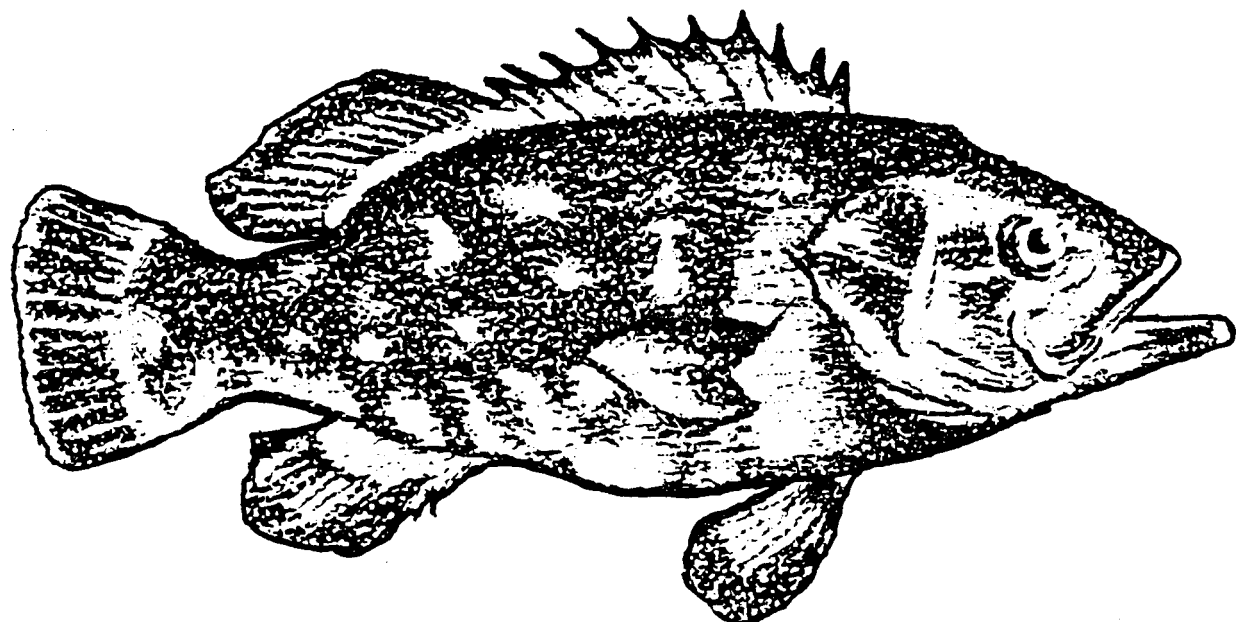


# WRECKFISH

AMENDMENT NUMBER 3,  
REGULATORY IMPACT REVIEW,  
INITIAL REGULATORY FLEXIBILITY ANALYSIS AND  
ENVIRONMENTAL ASSESSMENT

FOR THE

FISHERY MANAGEMENT PLAN FOR THE  
SNAPPER GROUPER FISHERY OF THE SOUTH ATLANTIC REGION



AUGUST 1990

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Prepared By The

South Atlantic Fishery Management Council

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## I. INTRODUCTION

### A. Background

The Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region was prepared by the South Atlantic Fishery Management Council and implemented by the Secretary of Commerce on August 31, 1983 [48 Federal Register 39463]. The Fishery Management Plan was prepared to prevent growth overfishing in thirteen species in the snapper grouper complex and to establish a procedure for preventing overfishing in other species. The Fishery Management Plan established a four inch trawl mesh size to achieve a twelve inch minimum size for vermilion snapper. Yield per recruit analyses indicated that a 12 inch minimum size would increase yield by 34% and maximize yield per recruit, thereby minimizing growth overfishing.

Amendment 1 was implemented by the Secretary effective January 12, 1989 [54 Federal Register 1720] and prohibits use of trawl gear to harvest fish in the directed snapper grouper fishery south of Cape Hatteras, North Carolina (35°15' N. Latitude) and north of Cape Canaveral, Florida (Vehicle Assembly Building, 28°35.1' N. Latitude). A vessel with trawl gear and more than 200 pounds of fish in the snapper grouper fishery (as listed in Section 646.2 of the regulations) on board was defined as a directed fishery. The amendment also established a rebuttable presumption that a vessel with fish in the snapper grouper fishery (as listed in Section 646.2 of the regulations) on board harvested its catch of such fish in the Exclusive Economic Zone.

The South Atlantic Council, at its February/March 1990 meeting, voted to develop Amendment 3 to the Snapper Grouper Fishery Management Plan to:

1. Add wreckfish to the management unit.
2. Define optimum yield.
3. Define overfishing.
4. Require an annual permit to fish for, land or sell wreckfish.
5. Collect data necessary for effective management.
6. Establish a control date of March 28, 1990 after which there would be no guarantee of inclusion in a limited entry program should one be developed. This was later limited to the area bounded by 33° and 30° N. latitude based on input from public hearings.
7. Establish a fishing year beginning April 1. This was later modified, based on input from fishermen during the public hearing process, to April 16.
8. Establish a process whereby annual total allowable catch (annual quotas) would be specified with the initial quota being 2, 8 or between 2 and 8 million pounds.

Additional actions proposed based on input from public hearings include a 10,000 pound trip limit and a spawning season closure from January 15 through April 15.

Some of the information presented in this document is taken from a report entitled "The Fishery for Wreckfish (*Polyprion americanus*) in the Southeastern United States prepared by

Glenn F. Ulrich and George R. Sedberry of the South Carolina Wildlife and Marine Resources Department (Ulrich and Sedberry, 1990).

**B. FMP Objectives**

The management objectives of the Snapper Grouper Fishery Management Plan are:

1. Prevent recruitment overfishing in all species and prevent growth overfishing of each species, except where growth overfishing is justified by social and economic considerations. Method of achieving objective: Minimum sizes will control growth overfishing and prevent recruitment overfishing. The Secretary is authorized to take whatever emergency action is necessary in the unlikely event of recruitment overfishing.
2. Collect the necessary data to monitor the fisheries. Method of achieving objective: Authorize data collection and analysis to monitor the status of the fishery.
3. Promote orderly utilization of the resource. Method of achieving objective: Restrictions on fish traps and prohibitions on poisons, explosives and spearing jewfish.

**C. Problems Requiring Amendment 3**

The original Snapper Grouper fishery management plan (SAFMC, 1983) did not include wreckfish in the management unit because it was not exploited and was relatively unknown at that time. Catches have increased dramatically since 1987. Catches for the first three months of 1990 are estimated (NMFS Wreckfish Review Group; Merriner 1990) to range from 891,000 to 3 million pounds depending upon the source. Data from the NMFS statistical files 1990 data for the first 3 months indicate a catch of 1.2 million pounds. This catch rate will exceed the 2 million pounds caught during 1989 (Data for 1987-89 from Ulrich and Sedberry, 1990):

**WRECKFISH CATCH & EFFORT OVER TIME**

Year	Number Vessels	Landings (pounds)
1987	2	28,849
1988	6	307,607
1989	25	2,017,000
1990 (Jan-Mar)	40	3,000,000

The number of vessels in this fishery also has increased dramatically over the past two years and the potential exists for large numbers of additional vessels to enter the fishery. Vessels from the swordfish, shark, shrimp, mackerel and snapper grouper fisheries are potential candidates for entering the wreckfish fishery in view of the recent and anticipated cutbacks in allowable catches or shortened seasons in these fisheries.

The Council is concerned not only that the rapid increase in effort and catch threatens the wreckfish resource with overfishing, but that the concentration of additional vessels in the relatively small area where the resource seems to be located also could create problems with vessel safety because of overcrowding.

D. Optimum Yield

Optimum yield is any harvest level for wreckfish which maintains, or is expected to maintain, over time, a survival rate of biomass into the stock of spawning age fish to achieve at least a 30% spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing.

Alternatives Considered But Rejected:

**Rejected Alternative 1.** Optimum yield is any harvest level for wreckfish which maintains, or is expected to maintain, over time, a survival rate of biomass into the stock of spawning age to achieve at least a 20% spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing.

This alternative tracks the Gulf Reef Fish Amendment 1. The 20% SSBR level was discussed at the recent NMFS overfishing workshop. The workshop preferred a SSBR of 30% for groupers as this roughly corresponds to  $F_{0.1}$ . This alternative was rejected as not being sufficiently conservative.

**Rejected Alternative 2.** Optimum yield is any harvest level for wreckfish which maintains, or is expected to maintain, over time, a survival rate of biomass into the stock of spawning age to achieve at least a 40% spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing. The threshold level is 30%.

This alternative is based on the Gulf Reef Fish Amendment 1 but specifies a 40% SSBR level as a goal. In addition, a threshold level is specified at 30% which means that there would be no retention of wreckfish if the SSBR was below this level. This alternative was rejected by the Council as being too conservative given the lack of information on wreckfish.

**Rejected Alternative 3.** Optimum yield is any harvest level for wreckfish which maintains, or is expected to maintain, over time, a survival rate of biomass into the stock of spawning age to achieve at least a 50% spawning stock biomass per recruit (SSBR) population level, relative to the SSBR that would occur with no fishing. The threshold level is 40%.

This alternative represents the most conservative alternative. The Council considered this alternative but concluded that this would manage too conservatively.

## E. Overfishing

Overfishing for wreckfish is defined as follows:

1. Wreckfish are overfished when the stock is below the level of 30% of the spawning stock biomass per recruit which would occur in the absence of fishing.
2. When wreckfish are overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 30% spawning stock biomass per recruit level.
3. When wreckfish are not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of OY on a continuing basis.

### Alternatives Considered But Rejected:

**Rejected Alternative 1.** Status quo (Snapper Grouper Plan, SAFMC 1983). Growth overfishing: The harvesting of a fish stock to the point where the harvest is less than the maximum possible (by weight). Growth overfishing can be controlled by limiting fishing mortality on all size fish (e.g. time/area closures or quotas) and/or by reducing the range of sizes that are liable to capture (impose minimum sizes). Growth overfishing is defined in the Snapper Grouper Fishery Management Plan as an existing combination of fishing pressure (F) and age liable to capture, such that an increase in age liable to capture (minimum sizes) or a decrease in fishing pressure will significantly increase yield per recruit (YPR). Growth overfishing is an established scientific definition measured by yield per recruit analyses but is not considered to be "overfishing" in the context of National Standard One of the Magnuson Act. Recruitment overfishing: The harvesting of a stock to the point that reproduction by the remaining brood stock is inadequate to produce as many fish as the habitat can support. Recruitment overfishing is an established scientific definition that is not measured by yield per recruit analyses. Recruitment overfishing is considered to be overfishing in the context of National Standard One of the Magnuson Act.

This alternative was rejected for wreckfish because the NMFS Southeast Fisheries Center advised that these levels of overfishing could not be measured and therefore the definition would not meet the criteria mandated in the regulations.

### **Rejected Alternative 2.** Gulf Reef Fish Amendment 1.

1. A reef fish stock or stock complex is overfished when it is below the level of 20% of the spawning stock biomass per recruit that would occur in the absence of fishing.
2. When a reef fish stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 20% spawning stock biomass per recruit level.
3. When a reef fish stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that

would not at least allow a harvest of OY on a continuing basis.

This alternative was rejected for wreckfish because the Council concurred with the Overfishing Workshop preference to use at least a SSBR of 30% for groupers as this roughly corresponds to F0.1.

### **Rejected Alternative 3.**

1. A reef fish stock or stock complex is overfished when it is below the level of 40% of the spawning stock biomass per recruit which would occur in the absence of fishing.
2. When a reef fish stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 40% spawning stock biomass per recruit level.
3. When a reef fish stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of OY on a continuing basis.
4. The threshold level is 30% SSBR.

This alternative was rejected as being too conservative in a newly developing fishery.

### **Rejected Alternative 4.**

1. A reef fish stock or stock complex is overfished when it is below the level of 50% of the spawning stock biomass per recruit which would occur in the absence of fishing.
2. When a reef fish stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 50% spawning stock biomass per recruit level.
3. When a reef fish stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of OY on a continuing basis.
4. The threshold level is 40% SSBR.

This alternative was rejected as being too conservative in a newly developing fishery.

## **II. DESCRIPTION OF FISHERY AND UTILIZATION PATTERNS**

### **A. Commercial Fishery (majority directly from Ulrich and Sedberry, 1990)**

The southeastern fishery began in 1987 with two vessels landing wreckfish in South Carolina. These vessels fished two heavy duty, hydraulic reels spooled with 1/8 inch cable and a terminal rig consisting of 50 pounds of weight and 8-12 large circle hooks baited with squid. Fishing occurred on an area of the Blake Plateau characterized by an extensive ridge having approximately 100 m of relief, in depths ranging from 450-600 m. Initial catch rates were impressive, ranging between 10-12 thousand pounds per 7-8 day trip. The fishery has expanded

rapidly since 1987. In 1988 six vessels participated in the fishery and by 1989 twenty-five vessels were fishing for wreckfish. In early 1990 a commercial fisherman estimated that there were at least 40 boats participating in this fishery (P. Reese, F/V Bold Venture). (NOTE: The wreckfish review group report estimated 37 vessels in the fishery during January through March 1990; Merriner, 1990.)

During the first two years of the fishery, fishing was done from anchored vessels. Vessels were anchored over suitable habitat by deploying an anchor and approximately 1 mile of cable from a bow-mounted, longline spool. Recently, vessels have been fishing up to 4 reels using a technique known as motor-fishing. In motor fishing, the vessel makes enough headway to counteract the velocity of the surface current and maintains a relatively stable position while lowering and retrieving the fishing gear.

Vessels known to be participating in this fishery range from 44-76 feet in length. These vessels are converted snapper-grouper vessels ("bandit" and longline boats), shrimp trawlers and swordfish vessels. Shrimp trawlers are expected to participate part-time (during closed seasons for shrimp). Swordfish vessels may also fall into the part-time category, alternating between the swordfish and wreckfish fisheries. Conversion costs to enter the wreckfish fishery are relatively low, at approximately \$3,000 - 5,000, for a vessel with an existing hydraulic system. (NOTE: Cost and returns data indicate \$12,000 to rig an average vessel that has an existing hydraulic system and \$12,000 is the reported median cost to rig for wreckfish; see Appendix 1.)

Vessel catch rates now range between 10 and 30 thousand pounds for a 7-8 day trip. (NOTE: Survey results indicate catch rates between 5 and 30 thousand pounds; see Appendix 1.) The present number of direct participants in this fishery is estimated to range between 125 and 175.

The fishing grounds comprise an area of the Blake Plateau of approximately 50-75 square nm, characterized by a rocky ridge system having a vertical relief of > 50 m and a slope of > 15 degrees (Figure 1). The depth range in this area is 450-600 m. The substrates in areas of the Blake Plateau exhibiting significant relief are generally characterized as composed of manganese-phosphate pavements, phosphorite slabs and coral banks (Pratt and McFarlin, 1966; Stetson et al, 1969). Bottom samples obtained from commercial fishermen indicate that wreckfish concentrations occur primarily on the manganese-phosphate bottoms. Prior observations from the research submersible, Johnson Sea-Link I, showed low densities of wreckfish associated with coral mounds or banks [C. A. Wenner (SCWMRD), personal communication]. There has been some exploratory efforts by commercial vessels but most of the fishing effort occurs on the initially discovered grounds of the Hoyt Hill area (Figure 1). The limited exploratory work is understandable, as catch rates in the original area remain high. There is presently little incentive for fishermen to utilize potential fishing time for possibly unproductive searching.



## B. Recreational Fishery

The recreational fishery for wreckfish is relatively unknown and expected to be very small. Thus far the only reference to recreational fishing was a letter published in Sport Fishing discussing deep dropping for wreckfish in 700 feet of water off Norfolk, Virginia.

## C. Status of the Stock (directly from Ulrich and Sedberry, 1990)

### Background

The wreckfish (Polyprion americanus), has a wide geographic distribution but little is known of its biology and fisheries potential. Hardy (1978) reported the distribution of Polyprion americanus in the western Atlantic as extending from Grand Banks, Newfoundland to La Plata River, Argentina. The available literature consists primarily of occurrence records or behavioral observations (Roberts, 1977; Ryall and Hargrave, 1984; Schroeder, 1930), with limited life history data (Roberts, 1989). Wreckfish are pelagic for the first several years of their life (up to 30 cm length), often associated with floating debris (Roberts, 1989), the habit responsible for their common name. They grow to large size (100 kg weight, 2 m length), and are commercially fished in portions of their range (Roberts, 1989). The shallowest reported demersal populations of Polyprion in the western Atlantic were reported off Argentina in depths of 66-84 m (Menni and Lopez, 1979). The maximum reported depth for wreckfish is 1000 m (Lythgoe and Lythgoe, 1971). The presence of fishable concentrations of wreckfish in the northwestern Atlantic was unknown until 1987, when a fishery began to develop on the Blake Plateau, adjacent to South Carolina and Georgia.

