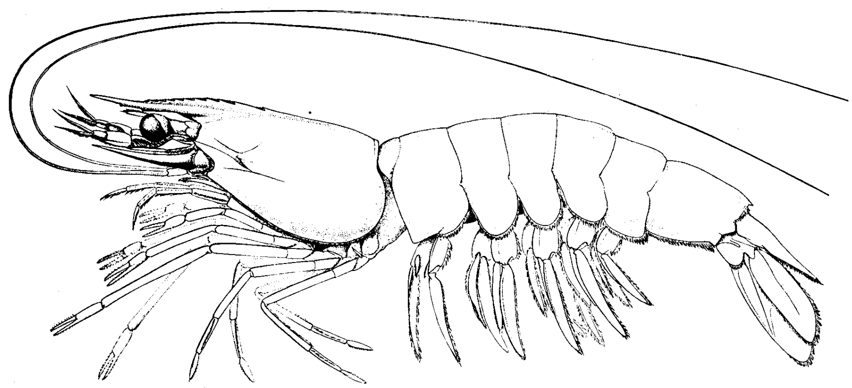
Update on the Economic Status of the Gulf of Mexico Commercial Shrimp Fishery



Michael D. Travis, Ph.D.
Fisheries Economics Office
National Marine Fisheries Service
St. Petersburg, Florida

Wade L. Griffin, Professor
Department of Agriculture Economics
Texas A&M University
College Station, Texas

April 5, 2004

SERO-ECON-04-01

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Update on the Economic Status of the
Gulf of Mexico Commercial Shrimp Fishery

The purpose of this report is to provide an update on the economic status of the Gulf of Mexico commercial shrimp fishery, and discuss the implications of this status on the expected future size of the fleet and the associated levels of effort. Although some discussion will be devoted to the fishery as a whole, the discussion will primarily focus on the "large" vessel sector of the fleet (herein defined as vessels equal to or greater than 60 feet in length) since this component of the fleet primarily operates in offshore waters and is, therefore, believed to have a much higher level of interaction with important finfish species, such as juvenile red snapper, than the "small" vessel sector (vessels less than 60 feet in length).

Historical Context

Prior to an examination of current conditions and projections of expected future conditions, a look at the industry's economic performance over time will provide some useful historical context. The most comprehensive analysis of the industry's historical economic performance was conducted in Funk (1998). This analysis examined fleet profitability during the 1965-1995 time period.[1] During these years, the average annual rate of return (net revenue or profit as a percentage of revenue) for the fishery as a whole was 12.5%, which is a respectable figure for capital investors. Given the inherent variability in shrimp stock conditions from year to year and, thus, landings and revenues, it is not surprising that profitability was also quite volatile from year to year, with the industry experiencing exceptionally high profits in some years and very low or negative profits (losses) in other years. In addition to the annual variability in abundance, economic performance appeared to be largely driven by changes in fuel prices, with changes in crew share expenses playing a secondary role. Several researchers have noted that fuel costs have and continue to represent a significant portion of the industry's operating costs (Haby, et al., 2003; Ward, Griffin, and Ozuna, 1995). Thus, fluctuations in fuel prices can significantly impact the industry's economic performance.

In addition to variability over time, Funk's analysis also indicated that economic performance varied by vessel size.[2] In general, rates of return tend to be higher on average for smaller vessels than for larger vessels, even though revenues and aggregate profits tend to be

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[1] In this analysis, "profits" were defined as revenue minus cash costs, and thus did not take depreciation or the owner's opportunity cost of capital into account. The analyses by NOAA Fisheries (2002) and Travis and Griffin (2003) cited in this report did take these additional costs into account when examining economic performance.

