

The Commercial Bottom Trawling Industry in Florida: Balancing Environmental Impact with Economic Contribution¹

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Introduction

The commercial fishing industry represents an important natural resource-based industry within the overall Florida economy. The industry is a vital source of income, export revenue, and employment in many of Florida's coastal communities. Although the commercial fishing industry has long been managed for maximum yield and/or economic benefits by agencies both at the state and federal level, recent management concerns have been increasingly focused on the long-term sustainability of harvesting and the industry's impact on the aquatic environment. From the environmental perspective, concerns have been most intently focused on those gear types that actively contact benthic, or bottom, habitats. Such gear types include trawls, which are used to harvest a variety of high valued species of crustaceans and molluscs in Florida. Otter trawls are the predominant form of trawl gear utilized in the Gulf of Mexico and South Atlantic region. These nets are held open by large doors and skim just across the surface of the bottom, with the mouth of the net held down by chains and rollers. Many non-governmental environmental groups have begun expressing increased concerns over the use of gear types that actively contact the bottom. Some groups have suggested that the use of such gear types should be more heavily managed or eliminated. However, disallowing or restricting the use of bottom trawls in Florida would have an initial, major negative impact on the commercial fishing industry.

This brief paper attempts to provide a preliminary assessment of the economic activities associated with the bottom trawling sector of the Florida commercial fishing industry. Such information will assist in identifying the costs and benefits associated with changes in allowable commercial gear types such as bottom trawls. Specifically, the information presented will provide some insight into the economic activity associated with the use of bottom trawls within the commercial fishing industry in Florida.

A Legacy of Controversy

Toward the overall objective of the wise and sustained use of Florida's marine resources, each sector of the commercial fishing industry has historically been managed by a host of

policies and regulations. A key element of Florida's marine resource management effort has been directed toward defining allowable designs and use patterns for gear. A variety of passive and active gear types, including traps, long lines, vertical hooks/lines, and trawls, are used to target the diverse mix of finfish and shellfish species that are commercially harvested in Florida. For the most part these management measures have been directed at own-species over-fishing and/or overcapitalization. However, the sector of the industry which uses trawls, particularly the shrimp industry, has endured a long legacy of restrictions that have been motivated by the non-target species, or by-catch, that are also landed with trawl gear.

Concern over the by-catch of sea turtles by shrimp trawls led to federal law that requires the use of turtle excluder devices (TEDs) in the throat of shrimp trawls utilized in state waters and the Exclusive Economic Zone (EEZ). The required use of TEDs was extremely controversial within the shrimp trawling industry due to several factors, including reported shrimp losses, cost of the devices, and at-sea safety issues associated with the use of steel-framed TEDs. Concern over sea turtle populations prevailed, and TEDs were required to be placed in shrimp trawls beginning in 1988. However, U.S. concern over sea turtles is global. In fact, the United States has now required that any nation that (1) has indigenous sea turtles and (2) is exporting trawled shrimp into the United States be required to place TEDs in all shrimp trawls used in that nation's coastal waters. Failure to do so will result in a trade embargo on that nation's U.S. shrimp exports.

Environmental concerns over the finfish by-catch associated with shrimp trawls led to the required use of by-catch reduction devices (BRDs). Concerns were initially linked to the by-catch of juvenile red snapper that congregate over Gulf of Mexico mud bottoms, a habitat also favored by economically important species of shrimp. Again, the issue was extremely controversial. Concern over red snapper and other finfish populations prevailed, and BRDs were required to be placed in shrimp trawls beginning in 1998.

The further technical refinement of existing and regulatory approval of new TEDs and BRDs continues at present. Many shrimp industry representatives viewed these devices as forced inefficiencies, while environmentalists argued the environmental benefits associated with their use.

The Saga Continues

The most recent issue to confront commercial trawling is the impact that trawls have on bottom habitats. With the reauthorization of the Magnuson-Stevens Act in 1996, attention has been increasingly focused on the environmental impacts of commercial and recreational fishing activities. The Magnuson-Stevens Act defined essential fish habitat (i.e., aquatic habitat that is essential for the sustainable use of a fishery resource). Now, the impact to essential fish habitat must be addressed in any new fisheries management plan, or with any changes made to an existing fishery management plan. This new provision has created a legitimate and effective venue into the management process for proponents of environmental awareness and, in some cases, activism. This is particularly true for those with an interest in assessing, controlling, and possibly eliminating damage allegedly done to bottom habitats by trawling activities. The essential fish habitat provisions of the Magnuson-Stevens Act essentially force these issues into the spotlight.

