and 1970. As another check on investment, it is shown that the proportion of vessels that "dropped out" of the fleet increased with age, comparing fishing years 1970 and 1961. For example, and more precisely, 41 percent of the number of vessels built in 1900-09 and operating in 1961 were not operating in 1970; 13 percent of the number of vessels built in 1940-49 and operating in 1961 were not operating in 1970. Age distribution patterns vary among regions and fisheries. The largest numbers of vessels operate in the shrimp, salmon and tuna fisheries. Investment and return on investment appear to be relatively high in these fisheries. Of course, even fisheries and the containing NMFS statistical regions with lower rates of return and investment do account for some new vessel construction.

Clearly, investment is occurring in both the net sense (meaning increased capital equipment stock as measured by the number and tonnage of vessels in the fleet) and gross sense (allowing for net capital formation and replacement, to the extent that the two can be separated). If one is concerned about the benefits of investment in terms of improving economic performance of the fish harvesting industry, this is occurring, although there are various reasons for believing that this performance may have improved faster historically without the embargo on use of foreign-built vessels. While investment in new vessels implies increasing fleet productivity and efficiency via improved technology, the high levels of fishing effort in many national and international fisheries compared to the effort necessary to harvest the maximum sustainable yield (MSY) or other target yield rate reduces fleet productivity.

Appendix Table A.--Age Distribution of U.S. Commerical Fishing Vessels for Construction Years 1957-70 and Fishing Years 1961-70

Construction year	Fishing year									
	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
	Number of vessels									
1957	422	390	388	378	394	378	367	363	353	336
1958	434	408	406	409	422	407	396	389	381	367
1959	290	270	270	266	270	276	265	266	256	263
1960	171	171	188	193	202	196	192	198	196	197
1961	105	179	197	201	210	218	212	221	215	220
1962	---	96	187	188	203	212	208	225	214	223
1963	---	---	195	274	308	323	325	336	316	308
1964	---	---	---	200	290	312	306	312	316	327
1965	---	---	---	---	247	361	376	384	388	410
1966	---	---	---	---	---	292	402	465	469	485
1967	---	---	---	---	---	---	381	536	550	550
1968	---	---	---	---	---	---	---	410	543	579
1969	---	---	---	---	---	---	---	---	319	437
1970	---	---	---	---	---	---	---	---	---	214
Fleet Total	11,964	11,511	11,928	11,808	12,311	12,677	12,874	13,150	13,187	13,591

Source: BCF(now NMFS), Fishery Statistics of the United States, annual issues for 1961-69, draft for 1970 (Washington, D.C.).

Appendix Table B.--Cumulative Numbers of Vessels Documented for Fishing for Construction Years 1957-71 and Fishing Years 1961-71. 1/

	Fishing Year								
Construction Year	1961	1962	1963	1964	1965	1966	1969	1970	1971
	Number of vessels								
1957	516	517	519	523	526	530	536	538	540
1958	529	529	533	536	539	540	552	555	566
1959	346	348	353	355	358	365	377	382	389
1960	245	253	261	264	268	274	286	290	291
1961	247	278	285	287	290	295	307	313	320
1962	---	239	270	277	282	288	300	304	313
1963	---	---	383	423	431	440	452	460	470
1964	---	---	---	369	402	407	419	424	426
1965	---	---	---	---	428	496	516	523	531
1966	---	---	---	---	---	551	646	658	669
1967	---	---	---	---	---	---	620	633	640
1968	---	---	---	---	---	---	600	615	633
1969	---	---	---	---	---	---	400	486	506
1970	---	---	---	---	---	---	---	537	628
1971	---	---	---	---	---	---	---	---	665

1/ The numbers for 1967-69 are estimated; hence, the cumulative numbers of vessels documented for construction years 1957-69 are estimated for 1969-71 fishing years, except that the actual additions (as shown in the published sources) are used in computing 1970 and 1971 fishing year cumulative numbers.

Comparison of Appendix Tables A and B suggests that considerably higher numbers of vessels are documented for fishing by the U. S. Coast Guard (with commercial fishing listed as the service or as one among other services) than engage in fishing, as observed by NMFS port agents.

Sources: BCF (now NMFS) or NMFS, Statistics of the Vessels Documented as Fishing Craft, 1957-66, Fishery Leaflet 610, (Washington, D.C.: December 1967), and Fisheries of the United States, annual issues.

Appendix Table C.--U.S. Commercial Fishing Vessel Operators and Gross Receipts by Legal Form of Organization, 1963 and 1967

Legal Form of Organization	1963 Commercial Fishing Vessel Operators		1963 Gross Revenue		1967 Commercial Fishing Vessel Operators		1967 Gross Revenue 1/	
	%	Number	$1000	%	%	Number	$1000	%
Individual proprietorship	77.4	7,157	119,410	43.1	83.7	8,590	n.a.	54.0
Partnership	8.5	783	43,333	15.6	7.8	801	n.a.	12.0
Corporations	13.9	1,287	113,178	40.9	8.2	839	n.a.	34.0
Other	.2	24	1,193	.4	.3	37	n.a.	-
Total	100.0	9,251	277,114	100.0	100.0	10,267	324,584	100.0

1/Percentages estimated from 1965 data in U.S. Internal Revenue Service, Statistics of Income, 1965 - Business Income Tax Returns (Washington, D.C.: U.S. Gov't Printing Office, August 1968).

