

# Groundfish Trawler Profitability, Northern Gulf of Mexico

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## Introduction

Trawling for bottomfish (groundfish) in the northern Gulf of Mexico has developed into a significant industry for fishing fleets in several states. The industry is centered on the Mississippi coast and most are landed at Bayou La Batre, Ala.; Biloxi or Pascagoula, Miss.; or Golden Meadow, La. (Fig. 1). The fishing grounds are considered to be the inshore waters (out to 50 fathoms) between Pensacola Bay, Fla., and Galveston Bay, Tex. However, the most productive and most commonly fished grounds are off the Mississippi River Delta.

This report summarizes costs and returns estimates for vessels operating in the Gulf of Mexico industrial groundfish and foodfish fisheries. A detailed understanding of relevant cost and revenue relationships is important to many individuals. Investment decisions are predicated on an accurate estimate of expected costs and revenues. Public agencies responsible for managing fishery resources must be able to examine the impact of alternative proposals on both the resource and the fishery industry.

Data were collected for the 24 months from April 1976 through March 1978 from the Gulf of Mexico industrial groundfish fleet and for the year 1977 from the foodfish fleet. Sources and procedures for data collection are presented in the "Data

Description" section. Following that is a description of the methods used in analyzing the data and preparing them in a format useful for comparisons and decision making. Results are then presented in self-explanatory tables and a brief discussion of inferences and implications implied in the data.

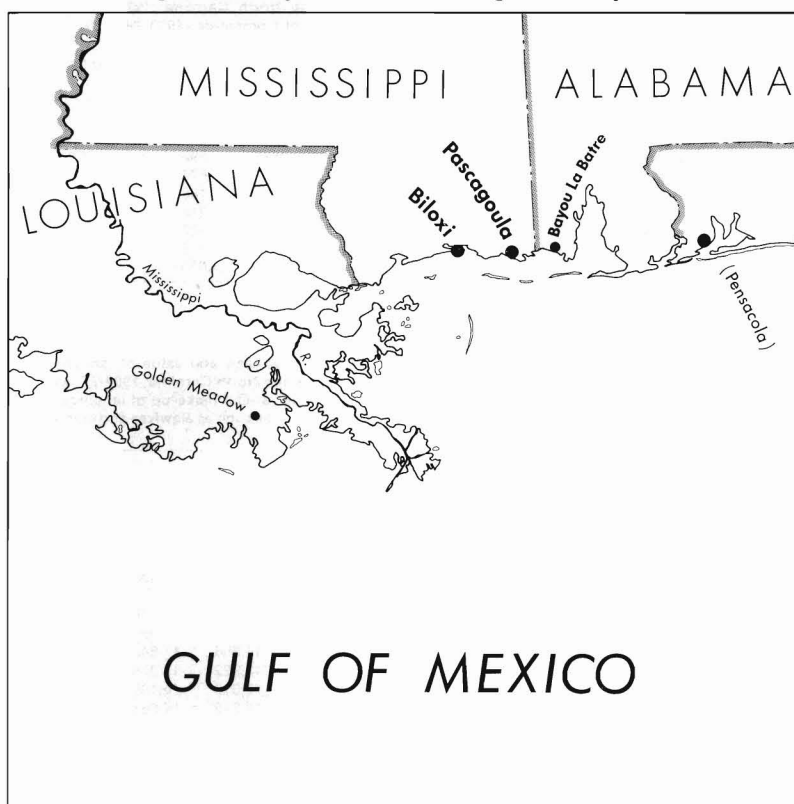
## Description of the Fishery

As indicated above, the fishing activities based on northern Gulf of

Mexico groundfish can be divided into two fisheries: Industrial and foodfish. The industrial groundfish fishery produces fish primarily for pet food processing and is based in Mississippi and Louisiana, while the foodfish fleet produces fish for the fresh fish market and is based in Bayou La Batre, Ala. Both depend primarily on the croaker, *Micropogon undulatus*.

Gutherz, et al. (1975) report that the industrial groundfish fleet is a develop-

Figure 1.—Major Gulf of Mexico groundfish ports.



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ment of the last 25 years. Interest in the fishery began in the early 1950's and exploitation increased steadily through the 1960's. Figure 2 presents annual landings for this fishery, average price received by the producer, and value of the landings for the 10-year period 1968-77.

After reaching an all-time peak production in 1974 (112.4 million pounds), the volume of landings has decreased rapidly. Although the fishery has been characterized by rather drastic variations in production, 1977 landings were the lowest in over 10 years. Average price paid to the producer has increased only slightly and very slowly. Between 1968 and 1976 it had increased from 1.8 cents per pound to only 2.5 cents. Most producers are still dissatisfied with the present 3.0 cents. Since price has increased only slightly and landings have dropped significantly since 1974, the value of landings has declined steadily over

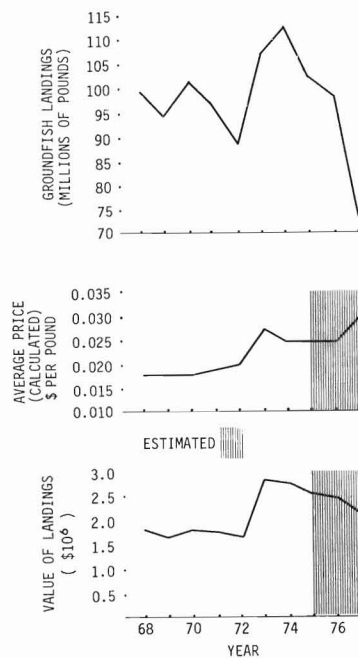


Figure 2.—Volume, average price, and value of Gulf of Mexico industrial groundfish landings, 1968-77. Sources: U.S. Department of Commerce, 1971-77, and Southeast Fisheries Center, NMFS, NOAA, Pascagoula, Miss.

the last 5 years. Due in part to these and other economic conditions—such as greatly increased fuel and vessel costs—participation in the fishery has dropped drastically. From a high of around 50 vessels in the 1950's, participation declined to 21 vessels in 1973 and to about 15 at the beginning of 1978 (12 out of Pascagoula and Biloxi and three out of Golden Meadow).

