Conditional Fishery Status as a Solution to Overcapitalization in the Gulf of Mexico Shrimp Fishery

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Introduction

Fluctuations in the economic health of natural resource industries are common whether managed or not. Agricultural, forestry, mining, and fisheries industries have all experienced boom and bust years due to environmental factors. When such fluctuations can be attributed to man-made factors, however, society and the industry itself can be expected to seek methods to eliminate or reduce them.

When industries exploit resources held in common, i.e., marine fish and shellfish stocks, there is a greater likelihood of man-made fluctuations than if the resources were owned privately. At the heart of this premise is the theory of common property resources, specifically put forth for fisheries by Gordon (1954) and Scott (1955). This theory demonstrates why more than the economic optimum level of harvesting inputs is used: Individual firms analyze their average returns instead of marginal returns (as affected by other fishermen) to make production decisions. Thus, economic returns from the resource are fully dissipated through larger than necessary costs.

A usual result of the common property resource situation is the overcapitalized state of the industry. Overcapitalization can be defined as the use of too many factors of production, or fishing effort, than is optimally profitable for the industry or economically efficient for society. This result is accelerated when the commodity's price increases faster than costs of operation. When public policy and resources contribute to overcapitalization in the industry, then all the participants suffer from less than optimal returns in even the best of years and society is not realizing the highest returns from its funds. Resolution of the overcapitalization issue can be addressed through regulations, economic incentives or disincentives, and a change in governmental fishing vessel programs which is called conditional fishery status.

The U.S. shrimp fishery, by virtue of its position as the most valuable U.S. fishery and of its investments and employment, has become a focal point of the U.S. fishing industry's poor economic condition in 1980 (Sullivan, 1980). Beset by escalating fuel costs and a sagging national economy and therefore demand for this luxury item, the Gulf of Mexico coastal area is particularly affected. This area accounts for the majority of the value, landings, fishing craft, and employment of U.S. shrimp totals (USDC, 1978).

The purpose of this paper is threefold: 1) To define a conditional fishery and outline the ramifications of a fishery being declared conditional; 2) to examine the present status of the Gulf shrimp fishery; and 3) to examine whether the Gulf shrimp fishery's characteristics qualify it as a conditional fishery. All objectives are complementary, but the last one serves notice that public resources (loan guarantees and income tax deferrals) should not be committed above economically efficient levels, i.e., above that point where excess vessel capacity exists.

Conditional Fishery

A conditional fishery is defined (Federal Register, 1973) as "a Fishery in which financial assistance for fishing vessels will be approved only under provisional terms consistent with needs and objectives of Management," as determined by the Director of the National Marine Fisheries Service (NMFS). Management refers to "activities related to assisting the fishing industry or protecting the Fisheries Resources," and is tied to the "wise use" provision of public funds in the Federal Ship Financing Act of 1972.

The financial assistance provided to the industry is in the form of: 1) Loan guarantees for vessel construction, reconstruction, or recondition, known as Fishing Vessel Obligation Guarantee (FVOG); and 2) income tax deferrals which go toward vessel construction or reconstruction, known as Fishing Vessel Capital Construction Fund (FVCCF)[1].

The motivation behind this public commitment can be traced to the Merchant Marine Act of 1936. The national policy behind the Act was the build-up of U.S. fishing fleets, provide for greater yields of seafood to an expanding populace, and provide for self-sufficiency of food supplies (thereby helping the balance-of-payments situation). However, the central theme of this paper calls this policy into question with regard to the shrimp fishery. The current situation in the fishery indicates: 1) Overcapacity (to be shown); 2) stable harvests disregarding environmental variations; and 3) decreased American

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[1]Financial assistance is also available from the Production Credit Administration (U.S. Department of Agriculture), Small Business Administration and Economic Development Administration (U.S. Department of Commerce). These are not discussed here.

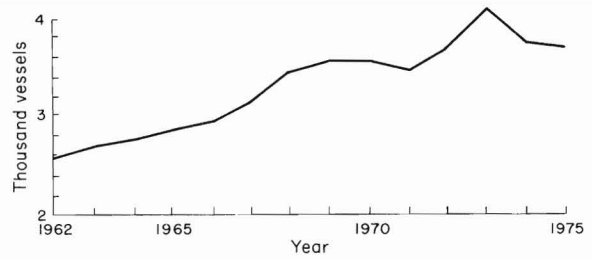

Figure 1.—Number of shrimp vessels in the Gulf of Mexico.

