

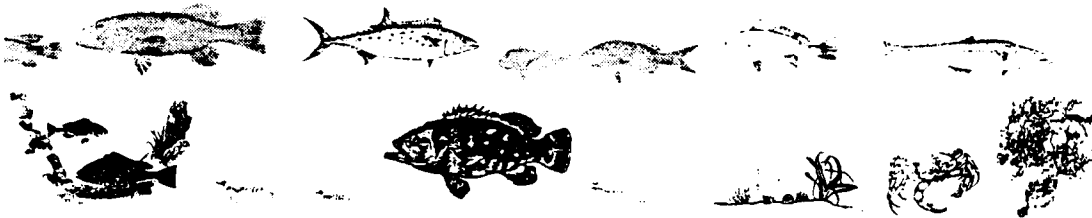


**FINAL**

**COMPREHENSIVE AMENDMENT ADDRESSING SUSTAINABLE FISHERY ACT DEFINITIONS  
AND OTHER REQUIRED PROVISIONS  
IN FISHERY MANAGEMENT PLANS OF THE SOUTH ATLANTIC REGION**

**AMENDMENT 4 TO THE SHRIMP FISHERY MANAGEMENT PLAN,  
AMENDMENT 2 TO THE RED DRUM FISHERY MANAGEMENT PLAN,  
AMENDMENT 11 TO THE SNAPPER GROUPER FISHERY MANAGEMENT PLAN,  
AMENDMENT 11 TO THE COASTAL MIGRATORY PELAGICS FISHERY MANAGEMENT  
PLAN, AMENDMENT 2 TO THE GOLDEN CRAB FISHERY MANAGEMENT PLAN,  
AMENDMENT 6 TO THE SPINY LOBSTER FISHERY MANAGEMENT PLAN,  
AMENDMENT 5 TO THE CORAL, CORAL REEFS, AND LIVE/HARD BOTTOM HABITAT  
FISHERY MANAGEMENT PLAN**

**(INCLUDING A FINAL EA, RIR, & SIA/FIS)**



**OCTOBER 1998**

**South Atlantic Fishery Management Council  
1 Southpark Circle, Charleston, South Carolina 29407-4699  
(843) 571-4366 / FAX (843) 769-4520  
email: safmc@noaa.gov**



*This is a publication of the South Atlantic Fishery Management Council pursuant to National Oceanic and Atmospheric Administration  
Award No. NA87FC0004*

**FINAL**

**COMPREHENSIVE AMENDMENT ADDRESSING SUSTAINABLE FISHERY ACT  
DEFINITIONS AND OTHER REQUIRED PROVISIONS  
IN FISHERY MANAGEMENT PLANS OF THE SOUTH ATLANTIC REGION**

**AMENDMENT 4 TO THE SHRIMP FISHERY MANAGEMENT PLAN,  
AMENDMENT 2 TO THE RED DRUM FISHERY MANAGEMENT PLAN,  
AMENDMENT 11 TO THE SNAPPER GROUPER FISHERY MANAGEMENT PLAN,  
AMENDMENT 11 TO THE COASTAL MIGRATORY PELAGICS FISHERY  
MANAGEMENT PLAN, AMENDMENT 2 TO THE GOLDEN CRAB FISHERY  
MANAGEMENT PLAN,  
AMENDMENT 6 TO THE SPINY LOBSTER FISHERY MANAGEMENT PLAN,  
AMENDMENT 5 TO THE CORAL, CORAL REEFS, AND LIVE/HARD BOTTOM  
HABITAT FISHERY MANAGEMENT PLAN**

**(INCLUDING A FINAL EA, RIR, & SIA/FIS)**

**Prepared by the:  
South Atlantic Fishery Management Council**

**OCTOBER 1998**

**Financial assistance for producing this document was provided by grant funds from the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, under Public Law 94-265, the Magnuson-Stevens Fishery Conservation and Management Act.**

## TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
LIST OF FIGURES .....	iv
LIST OF TABLES.....	v
LIST OF ACTIONS.....	viii
COMPREHENSIVE SFA AMENDMENT COVER SHEET.....	xiv
FINAL ENVIRONMENTAL ASSESSMENT.....	xv
REGULATORY IMPACT REVIEW.....	xvi
Summary of Expected Changes in Net Benefits: Summary of Regulatory Impact Review ....	xviii
SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT.....	xix
Social Impact Assessment Summary.....	xxi
1.0 PURPOSE AND NEED.....	1
1.1 Historical Overview of SAFMC Activities that Address SFA Required Provisions.....	1
1.2 SFA Responsibilities as Defined in the Magnuson-Stevens Fishery Conservation and Management Act.....	7
1.3 Affected Fishery Management Plans and Fish Stocks.....	12
1.4 Issues, Problems and Management Objectives for Comprehensive Amendment.....	12
1.5 Summary of Existing Management Measures which Directly or Indirectly Address SFA Provisions.....	13
1.6 Proposed Measures .....	19
2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION.....	25
Summary of Environmental Consequences.....	26
3.0 AFFECTED ENVIRONMENT .....	27
3.1 List and General Description of Stocks Comprising the Management Unit.....	27
3.1.1 Definitions of Overfishing for Managed Species .....	27
3.1.2 Optimum Yield for Managed Species.....	29
3.1.3 Maximum Sustainable Yield for Managed Species.....	31
3.1.4 Description of Fishing Activities for Managed Species .....	33
3.1.5 Status of Stocks for Managed Species.....	33
4.0 ENVIRONMENTAL CONSEQUENCES .....	36
4.1 Introduction.....	36
4.2. Management Options - Definitions.....	36

4.2.1 Consistency with SFA Section 102 definitions.....	36
4.2.1.1 ACTION 1A. No action to amend FMPs required except as specified in Action 1B. ....	37
4.2.1.2 ACTION 1B. Minor changed to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change “bycatch” to “trip limit”.....	38
4.3 Management Options - Other Required Provisions.....	38
4.3.1 Bycatch - bycatch management measures and bycatch reporting requirements.....	38
4.3.1.1 ACTION 2A. No action to amend the bycatch management measures in the FMPs is required.....	40
4.3.1.2 ACTION 2B. Amend Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include reporting requirements as specified in the Atlantic Coastal Cooperative Statistics Program (ACCSP).....	40
4.3.2 Commercial, recreational and charter fishing - sector descriptions, landing trends and data specification.....	42
4.3.2.1 ACTION 3. No action to amend the FMPs is required.....	42
4.3.3 Fishing Communities - Identify and define fishing communities. ....	43
4.3.3.1 ACTION 4. Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include available information on fishing communities. ....	43
4.3.3.1.1 South Atlantic Fishing Communities.....	48
4.3.3.1.2 North Carolina.....	50
4.3.3.1.3 South Carolina.....	59
4.3.3.1.4 Georgia.....	65
4.3.3.1.5 Florida.....	68
4.3.3.1.6 Other Community related analysis.....	78
4.3.3.1.7 Data Needs.....	79
4.3.4 Maximum Sustained Yield (MSY), Optimum Yield (OY), Overfishing and Overfished Levels.....	80
4.3.4.1 ACTION 5. Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs as required.....	98
4.3.4.1.1 Shrimp FMP.....	100
4.3.4.1.2 Red Drum FMP.....	103
4.3.4.1.3 Snapper Grouper FMP.....	107
4.3.4.1.4 Coastal Migratory Pelagics FMP.....	120
4.3.4.1.5 Golden Crab FMP.....	125
4.3.4.1.6 Spiny Lobster FMP.....	127
4.3.4.1.7 Coral, Coral Reefs and Live/Hard Bottom Habitat FMP.....	133
4.3.4.2 ACTION 6. Framework Adjustment Procedure.....	135
4.3.4.3 Summary of Council’s Control Rules.....	135
4.4 Unavoidable Adverse Effects.....	137
4.5 Relationship of Short-term Uses and Long-term Productivity.....	137
4.6 Irreversible and Irretrievable Commitments of Resources.....	137
4.7 Effects of the Fishery on the Environment.....	137
4.8 Public and Private Costs.....	138
4.9 Effects on Small Businesses: Initial Regulatory Flexibility Analysis.....	138



5.0 LIST OF PREPARERS.....	141
6.0 LIST OF AGENCIES AND ORGANIZATIONS.....	142
7.0 OTHER APPLICABLE LAW.....	143
7.1 Vessel Safety.....	143
7.2 Coastal Zone Consistency.....	143
7.3 Endangered Species and Marine Mammal Acts.....	143
7.4 Paperwork Reduction Act.....	144
7.5 Federalism.....	144
7.6 National Environmental Policy Act: Finding of No Significant Impact.....	144
8.0 REFERENCES.....	147
9.0 PUBLIC HEARING LOCATIONS AND DATES.....	151
10.0 APPENDICES.....	A-1
Appendix A. NMFS Technical Guidance Document on Approaches to Implementing National Standard 1 of the MSFCMA.....	A-1
Appendix B. Preliminary Staff Analysis: MSY, OY, and Overfishing.....	B-1
Appendix C. NMFS Review of SAFMC Plan for Implementing the SFA for MSY, OY, and Overfishing.....	C-1
Appendix D. Checklist for Amending FMPs to Comply with SFA.....	D-1
Appendix E. 1997/1998 SAFMC/NMFS Operations Plan.....	E-1
Appendix F. NMFS Correspondence to SAFMC: Rebuilding plans for jewfish, red drum, and Nassau grouper.....	F-1
Appendix G. Report of the GMFMC Ad Hoc Crustacean Stock Assessment Panel.....	G-1
Appendix H. Classification Codes and Definitions from the U.S. Census Bureau and Department of Commerce Bureau of Economic Analysis.....	H-1

## LIST OF FIGURES

Figure 1. Estimated Number of Marine Recreational Fishing Trips by State and Year for the South Atlantic. Source: Fisheries of the United States, 1996. ....	49
Figure 2. North Carolina Counties.....	51
Figure 3. South Carolina Counties.....	59
Figure 4. Georgia Coastal Counties.....	65
Figure 5. Florida Coastal Counties.....	69
Figure 6. Recommended default MSY control rule.....	85

## LIST OF TABLES

Table A. Summary of Expected Changes in Net Benefits: Summary of Regulatory Impact Review.....	xviii
Table B. Summary of Environmental Consequences .....	26
Table 1. U.S. Domestic Commercial Fishing Landings by Region, 1995 and 1996.....	48
Table 2. Quantity, Value and Rank of Commercial Landings for South Atlantic Ports among Major U.S. Ports.....	50
Table 3. Number of Fishers and Mean Annual Income for North Carolina in 1990.....	50
Table 4. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for North Carolina in 1990.....	51
Table 5. Population and Economic Information for Counties included in Area 1 .....	52
Table 6. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for North Carolina Coastal Counties included in Area 1 for 1970, 1980, and 1990 Census. ....	53
Table 7. Population and Economic Information for Counties included in Area 2.....	54
Table 8. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for Dare County (Area 2) for 1970, 1980, and 1990 Census.....	54
Table 9. Population and Economic Information for Counties included in Area 3.....	55
Table 10. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for North Carolina Coastal Counties included in Area 3 for 1970, 1980, and 1990 Census. ....	55
Table 11. Population and Economic Information for Counties included in Area 4.....	56
Table 12. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for North Carolina Coastal Counties included in Area 4 for 1970, 1980, and 1990 Census. ....	57
Table 13. Population and Economic Information for Counties included in Area 5.....	57
Table 14. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for Carteret County (Area 5) for 1970, 1980, and 1990 Census.....	57
Table 15. Number of Fishers and Mean Annual Income for South Carolina Fishers in 1990.....	59

Table 16. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for South Carolina in 1990.....	60
Table 17. Population and Economic Information for Horry County, South Carolina .....	61
Table 18. Population and Economic Information for Georgetown County, South Carolina .....	62
Table 19. Population and Economic Information for Charleston County, South Carolina.....	62
Table 20. Population and Economic Information for Beaufort County, South Carolina.....	63
Table 21. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for South Carolina Coastal Counties for 1970, 1980, and 1990 Census.....	64
Table 22. Number of Individuals in Occupation of Fishing By Work Status and Gender for the Charleston, SC MSA in 1989.....	64
Table 23. Number of Fishers and Mean Annual Income for Georgia in 1990.....	66
Table 24. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for Georgia in 1990.....	66
Table 25. Population and Economic Information for Chatham County, Georgia.....	67
Table 26. Population and Economic Information for Bryan County, Georgia.....	67
Table 27. Population and Economic Information for Liberty County, Georgia.....	67
Table 28. Population and Economic Information for McIntosh County, Georgia.....	67
Table 29. Population and Economic Information for Glynn County, Georgia.....	67
Table 30. Population and Economic Information for Camden County, Georgia.....	68
Table 31. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for Georgia Coastal Counties for 1970, 1980, and 1990 Census.....	68
Table 32. Number of Fishers and Mean Annual Income for Florida in 1990.....	69
Table 33. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for Florida in 1990.....	70
Table 34. Population and Economic Information for Nassau County, Florida.....	70
Table 35. Population and Economic Information for Duval County, Florida.....	70
Table 36. Population and Economic Information for St. John's County, Florida.....	71
Table 37. Population and Economic Information for Flagler County, Florida.....	71

Table 38. Population and Economic Information for Volusia County, Florida.....	71
Table 39. Population and Economic Information for Indian River County, Florida.....	71
Table 40. Population and Economic Information for St. Lucie County, Florida.....	72
Table 41. Population and Economic Information for Broward County, Florida.....	72
Table 42. Population and Economic Information for Brevard County, Florida.....	72
Table 43. Population and Economic Information for Martin County, Florida.....	72
Table 44. Population and Economic Information for Palm Beach County, Florida.....	73
Table 45. Population and Economic Information for Dade County, Florida.....	73
Table 46. Population and Economic Information for Monroe County, Florida.....	73
Table 47. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for East Florida Coastal Counties from 1970, 1980, and 1990 Census.....	75
Table 48. Number of Individuals in Occupation of Fishing By Work Status and Gender for Florida MSA in 1989.....	76
Table 49. Snapper Grouper Fishermen's Tenure and Attitude toward Change in their Present Community.....	78
Table 50. Parameter estimates for species under management by the SAFMC.....	83
Table 51. Black sea bass biomass proxy calculations.....	110
Table 52. Updated SPR Values for Snapper Grouper Species with Overfishing Status.....	117
Table 53. Specific values for the Council's control rules.....	136

## LIST OF ACTIONS IN THE COMPREHENSIVE SFA AMENDMENT

### Definitions

Address consistency with SFA Section 102 definitions

**Action 1A.** No action to amend FMPs is required except as specified in Action 1B.

**Action 1B.** Minor change to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change "bycatch" to "trip limit".

### Other Required Provisions

Bycatch - bycatch management measures and bycatch reporting requirements

**Action 2A.** No action to amend the bycatch management measures in the FMPs is required.

**Action 2B.** Amend Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include reporting requirements as specified in the Atlantic Coastal Cooperative Statistics Program (ACCSP).

Commercial, recreational and charter fishing - Sector descriptions, landing trends and data specification

**Action 3.** No action to amend FMPs is required.

Fishing Communities - Identify and define fishing communities

**Action 4.** Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include available information on fishing communities.

Maximum Sustainable Yield (MSY), Optimum Yield (OY), Overfishing and Overfished

**Action 5.** Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs as required.

### **Shrimp FMP**

**Action 1. Maximum Sustainable Yield (MSY).**

The Council concluded that No Action is necessary at this time.

**Action 2. Optimum Yield (OY).**

The Council concluded that No Action is necessary at this time.

**Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The Council concluded that No Action is necessary at this time.

**Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

**Action 5. Overfishing Evaluation to meet the Current Definition.**

None of the South Atlantic shrimp species are listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

## **Red Drum FMP**

### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for red drum is unknown. The Council reviewed alternatives and concluded the best available data supports using 30% Static SPR as a proxy for MSY.

### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR.

### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for red drum is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the red drum MSY proxy.

The "threshold level" for red drum is defined as 10% Static SPR.

### **Action 4. Rebuilding Timeframe.**

Rebuilding projections are not available at this time. The Council recommends that projections be incorporated into the next stock assessment to the extent practicable to determine whether red drum can be rebuilt in less than 10 years.

### **Action 5. Overfishing Evaluation to meet the Current Definition.**

Red drum are listed as overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. The Council has prohibited any retention in the EEZ which is the maximum protection that the Council can provide. The Council concluded no further action by the Council is necessary and the NMFS concurred with this action (see Appendix F).

## **Snapper Grouper FMP**

### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for species in the snapper grouper management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 40% Static SPR as a proxy for MSY for jewfish and Nassau grouper, and 30% Static SPR as a MSY proxy for the remaining species.

### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the snapper grouper fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR for all species in the snapper grouper management unit except the following:

A. Hermaphroditic groupers (that is, those that switch sex, generally from females to males as they grow older) will be managed for an OY of 45% Static SPR.

B. Jewfish and Nassau Grouper will be managed for an OY of 50% Static SPR.

### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for all species in the snapper grouper management unit, except for jewfish and Nassau grouper, is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the snapper grouper MSY proxy.

Overfishing for jewfish and Nassau grouper is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 40% Static SPR (F40% Static SPR) which is the MSY proxy for jewfish and Nassau grouper.

Overfishing for black sea bass is defined in terms of the Checklist (Appendix D) and information provided by Dr. Doug Vaughan, NMFS Beaufort Lab (Table 50). The two components of the status determination criteria are:

- A. A maximum fishing mortality threshold (MFMT) — A fishing mortality rate (F) in excess of F30% Static SPR which is 0.72 (Table 50).
- B. A minimum stock size threshold (MSST) — The minimum stock size threshold is 3.72 million pounds (Table 50).

The “threshold level” for all species in the snapper grouper management unit, except for jewfish and Nassau grouper, is defined as 10% Static SPR. For jewfish and Nassau grouper, the “threshold level” is defined as 30% Static SPR.

#### **Action 4. Rebuilding Timeframe.**

Rebuilding projections are not available at this time. The Council recommends that projections be incorporated into the next stock assessment to the extent practicable to determine whether the overfished snapper grouper species can be rebuilt in less than 10 years. Until such time as this information is provided to the Council, the current timeframe for recovery remains in effect: The timeframe for recovery of snappers (excluding red snapper), greater amberjack, black sea bass, and red pogy is not to exceed 10 years. For red snapper and the groupers, the timeframe is not to exceed 15 years. Year 1 was the 1991 fishing year.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

The Council made the determinations shown for each species based on having Snapper Grouper Amendment 8 and Snapper Grouper Amendment 9 in place. The Council is in a difficult situation, particularly for species in the snapper grouper management unit, because these two major amendments have not been implemented and previous amendments have not been incorporated into assessment results for some species. The Council’s previous actions will have major impacts on rebuilding overfished species. The Council’s conclusions reflect the belief that regulations already approved should be implemented and evaluated before determinations can be made whether additional regulations are required. The Council will continue to monitor the snapper grouper fishery and will use the framework procedure to implement any additional species specific measures as may be necessary following updated stock assessments received through the SAFE process described earlier.