### Present Research Activities

Our present knowledge of wreckfish distribution and abundance in the southeast is based on information collected by South Carolina Wildlife and Marine Resources Department scientists from the commercial fishermen and from two brief exploratory cruises on the R/V Palmetto. The S.C. Wildlife and Marine Resources Department is conducting fishery-dependent monitoring on the wreckfish fishery. Data collection elements from fishery-dependent and -independent efforts include: catch per effort statistics, size composition, scales and otoliths for aging, stomachs for food habit analysis and gonads for reproductive studies. Cooperating fishermen are landing small samples of ungutted fish to enable determination of sex ratios, reproductive stage and food habits. Samples collected by SCWMRD have allowed us to monitor length and weight frequency (Figures 2-4) of wreckfish landed in Charleston, SC. Mean lengths have not declined during this monitoring effort (Figure 3) and length frequency (Figure 2) is similar to that reported by Roberts (1989) for wreckfish from New Zealand, although females from South Carolina are more frequently represented by larger size classes (greater than 89 cm FL).

Research cruises on the R/V Palmetto were conducted to confirm locations of commercial fishing effort and develop techniques for conducting fishery independent populations assessments. During the second cruise it was determined that concentrations of wreckfish are not limited to the steep slope (<15 degrees) habitats presently utilized by the commercial fishery but also occur on rocky slopes of <3 degrees of rise. Examination of NOS bathymetric charts NI-18-10, NH 17-3 and NH 18-1 (Figure 1) indicates that substantial areas of potential habitat exist outside of the presently utilized areas.

Catch rates in 1989 have increased and the landings continue to climb (Table 1; Figure 5 and 6). Price per pound has decreased with time and increased landings (Figure 7 and 8). Regional landings of Polyprion reached 2,017,000 in 1989 (A. Applegate (SCWMRD), personal communication).

### Probable Future Conditions in the Fishery

The rapid development already exhibited by this fishery is expected to accelerate in the immediate future. Southeastern fishermen continue to seek diversification opportunities to alleviate problems experienced in fisheries for traditional species, such as user group conflicts, declining resources and over-capitalization. Tilefish and sharks were viewed as possible alternative fisheries during the 1980's but their potential for filling this role is limited. The tilefish fishery underwent rapid development but the limited habitat area was unable to withstand the heavy fishing pressure. Within three years average size of fish, landings and CPUE had dropped drastically. Increased markets and prices also attracted fishermen to shark fishing and landings increased substantially throughout the 1980's.

A draft federal shark management plan seeks to cap regional commercial landings at 5800 mt. If the plan is implemented in its present form, shark fishery expansion will be eliminated for the immediate future. The stocks of wreckfish on the Blake Plateau currently appear to represent the most viable alternative fishery for demersal and pelagic longline vessels. A major increase in entrants to the wreckfish fishery has occurred in 1990. If proposed quota limitations on the domestic swordfish fishery are implemented by the Fishery Management Councils, this rapid escalation is expected to continue. There are presently 244 vessels in the southeast region licensed to fish for swordfish. Swordfish vessels displaced from that fishery by low quotas could readily enter the wreckfish fishery.

### Research and Management Needs

Given the rapid development of this fishery, management agencies have little data on the available habitat, resource magnitude or biological parameters of the species on which to base management activities. The minimal support of management research to date appears to be related to the perception that the resource was very limited and the fishery would be short-lived. Sustained or increased CPUE, major increases in landings and size stability of landed fish indicates that the resource is larger than originally thought. There is, however, significant cause for concern

about potential over-exploitation. Research to support management actions is needed to avoid a "boom and bust" scenario and realize the sustained fisheries potential of this resource. A primary need is to determine the magnitude of the resource, by conducting a systematic survey of potential habitat areas identified from bathymetric data.

The effects of prior catches on local densities of wreckfish is unknown. Commercial fishermen have reported returning to a small area that they believed to be "fished out" (removals of 10,000 pounds in a 24 hour period) after two months and experience catch rates equal to previous rates (Captain P. Reese (F/V Bold Venture), personal communication). On areas of optimum habitat, fish may be recruited from marginal adjacent or distant habitats to "replace" those that were removed. An interesting observation lending support to this hypothesis is the capture of wreckfish with unusual hooks in their mouths or guts. The hooks have a flattened area on the shank that is used to secure the snelled monofilament gangion. Hooks of this type have not been used in the area where wreckfish were captured. These hooks are also smaller than would be used to capture fish as large as the average wreckfish. The origin of these hooks is unknown at this time, but their presence indicates substantial migratory behavior by at least some portions of the local stocks.

Biological data for western Atlantic stocks of wreckfish is non-existent. Information is needed on age and growth and reproductive biology. Required fisheries data includes; CPUE, landings and participation levels. Given the apparent regional potential of this resource it would seem appropriate to utilize public funding to develop the data necessary to promote full and sustainable development of this new fishery.

### III. ALTERNATIVE MANAGEMENT OPTIONS

The following alternatives were considered by the Council. A discussion of these alternatives is included in Section IV.

1. No action.
2. Add wreckfish (*Polyprion americanus*) to the management unit.
3. Require an annual permit to fish for/land/sell wreckfish and collect the necessary data (catch, effort, size, sex, hard parts, reproductive biology, etc.).
4. Establish a control date after which there would be no guarantee of inclusion in a limited entry program should one be developed:
  - A. Documented landings as of December 31, 1989.
  - B. Documented landings as of March 22, 1990 (PDT meeting).

- C. Documented landings as of March 27, 1990 (Committee meeting).
  - D. Documented landings as of March 28, 1990 (Council meeting).
  - E. One of the above and grant exception for anyone having documentation of gear on order as of \_\_\_\_\_.
5. Establish a control date (see 4 above) and cap the number of permits at:
- A. The estimated number of participating vessels at the end of 1989 — 25 permits.
  - B. The estimated number of participating vessels in early 1989 — 40 permits.
  - C. The estimated number of participating vessels in early 1989 (40) plus those vessels whose owner/captain can document that gear was on order as of \_\_\_\_\_.
6. Set a Total Allowable Catch that would be adjusted annually by modified notice actions similar to mackerel:
- A. Total allowable catch = 1,000,000 pounds.
  - B. Total allowable catch = 2,000,000 pounds.
  - C. Total allowable catch = 3,000,000 pounds.
  - D. Total allowable catch = 2,000,000 pounds with an additional 1,000,000 pounds in reserve to be released pending in-season data that indicates no biological problem.
  - E. Total allowable catch = 2, 8 or between 2 and 8 million pounds.
7. Cap permits at some number (see 5 above) and allocate some level of total allowable catch (see 6 above) on a percentage basis among the permit holders:
- A. Have total allowable catch fixed to the permit.
  - B. Allow total allowable catch to be freely marketed (Individual transferable quotas).
8. Additional measures considered included:
- A. Closure during the spawning season.
  - B. Recreational bag limit of \_\_\_\_\_ fish per person per day with a \_\_\_\_\_ day possession limit. Bag limit could be set up to change with total allowable catch through a modified notice action similar to mackerel.

#### IV. REGULATORY IMPACT REVIEW AND INITIAL REGULATORY FLEXIBILITY ANALYSIS

##### A. Introduction

The Regulatory Impact Review (RIR) and Initial Regulatory Flexibility Analysis (IRFA) analyze expected impacts resulting from the proposed measures for wreckfish in the South Atlantic. The RIR describes changes in appropriate consumer and producer welfare of user groups that are expected to result from the proposals. The IRFA serves as a basis for determining whether the proposed regulations would have a significant economic impact on a substantial number of small entities. In accordance with the Regulatory Flexibility Act, the IRFA enables regulators to relieve, to the greatest extent possible, small entities of burdensome regulations and recordkeeping requirements. The RIR and IRFA have been revised according to recommendations from informal review by the National Marine Fisheries Service and comments from the public after completion of the public hearing process.

##### B. Problems, Objectives and Management Measures

Problems in the fishery, as well as the objectives and measures considered in this Amendment, have been outlined in previous sections.

##### C. Impacts of Management Measures

**Management Measure One:** ADD WRECKFISH TO THE SNAPPER GROUPER MANAGEMENT UNIT AND REQUIRE AN ANNUAL PERMIT TO FISH FOR, LAND OR SELL WRECKFISH IN ORDER TO COLLECT MANAGEMENT DATA.

To be eligible for a wreckfish permit, applicants must prove they are actively fishing or provide evidence that they have gear on order. Management data includes but are not limited to information on catch, effort, size, sex, hard parts for ageing, body parts for reproductive and feeding studies, etc. The owner or operator of a vessel that is permitted to fish for, land or sell wreckfish, and who is selected by the Science and Research Director, must maintain a fishing record for each fishing trip on a form available from the Science and Research Director. These forms must be submitted to the Science and Research Director on a monthly basis (or more frequently, if requested by the Science and Research Director).

##### Potential Costs To Fishermen

At present, the permit requirement imposes virtually no costs on individuals presently fishing for wreckfish. To obtain permits, fishermen who are fishing for wreckfish would need only provide weigh-out sheets or other valid receipts from a fishhouse where wreckfish were sold. The measure as stated does not set a minimum quantity of wreckfish harvested or percentage income

requirement as a prerequisite for obtaining a permit.

For fishermen who are planning to enter the wreckfish fishery in the future, the measure to require permits as presently worded does not necessarily impose any costs. To acquire a permit, a fisherman who is not presently fishing for wreckfish has to establish that he has already purchased some wreckfish gear or has wreckfish gear on order. Under most circumstances, cash outlays are not required to order gear throughout the Southeast, at least for fishermen who are somewhat established in the fishing industry (Miles Mackaness, SAFMC Snapper Grouper Advisory Panel; personal communication). So most fisherman could order gear thus qualifying for a permit without tying up any working capital. Had the measure to require permits stipulated that gear had to be purchased before a permit could be obtained, then some costs to fishermen might have occurred because purchased gear might have remained idle while the permit request was being processed.

Requiring permits involves some administrative costs for the National Marine Fisheries Service. The Magnuson Fishery Management and Conservation Act allows for the recovery of administrative costs such as those related to the issuance of permits. At this time, it is not known whether a permit fee will be charged in order to cover those costs. Other costs are the portion of the operating costs of the South Atlantic Fishery Management Council and its staff attributable to wreckfish management and future costs for enforcement of the permit requirement by the Coast Guard and other applicable enforcement agencies. Estimates of those costs are not available at this time.

#### Potential Benefits To Fishermen

The potential benefits from a permit requirement in terms of helping to provide critical data are large because the longterm viability of the wreckfish fishery may be linked to adequate management. The potential benefit is that with permits, data collection can be improved and hence more representative landings data can be collected. Accurate and verifiable landings data are a key element in managing the wreckfish fishery for sustainable yields. At an average exvessel price of approximately \$1.25 per pound, the fishery had an exvessel value of over two million dollars in 1989, making it an important fishery in the South Atlantic, particularly if these yields from the fishery can be sustained.

Having a permit system also affords an opportunity to collect better information on catch per unit effort, size composition, reproduction and feeding habits, which is an important first step in monitoring the biological status of the fishery and its level of exploitation. Although these indices can be evaluated in the absence of a permit system, accuracy and completeness will be improved with a permit system.

### Analysis of Alternatives Considered But Rejected

#### **Rejected Alternative 1. No action.**

A decision to take no action regarding requiring permits for wreckfish fishing avoids incurring the administrative and management costs described earlier. Participants in the fishery are not spared any costs because the steps to acquire a permit that the Council has set forth do not appear to impose any costs on present or future participants in the fishery.

Not imposing a permit requirement involves potentially large forfeitures of longterm benefit. A permit requirement is critical to obtaining sound biological and economic data for the wreckfish fishery. Without these data, management of the fishery may not be possible and without management this fishery may not be able to provide longterm sustainable yields.

**Management Measure Two: ESTABLISH MARCH 28, 1990 AS A CONTROL DATE AFTER WHICH THERE WOULD BE NO GUARANTEE OF INCLUSION IN A LIMITED ENTRY PROGRAM SHOULD ONE BE DEVELOPED.**

This control date applies to fishing within the South Atlantic EEZ bounded by 33° and 30° N. latitude. Fishermen are advised to keep documentation (weigh-out sheets, receipts, etc.) which verify they landed wreckfish as of March 28, 1990.

#### Potential Costs To Fishermen

A control date for limited entry establishes a point in time to gauge participation in the fishery. The control date is a method of informing those that enter the fishery after the specified control date that their participation in the fishery may not be guaranteed should a limited entry system be implemented.

A control date can be used as a mechanism to decide who initially will be given available quota if a limited entry program is established. As such, it serves to reduce the number of participants in a fishery to a past level if that is deemed necessary. A control date can thus function as a way to decide who will bear the potential hardship of being excluded from the fishery if the number of participants needs to be decreased. Theoretically, anyone entering the fishery after the control date understands that they risk being excluded if a limited entry system is deemed necessary. Mechanisms can, however, be built into limited entry systems to allow those who entered the fishery after the control date or those who wish to enter the fishery in the future to do so. One such mechanism is a limited entry program that establishes individual transferable vessel quotas (ITQs). With a ITQ, individuals or vessels not initially allocated quota might have the opportunity to purchase it and individuals or vessels wishing to obtain more than their initial allocation might be able to purchase more quota.

In the event that a limited entry system is implemented and the control date is adhered to, the date that is selected as a control can impose costs on individuals to varying degrees. The impacts vary by degrees because individuals who entered the fishery after the control date probably have different levels of investment in the fishery. For instance, a fisherman who entered the fishery just

past the control date could fish for several years and then be subject to exclusion when a limited entry system was later implemented. Fisherman could have substantial investment in the fishery in terms of gear (and loans for that gear), experience and knowledge of the fishery, and possibly even supply contracts or other supply arrangements that obligate him. The other extreme would be the case of a fisherman who was just beginning to gear up to fish when a limited entry system was implemented. The impacts on most individuals entering after the control date will likely fall somewhere between these hypothetical cases.

The cost of wreckfish gear is approximately \$1,500-\$2,000 per reel for the original "bandit" type reels. Adapted longline reels, now frequently being substituted for the original style "bandit" gear, lists for around \$1,900 per reel. A cost and returns study (Appendix 1) indicates that the reported median total cost to rig a vessel already possessing a hydraulic system for wreckfish fishing was \$12,000. Regardless of which gear is used, most vessels fish between two and six reels. Both types of gear are thought to have a usable life of approximately five years (Miles Mackaness, SAFMC Snapper Grouper Advisory Panel; personal communication). If a vessel was excluded from the fishery, it would face the loss of the value (depreciated value) of the bandit gear (or longline reel gear) plus any other gear that is specific to wreckfish fishing if it is not transferable to another fishery. Bandit reels are known to be used for snapper grouper fishing but whether wreckfish bandit reels are of an appropriate size for snapper grouper fishing in this area is not known. Longline style reels are potentially usable for setting bottom longline gear for snapper grouper fishing (Miles Mackaness, SAFMC Snapper Grouper Advisory Panel; personal communication).

The knowledge and experience associated with wreckfish fishing is part of the loss to those excluded from the fishery. At present, it has been observed that fishermen have been able to make fairly good trips, in terms of pounds landed, after a relatively short period of time in the fishery. If areas presently known to yield good trips become depleted, however, the learning curve for wreckfish fishing could become steeper.

If supply contracts are used for this fishery, fishermen could face losses as an unfulfilled obligation. In most cases, informal dockage and fuel arrangements are the extent of supply contracts. A fisherman could, nonetheless, face the loss of whatever favorable arrangement that existed before he was excluded from the wreckfish fishery.

The proposed control date applies only to the areas bounded between 30° and 33° N. latitude including the Richardson, Harrington and Hoyt Hills areas along the Blake Plateau. To date, commercially feasible concentrations of wreckfish have not been found outside these areas. In fact, proven fishing grounds are limited to an area of approximately 75 square nautical miles or smaller in the south-central portion of the Hoyt Hills area. Only a limited amount of exploration for wreckfish is known to have been undertaken outside the Richardson, Harrington and Hoyt Hills areas and although this exploration has apparently not located concentrations of wreckfish, it is not known whether areas outside 30°-33° N. latitude have high potential for producing wreckfish.



Applying the proposed control date to the original wreckfish grounds appears to vest the early wreckfish participants without necessarily discouraging later entrants or future new entrants from developing new areas if that in fact turns out to be possible. It is not known whether this approach is perceived to be equitable by the wreckfish industry but limiting the control date to this area was supported during the public hearing process. Limited entry programs could also be developed for newly discovered areas that would favor those who invested in those newly discovered areas from the outset.

#### Potential Benefits To Fishermen

Individuals who were in the fishery before the control date stand to gain from the proposed measure. If the fishery can sustain substantial yields over time, then the reward for being in the fishery before the control date could be a valuable asset. Under certain conditions, the fishery could be managed for a total harvest that is associated with maximum economic yield from the fishery. At that point, the marginal cost of the next dollar spent on fishing for wreckfish would just be equal to the marginal revenue from the fishery. That point would maximize economic rents garnered from the wreckfish resource and could involve profits to fishermen that are larger than normal profits under open access. Profits would be greater than normal profits under open access because a smaller quantity of wreckfish would be supplied in the short run and the cost of catching wreckfish would be less than under open access because the standing wreckfish biomass would, over time, be greater than under open access. In theory, profits beyond normal returns could be put back into the resource by paying for research or management.

Limited entry is often perceived as unfair because it creates a windfall gain to those who meet the criterion for being included in the fishery. In the case of wreckfish, those who will be initially included are the individuals who entered the fishery early, before the control date. In some ways, the fishermen who first entered the fishery developed the technique to catch wreckfish and took the greatest risks in terms of investing in a fishery that was unproven. In that sense, giving a risk premium to fishermen who developed the fishery may be justified.