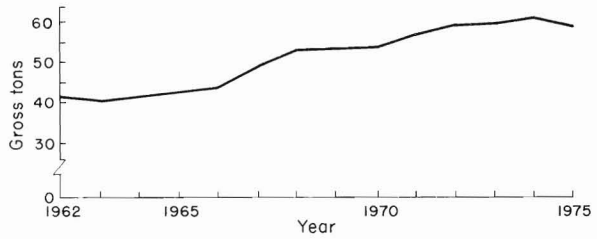

Figure 2.—Average gross tons of shrimp vessels in the Gulf of Mexico.

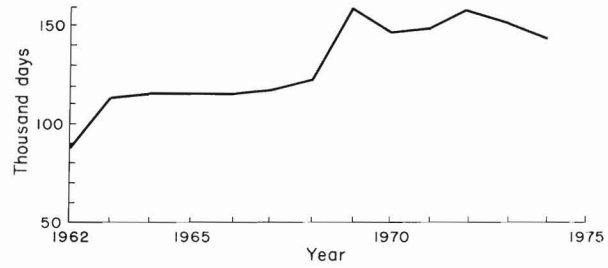

Figure 3.—Fishing effort in the Gulf of Mexico shrimp fishery, by vessels, in 24-hour units.

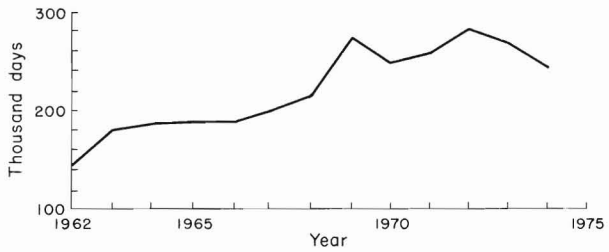

Figure 4.—Fishing effort in the Gulf of Mexico shrimp fishery, by vessels, adjusted for horsepower and footrope length of net, in 24-hour units.

effort in foreign waters with subsequent greater pressures in Gulf waters.

National policy (Federal Register, 1980) states that financial assistance, such as FVOG or FVCCF programs, will not be made unless it "is consistent with the wise use of the *fisheries resources* and with the development, advancement, *management*, conservation, and protection of the fisheries resources" (italics added). "When NMFS believes a fishery has too much vessel capacity, that fishery is adopted as a conditional fishery, provided other factors are not compelling enough to offset the vessel capacity factor."

After a fishery has been declared conditional, new applications for the FVOG and FVCCF programs will not be accepted. The exception to this is continuing the programs for "replacement capacity" of a standard vessel. Replacement of a standard vessel, however, has been given a liberal interpetation to allow, for example, replacement of a 45-foot wooden trawler—a standard vessel in the 1950's—with a 75-foot diesel-powered, twin-rigged, steel trawler—the current standard vessel. To date, seven fisheries have been declared conditional: 1) Pacific yellowfin tuna (10 June 1974), 2) Alaskan salmon (23 September 1974), 3) Alaskan king crab (22 September 1975), 4) west coast salmon (23 September 1974), 5) Gulf of Maine American lobster (23 September 1975), 6) surf clams (21 July 1977), and 7) Atlantic groundfish (22 January 1979).

Shrimp Fishery Trends

Analysis of the trends in the use of production inputs and their costs in the Gulf shrimp vessel fleet may lead to tentative conclusions about the shrimp fishery as a conditional one.

Vessels and Effort

The number of shrimp vessels has increased from 2,686 in 1962 to 3,690 in 1975, an average yearly increase of 2 percent (Gulf of Mexico Fishery Management Council, 1980). A record high 4,091 vessels occurred in 1973 (Fig. 1). The average size of a shrimp vessel has increased from 41.9 gross tons (GT) in 1962 to 59.3 GT in 1975, an average yearly increase of 2.6 percent (Fig. 2). The result of greater vessel numbers and larger vessel size is an increase in fleet capacity (Gulf of Mexico Fishery Management Council, 1980). Gulf shrimp catches, however, do not exhibit any upward trend.

Fishing effort has also increased significantly in the Gulf shrimp fishery. Nominal fishing days trawled (24-hour units) increased 50 percent between 1962 and 1974 (Blomo et al., 1978); a high of 67 percent was recorded in 1969 (Fig. 3). Total effort, defined as nominal fishing days trawled adjusted for growth in vessel horsepower and net size, increased even faster—69 percent between 1962 and 1974 (Blomo et al., 1978); a high of 96 percent occurred in 1972 (Fig. 4).