[2] Three vessel size categories were used in this analysis: small (< 45 feet), medium (45-60 feet), and large (>60 feet). The analyses by NOAA Fisheries (2002) and Travis and Griffin (2003) combined the small and medium categories into a single "small" vessel category.

higher for the larger vessels. This result indicates that the costs of operating larger vessels also tend to be relatively higher, both in the aggregate and on a per unit basis, than those of smaller vessels. However, Funk hypothesized that ownership status and level of participation in the fishery were two of the most important factors explaining this variation in profitability. That is, smaller vessels tend to be predominantly operated by their owners, but only participate in the shrimp fishery on a part-time basis. These factors increase the flexibility of these vessels' operations. In general, these vessels will only participate in the fishery when revenue and/or profit per unit of effort is relatively high. When low or negative profits are being earned, these vessels and their owners will allocate their time to other fisheries and endeavors. Conversely, the larger vessels are more frequently operated by hired captains, and participate in the fishery on a full-time basis. In addition to the fact that these captains must be paid, as well as the crew, these vessels have much less flexibility with respect to when they participate in the fishery. Good captains must be retained, lest they be lost to other owners, and bills for relatively high "fixed" costs, such as insurance, mortgage payments, etc., must still be paid regardless of whether the vessel fishes or not. Furthermore, many of these larger vessels are part of a vertically integrated operation (i.e. they are owned by processing firms). In such instances, the goal of the owner is likely to maximize profits for the entire operation as opposed to the individual vessel. A stable supply of shrimp is critical to the profitable operation of processing plants. All of these factors will cause these larger vessels to continue operating in the shrimp fishery, even when profits are low or negative. Therefore, on average and over time, a lower rate of return should be expected for larger vessels relative to smaller vessels in this fishery.

Funk's results confirm this expectation. Specifically, small and medium sized vessels earned a 30.8% and 18.9% rate of return on average, respectively, during the 1965-1995 time period, whereas large vessels only earned a 6.2% return. In fact, the smallest vessel class did not indicate a negative profit in any year during this time period, though the large vessel class experienced negative profits during several years. Nonetheless, overall, this industry was historically profitable during this time period.

Modeling Approach and Recent Analyses

Recent analyses, however, indicate that this trend of historical profitability ended in 2000. These analyses employed Griffin's General Bioeconomic Simulation Model (GBFSM). The details of GBFSM's structure and the calibration process are described in Grant and Griffin (1979) and at http://gbfsm.tamu.edu. The GBFSM currently represents the best available model for analyzing changes in the Gulf shrimp fishery's economic performance.

The GBFSM is flexible in the sense that it can analyze the fishery at different levels of aggregation. In these recent analyses, the fishery has been analyzed at a highly disaggregated level so as to more accurately capture the nature and sources of change in the fishery. Specifically, this version of GBFSM used the following components: five Regions/states of landing (West Florida, Alabama, Mississippi, Louisiana, and Texas); six areas fished - Lower

Florida (statistical areas 1 through 3), Upper Florida (statistical areas 4 through 9), Alabama/Mississippi/East Louisiana (statistical areas 10-12), West Louisiana (statistical areas 13-17), Upper Texas (statistical areas 18 and 19), and Lower Texas (statistical areas 20 and 21); five depths fished (inshore, one to five fathoms, six to 10 fathoms, 11 to 20 fathoms, and greater than 20 fathoms); three species of shrimp (brown shrimp, white shrimp, and pink shrimp); six size classes of shrimp (greater than 20 count, 21 to 30 count, 31 to 50 count, 51 to 67 count, 68 to 116 count, and greater than 116 count); two vessel size classes - small (less than 60 feet) and large (greater than or equal to 60 feet); and 48 time steps over the course of a year (i.e., each time step represents, approximately, an eight day time increment). The model was tuned to average landings over the 1991-1995 time period.[3] A nominal day fished (nominal effort) represents twenty-four hours of trawl time and is, therefore, equivalent to a "trawl day," which is the term commonly employed within the National Marine Fisheries Service's (NMFS) shrimp stock assessments. However, effort estimates within GBFSM are derived using the method developed by Griffin, Shah, and Nance (1997), as opposed to the "averaging" method used in the NMFS' shrimp stock assessments (Nance, 1992). Due to data limitations, the model measures changes in the number of vessels by employing the concept of "full-time equivalent vessels" (FTEVs). The number of FTEVs represents the number of vessels that would be necessary to harvest the resource if each vessel operated on a full-time basis (i.e. eight hours a day for five days a week). Landings, price, and revenue data were obtained from the NMFS shrimp landings datafiles maintained by the NMFS Galveston Laboratory. Due to the lack of current cost data for the fishery, costs were estimated based on the approach developed by Funk, et al. (1998). Costs and prices were converted into real or constant dollar terms using the Producer Price Index (PPI). Profits (rents) are defined as the difference between gross revenues and total costs, where total costs are composed of variable costs (i.e. fuel, ice, labor, etc.) and fixed costs (vessel loan payments, vessel insurance, etc.).