#### Potential Benefits To The Fishery As A Whole And Society

The control date is an integral part of a limited entry program because it allows managers, to some degree, to return to a former level of participation in a fishery while the limited entry system is being developed. In that sense, it should help avoid a flood of new or perhaps speculative entrants into the fishery. If the control date is effectively implemented and a limited entry system is successfully established, then the amount of fish available on a sustainable harvest basis will be divided up among a reasonable number of participants.

If a control date is set which excludes too many participants, then the total quota to be divided among participants would mean that each participant would be afforded more than he could reasonably be expected to catch on an annual basis. At that point, more entrants could be allowed into the fishery based on some equitable criterion. If the control date were set too late in the

development of a fishery, then the amount available to an individual who is entitled might not be enough to support their fixed costs involved with being in the fishery. At that point, if vessel quotas were not transferable, then management would have to reduce the number of individuals in the fishery and redistribute the quota among other participants or some other arrangement would have to be developed.

A limited entry program provides potential benefits to society by limiting the tendency for effort to outstrip the ability of the resource to renew itself. In that way, limited entry has been recognized as an effective way for society to derive yields from its natural resources at reasonable levels over time. Limited entry is also an effective means of preventing overcapitalization in fisheries. It also can allow for the recovery of economic rents from the resource. The control date specifically benefits society by making implementation of a limited entry system for an expanding fishery possible because it provides a way of returning to a reasonable number of initial participants in the fishery.

### Analysis of Alternatives Considered But Rejected

#### **Rejected Alternative 1. No action.**

Choosing not to set a control date for limited entry makes the task of setting up a limited entry system, should that be deemed necessary, potentially more difficult and costly. Without a control date, a limited entry system would probably have to grant initial available quota to a large number of boats that will most likely be in the fishery in the future. This might mean that a boat's individual share would be too small to cover operating and fixed costs of fishing or at least it might mean that far more capital would be tied up in this fishery than is necessary for the level of yields. If quota shares were not transferable, then this could potentially be an obstacle that would be difficult to circumvent. Expensive government buy-back programs or other such measures might be called for, raising many problems.

The use of control dates is presently being examined for use in other fisheries and there are still uncertainties as to their effectiveness and political feasibility. As described earlier, the choice of a control date will have economic impacts to varying degrees on fishermen that entered the fishery after the chosen control date. If many fishermen entered the fishery just after the control date, then these impacts could be potentially large and affect a significant number of fishermen.

If a control date were not set up, then many of the impacts on individual fishermen that entered after the date might be avoided. Yet, if a limited entry system cannot be implemented because a control date was not established and this, in turn, means that the fishery cannot be effectively managed for sustainable yields and adequate returns to participants, then the costs avoided by not setting up a control date may be small compared to the potentially large costs to both fishermen and society at large if the fishery cannot be adequately managed under open access.

**Rejected Alternative 2.** Establish a control date and cap the number of permits at: a) 25, b) 40, or c) estimated number in early 1990 plus those with gear on order as of \_\_\_\_\_ (date to be specified).

Alternative 2 has roughly the same impacts as Management Measure 2 (March 28, 1990 Control Date) except that it attempts to define the number of vessels that would be guaranteed inclusion into the fishery. The potential advantage to the rejected alternative is that it sets a somewhat precise criterion as to the number of individuals that would be guaranteed initial inclusion if a limited entry system is developed. The adopted control date appears to leave the number of eligible participants open to interpretation later on when exact language to define what "participation in the fishery" before and after the control date is decided upon. An exact number approach may also have disadvantages because there will undoubtedly be individuals who do not meet the exact criterion but appear to merit a place in the wreckfish fishery because of extenuating circumstances.

**Management Measure Three: SET A TOTAL ALLOWABLE CATCH (TAC) OF TWO MILLION POUNDS PER YEAR IN THE WRECKFISH FISHERY. THE TAC WILL BE ADJUSTED ANNUALLY BY NOTICE ACTION.**

The TAC setting procedure is as follows:

1. The Councils will appoint an assessment group (Group) that will assess the condition of the wreckfish resource in the management unit on an annual basis. The Group will present a report of its assessment and recommendations to the Council.
2. The Council will consider the report and recommendations of the Group and hold public hearings at a time and place of the Council's choosing to discuss the Group's report. The Council may convene the Advisory Panel and the Scientific and Statistical Committee to provide advice prior to taking final action. After receiving public input, the Council will make findings on the need for changes.
3. If changes are needed in the MSY, TAC, quotas, trip limits, fishing year or permits, the Council will advise the Regional Director in writing of their recommendations accompanied by the Group's report, relevant background material, draft regulations and public comments. This report will be submitted each year by such date as agreed upon by the Council.
4. The Regional Director will review the Council's recommendations, supporting rational, public comments and other relevant information. In the event the Regional Director rejects the recommendations, he will provide written reasons to the Council for the rejection and existing regulations will remain in effect until the issue is resolved.
5. If the Regional Director concurs that the Council's recommendations are consistent with the goals and objectives of the fishery management plan, the national standards and other applicable law, the Regional Director will recommend that the Secretary publish notice in the Federal Register of any changes prior to the appropriate fishing year.

6. Appropriate adjustments which may be implemented by the Secretary by notice in the Federal Register are:

- (a) Initial specification of MSY and subsequent adjustment of the best estimate of MSY.
- (b) Setting TAC for wreckfish. A TAC may not exceed 8 million pounds.
- (c) Modifying TAC, quotas, trip limits, fishing year, spawning closure or permits.
- (d) The fishing year and spawning closure may not be adjusted by more than one month.

The Council has initially established a TAC of 2 million pounds based on input from a number of sources. The Council's Snapper Grouper Plan Development Team recommended a TAC of 2 million pounds based on their professional experience, knowledge of the fishery and assessment of available wreckfish data. A special wreckfish review group made up of state and federal scientists and statisticians was convened to specifically look at the status of this new fishery. The review group recommended a harvest level of 2 million pounds for a 1990 fishing year running from April through December. The TAC levels the Council took to public hearing for comment ranged from 2-8 million pounds. Although there was not unanimity in the level of TAC the fishermen believed should be implemented, most felt the TAC should be in the lower part of the range. Also, testimony at the public hearings indicated that catch per unit effort was decreasing and the rapidly growing pressure on this fishery was already affecting catch levels.

In arriving at a TAC for the April 16, 1990 - April 15, 1991 fishing season that would allow for some growth in the fishery while providing for conservation of the resource, the Council addressed wreckfish harvest that would occur from January 1 - April 15, 1990. This was necessary to determine what the total CY 1990 catch level would be in comparison to CY 1989. The CY 1989 catch of wreckfish was slightly over 2 million pounds. Preliminary landings data available to the Council showed catches for the 1st quarter of 1990 (Jan.-Mar.) to be approximately 1.2 million pounds. However, it was believed this number would be higher when final landings were available. (Recent catch data indicate that approximately 2.3 million pounds of wreckfish were landed during the 1st quarter of 1990 - Source: NMFS SEFC.) The Council also considered the life history characteristics of the wreckfish and our limited biological knowledge of this resource.

The 2 million pound TAC established by the Council for the 1990/91 fishing season: 1) provides for some growth in the fishery by allowing for harvest levels double the CY 1989 landings, 2) ensures the resource will not be overexploited and that a sustained yield will be available on a continuing annual basis and 3) follows the recommendations of the Snapper Grouper Plan Development Team and the wreckfish review group, which are based on the best scientific information available. In subsequent years, TAC levels will be established following the procedure specified above.

### Estimated Impacts on Fishermen From Setting A Two Million Pound Total Allowable Catch

The appropriate methodology for evaluating effects the proposed TAC will have on wreckfish harvesters is to examine changes in producer surplus. This can be done in two ways: 1) by estimating a system of supply and demand equations and calculating changes in the magnitude of producer surplus, or 2) by estimating total costs, revenues and net revenues from cost and returns data before and after the proposed regulatory change. Although the first method is more commonly used to measure changes in producer surplus, the second method is used here because some costs and returns data on wreckfish are available but supply and demand estimations are not available at this time. Results from using both methods should be roughly equivalent, however. Regulatory impacts of the proposed TAC are analyzed in conjunction with the 10,000 pound trip limit (Management Measure 5) here in order to accurately address impacts.

Summarized costs and returns data along with a copy of the survey instrument and comment on the representativeness of these data can be found in Appendix 1. Cost and returns data were obtained from a voluntary survey that was informally administered to wreckfish captains and owners at recent public hearings for Amendments 2 and 3 to the Snapper Grouper Fishery Management Plan. This section quantifies regulatory impacts by estimating net returns or profits to wreckfish producers prior to and after the proposed regulation. This is done by developing four probable scenarios that describe net effects on wreckfish producers' profits under the proposed TAC (Table 2). Different scenarios are developed because regulatory impacts from the proposed TAC will differ somewhat depending on how wreckfish producers respond to the proposed TAC and other factors. The need for different scenarios arises from uncertainty as to how long the wreckfish fishery will remain open at the two million TAC and whether wreckfish boats will fish in other fisheries after the wreckfish TAC is met. How fishermen respond to the proposed TAC has implications on whether fixed costs should be assigned entirely to wreckfish fishing or should be pro-rated.

Regulatory impacts will also depend somewhat on the number of boats in the wreckfish fishery. At present we do not know the exact number of participants in the wreckfish fishery. The impact scenarios presented are broken down by probable numbers of vessels in the fishery (ranging from 25 to 60 vessels) to reflect the varying impacts with different numbers of boats targeting wreckfish.

In addition, the price that fishermen will receive for wreckfish under an annual TAC of 2,000,000 pounds is not known with certainty. The scenarios presented use two different estimates of exvessel price. These price estimates were arrived at using different methods of estimation.

### Explanation of Analysis of Impacts in Table 2

The different scenarios in Table 2 look at effects on returns to captains or owners that result from the proposed TAC in combination with the proposed 10,000 pound trip limit. In the TAC/# VESSELS block of rows in Table 2, the 2,000,000 lb TAC is divided by the different numbers of

vessels. For the purposes of this analysis, dividing the TAC evenly among vessels assumes that vessels are essentially homogeneous (and that competition does not play a major role). The TAC would probably not be distributed evenly under open access competition. Vessel size, differences in fishing gear, differences in skill levels and competition for allowable catch during the fishing year would likely distribute the TAC differently despite the 10,000 lb trip limit that will be put in place.

The TRIPS/YR PER VESSEL block divides the total quantity of wreckfish per vessel by 10,000, assuming every trip catches the maximum allowable catch per trip of 10,000 lb. Available data suggest that the median catch before the proposed regulation was 8,000 lb per trip and mean catch was 9,833 lb per trip. This means that the typical vessel can catch and probably has hold space to accommodate close to the trip limit quantity of wreckfish. Exceptions to this and resulting impacts on smaller and larger vessels will be discussed later on when the limitations to using a homogeneous firms approach when fishermen are not entirely homogeneous is discussed.

The block for TOTAL FIXED & VARIABLE COSTS multiplies relevant variable costs by the number of trips per year. Included in the variable costs is crew share per trip in order to isolate net revenues to captains/owners later on. Annual fixed costs (both straight-line and pro-rated) are added to total variable costs to give total annual costs per vessel fishing wreckfish. Given that the number of trips per year is small even assuming low estimates of the total number of boats in the fishery, it seems likely that boats would participate in other fisheries when not fishing for wreckfish. This argues for pro-rating fixed costs. The method used in the scenarios where pro-rating was done was as follows:

$$\text{Total Cost/Vessel} = (N \times \text{Total Variable Cost}^*/\text{trip}) + \left(\frac{N}{T} \times \text{Total Annual Fixed Costs}^{**}\right)$$

where: N = number of wreckfish trips per vessel per year.

T = total number of fishing trips per vessel per year (based on estimated number of 6-7 day trip snapper grouper vessels of similar size to wreckfish vessels can make in a typical year in the Southeast; T was set at 40 for this analysis).

\* median variable costs including crew share are \$4,250 per trip. Variable costs are detailed in Appendix 1.

\*\* median fixed costs are \$45,800 per year (see Appendix 1).

The TOTAL REVENUE/YR PER VESSEL block multiplies total quantity per vessel times exvessel price. Two exvessel prices (\$2.00/lb and \$1.60/lb) were used to estimate revenues. The \$2.00 per lb exvessel price is based on the proportional change in price relative to a unit quantity change from an estimated price flexibility for snappers and groupers in the South Atlantic and Gulf of Mexico (Keithly and Prochaska, 1985). Although wreckfish is not a grouper, it is frequently used as a market substitute for grouper in the Southeast. The \$1.60 per lb price is the consensus best guess of price changes by several owners of fishhouses that handle wreckfish in South

Carolina and Florida.

The block for ANNUAL NET RETURNS PER VESSEL CAPTAIN OR OWNER shows estimated profits under different fixed cost and exvessel price assumptions and different estimates of the number of boats in the wreckfish fishery. Profits are estimated for captains/owners because that approach is particularly relevant to the wreckfish fishery where most boats are owner-operated. Although crew in the wreckfish fishery are usually paid on a share of the total trip basis, available information indicates that captains/owners are the source of capital for gearing up and other fixed costs. In each scenario, net returns are presented on an individual owner-operator basis. These effects can be aggregated by multiplying by the estimated number of owners/operators to examine net changes in aggregate producer surplus.

Shortrun regulatory impacts on individual wreckfish fishermen can be evaluated by comparing estimated net returns in the wreckfish fishery prior to the proposed TAC, to net returns under the proposed TAC. This is done in Table 3. Estimated net returns prior to the proposed TAC were calculated from the same costs and returns data used above. Annual revenues from wreckfish fishing were estimated using reported median catch per trip in 1989 times reported median number of wreckfish trips taken in 1989 times median exvessel price (see cost and returns data summary in Appendix 1). Calculated in that manner, annual median revenue per wreckfish boat is approximately \$250,000 ( $8,000 \text{ lb/trip} \times 25 \text{ trips} \times \$1.25/\text{lb} = \$250,000$ ).

Another way to calculate annual revenue per boat is to multiply median annual reported catch per vessel times median exvessel price ( $150,000 \text{ lb} \times \$1.25/\text{lb} = \$187,000$ ). Annual catch reported in the cost and returns study differs from catch per trip times number of trips is not known.

Total costs annually per boat are estimated in the same way as was done above except that fixed costs were not pro-rated. Pro-rating was not done because the vast majority of respondents to the questionnaire reported fishing for wreckfish full time and throughout the year in 1989. When fixed and variable costs are deducted from the two revenue estimates, two estimates of typical net returns prior to the proposed TAC are obtained. These estimates are \$97,950 per year under the high revenue estimate and \$35,450 per year under the lower revenue estimate.

The differences between net returns before and after the proposed TAC appear in the last two blocks of Table 3. The difference in net returns is estimated under both the high low revenue estimates. Estimated changes in net returns illustrate the shortrun impacts on individual wreckfish fishermen as a result of the proposed TAC in combination with the proposed 10,000 lb trip limit.

When evaluating regulatory impacts, one should ideally compare shortrun costs to fishermen with longrun discounted benefits from proposed management measures. Because biological and other necessary data are lacking, however, this cannot be done rigorously for wreckfish at this time. The longrun benefits to wreckfish fishermen are potentially large, in this case, because unregulated fishing effort could lead to recruitment failure and long periods of time when yields from the wreckfish resource are not available. The tilefish fishery is a good example of how unrestricted fishing can lead to damage to the resource and losses incurred by the fishing industry.

Although we are unable to quantify the extent of future yields from the wreckfish fishery at this time, those yields should be seen as the longterm benefit from managing the wreckfish resource. It is believed that those longterm benefits far outweigh shortterm losses that may result from the proposed management measures.

#### Limitations From Using the Homogeneous Fishing Firm Assumption and Its Effects On Projected Short Run Impacts

Figure I in Appendix 1 illustrates an important point about the analysis of short run impacts that was done above. The impact analysis examined short run impacts on the "typical" wreckfish firm assuming that firms were fairly similar. This was done to make the task of analyzing impacts manageable. There is reason to believe, however, that firms are not as homogeneous as described. Figure I in Appendix 1 presents reported catch per trip from the informal cost and returns survey. There is evidence to indicate that there are fairly wide differences in catch per trip and other related characteristics of wreckfish vessels. This means that the "typical" fishing firm may not be widespread or numerous and impacts on individual fishing operations may not be exactly as those depicted for the "typical" operation. Expected revenues, as well as, expected effects on fixed and variable costs may be somewhat different from what was depicted, although, the net effect on aggregate producer surplus should be accurate if the information from the costs and returns survey is representative of the wreckfish fishery as a whole. Comments on the degree to which the cost and returns data represents the wreckfish industry on the whole can be found in Appendix 1.

#### Impacts the Proposed TAC Will Have on Consumers of Wreckfish

Impacts on consumers are important and should be considered when evaluating tradeoffs in net benefits resulting from management measures. Estimated demand functions are needed to gauge losses and gains to consumers from the proposed TAC. Unfortunately, an estimated demand function for wreckfish itself or as a substitute for grouper is not available at this time. Some short run losses to consumers will likely be felt because wreckfish landings will probably be smaller than they would have been without the proposed TAC. These shortrun losses will probably be felt as higher prices to consumers at the retail level but these losses will be more than compensated for if the proposed TAC is successful in helping to ensure sustainable yield from the wreckfish resource, particularly if unrestricted harvest would have caused longterm damage to the resource.