The Council’s evaluations are as follows:

1. **Black sea bass** remain overfished. Black sea bass are above the “threshold level” with a static SPR of 26%. Black sea bass are overfished given that the MSST is 3.72 million pounds and the 1995 biomass was estimated to be 1.33 million pounds. Black sea bass are also experiencing overfishing given that the MFMT is 0.72 and the average fishing mortality rate (F) for 1991-1995 was 0.95. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 26%, recreational catch by 36%, and total catch by 30%. **The Council concluded these reductions are sufficient to rebuild black sea bass above the overfished level.**

2. **Vermilion snapper** remain overfished with a static SPR of 21% to 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce headboat catch by 29%, MRFSS catch by 70%, and total catch by 13%. **The Council concluded these reductions are sufficient to rebuild vermilion snapper above the overfished level.**

3. **Red pogy** remain overfished with a static SPR of 14% to 19%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 65%, recreational



catch by 50%, and total catch by 59%. **The Council concluded these reductions are sufficient to rebuild red porgy above the overfished level.**

4. **Red snapper** remain overfished with a static SPR of 24% to 32%. The measures proposed through Snapper Grouper Amendment 7 will result in a projected SPR of 35%. **The Council concluded these reductions and the measures contained in Snapper Grouper Amendments 8 and 9 are sufficient to rebuild red snapper above the overfished level.**

5. **Gag** remain overfished with a static SPR of 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 37%, recreational catch by 13%, and total catch by 27%. **The Council concluded these reductions are sufficient to rebuild gag above the overfished level.**

6. **Scamp** are no longer overfished with a static SPR of 35%. The measures proposed in Snapper Grouper Amendment 9 will provide some additional protection. **The Council concluded no additional measures are necessary to maintain scamp above the overfished level.**

7. **Speckled hind** remain overfished with a static SPR of 8% to 13%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild speckled hind above the overfished level.**

8. **Warsaw grouper** remain overfished with a static SPR of 6% to 14%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild warsaw grouper above the overfished level.**

9. **Snowy grouper** remain overfished with a static SPR of 5% to 15%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild snowy grouper above the overfished level.**

10. **Golden tilefish** remain overfished but the Assessment Group concluded there was inadequate information to update the existing SPR of 21%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild golden tilefish above the overfished level.**

11. **Nassau grouper** remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. **The Council concluded no further action is required for Nassau grouper at this time.** This position is supported by the letter from NMFS (Appendix F.).

12. **Jewfish** remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. **The Council concluded no further action is required for jewfish at this time.** This position is supported by the letter from NMFS (Appendix F.).

13. **White grunt** are no longer overfished with a static SPR of 29% to 39%. The measures proposed in Snapper Grouper Amendments 8 and 9 will provide some additional

protection. The Council concluded no additional measures are necessary to maintain white grunt above the overfished level.

### **Coastal Migratory Pelagics FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for species in the coastal migratory pelagics management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 30% Static SPR as a proxy for MSY.

#### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the coastal migratory pelagics fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR.

#### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for all species in the coastal migratory pelagics management unit is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the coastal migratory pelagics MSY proxy.

The "threshold level" for all species in the coastal migratory pelagics management unit is defined as 10% Static SPR.

#### **Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

None of the Atlantic migratory group mackerels are listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States; cobia are not overfished, and cero, dolphin, and little tunny are listed as unknown.

### **Golden Crab FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

The Council concluded that No Action is necessary at this time.

#### **Action 2. Optimum Yield (OY).**

The Council concluded that No Action is necessary at this time.

#### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The Council concluded that No Action is necessary at this time.

#### **Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

Golden crab are not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

### **Spiny Lobster FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for species in the coastal migratory pelagics management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 20% Static SPR as a proxy for MSY.

**Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the spiny lobster fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 30% Static SPR.

**Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for species in the Spiny Lobster FMP can only be defined in terms of the fishing mortality component given the data-poor status of these species. Based on the written guidance from NMFS, the Council is setting the overfishing level as a fishing mortality rate (F) in excess of the fishing mortality rate at 20% Static SPR (F20% Static SPR).

**Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

**Action 5. Overfishing Evaluation to meet the Current Definition.**

Spiny lobster are not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States; slipper lobster are listed as unknown and have no overfishing definition.

**Coral, Coral Reefs, and Live/Hard Bottom Habitat FMP**

**Action 1. Maximum Sustainable Yield (MSY).**

The Council concluded that No Action is necessary at this time.

**Action 2. Optimum Yield (OY).**

The Council concluded that No Action is necessary at this time except the minor adjustment to the wording shown in bold ("and under live rock aquaculture permits") to incorporate Amendment 2 actions.

**Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The Council concluded that No Action is necessary at this time.

**Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

**Action 5. Overfishing Evaluation to meet the Current Definition.**

South Atlantic Corals are listed as unknown in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. The Council concluded no additional action is required at this time.

**Framework Adjustment Procedures**

**Action 6.** Add a provision to all framework procedures in all Council FMPs that allows the addition of biomass levels and age structured analyses as they become available.

## COMPREHENSIVE SFA AMENDMENT COVER SHEET

This integrated document contains all elements of the Comprehensive SFA Amendment, Final Environmental Assessment (EA), Regulatory Impact Review (RIR), and Social Impact Assessment (SIA)/Fishery Impact Statement (FIS). Separate Tables of Contents are provided to assist readers and the NMFS/NOAA/DOC reviewers in referencing corresponding sections of the Amendment. Introductory information and/or background for the EA, RIR, and SIA/FIS are included within the separate table of contents for each of these sections.

### Responsible Agencies

South Atlantic Fishery Management Council  
Contact: Robert K. Mahood  
1 Southpark Circle, Suite 306  
Charleston, South Carolina 29407-4699  
(843) 571-4366; FAX (843) 769-4520  
Email: safmc@noaa.gov

National Marine Fisheries Service  
Contact: Andrew J. Kemmerer  
Southeast Regional Office  
9721 Executive Center Drive North  
St. Petersburg, Florida 33702  
(813) 570-5301; FAX (813) 570-5300

Name of Action:

Administrative

Legislative

### SUMMARY

The Council is proposing to amend (where appropriate) the fishery management plans for Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, and Coral, Coral Reefs, and Live/Hard Bottom Habitats to: (1) Address the consistency with SFA Section 102 definitions, (2) Address bycatch management measures and bycatch reporting requirements to insure consistency with SFA Section 108 required provisions, (3) Address descriptions of each sector and quantify trends in landings and data specified for each sector for the commercial, recreational and charter fisheries to insure consistency with SFA Section 108 required provisions, (4) Address fishery impact statements to insure they incorporate the likely effects of management measures on fishing communities and (5) Address overfishing provisions specifying objective and measurable criteria for identifying whether a fishery is overfished, measures to rebuild overfished stocks and reductions in fishing mortality and fair allocation among harvesters, to insure consistency with SFA Section 108 required provisions.

## FINAL ENVIRONMENTAL ASSESSMENT

The Council has determined that because of the nature of the Comprehensive SFA Amendment (measures required by law) and the fact the measures in of themselves will not effectuate specific actions, an EIS is not required. Refer to Section 7.6 for NEPA determination.

<b>TABLE OF CONTENTS</b>	<b>SECTION</b>	<b>PAGE</b>
Impacts of the Proposed Action	4.0	36
Management Options - Definitions	4.2	36
Consistency with SFA Section 102 Definitions	4.2.1	36
ACTION 1A. - No Action to Amend FMPs Required	4.2.1.1	37
ACTION 1B. - Minor change to Snapper Grouper FMP	4.2.1.2	38
Management Options - Other Required Provisions	4.3	38
Bycatch - Bycatch Management Measures and Bycatch Reporting Requirements	4.3.1	38
ACTION 2A. No Action to Amend the Bycatch Management Measures in the FMPs is Required	4.3.1.1	40
ACTION 2B. Amend FMPs to include reporting requirements as specified in ACCSP	4.3.1.2	40
Commercial, Recreational and Charter Fishing - Sector Descriptions, Landing Trends and Data Specifications	4.3.2	42
ACTION 3. No Action to Amend the FMPs is Required	4.3.2.1	42
Fishing Communities - Identify and Define	4.3.3	43
ACTION 4. Amend/Establish FMPs to Include Available Information on Fishing Communities	4.3.3.1	43
Management Options - MSY, OY, Overfishing and Overfished	4.3.4	80
ACTION 5. Amend FMPs as Required	4.3.4.1	98
Shrimp FMP	4.3.4.1.1	100
Red Drum FMP	4.3.4.1.2	103
Snapper Grouper FMP	4.3.4.1.3	107
Coastal Migratory Pelagics FMP	4.3.4.1.4	120
Golden Crab FMP	4.3.4.1.5	125
Spiny Lobster FMP	4.3.4.1.6	127
Coral, Coral Reefs and Live/Hard Bottom Habitats FMP	4.3.4.1.7	133
Framework Adjustment Procedures	4.3.4.2	135
Summary of Council's Control Rules	4.3.4.3	135
Unavoidable Adverse Effects	4.4	137
Relationship of Short-Term Uses and Long-term Productivity	4.5	137
Irreversible and Irretrievable Commitments of Resources	4.6	137
Effects of the Fishery on the Environment	4.7	137
Public and Private Costs	4.8	138
Effects on Small Businesses	4.9	138

## REGULATORY IMPACT REVIEW

This integrated document contains all elements of the Comprehensive SFA Amendment, Final Environmental Assessment (EA), Regulatory Impact Review (RIR), and Social Impact Assessment (SIA)/Fishery Impact Statement (FIS). A table of contents for the RIR is provided separately to aid the reviewer in referencing corresponding sections of the Amendment.

<b>TABLE OF CONTENTS</b>	<b>SECTION</b>	<b>PAGE</b>
Introduction	RIR	xvi
Methodology and Framework for Analysis	RIR	xvii
Summary of Expected Changes in Net Benefits (Summary of Regulatory Impact Review)	RIR	xviii
Impacts of the Proposed Action	4.0	36
Management Options - Definitions	4.2	36
Consistency with SFA Section 102 Definitions	4.2.1	36
ACTION 1A. - No Action to Amend FMPs Required	4.2.1.1	37
ACTION 1B. - Minor change to Snapper Grouper FMP	4.2.1.2	38
Management Options - Other Required Provisions	4.3	38
Bycatch - Bycatch Management Measures and Bycatch Reporting Requirements	4.3.1	38
ACTION 2A. No Action to Amend the Bycatch Management Measures in the FMPs is Required	4.3.1.1	40
ACTION 2B. Amend FMPs to include reporting requirements as specified in ACCSP	4.3.1.2	40
Commercial, Recreational and Charter Fishing - Sector Descriptions, Landing Trends and Data Specifications	4.3.2	42
ACTION 3. No Action to Amend the FMPs is Required	4.3.2.1	42
Fishing Communities - Identify and Define	4.3.3	43
ACTION 4. Amend/Establish FMPs to Include Available Information on Fishing Communities	4.3.3.1	43
Management Options - MSY, OY, Overfishing and Overfished	4.3.4	80
ACTION 5. Amend FMPs as Required	4.3.4.1	98
Shrimp FMP	4.3.4.1.1	100
Red Drum FMP	4.3.4.1.2	103
Snapper Grouper FMP	4.3.4.1.3	107
Coastal Migratory Pelagics FMP	4.3.4.1.4	120
Golden Crab FMP	4.3.4.1.5	125
Spiny Lobster FMP	4.3.4.1.6	127
Coral, Coral Reefs and Live/Hard Bottom Habitats FMP	4.3.4.1.7	133
Framework Adjustment Procedures	4.3.4.2	135
Summary of Council's Control Rules	4.3.4.3	135
Unavoidable Adverse Effects	4.4	137
Relationship of Short-Term Uses and Long-term Productivity	4.5	137
Irreversible and Irrecoverable Commitments of Resources	4.6	137
Effects of the Fishery on the Environment	4.7	137
Public and Private Costs	4.8	138
Effects on Small Businesses	4.9	138

## INTRODUCTION

The Regulatory Impact Review (RIR) is part of the process of developing and reviewing fishery management plans, amendments and seasonal adjustments, and is prepared by the Regional Fishery Management Councils with assistance from the National Marine Fisheries Service (NMFS), as necessary. The regulatory impact review provides a comprehensive review of the level and incidence of economic impact associated with the proposed regulatory actions. The purpose of the analysis is to ensure that the regulatory agency or council systematically considers all available alternatives so that public welfare can be enhanced in the most efficient and cost effective way.

The National Marine Fisheries Service requires a RIR for all regulatory actions that are of public interest. The RIR does three things: 1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action, 2) it 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) it ensures the regulatory agency systematically and comprehensively considers all available alternatives so that public welfare can be enhanced in the most efficient and cost effective way.

The RIR also serves as the basis for determining whether any proposed regulations are a "significant regulatory action" under certain criteria provided in Executive Order 12866 and whether the proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act of 1980 (RFA) as amended by Public Law 104-121. The purpose of the Regulatory Flexibility Act is to relieve small businesses, small organizations, and small governmental entities from burdensome regulations and record-keeping requirements, to the extent possible.

This RIR analyzes the probable impacts on the fishery and habitat of the proposed Comprehensive SFA Amendment for the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat Fishery Management Plans.

## METHODOLOGY AND FRAMEWORK FOR ANALYSIS

The basic approach adopted in preparing RIRs is to assess management measures from the standpoint of determining the resulting changes in costs and benefits to society. Net benefits are usually stated in terms of producer and consumer surpluses for the harvesting, processing/dealer sectors and for consumers. However, the management measures in this comprehensive amendment are proposed to fulfill Sustainable Fisheries Act responsibilities as defined in the Magnuson-Stevens Fishery Conservation and Management Act of 1996. These measures are proposed to meet the guidelines set for the National Standards and are mandatory. Thus, the proposed measures set standards on which other management measures will be based. The approach taken in analyzing alternative management measures is to indicate the likely directions of changes in net benefits as it is not possible in most cases to quantify those changes.

Table A. Summary of Expected Changes in Net Benefits: Summary of Regulatory Impact Review

<b>Proposed Actions and Other Possible Options</b>	<b>Positive Impacts</b>	<b>Negative Impacts</b>	<b>Net Impacts</b>
<b><u>Consistency with SFA Section 102 Action 1A.</u></b> No action to amend FMPs is required except as specified in Action 1B.	None.	None.	None.
<b>Action 1B.</b> Minor change to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change "bycatch" to "trip limit".	None	None	None
<b><u>Bycatch management measures and bycatch reporting.</u></b> <b>Action 2A.</b> No action to amend the bycatch management measures in the FMPs is required.	None.	None.	None.
<b>Action 2B.</b> Amend FMPs to include reporting requirements as specified in the ACCSP.	Likely positive in the long term.	Likely minimal increase in cost to fishing units.	Likely positive net benefits in the long term.
<b><u>Commercial, recreational and Charter Fishing.</u></b> <b>Action 3.</b> No action to amend FMPs is required.	None.	None.	None.
<b><u>Identify and define fishing communities.</u></b> <b>Action 4.</b> Amend FMPs to include available information on fishing communities.	Would facilitate impact analysis by fishing communities providing more detailed information to fishery managers.	None.	Likely positive in the long term.
<b><u>Maximum Sustainable Yield (MSY), Optimum Yield (OY), Overfishing &amp; Overfished.</u></b> <b>Action 5.</b> Amend FMPs as required.	Could enhance other management measures.	None.	Likely positive in the long term.
<b>Framework Adjustment Procedures</b> <b>Action 6.</b> Add a provision to all framework procedures in all Council FMPs that allows the addition of biomass levels and age structured analyses as they become available.	None.	None.	None.



## SOCIAL IMPACT ASSESSMENT/FISHERY IMPACT STATEMENT

This integrated document contains all elements of the Comprehensive SFA Amendment, Final Environmental Assessment (EA), Regulatory Impact Review (RIR), and Social Impact Assessment (SIA)/Fishery Impact Statement (FIS). A table of contents for the SIA/FIS is provided separately to aid reviewers in referencing corresponding sections of the Amendment.

<b>TABLE OF CONTENTS</b>	<b>SECTION</b>	<b>PAGE</b>
Introduction	SIA/FIS	xix
Summary of Social Impact Assessment	SIA/FIS	xxi
Social Impact Assessment Data Needs	SIA/FIS	xxi
Social Impacts of the Proposed Action	4.0	36
Management Options - Definitions	4.2	36
Consistency with SFA Section 102 Definitions	4.2.1	36
ACTION 1A. - No Action to Amend FMPs Required	4.2.1.1	37
ACTION 1B. - Minor change to Snapper Grouper FMP	4.2.1.2	38
Management Options - Other Required Provisions	4.3	38
Bycatch - Bycatch Management Measures and Bycatch Reporting Requirements	4.3.1	38
ACTION 2A. No Action to Amend the Bycatch Management Measures in the FMPs is Required	4.3.1.1	40
ACTION 2B. Amend FMPs to include reporting requirements as specified in ACCSP	4.3.1.2	40
Commercial, Recreational and Charter Fishing - Sector Descriptions, Landing Trends and Data Specifications	4.3.2	42
ACTION 3. No Action to Amend the FMPs is Required	4.3.2.1	42
Fishing Communities - Identify and Define	4.3.3	43
ACTION 4. Amend/Establish FMPs to Include Available Information on Fishing Communities	4.3.3.1	43
Management Options - MSY, OY, Overfishing and Overfished	4.3.4	80
ACTION 5. Amend FMPs as Required	4.3.4.1	98
Shrimp FMP	4.3.4.1.1	100
Red Drum FMP	4.3.4.1.2	103
Snapper Grouper FMP	4.3.4.1.3	107
Coastal Migratory Pelagics FMP	4.3.4.1.4	120
Golden Crab FMP	4.3.4.1.5	125
Spiny Lobster FMP	4.3.4.1.6	127
Coral, Coral Reefs and Live/Hard Bottom Habitats FMP	4.3.4.1.7	133
Framework Adjustment Procedures	4.3.4.2	135
Summary of Council's Control Rules	4.3.4.3	135

### Introduction

Mandates to conduct Social Impact Assessments (SIA) come from both the National Environmental Policy Act (NEPA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA). NEPA requires Federal agencies to consider the interactions of natural and human environments by using a "systematic, interdisciplinary approach which will ensure the integrated use of the natural and social sciences...in planning and decision-making" [NEPA section 102 (2) (a)]. Under the Council on Environmental Quality's (CEQ, 1986)

*Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* a clarification of the terms "human environment" expanded the interpretation to include the relationship of people with their natural and physical environment (40 CFR 1508.14). Moreover, agencies need to address the aesthetic, historic, cultural, economic, social, or health effects which may be direct, indirect or cumulative (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994).