The food fish fleet depends essentially on croaker longer than about 9 inches and heavier than 0.3 pound. The landings are sized, either on board the trawler or at the plant, into three categories, the larger fish receiving a somewhat higher price per pound. This fishery has developed largely since 1967, when croaker for the fresh fish markets of the U.S. east coast began being handled in commercial quantities at Bayou La Batre. The fishery remains dependent on these markets, and activity is very responsive to the fluctuations in croaker production in

the South Atlantic states, particularly North Carolina (Table 1). Since the foodfish trawlers are essentially geared for shrimp trawling as well, most harvest both products, the proportion of catch being determined by species abundance and relative prices. In 1977, for example, shrimp prices were high, and as seen in Table 2, fish landings were very low and shrimp landings very high in Alabama.

The years since 1973 provide interesting bases for examining the responsiveness of the foodfish fishery to combinations of biological and economic stimuli. In 1973 in North Carolina, although landings of most foodfish species were high relative to preceding years, the market for foodfish was very strong. In 1973 the shrimp catch was relatively low. Hence, the Alabama fleet turned to fish, recording landings of all foodfish of over 22 million pounds, of which over 13 million pounds was croaker. While Alabama shrimp landings dropped to less than 14 million pounds, many Alabama vessels were able to turn almost exclusively to foodfish production due to the availability of the east coast market. In 1973, the east coast market absorbed a large increase in croaker from Alabama producers with almost no apparent effect on the average price for foodfish.

Since 1973 overall foodfish production in North Carolina has increased dramatically from 112 million to 225 million pounds. Croaker production

Table 1.—Volume and value of landings of croaker in Alabama and North Carolina, 1971-77. Sources: U.S. Department of Commerce (1973-78 a, b).

Year	Alabama		North Carolina	
	Volume (1,000 lb)	Value (\$1,000)	Volume (1,000 lb)	Value (\$1,000)
1977	2,766	399	18,995	2,076
1976	6,313	873	15,038	1,577
1975	9,065	1,186	10,252	904
1974	10,554	1,318	6,072	599
1973	13,300	1,526	4,324	372
1972	9,444	1,175	4,109	227
1971	8,384	1,036	948	54

Table 2.—Volume and value of landings and average price of shrimp in Alabama and of all foodfish in Alabama and North Carolina, 1968-77. Average prices for all fish are lower in North Carolina than in Alabama due to the varietal make-up of landings. A large portion of North Carolina landings is composed of lower value varieties such as alewives and menhaden. Sources: U.S. Department of Commerce (1971-77, 1973-78 a, b).

Year	Alabama						North Carolina		
	Shrimp			All foodfish			All foodfish		
	Volume (1,000 lb)	Value (\$1,000)	Price (\$/lb)	Volume (1,000 lb)	Value (\$1,000)	Price (\$/lb)	Volume (1,000 lb)	Value (\$1,000)	Price (\$/lb)
1977	25,020	33,478	1.34	5,842	1,212	0.21	224,865	16,079	0.07
1976	18,690	30,393	1.63	10,623	1,801	0.17	200,024	14,613	0.07
1975	14,056	17,843	1.27	15,211	2,283	0.15	214,517	12,255	0.06
1974	13,922	13,205	0.95	17,459	2,449	0.14	173,240	10,347	0.06
1973	12,018	14,165	1.18	22,025	2,710	0.12	111,867	8,516	0.08
1972	17,549	14,661	0.84	15,768	2,133	0.14	146,847	5,761	0.04
1971	16,713	11,451	0.69	15,136	1,876	0.12	117,150	4,368	0.04
1970	15,031	8,040	0.53	12,895	1,595	0.12	144,977		
1969	14,976	8,788	0.59	11,131	1,285	0.12	187,578		
1968	15,450	7,964	0.52	8,011	885	0.11	206,879		

has contributed to this trend by increasing four-fold from 4 million to 19 million pounds. Concurrently, production of all foodfish and of croaker in Alabama declined steadily between 1973 and 1977, while shrimp landings increased significantly.

The fact that biological phenomena have had definite impacts on these trends is recognized. However, it is the contention of the authors that economic factors have been predominant in explaining the recent virtual disappearance of foodfish production in Alabama. With recent increases in production, North Carolina and other east coast states have been able to meet the requirements of the east coast foodfish market. Given that these fisheries possess a considerable advantage over Alabama in transportation costs, Alabama producers are effectively excluded from the market except for very limited and sporadic quantities to meet temporary shortages in the east coast and northeastern markets. Until market conditions change—whether due to biological or economic factors—the foodfish industry will be limited to a very minor role in the Alabama fishery.

At the present time, the foodfish fleet is comprised of a very large number of Bayou La Batre vessels that trawl primarily for shrimp and land foodfish incidental to shrimp catch. Hence, the population of vessels sampled for this survey consists of the approximately 160 trawlers of length 60 feet or above, fishing out of Bayou La Batre.