#### Analysis of Alternatives Considered But Rejected

**Rejected Alternative 1. Potential Benefits And Losses That Could Result From Setting A TAC In The Upper Range Of Options Considered (2-8 million lb).**

Because of the lack of biological information, little can be stated with certainty regarding the specific tradeoffs of setting a TAC in the upper or lower portion of the range. For analytical



purposes, one needs to evaluate yield streams based on different levels of fishing mortality and probabilities associated with maintaining safe levels of spawning stock. An acceptable discount rate can be applied to yield streams to determine which one maximizes the short and longrun benefits to society. Lack of data and understanding of the wreckfish resource and its users precludes that type of analysis at this time.

What we do know is that prices for wreckfish have been somewhat sensitive to the quantity available thus far. We know this because price to the vessel has tended to drop when large quantities of wreckfish have arrived at the dock within a short period of time (observation made by Glenn Ulrich of SCWMRD to the SAFMC at the March Council meeting). This implies that demand for wreckfish is somewhat price elastic. If prices are sensitive to quantity fluxuations, then overall levels of benefits to those who produce wreckfish will probably be larger if exploitation of the resource is slowed down. This stands to reason because the price paid to fishermen for a pound of wreckfish will be greater on average if the market is not overloaded with wreckfish. A low TAC may help to do this at least in the shortrun.

The value of wreckfish to both producers and consumers in the future cannot be quantified but may be larger than its value at present. This is because efforts to develop and promote consumer appreciation of wreckfish via marketing have just begun and have met with considerable success thus far. This may explain why public testimony at the South Atlantic Council meeting in March from two fishhouse representatives that handle wreckfish spoke in favor of slowing down the harvest and providing for longrun availability of wreckfish. For fishhouse owners, and indirectly fishermen themselves, to get the most out of wreckfish, marketing and promotion will be involved and this will mean substantial investment. Returns from these investments will not compensate expenditures if the wreckfish resource is no longer available in the future. This seems to indicate that setting a TAC in the lower portion of the range would increase benefits to producers.

Another reason for setting a low TAC is that a conservative approach may be warranted if there is reasonable biological uncertainty. However, since there is no way of evaluating whether the probability of obtaining longterm yields from the resource is any higher with a low TAC than with a higher TAC, shortterm sacrifices may be unwarranted. When biological data are available, however, and the fishery is better understood, we will have the ability to determine if TAC was set too low and make adjustments accordingly.

## **Rejected Alternative 2. No Action.**

### Rudimentary Evaluation of Benefit Tradeoffs

As described above, there needs to be a better understanding of wreckfish biology to estimate probabilities that yields will be sustainable under unrestricted levels of harvest and the proposed levels of harvest under TAC options. Those probabilities cannot be estimated under existing data and scientific constraints. The tradeoff between not restricting harvest and attempting to restrict it

boils down to whether the cost of slowing the rate of exploitation by imposing a TAC is more than compensated by returns from biological and other management data that can be amassed in the meantime and used to measure what kind of yields can safely be removed from the wreckfish resource over time.

There appear to be several possible outcomes from the TAC options and taking no action, unfortunately none of which can be accurately predicted at this time. These are: 1) After the intense exploitation that has already occurred and would continue with no action, the wreckfish resource may no longer have the potential to produce sizable yields on a sustained basis and that even if we had proceeded more cautiously, the population would have crashed; 2) The resource could have sustained fairly substantial yields but we exploited more than could be renewed in the shortrun and the resource crashed; 3) Proceed cautiously and fortuitously we don't take too much in the shortrun and later find out that the resource can support moderate sustainable yields; and 4) Proceed with a conservative TAC and find out later on that the available biomass is greater than was thought to exist and we have foregone shortrun benefits unnecessarily. In face of biological uncertainty and in view of the public input received, the Council chose a conservative approach.

**Management Measure Four:** ESTABLISH A FISHING YEAR OF APRIL 16 THROUGH APRIL 15 WITH A SPAWNING CLOSURE OF JANUARY 15 THROUGH APRIL 15.

The procedure for modifying the fishing year and spawning closure is explained under the TAC setting procedure for Management Measure 3. The fishing year and spawning closure may not be adjusted by more than one month. The spawning closure was strongly supported during the public hearing process and the Council modified the initial fishing year from April 1 to April 16 based on fishermen's input about wreckfish spawning around the full moon which periodically occurs in early April.

#### Regulatory Impacts on Wreckfish Fishermen

Fishermen have observed that wreckfish caught during the January through April period appear to be full of roe or milt and are spawning. Preliminary research results provided by SCWMRD at the June Council meeting support this spawning season. Fishermen have also stated that wreckfish appear to bite baited hooks very aggressively during the spawning period. Because fishing effort is quite efficient at that time of year, a spawning closure seems to go against economic efficiency and effective use of capital, at least at face value. There are a number of reasons, however, that management may not want to allow harvest during the spawning period even if economic efficiency is maximized by allowing harvest at that time.

One reason for having a spawning closure is to protect the wreckfish resource from recruitment failure. Although we lack a complete understanding of wreckfish reproductive biology and recruitment, it stands to reason that allowing wreckfish to breed before harvest will most likely be more beneficial to the stock than harvest before spawning. The question of whether costs imposed on wreckfish fishermen are more than compensated by the conservation benefits of a

spawning closure cannot be examined until an understanding of wreckfish biology is achieved. At this point, however, a conservative approach to management is warranted because longterm benefits from the wreckfish resource are potentially great but will probably only be realized if rapid reduction of the wreckfish stock is avoided.

Another reason for a spawning closure is to attempt to maximize returns to the harvesting sector. Given the proposed 2 million lb TAC, it is likely that competition for available quota will induce a "derby" type fishery until a limited entry program is put in place. This means that large quantities of wreckfish will be brought to the dock in a short period of time, even under the proposed 10,000 lb trip limit. Decreases in exvessel price have already been observed when large quantities of wreckfish are brought to the dock in a short period of time. We cannot say for sure whether price dips will occur under the proposed TAC but it appears likely that they will occur if the quota is taken rather quickly. One way to slow down the rate of harvest is to restrict fishing when harvest is potentially rapid. If the trip limit of wreckfish can be caught in a one or two day period during the spawning season, then it is likely that boats will land their limit and immediately return to the wreckfish grounds to catch another limit after selling their catch. During other times of the year, it is probably not possible to catch wreckfish this rapidly and the quantity brought to the dock in a short period of time should not be as great.

Although some may view the closure as "legislated" inefficiency, given the present open access nature of the fishery, the immediate interests of harvesters are probably better served by closing the fishery during the spawning period because this will help to avoid low exvessel prices. Even if our present knowledge of the wreckfish resource does not allow us to demonstrate the benefits to the wreckfish stock, the longrun interests of fishermen and society at large are probably better served by closing during the spawning period to allow wreckfish to breed before being caught.

#### Analysis of Alternatives Considered But Rejected

##### **Rejected Alternative 1. No action.**

Not specifying a spawning closure would result in increased biological risk to the wreckfish resource, gluts of product on the market and potential vessel safety problems from vessels fishing during the winter months. In addition, significant public support was expressed for the spawning season closure during public hearings and testimony at the Council meeting. For these reasons, the Council rejected this alternative.

##### **Rejected Alternative 2. Establish a fishing year beginning April 1.**

This option for the fishing year was taken to public hearing. Input from fishermen indicated that during some years spawning would still occur during early April when the full moon fell in this time period. The fishermen recommended that the Council begin the fishing year on April 16

and as a result the Council rejected the April 1 beginning date for the fishing year.

**Management Measure Five: ESTABLISH A VESSEL TRIP LIMIT OF 10,000 POUNDS PER TRIP.**

The process for modifying the trip limit is explained under the TAC setting procedure for Management Measure 3. There was extensive support for the proposed trip limit during the public hearing process and by fishhouse representatives who provided testimony at public hearings and Council meetings.

Impacts on Wreckfish Fishermen

Impacts of the 10,000 lb trip limit in conjunction with a two million lb TAC on the typical wreckfish firm are addressed in detail in the section above entitled "Estimated Impacts on Wreckfish Fishermen From Setting a Two Million Pound TAC". That section details changes in producer surplus from the two measures under different assumptions about the number of boats in the fishery, the exvessel price of wreckfish and pro-rated versus full fixed costs. In reality, the impacts of the trip limit and the proposed TAC must be viewed together in order to measure impacts accurately.

Appendix 1 discusses the degree to which firms are similar and this has implications on how accurately regulatory impacts are described. The question of how similar wreckfish fishing firms really are is also germane to the question of trip limit impacts. This question can be analyzed, to some degree, via the information from the cost and returns study. Figure 9 illustrates how respondents answered the survey question inquiring how many pounds of wreckfish were needed to make the trip worthwhile in terms of meeting costs. Sixty-two percent of the thirteen captains/owners who responded indicated that a trip of 10,000 lb (or less) was worthwhile.

If the survey represents the entire wreckfish fishery accurately (see Appendix 1 for comments on that subject), then a majority of wreckfish boats will not be severely impacted by the proposed trip limit standing alone. Larger boats that report needing greater than 10,000 lb and as much as 20,000 lb per trip, may be impacted by the proposed trip limit. It is not known whether adjustments in fishing practices or being able to fish in weather that most other boats cannot fish in (hence potentially getting higher prices when wreckfish supplies are low) will compensate these larger boats and offset some of the potential impacts from the trip limit.

Trip limits will have some positive effects on wreckfish fishermen as well. As discussed above, wreckfish exvessel prices are known to be subject to decreases when large quantities of wreckfish arrive on the docks within a short period of time. For instance, wreckfish exvessel prices have dropped to between 80 and 90 cents per pound when supplies clearly outstripped wholesalers' ability to move wreckfish at the volume that was available. The proposed trip limit should benefit producers because it may prevent this short run over-supply problem to some degree. The occurrence of over-supply outside the spawning season has not been frequent, however, according to wreckfish dealers. Thus, the spawning season closure may be more

instrumental in preventing shortrun over-supplies. Wreckfish fishermen may realize somewhat higher prices because of the trip limit and this may make up for some of the losses that boats currently catching more than 10,000 lb per trip may incur.

#### Analysis of Alternatives Considered But Rejected

##### **Rejected Alternative 1: No Action.**

Imposing a trip limit quantity of wreckfish attempts to introduce a measure of control into the burgeoning wreckfish fishery. In conjunction with the two million lb TAC, the 10,000 lb trip limit will help keep exvessel prices from decreasing due to short run over-supply. These benefits would not be attained if trip limits were not put in place.

Perhaps the greatest effect of the proposed trip limit is the role it will play under the proposed TAC. Given the number of boats that could be fishing for wreckfish, a relatively low TAC could have equity implications if the wreckfish fishery does become a "derby" before limited entry is put in place. In the competition for available quota, larger boats would have an advantage over smaller boats in the absence of a trip limit. Owners of smaller boats might attempt to obtain larger boats and this could eventually encourage over-capitalization in the wreckfish fishery. With trip limits, some of the advantage of having larger boats is reduced, although larger boats will still be able to fish in more adverse weather than smaller boats.

If a trip limit were not implemented, some costs would not be imposed on larger vessels that may be more efficient at larger catch per trip levels. The exact size of these cost savings cannot be qualified at this time.

#### Initial Regulatory Flexibility Analysis

The Regulatory Flexibility Analysis focuses on regulatory impacts and paperwork requirements on small entities or firms. Most firms in the wreckfish fishery are small, owner-operated vessels that fit into the rubric of "small entity". The impact of proposed management measures on fishing firms are detailed in the Regulatory Impact Review. Those impacts are quantified in the analysis of the proposed two million pound TAC within the RIR. Given that the exact number of boats in the wreckfish fishery cannot be enumerated precisely, and price fluctuations are somewhat uncertain, it is not possible to examine impacts on individual firms more accurately than is done in the RIR at this time. It is not believed, however, that individual fishing entities will be significantly impacted by the proposed management measures in the shortrun. Shortrun impacts will vary, however, with the size and capacity of the individual vessel (see RIR for more detail). Longrun benefits to the wreckfish fishery may far outweigh shortrun costs that are imposed although we do not have enough information to quantify these tradeoffs sufficiently at this time.

## V. HABITAT CONCERNS (Directly from Ulrich and Sedberry, 1990)

The habitat section for the snapper grouper fishery management plan was updated as part of Amendment 1. Additional information on wreckfish is shown below.

Wreckfish are pelagic for the first several years of their life (up to 30 cm length), often associated with floating debris (Roberts, 1989), the habit responsible for their common name. They grow to large size (100 kg weight, 2 m length), and are commercially fished in portions of their range (Roberts, 1989). The shallowest reported demersal populations of Polyprion in the western Atlantic were reported off Argentina in depths of 66-84 m (Menni and Lopez, 1979). The maximum reported depth for wreckfish is 1000 m (Lythgoe and Lythgoe, 1971). The presence of fishable concentrations of wreckfish in the northwestern Atlantic was unknown until 1987, when a fishery began to develop on the Blake Plateau, adjacent to South Carolina and Georgia.

The fishing grounds comprise an area of the Blake Plateau of approximately 50-75 square nm, characterized by a rocky ridge system having a vertical relief of > 50 m and a slope of > 15 degrees (Figure 1). The depth range in this area is 450-600 m. The substrates in areas of the Blake Plateau exhibiting significant relief are generally characterized as composed of manganese-phosphate pavements, phosphorite slabs and coral banks (Pratt and McFarlin, 1966; Stetson et al, 1969). Bottom samples obtained from commercial fishermen indicate that wreckfish concentrations occur primarily on the manganese-phosphate bottoms. Prior observations from the research submersible, Johnson Sea-Link I, showed low densities of wreckfish associated with coral mounds or banks [C. A. Wenner (SCWMRD), personal communication]. There has been some exploratory efforts by commercial vessels but most of the fishing effort occurs on the initially discovered grounds of the Hoyt Hill area (Figure 1).

## VI. VESSEL SAFETY CONSIDERATIONS

P.L. 99-659 amended the Magnuson Act to require that a fishery management plan or amendment must consider, and may provide for, temporary adjustments (after consultation with the U.S. Coast Guard and persons utilizing the fishery) regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safety of the vessels.

No vessel will be forced to participate in the fishery under adverse weather or ocean conditions as a result of the imposition of management regulations set forth in this amendment to the Snapper Grouper Fishery Management Plan. Therefore, no management adjustments for fishery access will be provided.

There are no fishery conditions, management measures or regulations contained in this amendment which would result in the loss of harvesting opportunity because of crew and vessel safety effects of adverse weather or ocean conditions. No concerns have been raised by the people

engaged in the fishery or the Coast Guard that the proposed management measures directly or indirectly pose a hazard to crew or vessel safety under adverse weather or ocean conditions. Therefore, there are no procedures for making management adjustments in Amendment 3 due to vessel safety problems because no person will be precluded from a fair or equitable harvesting opportunity by the management measures set forth.

There are no procedures proposed to monitor, evaluate and report on the effects of management measures on vessel or crew safety under adverse weather or ocean conditions.

## VII. COASTAL ZONE CONSISTENCY

Section 307(c)(1) of the Federal Coastal Zone Management Act of 1972 requires that all federal activities which directly affect the coastal zone be consistent with approved State coastal zone management programs to the maximum extent practicable. While it is the goal of the Council to have complementary management measures with those of the states, federal and state administrative procedures vary and regulatory changes are unlikely to be fully instituted at the same time. Based upon the assessment of this amendment's impacts in previous sections, the Council has concluded that this amendment is an improvement to the federal management measures for the wreckfish fishery.

This amendment is consistent with the Coastal Zone Management Program of the States of Florida, South Carolina and North Carolina to the maximum extent possible; Georgia does not participate in the Coastal Zone Management Program.

This determination has been submitted to the responsible state agencies under Section 307 of the Coastal Zone Management Act administering approved Coastal Zone Management Programs in the states of Florida, South Carolina and North Carolina.

## VIII. ENDANGERED SPECIES AND MARINE MAMMAL ACTS

The proposed actions have no anticipated impact on threatened or endangered species or on marine mammals. A Section 7 consultation was conducted with the NMFS Southeast Regional Office. A biological assessment was prepared which concluded that the proposed actions will have no anticipated impact on threatened or endangered species or marine mammals. In addition, a Section 7 consultation was conducted for the original FMP, and it was determined the FMP was not likely to jeopardize the continued existence of threatened or endangered animals or result in the destruction or adverse modification of habitat that may be critical to those species.

## IX. PAPERWORK REDUCTION ACT

The purpose of the Paperwork Reduction Act is to control paperwork requirements imposed on the public by the federal government. The authority to manage information collection and record keeping requirements is vested with the Director of the Office of Management and Budget. This authority encompasses establishment of guidelines and policies, approval of information collection requests and reduction of paperwork burdens and duplications.

The Council proposes, through this amendment, to establish additional permit and data collection programs. The public reporting burdens for these collections of information are estimated to average 12 and 5 minutes per response, respectively, including the time for reviewing instructions, searching existing data sources, getting and maintaining the data needed, and completing and reviewing the collection of information.