A host of environmental players have taken a role in drawing attention to the interaction of

bottom habitats and bottom trawling activities. These include such national and international groups as American Oceans Campaign, Oceana, Greenpeace, Earthjustice, The Ocean Conservancy, World Wildlife Fund, Sierra Club, and Reef Keeper International. Local or regional groups such as Gulf Restoration Network have also become involved. Each of these groups has an agenda that addresses in some fashion the issue of commercial bottom trawling. Some of these groups adhere to a hard line philosophy that dictates preservation of bottom habitats through elimination of bottom trawling activities. Others suggest that sustainable use can be achieved through further gear restrictions, establishment of additional closed areas (such as marine protected areas), and creating market linkages by increasing consumer awareness of the relationship between the production of certain seafoods and environmental integrity (i.e., eco-labeling).

A considerable amount of scientific inquiry has been directed toward understanding the manner in which bottom fishing activities affect benthic marine habitats. In reality, many of these studies have addressed not only the use of trawls, but also the use of hard dredges. Hard dredges are used for the harvest of species such as sea scallops in New England. This gear type is not used in the Gulf of Mexico and the South Atlantic region off the east coast of Florida. The primary type of active bottom gear in the Gulf and South Atlantic region is the trawl. Throughout the region trawls are used for harvesting shrimp. An exception occurs off the east coast of Florida where trawls are also used for the harvest of calico scallops. It should be noted that proactive management in this region has created large areas that are closed to scallop trawling as a means to protect fragile *oculina* coral beds. These regions were initially established in 1984, but expansions to the closed regions have been added periodically in subsequent years. In addition, a large area referred to as the Tortugas Shrimp Sanctuary was initiated by the state of Florida in 1971 and at the Federal level in 1984. The Sanctuary, which is comprised of 2,600 square miles, was championed by the commercial shrimp industry as a means to protect key pink shrimp nursery areas.

Some of the recent science that has focused on the effects of bottom fishing on benthic habitats has been especially critical of some of the heavier bottom fishing gear such as rock hopper trawls and dredges, neither of which are utilized in the Gulf and South Atlantic regions. The reaction to a recent National Research Council study has led to the development of the Ocean Habitat Protection Act, which seeks to "prevent the most harmful trawling gear from smashing fragile seafloor habitats, including coral and rocky reefs and undersea boulder fields." Another study by the University of North Carolina found that on mud bottoms "the mechanical effects of trawls neither harms nor cultivates the growth of small bottom creatures." Mud bottom habitat is the predominant type of habitat impacted by shrimp trawling activities in the Gulf and South Atlantic region. This latter study suggests that the environmental impact on benthic habitats resulting from bottom trawling in the Gulf region is minimal. Thus, the current science provides evidence that might lend support to the respective viewpoints of both proponents and opponents of commercial bottom trawling activities.

Florida's Bottom Trawling Industry

The Florida commercial fishing industry harvests over 150 species of finfish and shellfish, while utilizing a wide variety of gear types (i.e., cast nets, vertical hook and lines, long-lines, traps, trawls, tongs/rakes, etc.). However, those species harvested with bottom (otter) trawls represent a significant component of the commercial fishing industry in Florida. The primary seafood species targeted with bottom trawls include shrimp (i.e., pink, white,

brown, and rock) and calico scallops. In addition, the bait shrimp industry in Florida uses small beam trawls to harvest bait shrimp from near-shore grass beds. However, the following analysis and discussion will describe the economic values associated only with the harvest and wholesale distribution of trawled seafood species in Florida. The purpose of the study is to provide a preliminary assessment of the economic contribution and activities attributed to the trawling component of the commercial seafood industry to the Florida economy. Such economic values should provide some indication of the initial economic change that would occur if reductions in bottom trawling activities were ever mandated in Florida.

Dockside Value

The commercial catch is initially offloaded from the vessels by first-handlers such as fish houses and shore-side processors. The value paid to the vessel owners at this time is referred to as "dockside value". The harvest volume, and thus the dockside value, fluctuates from year to year due to environmental conditions, effort levels, and other factors. Thus, the following analysis utilizes data that extend over a five-year period from 1997 to 2001. Rock shrimp are harvested in very deep waters utilizing trawl gear designed for deep-water operation, whereas the other species of shrimp are harvested in relatively shallow waters. Thus, these two shrimp fisheries are considered separately. Shrimp (excluding rock shrimp) generated an average annual dockside value during the 1997-2001 period of \$51.3 million. Rock shrimp and calico scallops generated an average annual dockside value of \$5.9 and \$1.5 million, respectively, during the same period. In aggregate, these three sectors of the industry represented approximately one-third of the total average annual dockside value (\$58.7 million) for the entire commercial seafood industry in Florida.

