Appendix A. Alternative Considered but Eliminated from Detailed Analyses

Action: Redistribute reverted shares to remaining shareholders.
Alternative 5: Redistribute reverted shares equally among all remaining shareholders.

Discussion: Because landings history and share holdings are highly varied in the wreckfish fishery, the South Atlantic Council chose to consider only alternatives that would incorporate these factors into the redistribution method. Specifically, the South Atlantic Council discussed that there were permit holders who had not reported wreckfish landings in several years, and also that two individuals had recently purchased wreckfish shares but did not have long-term landings. The South Atlantic Council selected landings history and share holdings, both of which vary significantly among the shareholders, as the primary considerations for defining inactive shares and for redistribution among remaining shareholders in order to adequately address concerns of active participants in the fishery.

Appendix B. Regulatory Impact Review

1.1 Introduction

The National Marine Fisheries Service requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: 1) provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; 2) provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, 3) ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the proposed regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866 and provides some information that may be used in conducting an analysis of impacts on small business entities pursuant to the Regulatory Flexibility Act (RFA). This RIR analyzes the impacts that the proposed management alternatives in this interim rule would be expected to have on the snapper grouper fishery.

1.2 Problems and Objectives

The problems and objectives addressed by this action are discussed in **Section 1.2** of this document and are incorporated herein by reference. In summary, management measures considered in this regulatory action are intended to achieve optimum yield in the commercial wreckfish sector of the South Atlantic snapper grouper fishery in accordance with National Standard 1 of the Magnuson-Stevens Act, which will in turn result in a more efficient use of the species in accordance with National Standard 5. Establishment of a share cap is necessary to comply with requirements for limited access privilege programs under Section 303A of the Magnuson-Stevens Act.

1.3 Description of Fisheries

A description of the commercial wreckfish sector of the South Atlantic snapper grouper fishery is provided in Section 3 of this document and is incorporated herein by reference.

1.4 Impacts of Management Measures

1.4.1 Action 1: Define and revert inactive wreckfish shares

A detailed analysis of the economic effects expected to result from this action is provided in **Section 4.1.2** and is incorporated herein by reference. Under **Alternative 3 (Preferred)**, 28.18% of the quota shares would be defined as inactive and reverted for redistribution to shareholders determined to be active. By definition, the 13 inactive shareholders would not incur any losses in wreckfish landings or gross revenue. Most of these shareholders (11) have not been active in commercial fishing during the past five fishing years. However, two of these inactive shareholders did have commercial landings and gross revenue of other species between 2006 and 2010. The extent to which these shareholders were involved in other fisheries differs greatly, as one was only minimally involved and the other significantly

involved in commercial fishing for other species. The loss of wreckfish shares under **Alternative 3 (Preferred)** is not expected to affect the current operations of these two shareholders' vessels, though it would take away the option of fishing for wreckfish in the future. Technically, the loss of shares would also prevent these shareholders from leasing their coupons. However, as no coupons have been leased by any shareholder since 1995, this loss is not considered to be "real" economically and is therefore discounted.

The loss of quota share to these 13 shareholders is estimated to be valued at approximately $180,600, or about $13,890 per shareholder. If the median quota share per shareholder is used, then the "average" loss per shareholder would be approximately $11,494. These losses represent a loss in asset value or wealth as opposed to profits or income. Because information on these shareholders' wealth is not available, it is not possible to determine the economic significance of these losses to them.

The seven active shareholders would not experience any direct economic effects under **Alternative 3 (Preferred),** but would be expected to economically benefit indirectly since the intent of this alternative is to redistribute the inactive shares to the active shareholders. The active shareholders would not only benefit from the increased value of their assets, but would also benefit due to the expected increase in their wreckfish landings, gross revenue, and profits, relative to **Alternative 1 (No Action)**. In turn, the eight vessels used by these shareholders to harvest their annual allocations would also benefit because of the expected increase in their wreckfish landings and gross revenue. Under **Alternative 3 (Preferred)**, active shareholders from South Carolina control approximately 40% of the total shares held by all active shareholders while active shareholders from Florida control about 60% of the total shares held by all active shareholders. The geographic distribution of these benefits will approximate the geographic distribution of the shares.

Similarly, the five active dealers who bought wreckfish in 2010 would also be expected to experience indirect economic benefits under **Alternative 3 (Preferred)**, as their sales of wreckfish would be expected to increase relative to what they would be under **Alternative 1 (No Action)**. **Alternative 3 (Preferred)** will also affect the distribution of benefits across dealers. In order to avoid disclosing confidential information, the nature of these distributional effects is only discussed in geographical terms. Specifically, the primary effect of **Alternative 3 (Preferred)** would be to shift landings and sales of wreckfish between dealers in Florida and dealers in South Carolina. In recent years, approximately 80% of landings and sales of wreckfish have occurred in South Carolina with the other 20% occurring in Florida. In general, active shareholders sell to dealers in the state from which they operate. Thus, the geographic distribution of active shareholders generally predicts the geographic distribution of the landings and sales of wreckfish. Given that approximately 40% of the shares held by active shareholders operate from South Carolina while the other 60% is held by active shareholders operating from Florida under **Alternative 3 (Preferred)**, a shift in the distribution of landings and sales of wreckfish from South Carolina to Florida dealers would likely occur.

1.4.2 Action 2: Redistribute reverted shares to remaining shareholders

Under **Alternative 3b (Preferred),** the distribution of additional and final shares between the seven remaining active shareholders is rather unequal as reflected by the fact that the minimum additional (i.e., redistributed) and final shares for any active shareholder occurs under this alternative and the differences between the median and mean additional and final shares, and in turn the standard deviations, are relatively large. More specifically, two of these shareholders would receive .04% and .06% in additional shares respectively, two of these shareholders would receive approximately 1.4% and 2.4% in additional shares respectively, one shareholder would receive slightly more than 5% in additional shares, while the other two shareholders would receive approximately 9.3% and 9.9% in additional shares respectively. These results are driven by the fact that the distribution of landings among active shareholders is unequally distributed in general and much more so relative to the distribution of shares among active shareholders. After redistribution, the final distribution of shares across the seven active shareholders is as follows: 3.55%, 9.05%, 11.24%, 11.62%, 18.38%, 23%, and 23.16%. Thus, the maximum amount of shares held by a single shareholder is 23.16%.

Even though the distribution of additional shares is rather unequal, all active shareholders would receive some economic benefits under **Alternative 3b (Preferred)**. In the short-term, increases in economic benefits would take the form of an increase in annual gross revenue. These increases would directly depend on the increase in each shareholder's annual allocation of wreckfish, which is in turn derived from the increase in wreckfish shares. It is assumed that active shareholders would harvest all of their annual allocation, which is reasonable given the significant reduction in the commercial quota due to actions in the Comprehensive ACL Amendment. Because the distribution of additional shares is highly unequal, so is the distribution of short-term economic benefits. Specifically, the increase in annual allocation for each active shareholder ranges from 86 pounds to 22,114 pounds, or by approximately 8,986 pounds on average. In turn, the expected change in annual gross revenue from wreckfish landings for all active shareholders is approximately $186,220. On a per shareholder basis, the increase ranges from $257 to $65,457, or by approximately $26,603 on average. This increase in shareholders' gross revenue from wreckfish landings represents an increase of approximately 15.4% in gross revenue from all of their commercial fishing activities on average.

In the long-term, these economic benefits are in the form of an increase in the value of each shareholder's shares, which would increase according to the amount of additional shares each shareholder receives under each alternative. The market value of a 1% share is estimated to be $6,407. Because the distribution of additional shares is highly unequal, so is the distribution of long-term economic benefits. Specifically, the expected change in the total value of shareholders' shares is approximately $180,600, which is equivalent to the value of the shares lost by inactive shareholders under **Action 1**. On a per shareholder basis, the increase ranges from $249 to $63,465, or by approximately $13,890 on average.

Some of the active shareholders are corporations. A few of these corporations are partly or wholly owned by individuals who partly or wholly own other shareholdings. When taken in

combination of **Action 1** and **Action 2**, there are only six individuals that will own wreckfish shares. Moreover, when viewed from the perspective of individuals, the distribution of final shares is even more unequal, and the concentration of shares is therefore greater. Specifically, the final distribution of shares across these six individuals is as follows: 3.55%, 5.70%, 9.05%, 11.24%, 28.93%, and 41.54%. Thus, the maximum amount of shares held by a single individual is 41.54%.

The U.S. Department of Justice (DOJ), the Federal Trade Commission (FTC), and state attorneys general have used the Herfindahl-Hirschman Index (HHI) to measure market concentration for purposes of antitrust enforcement. According to their guidelines, these agencies consider a market in which the post-merger HHI is below 1500 as "unconcentrated," between 1500 and 2500 as "moderately concentrated," and above 2500 as "highly concentrated." Given that the HHI is currently 1,433 in the commercial wreckfish component of the snapper grouper fishery, it is “unconcentrated” according to the DOJ/FTC guidelines. However, it is just below the threshold for “moderately concentrated.” The combination of **Action 1** and **Action 2** increases the HHI to 2,442, representing an increase of more than 1,000, which moves the commercial wreckfish sector into the “moderately concentrated” category. In effect, **Action 1** and **Action 2** create a merger between the active and inactive shareholders. A merger raises potential "significant competitive concerns" if it produces an increase in the HHI of more than 100 points in a moderately concentrated market or between 100 and 200 points in a highly concentrated market. A merger is presumed "likely to enhance market power" if it produces an increase in the HHI of more than 200 points in a highly concentrated market. Thus, **Action 1** and **Action 2** in combination are likely to reduce competition and enhance market power in the market for wreckfish quota shares.

1.4.3 Action 3: Establish a share cap

Alternative 4 (Preferred) would establish a 49% share cap. Since the maximum amount of shares owned by a single individual is 41.54% under the combination of **Action 1** and **Action 2**, no individuals would exceed the share cap and thus no individual would possess excess shares that could be subject to further redistribution. As such, **Action 3** is not currently binding and thus is not expected to generate any direct economic effects on active shareholders at the present time. However, it does preclude active shareholders from purchasing additional shares greater than the difference between their final shares, as determined under the combination of **Action 1** and **Action 2**, and the 49% share cap. For example, the individual with the maximum amount of shares could only purchase an additional 7.46% of the shares, even if he wanted to purchase more in order to maintain his recent level of wreckfish landings and gross revenue. Thus, **Action 3** may generate some indirect economic effects on active shareholders who want to own shares above the share cap.

1.4.4 Action 4: Establish an appeals process

Alternative 2 (Preferred) would establish an appeals process. Under **Alternative 2 (Preferred)**, the RA would have sole authority with respect to reviewing, evaluating, and rendering final decisions on appeals. In general, it is expected that appeals would be

resolved in a more timely and less costly manner if fewer people are involved in the decision making process. Thus, adverse economic effects are expected to be minimal and possibly trivial under **Alternative 2 (Preferred)**.

Alternative 2 (Preferred) facilitates the implementation of the quota share redistribution process by reducing any adverse effects of the appeals process on active shareholders. At the same time, in the event many appeals are settled in favor of shareholders, it also helps to ensure the commercial wreckfish quota would not be exceeded in the first fishing year following redistribution of the quota shares. Setting aside a relatively small portion of quota shares for appeals purposes limits the likelihood of major share adjustments. Small reductions would be more economically acceptable than large reductions in allocations (i.e., coupons) to active shareholders during the first fishing year following redistribution of the quota shares. An appeals process reduces the probability that shareholders presumed to be inactive might pursue legal action, which could delay redistribution of the quota shares and generate adverse economic effects on active shareholders by keeping them at their current level of shares.

With the exception of the administrative costs and potential costs associated with a potential delay in implementation, the establishment of an appeals process and the design of its structure have mainly equity effects. While equity considerations are important, they have less significance in determining the economic effects of restructuring an IFQ program. Thus, neither the appeals process nor its structure is expected to have a noticeable effect on the overall economic benefits associated with restructuring the IFQ program. This is particularly true when an appeals process would only marginally affect the distribution of quota shares among eligible (i.e., active) participants. Economic changes would only be evident if the number of successful appeals from inactive shareholders were large compared to the number of active shareholders. Given that there are only 20 wreckfish shareholders, of which no more than 13 are presumably inactive, the number of appeals is expected to be small and the number of successful appeals even smaller.

The amount of quota to be set aside for appeals would be 5%, or 11,163 pounds, under **Sub-alternative 2b (Preferred)**. A set aside of 11,163 pounds was determined to be large enough to meet the expected number of appeals, but also small enough to avoid creating adverse economic effects on active shareholders, as this poundage would be withheld in the early part of the fishing year when effort is relatively high.

1.4.5 Economic Impacts

By defining 28.18% of the quota shares as inactive and redistributing those shares to active shareholders, the combination of Action 1 and Action 2 is expected to increase annual gross revenue by approximately $186,220, assuming active shareholders harvest all of their annual wreckfish allocation.

This increase in gross revenue will in turn generate economic impacts for seafood dealers, restaurants, and other onshore businesses. The estimated economic impacts are presented in **Table B-1**. According to the information in this table, the expected increase in annual gross

revenue is expected to increase employment, income, and output by 35 jobs, $1.045 million, and $2.452 million, respectively.

Table B-1. Summary of Commercial Economic Impacts**.**

Industry Sector	Direct	Indirect	Induced	Total
Harvesters				
Employment impacts (FTE jobs)	3	0	1	5
Income Impacts (000 of dollars)	75	21	57	154
Output Impacts (000 of dollars)	139	75	185	399
Primary dealers/processors				
Employment impacts (FTE jobs)	1	0	1	3
Income Impacts (000 of dollars)	49	17	63	129
Output Impacts (000 of dollars)	139	58	205	402
Secondary wholesalers/distributors				
Employment impacts (FTE jobs)	1	0	1	2
Income Impacts (000 of dollars)	68	11	47	126
Output Impacts (000 of dollars)	108	37	151	296
Grocers				
Employment impacts (FTE jobs)	1	0	0	1
Income Impacts (000 of dollars)	29	3	20	53
Output Impacts (000 of dollars)	40	10	64	114
Restaurants				
Employment impacts (FTE jobs)	18	1	5	24
Income Impacts (000 of dollars)	331	30	223	583
Output Impacts (000 of dollars)	432	89	719	1,240
Harvesters and seafood industry				
Employment impacts (FTE jobs)	24	1	9	35
Income Impacts (000 of dollars)	552	82	410	1,045
Output Impacts (000 of dollars)	858	270	1,324	2,452

Data Source: SERO using SEFSC wreckfish logbook

1.5 Public and Private Costs of Regulations

The preparation, implementation, enforcement, and monitoring of this or any federal action involves the expenditure of public and private resources that can be expressed as costs associated with the regulations. Costs associated with this specific action would include:

Council costs of document preparation, meetings, public hearings, and information dissemination……..$140,000

NMFS administrative costs of document preparation, meetings, and review…….....$80,000

TOTAL……...$220,000

The Council and Federal costs of document preparation are based on staff time, travel, printing, and any other relevant items where funds were expended directly for this specific

action. There are no permit requirements proposed in this rule. Under a fixed budget, any additional enforcement activity due to the adoption of this rule would mean a redirection of resources to enforce the new measures.

1.6 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: 1) An annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities; 2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; 3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or 4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order. Based on the information provided above, this action has been determined to not be economically significant for purposes of E.O. 12866.

Appendix C. Regulatory Flexibility Analysis

1.1 Introduction

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct an initial regulatory flexibility analysis (IRFA) for each proposed rule. The IRFA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. An IRFA is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." In addition to analyses conducted for the RIR, the IRFA provides: 1) A description of the reasons why action by the agency is being considered; 2) a succinct statement of the objectives of, and legal basis for, the proposed rule; 3) a description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply; 4) a description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and, 5) an identification, to the extent practicable, of all relevant federal rules, which may duplicate, overlap, or conflict with the proposed rule.

1.2 Statement of the need for, objectives of, and legal basis for the rule

A discussion of the reasons why action by the agency is being considered is provided in **Section 1.2** of this document. In summary, the purposes of this proposed rule are to define and revert inactive shares, redistribute reverted shares to remaining, active shareholders, establish a share cap, and establish an appeals process. The objectives of this proposed rule are to achieve optimum yield in the commercial wreckfish sector of the South Atlantic snapper grouper fishery in accordance with National Standard 1 of the Magnuson-Stevens Act, which will in turn result in a more efficient use of the species in accordance with National Standard 5. Establishment of a share cap is necessary to comply with requirements for limited access privilege programs under Section 303A of the Magnuson-Stevens Act.

1.3 Description and estimate of the number of small entities to which the proposed action would apply

This proposed rule is expected to directly affect shareholders that possess quota shares in the commercial wreckfish sector of the snapper grouper fishery. The Small Business Administration (SBA) has established size criteria for all major industry sectors in the U.S. including fish harvesters. A business involved in fish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $4.0 million (NAICS code 114111, finfish fishing) for all its affiliated operations worldwide.

As of November, 17, 2011, there were 20 shareholders in the commercial wreckfish sector of the snapper grouper fishery. The current minimum quota share held by a shareholder is 0.06%, the maximum quota share is 20.63%, and the average quota share is approximately 5%. With respect to the distribution of shares, 13 shareholders own less than 5%, four shareholders own between 5% and 10%, two shareholders own between 10% and 15%, and one shareholder owns more than 20% of the quota shares. Given that the current market value of a 1% share is $6,407, the minimum market value of a shareholder's quota shares is $384, the maximum market value of a shareholder's quota shares is approximately $132,176, while the average market value of a shareholder's quota shares is approximately $32,035.

Based on landings data from the five most recent fishing years (i.e., 2006/2007 to 2010/2011), 13 of the 20 shareholders had no commercial wreckfish landings during this time. Further, 11 of the 13 inactive shareholders were not commercially active in any fisheries, and thus earned no gross revenue or profit from commercial fishing activities, between 2006 and 2010. The other two inactive shareholders commercially harvested species other than wreckfish during this time. The extent to which these two shareholders were involved in other commercial harvesting activities differs greatly, as one was only minimally involved and the other significantly involved in such activities. Specific information regarding their landings and gross revenue is confidential and thus cannot be provided, while information regarding their profits is currently not available.

Seven of the 20 shareholders had at least one pound of commercial wreckfish landings during the five most recent fishing years. More specifically, annual wreckfish landings and gross revenue were 32,804 pounds and $82,085 on average during this time, respectively. On average, these shareholders also earned $90,582 in annual gross revenue from other species during this time. Thus, annual gross revenue from commercial fishing was $172,668 per shareholder on average during the five most recent fishing years. Information regarding these shareholder's profits is not currently available. The maximum gross revenue earned by a single shareholder in any of the five most recent fishing years is confidential information and cannot be reported. However, this figure is less than the SBA threshold for a small business. Based on these figures, all shareholders expected to be directly affected by this proposed rule are determined for the purpose of this analysis to be small business entities.

1.4 Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

This proposed rule would not establish any new reporting, record-keeping, or other compliance requirements.

1.5 Identification of all relevant federal rules, which may duplicate, overlap or conflict with the proposed rule

No duplicative, overlapping, or conflicting federal rules have been identified.

1.6 Significance of economic impacts on small entities

Substantial number criterion

This proposed rule, if implemented, would be expected to directly affect all entities that possess quota shares in the commercial wreckfish sector of the snapper grouper fishery. All affected entities have been determined, for the purpose of this analysis, to be small entities. Therefore, it is determined that the proposed rule will affect a substantial number of small entities.

Significant economic impacts

The outcome of "significant economic impact" can be ascertained by examining two factors: disproportionality and profitability.

Disproportionality: Do the regulations place a substantial number of small entities at a significant competitive disadvantage to large entities?

All entities expected to be directly affected by the measures in this proposed rule are determined for the purpose of this analysis to be small business entities, so the issue of disproportionality does not arise in the present case.