## X. FEDERALISM

No federalism issues have been identified relative to the actions proposed in this amendment and associated regulations. The affected states have been closely involved in developing the proposed management measures and the principal state officials responsible for fisheries management in their respective states have not expressed federalism related opposition to adoption of this amendment.

## XI. NATIONAL ENVIRONMENTAL POLICY ACT -- ENVIRONMENTAL ASSESSMENT

The discussion of the need for this amendment, proposed actions and alternatives and their environmental impacts are contained in Section III of this amendment. A description of the fishery is contained in Section II.

The proposed amendment is not a major action having significant impact on the quality of the marine or human environment of the South Atlantic. The proposed action is an adjustment of the original regulations of the FMP to protect the wreckfish resource from depletion. The proposed action should not result in impacts significantly different in context or intensity from those described in the Environmental Impact Statement (EIS) published with the initial regulations implementing the approved FMP. The preparation of a formal EIS is not required for this amendment by Section 102(2)(c)(c) of the National Environmental Policy Act or its implementation regulations. For a discussion of the need for this amendment, please refer to Sections I and II.

Mitigating measures related to proposed actions are unnecessary. No unavoidable adverse impacts on protected species, wetlands or the marine environment are expected to result from the proposed management measures in this amendment.



Benefits from the proposed regulations and cap or reduction in wreckfish mortality will protect the resource from depletion, better achieve the objectives of the FMP and lessen the environmental impacts of the fishery. Overall, the benefits to the nation resulting from implementation of this amendment are greater than management costs incurred.

Finding of No Significant Environmental Impact (FONSI)

Having reviewed the environmental assessment and the available information relating to the proposed actions, I have determined that there will be no significant environmental impact resulting from the proposed actions.

Approved: \_\_\_\_\_  
 Assistant Administrator for Fisheries Date

RESPONSIBLE AGENCY:

South Atlantic Fishery Management Council  
 1 Southpark Circle  
 Southpark Building, Suite 306  
 Charleston, South Carolina 29407-4699  
 (803) 571-4366

LIST OF AGENCIES AND PERSONS CONSULTED:

Comments were solicited from the following on Amendment 3:

Atlantic Coast Conservation Association  
 Atlantic States Marine Fisheries Commission  
 Snapper Grouper Advisory Panel  
 Scientific and Statistical Committee  
 North Carolina Coastal Zone Management Program  
 South Carolina Coastal Zone Management Program  
 Florida Coastal Zone Management Program  
 Florida Department of Natural Resources  
 Florida Marine Fisheries Commission  
 Georgia Department of Natural Resources  
 South Carolina Wildlife and Marine Resources  
 North Carolina Department of Natural Resources and Community Development  
 National Marine Fisheries Service  
   - Southeast Region  
   - Southeast Center  
 United States Coast Guard  
 U.S. Environmental Protection Agency, Region IV  
 Center for Environmental Education  
 Conservation Council of Angling Clubs  
 Fishery Management Councils  
 Florida League of Anglers  
 South Atlantic Fisheries Development Foundation  
 Marine Advisory Agents  
 National Coalition for Marine Conservation  
 North Carolina Fisheries Association Inc.

Organized Fishermen of Florida  
Southeastern Fisheries Association  
Sportfishing Institute

### LIST OF CONTRIBUTORS

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John R. Gauvin, Economist, South Atlantic Fishery Management Council

Some of this material was taken directly from the report entitled "The Fishery for Wreckfish (*Polyprion americanus*) in the Southeastern United States" prepared by:

Glenn F. Ulrich, Office of Fisheries Management, South Carolina Wildlife and Marine Resources Department  
George R. Sedberry, Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department

### LOCATION AND DATES OF PUBLIC HEARINGS

May 7, 1990 — Holiday Inn Beachside, 1111 N. Roosevelt Blvd., Key West, Florida  
May 8, 1990 — Sheraton at Brickell Point, 495 Brickell Ave., Miami, Florida  
May 9, 1990 — Holiday Inn Oceanfront, 1617 N. First St., Jacksonville Beach, Florida  
May 10, 1990 — Hyatt Regency, Two West Bay St., Savannah, Georgia  
May 11, 1990 — Holiday Inn, 1706 Lumina Ave., Wrightsville Beach, North Carolina  
May 14, 1990 — South Carolina Wildlife & Marine Resources Center, Fort Johnson Road, Charleston, South Carolina

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Table 1. South Atlantic Bight wreckfish landings in whole weight (pounds) and dollars.

	1984		1985		1986		1987		1988		1989	
	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars	pounds	dollars
January							170	\$ 303	0	\$ 0	27,057	\$ 42,749
February							163	290	0	0	43,992	55,430
March							9	16	407	627	74,028	102,899
April							7	12	33	51	55,870	74,183
May							0	0	76	117	45,603	34,652
June							0	0	21,753	33,499	117,216	89,069
July							0	0	38,533	60,417		
August							9,602	17,092	77,099	119,852		
September							10,444	19,739	42,080	60,448		
October							8,444	15,959	77,941	120,560		
November							10	18	28,557	41,979		
December							0	0	21,128	33,383		
Annual	120	\$214	1,737	\$3,092	936	\$1,666	28,849	\$53,429	307,607	\$407,933	363,766	\$398,982
Total												

TABLE 2. FOUR SCENARIOS EXAMINING NET RETURNS PER VESSEL UNDER THE PROPOSED TAC.

	SCENARIO ONE (10,000 lb/trip \$2/lb, fixed costs not prorated)		SCENARIO TWO (10,000 lb/trip \$1.60/lb, fixed costs not prorated)		SCENARIO THREE (10,000 lb/trip \$2 /lb, fixed costs prorated)		SCENARIO FOUR (10,000 lb/trip \$1.60 /lb, fixed costs prorated)	
	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000	ANNUAL TAC 2,000,000
TAC/# VESSELS	25	30	35	40	45	50	55	60
	80,000	66,667	57,143	50,000	44,444	40,000	36,364	33,333
	25	30	35	40	45	50	55	60
	8.0	6.7	5.7	5.0	4.4	4.0	3.6	3.3
# TRIPS/YR PER VESSEL	25	30	35	40	45	50	55	60
	8.0	6.7	5.7	5.0	4.4	4.0	3.6	3.3
TOTAL FIXED & VARIABLE COSTS	\$79,800	\$74,133	\$70,086	\$67,050	\$64,689	\$62,800	\$61,255	\$59,967
	\$43,160	\$35,967	\$30,829	\$26,975	\$23,978	\$21,580	\$19,618	\$17,983
TOTAL REVENUE / YR PER VESSEL	\$128,000	\$133,333	\$114,286	\$100,000	\$88,889	\$80,000	\$72,727	\$66,667
	\$128,000	\$106,667	\$91,429	\$80,000	\$71,111	\$64,000	\$58,182	\$53,333
ANNUAL NET RETURNS PER VESSEL	\$48,200	\$59,200	\$44,200	\$32,950	\$24,200	\$17,200	\$11,473	\$6,700
CAPTAIN OR OWNER	\$84,840	\$70,700	\$60,600	\$53,025	\$47,133	\$42,420	\$38,564	\$35,350

TABLE 3. DIFFERENCES IN NET REVENUE BEFORE AND AFTER THE PROPOSED TAC AND TRIP LIMIT.

	SCENARIO ONE (10,000 lb/trip \$2/lb, fixed costs not pro-rated)	SCENARIO TWO (10,000 lb/trip \$1.60/lb, fixed costs not pro-rated)	SCENARIO THREE (10,000 lb/trip \$2 /lb, fixed costs pro-rated)	SCENARIO FOUR (10,000 lb/trip \$1.60/lb, fixed costs pro-rated)
ANNUAL NET RETURNS				
PER VESSEL	25	25	25	25
	\$80,200	\$48,200	\$116,840	\$84,840
CAPTAIN OR OWNER	30	\$32,533	\$97,367	\$70,700
UNDER PROPOSED	35	\$44,200	\$21,343	\$60,600
2,000,000 lb TAC	40	\$32,950	\$12,950	\$53,025
	45	\$24,200	\$6,422	\$47,133
	50	\$17,200	\$1,200	\$42,420
	55	\$11,473	(\$3,073)	\$38,564
	60	\$6,700	(\$6,633)	\$35,350
DIFFERENCE IN NET RETURNS BETWEEN PRIOR TO PROPOSED TAC AND AFTER (BASED ON \$97,950 PRIOR NET RETURNS)	25	(\$17,750)	(\$49,750)	(\$13,110)
	30	(\$38,750)	(\$65,417)	(\$27,250)
	35	(\$53,750)	(\$76,607)	(\$37,350)
	40	(\$65,000)	(\$85,000)	(\$44,925)
	45	(\$73,750)	(\$91,528)	(\$50,817)
	50	(\$80,750)	(\$96,750)	(\$55,530)
	55	(\$86,477)	(\$101,023)	(\$59,386)
	60	(\$91,250)	(\$104,583)	(\$62,600)
DIFFERENCE IN NET RETURNS BETWEEN PRIOR TO PROPOSED TAC AND AFTER (BASED ON \$35,450 PRIOR NET RETURNS)	25	\$44,750	\$12,750	\$49,390
	30	\$23,750	(\$2,917)	\$35,250
	35	\$8,750	(\$14,107)	\$25,150
	40	(\$2,500)	(\$22,500)	\$17,575
	45	(\$11,250)	(\$29,028)	\$11,683
	50	(\$18,250)	(\$34,250)	\$6,970
	55	(\$23,977)	(\$38,523)	\$3,114
	60	(\$28,750)	(\$42,083)	(\$100)

Figures\*

1. Present commercial wreckfish grounds.
2. Length frequency of wreckfish based on samples from South Carolina.
3. Monthly mean length of wreckfish based on samples from South Carolina.
4. Monthly mean weight of wreckfish based on samples from South Carolina.
5. Annual regional (Atlantic states, southeast) landings of wreckfish.
6. Monthly regional (Atlantic states, southeast) landings of wreckfish through June 1989.
7. Average price per pound for wreckfish, by month, through June 1989.
8. Regression of monthly landings (through June 1989) on average price per pound for wreckfish.
9. Wreckfish pounds per trip catch reported needed per trip. (Source: John Gauvin, SAFMC Staff)

\*Figures 1-8 from Ulrich and Sedberry (1990).

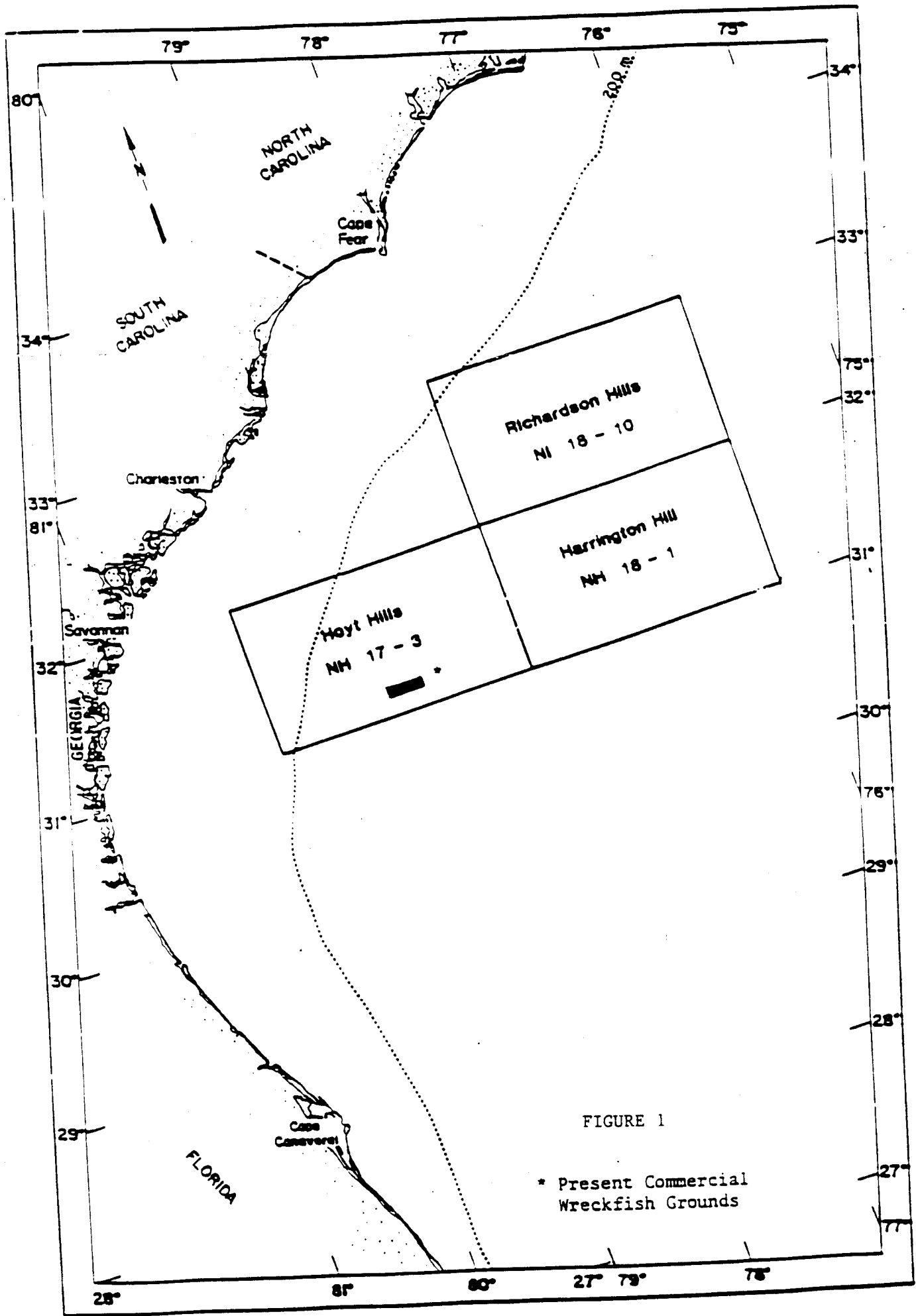
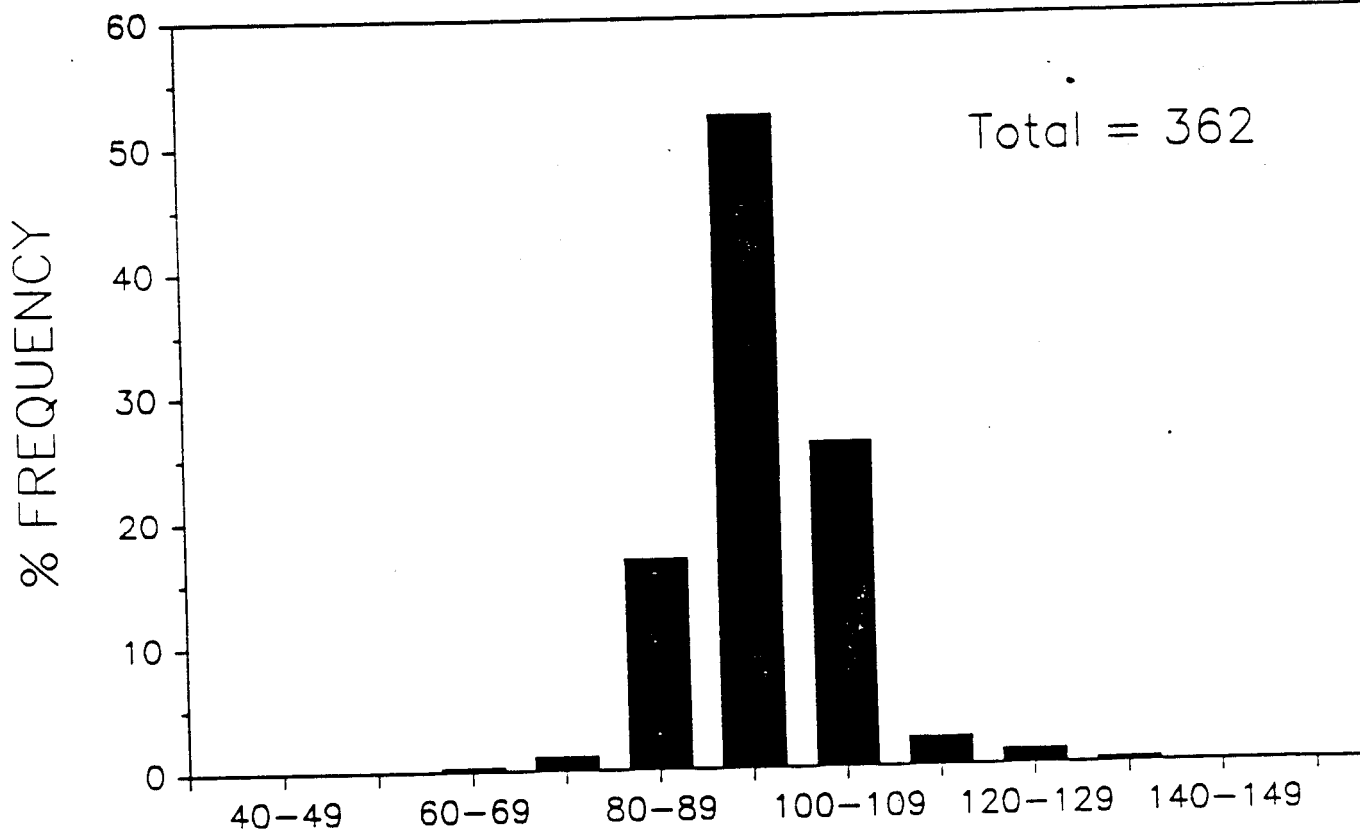
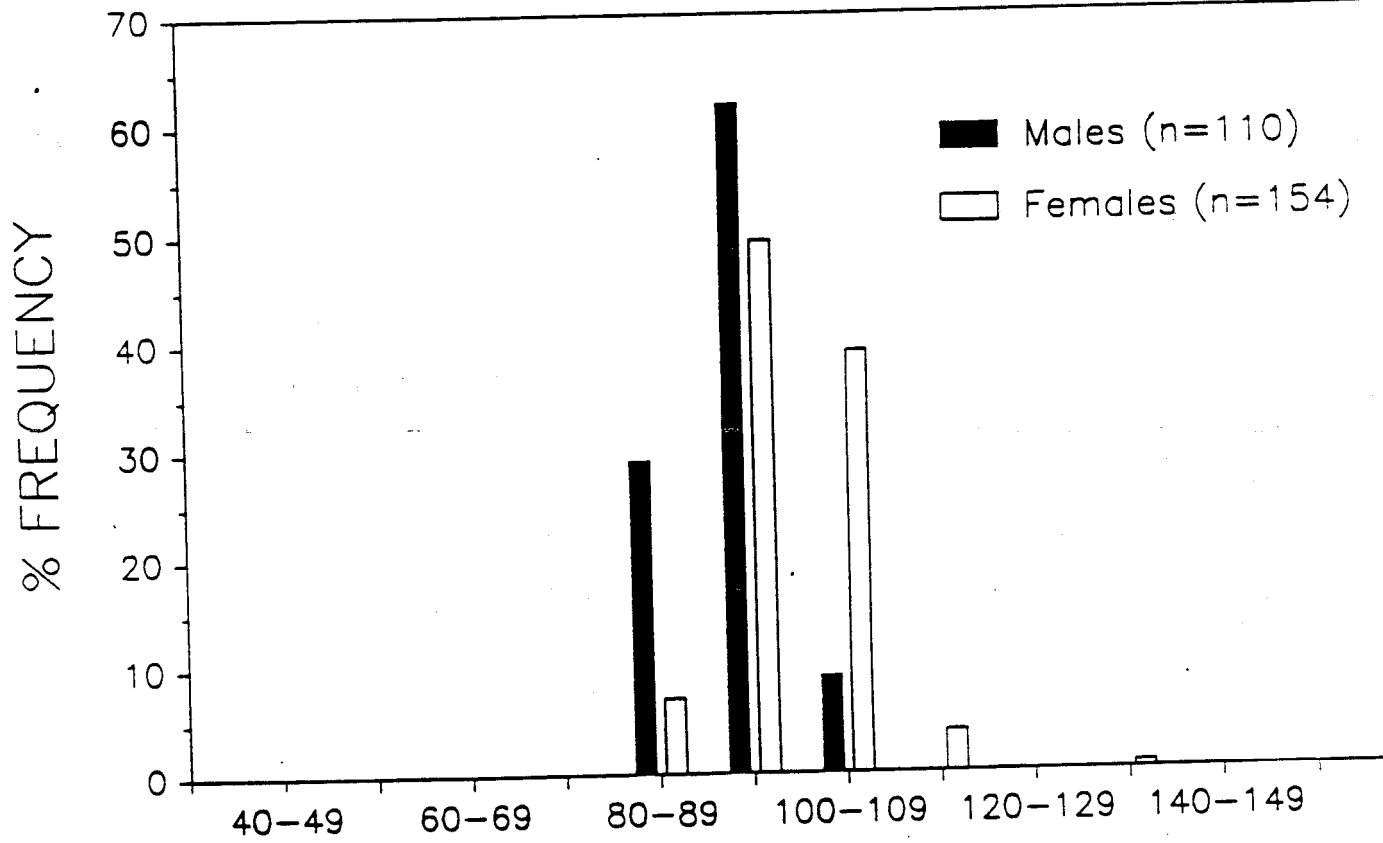