The first of these recent analyses was conducted to examine the impacts of the recently implemented rule that modified Turtle Excluder Device (TED) regulations in the Gulf and South Atlantic shrimp fisheries (NOAA Fisheries, 2002). Part of this analysis examined changes in the Gulf shrimp trawl fishery's economic performance between 1998 and 2001.[4] This analysis indicated that the large vessel component of the fishery was profitable to highly profitable between 1998 and 2000. Nominal shrimp prices were relatively stable and fuel prices were relatively low by historical standards, and abundance tended to be higher than historical averages. Undoubtedly, strong conditions at the macroeconomic level created relatively high levels of

[3] Effort data during this time period are exogenous to the model. Various biological coefficients related to recruitment, mortality, growth, and migration are adjusted until simulated landings by area, species, depth zone, size, and month approximate actual landings as closely as possible.

[4] Unlike the other analyses, the TED rule analysis only examined economic performance of the trawl component of the fishery, since non-trawl gear (e.g. skimmers and butterfly nets) is exempt from the TED requirements. The large vessels in the Gulf almost exclusively use trawl gear, whereas non-trawl gear has become increasingly important in the small vessel sector over the past 5 years. Thus, the results of that analysis for the small vessel sector are not directly comparable with results from the other analyses and are therefore not referenced here.

consumer demand for shrimp, which in turn engendered strong economic performance in the shrimp industry.

However, economic conditions took an abrupt change in the latter half of 2001. Current evidence indicates that as imports surged, macroeconomic conditions deteriorated, and the post 9/11 era began, the industry was hit by sharply declining prices and higher insurance premiums.[5] At least for the large vessel sector, profits turned into losses by the end of 2001. The deteriorating trend appears to have continued through 2002 and 2003, exacerbated by increases in fuel prices that began in the latter part of 2002 and continued through 2003. According to average price data reported by the Bureau of Labor Statistics (BLS), from 2002 to 2003, fuel prices increased between 21% and 29%, depending on the selected fuel price index.[6] Regardless of which index used, fuel prices increased significantly which, in turn, significantly increased shrimp vessels' operating costs.

By 2002, as indicated in the economic analysis of the 2003 Texas Closure policy (Travis and Griffin, 2003) and the supplemental economic analysis of Amendment 10 to the Shrimp Fishery Management Plan (NOAA Fisheries, 2003c), economic conditions deteriorated to the point where all sectors of the Gulf shrimp fishery, regardless of vessel size, state, or gear, were facing negative profits (losses), on average, by the end of 2002. According to the Texas Closure analysis, for the fishery as a whole in 2002, the average rate of return (profits or losses as a percentage of revenue) was expected to be approximately -41%, with lower loss rates being experienced for the small vessel sector (-30%) relative to the large vessel sector (-45%). Regardless of whether the Texas Closure policy was continued or not, projections for 2003 indicated that these economic losses would persist under current conditions.

The analyses clearly indicate that rapidly declining prices have been the primary source of the recent deterioration in the industry's economic condition. In the aggregate, the average nominal price of shrimp in the Gulf decreased by approximately 28% between 2000 and 2002. Revenues decreased even more as a result of relatively lower shrimp abundance and, therefore, landings in 2001 and 2002 relative to 2000. The magnitude of the price decline has varied by shrimp size category, with the under 15 count ("jumbo") and 68 and over count ("small") size categories seeing the smallest declines (approximately 23%) and the 31-40 and 41-50 count ("large" and "medium") size categories seeing the largest declines (approximately 35%). Due to inflation, these price declines are even larger in real terms.