Economic Activities and Impact

The trawling industry is conducted throughout Florida's coastal waters, but is concentrated in certain areas. For example, the calico scallop fishery exists primarily in the Cape Canaveral region of the Florida east coast. The pink shrimp fishery occurs primarily off the southwest Florida coast and the Dry Tortugas region. White shrimp are harvested in a somewhat ubiquitous manner. Brown shrimp are harvested primarily from the Florida west coast. Rock shrimp occur primarily along the middle-east coast of Florida, though some production occurs in the Gulf of Mexico. The somewhat localized landings results in localized economic activity with respect to offloading and other fleet-related activities. For example, Adams, et al. (2001) found that the shrimp harvesting and processing industry on San Carlos Island contributes up to \$55 million to the Lee County economy. Similar locally focused impacts likely occur in other communities where fleet activities are concentrated. However, the processing and wholesale distribution of trawl-caught seafood generates economic activity throughout the state.

A preliminary study of the economic activities and impacts associated with the harvest and processing of shrimp and calico scallops landed in Florida was performed during May 2002 for presentation at the Fiftieth Annual Southeastern Fisheries Association Convention in Jacksonville, Florida. A series of brief, informal interviews with the leading processors and wholesale distributors of shrimp and calico scallops was conducted. Information regarding the vessel-to-plant margin, plant-to-wholesale buyer markup, percent of total statewide harvest of each species eventually exported out of Florida, and other information was solicited. The resulting information yielded an interesting picture of the economic path that

trawl-caught seafood takes as it moves from the deck to the out-of-state wholesale buyer. Recall that the dockside value of trawl-caught species exhibited an average annual value of \$58.7 million. After reaching Florida processing and wholesale facilities, an additional \$28 million of value-added processing, packaging, etc. occurs. Of this total, 70 percent is exported to out-of-state buyers. For example, approximately two-thirds of shrimp (other than rock shrimp) is exported each year. If production is relatively high (so that the Florida-buyer demand is met), approximately 90 percent of the rock shrimp harvest is eventually sold to out-of-state buyers. Similarly, approximately 90 percent of the annual calico scallop harvest is eventually sold to out-of-state wholesale buyers. As a result, the total wholesale value of shrimp and calico scallops sold to out-of-state buyers is approximately \$61 million annually.

The economic contribution associated with the trawling industry in Florida was measured using the IMPLAN model. This model provides a tool by which the economic impact of an industry within an overall economy can be measured. True economic impact occurs when an industry brings in new dollars either through product export or non-resident expenditures. This analysis only examines the new dollars that were generated when out-of-state wholesale buyers exported products out of Florida. For example, if 90 percent of the rock shrimp are sold to buyers not located in the state of Florida, those sales represent new dollars flowing into the economy. Of course, the cost of inputs required to harvest and process rock shrimp, and whether or not those inputs originated in Florida or elsewhere, needs to be reconciled. That is what IMPLAN provides. IMPLAN also provides an approximation of the linkages between the various business sectors that are involved in harvesting and processing rock shrimp. That would include fuel and supplies for vessels, utilities, packaging materials, labor for processing plants, and other costs. IMPLAN also accounts for how incomes are derived by these expenditures, and how these incomes are spent and re-spent within the local economy. This is often referred to as the "multiplier" effect. Thus, as rock shrimp, for example, are sold outside the state of Florida, the economic activity that occurs is more than just the wholesale value of the shrimp. The Florida economy is impacted in a much more extensive manner.

The economic impact to the Florida economy resulting from the out-of-state sale of shrimp and calico scallops is provided in [Table 1](#). The total economic activity, or output, associated with all shrimp, excluding rock shrimp, is \$73.8 million, while the multiplier (re-sponding) effect is \$39.6 million. The total economic impact associated with shrimp other than rock shrimp is \$113.3 million. The economic impact associated with rock shrimp is \$15.4 million. The economic impact associated with calico scallops is \$7.4 million. Thus, the annual wholesale-level economic impact associated with all trawl-caught seafood is approximately \$136 million. This value excludes any consideration of retail sales and expenditures in Florida by non-resident tourists, such as expenditures in restaurants and seafood stores. Thus, the total value most likely represents a lower-bound estimate of the economic impact associated with this sector of the Florida commercial fishing industry.