FIGURE 1

\* Present Commercial Wreckfish Grounds



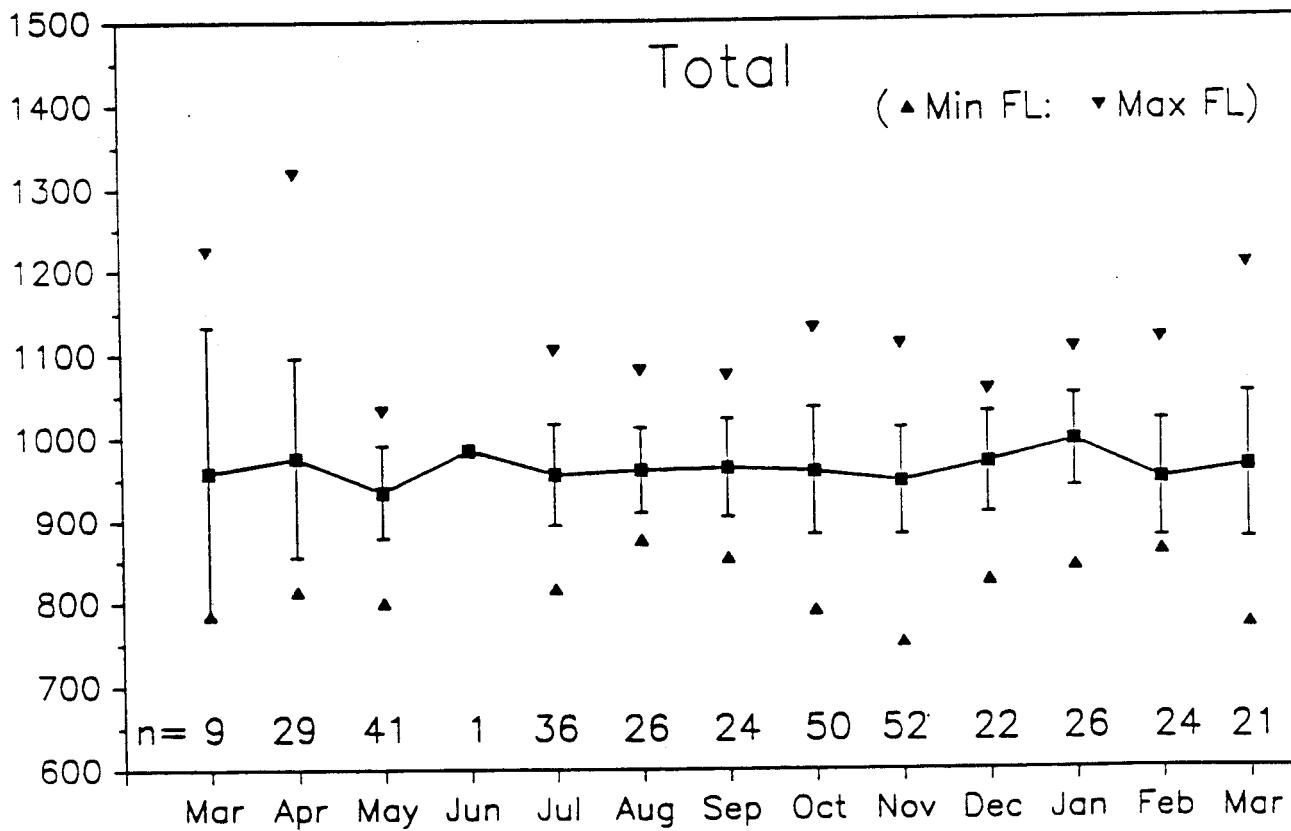
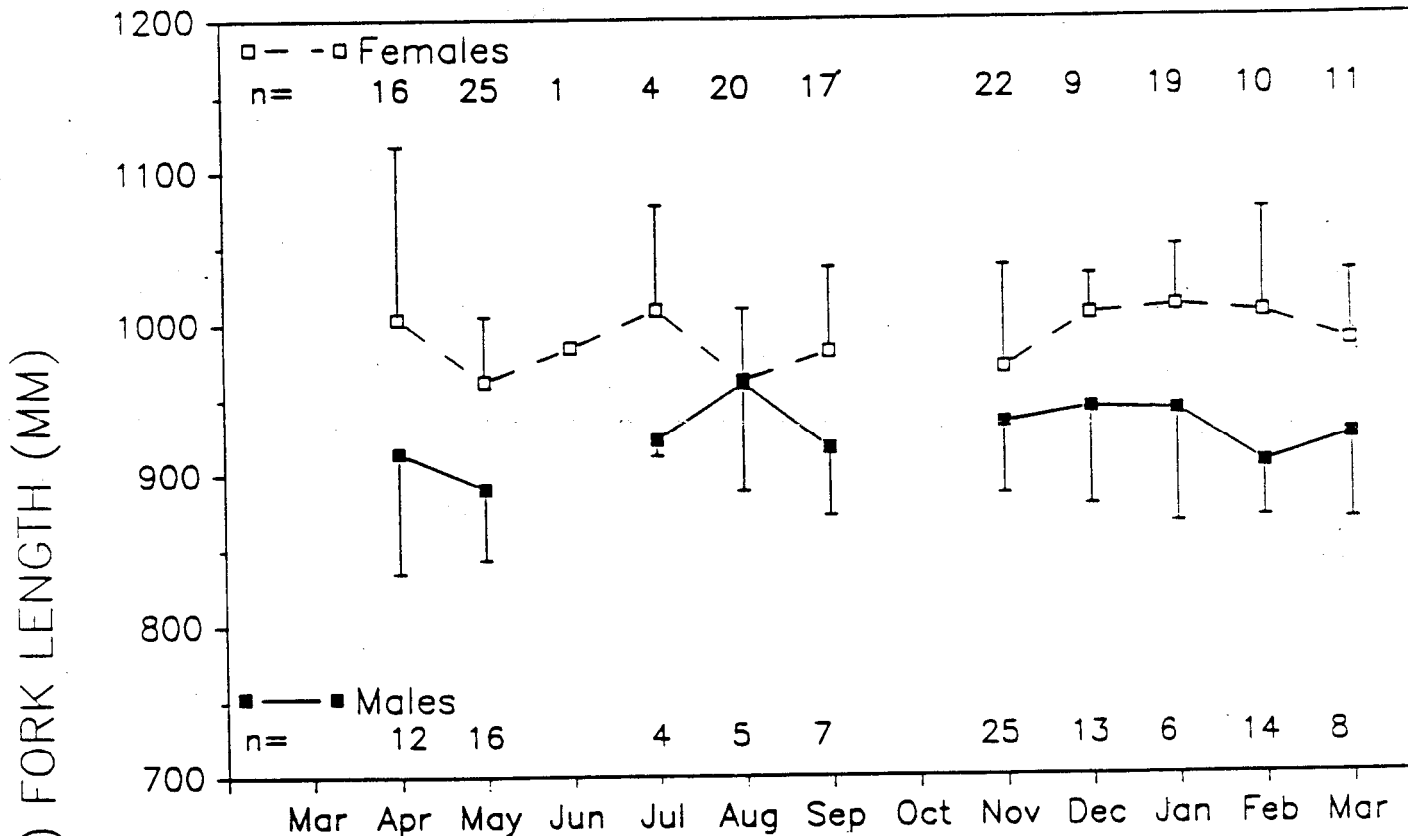
# WRECKFISH LENGTH FREQUENCY (S.C. SAMPLES)



FORK LENGTH (CM)

FIGURE 2

# WRECKFISH MONTHLY MEAN LENGTHS (S.C. SAMPLE)



MONTH (1989-90)