Capacity

Capacity is a concept useful for resource managers in analyzing the physical and economic use of production inputs. It is also cited above in NMFS criteria relating to a conditional fishery. Capacity, in both engineering and economic standpoints, is from Ballard and Blomo (1978).

The engineering aspect of capacity in the shrimp fishery can be measured through catch per unit effort (CPUE). The highest CPUE was in 1967: 494 pounds of shrimp per unit effort (Blomo et al., 1978). Assuming this catch rate to be 100 percent during 1962-74, capacity was as low as 53 percent utilization in 1973. If this catch rate per vessel (494 pounds) were maintained through 1975, the effect on the total number of vessels and revenue per vessel is dramatic when compared with the historical data (Table 1).

Another engineering capacity measurement is catch per GT. Again, its peak was achieved in 1967, 648.1 pounds of shrimp per GT. Recognizing the need for larger-sized vessels, Table 2 examines the effects on number of, catch, and revenue per vessel by maintaining the peak catch per GT and allowing for growth in vessel size (Fig. 2). The results are even more dramatic than those in Table 1. Catch and revenue per vessel are higher, while the number of vessels is significantly less[2].

Capacity from an economic standpoint would have maximum utilization where marginal revenue equals marginal cost (microeconomic approach). This would correspond to the economic optimum level of input use for each firm and for the (shrimp) fishery. Griffin, Lacewell, and Nichols (1976) estimated the economic optimum level of Gulf shrimp fishing effort for 1973. The results of this study indicated actual effort and vessel numbers were almost three times larger than would be economically optimum. Actual effort was still one-half as large as the effort which would earn the industry a "fair" return on its investment. Thus, from an economic standpoint as well, the industry is overcapitalized.

It is interesting to note that the Shrimp Fishery Management Plan (FMP), like other plans, utilizes the engineering aspect for estimating capacity. Capacity in the plan exceeds the expected domestic annual harvest, with a resultant zero foreign allocation. Use of the economic capacity concept could result in a foreign allocation in some circumstances if the optimum yield were not adjusted.

Table 1.—Maintaining 1967 shrimp catch per vessel: Effect on number of vessels and revenue per vessel.

Item	1967	1968	1969	1970	1971	1972	1973	1974
Total catch[1] (million lb)	99.7	83.7	82.4	96.1	91.3	94.3	71.0	73.9
Total revenue[1] (million $)	68.5	68.4	74.3	81.4	100.8	120.1	118.6	99.8
Historical catch per vessel (lb)	31,691	24,402	23,087	26,851	26,182	25,604	17,255	19,524
New catch per vessel (lb)	31,691	31,691	31,691	31,691	31,691	31,691	31,691	31,691
Historical no. of vessels	3,146	3,430	3,569	3,579	3,487	3,683	4,091	3,785
New no. of vessels[2]	3,146	2,641	2,600	3,032	2,881	2,975	2,240	2,332
Historical revenue per vessel ($)	21,773	19,941	20,818	22,743	28,907	32,609	28,990	26,367
New revenue per vessel ($)[3]	21,773	25,899	28,577	26,847	34,988	40,370	52,946	42,796

[1]Attributed to vessels, craft ≥ 5 GVT
[2]Derived by dividing total catch (row 1) by new catch per vessel (row 4).
[3]Derived by dividing total revenue (row 2) by new number of vessels (row 6).

Table 2.—Maintaining 1967 shrimp catch per gross vessel ton: Effect on number of vessels and revenue per vessel.[1]

Item	1967	1968	1969	1970	1971	1972	1973	1974
Total catch[2] (million lb)	99.7	83.7	82.4	96.1	91.3	94.3	71.0	73.9
Total revenue[2] (million $)	68.5	68.4	74.3	81.4	100.8	120.1	118.6	99.8
Historical catch per GVT	648.1	464.8	429.9	499.1	453.0	432.5	289.7	317.5
New catch per GVT	648.1	648.1	648.1	648.1	648.1	648.1	648.1	648.1
Historical no. of vessels	3,146	3,430	3,569	3,579	3,487	3,683	4,091	3,785
New no. of vessels[3]	3,146	2,460	2,368	2,756	2,437	2,510	1,829	1,854
Average gross tons per vessel	48.9	52.5	53.7	53.8	57.8	59.2	59.9	61.5
New catch per vessel (lb)[4]	31,691	34,024	34,797	34,869	37,464	37,570	38,819	39,860
Historical revenue per vessel ($)	21,773	19,941	20,818	22,743	28,907	32,609	28,990	26,367
New revenue per vessel ($)	21,773	27,805	31,376	29,535	41,362	47,848	64,844	53,829

[1]Maintains total fleet tonnage at 1967 level, 153,840 GVT
[2]Attributed to vessels, craft ≥ 5 GVT
[3]Derived by dividing total catch (row 1) by new catch per GVT (row 4) by average gross tons/vessel (row 7).
[4]Derived by dividing total catch (row 1) by new number of vessels (row 6).