Profitability: Do the regulations significantly reduce profits for a substantial number of small entities?

For the action to define and revert inactive shares, 28.18% of the quota shares would be defined as inactive and reverted for redistribution to shareholders determined to be active. By definition, the 13 inactive shareholders possessing these quota shares would not incur any losses in wreckfish landings or gross revenue. Eleven of these inactive shareholders had no commercial landings of any species between 2006 and 2010 and thus have no gross revenue or profits from commercial fishing. As such, this action would not reduce their profits from

commercial fishing. The other two inactive shareholders did have commercial landings and gross revenue of other species between 2006 and 2010. Because all of their landings, gross revenue, and thus profit come from the commercial harvest of species other than wreckfish, the loss of wreckfish shares under this action is not expected to affect the current operations of these two shareholders' vessels, though it would take away the option of fishing for wreckfish in the future. The loss of shares would also prevent the inactive shareholders from leasing their annual allocation of wreckfish coupons. However, as no coupons have been leased by any shareholder since 1995, no loss in profits is expected. The loss of quota share to these 13 inactive shareholders is estimated to be valued at approximately $180,600, or about $13,890 per shareholder. However, these losses represent a loss in asset value or wealth rather than a loss in profits.

For the action to redistribute reverted shares to remaining shareholders, the seven active shareholders would receive .04%, .06%, 1.43%, 2.37%, 5.07%, 9.3%, and 9.9% in additional shares, respectively. After redistribution, the final distribution of shares across the seven active shareholders would be: 3.55%, 9.05%, 11.24%, 11.62%, 18.38%, 23%, and 23.16%, respectively. Even though the distribution of additional shares is rather unequal, all active shareholders would receive some economic benefits. With respect to short-term economic benefits, the increase in annual allocation for each active shareholder ranges from 86 pounds to 22,114 pounds, or by approximately 8,986 pounds on average. In turn, the expected increase in annual gross revenue from wreckfish landings ranges from $257 to $65,457 per shareholder, or by approximately $26,603 on average. This increase in shareholders' gross revenue from wreckfish landings represents an increase of approximately 15.4% in gross revenue from all of their commercial fishing activities on average. Thus, this action would be expected to increase the profits of the seven active shareholders relative to the profits they would earn if the reverted shares were not redistributed. With respect to long-term economic benefits, the expected increase in the total value of shareholders' shares is approximately $180,600. On a per shareholder basis, the increase in the value of each shareholder's shares ranges from $249 to $63,465, or by approximately $13,890 on average. These gains represent an increase in asset value or wealth rather than an increase in profits.

For the action to establish a 49% share cap, share caps are applied at the individual rather than the shareholder level. The maximum quota share held by an individual as a result of the actions to define and revert inactive shares and redistribute those shares is 41.54%. Thus, no individuals would exceed the 49% share cap and, in turn, no individual would possess excess shares that would be subject to further redistribution. As a result, no direct, adverse economic effects are expected and profits would not be reduced.

For the action to establish an appeals process, because the RA would have sole authority with respect to reviewing, evaluating, and rendering final decisions on appeals, the cost to a shareholder for filing an appeal is expected to be minimal. Further, the set aside of 11,163 pounds to resolve appeals is likely small enough to avoid creating any adverse economic effects on active shareholders.

As a result of the information above, a reduction in profits for a substantial number of small entities would not be expected.

1.7 Description of significant alternatives to the proposed action and discussion of how the alternatives attempt to minimize economic impacts on small entities

This proposed action, if implemented, would not be expected to have a significant direct adverse economic effect on the profits of a substantial number of small entities. As a result, the issue of significant alternatives is not relevant.

Appendix D. Bycatch Practicability Analysis

Bycatch is defined as fish harvested in a fishery, but not sold or retained for personal use. This definition includes both economic and regulatory discards and excludes fish released alive under a recreational catch-and-release fishery management program. Economic discards are generally undesirable from a market perspective because of their species, size, sex, and/or other characteristics. Regulatory discards are fish required by regulation to be discarded, but also include fish that may be retained but not sold.

Agency guidance provided at 50 CFR 600.350(d)(3) identifies ten factors to consider in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable. These are:

1. Population effects for the bycatch species;
2. Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);
3. Changes in the bycatch of other species of fish and the resulting population and ecosystem effects;
4. Effects on marine mammals and birds;
5. Changes in fishing, processing, disposal, and marketing costs;
6. Changes in fishing practices and behavior of fishermen;
7. Changes in research, administration, and enforcement costs and management effectiveness;
8. Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;
9. Changes in the distribution of benefits and costs; and
10. Social effects.

The Councils are encouraged to adhere to the precautionary approach outlined in Article 6.5 of the Food and Agriculture Organization of the United Nations Code of Conduct for Responsible Fisheries when uncertain about these factors.

The commercial fishery for wreckfish (*Polyprion americanus*) occurs over a complex bottom feature that has over 100 m of topographic relief, known as the Charleston Bump, that is located 130-160 km southeast of Charleston, South Carolina, off the southeastern United States (Sedberry et al. 2001). Fishing occurs at water depths of 450-600 m. Vertical hook-and-line gear consisting of 1/8 inch cable and a terminal rig (around 23 kg of weight), with 8-12 hooks baited with squid, is deployed from hydraulic reels to target wreckfish.

There is limited information on bycatch in the wreckfish portion of the snapper grouper fishery; however, the mortality rate of any released wreckfish is likely to be 100%, because the fish are typically harvested in waters deeper than 300 m (Machias et al. 2003; NMFS 2001; SAFMC 1991). In the wreckfish commercial fishery, barrelfish (*Hyperoglyphe perciformes*) and red bream (*Beryx decadactylus*) are caught incidental to wreckfish (Friess and Sedberry 2011;

Goldman and Sedberry 2011) and are likely sold or used for personal consumption. Goldman and Sedberry (2011) reports other species caught by commercial wreckfish fishermen on vertical lines with baited hooks from 400 to 800 m depth, on and around Charleston Bump include: splendid alfonsino (*Beryx splendens*), conger eel (*Conger oceanicus*), gulper shark (*Centrophorus granulosus*), roughskin dogfish (*Cirrhigaleus asper*), and shortspine dogfish (*Squalus mitsukurii*). It is unknown if all these species are retained by commercial wreckfish fishermen. Red bream landings in the southeastern United States are not currently monitored, and the species is not under federal management since it is caught in very small numbers in the commercial wreckfish portion of the snapper grouper fishery (Friess and Sedberry 2011).

Because of the depth at which the wreckfish commercial fishery operates and the gear used, not all of the protected species known to occur in the South Atlantic interact with the wreckfish fishery (see **Section 3.2.2** for details). Sea turtles are vulnerable to capture in the vertical hook-and-line gear used in the wreckfish commercial fishery, and there may be impacts to the critical habitat designated for the North Atlantic right whale. The impacts of the wreckfish fishery on sea turtles were evaluated in the biological opinion on the entire South Atlantic snapper grouper fishery (NMFS 2006). The biological opinion concluded the entire South Atlantic snapper grouper fishery (including the wreckfish component) was likely to adversely affect sea turtles, but not jeopardize their continued existence. The biological opinion also concluded the continued authorization of the fishery would not affect Endangered Species Act (ESA)-listed marine mammals and is not likely to jeopardize the continued existence of any other ESA-listed species.

Therefore, regarding factors 1-4, as noted in **Sections 3.2**, **4.1.1**, and above, there is limited information available to determine the effects on bycatch and bycatch mortality that results from the commercial wreckfish fishery in the South Atlantic under current regulations.

The actions in Amendment 20A are largely administrative in nature and their implementation is not expected to significantly implicate factors 5-10 (see **Sections 3** and **4** for details). Defining inactive shares, and reverting them for redistribution would have no immediate biological impacts on target or non-target species; however, it could result in indirect biological impacts by freeing up the unused shares to be fished in the future. Redistribution of the inactive shares, may increase the probability of bycatch associated with the commercial fishery for wreckfish. However, the decrease in the new annual catch limit (ACL) for the commercial sector for wreckfish proposed in the Comprehensive ACL Amendment (SAFMC 2011) is 223,250 pounds whole weight (ww), compared to the previous 2 million pound ww commercial quota. This new harvest limit would result in a significant reduction in the amount of pounds associated with each share, including inactive shares, in order to maintain harvest at or below the ACL. Furthermore, the proposed regulations in the Comprehensive ACL Amendment would not change the manner in which the fisheries are conducted. However, if the ACL proposed in the Comprehensive ACL Amendment results in reduced effort for wreckfish, there could be a corresponding decrease in bycatch and potential interaction with protected species.

Any additional actions to reduce bycatch in the wreckfish portion of the snapper grouper fishery would affect effort or gear, resulting in potentially adverse changes to associated costs, benefits, and behavior of fishery participants. Also, new measures would result in additional administrative burdens related to implementation and enforcement.

Appendix E. Scoping Summary and Public Comment Summary

Scoping Summary- March 2009

Comment 1: Program continuation

- Do not abolish program (4 people)
- I have a major investment (3 people)
- Although unused in past, I may use shares in the future due to expected closures
- Abolish program (1 person)

Comment 2: Recreational allocation

- Provide for a recreational allocation
- Do not provide for a recreational allocation

Comment 3: Redistribute shares to current participants only

- If TAC is cut, can't maintain historical landings without economic difficulties

Comment 4: Do nothing until new stock assessment

Comment 5: Federal buyout of shareholders needed

Comment 6: Get additional public comment on this action

Public Comments Summary- November 14-17,2011, and December 6, 2011*

At the public hearings, three individuals spoke in regards to wreckfish. The comments of one individual were focused only on commercial/recreational allocations, including a request for 100% commercial allocation or requirement of hand gear only for recreational harvest of wreckfish.

Another individual expressed concern on how the SSC specified the ABC using landings data, and recommended that the SSC consider additional information on fishing effort and gear type.

One individual, on behalf of the Florida Saltwater Anglers, recommended a recreational allocation for wreckfish. The organization also does not support catch share programs because it is privatization of a public resource.

Six written comments were received in regards to Amendment 20A. Three of the letters came from organizations and three came from individuals.

Individual 1

- Amendment 20A consolidates the fishery and gives control of the fishery to a small number of participants.
- concerned about wreckfish discards of non-shareholders because of the ITQ program
- recommends abolishing the ITQ program and open the commercial wreckfish fishery to all Snapper Grouper permit holders.

- the ACL should be set at the current TAC of 2 million pounds
- the South Atlantic Council should support an artificial reef program for wreckfish habitat

Individual 2
- allocate wreckfish shares based on historic landings
- no new entrants until the commercial quota increases

Individual 3
- supports Action 1, Preferred Alternative 3
- supports Action 2, Preferred Alternative 3, Preferred Option b
- supports Action 3, Preferred Alternative 4 (49% share cap)
- supports Action 4, Preferred Alternative 2, Sub-alternative 2b

Southeastern Fisheries Association
- supports Action 1, Preferred Alternative 3
- supports Action 2, Alternative 2, Option b
- supports Action 3, Preferred Alternative 4 (49% share cap)
- supports Action 4, Preferred Alternative 2, Sub-alternative 2b

Florida Saltwater Anglers
- supports the recreational allocation of the proposed wreckfish ACL, and requests a fair share of the catch
- does not support the ITQ program, and supports the No Action alternatives on Actions 1 and 2. The proposed actions will put shares into the hands of a small number of fishermen.
- supports Action 3, Alternative 2 (15% share cap). No one person should be able to have 49% of the wreckfish shares.
- supports Action 4, Alternative 1. There should not be an ITQ program.

South Carolina Seafood Alliance
- concerned that the commercial quota will be too low after the whole weight to gutted weight conversion, 5% recreational allocation of the ACL, and 5% set-aside for appeals
- concerned about the data used by the SSC to specify the ABC
- the actions in 20A will result in negative perceptions of the efficacy of catch share programs
- recommends that wreckfish should be managed separately from the rest of the snapper grouper complex
- supports no action for Amendment 20A
- recommends setting the ACL at 750,000 pounds until the 2013 assessment is complete
- the Council and SSC should consult experts on wreckfish

Appendix F. Public Hearing Summary Document

PUBLIC HEARING SUMMARY
of
AMENDMENT 20A
to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (Wreckfish)

When the Wreckfish ITQ program was implemented in 1992, the Total Allowable Catch (TAC) was set at 2 million pounds whole weight (ww). The fishery has changed significantly over the last two decades, and while the effort of the active shareholders account for all of the landings, their ITQ shares represent less than 60% of the total shares. The 2012 ACL is expected to be set at 250,000 pounds (ww) through the Comprehensive ACL Amendment. The commercial ACL will be set at 237,500 pounds, (95% commercial/5% recreational allocation). This quota level represents an 87% decrease from the current TAC. With this significant reduction in the commercial sector's allocation, the annual pounds (coupons) each shareholder will receive under the new ACL will also be reduced by more than 87%. Thus, active shareholders, captains, crew, and dealers who depend on a certain level of wreckfish production to maintain their operations will be particularly affected by the reduction in the commercial ACL.

The purpose of the amendment is to identify and revert inactive wreckfish shares for redistribution among remaining shareholders, and establish a share cap and appeals process. The primary actions are necessary to achieve the optimum yield from the commercial wreckfish fishery in accordance with National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and result in more efficient use of wreckfish as supported by National Standard 5. Establishment of a share cap and appeals process are necessary to comply with requirements for limited access privilege programs under Section 303A of the MSA. The intended effect is to promote the management provisions of the Fishery Management Plan for Snapper Grouper and to allow the commercial fishery to maximize harvest potential within the constraints of the Annual Catch Limit.

This document is intended to serve as a SUMMARY for all the actions and alternatives in Amendment 20A. It also provides background information and includes a summary of the expected biological and socio-economic effects from the management measures.

Why is the South Atlantic Council taking Action?

With this significant reduction in the commercial sector's allocation, the annual pounds (coupons) each shareholder will receive under the new ACL will also be reduced by more than 87 percent. Thus, active shareholders, captains, crew, and dealers who depend on a certain level of wreckfish production to maintain their operations will be particularly affected by the reduction in the commercial ACL.

The purpose of Amendment 20A is to facilitate the maximum harvest in the commercial sector of the wreckfish fishery that would otherwise not occur due to a combination of inactive shares and a significantly reduced commercial annual catch limit (ACL).

What Are the Proposed Actions?

There are four actions in Amendment 20A. Each *action* has a range of *alternatives*, including a 'no action alternative' and a 'preferred alternative'.

Proposed Actions in Amendment 20A

1. Define and revert inactive wreckfish shares.
2. Redistribute reverted shares to remaining shareholders.
3. Establish a share cap.
4. Establish an appeals process.

Action 1. Define and revert inactive shares

Alternative 1: No Action. Do not define or revert inactive shares for redistribution.

Alternative 2: Define inactive shares as shares belonging to any ITQ shareholder who has not reported wreckfish landings in 2009-10 and/or 2010-11, and revert for redistribution.

Alternative 3 (Preferred): Define inactive shares as shares belonging to any ITQ shareholder who has not reported wreckfish landings in 2006-07 through 2010-11, and revert for redistribution.

Proposed Actions in Amendment 20A

1. Define and revert inactive shares.
2. Redistribute reverted shares to remaining shareholders.
3. Establish a share cap.
4. Establish an appeals process.

What Are the Expected Effects?

Biological Impacts

Alternative 1 (No Action) could result in the lowest overall commercial harvest of wreckfish and is considered the most biologically beneficial alternative for the wreckfish stock when compared to **Alternatives 2** and **3 (Preferred)**. Out of 25 wreckfish shareholders, currently there are either 18 inactive shareholders (**Alternative 2**), or 17 inactive shareholders (**Alternative 3 (Preferred)**) holding shares that would be redistributed among a group of 7-8 remaining active wreckfish shareholders (**Table S-1**).

Economic Impacts

Alternative 1 (No Action) would result in the most negative economic impacts. **Alternative 2** is not expected to affect these vessels' current operations, though it would take away the option of fishing for wreckfish in the future. **Alternative 3 (Preferred)** is not expected to affect these vessels' current operations, though it would take away the option of fishing for wreckfish in the future. Based on the average market value of a 1% share, the total loss of quota share to these 18 shareholders is estimated to be approximately $264,000, or $14,667 per shareholder.

Social Impacts

Alternative 1 (No Action) would result in the most negative social impacts. If the inactive shares are not redistributed to active shareholders it is assumed that the amount of wreckfish being fished and delivered would also be reduced at the same level. **Alternative 2** and **Alternative 3 (Preferred)** are the most socially beneficial because these alternatives revert inactive shares to active shareholders and allow for their continued participation at a comparable level to pre-Comprehensive ACL levels. **Alternatives 2** and **3 (Preferred)** will also cause some

negative social impacts by removing the ability of those shareholders deemed inactive to utilize their shares in the future.

Table S-1. Inactive shares held by ITQ shareholder with no landings during the time periods specified under each alternative.

Alternative	**Number of Active Shareholders**	**Percentage of Shares Held by Active Shareholders**	**Number of Inactive Shareholders***	**Percentage of Shares Held by Inactive Shareholders**
Alternative 2 (No landings during the 2009-10 thru 2010-11 fishing years)	7	45.55%	18	54.45%
Alternative 3 (Preferred) (No landings between and during the 2006-07 thru 2010-11 fishing years)	8	58.8%	17	41.2%

Action 2. Redistribute reverted shares to remaining shareholders

Alternative 1: No Action. Do not redistribute reverted shares.

Alternative 2: Redistribute reverted shares to remaining shareholders based on 50% equal allocation + 50% landings history.
Option a: landings history in fishing years 2009-10 through 2010-11.
Option b: landings history in fishing years 2006-07 through 2010-11.

Alternative 3 (Preferred): Redistribute reverted shares to remaining shareholders based landings history.
Option a: landings history in fishing years 2009-10 through 2010-11
Option b (Preferred): landings history in fishing years 2006-07 through 2010-11.

Proposed Actions in Amendment 20A

1. Define and revert inactive shares.
2. Redistribute reverted shares to remaining shareholders.
3. Establish a share cap.
4. Establish an appeals process.

Alternative 4: Redistribute reverted shares based on proportion of remaining shares held by each remaining shareholder after inactive shares are reverted.

What Are the Expected Effects?

Biological Impacts
Alternative 2 is the most complex of the alternatives considered. **Option a** would benefit individuals who recently entered the fishery and do not have extensive landings histories, whereas **Option b** would include a broader time series of landings histories among current active shareholders and would also include those active shareholder who have recently entered the fishery (**Table S-2**). Therefore, adverse biological impacts that could result from this action would be expected to be negligible unless the fishery far exceeds the ACL repeatedly over the course of several years. Regardless of how those shares are allocated among the active fishery participants, the total number of redistributed shares would not change, limiting effort to the total percentage of shares issued to each shareholder. The biological impacts of **Alternative 3 (Preferred)** would be similar to those under **Alternative 2** for the same reasons given above. No significant biological impacts are expected to result from redistributing reverted shares to active shareholders based on landings histories. Assuming the largest active shareholders are the most likely to fish all shares they own because they are the most active fishery participants, **Alternative 4** may have the potential to have slightly higher biological implications for the species when compared to **Alternatives 2** and **3 (Preferred)**. However, because overall harvest

would be limited by the system of ACLs and AMs included in the Comprehensive ACL Amendment, significant biological impacts would not be expected.