#### Data Description

The financial data used in this study were gathered by personal contact with vessel owners and/or managers operating out of ports in Alabama, Mississippi, and Louisiana. Additional general information was obtained from National Marine Fisheries Service publications and other secondary sources. The samples represent 60 percent (9 of 15 vessels) of the 1977 industrial fleet and about 10 percent (16 of approximately 160 vessels) of the larger foodfish fleet. Cost data were available for the Mississippi and Louisiana industrial fish and Alabama foodfish fleets. Three industrial vessels had some cost items missing and the

missing data were generated based on average costs for similar size vessels. Value of production data were available for all sample vessels.

Variable cost categories included: ice; fuel; nets, supplies, and groceries; repair and maintenance; crew shares; payroll taxes and other employee-related expenses; and packing charges. Variable cost data reported by vessel owners were used.

Fixed cost items included: insurance, depreciation, interest, and opportunity cost. Fixed charges for insurance and overhead are reported data, while charges relating directly to investment—depreciation and interest for costs and returns budgets—were calculated in nominal dollars for new vessels. Specifically, the standard formula for straight-line depreciation is:  $D=(I-S)/L$ , where  $D$ =yearly charge for depreciation,  $I$ =new vessel price,  $S$ =book salvage value, and  $L$ =depreciable life in years.

New vessel prices were estimated from cost data collected from vessel owners. Owners were asked to estimate replacement cost of their vessels. These figures were deflated to January 1976, and 1977 new vessel prices for the industrial vessels, and to January 1977 for foodfish vessels. Depreciation charges were calculated using straight line depreciation, with 8- and 10-year depreciable life and 15 percent salvage value for foodfish and industrial vessels, respectively.

The difference in terminal value and book depreciated value should be specifically recognized. As noted, book salvage value was taken as 15 percent of original cost, based on accounting practices in use for the fishery. However, actual terminal value is generally much higher. The reason for this difference is that even in periods of minimal new vessel price escalations, most vessel owners have been able to sell or trade their vessels at the end of their holding period. In recent years, capital gains have been realized on some such sales of used vessels.

Interest charges for costs and returns budgets, and interest and principal payments for cash flow budgets were calculated using 80 percent financing at 9 percent interest; for 10 years with

industrial vessels, 8 years with foodfish vessels; with 12 equally amortized payments per year. These terms were found to be representative from interviews with vessel owners. The specific amount of interest reported in each costs and returns budget is for the sixth year of vessel life for industrial vessels, and the fifth year for foodfish vessels.

#### Data Analysis

A systematic procedure was established to assimilate and report the data for the two fleets of the Gulf groundfish fishery (Wardlaw and Griffin, 1974). Interest rate, percent financed, number of years financed, number of loan payments per year, depreciation method, crew share agreement, rate of packing charges, payroll tax rate, discount rate, planning horizon, and object year under consideration were standardized within the two fisheries. This procedure is organized in a computer program format referred to as a budget-generator. The program reports results in the form of total costs and returns budgets, unit costs and returns budgets, and projected cash-flow budgets.

#### Costs and Returns Budgeting

Costs and returns budgets presented in this study are similar to the annual income statements used in business, with a subsection below each showing required return to equity capital and returns to owner's labor and management. The formula used in calculating opportunity cost (required return to equity capital) is:  $OC=E \times R$ , where  $OC$ =annual opportunity cost,  $E$ =equity, and  $R$ =required annual rate of return to equity capital. Opportunity cost used in this study applies to equity capital only, since all vessels in the sample represented leveraged investments; therefore all returns should be measured with respect to the equity capital used to gain ownership of the income-producing assets. While those two items may be ignored for accounting purposes, they are important in economic and financial analysis.

The equity requirement for investment in vessels was assumed to be a pool of liquid assets which could

have been invested elsewhere. The rate of return for this pool of equity capital should be based on the rate on the next best alternative use of this capital. However, after the investment is committed the required return to equity capital must be adjusted to take into consideration this loss of liquidity. In general, the more liquid an investment, the less the risk associated with it (Hopkin et al., 1973:43). Furthermore, there is a trade-off between risk and rates of return—risk and return vary directly (Robinson and Wrightman, 1974:95). In other words, since a loss of liquidity occurs after the purchase of a shrimp vessel, a “risk premium” must be added to the rate of return on an annual basis for the next best alternative use for the equity capital. The “risk premium” is somewhat arbitrary in that each vessel owner is in a unique situation and he has different risk-return preferences and investment alternatives. For this study the yield of Baa corporate bonds was chosen as a base and the risk premium, for the sake of simplicity, was figured at 2.0 percent.

Returns to owner's labor and management are simply excess returns over the fixed and variable costs. No absolute requirements were applied here, although each vessel owner must evaluate that item in terms of his own abilities.

### Cash Flow Budgeting

The cash flow budget is a measure of the projected timing and magnitude of cash inflows and outflows for the business under consideration, for a given period of time (Hopkin et al., 1973:118). More than any other type of budget, it is a measure of the relative liquidity of a firm. It identifies those periods that should exhibit a shortage of cash, indicating the need for arrangements for additional cash, and also those periods which exhibit an excess of cash above projected needs, indicating the opportunity for other investments (including early loan retirements) to best utilize that excess. The cash flow projections are on an annual basis and illustrate the demands on cash for a planning horizon for the life of the vessel, assuming that the conditions existing in a particular year

would hold for the entire period. Monthly cash flows are available only for the industrial fleet for the years 1976 and 1977.