[2]Although catch is not linearly related to either vessel numbers or gross tons, the examples provided in Tables 1 and 2 illustrate a reduction in both in order to keep factor input utilization at historic maximum levels. A linear assumption would be invalid in expanding vessel numbers or gross tons with a resource having a maximum sustainable (or limited) yield.

Financial Conditions

Revenues and costs have varied for the Gulf shrimp fleet in past years. Revenues are a function of: 1) Landings, which are affected by environmental factors and the number of other vessels, and 2) price, which is affected by supplies and demand for shrimp. Costs fall into the variable (with fishing effort and catch) and fixed categories (Griffin, Wardlaw, and Nichols, 1976). Fuel, repair and maintenance of the vessel, and mortgage payments make up most of these costs that vary with effort. (Crew share costs vary with catch.) Annual fluctuations in revenues and costs will determine profitability for the fleet and individual vessels.

The financial condition of the shrimp fleet in various states has indeed fluctuated in past years. Costs and returns surveys of shrimp vessels demonstrate the volatility of profit. Blomo and Griffin (1978) found all sizes of Florida-based vessels earning profits in 1977, although the smallest sized vessels (28-54 feet keel length) incurred negative returns to the owner's labor and management. All sizes of Louisiana-based vessels earned profits in 1978 (Roberts and Sass, 1979). Vessels in Texas earned profits in 1971 and 1973, incurred losses in 1974 and 1975, and earned profits again in 1978 (Griffin, 1977; Griffin et al., In press).

The price of diesel fuel is perhaps the most visible production factor as well as the most likely to increase. Recent trends indicate a tripling in diesel fuel cost from 1974 to 1980 (Sullivan, 1980). Fuel efficiency rates relative to shrimp catch and value are calculated in Table 3, as well as percentage of total cost. This data provides a base from which to evaluate the impact on individual vessels from recent decreases in shrimp prices and increases in diesel fuel cost, and increasing fleet capacity as it decreases individual catches, ceteris paribus.

The implications on the future financial conditions of the shrimp fleet are quite sobering, considering that fuel has now at least tripled in price. Swartz and Griffin (1979) also examined rising diesel fuel prices and calculated the necessary annual catches for a shrimp vessel to break even. Their results indicated the necessity for substantially higher shrimp prices or larger annual catches than historically recorded. This, however, will be difficult given the present structure of the shrimp market and competition for the resource on the trawling grounds.

Under these circumstances, vessel owners are investigating and trying ways to increase fuel efficiency: Kort nozzles on propellers, hull coatings to reduce drag, use of more than two nets, changes in crew share arrangements, and use of fuel meters. The combination of excess capacity in the Gulf shrimp fishery, and deteriorating general economic conditions during 1979-early 1980 have caused shrimp vessels, particularly along the Texas coast, to be either: 1) For sale, 2) switching to swordfish/bluefin tuna longlining, or 3) tied up.

Until recently, the net accumulation of shrimp vessels has been at least partially due to the marginal rate of return on investment exceeding opportunity costs; this situation has occurred in 8 of the last 10 years. The poor financial condition of some vessel owners may have been due to the effects of increased costs which tend to emphasize diseconomies of scale common to the larger fleet operations. These diseconomies include that of managing hired captains, fuel storage for vessels, office expense and personnel, dock space costs, and possibly depreciation and insurance.

Table 3.—Fuel efficiency rates for various shrimp vessels in the Gulf of Mexico.

Area and vessel size	Fuel percentage of total cost	Lb of shrimp per gallon	$ of shrimp per gallon
Louisiana (1978)[1]			
Small vessel	13%	2.7.	4.04
Medium vessel	12%	2.0	5.00
Large vessel	21%	0.8	2.56
Florida (1977)[2]			
All vessels	16%	1.3	2.96
Wood vessels	16%	1.5	3.25
Small	13%	1.8	3.30
Large	16%	1.5	3.25
Steel vessels	18%	1.1	2.50
Texas (51'-81' vessels)[3]			
1973[4]	13%		
1974 (33¢/gallon)	20%	0.8	1.37
1975 (37¢/gallon)	18%	0.9	1.96
1978 (41¢/gallon)	22%	0.8	2.35

[1] $0.40/gallon; from Roberts and Sass (1979).
[2] $0.42/gallon; from Blomo and Griffin (1978).
[3] From Griffin (1977); Griffin et al. (In press).
[4] Price not available.