Social and Economic Impacts

Alternative 2, Option a would benefit shareholders that are new to the fishery; whereas **Alternative 2, Option b** would benefit shareholders with a longer landing history. As with **Alternative 2, Alternative 3 (Preferred), Option a** would benefit shareholders that are new to the fishery because this option would redistribute reverted shares to remaining shareholders based on landings history in fishing years 2009/10 to 2010/11. Conversely, **Alternative 3, Option b (Preferred)** would benefit shareholders with a longer landing history because this alternative would redistribute reverted shares to remaining shareholders based on landings history in fishing years 2006/07 to 2010/11. **Options a** and **b** under **Alternative 3 (Preferred)** have a high likelihood of being perceived as fair redistribution methods because they are based on past participation. **Alternative 4** would benefit shareholders who have recently purchased additional or new shares.

Table S-2. Summary of total % shares that would be held by each shareholder after redistribution under **Action 2**.

% shares after redistribution	**Shareholders after redistribution - Action 1, Alt 2**					**Shareholders after redistribution - Action 1, Alt 3 (Preferred)**				
	Alt 2(a)	Alt 2(b)	Alt 3(a)	**Alt 3(b) (Pref)**	Alt 4	Alt 2(a)	Alt 2(b)	Alt 3(a)	**Alt 3(b) (Pref)**	Alt 4
0-5%	1	2	3	3	3	3	3	3	3	3
5.01-10%	2	1	0	0	0	0	0	0	0	0
10.01-15%	1	0	1	1	1	2	2	3	2	1
15.01-20%	1	2	1	0	1	1	1	0	1	2
20.01-25%	1	1	1	2	1	1	2	1	1	1
25.01-30%	0	1	0	0	0	1	0	0	1	1
30.01-35%	1	0	0	0	0	0	0	0	0	0
35.01-40%	0	0	0	1	1	0	0	1	0	0
40.01-45%	0	0	0	0	0	0	0	0	0	0
45.01-50%	0	0	1	0	0	0	0	0	0	0

Action 3. Establish a share cap

Alternative 1: No Action. Do not establish share cap.

Alternative 2: Establish share cap as 15% of the total shares.

Alternative 3: Establish share cap as 25% of the total shares.

Alternative 4 (Preferred): Establish share cap as 49% of the total shares.

Alternative 5: Establish share cap as 65% of the total shares.

Proposed Actions in Amendment 20A

1. Define and revert inactive shares.
2. Redistribute reverted shares to remaining shareholders.
3. Establish a share cap.
4. Establish an appeals process.

Alternative 6: Establish share cap as the percentage of total shares held by largest shareholder after redistribution.

What Are the Expected Effects?

Biological Impacts

The level at which the South Atlantic Council chooses to cap total shares held by any one active shareholding entity would not be expected to impact the biological environment. Regardless of the level at which shares are capped, the fishery may not exceed the proposed commercial ACL of 237,500 pounds ww in the Comprehensive ACL Amendment, without triggering corrective AMs. Biological impacts under **Alternative 6** may be slightly higher than under **Alternatives 2-4 (Preferred)**, but may be lower than **Alternative 5** since no shareholder currently holds 65% of the shares. Capping the number of shares held by a single active shareholder would not result in an increase or decrease in overall harvest of wreckfish in the commercial sector unless a large number of shares are held by relatively inactive fishermen who may not catch their allocated poundage. However, it is expected that any re-allocated shares would be, for the most part, fished to their respective poundage limits in order to maximize yield among the current universe of active shareholders.

Social and Economic Impacts

The number of shareholders who would be over the different share caps, and by how much, is shown in **Table S-3** and this would depend on the preferred alternatives in Actions 1 and 2. **Alternative 2** would allow for equal participation by all entities at some point in time; however it would cap the shares of 3 to 4 entities throughout the various alternatives assuming **Alternative 2** under **Action 1**, and would cap the shares of 2 to 3 entities assuming **Alternative 3** under **Action 1**. This would reduce the possible participation of the largest shareholders and although it is assumed the other participants would fish their shares and therefore the commercial sector's ACL would be harvested and OY would be achieved, this would act in opposition to the

underlying social and economic purpose of this amendment which includes not adversely impacting those who depend on wreckfish for their livelihoods. **Alternative 3** would cap the shares of 1 to 2 entities assuming **Alternative 3** under **Action 1**. These entities are the largest shareholders and as was explained above in **Alternative 2**, although other participants would likely fish the shares removed by implementation of a 25% cap, this would act in opposition to the underlying social and economic purpose of this amendment which includes not adversely impacting those who depend on wreckfish for their livelihoods.

Alternative 4 (Preferred) would establish a share cap at 49% and would prevent any one entity from holding the majority of shares in the fishery. The share cap would currently only impact 1 entity (at their current share level with any of the various alternatives and options) under **Action 2** assuming **Alternative 3** under **Action 1** for **Alternative 3 Sub-alternative a** (redistribute shares based on landings history in fishing years 2009/10 to 2010/11) and **Alternative 3 Option b** (redistribute shares based on landings history in fishing years 2006/07 to 2010/11).

Alternative 5 would establish a share cap at 65% and currently would not impact any entity at their current share levels with any of the various alternatives and sub-alternatives. If the largest entity were to acquire more shares prior to the freeze on transfers, this could change **Alternative 6** and could allow for a possible situation similar to that of **Alternative 5** where one entity would have the majority of the shares in the fishery. Both **Alternative 5** and **Alternative 6** have the capability of creating a majority shares held by an entity situation which could negatively impact other shareholders and dealers; however for years (including the time period of 2006-2011 considered by this amendment) the bulk of wreckfish landings have been delivered primarily by a few individuals and this does not appear to have caused negative social impacts.

Table S-3. Number of shareholders and shares exceeding share cap under alternatives for **Action 3** for each alternative under **Action 2** assuming **Alternative 3 (Preferred)** under **Action 1**.

Alternative under Action 2	Alt2	Alt3	Alt4 (**Pref**)	Alt5	Alt6	Alt2	Alt3	Alt4 (**Pref**)	Alt5	Alt6
2a	2	1	0	0	0	32.24	16.27	0	0	0
2b	2	1	0	0	0	32.24	16.50	0	0	0
3a	2	1	1	0	0	40.28	24.92	.92	0	0
3b (**Pref**)	2	1	1	0	0	40.29	25.39	1.39	0	0
4	3	2	0	0	0	38.23	15.90	0	0	0
5	3	1	0	0	0	24.54	7.62	0	0	0

It is the Council's intent that NMFS administratively prohibit transfers of wreckfish shares for the necessary amount of time, not to exceed 45 days, until the reverted shares are redistributed.

This action would allow for exact calculations of shareholdings to be finalized for redistribution of shares.

Action 4. Establish an appeals process

> ***Proposed Actions in Amendment 20A***
>
> 1. Define and revert inactive shares.
> 2. Redistribute reverted shares to remaining shareholders.
> 3. Establish a share cap.
> 4. Establish an appeals process.

Alternative 1: No Action. Do not specify provisions for an appeals process associated with the ITQ program.

Alternative 2 (Preferred): A percentage of the wreckfish shares for fishing year 2012/2013 will be set-aside to resolve appeals for a period of 90-days starting on the effective date of the final rule. The Regional Administrator (RA) will review, evaluate, and render final decisions on appeals. Hardship arguments will not be considered. The RA will determine the outcome of appeals based on NMFS' logbooks. If NMFS' logbooks are not available, the RA may use state landings records. Appellants must submit NMFS' logbooks or state landings records to support their appeal. After the appeals process has been terminated, any amount remaining from the set-aside will be distributed back to remaining ITQ shareholders according to the redistribution method selected under Action 2.

Sub-alternative 2a: Three percent of wreckfish shares will be set aside for appeals.

Sub-alternative 2b (Preferred): Five percent of wreckfish shares will be set aside for appeals.

Sub-alternative 2c: Ten percent of wreckfish shares will be set aside for appeals.

Alternative 3: A percentage of the wreckfish shares for fishing year 2012/2013 will be set-aside to resolve appeals for a period of 90-days starting on the effective date of the final rule. The Regional Administrator (RA) will review, evaluate, and render final decisions on appeals. Hardship arguments will not be considered. A special board composed of state directors/designees will review, evaluate, and make individual recommendations to RA on appeals. The special board and the RA will determine the outcome of appeals based on NMFS' logbooks. If NMFS' logbooks are not available, the RA may use state landings records. Appellants must submit NMFS' logbooks or state landings records to support their appeal. After the appeals process has been terminated, any amount remaining from the set-aside will be distributed back to remaining ITQ shareholders according to the redistribution method selected under Action 2.

Sub-alternative 3a: Three percent of wreckfish shares will be set aside for appeals.

Sub-alternative 3b: Five percent of wreckfish shares will be set aside for appeals.

Sub-alternative 3c: Ten percent of wreckfish shares will be set aside for appeals.

What Are the Expected Effects?

Biological Impacts

The wreckfish shareholders' appeals process is largely an administrative action that would have few if any biological implications. **Sub-Alternatives 2a-2c** and **3a-3c** may result is some short-term biological benefit during the 2012/2013 wreckfish fishing season, since 3%, 5% (**Preferred**), or10% respectively, of the wreckfish shares would not be fished during that season unless those shares are distributed to successful appellants. After the 2012/2013 season, the long-term biological impacts of all the sub-alternatives would be the same, assuming all shares would be redistributed to active shareholders who are likely to fish the redistributed shares.

Social and Economic Impacts

The absence of an appeals process, as would occur under **Alternative 1 (No Action)**, would be expected to increase the likelihood that one or more appropriate qualifiers would have either been deemed inactive and would not receive reverted shares or would not have received the proper amount of reverted shares through some sort of error, resulting in less social benefits. **Alternative 2 (Preferred)** and **Alternative 3** allow for an appeals process and would be expected to result in greater social benefits than **Alternative 1 (No Action)**. **Sub-alternative 2c** and **Sub-alternative 3c** set aside the largest amount of shares, ten percent, for appeals and if this amount of shares is not ultimately necessary for settling appeals, these two sub-alternatives have the potential to provide the most negative social impact to the remaining shareholders because these shares would be unavailable for use until all appeals are settled and they are redistributed (but then the social benefits of these additional shares would be received after redistribution of the remaining set-aside shares). Conversely, if ten percent of the shares are required for the appeals process and they are not set aside, those appealing could be negatively impacted as they would not receive the shares to which they are entitled.

Sub-alternative 2b (Preferred) and **Sub-alternative 3b** set aside five percent of shares for appeals and provide a mid-point between the other options for setting aside shares (ten percent or three percent) for the appeals process. These sub-alternatives would likely provide more immediate positive social benefits for active shareholders in that these sub-alternatives would allow a larger amount of the pool of latent shares to be redistributed and immediately harvested by those recognized immediately as active shareholders. However, as with **Sub-alternatives 2c** and **3c**, if not enough shares have been set aside for the appeals process then those appealing and entitled to those shares could be negatively impacted.

Sub-alternative 2a and **Sub-alternative 3a** set aside three percent of shares for appeals. These sub-alternatives would likely provide the most immediate positive social benefits for recognized active shareholders in that these sub-alternatives would allow a larger amount of the pool of latent shares to be redistributed and immediately harvested by those recognized as active shareholders. However, these sub-alternatives could have the most negative impact on appealing shareholders (if not enough shares have been set aside for the appeals process) since the percent set aside for these sub-alternatives is the lowest out of all the options.

PUBLIC HEARING DATES & LOCATIONS
All hearings are from 4 pm – 7 pm except Charleston and Raleigh

Monday, November 14, 2011 Avista Resort 300 N. Ocean Blvd. **North Myrtle Beach, SC** 29582 (843) 249-2521 Hampton Inn & Suites Savannah/Midtown 20 Johnston Street **Savannah, GA** 31405 (912) 721-3700	**Wednesday, November 16, 2011** Radisson Resort at the Port 8701 Astronaut Boulevard **Cape Canaveral, FL** 32920 (321) 784-0000
Tuesday, November 15, 2011 – Charleston Marriott Hotel* 170 Lockwood Blvd. **Charleston, SC** 29403 (843) 723-3000 *Hearing from 5:30 – 7:30 pm Jacksonville Marriott 4670 Salisbury Rd. **Jacksonville, FL** 32256 (904) 296-2222	**Thursday, November 17, 2011** Key Largo Bay Marriott 103800 Overseas Highway **Key Largo, FL** 33037 (305) 453-0000
	Tuesday, December 6, 2011 Holiday Inn Brownstone* 1707 Hillsborough Street Raleigh, NC 27605 (919) 828-0811 *Hearing begins at 5:30 pm

Written Comments:

Bob Mahood, Executive Director
South Atlantic Fishery Management Council
4055 Faber Place Drive; Suite 201
North Charleston, SC 29405

E-mail:
SGAmend20APHcomment@safmc.net

What's Next?

- Snapper Grouper Advisory Panel (10/5/11-10/6/11) in Charleston, SC; final review of Amendment 20A
- Scientific & Statistical Committee (11/8/11 - 11/10/11) in Charleston, SC; final review of Amendment 20A
- Public Hearings from SC thru FL (11/14/11-11/17/11)
- Comments due by 5 p.m. on Monday, November 21, 2011
- Public Hearing during Council meeting (12/6/11) in Raleigh, NC
- Snapper Grouper Committee & Council review hearing comments and approve all actions (12/7/11-12/9/11) in Raleigh, NC
- Council (12/8/11-12/9/11) in Raleigh – Final Approval
- Send to Secretary of Commerce by December 15, 2011
- Public Comment on proposed rule
- Public Comment on amendment to Secretary of Commerce

Appendix G. Depletion-Corrected Average Catch (DCAC) Estimates for Wreckfish

Depletion-Corrected Average Catch Estimates for U.S. South Atlantic Wreckfish
NOAA Fisheries Service
Southeast Regional Office
October 23, 2011; updated December 20, 2011
SERO-LAPP-2011-07

Introduction

Wreckfish *Polyprion americanus* is large bass distributed globally in temperate waters, including the U.S. South Atlantic (Heemstra 1986). They constitute a single genetic stock across the north Atlantic ocean (Sedberry et al. 1996). Significant catches are reported off Spain, Portugal, and the Blake Plateau of the U.S. South Atlantic (Sadovy 2003). Wreckfish are caught at depths ranging from 1,500-2,400 feet over high relief and flat hard bottom habitat (Sedberry et al. 1999). Spawning occurs in late winter and early spring, and juveniles are pelagic to 20-24 inches total length (TL), associating with floating seaweeds and wreckage.

In 1990, the South Atlantic Fishery Management Council (SAFMC) added wreckfish to the Snapper-Grouper Fishery Management Plan due to a rapid increase in landings and effort that resulted in overfishing (SAFMC 1990; Vaughn et al. 2001). In 1991, the SAFMC approved an individual transferable quota (ITQ) program for commercial wreckfish to address excess capacity and economic inefficiency in the wreckfish fleet (SAFMC 1991). The ITQ program allocated shares of quota to eligible participants; initial allocations were partially based on landings histories. Since the 1992/93 fishing year, wreckfish have been managed under an ITQ program, a two-million pound quota, and a fishing season from April 16-January 14 each year. A fixed seasonal closure from January 15-April 15 each year is in effect to protect wreckfish during peak spawning.

The Magnuson-Stevens Reauthorization Act of 2006 requires regional fishery management councils to implement annual catch limits (ACLs) and accountability measures (AMs) for all stocks under federal management by 2011. In August 2010, the SAFMC's Scientific and Statistical Committee (SSC) established an acceptable biological catch (ABC) for wreckfish of 0.250 million pounds (mp) whole weight (ww). The SAFMC later allocated 95% of the ABC to the commercial wreckfish sector and set a commercial quota of 0.2375 mp ww (SAFMC 2011). This quota is 88% less than the current 2 mp ww commercial quota and is based on recent, non-confidential average catches (SAFMC 2010). At their August 2010 meeting, the SSC recommended conducting Depletion-Corrected Average Catch (DCAC) or Depletion-Based Stock Reduction Analysis (DB-SRA) in 2011 to compare with their 2010 catch-only recommendation (SAFMC 2010). The intent of this analysis is to estimate a sustainable yield level for the U.S. segment of the north Atlantic wreckfish stock using DCAC analysis (MacCall 2009) as recommended by the SSC.

Methods

Depletion-Corrected Average Catch Formula

MacCall (2009) developed the DCAC formula to estimate sustainable yield in data poor situations. The formula is an extension of the potential-yield formula developed by Alverson and Pereyra (1969) and (Gulland 1970). DCAC divides landed catches over an extended period of time into a sustainable yield component and a windfall component associated with a reduction in stock biomass (MacCall 2009). The DCAC formula requires the following input parameters: 1) sum of catches; 2) number of years in the catch time series; 3) estimated reduction in biomass (Δ; expressed as a ratio); 4) natural mortality rate (M); and, 5) an assumed relationship (*c*) between the fishing mortality rate at maximum sustainable yield (F_{msy}) and M. The model also requires inputs on the coefficient of variation surrounding the sum of catches and standard deviations for M, *c, and* Δ. Users can also specify the type of distribution for *c* (lognormal or normal) and Δ (beta bounded, lognormal, or normal).

Sustainable yield (Y_{sust}) is calculated as:

$$Ysust = \frac{\sum c}{n + W/Y_{pot}} \tag{1}$$

where *C* is the sum of catches, *n* is the number of years in the catch time series, and W/Y_{pot} is the windfall ratio. The windfall ratio is calculated as:

$$\frac{W}{Y_{pot}} = \frac{\Delta B_0}{0.4cM\mathrm{B}_0} = \frac{\Delta}{0.4cM} \tag{2}$$

where *Δ is the decline in biomass from the first year to the last year of the catch time series relative to the unfished biomass level, c is the tuning adjustment for setting* F_{msy} *relative to M, M is the natural mortality rate,* B_{fyr} is biomass in the first year of the time series, B_{lyr} is biomass in the last year of the time series, and B_0 is the unfished biomass level.

Uncertainty in DCAC estimates is accomplished by Monte Carlo simulation. The distribution of sustainable catches is conditioned on the distribution of input parameters. For further details regarding the DCAC formula see MacCall (2009). The model, as well as reference manual for using DCAC, can be downloaded from the NOAA Fisheries Service stock assessment toolbox at: http://nft.nefsc.noaa.gov.

Model Inputs

Sum of Landings (C)

Wreckfish landings in whole weight (ww) were obtained from the Accumulated Landings System for 1987-1990 and from wreckfish ITQ logbooks for 1991-2010 (Gloeckner, pers. comm.). Table 1 summarizes total landings reported from 1987 through present and from 1989 through present. Two catch time periods were used in the DCAC analysis to explore the sensitivity of model results to the total sum of catches. Because DCAC calculates a windfall reduction in biomass, 1989 was chosen for sensitivity runs because landings significantly increased between the 1988 and 1989 fishing seasons. The highest reported annual landings were in 1990 (3.812 mp ww).

Table 1. Total wreckfish commercial landings (million pounds whole weight) for two different time periods and the number of years included in the sum of catches.

Years	Sum of Landings (mp ww)	Number of Years of Landings
1987-2010	15.556	24
1989-2010	15.220	22

Natural Mortality (M)

Vaughn et al. (2001) estimated wreckfish M from life history characteristics using the approaches of Pauly (1979) and Hoenig (1983). M ranged from 0.06-0.09 using Pauly (1979) and 0.11-0.14 using Hoenig (1983). Estimates of M for Hoenig (1983) were based on maximum ages of 30-39 years. More recent age and growth data from Peres and Haimovici (2004) indicate wreckfish may live considerably longer (up to 76 years). Based on Hoenig (1983) and Hewitt and Hoenig (2005) and a maximum age of 76 years, M ranged from 0.04-0.06. Vaughn et al. (2001) recommended 0.1 be used as the preferred estimate of M. This analysis evaluated the sensitivity of DCAC estimates for M = 0.025, 0.05, 0.075, and 0.1. A coefficient of variation (CV) for M of 0.5 was used for all sensitivity runs. MacCall (2009) indicated a CV of 0.5 should be used as a minimal default value and there appears to be no justification for assuming a CV<0.5 for data poor stocks.