Under the MSFCMA, fishery management plans (FMPs) must "...achieve and maintain, on a continuing basis, the optimum yield from each fishery" [MSFCMA section 2 (b) (4)]. When considering "a system for limiting access to the fishery in order to achieve optimum yield" the Secretary of Commerce and Regional Fishery Management Councils are to consider both the social and economic impacts of the system [MSFCMA section 303 (b) (6)]. Recent amendments to the MSFCMA require that FMPs address the impacts of any management measures on the participants in the affected fishery and those participants in other fisheries that may be affected directly or indirectly through the inclusion of a fishery impact statement [MSFCMA section 303 (a) (9)]. Most recently, with the addition of National Standard 8, FMPs must now consider the impacts upon fishing communities to assure their sustained participation and minimize adverse economic impacts upon those communities [MSFCMA section 301 (a) (8)]. Consideration of social impacts is a growing concern as fisheries experience increased participation and/or declines in stocks. With an increasing need for management action, the consequences of such changes need to be examined in order to mitigate the negative impacts experienced by the populations concerned.

### **Problems and Methods**

Social impacts are generally the consequences to human populations that follow from some type of public or private action. Those consequences may include alterations to "the ways in which people live, work or play, relate to one another, organize to meet their needs and generally cope as members of a society...." (Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994:1). In addition, cultural impacts which may involve changes in values and beliefs which affect people's way of identifying themselves within their occupation, communities and society in general are included under this interpretation. Social impact analyses help determine the consequences of policy action in advance by comparing the status quo with the projected impacts. Therefore, it is extremely important that as much information as possible concerning a fishery and its participants be gathered for an assessment. Although public hearings and scoping meetings do provide input from those concerned with a particular action, they do not constitute a full overview of the fishery.

Without access to relevant information for conducting social impact analyses it is important to identify any foreseeable adverse effects on the human environment. With quantitative data often lacking, qualitative data can be used to provide a rough estimate of some impacts. In addition, when there is a body of empirical findings available from the social science literature, it needs to be summarized and referenced in the analysis.

In attempting to assess the social impacts of the proposed amendment it must be noted that data used for this analysis did not represent a comprehensive overview of the fishery therefore the analyses do not include all social impacts. What information was available pertains primarily to the commercial harvesting sector of the snapper grouper fishery. Thus social impacts on non-commercial harvesters, the processing sector, the consumer, fishing communities and society as a whole are not fully addressed due to data limitations. The fishery impact statement consists of the description of the commercial fishery and the social impacts under each

action item and options. There is presently no information or sufficient guidelines to define or determine impacts upon fishing communities.

### **Social Impact Assessment Summary**

Because there are only two primary measures within this document where the council will take action and those actions affect many different plans, this summary of social impacts will address the general nature of those two measures.

#### **Action 4 Identify and define fishing communities**

Identification and definition of fishing communities would normally have a positive impact, except that for the South Atlantic there is no data collected on fishing communities. National Standard 8 imposes requirements on the council and the fishery management regulatory process that cannot be satisfied given existing data. Current data available do not allow for a meaningful definition of a fishing community, moreover, do not provide a measure of dependence upon fishing and will not contribute to useful impact analysis.

#### **Action 5. Define MSY, OY and Overfishing**

The social impacts that come from defining overfishing, maximum sustainable yield and optimum yield stem from the management measures that are implemented to reach each goal. The choice of an overfishing definition certainly has impacts when stocks reach that level because the Council must implement a program to begin rebuilding stocks above that level. There may be short term negative impacts associated with measures implemented to help stocks recover, but the long term benefits of a healthy fishery depend upon a sustainable resource. The program determined to best help a stock recover from overfishing must also meet mandated time frame requirements. The associated impacts would surely depend upon the Council's program for stock recovery within that time frame.

### **Social Impact Assessment Data Needs**

The recent socio-demographic survey and economic survey were snapshots of the commercial fishery. To provide better assessments socio-economic data need to be collected on a continuing basis for both the commercial and recreational sectors, including the for-hire sector. Collecting social and economic information in logbooks would be one manner of providing this information on a continuing basis for the commercial sector. Social and economic add-ons to the MRFSS data collection system can provide this type of data for recreational fishermen. In addition, information on fishing communities in the South Atlantic is virtually non-existent. Fishing communities need to be identified and their dependence upon fishing and fishery resources needs to be established. The following list of data needs is provided as a guideline:

1. Demographic information may include but not necessarily limited to: population; age; gender; ethnic/race; education; language; marital status; children, (age & gender); residence; household size; household income, (fishing/non-fishing); occupational skills; association with vessels & firms (role & status).

2. Social Structure information may include but not necessarily limited to: historical participation; description of work patterns; kinship unit, size and structure; organization & affiliation; patterns of communication and cooperation; competition and conflict; spousal and household processes; and communication and integration.
3. Emic culture information may include but not necessarily limited to: occupational motivation and satisfaction; attitudes and perceptions concerning management; constituent views of their personal future of fishing; psycho-social well-being; and cultural traditions related to fishing (identity and meaning).
4. Fishing community information might include but not necessarily limited to: identifying communities, dependence upon fishery resources (this includes recreational use), identifying businesses related to that dependence, determine the number of employees within these businesses and their status.

This list of data needs is not exhaustive or all inclusive. The upcoming issues for managing fisheries within the South Atlantic will undoubtedly focus upon allocation and the need for reliable and valid information concerning the social environment. A further recommendation might be for the NMFS to review and implement the "Southeast Social and Cultural Data and Analysis Plan" as this would address many of the current data needs.

## **1.0 PURPOSE AND NEED**

### **1.1 Historical Overview of SAFMC Activities that Address SFA Required Provisions Shrimp FMP**

Profile of the Penaeid Shrimp Fishery in the South Atlantic (1981).

The profile was used as a background/source document for preparing the FMP.

Shrimp Fishery Management Plan for the South Atlantic Region (1991).

Management: Provided South Atlantic states with the ability to request concurrent closure of the white shrimp fishery in the EEZ adjacent to their closed state waters following severe winter cold weather; established a buffer zone extending seaward from shore 25 nautical miles, inside which no trawling is allowed with a net having less than 4 inches stretch mesh during an EEZ closure. The plan also provides for transit through the EEZ during closure of the white shrimp fishery.

Amendment 1 (1995).

Management: Added rock shrimp to the management unit; limited the impact of the rock shrimp fishery on essential bottom habitat by prohibiting trawling for rock shrimp east of 80° W longitude between 27°30' N. latitude and 28°30' N. latitude in depths less than 100 fathoms; and implemented measures to ensure adequate reporting and monitoring of the fishery.

Amendment 2 (Bycatch Reduction) (April, 1996)

Management: Added pink shrimp to the management unit; defined overfishing for brown and pink shrimp; defined optimum yield for brown and pink shrimp; required the use of certified bycatch reduction devices in all penaeid shrimp trawls in the South Atlantic EEZ; and established a framework for BRD certification which specifies BRD certification criteria and testing protocol.

Bycatch Reduction Device Testing Protocol Manual (March, 1997)

The specifications in this document are used by the states and researchers testing the effectiveness of any new or modified BRD in reducing bycatch of target species as specified by the council.

### **Red Drum FMP**

Profile of the Atlantic Coast Red Drum Fishery and Source Document for the Atlantic Coast Red Drum Fishery Management Plan (1990).

The profile was used as a background document for preparing the FMP.

Atlantic Coast Red Drum Fishery Management Plan (1990).

Management: Prohibited the harvest or possession of red drum in or from the EEZ.

### **Snapper Grouper FMP**

Source Document for the Snapper Grouper Fishery in the South Atlantic Region (1983).

The source document was used as background for preparing the FMP.

Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (1983).

Management: Includes provisions to prevent growth overfishing in thirteen species in the snapper grouper complex and to establish a procedure for preventing overfishing in other

## 1.0 Purpose and Need

species; established minimum size limits for red snapper, yellowtail snapper, red and Nassau groupers, and black sea bass, and a 4" trawl mesh size to achieve a 12" minimum size for vermilion snapper; also included are additional harvest and gear limitations.

### Regulatory Amendment 1 (1987)

Management: Implemented Special Management Zones (SMZs) off SC and GA.

### Regulatory Amendment 2 (1988)

Management: Implemented SMZs off Ft. Pierce, FL.

### Amendment 1 (1988).

Management: Prohibited use of trawl gear to harvest fish in the snapper grouper fishery south of Cape Hatteras, NC and north of Cape Canaveral, FL; and defined directed snapper grouper fishery.

### Regulatory Amendment 3 (1989)

Management: Established a SMZ off Dade County, FL.

### Amendment 2 (1990).

Management: Prohibited harvest or possession of jewfish in or from the EEZ in the South Atlantic; and defined overfishing for snapper grouper species according to NMFS 602 guidelines.

### Amendment 3 (1990).

Management: Established a management program for the wreckfish fishery which: added wreckfish to the snapper grouper management unit; required an annual permit to fish for, land or sell wreckfish; established a control date of March 28, 1990 for the area bounded by 33° and 30° N. latitude; established a fishing year beginning 4/16; established a process whereby annual quotas would be specified; implemented a 10,000 pound trip limit and a 1/15-4/15 season closure.

### Amendment 4 (1991).

Management: Prohibited the use of various gear, including fish traps, the use of bottom longlines for wreckfish, and powerheads in Special Management Zones off SC; established bag limits and minimum size limits for several species; established income requirements to qualify for permits; and required that all snapper grouper species possessed in South Atlantic federal waters must have heads and fins intact through landing.

### Amendment 5 (1991).

Management: Established ITQ management program for the wreckfish fishery.

### Regulatory Amendment 4 (August 1992).

Management: Implemented additional Special Management Zones off South Carolina.

### Regulatory Amendment 5 (December 1992).

Management: Modified definition of black sea bass pots and allowed multi-gear trips; and allowed retention of incidentally caught fish.

Amendment 6 (1993).

Management: Implemented commercial trip limits, recreational bag limits, and an experimental closed area to manage and rebuild snowy, warsaw, misty, and yellowedge groupers, golden tilefish and speckled hind; and implemented phase-in quotas for snowy grouper and golden tilefish over a three-year period.

Amendment 7 (1994).

Management: Established size limits and bag limits for hogfish, mutton snapper, cubera snapper and gray triggerfish; specified allowable gear; prohibited the use of explosive charges, including powerheads, off SC; and required dealer, charter and headboat federal permits.

Regulatory Amendment 6 (October 1994).

Management: Includes provisions to rebuild and protect hogfish by implementing a recreational bag limit of 5 per person off Florida; cubera snapper by implementing a recreational bag limit of 2 per person for fish 30" total length or larger off Florida; and gray triggerfish by implementing a minimum size limit of 12 inches off Florida.

Documents Submitted to the Secretary of Commerce Awaiting Approval:

Amendment 8 (June 1996).

Management: Would establish a limited entry system for the snapper grouper fishery.

Amendment 9 (1997).

Management: Increase the red porgy minimum size limit from 12" TL to 14" TL for both recreational and commercial fishermen, establish a recreational bag limit of 5 red porgy per person per day, prohibit harvest and possession in excess of the bag limit during March and April, and prohibit purchase and sale during March and April.

Increase the black sea bass minimum size limit from 8" TL to 10" TL for both recreational and commercial fishermen, and establish a recreational bag limit of 20 black sea bass per person per day.

Require escape vents and escape panels with degradable fasteners in black sea bass pots.

Establish measures for greater amberjack that will: reduce the recreational bag limit from 3 to 1 greater amberjack per person per day, maintain the prohibition on harvest and possession in excess of the bag limit during April, establish a 1,000 pound daily commercial trip limit, establish a quota at 63% of 1995 landings (quota=1,169,931 pounds), begin the fishing year on May 1, prohibit sale of fish harvested under the bag limit when the season is closed, and prohibit coring.

Increase the recreational vermilion snapper minimum size limit from 10" to 11" TL and retain the current 10-fish bag limit.

## 1.0 Purpose and Need

Increase the gag grouper minimum size limit from 20" TL to 24" TL for both recreational and commercial fishermen, prohibit harvest and possession in excess of the bag limit during March and April, and prohibit purchase and sale during March and April.

Increase the black grouper minimum size limit from 20" to 24" TL for both recreational and commercial fishermen, prohibit harvest and possession in excess of the bag limit during March and April, and prohibit purchase and sale during March and April.

Specify that within the 5-fish aggregate grouper bag limit (which currently includes tilefish and excludes jewfish and Nassau grouper), no more than 2 may be gag grouper or black grouper (individually or in combination).

Establish an aggregate recreational bag limit of 20 fish per person per day inclusive of all snapper grouper species currently not under a bag limit, excluding tomtate and blue runners (there would be no bag limit on tomtate and blue runners).

Specify that vessels with bottom longline gear aboard may only possess snowy grouper, warsaw grouper, yellowedge grouper, misty grouper, golden tilefish, blueline tilefish, and sand tilefish.

### **Coastal Migratory Pelagic FMP**

The Fishery Management Plan for Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic (1982).

Management: Treated king and Spanish mackerel each as one U.S. stock. Allocations were established for recreational and commercial fisheries, and the commercial allocation was divided between net and hook-and-line fishermen; established procedures for the Secretary to take action by regulatory amendment to resolve possible future conflicts in the fishery, such as establish fishing zones and local quotas to each gear or user group.

#### **Amendment 1 (1985).**

Management: Provided a framework procedure for pre-season adjustment of total allowable catch (TAC), revised king mackerel maximum sustainable yield (MSY) downward, recognized separate Atlantic and Gulf migratory groups of king mackerel, and established fishing permits and bag limits for king mackerel. Commercial allocations among gear users were eliminated.

#### **Amendment 2 (1987).**

Management: Revised Spanish mackerel MSY downward, recognized two migratory groups, and set commercial quotas and bag limits. Charter boat permits were required, and it was clarified that TAC for overfished stocks must be set below the upper range of acceptable biological catch (ABC). The use of purse seines on overfished stocks was prohibited.

#### **Amendment 3 (1989).**

Management: Prohibited drift gill nets for Gulf group king mackerel and Gulf and Atlantic groups of Spanish mackerel; updated the habitat section of the FMP; added vessel safety considerations to the plan.



Re submission of Disapproved Measures of Amendment 3 (1990).

Management: Prohibited drift gill nets for coastal pelagics and purse seines and run-around gillnets for the overfished groups of mackerels; added a new objective to the FMP, which is to minimize waste and bycatch in the fishery.

Amendment 4 (1989).

Management: Reallocated Atlantic group Spanish mackerel equally between recreational and commercial fishermen with an increase in TAC.

Amendment 5 (1990).

Management: Extended management area for Atlantic groups of mackerels through (MAFMC) area of jurisdiction; revised problems in the fishery and plan objectives; revised the definition of "overfishing"; added cobia to the annual stock assessment procedure; provided that the South Atlantic Fishery Management Council (SAFMC) will be responsible for pre-season adjustments of TACs and bag limits for the Atlantic migratory groups of mackerels; redefined recreational bag limits as daily limits; provision specifying that bag limit catch of mackerel may be sold; provided guidelines for corporate commercial vessel permits; imposed a bag limit of two cobia per person per day for all fishermen; established a minimum size of 12-inch (30.5 cm.) fork length or 14-inch (35.6 cm.) total length for king mackerel and included a definition of "conflict" to provide guidance to the Secretary.

Amendment 6 (1992).

Management: Identified additional problems and an objective in the fishery; provided for rebuilding overfished stocks of mackerels within specific periods; provided for biennial assessments and adjustments; provided for more seasonal adjustment actions, including size limits, vessel trip limits, closed seasons or areas, and gear restrictions; provided for commercial Atlantic Spanish mackerel possession limits; changed commercial permit requirements to allow qualification in one of three preceding years; discontinued the reversion of the bag limit to zero when the recreational quota is filled; modified the recreational fishing year to the calendar year; and changed minimum size limit for king mackerel to 20 inches fork length, and changed all size limit measures to fork length only.

Amendment 7 (1994).

Management: Equally divided the Gulf commercial allocation in the Eastern Zone at the Dade-Monroe County line in Florida. The suballocation for the area from Monroe County through Western Florida is equally divided between commercial hook-and-line and net gear users.

Amendment 8 (Aug. 1996)

Management: Identifies additional problems in the fishery; specify allowable gear; establish a moratorium on new commercial king mackerel permits and provide for transferability of permits during the moratorium; revise qualifications for a commercial permit; extend the management area of cobia through New York; allow retention of up to 5 cut-off (damaged) king mackerel on vessels with commercial trip limits; revise the seasonal framework procedures to - a. delete a procedure for subdividing the Gulf migratory group of king mackerel, b. request that the stock assessment panel provide additional information on spawning potential ratios and mixing of king mackerel migratory groups; c. provide for consideration of public comment,

## 1.0 Purpose and Need

d. redefine overfishing and allow for adjustment by framework procedure, e. allow changes in allocation ratio of Atlantic Spanish mackerel, f. allow setting zero bag limits, g. allow gear regulation including prohibition.

### **Golden Crab FMP**

Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region (1995).

Management: Set up a management program for the golden crab fishery in the South Atlantic EEZ; established a limited entry system and divided the fishery into three zones; required escape gaps with degradable panels in crab traps; prohibited sale of female crabs and limited retention of female crabs to 0.5% by number; and required that crabs be landed whole.

### **Spiny Lobster FMP**

Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and the South Atlantic (1982).

Management: Included provisions to protect long-run yields and prevent depletion of lobster stocks; increase yield, reduce user group and gear conflicts, acquire the necessary information to manage the fishery and to promote efficiency in the fishery; and implemented a minimum size limit, gear limitations, possession limits, and seasonal restrictions.

#### Amendment 1 (1987).

Management: Required a commercial permit; limited possession of undersized lobsters as attractants and required a live well; Modified recreational possession and season regulations; Modified closed season regulations; required the immediate release of egg-bearing lobsters; Modified the minimum size limit; required a permit to separate the tail at sea; and prohibited possession or stripping of egg-bearing slipper lobsters.

#### Amendment 2 (1989).

Management: Modified the problems/issues and objectives of the fishery management plan; modified the statement of optimum yield; established a protocol and procedure for an enhanced cooperative state/council management system; and added to the vessel safety and habitat sections of the fishery management plan.

#### Amendment 3 (1990).

Management: Defined overfishing; and clarified that NMFS may charge the administrative cost of issuing permits.

#### Regulatory Amendment 1 (1992).

Management: Established a trap certification program for the EEZ off Florida; reduced the number of undersize lobster that could be held aboard a vessel for use of attractants to no more than fifty or one per trap on board.; specified allowable gear for use in the EEZ off Florida; Limited fishermen diving at night to the recreational bag limit; required divers to measure lobster while in the water; and specified uniform trap and buoy numbers.

#### Regulatory Amendment 2 (1993).

Management: Changed the days for the special recreational season in the EEZ off Florida; prohibited night-time harvest off Monroe County, Florida during special recreational

season; specified allowable gear during special recreational season; and provided for different bag limits during the special recreational season off the Florida Keys and the EEZ off other areas of Florida.

Amendment 4 (December 1994).

Management: Allowed the harvest of two lobsters per person per day for all fishermen year round, but only north of the Florida/Georgia border.

### **Coral, Coral Reefs and Live/Hard Bottom Habitat FMP**

Fishery Management Plan for Coral and Coral Reefs (1982).