### Investment Analysis

Investigating the feasibility of any investment alternative is at best a very subjective undertaking. Each vessel owner must set those standards of performance for the investment which are most meaningful in terms of his own situation. However, without some set of established criteria for evaluation, no basis for decision would exist. For this study, two methods of discrimination were established: 1) internal rate of return to original equity capital, and 2) payback period.

### Internal Rate of Return Criterion

Internal rate of return to equity capital analysis is a standard tool used to evaluate investments, and is a measure of the time costs of cash flows. The internal rate of return to equity is the discount rate necessary to set the sum of the present values of the net cash inflows per period equal to the original equity requirement (Hopkin et al., 1973:206). The formula used to calculate internal rate of return (IRR) to equity is:

$$I = \sum_{n=1}^N P_n (1+d)^{-n}, (d=IRR)$$

where  $I$  = initial investment (equity requirements),  $N$ =planning horizon in years,  $n$ =specific period in years,  $P_n$ =net cash inflow for a period  $n$ ,  $d$ =discount rate which equates initial investment and present value of net cash inflows, or internal rate of return (IRR).

### Payback Period

The payback period of an investment with respect to the equity requirement is the length of time that elapses between the initial investment and that period when the accumulated flow of undiscounted net operating returns generated by the investment equals the investment.

## Results

For this analysis, vessels were classified into industrial and food fish categories. Hence, this discussion examines costs and returns information by fleet, beginning with the industrial groundfish vessels. It should be pointed out that depreciation and interest shown in the following tables are based on new replacement cost of

**Table 3.—1976 average annual costs and returns in dollars for nine Gulf of Mexico industrial groundfish vessels in a class of 65-143 feet in overall length, all type(s) of construction, and 300-840 horsepower. Vessels made an average of 27.4 fishing trips of 6.1 days (167.1 total days fishing) average duration during the period.**

Item	Amount (\$)
<b>Returns<sup>1</sup></b>	
Gross receipts from shrimp	8,048
Gross receipts from groundfish	159,065
<b>Total receipts</b>	<b>167,113</b>
<b>Costs</b>	
<b>Variable costs not directly proportional to catch</b>	
Fuel <sup>2</sup>	39,265
Nets, supplies and groceries	16,395
Repair and maintenance	24,115
<b>Subtotal</b>	<b>79,775</b>
<b>Other variable costs</b>	
Crew shares <sup>3</sup>	36,060
Payroll expenses <sup>4</sup>	2,261
Packing <sup>5</sup>	956
<b>Subtotal</b>	<b>39,277</b>
<b>Total variable costs</b>	<b>119,052</b>
<b>Returns above variable costs</b>	<b>48,061</b>
<b>Fixed costs</b>	
Insurance	9,017
Depreciation <sup>6</sup>	41,634
Overhead <sup>7</sup>	997
Interest <sup>8</sup>	19,911
<b>Total fixed costs</b>	<b>71,559</b>
<b>Total costs of operation</b>	<b>190,611</b>
<b>Total profit or loss from operations</b>	<b>-23,498</b>
<b>Required return to equity capital<sup>9</sup></b>	<b>27,226</b>
<b>Return to owners labor and management</b>	<b>-50,724</b>

<sup>1</sup>Based on an average of 5,266,444 pounds of groundfish landed at an average of \$0.03 per pound.

<sup>2</sup>Average gallons of fuel used was 98,162 gallons.

<sup>3</sup>Based on share agreement of 21.58 percent.

<sup>4</sup>Based on reported amounts.

<sup>5</sup>Method of depreciation: Straight line; Depreciable life of 10 years; object year = 6; New cost of vessel = \$489,811. Percent salvage value = 15 percent.

<sup>6</sup>Includes office, professional, and license expenses.

<sup>7</sup>Based on interest rate of 9.00 percent, 80 percent of new vessel cost financed for 10 years, 12 equally amortized payments per year.

<sup>8</sup>Equity consists of down payment plus any negative net cash inflows to date. Required rate of return is 11.99 percent.



the vessel. However, for comparisons, since depreciation and interest (which are calculated based on vessel cost) are the major portion of fixed costs for owning a vessel, results are also given for net returns where depreciation and interest are calculated on the present

value of the vessel currently being operated.

### Industrial Vessels

The industrial fleet is made up of a variety of vessel types and sizes. Among the nine sampled vessels, for

example, length ranged from 65 to 143 feet, and power from 300 to 840 horsepower. However, only two of the vessels are less than 85 feet in length.

Monthly costs and returns data for these vessels are accumulated on the basis of the fiscal year most commonly

**Table 4.—1976 average annual cash flow statement in dollars for nine Gulf of Mexico industrial groundfish vessels in a class of 65-143 feet in overall length, all type(s) of construction, and 300-840 horsepower.**