Change in Biomass (Δ)

MacCall (2009) indicates that it is difficult to estimate the fractional depletion in biomass (Δ) and that informed judgment or expert opinions from fishermen may be useful in estimating Δ. To assess the depletion in wreckfish stock biomass, nominal and standardized catch per unit effort (CPUE) indices were developed using wreckfish logbook data from 1992 to 2010. The top 3 vessels reporting landings during the entire catch time series were selected for developing the CPUE index since these were the only vessels reporting landings continuously during the catch time series. These three vessels accounted for approximately 30% of the annual landings from 1992-1995 and 50% or more of the landings since 1996.

Variables reported in the wreckfish logbook data set include, but are not limited to: wreckfish permit number, vessel identification number, dealer number, state, day, month, and year of landing, days fished, lines fished, hooks per line, hours fished, pounds and numbers of wreckfish landed, area fished, and depth of fishing. A fixed-effects general linear model (using PROC GLM; SAS Institute 2008) was used to develop the CPUE index. The dependent variable was pounds landed per day. Other dependent variables were also explored, including numbers landed per day, pounds landed per hook-hour fished, and pounds landed per hook fished. Because DCAC requires specification of a windfall reduction in biomass, CPUE based on pounds caught per day was considered a better representation of changes in biomass than numbers caught per day. Hook-hours and hooks fished provided more temporally-refined metrics of effort, but were not used because plots of CPUE versus effort revealed decreasing catchability with increasing effort. In contrast, there was no trend in CPUE versus days-fished.

Wreckfish logbooks allow landings to be entered in both numbers and pounds for up to five additional species. If snapper-grouper, dolphin, wahoo, or mackerels are caught while fishing for wreckfish, then landings and effort for those species must be reported via separate coastal logbooks to the Southeast Fisheries Science Center. Landings (in pounds) of species other than wreckfish were summed from wreckfish logbooks. Landings of species other than wreckfish were also summed for trips reported in coastal logbooks and trip records were merged with wreckfish logbook data using vessel identification number and month, day, and year of landing. Of the 701 wreckfish logbook records, 22 had matching coastal logbook records. For each wreckfish trip, the ratio of wreckfish landings to total landings was determined. Total landings were determined using the maximum landings reported for all other species in either the wreckfish logbook or coastal logbook. Trips were then eliminated if less than 90% of the trip's total landings were not wreckfish. Of the 701 wreckfish trips, 44 were eliminated from CPUE analysis. These trips were eliminated to ensure only directly trips targeting wreckfish were included in CPUE calculations.

Log transformation of the dependent variable failed to satisfy GLM assumptions. A square root transformation of the dependent variable was performed to satisfy assumptions of normality and constant variance. Six factors were considered as possible influences on CPUE: fishing year, season (Apr-Jul, Aug-Oct, Nov-Jan) nested within fishing year, vessel ID, total hooks (i.e. lines fished*hooks per line), area fished, and depth fished. Factors were added to the base model using a forward stepwise procedure (α=0.05). Factors included in the final model were: fishing year, vessel ID, total hooks, and season nested within fishing year (Appendix 1). These variables explained 57.4% of the variation in CPUE. To facilitate visual comparison, a relative index and relative nominal CPUE series were calculated by dividing each value in the series by the mean CPUE of the series.

Figure 1 shows the nominal and standardized trend in catch per day from 1992-2010. Nominal and standardized catch rates declined from 1992-1997. From 1998 through 2005, standardized catch rates were stable, while nominal catch rates gradually declined. Since 2007, standardized and nominal catch rates have increased. The reduction in CPUE from 1992 to 2010 was 35% for nominal and standardized indices. Reductions in CPUE from 1992 to 2006 were ~57-58%. A 35% change in biomass was used as the lower bound for model runs and a 60% change in biomass was used as the upper bound for model runs. A middle run was also conducted using a 50% change in biomass. This run was based on personal communication with Paul Reiss (September 9, 2011), a wreckfish shareholder who currently lands a significant portion of the annual wreckfish landings. Mr. Reiss indicated that a 50% reduction in his CPUE has likely occurred since landings peaked in the early 1990s. Mr. Reiss also indicated that his CPUE has been increasing in recent fishing years.

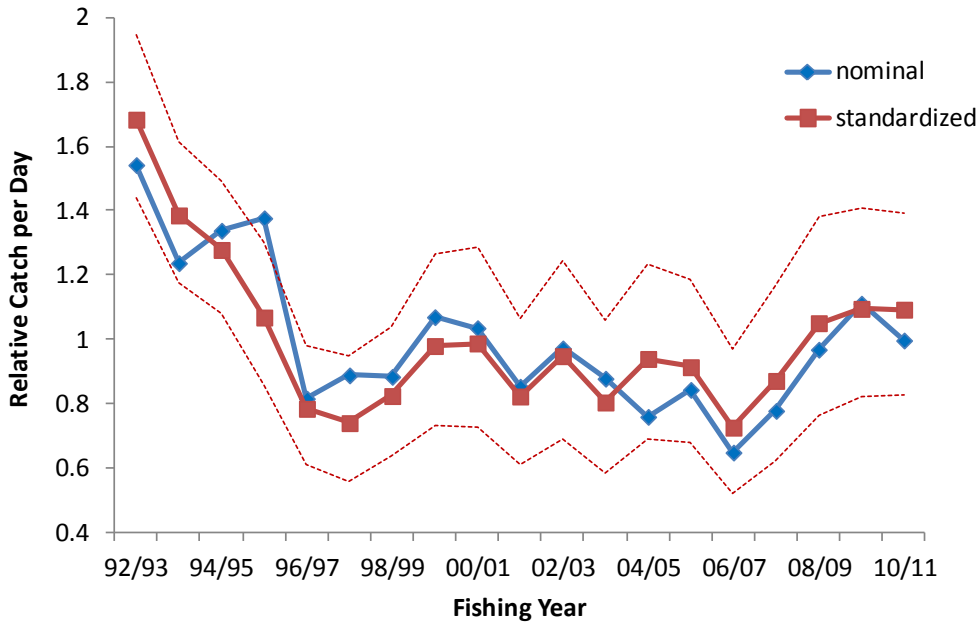


Figure 1. Nominal and standardized index of wreckfish abundance (± 80% confidence intervals) for High-3 fishing vessels, 1992-2010.

Fmsy relative to M (c)

There is currently no estimate for F_{msy}. M is often considered a conservative proxy for F_{msy} (Restrepo et al. 1998) and MacCall (2009) noted that a ratio of F_{msy} to M = 1 may be considered a target or upper limit for many stocks. Walters and Martell (2004) indicated ratios = 0.75-0.8 may be appropriate in data poor situations and that the ratio of F_{msy} to M may be as low as 0.6 for highly vulnerable stocks. For this analysis, sensitivity runs were conducted using F_{msy} to M ratios of 0.8 and 1.0.

Sensitivity Runs

Eighteen sensitivity runs were performed to evaluate how changes to various model parameters affect estimates of sustainable yield (Table 2). Runs 1-3 explored how changes in biomass affected yield estimates (35%, 50%, and 60%). Runs 4-6 explored how estimates of yield were affected by a different landing time series (1987-2010 vs. 1989-2010). Runs 7-15 evaluated how estimates of yield were affected by higher and lower assumed natural mortality rates (0.05 vs. 0.025, 0.075, and 0.10). Runs 16-18 evaluated how estimates of yield were affected by a lower F_{msy} to M ratio (0.8 vs 1.0).

Length-frequencies

Wreckfish lengths were obtained from the Trip Interview Program to evaluate trends in wreckfish length over time. A total of 16,962 length measurements collected between 1988 and 2010 were available. Lengths were reported as total length, fork length, or standard length in both centimeters and millimeters and were converted to total length in inches using length conversions summarized in Vaughn et al (2001). Sample sizes varied greatly over time, with most length measurements collected

prior to 2000 (n = 14,984 lengths 1988-1999; n = 1,978 lengths 2000-2010). Most wreckfish length measurements were from South Carolina (52.6%) and Florida (36.1%), followed by North Carolina (10.3%) and Georgia (1.0%). Lengths were aggregated across years (1988-1991, … , 2008-2010) to determine if changes in length-frequency distributions have occurred over time. A two factor general linear model ($\alpha = 0.05$) was used to test if the mean size of wreckfish was significantly affected by time period, state landed (Florida, Georgia, and other South Atlantic states), and the interaction between state landed and time period. Bonferroni t-tests were used to conduct multiple comparisons of main effects and summary statistics were generated to facilitate comparisons of mean, median, minimum, and maximum lengths over time by state of landing.

Results

Estimated DCAC yields

Figure 2 and Table 2 summarize estimated yields from Monte Carlo simulations using eighteen different DCAC model parameterizations for wreckfish. Estimated sustainable yields ranged from 0.175 to 0.449 mp ww. The lowest yield was based on model run 9, which assumed a 60% windfall reduction in biomass and an M of 0.025. The highest yield was based on model run 13, which assumed a 35% windfall reduction in biomass and an M = 0.1. Of the 18 model runs, 11 estimated a higher mean annual yield for wreckfish than the current 0.250 mp ABC, three estimated a lower mean yield than the current ABC, and four estimated a mean yield comparable to the current ABC. Mean annual yields for model runs 1-3 and 4-6 were nearly identical, indicating the time series of catch data had little influence on model results. Higher assumed M increased the estimated mean annual yields (runs 10-15), while lower M (runs 7-9) and an F_{msy} to M ratio equal to 0.8 decreased the estimated yields (runs 16-18).

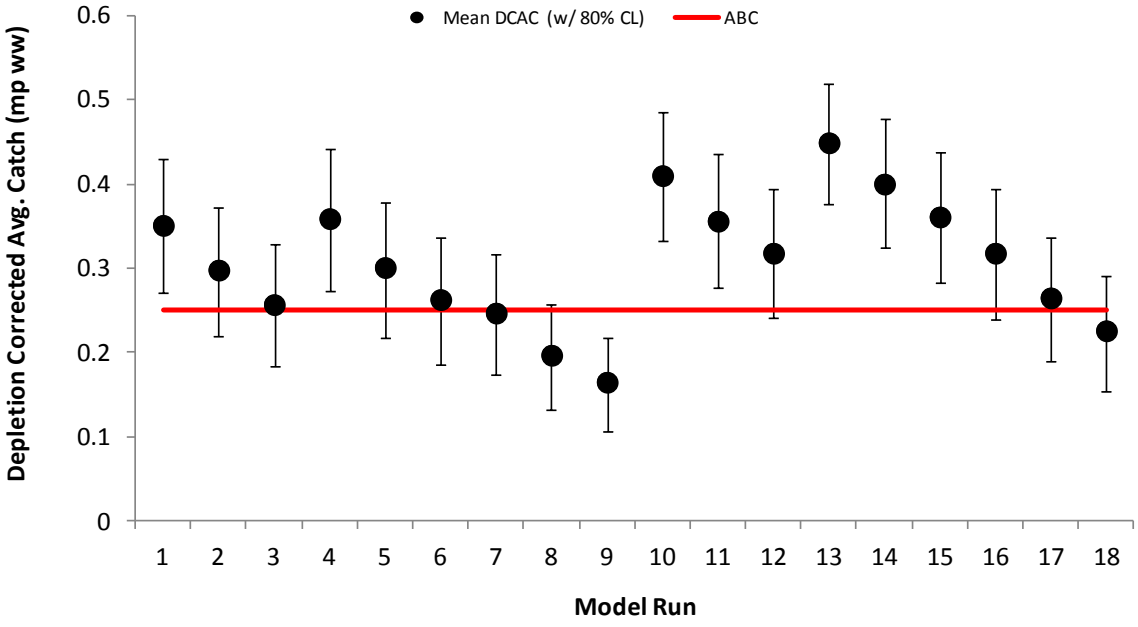


Figure 2. Mean yields (± 80% CL) estimated for eighteen different DCAC model parameterizations for wreckfish.

Length-frequencies

Length-frequency distributions of wreckfish were significantly different for time period ($F = 78.6$, $p < 0.0001$), state landed ($F = 90.45$, $p < 0.0001$), and the interaction of time period by state landed ($F = 61.7$, $p < 0.0001$). Multiple comparison tests indicated that significant differences in mean length between time periods were no greater than 0.8 inches TL and significant differences in mean length between states of landing were no greater than 0.4 inches TL. There were no discernable trends in mean length over time by state of landing (Table 3, Figure 3). Lengths of 38 to 42 inches TL were the most frequent in all six aggregated time periods. Lengths collected during 2000-2003 showed the broadest distribution and highest proportion of fish above 44 inches TL, while lengths collected during 2004-2007 showed the largest proportion of fish collected below 28 inches TL.

Table 2. Estimated yields resulting from Monte Carlo simulations using eighteen DCAC model parameterizations for wreckfish.

Parameter	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10	Run 11	Run 12
Fishery performance												
Catch (mp ww)	15.556	15.556	15.556	15.220	15.220	15.220	15.556	15.556	15.556	15.556	15.556	15.556
Number of years	24	24	24	22	22	22	24	24	24	24	24	24
CV of sum of catch	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Average catch (mp ww)	0.648	0.648	0.648	0.692	0.692	0.692	0.648	0.648	0.648	0.648	0.648	0.648
DCAC												
Assumed M (yr^{-1})	0.05	0.05	0.05	0.05	0.05	0.05	0.025	0.025	0.025	0.075	0.075	0.075
Standard deviation ln(M) (yr -1)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Assumed Biomass Change (Δ)	0.35	0.5	0.6	0.35	0.5	0.6	0.35	0.5	0.6	0.35	0.5	0.6
Standard Deviation Δ	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Assumed c	1	1	1	1	1	1	1	1	1	1	1	1
Standard Deviation c	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Monte Carlo results (n=10,000)												
Monte Carlo mean (mp ww)	**0.351**	**0.298**	**0.269**	**0.359**	**0.301**	**0.275**	**0.247**	**0.197**	**0.175**	**0.410**	**0.356**	**0.330**
Percentiles (%)												
5	0.203	0.161	0.140	0.205	0.158	0.141	0.122	0.092	0.078	0.262	0.209	0.188
20	0.271	0.219	0.194	0.274	0.218	0.197	0.174	0.132	0.114	0.333	0.277	0.253
50	0.351	0.293	0.262	0.356	0.296	0.269	0.240	0.188	0.166	0.411	0.354	0.328
80	0.429	0.373	0.341	0.441	0.379	0.351	0.316	0.258	0.230	0.485	0.436	0.407
95	0.502	0.450	0.419	0.521	0.463	0.433	0.395	0.334	0.306	0.556	0.509	0.482

Table 2 (cont.) Estimated yields resulting from Monte Carlo simulations using eighteen DCAC model parameterizations for wreckfish.

Parameter	Run 13	Run 14	Run 15	Run 16	Run 17	Run 18
Fishery performance						
Catch (mp ww)	15.556	15.556	15.556	15.556	15.556	15.556
Number of years	24	24	24	24	24	24
CV of sum of catch	0.1	0.1	0.1	0.1	0.1	0.1
Average catch (mp ww)	0.648	0.648	0.648	0.648	0.648	0.648
DCAC						
Assumed M (yr^{-1})	0.1	0.1	0.1	0.05	0.05	0.05
Standard deviation ln(M) (yr -1)	0.5	0.5	0.5	0.5	0.5	0.5
Assumed Biomass Change (Δ)	0.35	0.5	0.6	0.35	0.5	0.6
Standard Deviation Δ	0.2	0.2	0.2	0.2	0.2	0.2
Assumed c	1	1	1	0.8	0.8	0.8
Standard Deviation c	0.2	0.2	0.2	0.2	0.2	0.2
Monte Carlo results (n=10,000)						
Monte Carlo mean (mp ww)	**0.449**	**0.400**	**0.373**	**0.318**	**0.265**	**0.237**
Percentiles (%)						
5	0.307	0.254	0.228	0.175	0.136	0.116
20	0.377	0.324	0.295	0.239	0.190	0.165
50	0.450	0.401	0.372	0.316	0.259	0.229
80	0.520	0.477	0.449	0.395	0.337	0.305
95	0.583	0.545	0.517	0.472	0.414	0.386

Table 3. Mean, median, minimum, and maximum wreckfish total lengths (in) by state landed for six time periods between 1988 and 2010.

State	Time Period	n	Mean	Median	Min	Max
eFL	1988-1991	718	37.9	37.8	26	60
	1992-1995	4,002	38.3	38.2	25.2	57.6
	1996-1999	781	38.2	38.3	25.2	52
	2000-2003	30	39.4	40	29.8	47.1
	2004-2007	509	38.7	38.9	23.9	55.1
	2008-2010	79	39.5	39.6	28.3	49.1
SC	1988-1991	2,376	38.9	38.6	25.6	58.7
	1992-1995	3,047	38.9	38.6	25.2	57.5
	1996-1999	2,178	38.1	38.2	23.6	57.6
	2000-2003	1,043	38.9	38.7	24.8	57.6
	2004-2007	172	39	38.5	24.8	59.6
	2008-2010	110	37.6	38.3	27.2	49.4
GA/NC	1988-1991	1,476	38.9	38.6	26.8	55.1
	1992-1995	406	38.8	38.6	27.6	55.5
	1996-1999	0	--	--	--	--
	2000-2003	5	26.4	24.8	21.5	32.6
	2004-2007	30	23.6	23.1	22.1	28.7
	2008-2010	0	--	--	--	--

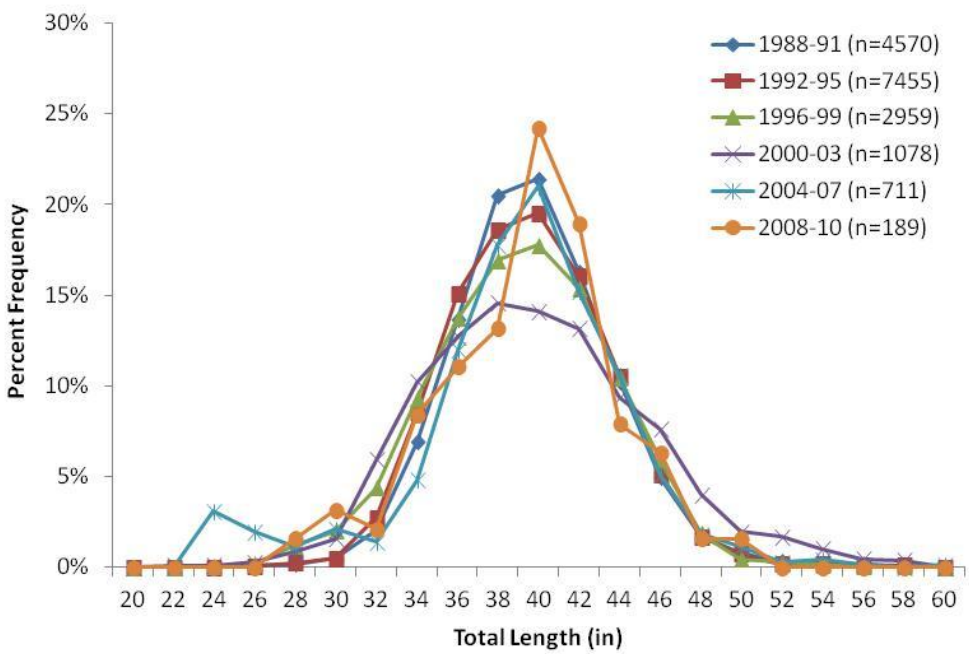


Figure 3. Frequency of wreckfish total lengths during six different time periods between 1988 and 2010.