Management: Set optimum yield for stony corals and sea fans at zero, except as may be authorized for scientific and educational purposes under permit issued by NMFS Southeast Regional Administrator; OY for octocorals, except sea fans, was set at the level harvested by U.S. fishermen with the expected level of harvest

Amendment 1 (1990).

Management: Implemented a combined octocoral quota for Gulf and South Atlantic EEZ.

Amendment 2 (1994).

Management: Provided definitions of live rock and allowable octocoral; prohibited all wild live rock harvest north of Dade County, FL; prohibited chipping throughout South Atlantic jurisdiction; required permit for possession or harvest of aquaculture operation in the EEZ; and implemented a phase-out of all wild rock harvest South of Dade County, FL.

Amendment 3 (1995).

Management: Established a live rock aquaculture permit system for the South Atlantic EEZ; prohibited octocoral harvest north of Cape Canaveral, Florida; prohibited anchoring or use of grapples by fishing vessels in the Oculina Bank Habitat Area of Particular Concern; and established a separate fishery management plan for the South Atlantic.

## **1.2 SFA Responsibilities as Defined in the Magnuson-Stevens Fishery Conservation and Management Act**

This information is taken directly from the NOAA web site and was prepared by NOAA General Counsel. Section numbers identified refer to the Sustainable Fisheries Act.

### **Definitions**

#### Bycatch, economic discards, and regulatory discards

##### Summary:

These defined terms are used throughout the amendments (see 106, national standard 9; 108(a), required provisions; 108(c), discretionary provisions; 117(a), North Pacific bycatch reduction program; 206, bycatch reduction program). "Bycatch" is "fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards." There is an exclusion of fish released alive under a recreational catch-and-release program. "Economic discards" are targeted fish that aren't retained because the harvester doesn't want them (undesirable size, sex, quality, etc.). "Regulatory discards" are fish (targeted or not) required by regulation to be discarded, or to be retained but not sold.

## 1.0 Purpose and Need

### Legislative history:

The definitions were developed by the House in H.R. 39. The Senate report explains the purpose of the catch-and-release exclusion is to encourage such programs, but adds that fish released dead and all regulatory discards are considered "bycatch".

### Issues:

These definitions encompass fish species only, not marine mammals or birds (see definition of "fish" at section 3(12)). That does not mean that Councils and the Secretary cannot address all forms of incidental catch, just that the new national standard and other substantive provisions on bycatch are aimed at fish. In light of the Senate report, the catch-and-release exclusion should cover only fish that could legally have been retained. This means that fish under the minimum size limit that are released alive in a catch-and-release program are nonetheless subject to the new national standard and other requirements aimed at reducing bycatch.

### Charter, commercial, and recreational fishing

#### Summary:

"Charter fishing" is defined as "fishing from a vessel carrying a passenger for hire...who is engaged in recreational fishing." The term "commercial fishing" is defined as "fishing in which the fish harvested, either in whole or in part, are intended to enter commerce or enter commerce through sale, barter or trade." "Recreational fishing" means "fishing for sport or pleasure." All three terms are used in MSFCMA sections 303(a)(5), (13), and (14); in 303(b)(3)(B); and in 407(a) and (d). "Commercial fishing" and "recreational fishing" appear together in 305(f)(2). "Commercial fishing" is also used in 305(i)(2)(B)(iii) and 312(a)(2). "Recreational fishing" appears in the definition of "charter fishing" and in sections 201(i), 303(a)(12), and 307(2). "Commercial" and "recreational" are used frequently as adjectives throughout the act, modifying "harvest," "fishery(ies)," "fishing effort," "use," "fishing industry," "fishermen," and "vessels."

#### Legislative history:

Various interest groups have been trying to pursue their (conflicting) goals through the vehicle of defining these terms. Some commercial fishermen want their quotas reserved for full-time, licensed operators and don't want their markets subjected to competition (or lower-quality seafood) from part-time fishermen who might sell some of their catch. Other commercial fishermen view charter operations as encroaching on commercial quotas. Some recreational fishermen believe their pastime is tainted by those who call themselves recreational fishermen but sell some of their catch to offset expenses of the trip. Other fishermen are simply concerned that landings not be double-counted, to avoid premature closures. Some legislators fought for air-tight definitions that they hoped would prohibit the sale of recreationally caught fish. Those formulations were rejected, leaving overlapping and ambiguous definitions. NOAA asked for the "intended to enter commerce" language, so that agents would not have to show that fish had actually entered commerce before enforcing a commercial fishing restriction. The Committee-reported version of S. 39 did not define "charter fishing," but the Senate report said the Committee believes quotas for charter vessels should be separate from those for commercial vessels not carrying passengers for hire. In the managers' amendment, the definition of "charter fishing" was added, plus specific references to it in sections 303 and 407. A controversy over the definition of "recreational fishing" developed at the last minute, as a New Jersey industry representative put forth the possible interpretation that fishing "for sport or pleasure" precluded

personal consumption of the harvest. The actual concern may have been that the definition might be used to favor catch-and-release fishermen over recreationalists who take home their catch or even sell it. Congressmen Saxton and Young, invoking NMFS's interpretation that consumption would not be precluded, conducted a colloquy establishing that recreational fishermen may indeed eat their fish. Congressman Pallone warned that the new definition must not "somehow negatively impact" recreational fishermen.

#### Issues:

NMFS has reviewed existing regulatory definitions of these terms. While they are not all identical, none was found to be inconsistent with the new definitions. The definitions, by themselves, don't change the status quo very much. They don't ban the sale of recreationally caught fish; they don't dictate particular allocation decisions. If they are used as tools for change, to the disadvantage of major constituencies, Congress will undoubtedly address them again.

#### Essential fish habitat

##### Summary:

This term is used in the new sections regarding fish habitat (see 101, findings; purposes; policy; 108(a)(7), required provisions; and 110, other requirements and authority. Essential fish habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."

##### Legislative history:

The House and Senate developed different definitions of EFH in their bills. Both versions included the idea that EFH must be waters, as opposed to upland areas that may also be important, such as buffer zones along anadromous fish streams. Both versions also included the idea that these waters must be "necessary" to the fish, presumably to prevent inclusion of less important habitat. The Senate version expanded the House definition to include "substrate" necessary to fish, as well as waters. The Senate also included "feeding" as a habitat use that was not in the House bill. Generally, the Senate language is a little broader than the House, but the general concept that EFH is habitat necessary for fish is the same in both.

##### Issues:

The Office of Habitat Conservation (HC) formed a working group to develop the guidelines and work on other implementation issues. The group has divided the definition into its key components and analyzed each. First, "waters" will include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include historic areas, where appropriate. For example, each species has certain requirements for temperature, dissolved oxygen, depth, current flow, and prey species. Second, "substrate" includes sediments, geologic features underlying the waters, and associated biological communities such as coral reefs or submerged aquatic vegetation. For example, different species have different requirements regarding the type of sediment, such as clay, sand, gravel, natural or artificial reefs, submerged aquatic vegetation, or coral. Third, "necessary" means the habitat required to support a managed species or assemblage at a target production level, reflecting conscientious stewardship. HC is considering how best to tie "necessary" to the idea of rebuilding depleted stocks or maintaining stocks that are in good shape. HC wants to tie "necessary" to Magnuson-Stevens Act goals for rebuilding stocks rather than maintaining them at depleted levels. Historic EFH may also come into play because, if habitat is a limiting factor for a depleted stock, then it

## 1.0 Purpose and Need

may be necessary to look at habitat that was once essential, but is no longer, as a means to rebuild. Fourth, "spawning, breeding, feeding or growth to maturity" covers a species' full life cycle. The inclusion of "feeding" may mean that predator-prey relationships should be considered. Although the Senate listed only certain critical life stages, it would be illogical to protect only those stages and not transition times and access to these areas. Finally, EFH may include habitat for individual species or an assemblage of species, depending on the species and FMPs. Some of the plans include many more than one species, so it would be easier to consolidate the habitats into one EFH designation.

### Fishing community

#### Summary:

The term is defined as "a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs" including various fishery participants based in such community. The term is used in new national standard 8; in section 303(a)(9) for fishery impact statements; in section 303(b)(6)(E) on limited access systems; at several places in the IFQ report; in section 304(e) on rebuilding programs; and in section 312(a) on disaster relief.

#### Legislative history:

H.R. 39 used the term "local coastal communities" in the individual quota section (e.g., an IQ system should "minimize negative social and economic impacts of the system on local coastal communities"). While the term was not defined in H.R. 39, several House members felt the Senate bill diluted these "protections." Congressman. Miller said that S. 39 defines fishing communities "far too broadly." Congressman. Furse believed the Senate bill "removes safeguards for coastal communities." Congressman. Riggs said the Senate bill includes under "fishing community" the "home ports of the distant water, corporately held, factory trawlers." The definition of "fishing community" in the bill reported out of the Senate Commerce Committee was changed very little in the managers' amendment. Instead, the understanding of the definition seems to have evolved over the summer from the drafters' hope that it was the equivalent of the House's "local coastal communities" to a near-consensus that it includes any place where vessel owners, operators, and crew or U.S. fish processors are based. The Washington delegation insisted on this interpretation, because they did not want their residents disadvantaged (see Gorton's and Murray's floor statements).

#### Issues:

Rather than trying to define "substantially dependent" or "substantially engaged," NMFS might use an excess employment theory, historical landings, or cultural adaptation to fishing in deciding what communities to cover. (See discussions below of sections using the term "fishing community.")

### Optimum Yield

#### Summary:

The definition has been revised (in (28)(A)) to require considering the protection of marine ecosystems in setting optimum yield. It clarifies (in (28)(B)) that social, economic, or ecological factors may be used to set OY lower than the maximum sustainable yield, but not higher. And it specifies (in (28)(C)) that, for an overfished fishery, the OY must provide for rebuilding to a level consistent with producing the MSY.

Legislative history:

H.R. 39 would have allowed healthy fisheries to be harvested at an OY level higher than MSY, but required the OY in overfished fisheries to be lower than MSY, to allow for rebuilding. The Senate bill removed that flexibility. The Senate report says this change "is not meant to preclude the Secretary, the Councils and the scientific and statistical committees of the Councils from using other appropriate scientific measures of Sustainable yield where there are insufficient data to determine the maximum sustainable yield of a fishery" (at 11). The summary of the managers' amendment states that the change "prevents the maximum sustainable yield from being exceeded."

Issues:

This definition intersects with the new provision at 109(e) requiring rebuilding programs for overfished fisheries. What does "rebuilding" mean? Read together, 109(e) and the new definition of "optimum" yield require a program that, at the end of the time period, restores a stock to the level that can then produce MSY on a continuing basis. It has been suggested that rebuilding to a level "consistent with producing the MSY" means merely a level that could someday be restored to MSY. That interpretation is contrary to the intent of Congress, the Administration, and the environmentalists who lobbied for these amendments. Probably all our overfished stocks are right now at levels that have the potential to be restored to MSY production. Setting a standard that low would not enhance the cause of conservation. This issue should be addressed in the revision to the guidelines for national standard 1.

Note:

The framework provision for royal red shrimp in the Gulf shrimp FMP allows optimum yield to be set at MSY plus 30 percent; the change in the statutory definition will affect use of that provision.

Overfished and overfishing

Summary:

These terms are defined as "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis."

Legislative history:

NMFS' definition of "overfishing" from the national standard 1 guidelines was the basis for this language, but Congress deleted the qualifier "long-term" before "capacity." The intent was to apply the "overfished" label to more fisheries by focusing on the current capacity to produce MSY. See the discussion of "optimum."

Issues:

Congress may have confused the situation by lumping an adjective (describing a fishery) and a verb (describing an activity) in the same definition. The activity of overfishing may occur in a fishery that is not in an overfished status; harvest in an overfished fishery may not be overfishing. These usages should be addressed in the national standard 1 guidelines.

## **Fishery Management Plans**

### Section 108 required provisions

#### Summary:

FMPs must now specify data to be submitted to the Secretary with respect to "commercial, recreational, and charter fishing in" the fishery. Plans must describe these sectors and quantify trends in landings from them. Plans must describe and identify essential fish habitat, minimize "to the extent practicable" adverse effects on such habitat, and identify other actions to encourage the conservation of such habitat. Fishery impact statements must assess the likely effects of measures on fishing communities. FMPs must specify objective and measurable criteria for identifying whether a fishery is overfished; if a fishery is overfished or approaching an overfished condition, the plan must contain measures to prevent overfishing or to end overfishing and rebuild the fishery. If rebuilding plans call for reduced harvests, the restrictions and recovery benefits must be fairly allocated among the harvesters. Plans must establish standardized reporting methods to assess the type and amount of bycatch in a fishery; measures must, to the extent practicable, minimize bycatch and minimize the mortality of bycatch that cannot be avoided. FMPs with recreational catch-and-release programs must include measures to minimize mortality of released fish.

#### Issues:

One issue is whether the change to section 303(a)(5) means that data must be collected from the commercial, recreational, and charter sectors and segregated by category. This might entail overhauls of reporting systems in many fisheries. Another is the meaning of "standardized" in section 303(a)(11). Rather than regional or national standardization, the requirement applies to each FMP for the fishery managed under it. The methodology could vary from one gear type to another, as long as the bycatch reports yield compatible data.

### Implementation

#### Summary:

Councils must submit FMP amendments containing these new provisions by October 11, 1998.

#### Issue:

When must FMPs for Atlantic highly migratory species comply with the new provisions of section 303(a)? The directive in this paragraph is only to the Councils, which may have been an oversight.

### **1.3 Affected Fishery Management Plans and Fish Stocks**

The affected fishery management plans include the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs. The species affected are listed in these fishery management plans.

### **1.4 Issues, Problems and Management Objectives for Comprehensive Amendment**

The Council is required by the Sustainable Fisheries Act of 1996 to amend (where appropriate) the fishery management plans for Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral, Coral Reefs, and Live/Hard Bottom Habitats to: (1) Address consistency with SFA Section 102 definitions, (2) Address bycatch management measures and bycatch reporting requirements to insure consistency with SFA Section 108 required provisions, (3) Address descriptions of each sector and quantify trends in



landings and data specified for each sector for the commercial, recreational and charter fisheries to insure consistency with SFA Section 108 required provisions, (4) Address fishery impact statements to insure they incorporate the likely effects of management measures on fishing communities and (5) Address overfishing provisions specifying objective and measurable criteria for identifying whether a fishery is overfished, measures to rebuild overfished stocks and reductions in fishing mortality and fair allocation among harvesters, to insure consistency with SFA Section 108 required provisions.

To aid the Council in meeting these requirements, NOAA/NMFS was to establish "National Standard Guidelines" and provide them to the Councils by September 1, 1997. When the Council approved the document for public hearing, the guidelines had not been finalized and provided to the Councils.

The deadline for the Council to meet the mandates of the SFA (submit amendments for all FMPs) is October 11, 1998. Faced with this deadline and the lack of National Standard Guidelines, the Council approved the parts of Section 4.0 relative to MSY, OY, overfishing and overfished to go forward to public hearing with a range of options (without any preferences) that were intended to address the final guidelines for implementing the SFA.

A final rule specifying regional fishery management council guidelines for amending FMP to be consistent with the definitions contained in Section 102 and other required provisions in Section 108 of the SFA was published by NMFS on May 1, 1998. On July 27, 1998 the Council received a copy of the "Technical Guidance On the Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act" that provides technical guidance on the use of precautionary approaches in addressing the MSY, OY, overfishing and overfished sections of the NSG. On August 3, 1998 the Council received the "Checklist for FMP Amendments" that addresses questions that should be considered by the Councils in making amendments to FMPs in order to comply with National Standard 1 of the SFA in accordance with the NSG. The guidance provided in these two documents have been incorporated into the actions contained in Section 4.0 of this amendment.

## **1.5 Summary of Existing Management Measures which Directly or Indirectly Address SFA Provisions**

### **Shrimp FMP**

The use of certified bycatch reduction devices (BRD) is required in all penaeid shrimp trawls in the South Atlantic EEZ

A framework has been established for BRD certification which specifies BRD certification criteria and testing protocol.

The specifications in the Bycatch Reduction Device Testing Protocol Manual are required to be used by the states and researchers testing the effectiveness of any new or modified BRD in reducing bycatch of target species as specified by the council.

Because shrimp are annual crops that fluctuate considerably from year to year depending primarily on environmental factors, MSY is not a particularly useful concept. For management purposes, MSY was considered to be the mean total landings for the southeast region:

White Shrimp	= 14.5 million pounds
Brown Shrimp	= 9.2 million pounds
Pink Shrimp	= 1.8 million pounds

## 1.0 Purpose and Need

The same methodology was used to generate a MSY proxy for rock shrimp

Rock Shrimp = 6.8 million pounds

White Shrimp - Optimum yield (OY) for the white shrimp fishery is defined as the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction. This level has been estimated only for the central coastal area of South Carolina, and only in terms of subsequent fall production (assumed to represent recruitment). Therefore, in actual application, OY for the white shrimp fishery is the amount of harvest that can be taken by the U.S. fishery during the fishing season which may vary from year to year based on both state regulations and regulations promulgated pursuant to this plan (i.e., closures due to cold kills).

Rock Shrimp - OY is MSY which for the rock shrimp fishery in the south Atlantic EEZ is defined as the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction.

Brown and Pink Shrimp - OY for the brown shrimp and pink shrimp fisheries in the south Atlantic EEZ are defined as the amount of harvest that can be taken by U.S. fishermen without annual landings falling two standard deviations below mean landings 1957-1993 for three consecutive years [2,946,157 pounds (heads on) for brown shrimp and 286,293 pounds (heads on) for pink shrimp].

White shrimp - Overfishing is indicated when the overwintering white shrimp population within a state's waters declines by 80% or more following severe winter weather resulting in prolonged cold water temperatures. Continued fishing following such a decline may reduce the reproductive capacity of the stock affecting subsequent recruitment and would be considered overfishing. Relative population abundance will be determined by catch per unit effort (CPUE) during standardized assessment sampling.

Brown and Pink Shrimp - The South Atlantic brown shrimp and pink shrimp resources are overfished when annual landings fall below two standard deviations below mean landings 1957-1993 for three consecutive years [2,946,157 pounds (heads on) for brown shrimp and 286,293 pounds (heads on) for pink shrimp]. If annual landings fall below two standard deviations of the 1957-1993 mean landings for two consecutive years the Council shall convene the Shrimp Stock Assessment Panel, Shrimp Advisory Panel, and Shrimp Committee to review the causes of such declines and recommend any appropriate Council action to address the problem.

Rock Shrimp - The South Atlantic rock shrimp resource is overfished when the annual landings exceed the value which is two standard deviations above mean landings 1986-1994. This level, based on the more accurate state data, is 6,829,449 pounds.

### Red Drum FMP

All harvest or possession of red drum in or from the EEZ is prohibited.

There currently is not an accepted estimate of MSY for Atlantic red drum, due primarily to lack of adequate data.

Optimum Yield for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the spawning stock biomass per recruit ratio (SSBR) at or above 30%.