According to Haby, et al. (2003), increases in shrimp imports have been the primary

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[5]Increases in vessel insurance premiums are documented in a Commercial Fisheries News article, a reprint of which can be found at http://www.fishresearch.org/Articles/2002/10/insurance.asp.

[6]According to information posted to http://data.bls.gov on February 17, 2004, the Consumer Price Index's average price data for fuel oil, Series APU00007251, indicates that fuel prices increased by 21% between 2002 and 2003. However, the PPI's data on average prices for #2 diesel fuel, Series WPU057303, indicates that fuel prices increased by 29% during this time.

cause of the recent decline in U.S. shrimp prices. A complete discussion of the factors contributing to the increase in imports can be found in Haby, et al. (2003). In general, recent surges in imports have been caused by increases in the production of foreign, farm-raised shrimp. More specifically, increased competition from shrimp imports has been due to three primary factors: 1) changes in product form due to relatively lower wages in the exporting countries, 2) shifts in production to larger count sizes, and 3) tariff and exchange rate conditions which have been favorable to shrimp imports into the U.S. With respect to the first factor, relatively lower wage rates have allowed major shrimp exporters (e.g. Thailand) to increase production of more convenient and higher value product forms, such as hand-peeled raw and cooked shrimp. With respect to the second factor, changes in farming technology and species have allowed production of foreign product to shift towards larger, more valuable sizes. As a result of these factors, imports are more directly competing with the product traditionally harvested by the domestic industry, thereby reducing the latter's historical comparative advantage with respect to these product forms and sizes. Finally, with respect to the third factor, the lack of duties on shrimp imports into the U.S., the presence of relatively significant duties on shrimp imports into the European Union (E.U.), and the recent strength of the U.S. dollar relative to foreign currencies have created favorable conditions for countries exporting products to the U.S.

As Haby et. al. note, the increase in imports has caused the domestic industry's share of the U.S. shrimp market to decrease from 44.6% to 14.8% between 1980 and 2001. And while the growth in imports was relatively steady throughout most of this time period (for e.g., 4-5% in the late 1990's), shrimp imports surged by 16% in 2001. And since 2001, which is the last year accounted for in their analysis, shrimp imports have continued to rise. Although the increase in 2002 was a modest 7.2%, relative to the increase in 2001, a significant increase of 17.5% occurred in 2003 according to the most recently available data.[7] Undoubtedly, these increases have led to further erosion in the domestic industry's market share and additional price declines.

Update on the Economic Status of the Fishery

The economic analysis of the 2003 Texas Closure was recently re-examined and updated to investigate pertains to the industry's current economic status. Certain changes were incorporated in this examination. First, the original analysis was based on preliminary data for 2002. The new projections incorporate finalized data for 2002.

Second, caps of 5% and 8% were placed on the rate of exit from the fishery for large and small vessels respectively in the original analysis. In general, vessels are expected to exit the fishery when profits (rents) are negative (i.e. losses are being incurred) and enter when profits are positive. The rate of exit and entry is dependent on the magnitude of those profits or losses. The use of caps on the maximum rate of entry and exit within GBFSM has been historically based on the concept of asset fixity. The purpose of this concept is to recognize the fact that capital (the

[7] Shrimp import data can be found at http://www.st.nmfs.gov/st1/trade/trade_prdct_cntry.html Statistics cited in this report were based on data posted as of March 25, 2004.

vessel) is not perfectly malleable or transferable. That is, capital cannot be immediately converted for other uses. Differences in the flexibility of large and small vessel operations explain the differential caps between the two sectors. However, as valid as this concept may be, asset fixity becomes less important and relevant if vessels continue to lose money (i.e. operate at a loss) over an extended period of time. Losses, particularly large losses, cannot be incurred indefinitely. The analysis indicated that the cap on the rate of exit was being reached in both the large and small vessel sectors in 2002. Furthermore, the analysis revealed that, on average, vessels were not even able to cover their variable costs in 2002. Preliminary information indicates that prices have continued to decline in 2003,[8] which would lead to the expectation that the vessels' inability to cover their variable costs has continued in 2003. If vessels cannot cover their variable costs, they will be forced to cease operations (i.e. exit the fishery), at least until conditions change. In response to these considerations, when variable costs exceed total revenue in the updated analysis, the caps on the rate of exit were doubled to 10% and 16%, respectively, thereby allowing vessels to exit the fishery more quickly if conditions so warrant.