Discussion

In September 2011, the SAFMC approved a Comprehensive Annual Catch Limit (ACL) Amendment, which specifies ACLs for most federally managed species in the South Atlantic, including wreckfish (SAFMC 2011). The SAFMC cannot establish an ACL above the 0.250 mp ww ABC recommended by the SSC, which was based on recent average wreckfish commercial catches. The Comprehensive ACL Amendment sets the wreckfish ACL equal to ABC and allocates 95% of the ACL to the commercial sector (0.2375 mp ww) and 5% of the ACL to the recreational sector (0.0125 mp ww). Upon implementation, this amendment will reduce the commercial wreckfish quota by 88%; from 2 mp ww to 0.2375 mp ww.

During their August 2010 meeting, the SSC recommended conducting Depletion-Corrected Average Catch (DCAC) or Depletion-Based Stock Reduction Analysis (DB-SRA) in 2011 to compare with the current catch-only recommendations (SAFMC 2010), resulting in the work summarized herein. The DCAC model results appear to indicate that ABC could be set slightly higher than the SSC's current 0.250 mp recommendation; however, this result is contingent on model parameters assumed for Δ, M, and F_{msy}.

Evaluation of model parameterizations indicated that results were most sensitive to changes in natural mortality rate, followed by reductions in biomass and the assumed ratio of F_{msy} to M. An M of 0.05 is consistent with a longevity of 70+ years, as determined by Peres and Haimovici (2004), whereas an M of 0.10 is more consistent with a longevity of 30-40 years, which is the oldest known age of wreckfish sampled from the South Atlantic (Vaughn et al. 2001). An M of 0.075 is intermediate to the above-mentioned natural mortality rates and is consistent with a life-span of 50-60 years, while an M of 0.025 is representative of a maximum age greater than currently observed for wreckfish. Based upon a review of recent stock assessments in the Southeast Region and estimates of M based on Hoenig (1983) and Hewitt and Hoenig (2005), values of M at or near 0.05 are more likely given the longevity (76 years) and life history of the species (Table 4).

Table 4. Summary of Fmsy or Fmsy proxies compared to M for recent stock assessments in the Gulf of Mexico and South Atlantic.

Region	Species	Fmsy or proxy	F value	M	F to M ratio	Max Age	Source
SA	Wreckfish	Fmax	0.14-0.16	0.05	2.8-3.2	39	Vaughn et al. 2001
SA	Wreckfish	$F_{0.1}$	0.14-0.15	0.10	1.4-1.5	39	Vaughn et al. 2001
SA	Wreckfish	$F_{0.1}$	0.23-0.25	0.15	1.5-1.6	39	Vaughn et al. 2001
SA/Gulf	Black Grouper	$F_{30\%SPR}$	0.216	0.136	1.6	33	SEDAR 19 2010
SA	Red Grouper	Fmsy	0.221	0.14	1.6	26	SEDAR 19 2010
SA	Red Snapper	F30%/F40%SPR	0.104-0.148	0.078	1.3-1.9	54	SEFSC 2009
Gulf	Gag	Fmax	0.22	0.15	1.5	31	GMFMC 2010
Gulf	Yellowedge Grouper	$F_{30\%SPR}$	0.0964	0.073	1.3	85	SEDAR 22 2011
Gulf	Yellowedge Grouper	$F_{30\%SPR}$	0.092	0.055	1.7	85	SEDAR 22 2011

The change in biomass is also an important factor in determining the DCAC. CPUE indices and one fishermen interview were conducted to gauge the decline in biomass that occurred after wreckfish exploitation began and reached peak landings in 1990. CPUE trends indicated a 35-60% drop in catch

rate occurred from the early 1990s through present. Catch rates declined rapidly from 1992 to 1997 then remained stable for nearly a decade, before increasing from 2007-2010. Not surprisingly, results indicated that smaller windfall reductions in biomass resulted in higher sustainable yield estimates. A 35% reduction in biomass resulted in sustainable yields from 0.247-0.449 mp, whereas a 60% reduction in biomass resulted in sustainable yields that ranged from 0.175-0.373 mp. A 50% reduction in biomass resulted in sustainable yields that ranged from 0.197-0.400 mp. The 50% reduction level was based on expert opinion by a fisherman who has participated in the fishery since it began. This reduction in biomass is within the range of estimates provided by the CPUE index. Given that catch rates and fish lengths have remained stable for a decade or more and catch rates are showing signs of increase in recent years, a 50% reduction in biomass seems to be a reasonable proxy for the windfall reduction in biomass. This estimated reduction is considerably lower than Vaughn et al. (2001), who estimated ~85-90% reduction in biomass using wreckfish data through 1998.

Trends in CPUE are affected by a variety of factors. In this analysis, several effort metrics were evaluated and it was determined that landings in pounds per day was most appropriate for calculating CPUE. Because small changes in Δ can affect estimates of sustainable yield, estimates derived from the CPUE index are critical to how high or low sustainable yield can be set. CPUE can be affected by a variety of factors including changes in abundance, changes in fishing practices and geographic areas fished, concentration of fishing effort in areas of greatest fish abundance, environmental conditions, and many other factors. These factors can lead to CPUE not corresponding to trends in abundance. If hyperstabilization of CPUE occurs, then trends in CPUE will remain high as stock abundance declines (Hilborn and Walters 1992). Similarly, hyperdepletion may occur if CPUE declines faster than stock abundance (Hilborn and Walters 1992). Review of logbook records indicated that wreckfish were harvested from 10 different statistical areas between 1992 and 2010. Of the 10 statistical areas, three accounted for 98% of the wreckfish landings. Beginning in 2003 there was a shift to catching wreckfish in statistical areas closer to shore. The influence of this shift on CPUE is unknown. Similarly, it is unknown how fishing practices may have affected the CPUE index. Logbook records indicated trip length increased from slightly over 6 days to more than 9 days, while the number of lines fished per vessel has remained relatively stable over time and the number of hooks fished per line has declined. This latter change in gear usage was accounted for when standardizing CPUE.

Given that there is no estimate of F_{msy}, a proxy for F_{msy} must be assumed. In this analysis, F_{msy} was assumed to be equal to M or 80% of M. The lower F_{msy} is set, the less productive the stock is estimated to be; reducing the estimate of sustainable yield. Recent stock assessments from the Southeast Region were used to compare values of F_{msy} to M to assess if M is a reasonable proxy for F_{msy} (Table 4). For all assessments reviewed, the estimated ratio of F_{msy} to M was greater than 1. It should be noted that this conclusion is based on a limited number of assessments of species with differing life history characteristics and is not intended to be a comprehensive list of F_{msy} to M ratios for all species in the Southeast Region. Given these results, an F_{msy} to M ratio of 1 is considered a reasonable proxy for wreckfish.

In conclusion, the intent of this analysis was to provide additional information for SSC consideration based on their recommendation for conducting a DCAC or DBSRA analysis for wreckfish (SAFMC 2010). Given the sensitivity runs considered in this report, and the discussion above, it appears the ABC for wreckfish could be increased by 19,000 to 109,000 lbs given a windfall biomass reduction of 35-60%, M = 0.05, and an F_{msy} to M ratio of 1.0. Catch rates for wreckfish have been stable since the late 1990s and in recent years have been slightly increasing, while fish lengths have been stable since the fishery began

in the late 1980s. This is evidence that a sustainable yield has been taken over a prolonged period of time without indication of a change in underlying resource abundance (MacCall 2009). Given the stability of catch rates over time, the level of current take appears sustainable and could potentially be increased.

It should be noted that yields summarized in Table 2 represent sustainable yields but may not represent maximum sustainable yield, given that wreckfish constitutes a single genetic stock across the North Atlantic ocean (Sedberry et al. 1996) and fishing mortality in other regions of the Atlantic Ocean could affect yields from U.S. South Atlantic waters. Similar to the U.S. segment of the wreckfish stock, landings of wreckfish in Portugal and Spain peaked in the early 1990s and then declined thereafter due to overexploitation (Sadovy 2003). Fishing records from the Azores indicate wreckfish landings have stabilized in more recent years after sharply declining from 1994-1999 (Damaso 2006). For this assessment of wreckfish, it was assumed that wreckfish stocks on U.S. fishing grounds would not be affected by fishing elsewhere. However, given that the source of juvenile wreckfish is unknown and European fish hooks are frequently found in wreckfish caught in U.S. waters (Sedberry et al. 1999), this is a tenous assumption. A north Atlantic assessment of wreckfish may be more appropriate, but would require reliable landings and CPUE data from numerous fishing grounds throughout the north Atlantic. Given the complexity of conducting a north Atlantic assessment, it is recommended that the U.S. South Atlantic portion of wreckfish be managed based on a target level of depletion, thus avoiding local overfishing. Regular review of U.S. trends in catch per unit effort and fish length would ensure annual catch limits are not resulting in stock depletion.

Literature Cited

Alverson, D. and W. Pereyra. 1969. Demersal fish explorations in the northeastern Pacific Ocean – an evaluation of exploratory fishing methods and analytical approaches to stock size and yield forecasts. Journal of Fisheries Research Board of Canada, 26: 1985-2001.

Damaso, C. 2006. Azorean Demersal Fishery Audit Report. Department of Oceanography and Fisheries. 118 pp.

Gulf of Mexico Fishery Management Council (GMFMC). 2010. Stock assessment of gag in the Gulf of Mexico: Report of assessment re-run webinars. GMFMC, Tampa, FL. 33 pp.

Gulland, J. 1970. Preface. *In* the Fish Resources of the Oceans pp. 1-4. Ed. By J. Gulland. FAO Fisheries Technical Paper, 97.

Heemstra, P.C. 1986. Family no. 165: Polyprionidae. Page 509 *in* M. M. Smith and P.C. Heemstra, editors. Smith's sea fishes, 6th edition. Spring-Verlag, Berlin.

Hewitt, D.A., and J.M. Hoenig. 2005. Comparison of two approaches for estimating natural mortality based on longevity. Fishery Bulletin. 103(2): 433-437.

Hilborn, R., and C.J. Walters. 1992. Quantative fisheries stock assessment: choice, dynamics, and uncertainty. Chapman and Hall, New York, NY. 570 pp.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bulletin, 82: 898-903.

MacCall, A.D. 2009. Depletion corrected average catch: a simple formula for estimating sustainable yields in data poor situations. ICES Journal of Marine Science, 66: 2267-2271.

Pauly, D. 1979. On the interrelationships between natural mortality, growth parameters, and mean environmental temperature in 175 fish stocks. Journal du Conseil International Exploration Mer. 39: 175-192.

Peres, M.B., and M. Haimovici. 2004. Age and growth of southwestern Atlantic wreckfish *Polyprion americanus.* Fisheries Research, 66: 157-169.

Restrepo, V.R., convenor, and 10 coauthors. 1998. Technical guidance on the use of precautionary approaches to implementing National standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act. National Oceanic and Atmospheric Administrations Technical Memorandum NMFS-F/SPO-31.

Sadovy, Y. 2003. *Polyprion americanus.* In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.1 www.iucnredlist.org. Downloaded on 23 September 2011.

Sedberry, G.R., J.L. Carlin, R.W. Chapman, and B. Eleby. 1996. Population structure in the pan-oceanic wreckfish, *Polyprion americanus*, (Teleostei: Polyprinidae), as indicated by mtDNA variation. Journal of Fishery Biology 49 (Supplement A): 318-329.

Sedberry G.R., Andrade C.A.P., Carlin J.L., Chapman R.W., Luckhurst B.E., Manooch C.S. III, Menezes G., Thomsen B. and Ulrich G.F. 1999. Wreckfish *Polyprion americanus* in the North Atlantic: Fisheries, Biology, and Management of a widely distributed and Long lived fish. *American Fisheries Society Symposium* 23:27-50

South Atlantic Fishery Management Council (SAFMC). 1990. Amendment 3 to the fishery management plan for the snapper-grouper fishery of the South Atlantic region. SAFMC, Charleston, SC. 34 pp.

South Atlantic Fishery Management Council (SAFMC). 1991. Amendment 5 to the fishery management plan for the snapper-grouper fishery of the South Atlantic region. SAFMC, Charleston, SC. 87 pp.

South Atlantic Fishery Management Council (SAFMC). 2010. Scientific and Statistical Committee Meeting Report , August 16-17, 2010, Charleston, SC. 21 pp.

South Atlantic Fishery Management Council (SAFMC). 2011. Comprehensive annual catch limit amendment for the South Atlantic region. SAFMC, Charleston, SC.

Southeast Data, Assessment, and Review (SEDAR 19). 2010. Stock Assessment Report: Gulf of Mexico and South Atlantic Black Grouper. SEDAR 19, Charleston, SC. 661 pp.

Southeast Data, Assessment, and Review (SEDAR 19). 2010. Stock Assessment Report: South Atlantic Red Grouper. SEDAR 19, Charleston, SC. 612 pp.

Southeast Data, Assessment, and Review (SEDAR 22). 2011. Stock Assessment Report: Gulf of Mexico Yellowedge Grouper. SEDAR 22, Charleston, SC. 423 pp.

Southeast Fisheries Science Center (SEFSC). 2009. Red snapper projections V. SEFSC, Beaufort, NC. 34 pp.

Vaughn, D.S., C.S. Manooch III, and J.C. Potts. 2001. Assessment of the Wreckfish Fishery on the Blake Plateau. Pages 105-122 in G.R. Sedberry, editor. Island in the stream: oceanography and fisheries of the Charleston Bump. AFS, Symposium 25, Bethesda, MD.

Walters, C., and S. Martell. 2004. Fisheries ecology and management. Princeton University Press, Princeton, NJ. 399 pp.

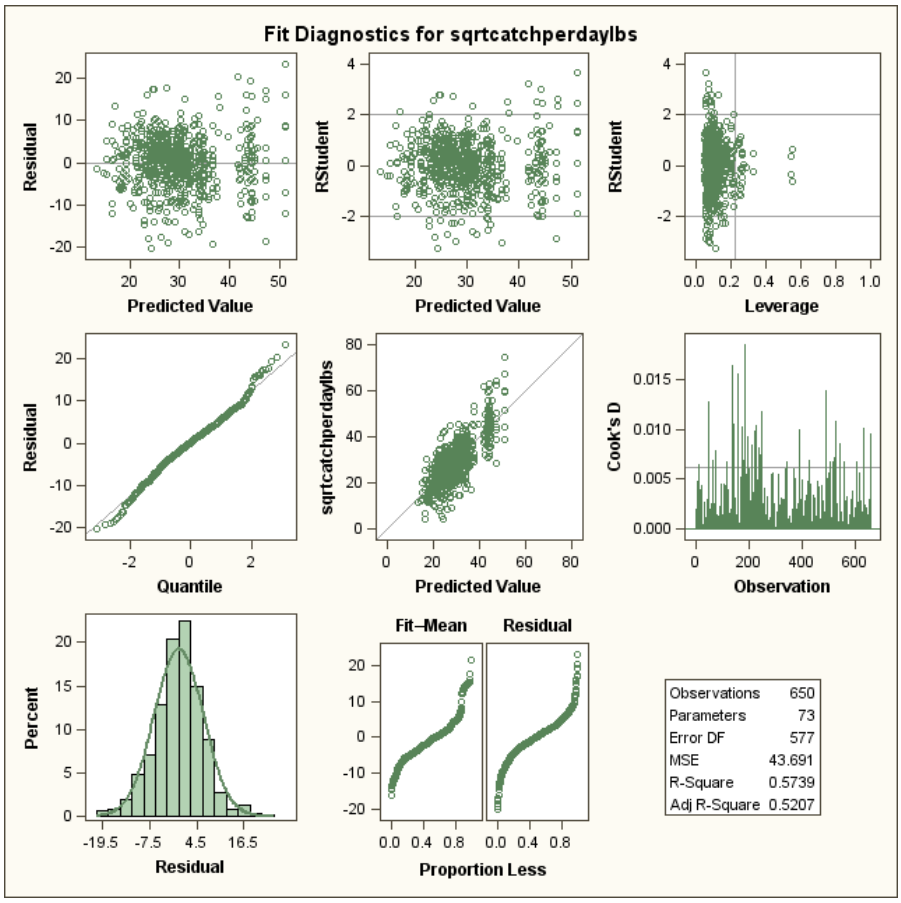
Appendix 1: GLM results and diagnostic plots for standardized pounds per day indices.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	72	33955.37356	471.60241	10.79	<.0001
Error	577	25209.94928	43.69142		
Corrected Total	649	59165.32284			

R-Square	Coeff Var	Root MSE	sqrtcatchperdaylbs Mean
0.573907	22.27010	6.609949	29.68083

Source	DF	Type I SS	Mean Square	F Value	Pr > F
vesselid	2	15950.71662	7975.35831	182.54	<.0001
fishingyear	18	11177.10363	620.95020	14.21	<.0001
seasons(fishingyear)	38	3342.52751	87.96125	2.01	0.0004
totalhooks	14	3485.02580	248.93041	5.70	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
vesselid	2	4783.766042	2391.883021	54.74	<.0001
fishingyear	18	4550.019905	252.778884	5.79	<.0001
seasons(fishingyear)	38	2769.711567	72.887146	1.67	0.0083
totalhooks	14	3485.025799	248.930414	5.70	<.0001



ADDENDUM

Background and Methods

During the November 8-10, 2011 SAFMC's Scientific and Statistical Committee (SSC) meeting, the SSC convened a subcommittee to review the wreckfish DCAC analysis. The subcommittee went through each one of the model input parameters and made the following recommendations:

1. Natural mortality should be set equal to 0.06 based on Hewitt and Hoenig (2005). A standard deviation of 0.5 on ln(M) should be used for Monte Carlo simulations.
2. Landings from 1992 through 2006 should be used as this time period is consistent with the CPUE time series used to derive the depletion estimate. A coefficient of variation of 10% should be used for catch as ITQ landings are well-estimated.
3. The ratio of F_{msy} to M should be set equal to 1.0. Meta-analysis of stocks in the region with known F_{msy} and M indicated that c was greater than 1. There is nothing about wreckfish life history or the fishery that would justify setting c<1.
4. Biomass depletion should be calculated as:

$$\Delta = \frac{CPUE_{max} - CPUE_{min}}{CPUE_{B0}}$$

where $CPUE_{max}$ corresponds to the CPUE in 1992/1993, $CPUE_{min}$ corresponds to the CPUE in 2006/2007, and $CPUE_{B0}$ corresponds to the CPUE in 1990/1991, the peak year of landings and effort.

Based on these updated model parameters, the subcommittee recommended model Run 19 as the base run. Three additional sensitivity runs (Runs 20-22) were also conducted. Run 20 included the same input parameters as model run 19, except landings through 2010/2011 were included and Δ was computed using $CPUE_{min}$ equal to CPUE in 2010/11. Model run 21 was similar to run 19, except two additional years of landings were included (1990/1991 and 1991/1992) and $CPUE_{max}$ was set equal to the estimated CPUE in 1990/1991 (see below). Run 22 was similar to run 21, except landings through 2010/11 were included and Δ was computed using $CPUE_{min}$ equal to CPUE in 2010/11.

The subcommittee also discussed estimating uncertainty in Δ using the standardized CPUE (e.g., the distribution of maximum and minimum year CPUE) rather than an assumed standard deviation of 0.2 and extending the CPUE time series back to 1991/1992. The subcommittee suggested doing a bootstrap analysis of the GLM to derive joint-distributions of the maximum and minimum year CPUE, and the resulting distribution in depletion. This recommendation was not completed due to time constraints; however, the CPUE time series was extended to include 1991/1992.

Review of logbook records indicated that permit data were available, but vessel IDs for the 1991/1992 fishing season were not available. The general linear model was updated to include data beginning in 1991/1992. The model was fit using the same methods as previously described, except permit number rather than vessel ID was used as factor in the model. Catch per day was the dependent variable and was square root transformed to satisfy model assumptions. Permit number, fishing year, season nested within fishing year, and total hooks were all significant factors included in the model. These parameters explained 57% of the variability in catch per day. An updated CPUE index is provided in Figure A1. Model results and fit diagnostics are summarized in Table A1.