Overfishing is defined as a fishing mortality rate that will, if continued, reduce the spawning stock biomass per recruit (SSBR) below 30% of the level that would exist at equilibrium without fishing (Red Drum FMP (1990), pages 77-78). The Atlantic coast red drum stock will be considered overfished when the SSBR is below 30% of the level that would have existed in the absence of fishing.

### Snapper Grouper FMP

All harvest or possession of jewfish and Nassau grouper is prohibited.

Measures have been implemented to reduce bycatch by specifying allowable gear and gear construction.

Maximum sustainable yield is comparable to maximum yield if recruitment is constant. Until scientific evidence about recruitment patterns indicate otherwise, maximum yield by yield-per-recruit analysis is the best available proxy for MSY for individual species. There are no estimates of maximum yield or MSY for the whole multi-species snapper grouper fishery.

The South Atlantic Council's target level of Optimum Yield is 40% static SPR.

The current definition for overfishing is as follows:

(i) A snapper grouper stock or stock complex is overfished when it is below the level of 30% of the spawning stock biomass per recruit which would occur in the absence of fishing. (Note: For jewfish 40% was used.)

(ii) When a snapper grouper stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 30% spawning stock biomass per recruit level. (Note: For jewfish 40% was used.)

(iii) When a snapper grouper stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of Optimum Yield (OY) on a continuing basis.

(iv) For jewfish the threshold level is 30% SSBR; below this level, no harvest or possession of jewfish is allowed.

(v) The timeframe for recovery of snappers (excluding red snapper), greater amberjack, black sea bass, and red porgy is not to exceed 10 years. For red snapper and the groupers, the timeframe is not to exceed 15 years. Year 1 was the 1991 fishing year. The recovery time period may be modified by the framework (regulatory amendment) procedure. These timeframes were established in Amendment 4 and are based on the life history characteristics (growth rate, mortality rate, longevity, etc.). Longer lived, slower growing species are more susceptible to overfishing and will rebuild more slowly, hence the 15 year recovery period. Shorter-lived, faster growing species will recover more quickly and thus was the basis for choosing a 10 year recovery time period.

### Coastal Migratory Pelagic FMP

The use of drift gill nets for coastal pelagics and purse seines and run-around gillnets for the overfished groups of mackerels is prohibited.

## 1.0 Purpose and Need

Measures have been implemented to minimize waste and to reduce bycatch in the fishery by specifying allowable gear and gear construction.

MSY for king mackerel is set within the range of 21.9 and 35.2 million pounds with the best current point estimate at 26.2 million pounds for the overall king mackerel stock (South Atlantic and Gulf).

MSY for Spanish mackerel is within a range of 15.7 to 19.7 million pounds with the best estimate of 18 million pounds (South Atlantic and Gulf).

The South Atlantic Council's target level or Optimum Yield for a mackerel stock or migratory group is 40% static SPR.

A stock of fish shall be considered overfished if the fishing mortality rate exceeds  $F_{msy}$  or  $F_{0.1}$ , or spawning biomass is low enough to affect recruitment. The  $F_{0.1}$  fishing rate is the level of fishing mortality at which an increase in effort produces ten percent of the increase in yield that would occur in a lightly fished fishery for a comparable increase in effort. An  $F_{0.1}$  yield per recruit management strategy better protects against growth overfishing and maintains a larger spawning population than does a  $F_{max}$  strategy. If any stock or subgroup is overfished, the assessment group will estimate levels of ABC which would allow that stock to recover in one year, three years, five years, or other period as requested by the Councils."

In Amendment 5 the Council revised the overfishing definition to conform with recently approved guidelines for fishery management plans.

"(a) A mackerel or cobia stock shall be considered overfished if the spawning stock biomass per recruit (SSBR) is less than the target level percentage recommended by the assessment group, approved by the Scientific and Statistical Committee (SSC), and adopted by the Councils. The target level percentage shall not be less than 20 percent.

(b) When a stock is overfished (as defined in (a)), the act of overfishing is defined as harvesting at a rate that is not consistent with a program to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges for recovery periods consistent with a program to rebuild an overfished stock.

(c) When a stock is not overfished (as defined in (a)), the act of overfishing is defined as a harvest rate that if continued would lead to a state of the stock that would not at least allow a harvest of OY on a continuing basis, and the assessment group will develop ABC ranges based upon OY (currently MSY)."

In Amendment 6 the Council revised paragraph (b) to add the following rebuilding timeframe and increase the overfishing level:

"(b) When a stock is overfished (as defined in a), the act of overfishing is defined as harvesting at a rate that is not consistent with programs to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges based on a fishing mortality rate that will achieve and maintain at least the minimum specified spawning potential ratio (currently set at 30 percent). The recovery period was not to exceed 12 years for king mackerel beginning in 1985 and 7 years for Spanish mackerel beginning in 1987." *However, both stocks have recovered and are no longer overfished.*

### Golden Crab FMP

Escape gaps with degradable panels are required in crab traps to minimize waste and reduce bycatch.

Sale of female crabs is prohibited and retention of female crabs is limited to 0.5% by number.

The South Atlantic Council reviewed the MSY estimates, the methodology, review comments by the NMFS SEFSC, SSC, and Golden Crab AP and concluded, based upon the best available information, not to specify a total MSY for the golden crab resource within the Council's area of jurisdiction. As soon as sufficient information becomes available to calculate MSY, the framework procedure will be used to incorporate the MSY figures into the management plan.

Optimum Yield is all golden crab that are harvested legally under the provisions of the golden crab fishery management plan which is equivalent to that level of golden crab harvest that would minimize user conflict among vessels, minimize the cost of fishing, produce a stable level of landings that would maximize returns to the fishermen, provide for a stable supply, and minimize management costs.

Overfishing is defined as any rate of fishing mortality in excess of  $F_{msy}$  for golden crab in the South Atlantic Council's management area

#### **Spiny Lobster FMP**

Measures have been implemented to minimize waste and to reduce bycatch in the fishery by specifying allowable gear and gear construction.

Possession or stripping of egg-bearing slipper lobsters is prohibited.

MSY is set to be the same as OY.

Optimum yield is all spiny lobster with carapace or tail lengths equal to or larger than the minimum legal lengths that are harvested legally under the provisions of the FMP. OY is estimated at 9.5 million pounds. The current legal size specified in the regulations is lobsters larger than 3.0 inches carapace length or for those fishermen with a tailing permit, lobster tails equal to or larger than 5.5 inches.

OY for slipper lobster is all non egg bearing slipper lobster that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions.

Overfishing exists when the eggs per recruit ratio of the exploited population to the unexploited population is reduced below 5% and recruitment of small lobsters into the fishery has declined for three consecutive fishing years. Overfishing will be avoided when the eggs per recruit ratio of exploited to unexploited populations is maintained above 5%.

#### **Coral, Coral Reefs and Live/Hard Bottom Habitat FMP**

All wild live rock harvest north of Dade County, FL is prohibited.

Harvest by chipping throughout South Atlantic jurisdiction is prohibited.

## 1.0 Purpose and Need

MSY is addressed as follows: The lack of sufficient data on biomass and mortality, and the absence of a fishery from which catch and effort data may be obtained, prevents any calculation of MSY for the entire management area.

Optimum yield for coral reefs, stony corals, and sea fans (*Gorgonia ventalina* and *Gorgonia flabellum*), hereafter to be referred to as prohibited corals, in the EEZ is to be zero (0) except as may be authorized for scientific and educational purposes. The level of harvest is expected to be about 140 kilograms per year. Harvest of allowable octocorals (those other than sea fans) in the EEZ is not to exceed 50,000 colonies per year. Fishing for octocorals in the EEZ will cease when the quota is reached.

Optimum yield for wild live rock is zero (0) except for that which may be allowed by permit.

Overfishing is defined as an annual level of harvest that exceeds OY.

## 1.6 Proposed Measures

### Definitions

Address consistency with SFA Section 102 definitions

**Action 1A.** No action to amend FMPs is required except as specified in Action 1B.

**Action 1B.** Minor change to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change "bycatch" to "trip limit".

### Other Required Provisions

Bycatch - bycatch management measures and bycatch reporting requirements

**Action 2A.** No action to amend the bycatch management measures in the FMPs is required.

**Action 2B.** Amend Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include reporting requirements as specified in the Atlantic Coastal Cooperative Statistics Program (ACCSP).

Commercial, recreational and charter fishing - Sector descriptions, landing trends and data specification

**Action 3.** No action to amend FMPs is required.

Fishing Communities - Identify and define fishing communities

**Action 4.** Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include available information on fishing communities.

Maximum Sustainable Yield (MSY), Optimum Yield (OY), Overfishing and Overfished

**Action 5.** Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs as required.

### **Shrimp FMP**

**Action 1. Maximum Sustainable Yield (MSY).**

The Council concluded that No Action is necessary at this time.

**Action 2. Optimum Yield (OY).**

The Council concluded that No Action is necessary at this time.

**Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The Council concluded that No Action is necessary at this time.

**Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

**Action 5. Overfishing Evaluation to meet the Current Definition.**

None of the South Atlantic shrimp species are listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

### **Red Drum FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for red drum is unknown. The Council reviewed alternatives and concluded the best available data supports using 30% Static SPR as a proxy for MSY.

#### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR.

#### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for red drum is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the red drum MSY proxy.

The "threshold level" for red drum is defined as 10% Static SPR.

#### **Action 4. Rebuilding Timeframe.**

Rebuilding projections are not available at this time. The Council recommends that projections be incorporated into the next stock assessment to the extent practicable to determine whether red drum can be rebuilt in less than 10 years.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

Red drum are listed as overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. The Council has prohibited any retention in the EEZ which is the maximum protection that the Council can provide. The Council concluded no further action by the Council is necessary and the NMFS concurred with this action (see Appendix F).

### **Snapper Grouper FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for species in the snapper grouper management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 40% Static SPR as a proxy for MSY for jewfish and Nassau grouper, and 30% Static SPR as a MSY proxy for the remaining species.

#### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the snapper grouper fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR for all species in the snapper grouper management unit except the following:

A. Hermaphroditic groupers (that is, those that switch sex, generally from females to males as they grow older) will be managed for an OY of 45% Static SPR.

B. Jewfish and Nassau Grouper will be managed for an OY of 50% Static SPR.

#### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for all species in the snapper grouper management unit, except for jewfish and Nassau grouper, is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the snapper grouper MSY proxy.

Overfishing for jewfish and Nassau grouper is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 40% Static SPR (F40% Static SPR) which is the MSY proxy for jewfish and Nassau grouper.



Overfishing for black sea bass is defined in terms of the Checklist (Appendix D) and information provided by Dr. Doug Vaughan, NMFS Beaufort Lab (Table 50). The two components of the status determination criteria are:

- A. A maximum fishing mortality threshold (MFMT) — A fishing mortality rate (F) in excess of F30% Static SPR which is 0.72 (Table 50).
- B. A minimum stock size threshold (MSST) — The minimum stock size threshold is 3.72 million pounds (Table 50).

The “threshold level” for all species in the snapper grouper management unit, except for jewfish and Nassau grouper, is defined as 10% Static SPR. For jewfish and Nassau grouper, the “threshold level” is defined as 30% Static SPR.

#### **Action 4. Rebuilding Timeframe.**

Rebuilding projections are not available at this time. The Council recommends that projections be incorporated into the next stock assessment to the extent practicable to determine whether the overfished snapper grouper species can be rebuilt in less than 10 years. Until such time as this information is provided to the Council, the current timeframe for recovery remains in effect: The timeframe for recovery of snappers (excluding red snapper), greater amberjack, black sea bass, and red porgy is not to exceed 10 years. For red snapper and the groupers, the timeframe is not to exceed 15 years. Year 1 was the 1991 fishing year.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

The Council made the determinations shown for each species based on having Snapper Grouper Amendment 8 and Snapper Grouper Amendment 9 in place. The Council is in a difficult situation, particularly for species in the snapper grouper management unit, because these two major amendment have not been implemented and previous amendments have not been incorporated into assessment results for some species. The Council’s previous actions will have major impacts on rebuilding overfished species. The Council’s conclusions reflect the belief that regulations already approved should be implemented and evaluated before determinations can be made whether additional regulations are required. The Council will continue to monitor the snapper grouper fishery and will use the framework procedure to implement any additional species specific measures as may be necessary following updated stock assessments received through the SAFE process described earlier.

The Council’s evaluations are as follows:

1. **Black sea bass** remain overfished. Black sea bass are above the “threshold level” with a static SPR of 26%. Black sea bass are overfished given that the MSST is 3.72 million pounds and the 1995 biomass was estimated to be 1.33 million pounds. Black sea bass are also experiencing overfishing given that the MFMT is 0.72 and the average fishing mortality rate (F) for 1991-1995 was 0.95. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 26%, recreational catch by 36%, and total catch by 30%. **The Council concluded these reductions are sufficient to rebuild black sea bass above the overfished level.**

2. **Vermilion snapper** remain overfished with a static SPR of 21% to 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce headboat catch by 29%, MRFSS catch by 70%, and total catch by 13%. **The Council concluded these reductions are sufficient to rebuild vermilion snapper above the overfished level.**

3. **Red porgy** remain overfished with a static SPR of 14% to 19%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 65%, recreational

catch by 50%, and total catch by 59%. **The Council concluded these reductions are sufficient to rebuild red porgy above the overfished level.**

4. **Red snapper** remain overfished with a static SPR of 24% to 32%. The measures proposed through Snapper Grouper Amendment 7 will result in a projected SPR of 35%. **The Council concluded these reductions and the measures contained in Snapper Grouper Amendments 8 and 9 are sufficient to rebuild red snapper above the overfished level.**

5. **Gag** remain overfished with a static SPR of 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 37%, recreational catch by 13%, and total catch by 27%. **The Council concluded these reductions are sufficient to rebuild gag above the overfished level.**

6. **Scamp** are no longer overfished with a static SPR of 35%. The measures proposed in Snapper Grouper Amendment 9 will provide some additional protection. **The Council concluded no additional measures are necessary to maintain scamp above the overfished level.**

7. **Speckled hind** remain overfished with a static SPR of 8% to 13%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild speckled hind above the overfished level.**

8. **Warsaw grouper** remain overfished with a static SPR of 6% to 14%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild warsaw grouper above the overfished level.**

9. **Snowy grouper** remain overfished with a static SPR of 5% to 15%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild snowy grouper above the overfished level.**

10. **Golden tilefish** remain overfished but the Assessment Group concluded there was inadequate information to update the existing SPR of 21%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild golden tilefish above the overfished level.**

11. **Nassau grouper** remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. **The Council concluded no further action is required for Nassau grouper at this time.** This position is supported by the letter from NMFS (Appendix F.).

12. **Jewfish** remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. **The Council concluded no further action is required for jewfish at this time.** This position is supported by the letter from NMFS (Appendix F.).

13. **White grunt** are no longer overfished with a static SPR of 29% to 39%. The measures proposed in Snapper Grouper Amendments 8 and 9 will provide some additional

protection. **The Council concluded no additional measures are necessary to maintain white grunt above the overfished level.**

### **Coastal Migratory Pelagics FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for species in the coastal migratory pelagics management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 30% Static SPR as a proxy for MSY.

#### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the coastal migratory pelagics fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR.

#### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for all species in the coastal migratory pelagics management unit is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the coastal migratory pelagics MSY proxy.

The "threshold level" for all species in the coastal migratory pelagics management unit is defined as 10% Static SPR.

#### **Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

None of the Atlantic migratory group mackerels are listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States: cobia are not overfished, and cero, dolphin, and little tunny are listed as unknown.

### **Golden Crab FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

The Council concluded that No Action is necessary at this time.

#### **Action 2. Optimum Yield (OY).**

The Council concluded that No Action is necessary at this time.

#### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The Council concluded that No Action is necessary at this time.

#### **Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

#### **Action 5. Overfishing Evaluation to meet the Current Definition.**

Golden crab are not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

### **Spiny Lobster FMP**

#### **Action 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for species in the coastal migratory pelagics management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 20% Static SPR as a proxy for MSY.

## 1.0 Purpose and Need

### **Action 2. Optimum Yield (OY).**

Optimum Yield (OY) for the spiny lobster fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 30% Static SPR.

### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

Overfishing for species in the Spiny Lobster FMP can only be defined in terms of the fishing mortality component given the data-poor status of these species. Based on the written guidance from NMFS, the Council is setting the overfishing level as a fishing mortality rate (F) in excess of the fishing mortality rate at 20% Static SPR (F20% Static SPR).

### **Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

### **Action 5. Overfishing Evaluation to meet the Current Definition.**

Spiny lobster are not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States; slipper lobster are listed as unknown and have no overfishing definition.

## **Coral, Coral Reefs, and Live/Hard Bottom Habitat FMP**

### **Action 1. Maximum Sustainable Yield (MSY).**

The Council concluded that No Action is necessary at this time.

### **Action 2. Optimum Yield (OY).**

The Council concluded that No Action is necessary at this time except the minor adjustment to the wording shown in bold (“and under live rock aquaculture permits”) to incorporate Amendment 2 actions.

### **Action 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The Council concluded that No Action is necessary at this time.

### **Action 4. Rebuilding Timeframe.**

The Council concluded that No Action is necessary at this time.

### **Action 5. Overfishing Evaluation to meet the Current Definition.**

South Atlantic Corals are listed as unknown in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. The Council concluded no additional action is required at this time.

## **Framework Adjustment Procedures**

**Action 6.** Add a provision to all framework procedures in all Council FMPs that allows the addition of biomass levels and age structured analyses as they become available.

## **2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION**

National Environmental Policy Act (NEPA) regulations indicate that Section 2.0 should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public. The Council's documents must also conform to Magnuson-Stevens Act and "Other Applicable Law" requirements. National Environmental Policy Act regulations are one of the "other applicable laws" referenced. The Council decided to blend Magnuson-Stevens Act and "other applicable law" (including NEPA) requirements in one consolidated, non-duplicative, and non-repetitive document. The bulk of the evaluation of alternatives and discussion about the effects on the environment is in Section 4.0 Environmental Consequences. Section 2.0 Alternatives presents a summary of Section 4.0. The Council concluded this meets NEPA regulatory requirements.

The Council is proposing to: amend (where appropriate) the fishery management plans for Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral, Coral Reefs, and Live/Hard Bottom Habitats to: (1) Address the consistency with SFA Section 102 definitions, (2) Address bycatch management measures and bycatch reporting requirements to insure consistency with SFA Section 108 required provisions, (3) Address descriptions of each sector and quantify trends in landings and data specified for each sector for the commercial, recreational and charter fisheries to insure consistency with SFA Section 108 required provisions, (4) Address fishery impact statements to insure they incorporate the likely effects of management measures on fishing communities and (5) Address overfishing provisions specifying objective and measurable criteria for identifying whether a fishery is overfished, measures to rebuild overfished stocks and reductions in fishing mortality and fair allocation among harvesters, to insure consistency with SFA Section 108 required provisions.