Item	Year										
	0	1	2	3	4	5	6	7	8	9	10
<b>Loan information<sup>1</sup></b>											
Investment requirement	489,811	0	0	0	0	0	0	0	0	0	0
Equity requirement	97,963	0	0	0	0	0	0	0	0	0	0
Loan balance	391,848	366,520	338,816	308,514	275,369	239,115	199,460	156,086	108,643	56,749	-12
<b>Cash flow</b>											
Total sales	0	167,113	167,113	167,113	167,113	167,113	167,113	167,113	167,113	167,113	167,113
Capital sales	0	0	0	0	0	0	0	0	0	0	489,811
Total cash inflow	0	167,113	167,113	167,113	167,113	167,113	167,113	167,113	167,113	167,113	656,924
Cash operating expenses <sup>2</sup>	0	129,066	129,066	129,066	129,066	129,066	129,066	129,066	129,066	129,066	129,066
<b>Loan payment<sup>1</sup></b>											
Principal portion	0	25,328	27,704	30,302	33,145	36,254	39,655	43,374	47,443	51,894	56,761
Interest portion	0	24,238	31,862	29,263	26,421	23,312	19,911	16,191	12,123	7,672	2,804
<b>Income taxes<sup>3</sup></b>											
On ordinary income	0	0	0	0	0	0	0	0	0	0	0
On recaptured depr. <sup>4</sup>	0	0	0	0	0	0	0	0	0	0	91,594
On capital gains <sup>4</sup>	0	0	0	0	0	0	0	0	0	0	0
Capital purchases (equity) <sup>1</sup>	97,963	0	0	0	0	0	0	0	0	0	0
Total cash outflow	97,963	178,632	188,632	188,631	188,632	188,632	188,632	188,631	188,632	188,632	280,225
Net cash inflow	-97,963	-11,519	-21,519	-21,518	-21,519	-21,519	-21,519	-21,518	-21,519	-21,519	376,699
Cumulative cash position	-97,963	-119,482	-141,001	-162,519	-184,038	-205,557	-227,076	-248,594	-270,113	-291,632	85,057

Internal rate of return = 6.53 percent

<sup>1</sup>Based on new vessel cost of \$489,811; 80 percent financed for 10 years, 12 equally amortized payments per year, at 9.00 percent interest rate.

<sup>2</sup>Exclusive of principal and interest payments.

<sup>3</sup>Based on income tax rate of 22 percent.

<sup>4</sup>Based on sales price of \$489,811

**Table 5.—Monthly cash flow analysis in dollars for nine Gulf of Mexico industrial groundfish vessels in a class of 65-143 feet in overall length, all type(s) of construction, and 300-840 horsepower for the 12 months beginning April 1976.**

Item	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
<b>Inflow</b>												
<b>Production</b>												
Receipts from shrimp sales	258	173	524	767	339	985	1,613	861	645	733	658	492
Receipts from industrial fish sales	16,728	9,454	16,139	23,989	21,878	15,053	18,402	9,845	4,872	6,661	7,143	8,901
Total receipts from operations	16,986	9,627	16,663	24,756	22,217	16,038	20,015	10,706	5,517	7,394	7,801	9,393
<b>Outflow</b>												
<b>Variable cash operating expenses</b>												
Fuel	4,578	2,844	4,118	3,702	3,988	3,348	3,194	2,233	1,934	3,021	3,199	3,106
Nets, supplies and groceries	533	1,913	1,479	1,357	2,043	2,221	1,206	1,512	1,979	566	773	813
Repair and maintenance	4,862	2,770	2,581	1,700	1,187	244	1,008	1,749	5,166	285	755	1,808
Packing	95	53	99	147	134	105	121	60	27	33	33	49
Crew shares	2,332	2,308	3,615	5,549	4,889	3,766	4,174	2,618	1,062	2,089	1,459	2,199
Payroll taxes and expenses	452	72	127	527	79	87	404	127	79	135	93	79
Total	12,852	9,960	12,019	12,982	12,320	9,771	10,107	8,299	10,247	6,129	6,312	8,054
Return above variable cost	4,134	-333	4,644	11,774	9,897	6,267	9,908	2,407	-4,730	1,265	1,489	1,339
Cumulative return above variable cost	4,134	3,801	8,445	20,219	30,116	36,383	46,291	48,698	43,968	45,233	46,722	48,061
<b>Fixed cash expenses</b>												
Insurance	723	723	723	723	702	905	702	737	702	973	702	702
Overhead	64	65	203	99	59	63	59	60	109	61	65	63
Loan repayment	4,968	4,968	4,968	4,968	4,968	4,968	4,968	4,968	4,968	4,968	4,968	4,968
Total	5,755	5,756	5,894	5,790	5,729	5,936	5,729	5,765	5,779	6,002	5,735	5,733
Total cash outflow	18,607	15,716	17,913	18,772	18,049	15,707	15,835	14,064	16,026	12,131	12,047	13,787
Net cash flow	-1,621	-6,089	-1,250	5,984	4,168	331	4,179	-3,358	-10,509	-4,737	-4,246	-4,394
Cumulative cash position for year	-1,621	-7,710	-8,960	-2,976	1,192	1,523	5,702	2,344	-8,165	-12,902	-17,148	-21,542

used in the fleet, 1 April through 31 March. For the fiscal year beginning 1 April 1976 the average vessel was out of port 167 days landing limited shrimp and 5.266 million pounds of groundfish, valued at \$167,113 (Table 3). Total costs were \$190,611 which exceeds total sales by \$23,498, on the average. Of the items making up total costs, fuel, crew shares, and depreciation are the most important. Depreciation and interest are based on average 1976 new vessel cost of \$489,811.

Annual costs and returns are also estimated based on present values of vessels (deflated to 1976) as opposed to new replacement cost. For the year 1976, the average present value of the industrial groundfish vessel was \$307,399. The substitutions of this vessel cost reduced total costs from \$190,611 to \$167,691, due to large decreases in fixed costs for depreciation and interest. Hence, average vessel losses using the present value basis of vessel valuation are \$578.

As noted in Table 4, expected internal rate of return, based on 1976 costs and returns, over a 10-year ownership period, is 6.53 percent. However, it should be noted that there is a positive return only because the vessel can be sold at a relatively high price at the end of the period. Each year of operation prior to year 10 is characterized by a negative net cash inflow from operations. A monthly cash flow analysis for 1976 indicates that the months from July through October constitute the only period in which positive cash flows are generated (Table 5).