Third, projections of fleet size (as measured by FTEVs) and nominal effort were updated and extended farther into the future (20 years, or through 2021) to determine how long it would take for the fishery to reach an equilibrium state, assuming no changes in external factors (e.g. imports, regulations, etc.). In general, equilibrium occurs once economic losses are no longer being incurred (i.e. economic profits are zero) and fleet size is stable (i.e. fleet size has reached its minimum level).

According to the new projections (see Tables 1 and 2), the average rate of return in the fishery for 2002 is projected to have been approximately -33%, slightly better than initial projection, and the difference between the rates of return in the small vessel sector and large vessel sector also narrowed to a small degree (-27% and -36%, respectively). Economic losses are forecast to continue throughout the fishery on average until 2012, *ceteris paribus*. As would be expected, these losses cause vessels to continue exiting from the fishery during this time. As shown in Table 1, the size of the large vessel sector and level of associated fishing activity decline continuously, in terms of FTEVs and nominal effort, through 2012 and are expected to have decreased by 39% and 34%, respectively, relative to 2002 levels.[9] However, only the large vessel sector reaches an equilibrium by 2012. Although the number of FTEVs and nominal effort are expected to decrease in the small vessel sector by approximately 29% by 2012, the small vessel sector continues to decrease in size and effort throughout the entire twenty-year simulation (see Table 2). The logic behind this differential result between the large and small

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[8]Currently available data for 2003, which does not generally include information pertaining to the fourth quarter of the year, indicates that the decline in nominal prices from 2000 is 36% across all size categories. Depending on the size category, the declines range from 27% to 40%.

[9]Within each region, nominal effort and the number of FTEVs are proportional by definition. However, if economic performance varies across regions, then rates of vessel entry and exit will also vary by region. As such, the percentage changes in nominal effort and the number of FTEVs over time will not be exactly proportional for the fishery as a whole.

vessel sectors is fairly straightforward. Specifically, as large vessels, which predominately operate in offshore waters, exit the fishery, their departure leads to an improvement in the economic performance of the large vessels that remain in the fishery, primarily as a result of increases in catch per unit of effort (CPUE) in offshore waters. However, given the migration pattern of shrimp from inshore to offshore waters, the departure of large vessels does not generally increase CPUE in inshore waters where the smaller vessels tend to operate. Conversely, the departure of small vessels improves the economic performance of both small and large vessels by removing competition in inshore waters and by allowing more shrimp to escape into offshore waters (i.e., CPUE should increase in both inshore and offshore waters). Although the economic performance of large vessels is expected to improve more quickly than that of small vessels, *ceteris paribus*, it must be emphasized that, under current conditions, economic recovery even in the large vessel sector is not expected for several years.

It is important to note that these projections assume that external factors such as imports, fuel prices, and other costs remain unchanged from their 2002 status. That is, recent information regarding increases in fuel prices, insurance premiums, and imports, and further declines in shrimp prices during 2003 have not yet been incorporated into the model and analysis since final data are not yet available. Since these changes would be expected to further erode the industry's economic performance, the projections of economic losses, decreases in fleet size and effort, and the period of time before the large vessel sector stabilizes are likely underestimated. Thus, unless other factors change in a manner that would contravene these adverse impacts, these projections should be considered conservative.