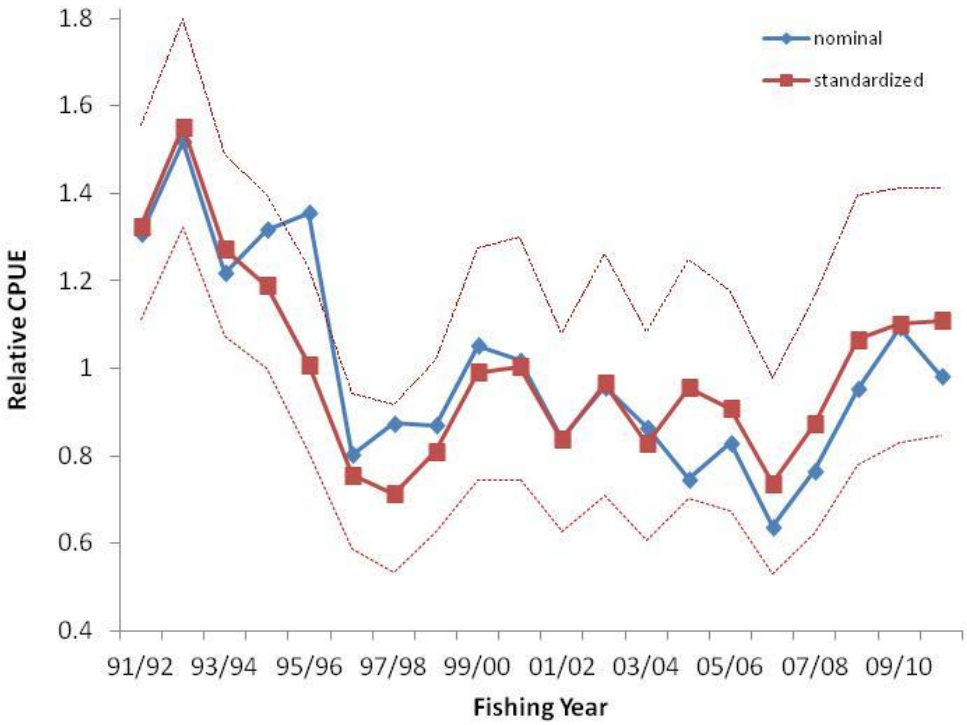


Figure A1. Nominal and standardized index of wreckfish abundance (± 80% confidence intervals) for High-3 fishing vessels, 1991/1992 through 2010/2011.

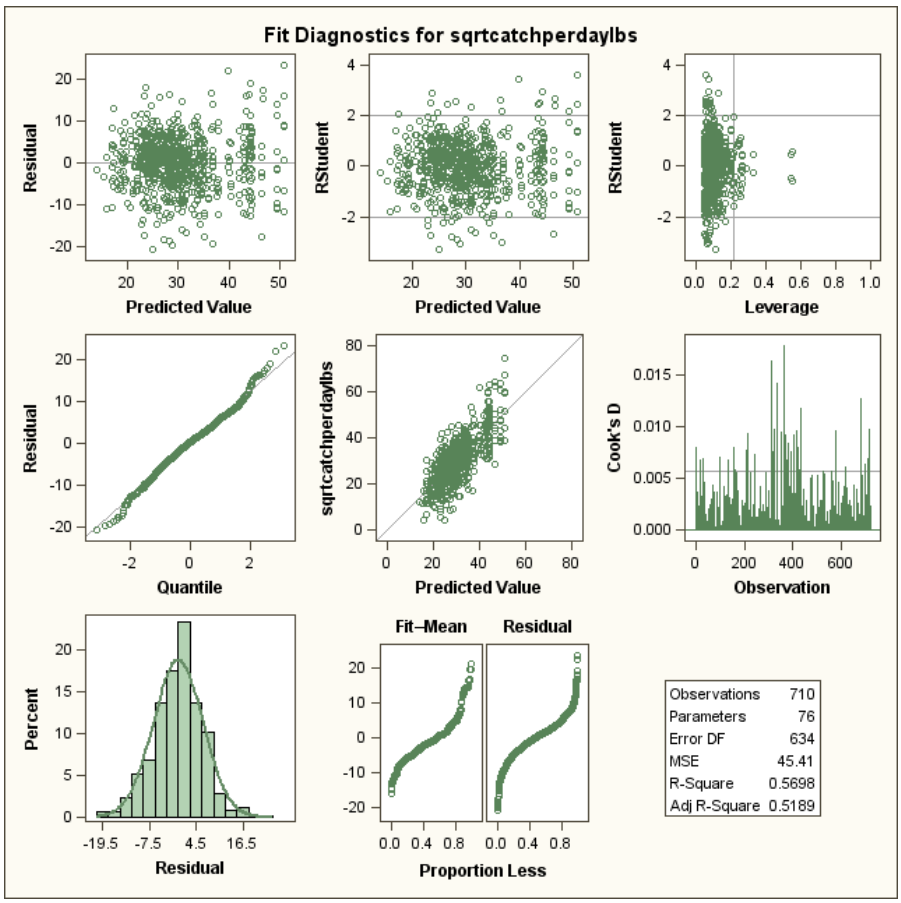
Table A1. Model fit and diagnostics for CPUE general linear model.

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	75	38136.98156	508.49309	11.20	<.0001
Error	634	28789.94388	45.41001		
Corrected Total	709	66926.92544			

R-Square	Coeff Var	Root MSE	sqrtcatchperdaylbs Mean
0.569830	22.46560	6.738695	29.99562

Source	DF	Type I SS	Mean Square	F Value	Pr > F
PERMNUM	2	17798.97630	8899.48815	195.98	<.0001
fishingyear	19	12388.33619	652.01769	14.36	<.0001
seasons(fishingyear)	40	4423.62357	110.59059	2.44	<.0001
totalhooks	14	3526.04550	251.86039	5.55	<.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
PERMNUM	2	4751.142709	2375.571354	52.31	<.0001
fishingyear	19	4205.954099	221.366005	4.87	<.0001
seasons(fishingyear)	40	3502.258890	87.556472	1.93	0.0007
totalhooks	14	3526.045501	251.860393	5.55	<.0001



To estimate CPUE in 1990/1991, a linear regression was fit to CPUE data from 1992/1993 through 1997/1998. This provided a very good fit (r^2 = 0.97) to the data and allowed for CPUE in 1990/1991 to be estimated through extrapolation of the regression line (Figure A2). Non-linear regression lines were also explored, but did not improve the fit to the data. If CPUE is higher than estimated in Figure A2, then Δ would be lower for runs 19-20 and higher for runs 21-22.

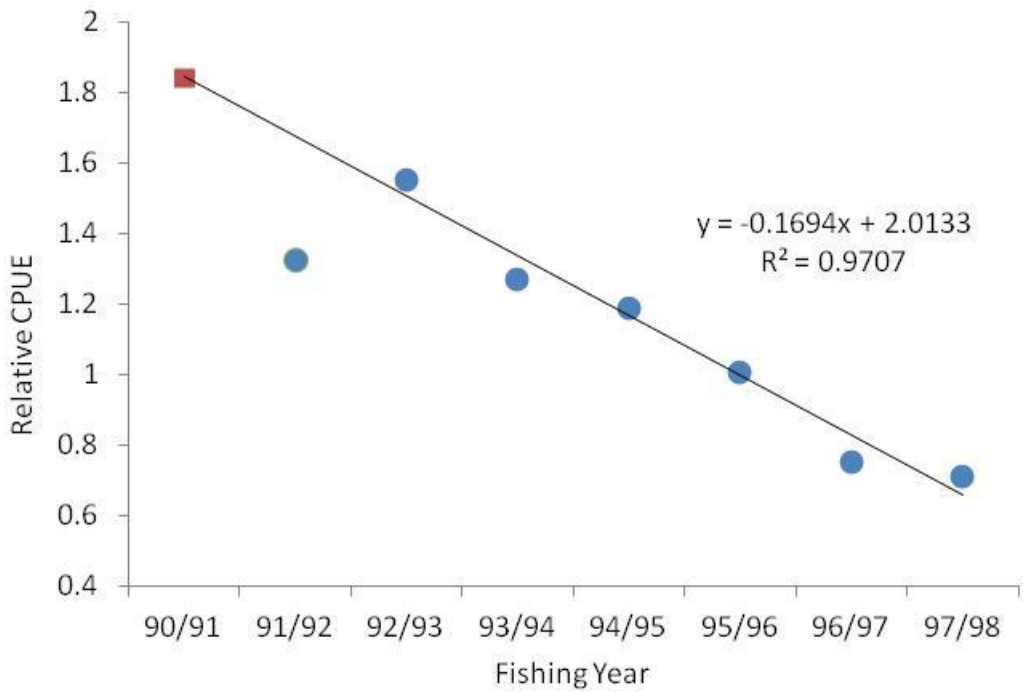


Figure A2. Linear regression of relative CPUE versus fishing year. Blue circles represent standardized CPUE values based on logbook data. The red square indicates the extrapolated CPUE value for 1990/1991.

Results

Relative CPUE in 1990/1991 was 1.84, or approximately 19% greater than the 1992/1993 CPUE estimate. CPUE in 1991/1992 was lower than the CPUE observed in 1992/1993 and consistent with results presented in Vaughn et al. (2001). Table A2 summarizes estimated yields for Runs 19-22. Sustainable yield was estimated to be 0.191 mp ww for Run 19, 0.247 mp ww for Run 20, 0.278 mp for Run 21, and 0.330 mp ww for Run 22. Figure A3 summarizes the frequency distribution of DCAC results for runs 19 and 21 based on Monte Carlo sampling of parameter values.

Discussion

The SSC recommended model runs 19 and 21 as preferred model runs that were equally plausible. Model run 19 was based on landings corresponding to the time period when CPUE data were available (1992+), while model run 21 relied on a projected estimate of CPUE to estimate biomass during the first year of catch. The SSC recommended averaging the two model runs, producing an ABC of 0.235 mp ww, which is 0.015 mp ww less than the current ABC based on non-confidential average landings. MacCall (pers. comm.) indicated it was most appropriate to include only data in the model corresponding to when the depletion occurred, therefore, runs 20 and 22 were excluded from further consideration since CPUE has increased since 2006/2007.

Table A2. Estimated yields and model parameters for Runs 19-22.

Parameter	Run 19	Run 20	Run 21	Run 22
Fishery performance				
First yr of landings	1992/93	1992/93	1990/91	1990/91
Last yr of landings	2006/07	2010/11	2006/07	2010/11
Catch (mp ww)	6.776	7.559	12.499	13.281
Number of years	15	19	17	21
CV of sum of catch	0.1	0.1	0.1	0.1
Average catch (mp ww)	0.452	0.398	0.735	0.632
DCAC				
Assumed M (yr^{-1})	0.06	0.06	0.06	0.06
Standard deviation ln(M) (yr -1)	0.5	0.5	0.5	0.5
Assumed Biomass Change (Δ)	0.44	0.24	0.60	0.40
Standard Deviation Δ	0.2	0.2	0.2	0.2
Assumed c	1	1	1	1
Standard Deviation c	0.2	0.2	0.2	0.2
Monte Carlo results (n=10,000)				
Monte Carlo mean (mp ww)	**0.191**	**0.247**	**0.278**	**0.330**
Percentiles (%)				
5	0.099	0.154	0.139	0.190
20	0.137	0.199	0.197	0.254
50	0.187	0.247	0.270	0.329
80	0.242	0.294	0.356	0.405
95	0.297	0.337	0.444	0.472

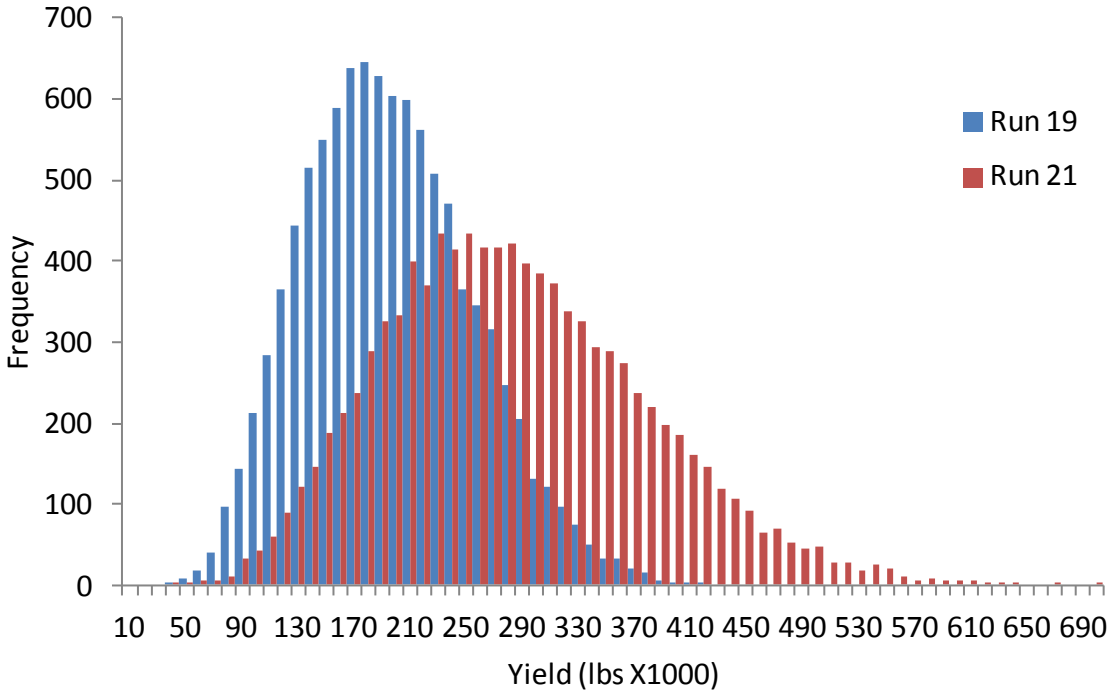


Figure A3. Frequency distribution of wreckfish DCAC results for Runs 19 and 21 based on Monte Carlo sampling of parameter values.

Appendix H. Scientific and Statistical Committee (SSC) Subcommittee Review of DCAC Report

Peer Review of "Depletion-Corrected Average Catch Estimates for U.S. South Atlantic Wreckfish"
SAFMC SSC Subcommittee
November 10, 2011

The report (NMFS SERO, October 23, 2011) was reviewed by a subcommittee of the SEFSC SSC (L. Barbieri, chair; J. Berkson; S. Cadrin, and Y. Jiao) and met with A. Strelcheck on November 9 2011. Each of the model inputs (landings series, natural mortality, depletion estimate, and the ratio of Fmsy to natural mortality) to attempt a determination of a 'best run' and a candidate ABC recommendation for review by the entire SSC.

1. Landings:
Time series: Two options for time series of landings were used in the report (1987-2010 and 1989-2010). The subcommittee requested revised analyses that use a time periods of landings that are consistent with the two options for periods used to derive the depletion estimate (1990 to 2006 and 1992 to 2006). The choice on period of rebuilding is discussed below. Total landings were 12.5 mil lb for the 17 years from 1990 to 2006, and 6.8 mil lb from the 15 years of 1992 to 1996.

Uncertainty in landings: The assumed variability in total catch (CV=10%) corresponds to a relatively well-estimated catch in this ITQ fishery with few fishery

2. Natural Mortality (M)
Most likely value of M: The report states: "*M ranged from 0.06-0.09 using Pauly (1979) and 0.11-0.14 using Hoenig (1983). Estimates of M for Hoenig (1983) were based on maximum ages of 30-39 years. More recent age and growth data from Peres and Haimovici (2004) indicate wreckfish may live considerably longer (up to 76 years). Based on Hoenig (1983) and Hewitt and Hoenig (2005) and a maximum age of 76 years, M ranged from 0.04-0.06. Vaughn et al. (2001) recommended 0.1 be used as the preferred estimate of M*."

The subcommittee agreed that calculations of M that are based on the most recent age data are most defensible (Peres et al. 2004; maximum age of 76 years). However, the subcommittee recommended that the estimate of M from Hewitt and Hoenig (2005; M=0.06) is an improvement for deriving M from maximum age than the Hoenig (1983) method.

Uncertainty in M: We can only approximate uncertainty in M, and a standard deviation of 0.5 in Ln(M) produces a reasonable distribution of M (0.04 to 0.10 +/- 1 SD).

3. Depletion:
CPUE standardization: Appendix 1 gives sufficient detail to accept the analysis to provide a standardized CPUE. A large portion of variance was explained (R^2=57%), and the model diagnostics (distribution of residuals, etc.) look quite good.

CPUE trends: The use of CPUE as a measure of relative abundance assumes that catchability of a GLM-standardized unit of effort is constant throughout the time series. Violation of this assumption should be expected to be in a direction of increasing catchability, because of technological advances since the early fishery (1992). Therefore, the apparent depletion from the trend in CPUE may be an underestimate of depletion.

Choice of depletion period: The report states that "*Since 2007, standardized and nominal catch rates have increased. The reduction in CPUE from 1992 to 2010 was 35% for nominal and standardized indices. Reductions in CPUE from 1992 to 2006 were ~57-58%. A 35% change in biomass was used as the lower bound for model runs and a 60% change in biomass was used as the upper bound for model runs. A middle run was also conducted using a 50% change in biomass. This run was based on personal communication with Paul Reiss (September 9, 2011), a wreckfish shareholder who currently lands a significant portion of the annual wreckfish landings. Mr. Reiss indicated that a 50% reduction in his CPUE has likely occurred since landings peaked in the early 1990s. Mr. Reiss also indicated that his CPUE has been increasing in recent fishing years*." (page 4).

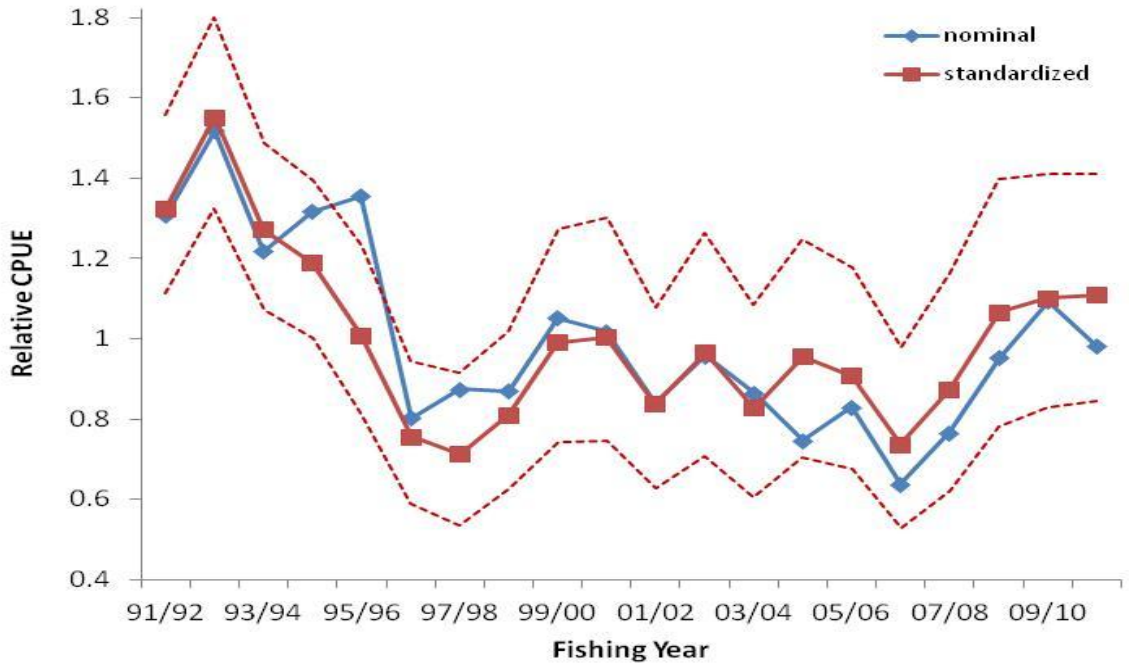


Figure 1. Extended series nominal and standardized index of wreckfish abundance (± 80% confidence intervals) for High-3 fishing vessels, 1991-2010.