**SUMMARY OF ENVIRONMENTAL CONSEQUENCES  
(Effects of Alternatives on the Issues/Problems)**

Table B. Summary of Environmental Consequences

<b>Alternatives</b>	<b>ISSUES/PROBLEMS</b>	
	<b>Biological:</b>	<b>Socioeconomic:</b>
<b><u>Consistency with SFA Section 102</u></b> Action 1A. No action to amend FMPs is required except as specified in Action 1B.	None	None
Action 1B. Minor change to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change "bycatch" to "trip limit".	None	None
<b><u>Bycatch management measures and bycatch reporting.</u></b> Action 2A. No action to amend the bycatch management measures in the FMPs is required.	None	None
Action 2B. Amend FMPs to include reporting requirements as specified in the ACCSP.	None	None
<b><u>Commercial, recreational and Charter Fishing.</u></b> Action 3. No action to amend FMPs is required.	None	None
<b><u>Identify and define fishing communities.</u></b> Action 4. Amend FMPs to include available information on fishing communities.	None	Addresses social and economic problems. Would promote stability.
<b><u>Maximum Sustainable Yield (MSY), Optimum Yield (OY), Overfishing &amp; Overfished.</u></b> Action 5. Amend FMPs as required.	Provides basic biological protection. Prevents overfishing.	Promotes stability and facilitates long term planning.
<b><u>Framework Adjustment Procedures</u></b> Action 6. Add a provision to all framework procedures in all Council FMPs that allows the addition of biomass levels and age structured analyses as they become available.	None	None

### 3.0 AFFECTED ENVIRONMENT

The affected environment including a description of the fisheries in the South Atlantic Region are presented in detail in the original Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom FMPs and updated in subsequent amendments.

#### 3.1 List and General Description of Stocks Comprising the Management Unit

A listing and general description of the stocks comprising the management units are presented in detail in the original Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom FMPs and updated in subsequent amendments.

##### 3.1.1 Definitions of Overfishing for Managed Species

###### Shrimp

White Shrimp (Shrimp FMP (1993), pages 66-67). Overfishing is indicated when the overwintering white shrimp population within a state's waters declines by 80% or more following severe winter weather resulting in prolonged cold water temperatures. Continued fishing following such a decline may reduce the reproductive capacity of the stock affecting subsequent recruitment and would be considered overfishing. Relative population abundance will be determined by catch per unit effort (CPUE) during standardized assessment sampling.

Brown and Pink Shrimp (Shrimp Amendment 2 (1996), pages 56-58). The South Atlantic brown shrimp and pink shrimp resources are overfished when annual landings fall below two standard deviations below mean landings 1957-1993 for three consecutive years [2,946,157 pounds (heads on) for brown shrimp and 286,293 pounds (heads on) for pink shrimp]. If annual landings fall below two standard deviations of the 1957-1993 mean landings for two consecutive years the Council shall convene the Shrimp Stock Assessment Panel, Shrimp Advisory Panel, and Shrimp Committee to review the causes of such declines and recommend any appropriate Council action to address the problem.

Rock Shrimp (Shrimp Amendment 1 (1996), pages 32-33). The South Atlantic rock shrimp resource is overfished when the annual landings exceed the value which is two standard deviations above mean landings 1986-1994. This level, based on the more accurate state data, is 6,829,449 pounds.

###### Red Drum

Overfishing is defined as a fishing mortality rate that will, if continued, reduce the spawning stock biomass per recruit (SSBR) below 30% of the level that would exist at equilibrium without fishing (Red Drum FMP (1990), pages 77-78). The Atlantic coast red drum stock will be considered **overfished** when the SSBR is below 30% of the level that would have existed in the absence of fishing. The 1989 stock assessment report indicated the red drum stock was overfished with a SSBR between 2% and 3%. Subsequently, a stock assessment conducted in March 1996 showed rebuilding had occurred and the SPR had increased to 9% in the northern region and 14% in the southern region.

###### Snapper Grouper Complex

The current definition for overfishing is as follows (Snapper Grouper Amendment 4 (1991), pages 7-13):

### 3.0 Affected Environment

(i) A snapper grouper stock or stock complex is **overfished** when it is below the level of 30% of the spawning stock biomass per recruit which would occur in the absence of fishing. (Note: For jewfish 40% was used.)

(ii) When a snapper grouper stock or stock complex is overfished, **overfishing** is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 30% spawning stock biomass per recruit level. (Note: For jewfish 40% was used.)

(iii) When a snapper grouper stock or stock complex is not overfished, **overfishing** is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of Optimum Yield (OY) on a continuing basis.

(iv) For jewfish the **threshold** level is 30% SSBR; below this level, no harvest or possession of jewfish is allowed.

(v) The **timeframe for recovery** of snappers (excluding red snapper), greater amberjack, black sea bass, and red porgy is not to exceed 10 years. For red snapper and the groupers, the timeframe is not to exceed 15 years. Year 1 was the 1991 fishing year. The recovery time period may be modified by the framework (regulatory amendment) procedure. These timeframes were established in Amendment 4 and are based on the life history characteristics (growth rate, mortality rate, longevity, etc.). Longer lived, slower growing species are more susceptible to overfishing and will rebuild more slowly, hence the 15 year recovery period. Shorter-lived, faster growing species will recover more quickly and was the basis for choosing 10 years.

#### Coastal Migratory Pelagics

Amendment 1 (Mackerel Amendment 1 (1985), pages 12-11 and 12-12) specified the following definition. "A stock of fish shall be considered **overfished** if the fishing mortality rate exceeds  $F_{msy}$  or  $F_{0.1}$ , or spawning biomass is low enough to affect recruitment. The  $F_{0.1}$  fishing rate is the level of fishing mortality at which an increase in effort produces ten percent of the increase in yield that would occur in a lightly fished fishery for a comparable increase in effort. An  $F_{0.1}$  yield per recruit management strategy better protects against growth overfishing and maintains a larger spawning population than does a  $F_{max}$  strategy. If any stock of subgroup is overfished, the assessment group will estimate levels of ABC which would allow that stock to recover in one year, three years, five years, or other period as requested by the Councils."

In Amendment 5 (Mackerel Amendment 5 (1990), pages 10-13) the Council revised the overfishing definition to conform with recently approved guidelines for fishery management plans.

"(a) A mackerel or cobia stock shall be considered **overfished** if the spawning stock biomass per-recruit (SSBR) is less than the target level percentage recommended by the assessment group, approved by the Scientific and Statistical Committee (SSC), and adopted by the Councils. The target level percentage shall not be less than 20 percent.

(b) When a stock is overfished (as defined in (a)), the act of **overfishing** is defined as harvesting at a rate that is not consistent with a program to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges for recovery periods consistent with a program to rebuild an overfished stock.

(c) When a stock is not overfished (as defined in (a)), the act of **overfishing** is defined as a harvest rate that if continued would lead to a state of the stock that would not at least allow a harvest of OY on a continuing basis, and the assessment group will develop ABC ranges based upon OY (currently MSY)."



In Amendment 6 (Mackerel Amendment 6 (1992), pages 7-9) the Council revised paragraph (b) to add the following rebuilding timeframe and increase the overfishing level:

“(b) When a stock is overfished (as defined in a), the act of overfishing is defined as harvesting at a rate that is not consistent with programs to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges based on a fishing mortality rate that will achieve and maintain at least the minimum specified spawning potential ratio (currently set at 30 percent). The recovery period is not to exceed 12 years for king mackerel beginning in 1985 and 7 years for Spanish mackerel beginning in 1987.”

In Amendment 8 (Mackerel Amendment 8 (1996), pages 27-31), as the result of a NMFS scientific workgroup report, the Council proposed lowering the overfished level to 20% transitional SPR but this was rejected by NMFS. The overfished level remains as specified in Amendment 6.

### **Golden Crab**

Overfishing is defined as any rate of fishing mortality in excess of  $F_{msy}$  for golden crab in the South Atlantic Council's management area (Golden Crab FMP (1995), pages 97-102).

### **Spiny Lobster**

Amendment 3 (Spiny Lobster Amendment 3 (1990), pages 4-10) proposed the following definition: Overfishing exists when the eggs per recruit ratio of the exploited population to the unexploited population is reduced below 5% and recruitment of small lobsters into the fishery has declined for three consecutive fishing years. Overfishing will be avoided when the eggs per recruit ratio of exploited to unexploited populations is maintained above 5%.

### **Coral, Coral Reefs, and Live/Hard Bottom Habitat**

Amendment 1 (Coral Amendment 1 (1990), page 7) proposed the following definition: Overfishing is defined as an annual level of harvest that exceeds OY.

## **3.1.2 Optimum Yield for Managed Species**

### **Shrimp**

White Shrimp (Shrimp FMP (1993), pages 65-66). OY for the white shrimp fishery is defined as the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction. This level has been estimated only for the central coastal area of South Carolina, and only in terms of subsequent fall production (assumed to represent recruitment). Therefore, in actual application, OY for the white shrimp fishery is the amount of harvest that can be taken by the U.S. fishery during the fishing season which may vary from year to year based on both state regulations and regulations promulgated pursuant to this plan (i.e., closures due to cold kills).

Rock Shrimp (Shrimp Amendment 1 (1996), page 32). OY is MSY which for the rock shrimp fishery in the south Atlantic EEZ is defined as the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction.

Brown and Pink Shrimp (Shrimp Amendment 2 (1996), pages 59-61). OY for the brown shrimp and pink shrimp fisheries in the south Atlantic EEZ are defined as the amount of harvest that can be taken by U.S. fishermen without annual landings falling two standard deviations

### 3.0 Affected Environment

below mean landings 1957-1993 for three consecutive years [2,946,157 pounds (heads on) for brown shrimp and 286,293 pounds (heads on) for pink shrimp].

#### **Red Drum**

Optimum Yield for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the spawning stock biomass per recruit ratio (SSBR) at or above 30% (Red Drum FMP (1990), pages 76-77).

#### **Snapper Grouper Complex**

The South Atlantic Council's target level of Optimum Yield (OY) is 40% static SPR.

#### **Coastal Migratory Pelagics**

The South Atlantic Council's target level or Optimum Yield for a mackerel stock or migratory group is 40% static SPR (Mackerel Amendment 8 (1996), pages 38-39). In Amendment 2 (Mackerel Amendment 2 (1987), page 6) the Council specified the long-term goal of optimum yield from mackerels is MSY.

#### **Golden Crab**

Optimum Yield (OY) is all golden crab that are harvested legally under the provisions of the golden crab fishery management plan which is equivalent to that level of golden crab harvest that would minimize user conflict among vessels, minimize the cost of fishing, produce a stable level of landings that would maximize returns to the fishermen, provide for a stable supply, and minimize management costs (Golden Crab FMP (1995), pages 94-97).

#### **Spiny Lobster**

The original FMP (Spiny Lobster FMP (1982), pages ) defined OY as follows: OY is specified to be all spiny lobster more than 3.0 inches carapace length or not less than 5.5 inches tail length that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions. OY is estimated at 9.5 million pounds. Tail length measure applies only if legally separated from the body.

Amendment 1 (Spiny Lobster Amendment 1 (1987), pages 22-23) specified the OY for slipper lobster to be all non egg bearing slipper lobster that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions.

Amendment 2 (Spiny Lobster Amendment 2 (1989), page 10) modified the first sentence of the statement of OY to read as follows for spiny lobster (OY for slipper lobster is unchanged): OY is all spiny lobster with carapace or tail lengths equal to or larger than the minimum legal lengths that are harvested legally under the provisions of the FMP. Note: Current legal size specified in the regulations is 3.0 inches.

Amendment 4 (Spiny Lobster Amendment 4 (1994), page 10) contains the following restatement of OY: Optimum yield (OY) is all spiny lobster with carapace or tail lengths equal to or larger than the minimum legal lengths that are harvested legally under the provisions of the FMP. OY is estimated at 9.5 million pounds. The current legal size specified in the regulations is lobsters larger than 3.0 inches carapace length or for those fishermen with a tailing permit, lobster tails equal to or larger than 5.5 inches.

### **Coral, Coral Reefs, and Live/Hard Bottom Habitat**

The original FMP (Coral FMP (1982), pages 12-4 to 12-5) defined OY as follows: OY for all corals is the level of harvest specified or as may be authorized pursuant to the permitting criteria established in this plan. Based on available data it is the Councils' intent to allow the existing level of legal, reported harvest consistent with the objectives of the plan. OY for stony corals and sea fans is to be zero (0) except as may be authorized for scientific and educational purposes. The current and expected level of harvest for this purpose is estimated to be about 140 kilograms per year. OY for octocorals is the amount of harvest which is authorized pursuant to this plan. It is to be all octocorals (except sea fans) that are harvested by U.S. fishermen. Octocorals, except for sea fans, are identified as presently being harvested without apparent stock damage. Present and expected level of harvest is estimated to be about 5,845 colonies annually, 1,463 of which come from the EEZ.

Amendment 1 (Coral Amendment 1 (1990), pages 5-7) revised OY to read as follows: OY for coral reefs, stony corals, and sea fans (Gorgonia ventalina and Gorgonia flabellum), hereafter to be referred to as prohibited corals, in the EEZ is to be zero (0) except as may be authorized for scientific and educational purposes. The level of harvest is expected to be about 140 kilograms per year. Harvest of allowable octocorals (those other than sea fans) in the EEZ is not to exceed 50,000 colonies per year. Fishing for octocorals in the EEZ will cease when the quota is reached.

Amendment 2 (Coral Amendment 2 (1994), pages 26-27) contains the following statement of OY for live rock: Optimum yield (OY) for wild live rock is to be 485,000 pounds annually for the South Atlantic region where harvest is allowed during 1994 and 1995, after which it is to be zero except for that which may be allowed by permit.

### **3.1.3 Maximum Sustainable Yield for Managed Species**

#### **Shrimp**

Because shrimp are annual crops that fluctuate considerably from year to year depending primarily on environmental factors, MSY is not a particularly useful concept (Attachment 1: Shrimp FMP (1993), pages 16-17). For management purposes, MSY was considered to be the mean total landings for the southeast region:

White Shrimp = 14.5 million pounds

Brown Shrimp = 9.2 million pounds

Pink Shrimp = 1.8 million pounds

The same methodology was used to generate a MSY proxy for rock shrimp (Attachment 1: Shrimp Amendment 1 (1996), pages 32-33):

Rock Shrimp = 6.8 million pounds

#### **Red Drum**

There currently is not an accepted estimate of MSY for Atlantic red drum, due primarily to lack of adequate data (Red Drum FMP (1990), page 19).

#### **Snapper Grouper Complex**

Maximum yield is comparable to maximum sustainable yield if recruitment is constant (Snapper Grouper FMP (1983), page 23). Until scientific evidence about recruitment patterns indicate otherwise, maximum yield by yield-per-recruit analysis is the best available proxy for MSY for individual species. There are no estimates of maximum yield or MSY for the whole multi-species fishery.

### **Coastal Migratory Pelagics**

MSY for king mackerel is set within the range of 21.9 and 35.2 million pounds with the best current point estimate at 26.2 million pounds for the overall king mackerel stock (Mackerel Amendment 1 (1985), pages 5-20 to 5-22).

The following information is taken directly from the 1996 Report of the Mackerel Stock Assessment Panel:

“In 1983, the Councils adopted a maximum sustainable yield of 26.2 million pounds that was proportioned by historical landings into 18.5 million pounds for the Gulf migratory group and 7.7 million pounds for the Atlantic migratory group. Maximum sustainable yield is a dynamic quantity that is dependent upon environmental variables and fishery patterns governed by changes in selectivity and availability. In this regard, the Councils have changed the selectivity patterns of king mackerel by raising the minimum size limit from 12 inches to 20 inches fork length. Overall selectivity’s are also changed because stock assessments are beginning to include the impact associated with the harvest of mackerels in non-directed fisheries. Furthermore, closures of the commercial mackerel fishery have changed the temporal and geographic distribution of harvest which in turn has affected the age and sex structure of the harvest. Given these changes in the fishery, it is likely that the MSY for the Gulf and Atlantic king mackerel is less than 26.2 million pounds.”

The MSY for Spanish mackerel was modified in Mackerel Amendment 2 (Mackerel Amendment 2 (1987), pages 4-5) to a range of 15.7 to 19.7 million pounds with the best estimate of 18 million pounds. For similar reasons, in 1996 the Mackerel Stock Assessment Panel concluded “the Spanish mackerel MSY is also most likely to be less than the previously estimated value of 18 million pounds”.

### **Golden Crab**

The South Atlantic Council reviewed the MSY estimates, the methodology, review comments by the NMFS SEFSC, SSC, and Golden Crab AP and concluded, based upon the best available information, not to specify a total MSY for the golden crab resource within the Council’s area of jurisdiction. As soon as sufficient information becomes available to calculate MSY, the framework procedure will be used to incorporate the MSY figures into the management plan (Golden Crab FMP (1995), pages 40-47).

### **Spiny Lobster**

The original FMP (Spiny Lobster FMP (1982), pages 5-13 to 5-21) defined MSY as follows: A surplus yield model using only recorded catch and effort data for the commercial trap fishery in the primary fishing areas was used to estimate a sustainable yield of 5.9 million pounds with the present size limit. After considering other unrecorded harvest and optimum size at recruitment, MSY was estimated as 12.7 million pounds. Size at maximum yield per recruit given present fishing effort was estimated to be between 3.7 and 3.9 inches carapace length (94-99 mm). The present 3.0 inch minimum size was estimated to provide between 85 and 91 percent of the maximum yield per recruit at present effort levels.

Amendment 1 (Spiny Lobster Amendment 1 (1987), pages 22-23) presents the conclusion that the current database is insufficient to quantitatively determine MSY, therefore MSY is set to be the same as OY.

### **Coral, Coral Reefs, and Live/Hard Bottom Habitat**

The original FMP (Coral FMP (1982), pages 5-61 to 5-62) addressed MSY as follows: The lack of sufficient data on biomass and mortality, and the absence of a fishery from which catch and effort data may be obtained, prevents any calculation of MSY for the entire management area. An estimated MSY has been determined for several species at specific reefs in the Florida reef tract, but cannot be expanded to other corals due to great differences in species, density, growth rates, and other factors. An approximation of MSY was calculated for several communities.

#### **3.1.4 Description of Fishing Activities for Managed Species**

Descriptions of fishing activities for managed species in the South Atlantic Region are presented in detail in the original FMPs and updated in subsequent amendments.

#### **3.1.5 Status of Stocks for Managed Species**

##### **Shrimp**

There were no South Atlantic shrimp species (including penaeid and rock shrimp) listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

However, rock shrimp landings in 1997 were above the overfishing level; therefore rock shrimp were overfished in 1997. Indications are that the 1998 rock shrimp harvest will not exceed the overfishing level. Also, in the Comprehensive Habitat Amendment the Council is requesting the Oculina Bank HAPC be expanded. This will provide protection to juvenile rock shrimp and should insure overfishing does not occur in the future.

##### **Red Drum**

Red drum are listed as overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. The Council has prohibited any retention in the EEZ which is the maximum protection that the Council can provide. The Council concluded no further action is necessary.