Source: U.S. Bureau of the Census, Census of Commerical Fisheries, 1963 (Washington, D.C.: GPO, 1966), and Census of Commercial Fisheries, 1967 (Washington, D.C.: GPO, 1970).

Appendix Table D.--U.S. Commercial Fisherman, Fishing Vessel Tonnage and Vessel Tons Per Vessel Fisherman, 1940-70

Year	Fisherman Total	Fisherman On Vessels	Vessel Tonnage 1/	Tons Per Fisherman
1940	124,795	35,965	112,752	3.14
1941	122,069	35,959	112,043	3.12
1942	110,848	32,299	99,723	3.09
1943	116,222	32,305	94,486	2.92
1944	122,077	33,154	103,913	3.13
1945	141,919	36,095	131,390	3.64
1946	150,404	38,357	134,854	3.52
1947	153,056	45,638	169,474	3.71
1948	158,001	49,001	189,687	3.87
1949	157,663	49,849	205,188	4.12
1950	161,463	53,999	220,405	4.08
1951	155,403	54,574	223,174	4.09
1952	151,559	52,405	220,202	4.20
1953	152,907	50,460	203,423	4.03
1954	144,645	50,450	221,270	4.39
1955	144,359	52,741	232,479	4.41
1956	141,547	51,343	243,488	4.74
1957	138,171	50,109	245,195	4.89
1958	128,960	47,629	239,258	5.02
1959	128,985	42,920	246,445	5.74
1960	130,431	41,761	402,212	9.63
1961	129,693	41,005	400,935	9.78
1962	126,333	39,112	395,164	10.10
1963	128,470	40,052	408,778	10.21
1964	127,875	40,705	415,338	10.20
1965	128,565	41,090	435,300	10.59
1966	135,636	41,123	456,450	11.10
1967	131,752	42,626	486,273	11.41
1968	127,924	43,040	522,556	12.14
1969	132,448	42,740	534,146	12.50
1970	140,538	44,711	554,785	12.41

1/ Net tons, 1940-59; gross tons, 1960-70.
Source: BCF (now NMFS) or NMFS, Fishery Statistics of the United States, annual issues for 1940-69 and draft copy for 1970.

Table 1.--U.S. Commcerical Fishing Vessels, Number and Tonnage Data, 1940-70 1/

Year	Number of Vessels			Vessel Tonnage 2/			
	Total	Change	Documented	Total	Change	Documented	Average
1940	5,562	-----	320	112,752	------	------	20.3
1941	5,597	35	354	112,043	-709	------	20.0
1942	5,383	-214	358	99,723	-12,320	------	18.5
1943	5,506	123	358	94,486	-5,237	------	17.2
1944	5,931	425	635	103,913	9,427	------	17.5
1945	6,929	998	741	131,390	27,477	------	19.0
1946	7,207	278	1,085	134,854	3,464	------	18.7
1947	8,661	1,454	1,300	169,474	34,620	------	19.6
1948	9,632	971	1,184	189,687	20,213	------	19.7
1949	10,273	641	1,002	205,188	15,501	------	20.0
1950	11,496	1,223	812	220,405	15,217	------	19.2
1951	11,242	-254	780	223,174	2,769	------	19.9
1952	11,065	-177	675	220,202	-2,972	------	20.0
1953	10,621	-444	729	203,423	-16,779	------	19.2
1954	11,179	558	717	221,270	17,847	------	19.8
1955	11,796	617	418	232,479	11,209	------	19.7
1956	11,458	-338	521	243,488	11,009	------	21.3
1957	11,671	213	619	245,195	1,707	22,754	21.0
1958	11,496	-175	713	239,258	-5,937	25,815	20.8
1959	12,109	613	507	246,445	7,187	15,164	20.4
1960	12,018	-91	449	402,212	------	14,401	33.5
1961	11,964	-54	427	400,935	-1,277	17,035	33.5
1962	11,511	-453	367	395,164	-5,771	16,267	34.3
1963	11,928	417	589	408,778	13,614	25,020	34.3
1964	11,808	-120	503	415,338	6,560	23,412	35.2
1965	12,311	503	663	435,308	19,970	36,474	35.4
1966	12,677	366	816	456,458	21,150	46,194	36.0
1967	12,874	197	869	486,273	29,815	58,262	37.8
1968	13,150	276	856	522,556	36,283	55,193	39.7
1969	13,187	37	783	534,146	11,590	52,982	40.5
1970	13,591	404	829	554,785	20,639	44,962	40.8

1/ Includes commercial fishing vessels 5 net tons and over; includes Alaska.

2/ Net tons, 1940-59; gross tons, 1960-70 and documented, all years.

Sources: BCF (now NMFS) or NMFS, *Fishery Statistics of the United States*, annual issues for 1940-69 and draft for 1970; *Fisheries of the United States*, annual issues for 1967-71; *Statistics of Vessels Documented as Fishing Craft, 1957-66*, Fishery Leaflet 610 (December 1967).