The subcommittee supports the derivation of depletion based on the maximum year of CPUE (1992/1993) and the minimum year of CPUE (2006/2007). This choice of depletion period is consistent with MacCall's (2009) application of DCAC to Gulf of Maine redfish in which he chose the year of minimum biomass as the last year of the depletion, and excluded subsequent years of rebuilding to provide a good approximation of MSY from a more informative age-based assessment.

Unfished Biomass: The subcommittee felt that there were two valid options for calculating depletion relative to unfished biomass (B0):

1) $\Delta = \frac{CPUE_{max} - CPUE_{min}}{CPUE_{B0}}$

2) $\Delta = \frac{CPUE_{B0} - CPUE_{min}}{CPUE_{B0}}$

The CPUE standardization was extending further back in time. The Extended series back to 1991 had lower CPUE than 1992, similar to the CPUE series developed by Vaughan et al. (2001). In lieu of a CPUE observation that represents B0, the depletion trend in the CPUE series was extrapolated back to the beginning of the fishery to derive $CPUE_{B0}$ (1.82). The resulting calculations of depletion are 44% (equation 1) and 60% (equation 2).

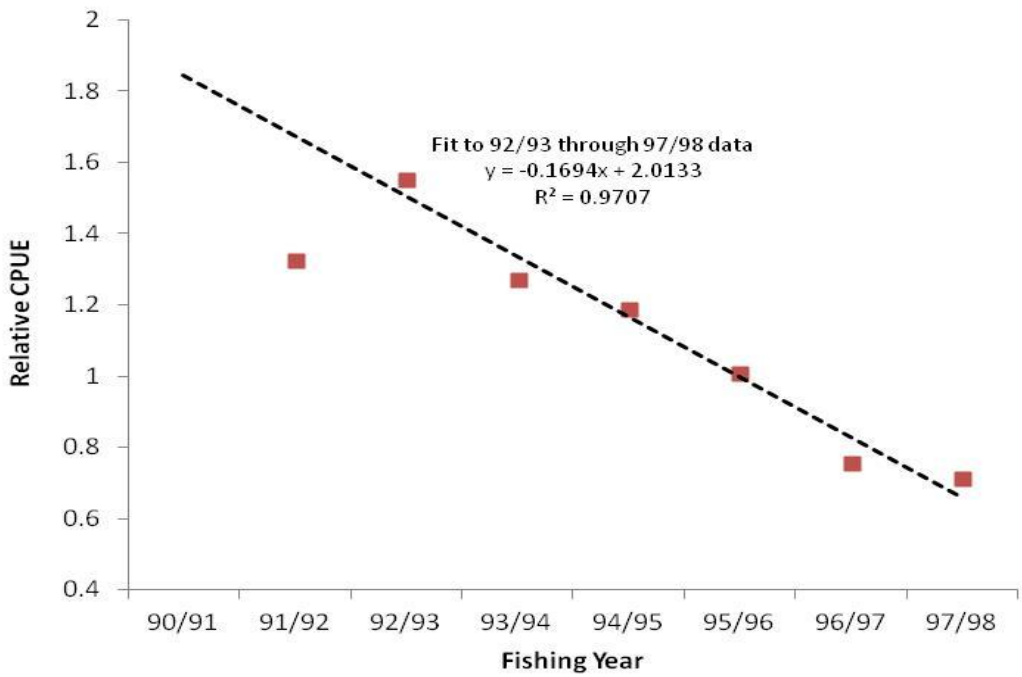


Figure 2. Extrapolation of depletion to the beginning of the fishery to approximate CPUE at B0.

<u>Uncertainty in depletion:</u> The distribution of delta should be a function of uncertainty in the standardized CPUE (e.g., the distribution of maximum and minimum year CPUE) rather than an assumed standard deviation of 0.2. This can be done using a bootstrap analysis of the GLM to derive joint-distributions of the maximum and minimum year CPUE, and the resulting distribution in depletion.

A crude approximation of such an analysis is calculating extremes of depletion using confidence limits of CPUE during the maximum and minimum years. The resulting range of depletion calculations around the point estimate of 44% depletion (17% to 68%) is similar to the distribution of depletions based on a standard deviation of 0.2 (24% to 64% +/- 1 SD).

4. Fmsy:

The report states that "*There is currently no estimate for Fmsy. M is often considered a conservative proxy for Fmsy (Restrepo et al. 1998) and MacCall (2009) noted that a ratio of Fmsy to M = 1 may be considered a target or upper limit for many stocks. Walters and Martell (2004) indicated ratios = 0.75-0.8 may be appropriate in data poor situations and that the ratio of Fmsy to M may be as low as 0.6 for highly vulnerable stocks. For this analysis, sensitivity runs were conducted using Fmsy to M ratios of 0.8 and 1.0.*"

The choice of the parameter c (Fmsy/M) is an expert judgment. Meta-analysis of all stocks in the region with known Fmsy and M indicated that c was greater than 1 for all stocks. There is nothing about wreckfish life history or the fishery that would justify c<1. Therefore, the most defensible value of c provided in the report is c=1.0.

Recommendation

The subcommittee concludes that two alternative analyses are equally valid, and have complementary strengths and weaknesses. The 44% depletion estimate is based directly on observed years of CPUE, whereas the 60% depletion estimate is based on the entire period of depletion. The average estimate of Ysust is 0.235 mil lb. This is 6% less than the previous ABC recommendation of 0.25 mil lb.

In the future, the catch and CPUE series may support a biomass dynamics approach to stock assessment of wreckfish, which would be a more informative basis for fishery management. Both DCAC and biomass dynamics models represent productivity in the fished area, and sustainable yield in the entire resource area may be greater.

Acknowledgments

The subcommittee thanks Andy Strelcheck for his efforts and responsiveness in providing alternative analyses. We are also grateful to Alec MacCall for his technical guidance.

References

MacCall, A.D. 2009. Depletion corrected average catch: a simple formula for estimating sustainable yields in data poor situations. ICES Journal of Marine Science, 66: 2267-2271.

Hewitt, D.A., and J.M. Hoenig. 2005. Comparison of two approaches for estimating natural mortality based on longevity. Fishery Bulletin. 103(2): 433-437.

Hoenig, J.M. 1983. Empirical use of longevity data to estimate mortality rates. Fishery Bulletin, 82: 898-903.

Peres, M.B., and M. Haimovici. 2004. Age and growth of southwestern Atlantic wreckfish *Polyprion americanus*. Fisheries Research, 66: 157-169.Vaughn, D.S., C.S. Manooch III, and J.C. Potts. 2001. Assessment of the Wreckfish Fishery on the Blake

Plateau. Pages 105-122 in G.R. Sedberry, editor. Island in the stream: oceanography and fisheries of the Charleston Bump. AFS, Symposium 25, Bethesda, MD.

Appendix I. Essential Fish Habitat and Move to Ecosystem Based Management

South Atlantic Fishery Management Council Habitat Conservation, Ecosystem Coordination and Collaboration

The Council, using the Essential Fish Habitat Plan as the cornerstone, adopted a strategy to facilitate the move to an ecosystem-based approach to fisheries management in the region. This approach required a greater understanding of the South Atlantic ecosystem and the complex relationships among humans, marine life and the environment including essential fish habitat. To accomplish this, a process was undertaken to facilitate the evolution of the Habitat Plan into a Fishery Ecosystem Plan (FEP), thereby providing more comprehensive understanding of the biological, social and economic impacts of management necessary to initiate the transition from single species management to ecosystem-based management in the region.

Moving to Ecosystem-Based Management

The Council adopted broad goals for Ecosystem-Based Management to include maintaining or improving ecosystem structure and function; maintain or improving economic, social and cultural benefits from resources; and maintaining or improving biological, economic and cultural diversity. Development of a regional FEP (SAFMC 2009a) provided an opportunity to expand scope of the original Council Habitat Plan and compile and review available habitat, biological, social, and economic fishery and resource information for fisheries in the South Atlantic ecosystem. The South Atlantic Council views habitat conservation at the core of the move to EBM in the region. Therefore, development of the FEP was a natural next step in the evolution and expands and significantly updates the SAFMC Habitat Plan (SAFMC 1998a) incorporating comprehensive details of all managed species (SAFMC, South Atlantic States, ASMFC, and NOAA Fisheries Highly Migratory Species and Protected Species) including their biology, food web dynamics, and economic and social characteristics of the fisheries and habitats essential to their survival. The FEP therefore serves as a source document presents more complete and detailed information describing the South Atlantic ecosystem and the impact of the fisheries on the environment. This FEP updates information on designated Essential Fish Habitat (EFH) and EFH-Habitat Areas of Particular Concern; expands descriptions of biology and status of managed species; presents information that will support ecosystem considerations for managed species; and describes the social and economic characteristics of the fisheries in the region. In addition, it expands the discussion and description of existing research programs and needs to identify biological, social, and economic research needed to fully address ecosystem-based management in the region. In is anticipated that the FEP will provide a greater degree of guidance by fishery, habitat, or major ecosystem consideration of bycatch reduction, prey-predator interactions, maintaining biodiversity, and spatial management needs. This FEP serves as a living source document of biological, economic, and social information for all Fishery Management Plans (FMP). Future Environmental Assessments and Environmental Impact Statements associated with subsequent amendments to Council FMPs will draw from or cite by reference the FEP.

The Fishery Ecosystem Plan for the South Atlantic Region encompasses the following volume structure: FEP Volume I - Introduction and Overview of FEP for the South Atlantic Region
FEP Volume II - South Atlantic Habitats and Species
FEP Volume III - South Atlantic Human and Institutional Environment
FEP Volume IV - Threats to South Atlantic Ecosystem and Recommendations
FEP Volume V - South Atlantic Research Programs and Data Needs
FEP Volume VI - References and Appendices

Comprehensive Ecosystem-Based Amendment (CE-BA) 1 (SAFMC 2009b) is supported by this FEP and updates EFH and EFH-HAPC information and addresses the Final EFH Rule (e.g., GIS presented for all EFH and EFH-HAPCs). Management actions implemented in the CE-BA establish deepwater Coral HAPCs to protect what is thought to be the largest continuous distribution (>23,000 square miles) of pristine, deepwater coral ecosystems in the world.

Ecosystem Approach to Deepwater Ecosystem Management

The South Atlantic Council manages coral, coral reefs and live/hard bottom habitat, including deepwater
corals, through the Fishery Management Plan for Coral, Coral Reefs and Live/Hard Bottom Habitat of the South Atlantic Region (Coral FMP). Mechanisms exist in the FMP, as amended, to further protect deepwater coral and live/hard bottom habitats. The SAFMC's Habitat and Environmental Protection Advisory Panel and Coral Advisory Panel have supported proactive efforts to identify and protect deepwater coral ecosystems in the South Atlantic region. Management actions in Comprehensive Ecosystem-Based Amendment (CE-BA 1) (SAFMC 2009b)established deepwater coral HAPCs (C- HAPCs) to protect what is thought to be the largest continuous distribution (>23,000 square miles) of pristine deepwater coral ecosystems in the world. In addition, CE-BA 1 established areas within the CHAPC which provide for traditional fishing in limited areas which do not impact deepwater coral habitat. CE-BA 1, supported by the FEP, also addresses non-regulatory updates for existing EFH and EFH- HAPC information and addresses the spatial requirements of the Final EFH Rule (i.e., GIS presented for all EFH and EFH-HAPCs).

Building from a Habitat to an Ecosystem Network to Support the Evolution

Starting with our Habitat and Environmental Protection Advisory Panel, the Council expanded and
fostered a comprehensive Habitat network in our region to develop the Habitat Plan of the South Atlantic Region completed in 1998 to support the EFH rule. Building on the core regional collaborations, the Council facilitated an expansion to a Habitat and Ecosystem network to support the development of the FEP and CE-BA as well as coordinate with partners on other regional efforts.

These efforts include participation as a member and on the Board of the Southeast Coastal Regional Ocean Observing Association (SECOORA) to guide and direct priority needs for observation and modeling to support fisheries oceanography and integration into stock assessment process through SEDAR. Cooperation through SECOORA is envisioned to facilitate the following:

- Refining current or water column designations of EFH and EFH-HAPCs (e.g., Gulf Stream and Florida Current)
- Providing oceanographic models linking benthic, pelagic habitats and food webs
- Providing oceanographic input parameters for ecosystem models
- Integration of OOS information into Fish Stock Assessment process in the SA region
- Facilitating OOS system collection of fish and fishery data and other research necessary to support the Council's use of area-based management tools in the SA Region including but not limited to EFH, EFH-HAPCs, Marine Protected Areas, Deepwater Coral Habitat Areas of Particular Concern, Special Management Zones and Allowable Gear Areas.
- Integration of OOS program capabilities and research Needs into the South Atlantic Fishery Ecosystem Plan
- Collaboration with SECOORA to integrate OOS products on the Council's Habitat and Ecosystem Internet Mapping System to facilitate model and tool development
- Expanding IMS and Arc Services will provide permissioned researchers access to data or products including those collected/developed by SA OOS partners

In addition, the Council serves on the National Habitat Board and, as a member of the Southeast Aquatic Resource Partnership (SARP), has highlighted the collaboration by including the Southeast Aquatic Habitat Plan and associated watershed conservation restoration targets into the FEP. Many of the habitat, water quality, and water quantity conservation needs identified in the threats and recommendations Volume of the FEP are directly addressed by on-the-ground projects supported by SARP. This cooperation results in funding fish habitat restoration and conservation intended to increase the viability of fish populations and fishing opportunity which also meets the needs to conserve and manage Essential Fish Habitat for Council managed species or habitat important to their prey.

Initially discussed as a South Atlantic Eco-regional Compact, the Council has also cooperated with South Atlantic States in the formation of a Governor's South Atlantic Alliance (SAA). This will also provide regional guidance and resources that will address State and Council broader habitat and ecosystem conservation goals. The SAA was initiated in 2006. An Executive Planning Team (EPT), by the end of 2007, had created a framework for the Governors South Atlantic Alliance. The formal agreement between the four states (NC, SC, GA, and FL) was executed in May 2009. The Agreement specifies that the Alliance will prepare a "Governors South Atlantic Alliance Action Plan" which will be reviewed annually for progress and updated every five years for relevance of content. Alliance mission and purpose is to promote collaboration among the four states, and with the support and interaction of federal agencies, academe, regional organizations, non-governmental organizations, and the private sector, to sustain and enhance the region's coastal and marine resources. The Alliance proposes to regionally implement science-based actions and policies that balance coastal and marine ecosystems capacities to support both human and natural systems. An Action Plan was approved by the Governors and an Implementation Plan is under development.

One of the more recent collaborations is the Council participation as Steering Committee

member for the newly establish South Atlantic Landscape Conservation Cooperative (SALCC). Landscape Conservation Cooperatives (LCCs) are applied conservation science partnerships focused on a defined geographic area that informs on-the-ground strategic conservation efforts at landscape scales. LCC partners include DOI agencies, other federal agencies, states, tribes, non-governmental organizations, universities and others. The newly formed Department of Interior Southeast Climate Services Center (CSC) has the LCCs in the region as their primary clients. One of the initial charges of the CSCs is to downscale climate models for use at finer scales.

Building Tools to support EBM in the South Atlantic Region
The Council has developed a Habitat and Ecosystem Section of the website http://www.safmc.net/ecosystem/Home/EcosystemHome/tabid/435/Default.aspx and, in cooperation with the Florida Wildlife Research Institute (FWRI), developed a Habitat and Ecosystem Internet Map Server (IMS) http://www.safmc.net/EcosystemManagement/EcosystemBoundaries/MappingandGISData/tabid /62/Default.aspx. The IMS was developed to support Council and regional partners' efforts in the transition to EBM. Other regional partners include NMFS Habitat Conservation, South Atlantic States, local management authorities, other Federal partners, universities, conservation organizations, and recreational and commercial fishermen. As technology and spatial information needs evolve, the distribution and use of GIS demands greater capabilities. The Council has continued its collaboration with FWRI in the now evolution to Web Services initially for for Essential Fish Habitat (http://ocean.floridamarine.org/SAFMC_EFH/) and Fishery Regulations (http://ocean.floridamarine.org/SAFMC_Regulations/) and is refining permissioned services for Fishery Independent and Habitat Research and developing one for Ocean Energy activities in the region (e.g., wind, wave and current).

Ecosystem Based Action, Future Challenges and Needs
The Council has implemented ecosystem-based principles through several existing fishery management
actions including establishment of deepwater Marine Protected Areas for the Snapper Grouper fishery, proactive harvest control rules on species (e.g., dolphin and wahoo) which are not overfished, implementing extensive gear area closures which in most cases eliminate the impact of fishing gear on Essential Fish Habitat and use of other spatial management including Special Management Zones. Pursuant to the development of the Comprehensive Ecosystem-Based Amendment, the Council is taking an ecosystem approach to protect deepwater ecosystems while providing for traditional fisheries for the Golden Crab and Royal Red shrimp in areas where they do not impact deepwater coral habitat. The stakeholder based process taps in on an extensive regional Habitat and Ecosystem network. Support
tools facilitate Council deliberations and with the help of regional partners, are being refined to address long-term ecosystem management needs.

One of the greatest challenges to the long-term move to EBM in the region is funding high priority research, including but not limited to, comprehensive benthic mapping and ecosystem model and management tool development. In addition, collecting detailed information on fishing fleet dynamics including defining fishing operation areas by species, species complex and season, as well as catch relative to habitat is critical for assessment of fishery, community, and habitat impacts and for Council use of place based management measures. Additional resources need to be dedicated to expand regional coordination of modeling, mapping, characterization of species use of habitats, and full funding of regional fishery independent surveys (e.g., MARMAP, SEAMAP and SEFIS) which are linking directly to addressing high priority management needs. Development of ecosystem information systems to support Council management should build on existing tools (e.g., Regional Habitat and Ecosystem GIS and Arc Services) and provide resources to regional cooperating partners for expansion to address long-term Council needs.

The FEP and CE-BA 1 complement, but do not replace, existing FMPs. In addition, the FEP serves as source document to the CE-BAs. NOAA should support and build on regional coordination efforts of the Council as it transitions to a broader management approach. Resources need to be provided to collect information necessary to update and refine our FEP and support future fishery actions including but not limited to completing one of the highest priority needs to support EBM, the completion of mapping of near-shore, mid-shelf, shelf edge and deepwater habitats in the South Atlantic region. In developing future FEPs, the Council will draw on SAFEs (Stock Assessment and Fishery Evaluation reports) which NMFS is required to provide the Council for all FMPs implemented under the Magnuson-Stevens Act. The FEP, serving as the source document for CE-BAs, could also meet NMFS SAFE requirements if information is provided to the Council to update necessary sections.

EFH and EFH-HAPC Designations Translated to Cooperative Habitat Policy Development and Protection The Council actively comments on non-fishing projects or policies that may impact fish habitat. Appendix A of the Comprehensive Amendment Addressing Essential Fish Habitat in Fishery Management Plans of the South Atlantic Region (SAFMC 1998b) outlines the Council's comment and policy development process and the establishment of a four-state Habitat Advisory Panel. Members of the Habitat Advisory Panel serve as the Council's habitat contacts and professionals in the field. AP members bring projects to the Council's attention, draft comment letters, and attend public meetings. With guidance from the Advisory Panel, the Council has developed and approved policies on:

1. Energy exploration, development, transportation and hydropower re-licensing;
2. Beach dredging and filling and large-scale coastal engineering;
3. Protection and enhancement of submerged aquatic vegetation;
4. Alterations to riverine, estuarine and nearshore flows; and
5. Marine aquaculture.
6. Marine Ecosystems and Non-Native and Invasive Species
7. Estuarine Ecosystems and Non-Native and Invasive Species

NOAA Fisheries, State and other Federal agencies apply EFH and EFH-HAPC designations and protection policies in the day-to-day permit review process. In addition to the workshop process described above the revision and updating of existing habitat policies and the development of new policies is being coordinated with core agency representatives on the Habitat and Coral Advisory Panels. Existing policies are included at the end of this Appendix.