FIGURE 3

# WRECKFISH MONTHLY MEAN WEIGHTS (S.C. SAMPLES)

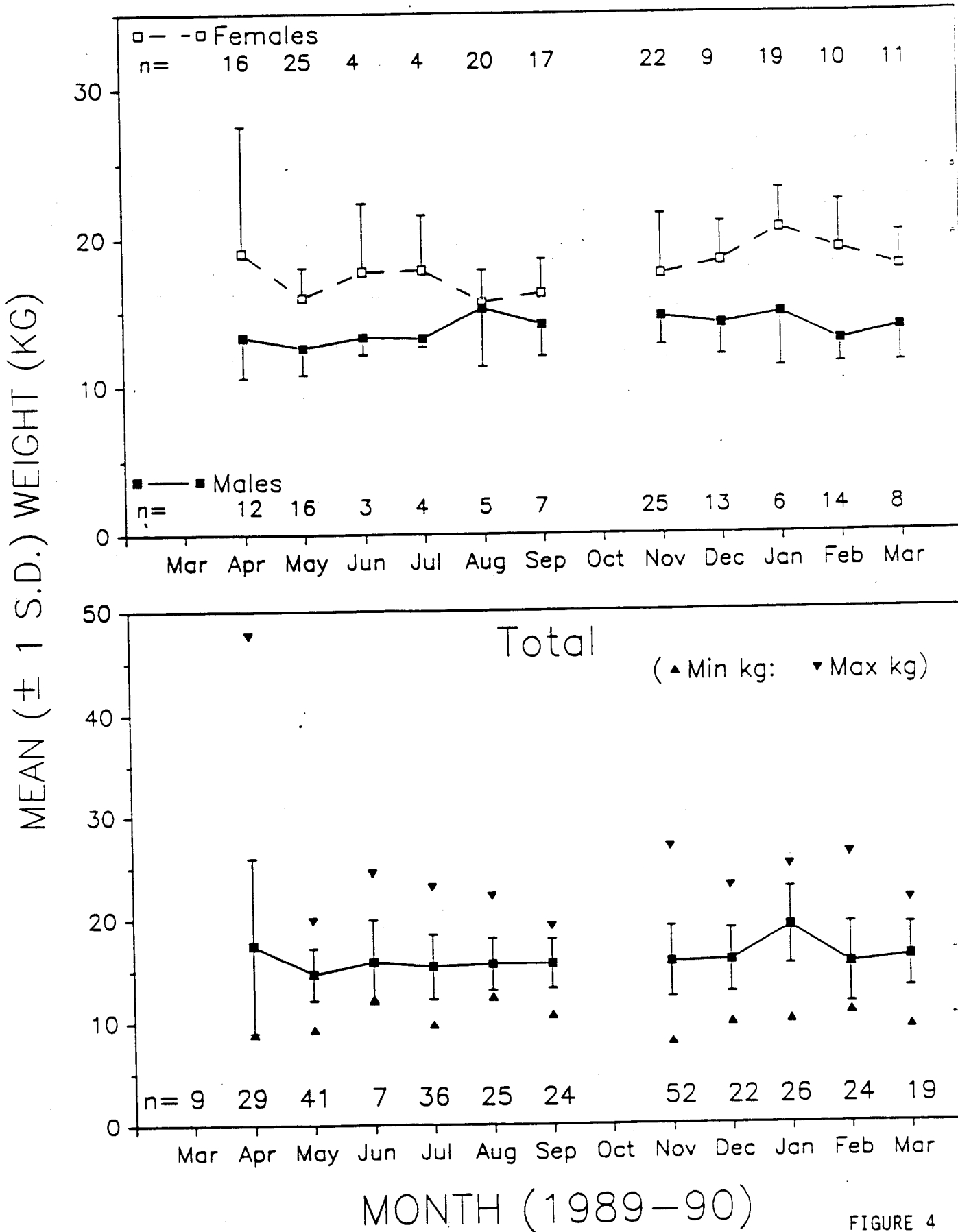
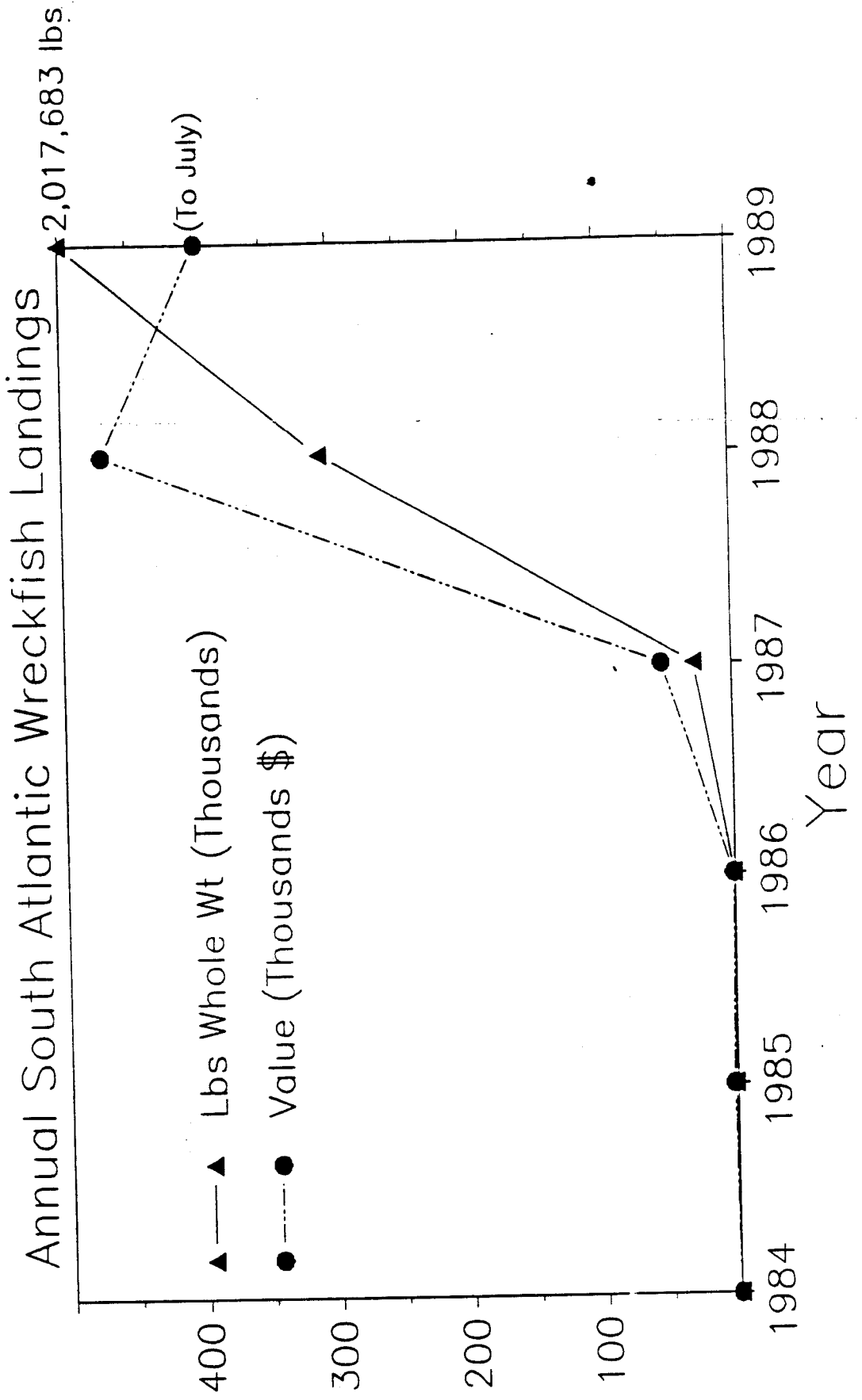
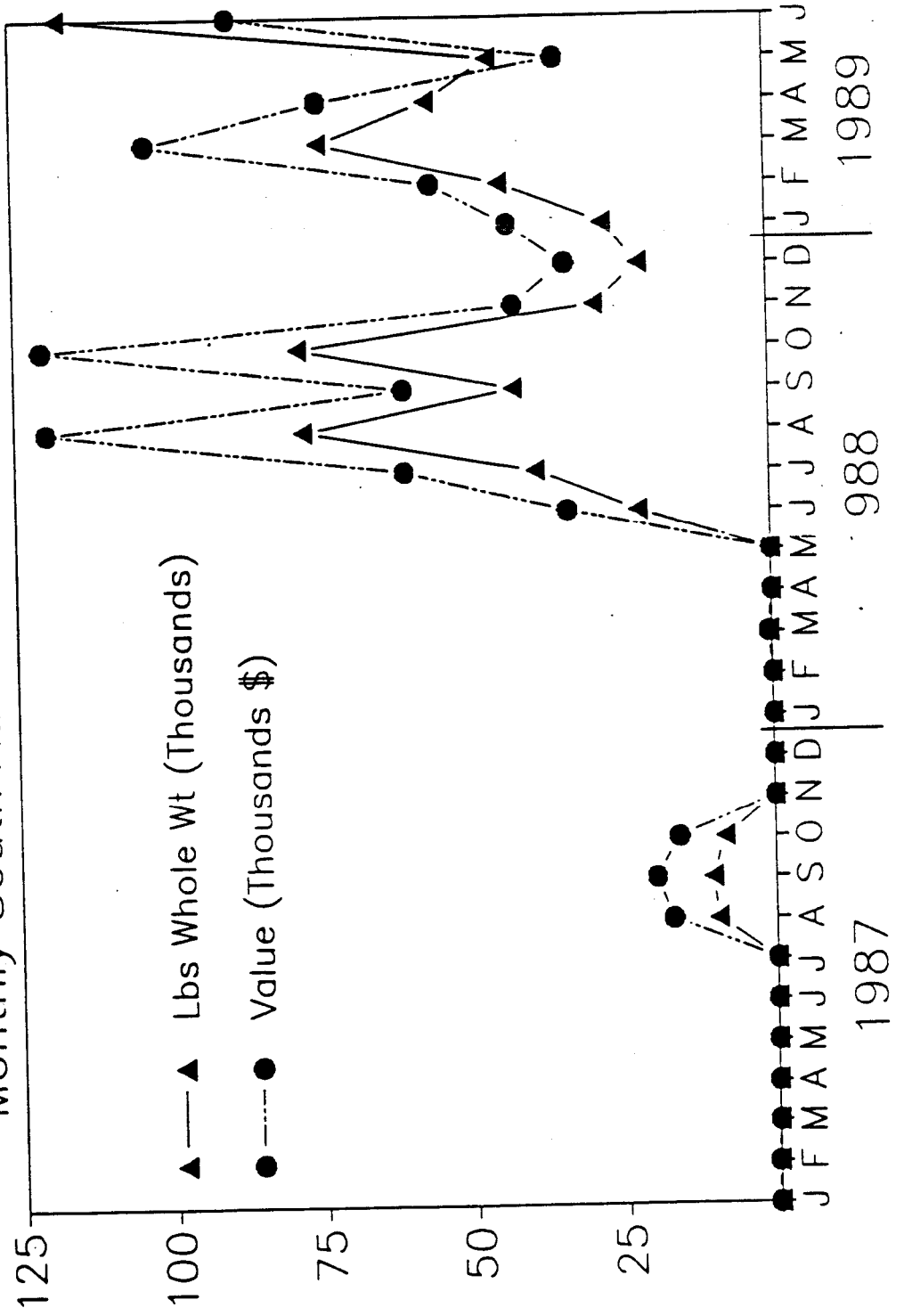


FIGURE 4



# Monthly South Atlantic Wreckfish Landings



# Monthly South Atlantic Wreckfish Landings

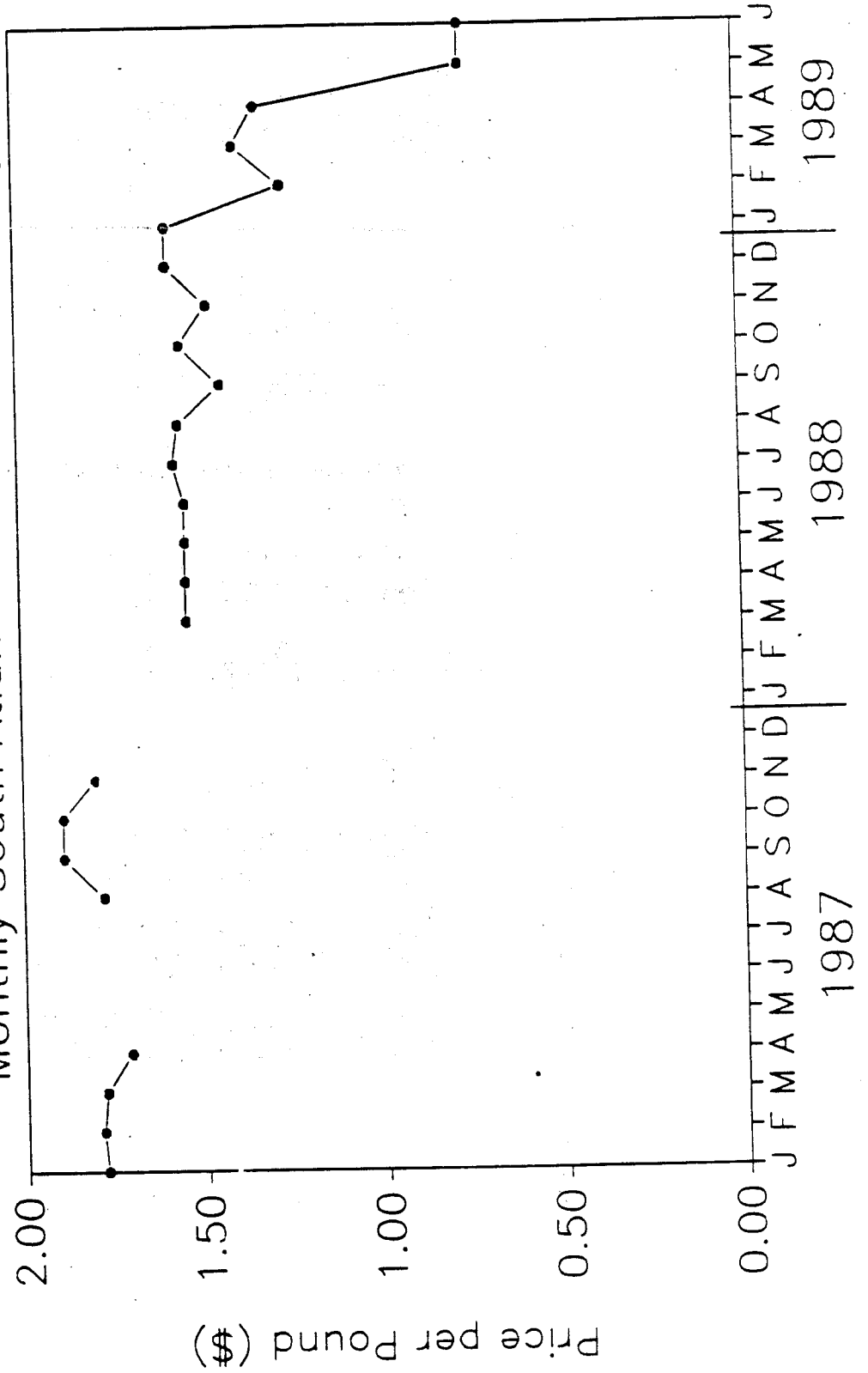


FIGURE 7

Monthly South Atlantic Wreckfish Landings (Jan 87 - Jun 89)

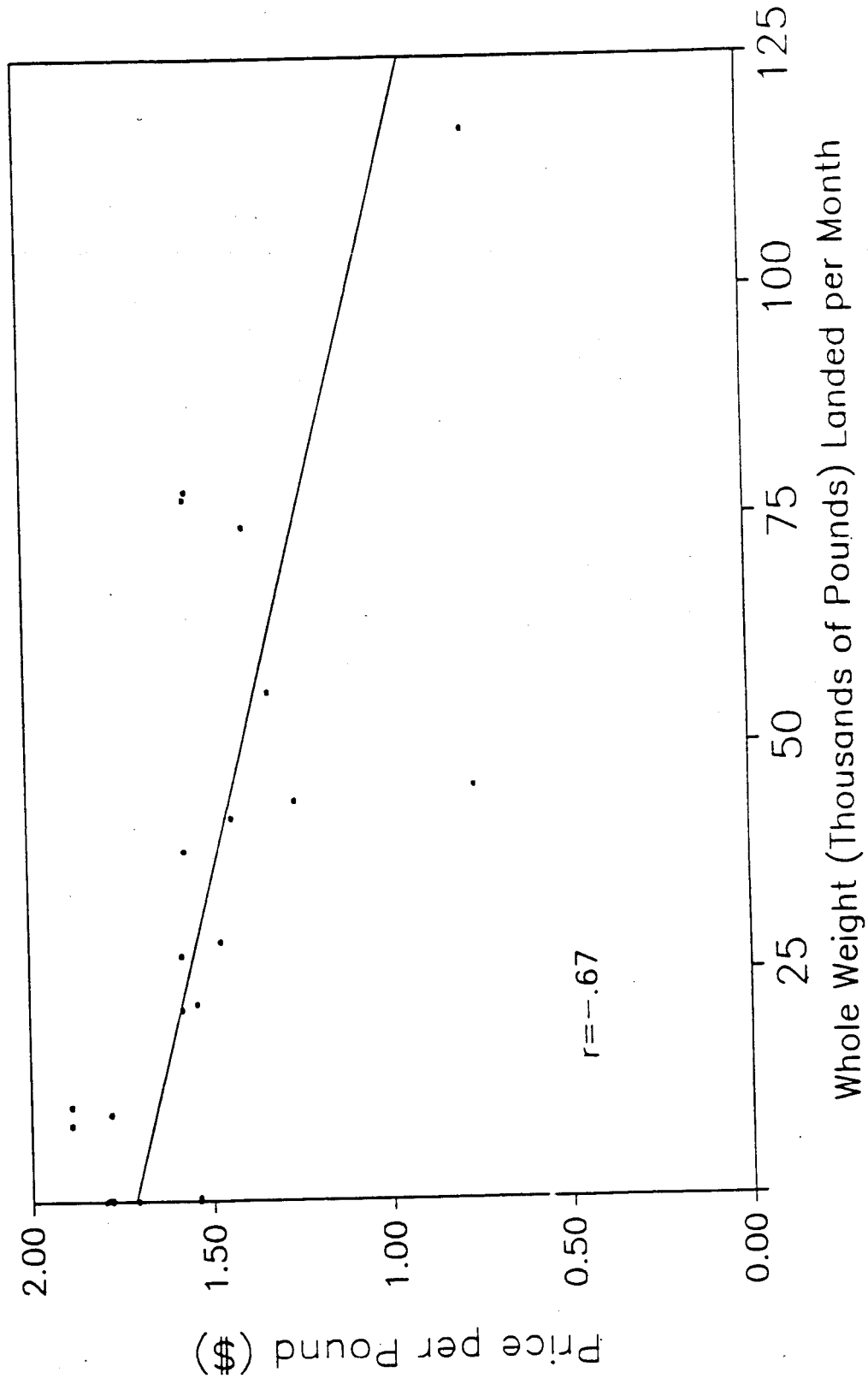
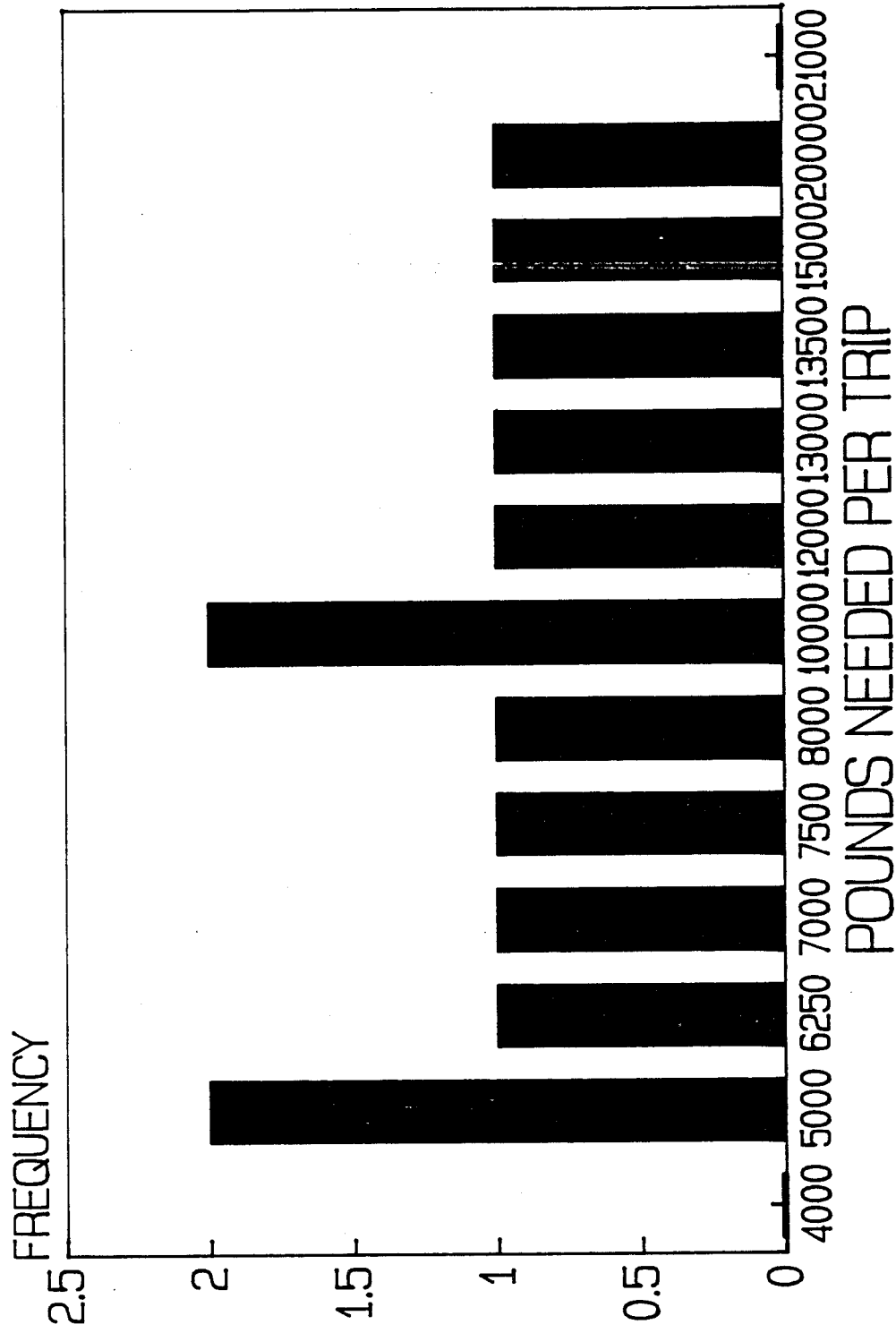


FIGURE 9 WRECKFISH POUNDS PER TRIP  
CATCH REPORTED NEEDED PER TRIP



MEDIAN=10,000 MEAN=10,173



# Appendix 1.

## WRECKFISH ECONOMIC INFORMATION

### Introduction

During the public hearings for jewfish and wreckfish, wreckfish fishermen in attendance were asked to voluntarily fill out a three page questionnaire to help us analyze some of the economic characteristics of the wreckfish fishery. The questionnaire inquired into the costs of rigging up for wreckfish, vessel catch and price information, revenues and costs per trip, bycatch, what fishery respondents left before wreckfish fishing, and other general descriptive information (a copy of the questionnaire is included at the end of this report). Respondents were asked not to identify themselves and confidential treatment of proprietary information was assured. The questionnaire was designed to be filled out by wreckfish captains who are most often vessel owners.