The year beginning 1 April 1977 is characterized by even poorer average operating conditions than those experienced by the fleet in 1976 (Table 6). There are a number of reasons for this. Total groundfish landings for the fleet decreased for the third consecutive year (Fig. 2). The impact of decreased catch is particularly noticeable on the sample of nine vessels, since two of these were involved in legal action during 1977 and were not in operation for several months. Relative to costs, fuel price increased in 1977, and all fixed costs increased considerably over 1976 averages. The result is greater

average losses in spite of an increase in average ex-vessel price received for fish of about 0.5 cent per pound.

On an annual basis, average sales are \$151,459 (down \$15,564 from the previous year), total costs are \$192,199, and average losses are \$40,740 per vessel, with fixed financing (depreciation and interest) costs based on the average vessel, new replacement cost procedure (Table 6). Landings of groundfish are down from an average of over 5.2 million pounds to 4.067 million pounds. If the present value basis of vessel valuation is applied, losses for the year are \$16,352.

The cash flow statement based on 1977 costs and returns for a 10-year financing period shows negative net cash inflows for every year except year 10 in which the vessel is sold (Table 7). However, cumulative losses are such that sale of the vessel does not result in complete recovery of net cash outflow.

Only in August and September did average 1977 operations result in a positive net cash flow for industrial vessels (Table 8). In summary, the data indicate that the conditions in the industrial groundfish industry have deteriorated in the last 2 years, and that the combination of increasing costs, decreasing catch, and relatively low ex-vessel price is essentially responsible.

#### Foodfish Vessels

With respect to the foodfish fleet, there is considerably less variation in vessel configuration than in the industrial fleet. Sample vessels range from 65 to 85 feet in length and from 330 to 420 horsepower. Costs and returns data were accumulated for these vessels for calendar year 1977. The total foodfish vessels made an average of over 15 trips during 1977, for an average duration of over 12 days (Table 9). Landings of foodfish average 84,407 pounds and of shrimp, 65,695 pounds. Financial operating conditions for this fleet are much more responsive to shrimp catch and price than to groundfish conditions, since receipts from fish constitute only about 8 percent by value of vessel receipts.

The total costs of operating a large vessel based on new replacement cost in 1977 was \$156,425 and net revenue

Table 6.—1977 average annual costs and returns in dollars for nine Gulf of Mexico industrial groundfish vessels in a class of 65-143 feet in overall length, all type(s) of construction, and 300-840 horsepower. Vessels made an average of 25.2 fishing trips of 6.1 days (153.7 total days fishing) average duration during the period.

Item	Amount (\$)
<b>Returns<sup>1</sup></b>	
Gross receipts from shrimp	9,685
Gross receipts from groundfish	141,774
Total receipts	151,459
<b>Costs</b>	
Variable costs not directly proportional to catch	
Fuel <sup>2</sup>	37,160
Nets, supplies and groceries	14,672
Repair and maintenance	25,735
Subtotal	77,567
Other variable costs	
Crew shares <sup>3</sup>	36,965
Payroll expenses <sup>4</sup>	573
Packing <sup>5</sup>	732
Subtotal	38,270
Total variable costs	115,837
Returns above variable costs	35,622
Fixed costs	
Insurance	9,607
Depreciation <sup>6</sup>	44,299
Overhead <sup>7</sup>	1,271
Interest <sup>8</sup>	21,185
Total fixed costs	76,362
Total costs of operation	192,199
Total profit or loss from operations	-40,740
Required return to equity capital <sup>9</sup>	37,367
Return to owners labor and management	-78,107

<sup>1</sup>Based on an average of 4,067,000 pounds of groundfish landed; at an average price of \$0.035 per pound.

<sup>2</sup>Average gallons of fuel used was 88,476 gallons

<sup>3</sup>Based on share agreement of 24.41 percent.

<sup>4</sup>Based on reported amounts.

<sup>5</sup>Method of depreciation: Straight line; Depreciable life of 10 years; Object year = 6; New cost of vessel = \$521,159; Percent salvage value = 15 percent.

<sup>6</sup>Includes office, professional, and license expenses.

<sup>7</sup>Based on interest rate of 9.00 percent, 80 percent of new vessel cost financed for 10 years, 12 equally amortized payments per year.

<sup>8</sup>Equity consists of down payment plus any negative net cash inflows to date. Required rate of return is 11.12 percent.

was \$5,866 (Table 9). Based on required return to equity capital of 11 percent, average returns to owners labor and management are \$961. If vessels are valued at estimated present value, deflated to 1977, the costs and

**Table 7.—1977 average cash flow statement in dollars for nine Gulf of Mexico industrial groundfish vessels in a class of 65-143 feet in overall length, all type(s) of construction, and 300-840 horsepower.**