##### **Snapper Grouper Complex**

In the September 1997 NMFS Report to Congress on the Status of Fisheries of the United States, the following species are listed as overfished: (1) black sea bass, (2) vermilion snapper, (3) red porgy, (4) red snapper, (5) gag, (6) scamp, (7) speckled hind, (8) warsaw grouper, (9) snowy grouper, (10) golden tilefish, (11) Nassau grouper, (12) jewfish, and (13) white grunt. These 13 species are the ones the Council must legally specify rebuilding programs to reverse the overfished status.

The Council's Snapper Grouper Assessment Group met in early February 1998 to review the current status of species in the snapper grouper complex. The Group reviewed last years wreckfish assessment (Vaughan, et al, 1997), the 1998 data summary (Vaughan, 1998), the 1997-1998 wreckfish fishery annual report (Hardy, 1998), the scamp assessment (Manooch, et al, 1997), the updated trends and estimated SPR values for 15 species (Potts, Burton, and Manooch, 1998), and a retrospective (1979-1996) multispecies assessment from the Florida Keys. The Assessment Group drew on results from each of these works, as well as the most recent stock assessment results previously reviewed by the Council.

### 3.0 Affected Environment

1. Black sea bass remain overfished. Black sea bass are above the "threshold level" with a static SPR of 26%. Black sea bass are overfished given that the MSST is 3.72 million pounds and the 1995 biomass was estimated to be 1.33 million pounds. Black sea bass are also experiencing overfishing given that the MFMT is 0.72 and the average fishing mortality rate (F) for 1991-1995 was 0.95. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 26%, recreational catch by 36%, and total catch by 30%. The Council concluded these reductions are sufficient to rebuild black sea bass above the overfished level.

2. Vermilion snapper remain overfished with a static SPR of 21% to 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce headboat catch by 29%, MRFSS catch by 70%, and total catch by 13%. The Council concluded these reductions are sufficient to rebuild vermilion snapper above the overfished level.

3. Red porgy remain overfished with a static SPR of 14% to 19%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 65%, recreational catch by 50%, and total catch by 59%. The Council concluded these reductions are sufficient to rebuild red porgy above the overfished level.

4. Red snapper remain overfished with a static SPR of 24% to 32%. The measures proposed through Snapper Grouper Amendment 7 will result in a projected SPR of 35%. The Council concluded these reductions and the measures contained in Snapper Grouper Amendments 8 and 9 are sufficient to rebuild red snapper above the overfished level.

5. Gag remain overfished with a static SPR of 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 37%, recreational catch by 13%, and total catch by 27%. The Council concluded these reductions are sufficient to rebuild gag above the overfished level.

6. Scamp are no longer overfished with a static SPR of 35%. The measures proposed in Snapper Grouper Amendment 9 will provide some additional protection. The Council concluded no additional measures are necessary to maintain scamp above the overfished level.

7. Speckled hind remain overfished with a static SPR of 8% to 13%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. The Council concluded these reductions are sufficient to rebuild speckled hind above the overfished level.

8. Warsaw grouper remain overfished with a static SPR of 6% to 14%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. The Council concluded these reductions are sufficient to rebuild warsaw grouper above the overfished level.

9. Snowy grouper remain overfished with a static SPR of 5% to 15%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. The Council concluded these reductions are sufficient to rebuild snowy grouper above the overfished level.

10. Golden tilefish remain overfished but the Assessment Group concluded there was inadequate information to update the existing SPR of 21%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. The Council concluded these reductions are sufficient to rebuild golden tilefish above the overfished level.

11. Nassau grouper remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. The Council concluded no further action is required for Nassau grouper at this time.

12. Jewfish remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. The Council concluded no further action is required for Nassau grouper at this time.

13. White grunt are no longer overfished with a static SPR of 29% to 39%. The measures proposed in Snapper Grouper Amendments 8 and 9 will provide some additional protection. The Council concluded no additional measures are necessary to maintain white grunt above the overfished level.

#### **Coastal Migratory Pelagics**

Atlantic migratory group mackerels are listed as not overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States; cobia are listed as not overfished; and cero, dolphin, and little tunny are listed as status unknown.

#### **Golden Crab**

Golden crab is not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States

#### **Spiny Lobster**

Spiny lobster are not overfished as listed in the September 1997 NMFS Report to Congress on Status of Fisheries in the United States; slipper lobster are listed as unknown and have no overfishing definition. The latest assessment conducted by the State of Florida during 1997 indicated the following: "Transitional spawning potential ratios based upon biomass varied between 7% and 19% in the upper Keys during these years. The SPR values in the lower Keys were higher and varied between 20% and 31%. The spawning potential ratios were approximately 2%-4% higher when they were calculated using fecundity instead of biomass."

#### **Coral, Coral Reefs, and Live/Hard Bottom Habitat**

South Atlantic Corals are listed as status unknown in the September 1997 NMFS Report to Congress on Status of Fisheries in the United States.

## **4.0 ENVIRONMENTAL CONSEQUENCES**

### **4.1 Introduction**

This section presents management measures and alternatives considered by the Council and the environmental consequences of management. The regulatory impact review (RIR), and social impact assessment (SIA)/fishery impact statement/FIS are incorporated into the discussion under each of the proposed action items.

The Council's preferred actions are followed by four sub-headings: Biological Impacts, Economic Impacts, Social Impacts and Conclusions. These are self explanatory presenting the impacts of each measure considered and the Council's rationale for the action. The Council's preferred action is listed below the Action number and options considered by the Council are indicated under the heading "Other Possible Options".

The October 11, 1998 deadline for the Council to meet the mandates of the SFA (submit amendments for all FMPs) and the lack of National Standard Guidelines (NSG) prior to taking action, resulted in the Council approving the parts of Section 4.0 addressing MSY, OY, overfishing and overfished to go forward to public hearing with a range of options (without any preferences). A final rule specifying regional fishery management council guidelines for amending FMP to be consistent with the definitions contained in Section 102 and other required provisions in Section 108 of the SFA was published by NMFS on May 1, 1998. On July 27, 1998 the Council received a copy of the "Technical Guidance On the Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act" that provides technical guidance on the use of precautionary approaches in addressing the MSY, OY, overfishing and overfished sections of the NSG. On August 3, 1998 the Council received the "Checklist for FMP Amendments" that addresses questions that should be considered by the Councils in making amendments to FMPs in order to comply with National Standard 1 of the SFA in accordance with the NSG. The guidance provided in these two documents have been incorporated into the actions contained in Section 4.0 of this amendment.

### **4.2. Management Options - Definitions**

#### **4.2.1 Consistency with SFA Section 102 definitions**

The Section 102 definitions are as follows:

The term bycatch means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

The term economic discards means fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, or quality, or for other economic reasons.

The term regulatory discards means fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell.

The term charter fishing means fishing from a vessel carrying a passenger for hire (as defined in section 2101(21a) of title 46, United States Code) who is engaged in recreational fishing.

The term commercial fishing means fishing in which the fish harvested, either in whole or in part, are intended to enter commerce or enter commerce through sale, barter or trade.



The term recreational fishing means fishing for sport or pleasure.

The term fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community.

The term individual fishing quota means a Federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by a person. Such term does not include community development quotas as described in section 305(I).

The term optimum, with respect to the yield from a fishery, means the amount of fish which--

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(B) is prescribed on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant social, economic, or ecological factor; and

(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

The terms overfishing and overfished mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis.

The term essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.

#### **4.2.1.1 ACTION 1A. No action to amend FMPs required except as specified in Action 1B.**

##### Biological Impacts

There would be no biological impact since the FMP regulations for the current management regimes are consistent with the SFA Section 102 definitions.

##### Economic Impacts

There would be no economic impact since the FMP regulations for the current management regimes are consistent with the SFA Section 102 definitions.

##### Social Impacts

There would be no social impact since the FMP regulations for the current management regimes are consistent with the SFA Section 102 definitions.

## 4.0 Environmental Consequences

### Conclusions

The Council concluded the definitions and word usage contained in the Shrimp, Red Drum, Snapper Grouper (with one exception - see Action 1B.), Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom FMPs and FMP regulations are consistent with the SFA Section 102 definitions.

#### **4.2.1.2 ACTION 1B. Minor change to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change “bycatch” to “trip limit”.**

### Biological Impacts

None

### Economic Impacts

None

### Social Impacts

None

### Conclusions

In Amendment 6 to the Snapper Grouper FMP the use of the term “bycatch” is not consistent with the SFA Section 102 definition for “bycatch”. In Amendment 6 the term “bycatch” is used to describe the 300 pound daily trip limit for snowy grouper and golden tilefish that is allowed after the quota is reached. It is not a “bycatch” as defined in SFA Section 102. However, the FMP regulations use the term “trip limit” to describe the after quota 300 pound trip limit and therefore is consistent with Section 102 definitions. The Council determined to correct this word misuse in Amendment 6.

## **4.3 Management Options - Other Required Provisions**

### **4.3.1 Bycatch - bycatch management measures and bycatch reporting requirements.**

The Council addressed the need for additional bycatch management measures on a fishery-by-fishery basis as follows:

#### **Shrimp FMP**

Penaeid shrimp - Certified bycatch reduction devices (BRDs) are required in all penaeid shrimp trawls in the South Atlantic EEZ. A framework has been established for BRD certification which specifies BRD certification criteria and testing protocol. The species of fish (weakfish and Spanish mackerel) specified in the criteria represent two groups (pelagic and benthic) that encompass the vast majority of species that would constitute bycatch in the shrimp trawl fishery. Thus the BRD requirement minimizes bycatch to the greatest extent practicable.

Rock shrimp - During development of the BRD management measure the Council reviewed information from a small number of observer trips aboard rock shrimp vessels that indicated bycatch was minimal in this fishery. This information was collaborated by industry members serving on the Council’s Rock Shrimp Advisory Panel. Also, the Council was provided information indicating BRDs are being used in rock shrimp trawls voluntarily by the industry. The Council has requested NMFS conduct additional observer trips aboard rock shrimp vessels to verify that the bycatch in the fishery is minimal during all months in which the

fishery is pursued. If the Council receives information that there is more than minimal bycatch and that BRDs are not being used, the Council will move to extend the BRD requirement to the rock shrimp fishery. In addition, trawling for rock shrimp is prohibited in areas where coral resources may be impacted, thus bycatch of coral is minimized and coral habitat is protected.

### **Red Drum FMP**

Red drum - All harvest of red drum in the EEZ is prohibited. Since there is no fishery, there is no bycatch of other species. Release mortality (regulatory discards) of red drum is minimal due to the shallow depths in which incidental catch may occur.

### **Snapper Grouper FMP**

Snapper grouper species complex - The Council has prohibited the use of trawl gear and fish traps to harvest snapper grouper species, required black sea bass pots to have escape vents and panels, and prohibited the use of bottom longlines inside of 50 fathoms. All of these measures effectively reduce bycatch in the fishery. Bycatch that does occur in the fishery is primarily in relation to mortality associated with the release of undersized fish or prohibited harvest species (Nassau grouper and Jewfish). However, this regulatory discard bycatch has been minimized to the greatest extent practicable by the management measures the Council has adopted and is accounted for in most of the stock assessments conducted for the various snapper grouper species. The Council continues to explore new methods to manage the fishery and further reduce bycatch. The Council created an experimental closed area to study the benefits of marine reserves and is currently examining the potential for using marine reserves as a management tool for the snapper grouper fishery.

### **Coastal Migratory Pelagics FMP**

King and Spanish mackerel and other coastal pelagics - The Council has prohibited the use of drift gill nets in the coastal pelagics fishery and the use of purse seines and run-around gill nets for the overfished groups of mackerels. Where gill nets are used to target coastal migratory species minimum mesh sizes are required. These actions have had the effect of reducing to the greatest extent practicable the regulatory discard bycatch in the net fishery. Species other than coastal pelagics taken in the net fishery generally have market value and are therefore retained and do not constitute a bycatch. In the hook and line fishery release mortality (regulatory discards) of coastal pelagics is minimal due to the fishing methods employed and areas fished.

### **Golden Crab FMP**

Golden crab - The Council has required that golden crab traps have escape gaps and degradable panels which effectively eliminates regulatory discard bycatch and any bycatch associated with lost traps continuing to fish. Due to the areas golden crab traps are fished there is no other bycatch in the fishery.

### **Spiny Lobster FMP**

Spiny lobster and slipper lobster - The Council has required that lobster traps have degradable panels which effectively eliminates any bycatch of lobsters associated with lost traps continuing to fish. The Council examined the issue of finfish bycatch in lobster traps, especially traps constructed of wire, and determined from the information available that finfish bycatch is minimal and additional regulations are not warranted. The Council will continue to monitor this

#### 4.0 Environmental Consequences

situation and will take action in the future if new information indicates there is a finfish bycatch problem.

#### **Coral and Coral Reefs and Live/Hard Bottom Habitat FMP**

Hard and soft corals - Due to the very limited and selective nature of the harvest allowed in this fishery there is no associated bycatch.

The Council's efforts to minimize bycatch will be an ongoing process incorporated in each new FMP, amendment or other action taking into account changing management goals, improvements in data availability and quality and changes in fishing gear and techniques .

#### **4.3.1.1 ACTION 2A. No action to amend the bycatch management measures in the FMPs is required.**

##### Biological Impacts

There would be no biological impact since the FMP regulations for the current management regimes are consistent with the SFA Section 108 provisions.

##### Economic Impacts

There would be no economic impact since the FMP regulations for the current management regimes are consistent with the SFA Section 108 provisions.

##### Social Impacts

There would be no social impact since the FMP regulations for the current management regimes are consistent with the SFA Section 108 provisions.

##### Conclusions

The council has concluded the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs and FMP regulations contain bycatch management measures that minimize bycatch to the greatest practicable and are consistent with the SFA Section 108 required provisions relative to bycatch management measures.

#### **4.3.1.2 ACTION 2B. Amend Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include reporting requirements as specified in the Atlantic Coastal Cooperative Statistics Program (ACCSP).**

SAFMC staff will work with NOAA General Counsel to determine the appropriate procedure to remove all the varied data reporting requirements in individual FMPs and reference one comprehensive data reporting document. This will be done during 1999.

##### Biological Impacts

There would be benefits relative to knowing the type and magnitude of bycatch in each of the fisheries. This data could be incorporated in the fisheries assessments providing managers with more accurate and precise stock assessments.

Economic Impacts

To the degree this will require fishermen to fill out logbooks or provide these data in some other format, there may be some costs in terms of time and effort. However, the cost should be minimal. Long-term benefits would likely be positive if this measure results in more efficient management of fish stocks.

Social Impacts

There may be some resistance to regulations that require fishermen to spend more time providing additional data.

Conclusions

With the new mandate under the Magnuson-Stevens Act to include bycatch reporting requirements, the Council is mandated to amend all of its FMPs to include bycatch reporting requirements.

The ACCSP that is currently being developed will provide for bycatch reporting consistent with the mandates of the SFA. Also, with the bycatch issue in the forefront it is in the best interests of the fishery and the fishermen that bycatch be recorded and reported. Most fishermen want managers to know what they are discarding as bycatch and this data needs to be factored into the management equation.

**Other Possible Options for Action 2:**

**Option 1.** Amend Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include bycatch reporting requirements and authorize NMFS to utilize the most efficient and cost effective methodology for collecting bycatch data.

Biological Impacts

There would be benefits relative to knowing the type and magnitude of bycatch in each of the fisheries. This data could be incorporated in the fisheries assessments providing managers with more accurate and precise stock assessments.

Economic Impacts

To the degree this will require fishermen to fill out logbooks or provide these data in some other format, there may be some in time and effort. However, the cost should be minimal. Long term benefits would likely be positive if this measure results in more efficient management of fish stocks.

Social Impacts

There may be some resistance to regulations that require fishermen to spend more time providing additional data.

Conclusions

At the June 1996 meeting, during a presentation on snapper grouper logbooks, the Council learned that requirements for reporting bycatch in the snapper grouper fishery had been dropped from the logbook form. The Council protested at that time but was informed because of other data additions to the logbooks there was no longer any space available on the forms to

#### 4.0 Environmental Consequences

record bycatch. Since that time, as far as we are aware, bycatch information has not been collected.

With the new mandate under the Magnuson-Stevens Act to include bycatch reporting requirements, the question is should the Council amend all of its FMPs to include these reporting requirements or is it still the responsibility of NMFS to determine what data to collect?

The ACCSP that is currently being developed will provide for bycatch reporting. Also, with the bycatch issue in the forefront it is in the best interests of the fishery and the fishermen that bycatch be recorded and reported. Many fishermen want the managers to know what they are discarding as bycatch and this data needs to be factored into the management equation.

#### **4.3.2 Commercial, recreational and charter fishing - sector descriptions, landing trends and data specification.**

##### **4.3.2.1 ACTION 3. No action to amend the FMPs is required.**

#### Biological Impacts

There would be no biological impact. The current FMPs for the fisheries under management provide information on commercial, recreational and charter fishing to the extent that data are available, as required by the provisions under SFA Section 108.

#### Economic Impacts

There would be no economic impact. The current FMPs for the fisheries under management provide information on commercial, recreational and charter fishing to the extent that data are available, as required by the provisions under SFA Section 108.

#### Social Impacts

There would be no social impact. The current FMPs for the fisheries under management provide information on commercial, recreational and charter fishing to the extent that data are available, as required by the provisions under SFA Section 108.

#### Conclusions

The council has concluded the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom FMPs and FMP regulations contain commercial, recreational and charter fishing sector descriptions, landing trends and data specification that are consistent with the SFA Section 108 required provisions relative to commercial, recreational and charter fishing.

### 4.3.3 Fishing Communities - Identify and define fishing communities

**4.3.3.1 ACTION 4. Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include available information on fishing communities (see the following discussion/example).**

#### Biological Impacts

None

#### Economic Impacts

Identifying fishing communities provides a basis for analyzing impacts of management measures on fishing communities rather than on a fishery-wide basis. This would be more relevant in situations where impacts are differential because of the location, level of activity and dependency on fishing, availability of alternative job opportunities, etc. in different fishing communities. This measure would allow fishery managers to obtain information on the impacts of future management measures on different fishing communities. It could make for the formulation of management measures that would minimize impacts on fishing communities that have less opportunities to adapt to changes imposed by the measures.

#### Social Impacts

Identification and definition of fishing communities would normally have a positive impact, except that, for the South Atlantic, there are no data collected on fishing communities. National Standard 8 imposes requirements on the council and the fishery management regulatory process that cannot be satisfied given existing data. Current data available do not allow for a meaningful definition of fishing community, moreover, do not provide a measure of dependence upon fishing and will not contribute to useful impact analysis.

At its March meeting, the Gulf of Mexico Fishery Management Council's Socio-economic Panel recommended that further research be initiated and funded by National Marine Fisheries Service as soon as possible to aid in the identification and definition of fishing communities in the Southeast. The panel also recommended the scope of this problem be addressed at a national level, such that impacts upon fishing communities can be analyzed across regions as well as within. A key area for expanded research is ethnographic and survey research to identify, not only communities, but those who provide supporting services to the economy and culture of fishing communities. Especially important in the Southeast is the need to provide a realistic portrayal of recreational fishing, diving, and eco-tourism and their importance to a fishing community.