Descriptive statistics summarizing a portion of the information from this survey are presented in this report. Extensions of this information will be presented at the Snapper/ Grouper Committee session to illustrate how available management options may affect aggregate and vessel level profits in the wreckfish fishery as it develops.

### Response To The Questionnaire

A total of 15 cost and returns questionnaires were completed. In general, returned questionnaires appeared to be filled out carefully with few or no missing values. Respondents did not appear to have difficulty estimating cost information without access to their records.

It is difficult to evaluate the degree to which 15 returned questionnaires represents the fishery overall because we do not have a firm estimate of the total number of boats in the fishery at this time. Catch in 1989 reported in the 15 returned surveys totals 1,114,000 lbs dressed weight which is 55% of landings in 1989 based on NMFS statistics. For 1990 through March, 880,880 lbs can be accounted for from completed questionnaires which is 73% of NMFS reported landings in 1990. The above percentages indicate that the cost and returns survey either sampled most of the boats in the fishery, or alternatively, the survey sampled boats that account for most of production.

Whenever a survey is administered such that sampling is not strictly random, the potential for sample selection bias exists. The question boils down to whether those who returned the questionnaire can be used to develop a prototype of the typical wreckfish fisherman. One would expect a fisherman attending a public hearing and completing a questionnaire to be more involved in the fishery and probably more likely to be closely affected by management decisions. Given this tendency toward sampling more involved fishermen, there is clearly potential for selection bias to influence survey results, but this does not necessarily mean the survey results are invalid.

State and NMFS representatives attending the May 23-24 Wreckfish Review Group Meeting indicated that given the high percentage of reported landings accounted for in the survey and the description the survey results provide of the "typical" wreckfish fisherman, it is likely that survey respondents are above-average wreckfish fisherman. This should be kept in mind when reviewing the results and attempting to expand them to the case of the general wreckfish fisherman. As more information becomes available, it may be possible to systematically test for selection bias so that results can be expanded to the general case with more accuracy and confidence.

### Description Of Wreckfish Fishing From Questionnaire Data

Table I summarizes some descriptive information on boats and gear used for wreckfish fishing. Because some values are significantly above or below the center of the range, the median value is probably the best indicator of central tendency for each characteristic. Boat value is the value respondents reported they felt they could get if they sold their boat and wreckfish gear now. Catch needed is the pounds per trip that respondents felt they needed to catch to make the trip worthwhile.

Boats used for wreckfish fishing appear to be fairly new, the oldest reported to be 12 years old. Nearly all boats were made of fiberglass. The predominant type of wreckfish reel reported used was the "Miler" which looks like an oversized Bandit reel. Some boats use longline reels similar to those used for swordfish. A few boats report using homemade wreckfish reels and there appears to be some cost savings from making one's own reels. The majority of respondents stated that they were fishing for snappers and groupers prior to wreckfish. The next most frequent previous fishery was shrimp. A few respondents reported fishing for swordfish prior to wreckfish.

Note that there is a fairly wide range reported in catch per trip in 1990. Figure I looks at this dispersion in order to see whether there are many boats like the typical boat (via the statistics of central tendency) in terms of catch per trip. Factors that may account for this wide dispersion in catch per trip can be analyzed by statistical correlation tests. Table II is a portion of a correlation matrix showing the degree of simple (single) correlation between catch per trip (LBS90) and how long the fisherman has been in the wreckfish fishery (Entry), boat value, horsepower, vessel length, and number of wreckfish reels used. The strongest correlation is between catch per trip and the number of reels per boat suggesting that factor, above all, appears to play a role in determining which boats have bigger trips.

### Costs And Returns

Table III illustrates costs associated with wreckfish fishing. Variable costs are on a per trip basis. Crew share is the amount an owner pays in total to his crew (not figuring his own compensation for labor). Fixed Costs are on an annual basis except for boat loan payments which are monthly payments. These costs can be summed and subtracted from annual revenues to estimate annual net returns or profits to the captain assuming he is the vessel owner. This is done in the calculations below:

#### **Annual Revenues. Two ways to estimate:**

$$1) \text{ Catch per trip } \times \text{ number of trips } \times \text{ price per pound} \\ (8,000 \quad \times \quad 25 \quad \times \quad \$1.25 \quad = \quad \$250,000/\text{yr})$$

$$2) \text{ Annual reported catch (1989) } \times \text{ price per pound} \\ (150,000 \quad \times \quad \$1.25 \quad = \quad \$187,500/\text{yr})$$

Two methods were used to calculate annual revenues. The first uses average catch per trip x the annual number of trips x price per pound. The second uses reported annual catch per vessel x price per pound.

Depending on which annual revenue estimate is used, estimated profits vary. Costs to be subtracted are average variable costs times number of trips plus fixed costs. Number of trips per year here is 25, the median number for vessels that fished for the entire year in 1989. Using the two different annual revenue estimates, net returns to the captain/owner are \$35,450 to \$97,950 per year.

#### **Profits to Captain/Owner (total revenue - total cost)**

$$1) \quad \$250,000 - [(\$4,250/\text{trip} \times 25 \text{ trips}) + \$45,800] = \$97,950/\text{yr}$$

$$2) \quad \$187,500 - [(\$4,250/\text{trip} \times 25 \text{ trips}) + \$45,800] = \$35,450/\text{yr}$$

**TABLE I. GENERAL DESCRIPTION OF WRECKFISH FISHING  
FROM QUESTIONNAIRE DATA**

**VESSEL AND GEAR INFORMATION**

	<b>MEAN</b>	<b>MEDIAN</b>	<b>MIN</b>	<b>MAX</b>
vessel length(ft)	58	56	46	72
horsepower	389	365	240	1,070
year built	1981	1980	1978	1988
# crew	3	3	2	4
boat value(000s)	\$179	\$145	\$100	\$325
#reels	3	3	2	6
#trips 1989	18	20	1	29
#trips 1990	7	8	2	12
exvessel price	\$1.25	\$1.25	\$1.10	\$1.40
cost/reel	\$1,657	\$1,700	\$900	\$2,000
catch/trip(90)	9,833	8,000	3,000	25,000
catch needed	10,173	10,000	5,000	20,000
cost to rig	\$15,000	\$12,000	\$8,000	\$30,000

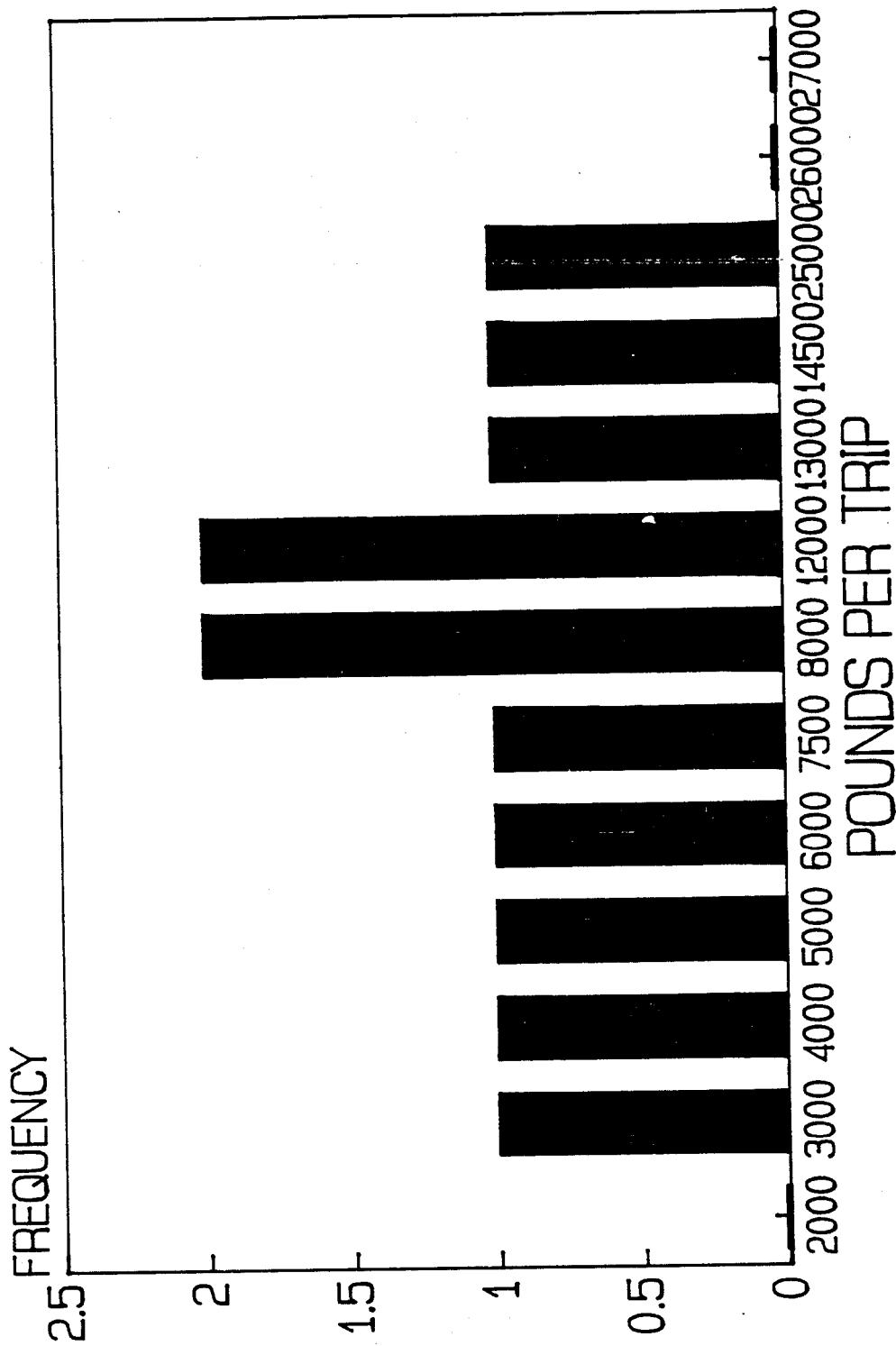
**TABLE II. CORRELATION ANALYSIS**

	<b>LBS90</b>	<b>REELS90</b>	<b>BOATVAL</b>	<b>ENTRY</b>	<b>HP</b>	<b>LENGTH</b>
<b>Pearson correlation coefficients with LBS90</b>	1.00000	0.67122	0.55410	-0.42992	-0.25321	-0.22185
<b>Prob. &gt;  R  under Ho: Rho=0</b>	0.0	0.0169	0.1968	0.1630	0.4271	0.4883
<b># observations</b>	12	12	7	12	12	12

**TABLE III. VARIABLE AND FIXED COSTS**

	<b>MEAN</b>	<b>MEDIAN</b>	<b>MIN</b>	<b>MAX</b>
<b>VARIABLE COSTS</b>				
fuel	\$900	\$1,000	\$500	\$1,400
crew share	\$3,288	\$2,000	\$1,125	\$9,990
ice	\$387	\$350	\$150	\$800
tackle	\$512	\$350	\$200	\$1,000
groceries	\$325	\$300	\$150	\$500
bait	\$302	\$250	\$200	\$900
<b>FIXED COSTS</b>				
boat loan/mon.	\$1,897	\$1,900	\$1,100	\$3,000
insurance	\$9,681	\$10,000	\$6,000	\$14,000
repairs(vessel)	\$18,800	\$10,000	\$2,000	\$100,000
repairs(gear)	\$3,277	\$3,000	\$500	\$10,000

FIGURE I. WRECKFISH POUNDS PER TRIP  
RANGE & DISTRIBUTION



MED=7750, +1STD DEV=13795, -1STD DEV=1750

## WRECKFISH QUESTIONNAIRE

### INSTRUCTIONS:

We need your help in collecting accurate information on fishing for wreckfish. The information you provide will give us a better understanding of how different management options might affect fishermen in the wreckfish fishery. Please fill out this survey carefully and give us your best estimates. This is an anonymous survey. Do not identify yourself or your vessel.

### I. Vessel Characteristics

length of vessel \_\_\_\_\_ feet  
horsepower \_\_\_\_\_ hp  
hull material \_\_\_\_\_  
year constructed \_\_\_\_\_  
# of crew members \_\_\_\_\_ (in addition to the captain)

### II. GEAR

Please check the box that describes your gear:

- bandit type reel                       longline type reel  
 homemade reel                               other (please describe)  
\_\_\_\_\_  
\_\_\_\_\_

How many reels did you fish in 1988? \_\_\_\_\_ reels  
in 1989? \_\_\_\_\_ reels  
so far in 1990? \_\_\_\_\_ reels

How much did your reels cost?  
\$ \_\_\_\_\_ /reel (purchase price)

If homemade reel, what did your reels cost?  
\$ \_\_\_\_\_ (cost of materials)  
\_\_\_\_\_ (# hours to build)

### III. WRECKFISH FISHING

What is your homeport? \_\_\_\_\_  
When did you first start fishing for wreckfish?  
year \_\_\_\_\_ month \_\_\_\_\_

How many wreckfish trips did you make in 1988? \_\_\_\_\_ trips  
in 1989? \_\_\_\_\_ trips  
so far in 1990? \_\_\_\_\_ trips

How many pounds of wreckfish did you land on an average trip  
(gutted weight) in 1988? \_\_\_\_\_ lbs/trip  
in 1989? \_\_\_\_\_ lbs/trip  
so far in 1990? \_\_\_\_\_ lbs/trip

What was the average price you got per pound (gutted weight)  
for wreckfish in 1988? \$ \_\_\_\_\_ /lbs  
in 1989? \$ \_\_\_\_\_ /lbs  
so far in 1990? \$ \_\_\_\_\_ /lbs

Roughly how many pounds of wreckfish did you land overall  
in 1988? \_\_\_\_\_ lbs  
in 1989? \_\_\_\_\_ lbs  
so far in 1990? \_\_\_\_\_ lbs

What percentage was wreckfish of your total landings from all  
commercial fishing in 1988? \_\_\_\_\_ %  
in 1989? \_\_\_\_\_ %  
so far in 1990? \_\_\_\_\_ %

What other species did you catch on wreckfish trips? (please  
list in order of most frequent to least frequent)

- 1) \_\_\_\_\_ approximate lbs/trip \_\_\_\_\_
- 2) \_\_\_\_\_ approximate lbs/trip \_\_\_\_\_
- 3) \_\_\_\_\_ approximate lbs/trip \_\_\_\_\_

What price per pound do you get for these if you sell them?

- 1) \$ \_\_\_\_\_ /lb (price for species 1 above)
- 2) \$ \_\_\_\_\_ /lb (price for species 2 above)
- 3) \$ \_\_\_\_\_ /lb (price for species 3 above)

Are you fishing wreckfish year round now or for part of the  
year?

- year round                       part year

If part of the year, what else are your fishing for? (please  
list) \_\_\_\_\_  
\_\_\_\_\_

What were you fishing for before you started fishing wreckfish?  
(please list)  
\_\_\_\_\_  
\_\_\_\_\_

Roughly how much did it cost you to rig for wreckfish?  
\$ \_\_\_\_\_

How many pounds of wreckfish do you need to catch on a trip to  
make the trip worthwhile? \_\_\_\_\_



**IV. OPERATING COSTS PER TRIP**

(Please estimate your expenses on an average trip this year)

fuel \$ \_\_\_\_\_/trip  
bait \$ \_\_\_\_\_/trip  
crew wage or share \$ \_\_\_\_\_/trip  
(for crew overall, excluding captain)  
groceries \$ \_\_\_\_\_/trip  
ice \$ \_\_\_\_\_/trip  
unloading fee \$ \_\_\_\_\_/trip  
other \$ \_\_\_\_\_/trip

please describe "other" \_\_\_\_\_

**V. FIXED COSTS**

vessel repairs \$ \_\_\_\_\_/year  
gear repairs \$ \_\_\_\_\_/year  
insurance \$ \_\_\_\_\_/year  
dockage \$ \_\_\_\_\_/year  
boat loan payment \$ \_\_\_\_\_/month  
gear loan payment \$ \_\_\_\_\_/month  
other \$ \_\_\_\_\_/year

please describe "other" \_\_\_\_\_

VI. If you wanted to sell your boat and wreckfish gear, what do you think you could get for it right now? \$ \_\_\_\_\_

VII. Are there any general comments or management recommendations you want to give to the Council?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_