Item	Year											
	0	1	2	3	4	5	6	7	8	9	10	
Loan information <sup>1</sup>												
Investment requirement	521,159	0	0	0	0	0	0	0	0	0	0	0
Equity requirement	104,232	0	0	0	0	0	0	0	0	0	0	0
Loan balance	416,927	389,978	360,501	328,259	292,993	254,419	212,226	166,075	115,595	50,330	-14	
Cash flow												
Total sales	0	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459
Capital sales	0	0	0	0	0	0	0	0	0	0	0	521,159
Total cash inflow	0	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459	151,459	672,618
Cash operating expenses	0	126,715	126,715	126,715	126,715	126,715	126,715	126,715	126,715	126,715	126,715	126,715
Loan payment <sup>1</sup>												
Principal portion	0	26,949	29,477	32,242	25,266	38,574	42,193	45,151	50,480	55,215	60,394	
Interest portion	0	36,429	33,901	31,136	28,112	24,804	21,185	17,228	12,898	8,153	2,934	
Income taxes <sup>1</sup>												
On ordinary income	0	0	0	0	0	0	0	0	0	0	0	0
On recaptured depr <sup>1</sup>	0	0	0	0	0	0	0	0	0	0	0	97,457
On capital gains <sup>1</sup>	0	0	0	0	0	0	0	0	0	0	0	0
Capital purchases (equity) <sup>2</sup>	104,232	0	0	0	0	0	0	0	0	0	0	0
Total cash outflow	104,232	190,093	190,093	190,093	190,093	190,093	190,093	190,094	190,093	190,093	190,093	287,550
Net cash inflow	-104,232	-38,634	-38,634	-38,634	-38,634	-38,634	-38,634	-38,635	-38,634	-38,634	-38,634	385,053
Cumulative cash position	104,232	-142,866	181,500	-220,134	-258,758	297,402	-336,036	-374,571	-413,305	-451,939	-66,871	

Internal rate of return=1.00 percent

<sup>1</sup>Based on new vessel cost of \$521,159, 80 percent financed for 10 years, 12 equally amortized payments per year at 9.00 percent interest rate.

Exclusive of principal and interest payments

<sup>2</sup>Based on income tax rate of 22 percent

<sup>3</sup>Based on sales price of \$521,159

**Table 8.—Monthly cash flow analysis in dollars for nine Gulf of Mexico industrial groundfish vessels in a class of 65-143 feet in overall length, all type(s) of construction, and 300-840 horsepower for the 12 months beginning April 1977.**

Item	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Inflow												
Production												
Receipts from shrimp sales	469	1,127	1,552	1,253	1,746	723	1,062	628	412	277	151	285
Receipts from industrial fish sales	9,842	14,752	16,140	13,434	20,957	17,543	16,936	13,859	5,189	3,341	3,373	6,408
Total receipts from operations	10,311	15,879	17,692	14,687	22,703	18,266	17,998	14,487	5,601	3,618	3,524	6,693
Outflow												
Variable cash operating expenses												
Fuel	3,026	5,511	3,463	3,703	4,559	2,500	2,832	2,068	1,935	1,730	2,818	3,015
Nets, supplies and groceries	99	496	2,220	2,244	1,956	1,286	1,807	1,705	612	416	636	1,195
Repair and maintenance	1,560	927	2,601	1,783	3,052	863	2,826	6,486	1,217	289	1,738	2,393
Packing	51	81	91	68	117	98	86	66	26	17	12	19
Crew shares	2,795	3,521	4,394	4,347	5,567	4,449	3,790	3,483	1,546	686	850	1,537
Payroll taxes and expenses	181	-5	32	44	78	-25	38	38	51	48	38	55
Total	7,712	10,531	12,801	12,189	15,329	9,171	11,379	13,846	5,387	3,186	6,092	8,214
Return above variable cost	2,599	5,348	4,891	2,498	7,374	9,095	6,619	641	214	432	-2,568	-1,521
Cumulative return above variable cost	2,599	7,947	12,838	15,336	22,710	31,805	38,424	39,065	39,279	38,711	37,143	35,622
Fixed cash expenses												
Insurance	2,652	339	339	339	299	802	802	802	802	802	802	827
Overhead	60	68	277	88	177	69	67	64	132	70	73	126
Loan repayment	5,920	5,920	5,920	5,920	5,920	5,920	5,920	5,920	5,920	5,920	5,920	5,920
Total	8,632	6,327	6,536	6,347	6,396	6,791	6,789	6,786	6,854	6,792	6,795	6,873
Total cash outflow	16,344	16,858	19,337	18,536	21,725	15,962	18,168	20,632	12,241	9,973	12,887	15,087
Net cash flow	-6,033	-979	1,645	-3,849	978	2,304	170	-6,145	-6,640	-6,360	-9,363	-8,394
Cumulative cash position for the year	-6,033	7,012	-8,657	-12,506	-11,528	-9,224	-9,394	15,539	22,179	-28,529	-37,902	-46,296

returns situation is somewhat changed. Total costs are reduced to \$147,966 due to decreased depreciation and interest costs, and average net revenue from operations is \$14,295.

The annual cash flow statement for the foodfish fleet shows an internal rate of return of 27.63 percent and a positive net cash inflow every year after the initial investment is made (Table

10). However, cumulative cash position is negative until the vessel is sold in year eight.

In summary, the Alabama shrimp and foodfish vessels appear to have had

Table 9.—1977 average annual costs and returns in dollars for 16 Gulf of Mexico shrimp and foodfish vessels in a class of vessels of over 65 feet in overall length, all type(s) of construction, and 330-420 horsepower. Vessels made an average of 15.5 fishing trips of 12.2 days (189.1 total days fishing) average duration during the period.