Summary

It must be remembered that the economic impact estimates presented in this paper are only preliminary estimates. A more detailed study will be needed to provide a more representative measure of the economic activities associated with commercial trawling in Florida. However, the estimate does provide some insight into the relative importance of this sector of the industry. Restrictions in the industry's ability to utilize trawl gear, though

not currently looming on the legislative horizon in Florida, would have a detrimental impact on the industry. Not only would sales and associated expenditures be reduced, but also incomes and jobs. Constraints on the trawling industry would likely have a ripple effect within the communities in which the industry (harvesting and processing) is located. These direct effects would likely be realized in the short term, but carry long-term implications. Whether indirect long-term benefits associated with reductions in bottom trawling would occur, and whether such benefits would offset any resulting costs, is yet to be determined.

References

Adams, C.M., W.D. Mulkey, and A. Hodges. 2001. Economic importance of the San Carlos Island shrimp processing industry to the Lee County economy. Chapter 12 in *Florida's coastal environmental resources: A guide to economic valuation and impact analysis*. Gainesville, FL: University of Florida [Florida Sea Grant Report 124].

National Research Council. 200. *Effects of trawling and dredging on seafloor habitat*. Washington, D.C.: National Academy Press.

Cahoon, L., M. Posey, and T. Alphin. 2002. Shrimp and crab trawling impacts on estuarine soft bottom organisms. Final Report to North Carolina Sea Grant Program. Department of Biological Sciences and Center for Marine Science, University of North Carolina, Wilmington, NC.

Tables

Table 1. Economic Impact of Commercial Bottom Trawling Activities at the Wholesale Level.

Industry Sector	Economic Output	Multiplier Effects	Total Economic Impacts
	<i>(million dollars)</i>		
Rock Shrimp	8.8	6.5	15.4
Calico Scallops	4.1	3.0	7.4
Other Shrimp	73.8	39.6	113.3
Total			136.1

Footnotes

1. This is EDIS document FE345, a publication of the Department of Food and Resource Economics, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL. Published August

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The Southeast Regional Report

THE COMMERCIAL HARVESTING SECTOR

Basic Economic Issues

The Southeast Region of the United States supports a large and diverse harvesting and processing industry for marine fisheries. Fleets in eight states from Texas to North Carolina, Puerto Rico, and the U.S. Virgin Islands land hundreds of species of finfish and shellfish, with the shrimp fisheries by far the most important in terms of total revenues. In 1994, there were about 2.44 billion pounds of landings valued at about \$1.03 billion and shrimp accounted for 235 million pounds of the landings valued at \$531 million. Other important commercial fisheries include menhaden, blue crab, reef fish, oysters, spiny lobster, mullet, highly migratory species, and coastal pelagics.

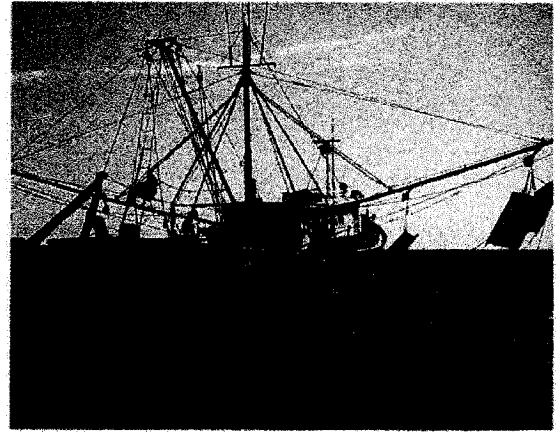
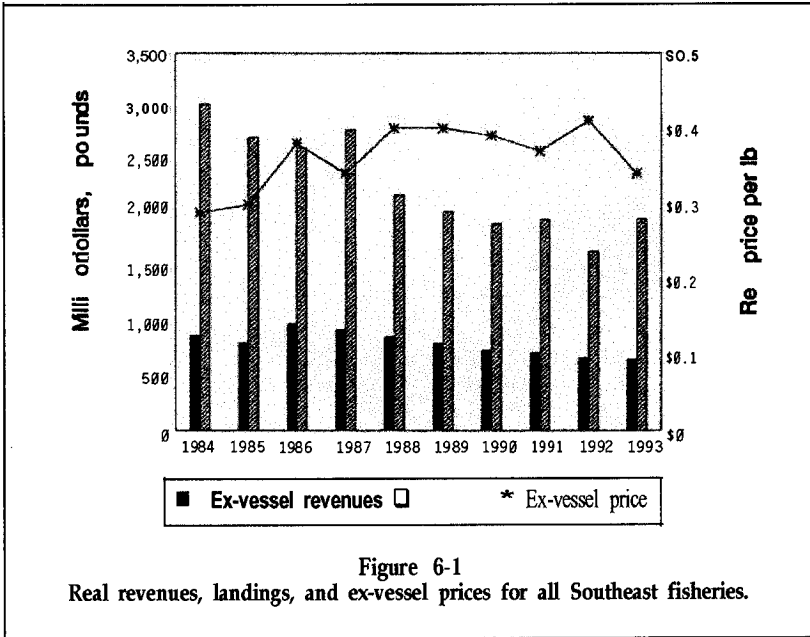
The most important factors influencing the economic performance of the commercial fishing industry in the Southeast Region can be categorized as follows:

- 1) A major portion of the stocks are being harvested at less than their long term potential yield (LTPY) (USDOC, 1993, provides a full definition).
- 2) Most of the fisheries are overcapitalized in the sense that more harvesting effort than is necessary is employed to catch a given amount of the stock.
- 3) There are multiple, competing uses of the stocks, and these competing uses complicate management and raise the cost of management.
- 4) Most of the management regimes for the stocks feature controls, usually overall quotas, that have been largely successful in beginning to halt or reverse stock declines.
- 5) However, in most cases there are no overall controls on effort and a number of gear, trip limit, size, and other regulations tend to reduce harvesting efficiency and redistribute existing fish stocks with the result of increasing the costs of harvesting, management, enforcement, and monitoring.
- 6) From a marketing viewpoint, a number of the stocks face market competition from imports

of identical or similar species, and prices are often dictated not only by the supply of imported products but by the state of the world economy as well.

7) Probably because the world supply of fishery products cannot be easily increased in response to favorable market signals and because the U.S. demand for seafood products has shifted upwards based on perceived nutritional benefits of seafood consumption, there has been a general tendency for southeastern U.S. seafood prices to increase faster than the rate of inflation. However, a notable exception is that the real price of shrimp has tended to decline in recent years, largely because world shrimp supplies have grown via mariculture.

While some commercial fisheries in the Southeast Region are exclusively or largely the domain of one user group, most fishery resources are exploited by a number of competing commercial and recreational user groups. In heavily utilized open-access fisheries, this leads to allocation problems and a variety of user conflicts that have economic consequences. These issues are difficult to quantify, and as a result it is difficult to address the complex management problems which arise when a diverse group of users with different objectives and harvesting methods are participating in the catch. While most observers tend to think of the competition in terms of the number of harvesters competing directly for the use value of the resources, the finfish bycatch in the Gulf of Mexico shrimp fishery provides a case where the use by one sector, shrimp harvesters, is not intentional. In this particular case, the bycatch is of such magnitude that the stock effects on the finfish resources have profound biological and economic implications for those recreational and commercial fishermen who directly target the bycatch species. For one fishery, red snapper, it has been determined that unless the mortality that results from shrimp harvesting can be decreased by 50%, then the resource cannot recover in any reasonable period of time even if all directed recreational and commercial harvest ceased. (This region's spotlight article provides for a more thorough discussion of



A Florida shrimp boat (NMFS photo by William Antozzi).

fisherman's decision to enter the fishery, further indirect evidence supporting the extent of overcapitalization in this fishery.

the management regime for red snapper and how it is impacted by the shrimp bycatch situation.)

As is relatively common in fisheries throughout the United States and the world, the exploitation of open-access marine fishery resources in the Southeast Region has resulted in overcapitalization in the harvesting sector for a number of species. As the term is used here, overcapitalization does not necessarily imply a level of fishing effort that creates a biological overfishing scenario, but instead is meant to imply that effort levels have expanded to the point where a given level of harvest could be produced at a lower cost. The region's shrimp fisheries are prime examples wherein the stocks are not biologically threatened, but where shrimp harvesting effort, by almost any accounting, is far in excess of that needed to harvest the annual shrimp crop. When Ward (1989) compared the optimal fleet size to the actual fleet size in the Gulf of Mexico shrimp fishery, his results indicated that fleet size in the open-access shrimp fishery at that time was more than three times as large as it would be in a controlled-access fishery generating the maximum level of profits. Vessel crowding, often cited as a symptom of overcapitalization, was investigated by Ward and Sutinen (1994) by using fleet size as a measure of the crowding externality (Chapter 1 provides a definition) for the Gulf of Mexico shrimp fishery. One of their main results was that crowding had a highly significant, negative impact on a