Effect of Conditional Fishery Declaration

The trends in the Gulf shrimp fishery, namely vessel numbers and effort, capacity utilization, and its financial conditions, would force one to conclude that it does indeed qualify as a conditional fishery. Its overcapitalization and resultant application of excess effort and costs would seem to preclude the use of public resources to finance new or improved vessels.

Declaring a fishery conditional would have immediate and longer run effects. First, there would be an immediate cessation of the FVOG or FVCCF grants other than those existing and the "replacement capacity" described above. This would reduce present program activity by 50 percent (Greenfield, 1980). Presumably, other government loan programs (footnote 1) would be similarly affected.

In the short and possibly long term, the banking and credit community would be aware of the government's view of the fishery; this may affect the industry from the harvesting through the processing sectors. However, most other conditional fisheries have not experienced this; in fact, fleets have expanded in those fisheries through 1979 (M. Miller, NMFS, pers. commun.)

Policy Implications

The overt act of declaring a fishery conditional would address somewhat the overall problem of overcapitalization. Declaring a fishery conditional will not alleviate current problems such as factor cost increases or downturns in the national economy which affect demand for shrimp (Doll,

1976). FVOG and FVCCF programs in the past have accounted for only a small percentage (4-5 percent) of capital funds in the Gulf shrimp fishery (Greenfield, 1980). However, when the equity requirement for an applicant was decreased from 25 to 12.5 percent of the value of the vessel, the program accounted for 80 percent of new vessel construction and 8-10 percent of the total current fleet.

Programs which concentrate on all production factors—vessels and fishermen, primarily—would be more efficient. The value of discussing a fishery as conditional is that it may shift the discussion in the direction of total input use instead of additional inputs. FVOG and FVCCF could still be of value in this context if used only for refitting vessels to operate in other fisheries.

It may be that of the alternatives, conferring conditional fishery status would achieve the most benefits—reduction of fishing effort and more efficient allocation of public funds—with the least socioeconomic adjustments. It should be noted that the FVOG and FVCCF programs are self-adjusting, that is, during poor economic conditions new applications decrease substantially and the programs are not a major factor. However, presuming conditions improve, applications should again increase only to fuel future increases in fleet capacity and potential financial difficulties.

Another aspect of this issue is that the management of the fishery via the Shrimp FMP is essentially laissez faire. Consideration of conditional fishery status would be consistent with this philosophy by removing government distortions from the industry. Other more effective and efficient programs would thrust the Federal Government or the Gulf Council into active management of the industry.

Such programs which would concentrate on the factors of production involve economic incentives and/or regulations. These incentives and regulations include:

1) Permits for shrimping charged to fishermen; with these permit fees, offer financial incentives for shrimpers to go into other fisheries;

2) Landing quotas on vessels over a certain GT (or length) and a financial penalty per pound of shrimp over the quota, with proceeds acting as a financial incentive similar to #1 above;

3) Tax all new (or new above certain GT or length) vessels, levied at the shipbuilder level, with proceeds to go towards retiring older vessels;

4) Limited entry, with long- and short-term permits, and provisions for constraints on number of vessels, number of fishermen, fleet tonnage, average size vessel, or a combination thereof.

This list is not all-inclusive and is presented here for identification only. There are many issues associated with each program and each deserves adequate discussion as this dialogue on overcapitalization develops.

Summary and Conclusions

The Gulf shrimp fishery exhibits the classic symptoms of overcapitalization in an open access fishery enjoying high product prices. Analysis of the growth in vessel numbers and effort, the low rate of capacity utilization in engineering and economic terms, and the volatility of profits for what is essentially a luxury item appear to be adequate justification for conditional fishery status. Immediate effects of such status are denial of new applications for federal loan guarantee and income tax deferral programs. Longer term effects may include availability of credit from private sources.

Conditional fishery status will solve the problem of committing public resources in the shrimp fishery, of which the resource is common property. However, specific impacts would take several years in light of the fraction of the fleet which such vessels make up. There are other more efficient and effective programs, such as economic incentives and regulations, which would address the overcapitalization issue. Loan guarantee and income tax deferral programs may still be useful by diverting vessels into other fisheries, but their continued availability in the shrimp fishery is seriously questioned.

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