Item	Amount (\$)
<b>Returns</b>	
Gross receipts from fish <sup>1</sup>	11,950
Gross receipts from shrimp <sup>2</sup>	150,341
Total receipts	162,291
<b>Costs</b>	
Variable costs not directly proportional to catch	
Ice	4,931
Fuel <sup>3</sup>	25,152
Nets, supplies and groceries	18,713
Repair and maintenance	17,457
Subtotal	66,253
Other variable costs	
Crew shares <sup>4</sup>	49,700
Payroll expenses <sup>5</sup>	419
Subtotal	50,119
Total variable costs	116,372
Returns above variable costs	45,919
<b>Fixed costs</b>	
Insurance	5,375
Depreciation <sup>6</sup>	23,690
Overhead <sup>7</sup>	2,464
Interest <sup>8</sup>	8,524
Total fixed costs	40,053
Total costs of operation	156,425
Total profit or loss from operations	5,866
Required return to equity capital <sup>9</sup>	4,905
Returns to owners labor and management	961

<sup>1</sup>Based on an average of 84,407 pounds of fish landed; at an average price of \$0.14 per pound.  
<sup>2</sup>Based on an average of 65,695 pounds of shrimp landed; at an average price of \$2.29 per pound.  
<sup>3</sup>Average gallons of fuel used was 59,454 gallons.  
<sup>4</sup>Based on share agreement of 30.62 percent.  
<sup>5</sup>Based on reported amounts.  
<sup>6</sup>Method of depreciation: Straight line; Depreciable life of 8 years; Object year = 5; New cost of vessel = \$222,969; Percent salvage value = 15 percent.  
<sup>7</sup>Includes office, professional, and license expenses.  
<sup>8</sup>Based on interest rate of 9.00 percent, 80 percent of new vessel cost financed for 8 years, 12 equally amortized payments per year.  
<sup>9</sup>Equity consists of down payment plus any negative net cash inflows to date. Required rate of return is 11.00 percent.

a reasonably successful year in 1977, based on costs and returns data for that year. This performance was due primarily to good returns for shrimp-ing operations, since none of the vessels in the sample fished exclusively for foodfish because of market conditions

Table 10.—1977 average annual cash flow statement in dollars for 16 Gulf of Mexico shrimp and foodfish vessels in a class of vessels of over 65 feet in overall length, all type(s) of construction, and 330-420 horsepower.

Item	Year								
	0	1	2	3	4	5	6	7	8
<b>Loan information<sup>1</sup></b>									
Investment requirement	222,969	0	0	0	0	0	0	0	0
Equity requirement	44,594	0	0	0	0	0	0	0	0
Loan balance	178,375	162,422	144,973	125,887	105,011	82,176	57,199	29,879	-3
<b>Cash flow</b>									
Total sales	0	162,291	162,291	162,291	162,291	162,291	162,291	162,291	162,291
Capital sales	0	0	0	0	0	0	0	0	222,969
Total cash inflow	0	162,291	162,291	162,291	162,291	162,291	162,291	162,291	385,260
Cash operating expenses <sup>2</sup>	0	124,211	124,211	124,211	124,211	124,211	124,211	124,211	124,211
<b>Loan payment</b>									
Principal portion	0	15,953	17,449	19,086	20,876	22,835	24,977	27,320	29,882
Interest portion	0	15,406	13,909	12,273	10,482	8,524	6,382	4,039	1,476
<b>Income taxes<sup>3</sup></b>									
On ordinary income	0	0	105	465	859	1,290	1,761	2,277	2,841
On recaptured depr <sup>4</sup>	0	0	0	0	0	0	0	0	41,694
On capital gains <sup>5</sup>	0	0	0	0	0	0	0	0	0
Capital purchases (equity) <sup>1</sup>	44,594	0	0	0	0	0	0	0	0
Total cash outflow	44,594	155,570	155,674	156,035	156,428	156,860	157,331	157,847	200,104
Net cash inflow	-44,594	6,721	6,617	6,256	5,863	5,431	4,960	4,444	185,156
Cumulative cash position	-44,594	-37,873	-31,256	-25,000	-19,137	-13,706	-8,746	-4,302	180,854

Internal rate of return=27.63 percent

<sup>1</sup>Based on new vessel cost \$222,969, 80 percent financed for 8 years, 12 equally amortized payments per year, at 9.00 percent interest rate

<sup>2</sup>Exclusive of principal and interest payments

<sup>3</sup>Based on income tax rate of 22 percent

<sup>4</sup>Based on sales price of \$222,969

already discussed. In spite of good overall results in 1977, increasing costs throughout the industry and the high variability in ex-vessel shrimp prices contribute to continued uncertainty in the fleet.

For both industrial and foodfish fleets, the very high prices for new and used vessels in recent years is an issue of major impact on investment decisions and projected cash flows.

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### Literature Cited

- Anonymous. 1977. Consumer and wholesale prices. Fed. Res. Bull. 63(1):A51.
- \_\_\_\_\_. 1978. Federal Reserve Bulletin 64(3):A51.
- Gutherz, E. J., G. M. Russell, A. R. Serra, and B. A. Rohr. 1975. Synopsis of the northern Gulf of Mexico industrial and food fish industries. Mar. Fish. Rev. 37(7):1-11.
- Hopkin, J. A., P. J. Barry, and C. B. Baker. 1973. Financial management in agriculture. Interstate Printers and Publishers, Inc., Danville, Ill.
- Robinson, R. I., and D. Wrightsman. 1974. Financial markets: The accumulation and allocation of wealth. McGraw-Hill Book Co., N.Y., 439 p.
- U.S. Department of Commerce. 1971-77. Fishery statistics of the United States, 1968-74. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Stat. Dig. 62-68, var. pag.
- \_\_\_\_\_. 1973-78a. Alabama landings. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Curr. Fish. Stat. 6121, 6437, 6720, 6920, 7220, and 7518.
- \_\_\_\_\_. 1973-78b. North Carolina landings. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Curr. Fish. Stat. 6117, 6416, 6716, 6916, 7216, and 7461.
- Wardlaw, N. J., and W. L. Griffin. 1974. Economic analysis of costs and returns for Gulf of Mexico shrimp vessels: 1973. Departmental Tech. Rep. 74-3, Tex. Agric. Exp. Stn., College Station.