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Table 1. Simulation Results for Large Vessels

Year	FTEVs	Days Fished	Landings (heads-off lbs. millions)	Revenue ($ millions)	Price/lb ($)	Variable Costs ($ millions)	Producer Surplus ($ millions)	Fixed/ Opportunity Costs ($ millions)	Rent ($ millions)	CPUE	Rent per FTEV ($)
2002	2144	158662	72493	190706	2.63	187612	3093	70950	-67857	457	-31650
2003	1954	144599	69964	185923	2.66	173831	12092	64663	-52571	484	-26904
2004	1796	133341	68961	185320	2.69	163558	21763	59434	-37671	517	-20975
2005	1663	124091	68010	184665	2.72	155078	29586	55033	-25446	548	-15301
2006	1555	117077	67281	184240	2.74	148666	35575	51459	-15884	575	-10215
2007	1469	111648	66361	183085	2.76	143509	39576	48613	-9037	594	-6152
2008	1404	107806	65651	182064	2.77	139811	42253	46462	-4209	609	-2998
2009	1359	105423	65278	181717	2.78	137585	44132	44973	-841	619	-619
2010	1331	104279	65220	182004	2.79	136622	45382	44046	1336	625	1004
2011	1318	104131	65469	183008	2.8	136725	46283	43616	2667	629	2024
2012	1313	104707	65945	184518	2.8	137598	46919	43450	3469	630	2642
2013	1315	105751	66566	186310	2.8	138960	47351	43517	3834	629	2916
2014	1320	107042	67264	188233	2.8	140573	47660	43682	3978	628	3014
2015	1325	108459	68003	190214	2.8	142314	47901	43848	4053	627	3059
2016	1331	109978	68771	192215	2.79	144151	48064	44046	4018	625	3019
2017	1337	111589	69560	194225	2.79	146074	48152	44245	3907	623	2922
2018	1342	113171	70326	196130	2.79	147945	48185	44410	3775	621	2813
2019	1347	114853	71115	198071	2.79	149915	48157	44576	3581	619	2659
2020	1352	116625	71919	200034	2.78	151971	48063	44741	3322	617	2457
2021	1357	118494	72726	201958	2.78	154106	47853	44907	2946	614	2171

Table 2. Simulation Results for Small Vessels

Year	FTEVs	Days Fished	Landings (heads-off lbs. millions)	Revenue ($ millions)	Price/lb ($)	Variable Costs ($ millions)	Producer Surplus ($ millions)	Fixed/ Opportunity Costs ($ millions)	Rent ($ millions)	CPUE	Rent per FTEV ($)
2002	6920	138595	49541	79801	1.61	90828	-11027	10584	-21612	357	-3123
2003	6481	129796	48450	78843	1.63	85834	-6992	9900	-16891	373	-2606
2004	5993	120010	46832	77064	1.65	80150	-3087	9141	-12228	390	-2040
2005	5645	113105	45605	75826	1.66	76176	-351	8629	-8979	403	-1591
2006	5374	107735	44543	74654	1.68	73049	1605	8228	-6623	413	-1232
2007	5259	105450	44186	74371	1.68	71750	2621	8048	-5427	419	-1032
2008	5165	103582	43857	74042	1.69	70669	3373	7902	-4529	423	-877
2009	5084	102007	43542	73671	1.69	69739	3932	7774	-3842	427	-756
2010	5015	100661	43236	73259	1.69	68925	4334	7664	-3330	430	-664
2011	4954	99491	42933	72816	1.7	68201	4615	7566	-2950	432	-595
2012	4900	98452	42633	72346	1.7	67543	4803	7477	-2674	433	-546
2013	4851	97511	42335	71857	1.7	66934	4923	7395	-2472	434	-510
2014	4805	96639	42042	71359	1.7	66362	4997	7318	-2320	435	-483
2015	4762	95819	41753	70858	1.7	65818	5040	7246	-2206	436	-463
2016	4721	95040	41467	70352	1.7	65294	5058	7177	-2119	436	-449
2017	4683	94291	41184	69841	1.7	64786	5055	7112	-2057	437	-439
2018	4645	93566	40912	69349	1.7	64294	5056	7047	-1991	437	-429
2019	4608	92864	40640	68851	1.69	63812	5039	6982	-1943	438	-422
2020	4572	92181	40369	68348	1.69	63339	5009	6919	-1910	438	-418
2021	4537	91513	40098	67840	1.69	62872	4968	6857	-1889	438	-416