South Atlantic Bight Ecopath Model

The Council worked cooperatively the University of British Columbia and the Sea Around Us project to

develop a straw-man and preliminary food web models (Ecopath with Ecosim) to characterize the ecological relationships of South Atlantic species, including those managed by the Council. This effort was envisioned to help the Council and cooperators in identifying available information and data gaps while providing insight into ecosystem function. More importantly, the model development process provides a vehicle to identify research necessary to better define populations, fisheries and their interrelationships. While individual efforts are still underway in

the South Atlantic (e.g., Biscayne Bay) only with significant investment of new resources through other programs will a comprehensive regional model be further developed.

Essential Fish Habitat and Essential Fish Habitat Areas of Particular Concern
Following is a summary of the current South Atlantic Council's EFH and EFH-HAPCs. Information supporting their designation is being updated (pursuant to the EFH Final Rule) in the Council's Fishery Ecosystem Plan and Comprehensive Ecosystem Amendment:

Snapper Grouper FMP
Essential fish habitat for snapper-grouper species includes coral reefs, live/hard bottom, submerged aquatic vegetation, artificial reefs and medium to high profile outcroppings on and around the shelf break zone from shore to at least 600 feet (but to at least 2000 feet for wreckfish) where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical complex. EFH includes the spawning area in the water column above the adult habitat and the additional pelagic environment, including *Sargassum*, required for larval survival and growth up to and including settlement. In addition the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse snapper grouper larvae.

For specific life stages of estuarine dependent and nearshore snapper-grouper species, essential fish habitat includes areas inshore of the 100-foot contour, such as attached macroalgae; submerged rooted vascular plants (seagrasses); estuarine emergent vegetated wetlands (saltmarshes, brackish marsh); tidal creeks; estuarine scrub/shrub (mangrove fringe); oyster reefs and shell banks; unconsolidated bottom (soft sediments); artificial reefs; and coral reefs and live/hard bottom.

Areas which meet the criteria for EFH-HAPCs for species in the snapper-grouper management unit include medium to high profile offshore hard bottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; nearshore hard bottom areas; The Point, The Ten Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump (South Carolina); mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper (e.g., Primary and Secondary
Nursery Areas designated in North Carolina); pelagic and benthic *Sargassum*; Hoyt Hills for wreckfish; the *Oculina* Bank Habitat Area of Particular Concern; all hermatypic coral habitats and reefs; manganese outcroppings on the Blake Plateau; and Council-designated Artificial Reef Special Management Zones (SMZs). In addition, the Council through CEBA 2 (SAFMC 2011) is
proposing the deepwater snapper grouper MPAs and golden tilefish and blueline tilefish habitat as
EFH-HAPCs under the Snapper Grouper FMP as follows:

EFH-HAPCs for golden tilefish to include irregular bottom comprised of troughs and terraces inter-mingled with sand, mud, or shell hash bottom. Mud-clay bottoms in depths of 150-300 meters are HAPC. Golden tilefish are generally found in 80-540 meters, but most commonly

found in 200-meter depths.

EFH-HAPC for blueline tilefish to include irregular bottom habitats along the shelf edge in 45-65 meters depth; shelf break; or upper slope along the 100-fathom contour (150-225 meters); hardbottom habitats characterized as rock overhangs, rock outcrops, manganese-phosphorite rock slab formations, or rocky reefs in the South Atlantic Bight; and the Georgetown Hole (Charleston Lumps) off Georgetown, SC.

EFH-HAPCs for the snapper grouper complex to include the following deepwater Marine Protected Areas (MPAs) as designated in Snapper Grouper Amendment 14; Snowy Grouper Wreck MPA, Northern South Carolina MPA, Edisto MPA, Charleston Deep Artificial Reef MPA, Georgia MPA, North Florida MPA, St. Lucie Hump MPA and East Hump MPA.

Shrimp FMP

For penaeid shrimp, Essential Fish Habitat includes inshore estuarine nursery areas, offshore marine habitats used for spawning and growth to maturity, and all interconnecting water bodies as described in the Habitat Plan. Inshore nursery areas include tidal freshwater (palustrine), estuarine, and marine emergent wetlands (e.g., intertidal marshes); tidal palustrine forested areas; mangroves; tidal freshwater, estuarine, and marine submerged aquatic vegetation (e.g., seagrass); and subtidal and intertidal non- vegetated flats. This applies from North Carolina through the Florida Keys.

For rock shrimp, essential fish habitat consists of offshore terrigenous and biogenic sand bottom habitats from 18 to 182 meters in depth with highest concentrations occurring between 34 and 55 meters. This applies for all areas from North Carolina through the Florida Keys. Essential fish habitat includes the shelf current systems near Cape Canaveral, Florida which provide major transport mechanisms affecting planktonic larval rock shrimp. These currents keep larvae on the Florida Shelf and may transport them inshore in spring. In addition the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse rock shrimp larvae.

Essential fish habitat for royal red shrimp include the upper regions of the continental slope from 180 meters (590 feet) to about 730 meters (2,395 feet), with concentrations found at depths of between 250 meters (820 feet) and 475 meters (1,558 feet) over blue/black mud, sand, muddy sand, or white calcareous mud. In addition the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse royal red shrimp larvae.

Areas which meet the criteria for EFH-HAPCs for penaeid shrimp include all coastal inlets, all state-designated nursery habitats of particular importance to shrimp (for example, in North Carolina this would include all Primary Nursery Areas and all Secondary Nursery Areas), and state-identified overwintering areas.

Coastal Migratory Pelagics FMP

Essential fish habitat for coastal migratory pelagic species includes sandy shoals of capes and offshore bars, high profile rocky bottom and barrier island ocean-side waters, from the surf to the shelf break zone, but from the Gulf stream shoreward, including *Sargassum*. In addition, all

coastal inlets, all state-designated nursery habitats of particular importance to coastal migratory pelagics (for example, in North Carolina this would include all Primary Nursery Areas and all Secondary Nursery Areas).

For Cobia essential fish habitat also includes high salinity bays, estuaries, and seagrass habitat. In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse coastal migratory pelagic larvae.
For king and Spanish mackerel and cobia essential fish habitat occurs in the South Atlantic and Mid-Atlantic Bights.

Areas which meet the criteria for EFH-HAPCs include sandy shoals of Capes Lookout, Cape Fear, and Cape Hatteras from shore to the ends of the respective shoals, but shoreward of the Gulf stream; The Point, The Ten-Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump and Hurl Rocks (South Carolina); The Point off Jupiter Inlet (Florida); *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; nearshore hard bottom south of Cape Canaveral; The Hump off Islamorada, Florida; The Marathon Hump off Marathon, Florida; The "Wall" off of the Florida Keys; Pelagic *Sargassum*; and Atlantic coast estuaries with high numbers of Spanish mackerel and cobia based on abundance data from the ELMR Program. Estuaries meeting this criteria for Spanish mackerel include Bogue Sound and New River, North Carolina; Bogue Sound, North Carolina (Adults May-September salinity >30 ppt); and New River, North Carolina (Adults May-October salinity >30 ppt). For Cobia they include Broad River, South Carolina; and Broad River, South Carolina (Adults & juveniles May-July salinity >25ppt).

Golden Crab FMP
Essential fish habitat for golden crab includes the U.S. Continental Shelf from Chesapeake Bay south through the Florida Straits (and into the Gulf of Mexico). In addition, the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse golden crab larvae. The detailed description of seven essential fish habitat types (a flat foraminferan ooze habitat; distinct mounds, primarily of dead coral; ripple habitat; dunes; black pebble habitat; low outcrop; and
soft-bioturbated habitat) for golden crab is provided in Wenner et al. (1987). There is insufficient knowledge of the biology of golden crabs to identify spawning and nursery areas and to identify
HAPCs at this time. As information becomes available, the Council will evaluate such data and identify HAPCs as appropriate through the framework

Spiny Lobster FMP
Essential fish habitat for spiny lobster includes nearshore shelf/oceanic waters; shallow subtidal bottom; seagrass habitat; unconsolidated bottom (soft sediments); coral and live/hard bottom habitat; sponges; algal communities (*Laurencia*); and mangrove habitat (prop roots). In addition the Gulf Stream is an essential fish habitat because it provides a mechanism to disperse spiny lobster larvae.

Areas which meet the criteria for EFH-HAPCs for spiny lobster include Florida Bay, Biscayne

Bay, Card Sound, and coral/hard bottom habitat from Jupiter Inlet, Florida through the Dry Tortugas, Florida.

Coral, Coral Reefs, and Live/Hard Bottom Habitats FMP
Essential fish habitat for corals (stony corals, octocorals, and black corals) must incorporate habitat for over 200 species. EFH for corals include the following:

A. Essential fish habitat for hermatypic stony corals includes rough, hard, exposed, stable substrate from Palm Beach County south through the Florida reef tract in subtidal to 30 m depth, subtropical (15°-35° C), oligotrophic waters with high (30-35$^{o}/_{oo}$) salinity and turbidity levels sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis. Ahermatypic stony corals are not light restricted and their essential fish habitat includes defined hard substrate in subtidal to outer shelf depths throughout the management area.

B. Essential fish habitat for *Antipatharia* (black corals) includes rough, hard, exposed, stable substrate, offshore in high (30-35$^{o}/_{oo}$) salinity waters in depths exceeding 18 meters (54 feet), not restricted by light penetration on the outer shelf throughout the management area.

C. Essential fish habitat for octocorals excepting the order Pennatulacea (sea pens and sea pansies) includes rough, hard, exposed, stable substrate in subtidal to outer shelf depths within a wide range of salinity and light penetration throughout the management area.

D. Essential fish habitat for Pennatulacea (sea pens and sea pansies) includes muddy, silty bottoms in subtidal to outer shelf depths within a wide range of salinity and light penetration.

Areas which meet the criteria for EFH-HAPCs for coral, coral reefs, and live/hard bottom include: The 10-Fathom Ledge, Big Rock, and The Point (North Carolina); Hurl Rocks and The Charleston Bump (South Carolina); Gray's Reef National Marine Sanctuary (Georgia); The *Phragmatopoma* (worm reefs) reefs off the central east coast of Florida; Oculina Banks off the east coast of Florida from Ft. Pierce to Cape Canaveral; nearshore (0-4 meters; 0-12 feet) hard bottom off the east coast of Florida from Cape Canaveral to Broward County); offshore (5-30 meter; 15-90 feet) hard bottom off the east coast of Florida from Palm Beach County to Fowey Rocks; Biscayne Bay, Florida; Biscayne National Park, Florida; and the Florida Keys National Marine Sanctuary. In addition, the Council through CEBA 2 (SAFMC 2011) is proposing the Deepwater Coral HAPCs as EFH-HAPCs under the Coral FMP as follows:

Deepwater Coral HAPCs designated in Comprehensive Ecosystem-Based Amendment 1 as Snapper Grouper EFH-HAPCs: Cape Lookout Coral HAPC, Cape Fear Coral HAPC, Blake Ridge Diapir Coral HAPC, Stetson-Miami Terrace Coral HAPC, Pourtalés Terrace Coral HAPC.

Dolphin and Wahoo FMP
EFH for dolphin and wahoo is the Gulf Stream, Charleston Gyre, Florida Current, and pelagic

Sargassum. This EFH definition for dolphin was approved by the Secretary of Commerce on June 3, 1999 as a part of the South Atlantic Council's Comprehensive Habitat Amendment (SAFMC, 1998b) (dolphin was included within the Coastal Migratory Pelagics FMP).

Areas which meet the criteria for EFH-HAPCs for dolphin and wahoo in the Atlantic include The Point, The Ten-Fathom Ledge, and Big Rock (North Carolina); The Charleston Bump and The Georgetown Hole (South Carolina); The Point off Jupiter Inlet (Florida); The Hump off Islamorada, Florida; The Marathon Hump off Marathon, Florida; The "Wall" off of the Florida Keys; and Pelagic *Sargassum*. This EFH-HAPC definition for dolphin was approved by the Secretary of Commerce on June 3, 1999 as a part of the South Atlantic Council's Comprehensive Habitat Amendment (dolphin was included within the Coastal Migratory Pelagics FMP).

Pelagic *Sargassum* Habitat FMP

The Council through CEBA 2 (SAFMC 2011) is proposing to designate the top 10 meters of the water column in the South Atlantic EEZ bounded by the Gulfstream, as EFH for pelagic Sargassum.

Actions Implemented That Protect EFH and EFH-HAPCs

Snapper Grouper FMP

- Prohibited the use of the following gears to protect habitat: bottom longlines in the EEZ inside of 50 fathoms or anywhere south of St. Lucie Inlet Florida, fish traps, bottom tending (roller- rig) trawls on live bottom habitat, and entanglement gear.
- Established the *Oculina* Experimental Closed Area where the harvest or possession of all species in the snapper grouper complex is prohibited

Shrimp FMP

- Prohibition of rock shrimp trawling in a designated area around the *Oculina* Bank,
- Mandatory use of bycatch reduction devices in the penaeid shrimp fishery,
- Mandatory Vessel Monitoring System (VMS) in the Rock Shrimp Fishery.
- A mechanism that provides for the concurrent closure of the EEZ to penaeid shrimping if environmental conditions in state waters are such that the overwintering spawning stock is severely depleted.

***Pelagic Sargassum* Habitat FMP**

- Prohibited all harvest and possession of *Sargassum* from the South Atlantic EEZ south of the latitude line representing the North Carolina/South Carolina border (34° North Latitude).
- Prohibited all harvest of *Sargassum* from the South Atlantic EEZ within 100 miles of shore between the 34° North Latitude line and the Latitude line representing the North Carolina/Virginia border.
- Harvest of *Sargassum* from the South Atlantic EEZ is limited to the months of November through June.
- Established an annual Total Allowable Catch (TAC) of 5,000 pounds landed wet weight.
- Required that an official observer be present on each *Sargassum* harvesting trip.

Require that nets used to harvest *Sargassum* be constructed of four inch stretch mesh or larger fitted to a frame no larger than 4 feet by 6 feet.

Coastal Migratory Pelagics FMP

- Prohibited of the use of drift gill nets in the coastal migratory pelagic fishery;

Golden Crab FMP

- In the northern zone golden crab traps can only be deployed in waters deeper than 900 feet; in the middle and southern zones traps can only be deployed in waters deeper than 700 feet.

Northern zone - north of the 28°N. latitude to the North Carolina/Virginia border;
Middle zone - 28°N. latitude to 25°N. latitude; and
Southern zone - south of 25°N. latitude to the border between the South Atlantic and Gulf of Mexico
Fishery Management Councils.

Coral, Coral Reefs and Live/Hard Bottom FMP

- Established an optimum yield of zero and prohibiting all harvest or possession of these resources which serve as essential fish habitat to many managed species.
- Designated of the *Oculina* Bank Habitat Area of Particular Concern
- Expanded the *Oculina* Bank Habitat Area of Particular Concern (HAPC) to an area bounded to the west by 80°W. longitude, to the north by 28°30' N. latitude, to the south by 27°30' N. latitude, and to the east by the 100 fathom (600 feet) depth contour.
- Established the following two Satellite *Oculina* HAPCs: (1) Satellite *Oculina* HAPC #1 is bounded on the north by 28°30'N. latitude, on the south by 28°29'N. latitude, on the east by 80°W. longitude, and on the west by 80°3'W. longitude, and (2) Satellite *Oculina* HAPC #2 is bounded on the north by 28°17'N. latitude, on the south by 28°16'N. latitude, on the east by 80°W. longitude, and on the west by 80°3'W. longitude.
- Prohibited the use of all bottom tending fishing gear and fishing vessels from anchoring or using grapples in the *Oculina* Bank HAPC.
- Established a framework procedure to modify or establish Coral HAPCs.
- Established the following six deepwater CHAPCs: Cape Lookout Lophelia Banks, Cape Fear Lophelia Banks, Stetson Reefs, Savannah and East Florida Lithoherms, and Miami Terrace (Stetson- Miami Terrace), Pourtales Terrace, and Blake Ridge Diapir Methane Seep.
- Within the deepwater CHAPCs, the possession of coral species and the use of all bottom damaging gear is prohibited including bottom longline, trawl (bottom and mid-water), dredge, pot or trap, or the use of an anchor, anchor and chain, or grapple and chain by all fishing vessels.

South Atlantic Council Policies for Protection and Restoration of Essential Fish Habitat.

SAFMC Habitat and Environmental Protection Policy

In recognizing that species are dependent on the quantity and quality of their essential habitats, it is the policy of the SAFMC to protect, restore, and develop habitats upon which fisheries species depend; to increase the extent of their distribution and abundance; and to improve their productive capacity for the benefit of present and future generations. For purposes of this policy, "habitat" is defined as the physical, chemical, and biological parameters that are necessary for continued productivity of the species that is being managed. The objectives of the SAFMC policy will be accomplished through the recommendation of no net loss or significant environmental degradation of existing habitat. A long-term objective is to support and promote a net-gain of fisheries habitat through the restoration and rehabilitation of the productive capacity of habitats that have been degraded, and the creation and development of productive habitats where increased fishery production is probable. The SAFMC will pursue these goals at state, Federal, and local levels. The Council shall assume an aggressive role in the protection and enhancement of habitats important to fishery species, and shall actively enter Federal, decision- making processes where proposed actions may otherwise compromise the productivity of fishery resources of concern to the Council.

SAFMC EFH Policy Statements

In addition to implementing regulations to protect habitat from fishing related degradation, the Council in cooperation with NOAA Fisheries, actively comments on non-fishing projects or policies that may impact fish habitat. The Council adopted a habitat policy and procedure document that established a four-state Habitat Advisory Panel and adopted a comment and policy development process. Members of the Habitat Advisory Panel serve as the Council's habitat contacts and professionals in the field. With guidance from the Advisory Panel, the Council has developed and approved the following habitat policy statements which are available on the Habitat and Ecosystem section of the Council website:

Protection and Restoration of EFH from Marine Aquaculture
http://www.safmc.net/Portals/0/HabitatPolicies/SAFMCAquaPolicyFinalJune07.pdf

Protection and Enhancement of Marine Submerged Aquatic Vegetation
http://www.safmc.net/Portals/0/HabitatPolicies/SAFMCSAVPol.pdf

Protection and Restoration of EFH from Beach Dredging and Filling
http://www.safmc.net/Portals/0/HabitatPolicies/BeachPolicy.pdf

Protection and Restoration of EFH from Energy Exploration, Development, Transportation and Hydropower Re-Licensing
http://www.safmc.net/Portals/0/HabitatPolicies/SAFMCEnergyPolicyFinal05.pdf

Protection and Restoration of EFH from Alterations to Riverine, Estuarine and Nearshore Flows
http://www.safmc.net/Portals/0/HabitatPolicies/FlowsPolicy.pdf

Policies for the Protection of South Atlantic Estuarine Ecosystems from Non-Native and Invasive Species
http://www.safmc.net/LinkClick.aspx?fileticket=Qn%2baT%2blNjZM%3d&tabid=245

Policies for the Protection of South Atlantic Marine Ecosystems from No-Native and Invasive Species
http://www.safmc.net/LinkClick.aspx?fileticket=bNFKO%2fIcvHQ%3d&tabid=245