#### Conclusions

The Council concluded incorporating all available information at this time will meet the mandates of the recent Magnuson-Stevens Act amendments relative to fishing communities.

#### Other Possible Options for Action 4:

**Option 1.** No Action at this time. Update information on fishing communities for each FMP within each new amendment.

#### Biological Impacts

None

## 4.0 Environmental Consequences

### Economic Impacts

None.

### Social Impacts

None

### Conclusions

The Council concluded taking no action at this time may not meet the mandates of the recent Magnuson-Stevens Act amendments relative to fishing communities. It was determined that available information should be incorporated into each FMP in this comprehensive amendment.

With the addition of National Standard 8, FMPs must now identify and consider the impacts upon fishing communities to assure their sustainable participation and minimize adverse economic impacts [MSFCMA section 301 (a) (8)].

The proposed guidelines for this new standard state: "... *fishing communities are considered geographic areas encompassing a specific locale where residents are dependent on fishery resources or are engaged in the harvesting or processing of those resources. The geographic area is not necessarily limited to the boundaries of a particular city or town. No minimum size for a community is specified, and the degree to which the community is 'substantially engaged in' or 'substantially dependent on' the fishery resources must be defined within the context of the geographical area of the FMP. Those residents in the area engaged in the fisheries include not only those actively working in the harvesting or processing sectors, but also "fishery-support services or industries," such as boat yards, ice suppliers, or tackle shops, and other fishery-dependent industries, such as ecotourism, marine education, and recreational diving.*" [Federal Register Volume 62, Number 149 (August 4, 1997)]

*"The term 'sustained participation' does not mandate maintenance of any particular level or distribution of participation in one or more fisheries or fishing activities. Changes are inevitable in fisheries, whether they relate to species targeted, gear utilized, or the mix of seasonal fisheries during the year. This standard implies the maintenance of continued access to fishery resources in general by the community. As a result, national standard 8 does not ensure that fishermen would be able to continue to use a particular gear type, to target a particular species, or to fish during a particular time of the year."* [Federal Register Volume 62, Number 149 (August 4, 1997)]

*"The term 'fishing community' means a community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors that are based in such communities. A fishing community is a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries-dependent services and industries (for example, boatyards, ice suppliers, tackle shops)." [Federal Register Volume 62, Number 149 (August 4, 1997)]*

In order to determine a community's "substantial dependence" or "sustained participation" on fishing, those communities must first be identified. Presently, the NMFS has not identified fishing communities, nor their dependence upon fishing in the South Atlantic. Moreover, there are no ongoing data collection programs to gather the necessary information that



would allow for the identification of fishing communities in the South Atlantic or other regions. Also, there are no future plans to implement any such data collection program that would determine dependence upon fishing in order to provide the Councils with important information necessary for social and economic impact analysis of fishing communities. This leaves the councils with existing data collected through other agencies, not always specific to fisheries management, i.e., census data, regional economic census, and previous research on specific fisheries. Although this data can be useful, it is often not specific enough to identify or provide a clear representation of a community and its dependence upon fishing. One reason for this difficulty is that fishermen in a specific fishery often do not reside within one particular municipality that can easily be identified as a fishing community or one that is substantially dependent upon fishing. Also, that information is often not provided at the municipality level, but more often at the county level.

Commercial fishermen may have a domicile (home) in one community and dock their boat in another. They may sell their fish in either place or an entirely different location. Recreational fishermen often do not live on the coast, but drive from inland counties and may launch their boats or fish from several different sites. For these reasons, identifying a "fishing community" becomes problematic in that such a community does not fit the normal geographic boundaries or fall within the metes and bounds that would surround a normal incorporated municipality.

The impacts of fisheries management may be minimal in a single community, but, when taken overall may be substantial to an entire county or several county area. Those same measures may have a small impact on a large metropolitan area, but, to a neighborhood where most fishing families live or most fishing activity originates it could be substantial. Therefore, a "fishing community" may encompass a single municipality, a county, several counties or one neighborhood within a major metropolitan area depending upon a variety of demographic, social, economic and ecological factors that one must consider.

One important circumstance to consider when assessing the impacts upon fishing communities is the difference between rural and urban areas, as many fishing communities exist in rural areas on the Southeast coast. There are several ways in which rural areas differ from the more urban or metropolitan as illustrated in *Understanding Rural America* (ERS-USDA, 1993). Rural areas have consistently lagged behind urban areas with respect to real earnings per job and education levels. Rural areas have also seen a rise in subgroups who are prone to economic disadvantage--families headed by single mothers and minorities. However, these differences vary across the country and are influenced by several factors, one of which is the availability of natural resources. In order to explain and examine some of these differences, counties within the U.S. have been classified as either metropolitan or non-metropolitan. A further subdivision of non-metro counties provides a more clear understanding into each subtype's dependence upon certain economic specialization and the importance of those differences to the residents of those counties (ERS-USDA, 1993). The following classification system may also suggest a possible method for defining an area's dependence upon fishing using the appropriate criteria.

Six types of non-metro counties have been classified, three of which are based upon economic specialization - farming, manufacturing and services. The other three county classifications are based upon their relevance to policy -- retirement-destination; Federal lands; and persistent poverty. Using earned income as a measure of dependence, the classification for counties based upon economic specialization is as follows:

#### 4.0 Environmental Consequences

Farming counties - 20% or more earned income from farming  
Manufacturing - 30% or more earned income from manufacturing  
Services - 50% or more earned income from services industries

Those counties whose classification is based upon economic specialization are mutually exclusive; the other three classification types are not mutually exclusive (ERS-USDA, 1993).

This type of classification system, based upon a percentage of earned income or other measure, might be used to determine a community, county or region's dependence upon fishing. However, like farming counties, those dependent upon fishing have likely seen a decline in the dependence upon fishing over time. This is probably due to significant increases in the population of coastal areas since the 1970's. Much of the population growth has been in the form of immigration of people 60 and older who seek coastal areas for retirement destinations. The increase in this population sector, in turn, brings a greater dependence upon service industries. Choosing such a measure of dependence is not possible at this time and would have to be developed through further analysis and/or research.

Griffith and Dyer developed a typology of fishing community dependence for the Northeast Multi-species Groundfish Fishery (MGF) (Aguirre, 1996). In that typology, they identified critical indicators of dependence which included specific physical-cultural and general social-geographic indicators, i.e., number of repair/supply facilities; number of fish dealers/processors; presence of religious art/architecture dedicated to fishing; presence of secular art/architecture dedicated to fishing; number of MGF permits; and number of MGF vessels. Using previous results and supplemental research of their own, they were able to develop a fishery dependence index score for the five primary ports in the MGF.

From their research Griffith and Dyer were able to document five variables which best predicted dependence upon the MGF:

1. Relative isolation or integration of fishers into alternative economic sectors, including political participation. To what extent have the fleets involved in the MGF enclaved themselves from other parts of the local political economy or other fisheries? How much have the MGF fleets become, similar to an ethnic enclave, closed communities?
2. Vessel types within the port's fishery. Is there a predominance of large vessels or small vessels, or a mix of small, medium, and large?
3. Degree of specialization. To what extent do fishers move among different fisheries? Clearly, those fishers who would have difficulty moving into alternative fisheries or modifying their vessels with alternative gears are more dependent on the MGF than those who have histories of moving among several fisheries in an opportunistic fashion.
4. Percentage of population involved in fishery or fishery-related industries. Those communities where between five and ten percent of the population are directly employed in MGF fishing or fishing-related industries are more dependent on the MGF than those where fewer than five percent are so employed.
5. Competition and conflict within the port, between different components of the MGF. Extensive competition and conflict between fishers within the same port--as well as between different actors in the MGF, such as boat owners and captains--seem to be

associated with intensive fishing effort and consequent high levels of dependence on the MGF. In this case, dependence may have a strong perceptual dimension, with fishers perceiving the resources they are harvesting to be scarce and that one fleet's gain is another fleet's loss.

It is important to understand that these factors are appropriate for the MGF and are not necessarily the best predictors for all fishing communities. Fisheries in the Southeast will differ markedly from those in other regions of the country, especially with regard to their integration into other economies and notably the tourist economy. Recreational fishing is an integral part of the tourism and service economy that has developed for coastal communities in the South Atlantic. For these communities, dependence upon fishing will undoubtedly be tied to commercial and recreational fishing and their associated businesses. Therefore, it is important for fishery dependence models to be developed specifically for the South Atlantic.

Griffith and Dyer (Aguirre 1996) also discuss their description of fishing communities as it relates to the term Natural Resource Community (NRC). Dyer et. al define a NRC as "a population of individuals living within a bounded area whose primary cultural existence is based upon the utilization of renewable natural resources" (1992:106). Natural Resource Communities possess an elementary connection between biological cycles within the physical environment and socio-economic interactions within the community. An adaptation to working on the water by fishermen has important implications for the community as a whole because of the necessary support activities that take place on land, i.e., net hanging & mending; fish handling & preparation; boat building & repair. This important tie to the physical environment not only dictates occupational participation, but structures community interaction and defines social values for those living in Natural Resource Communities. While fishing communities in the MGF are not bounded or set apart from the larger community in which they reside, they still manifest certain recognizable features that would classify them as NRCs (Aguirre 1996). Fishing communities in the South Atlantic will also show signs of being integrated into the larger economy, but may still maintain certain vestiges of an NRC. Fishermen in the South Atlantic, like those in the Northeast MGF, will not likely see their ecological systems being closed, but affected by a host of other forces, both globally and locally. Far more detailed research will need to be conducted among South Atlantic fishing communities to determine changes in integration of the larger economy. One of the most likely changes will be an increasing dependence upon the service sectors as recreational fishing and other recreational activities play an increasing role in the economies of coastal communities. While there will continue to be a connection between the social and physical environments, the nature of that interaction will undoubtedly change.

At this time there is insufficient data to completely identify and define fishing communities in the South Atlantic. The following description of fishing communities provides information to explore ways of defining fishing communities that range from geographical regions to a well bounded municipality. With varied levels of research or data available for each state, descriptions of fishing communities will depend upon the amount of data available and the specific nature and timeliness of that data. In some cases, it may be possible to find a municipality that will clearly fit a definition of fishing community and meet a criterion for dependence upon fishing. In others, it may be a series of communities or counties designated a "fishing community" or possibly a particular sector of a large metropolitan area.

Readily available data will be discussed to allow for public input on the best way to identify fishing communities and determine their dependence upon fishing. Following the discussion of fishing communities in the South Atlantic a discussion of data needs and format will provide possible directions for data collection and analysis. The Council welcomes comments on all aspects of incorporating this new national standard, in order to devise a classification system which will assist in assessing the impacts of fishery management upon fishing communities.

#### 4.3.3.1.1 South Atlantic Fishing Communities

According to NMFS, South Atlantic commercial fishermen have harvested well over 250,000 pounds of seafood in each of the years 1995 and 1996 (Table 1). Those landings have represented over \$200,000,000 in harvest value. The value of those landings can become even greater once it diffuses throughout South Atlantic fishing communities as it provides employment and other benefits to other sectors within each community's economic base.

Table 1. U.S. Domestic Commercial Fishing Landings by Region, 1995 and 1996.  
Source Fisheries of the United States, 1996.

Region	1995		1996	
	Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars
New England	592,665	580,957	641,821	564,169
Middle Atlantic	240,413	179,747	241,936	181,869
Chesapeake	845,632	174,229	728,830	158,736
<b>South Atlantic</b>	<b>277,035</b>	<b>238,112</b>	<b>268,990</b>	<b>209,407</b>
Gulf of Mexico	1,464,718	724,619	1,496,875	680,304

Commercial seafood landings also represent other forms of expenditure which have an impact upon fishing communities, such as: fuel, gear, groceries, etc. Support industries like, gas stations, tackle shops, grocery stores all have an investment in the harvesting capability of the local fishing fleet.

As with commercial fishing, recreational fishing activity will also contribute to the economic base of a fishing community as fishermen buy fuel, bait, tackle and food & beverage for fishing trips. Figure 1 demonstrates an increasing trend in recreational fishing trips for most South Atlantic states, but, also substantial variation in the number of trips over time. Such variation can mean significant economic impacts for those communities that rely upon recreational fishing.

South Atlantic fishing communities will depend upon both recreational fishing and commercial fishing for determining the importance of fishing to their economic base. The supporting role of associated businesses will also need to be incorporated into any measure of dependence. Such businesses as: seafood dealers and processors, marinas, gas stations, bait and tackle shops, dive shops, trucking firms, restaurants and many others, all have some role in determining dependence upon fishing. Unfortunately, data that is robust and/or specific enough does not exist to include in such a determination.

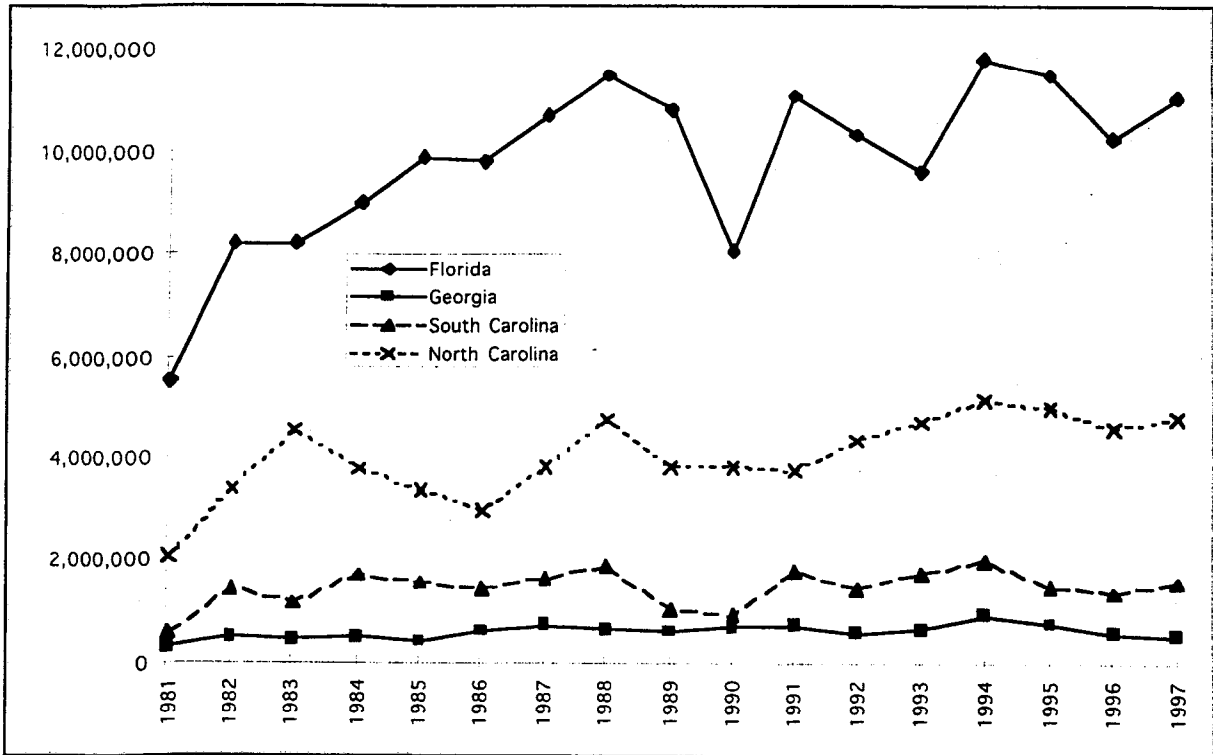


Figure 1. Estimated Number of Marine Recreational Fishing Trips by State and Year for the South Atlantic. Source: Personal communication from the National Marine Fisheries Service, Fisheries Statistics and Economics Division.

To identify fishing communities in the South Atlantic one might begin with the National Oceanic and Atmospheric Administration's publication *Fisheries of the United States* (1996). Among the various statistics listed are commercial landings of major U.S. ports. These ports could be considered to be substantially dependent upon fishing. Table 2 lists the major ports for the South Atlantic in 1996 and 1995 for quantity and value of landings. Some ports are listed as individual communities while others are a combination of several communities over a limited geographical range. This characterization may be useful as we attempt to further delineate fishing communities in each state. Other sources of information helpful in defining fishing communities include the United States Census and Bureau of Economic Research, which include economic information for many areas of the U.S.

Table 2. Quantity, Value and Rank of Commercial Landings for South Atlantic Ports among Major U.S. Ports Source: Fisheries of the United States, 1996.

Port	1995 Quantity*	1995 Rank	1995 Value*	1995 Rank	1996 Quantity*	1996 Rank	1996 Value*	1996 Rank
Key West	23.4	32	66.7	5	23.7	37	62.8	4
Beaufort-Morehead City, NC	87.0	16	35.0	15	75.4	18	20.3	34
Wanchese-Stumpy Point, NC	39.0	25	25.0	24	43.4	24	24.6	27
Charleston-Mt.Pleasant, SC	11.0	58	19.0	32	---	---	---	---
Cape Canaveral, FL	10.1	--	16.9	35	21.2	43	17.7	42
Darien-Bellville, GA	---	--	11.0	50	---	---	---	---
Beaufort, SC	---	--	11.0	51	---	---	---	---
Englehard-Swanquarter, NC	11.0	58	---	--	15.0	50	---	---
Oriental-Vandemere, NC	9.0	--	10.0	--	14.0	53	13.3	50
Bellhaven-Washington, NC	---	--	6.0	--	---	---	11.5	58

\*Value and quantity are in millions of dollars and pounds respectively.

#### 4.3.3.1.2 North Carolina

The 1990 Census of Population and Housing provides the following information for North Carolina regarding individuals who reported their occupation as fisher in Table 3. This data will likely include those individuals who commercially fish fresh water areas and others who are not impacted by fisheries management of marine fisheries at the council level. This information does provide data for comparison and could help set parameters for a measure of dependency upon fishing. It is not recommended that these figures be used to determine dependency upon fishing, however. The 1990 Census classifies year-round full-time workers as all persons 16 years old and over who usually worked 35 hours or more per week for 50 to 52 weeks in 1989.

Table 3. Number of Fishers and Mean Annual Income for North Carolina in 1990. Source: U.S. Bureau of the Census.

	Year Round/Full Time	Other	Total
Number of fishers			
Male	989	1,271	2,260
Female	47	105	152
Total	1,036	1,376	2,412
Mean Annual Income (\$)			
Male	16,315	13,069	14,489
Female	11,518	4,489	6,662
Total	16,097	12,414	13,996

The 1990 Census also provides the following information for North Carolina regarding individuals who reported their occupation as captain of a fishing vessel in Table 4. It is interesting to note that there were no females listed as captain of fishing vessels. This concurs with the much of the research on the occupation of fishing which finds very few women in this role. Although women often play an important role in the fishing operation, they are rarely in the position of captain of fishing vessels.

Table 4. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for North Carolina in 1990. Source: U.S. Bureau of the Census.

	Year Round/Full Time	Other	Total
Number of Captains			
Male	102	141	243
Female	0	0	0
Total	102	141	243
Mean Annual Income (\$)			
Male	26,917	33,640	30,818
Female	0	0	0
Total	26,917	33,640	30,818

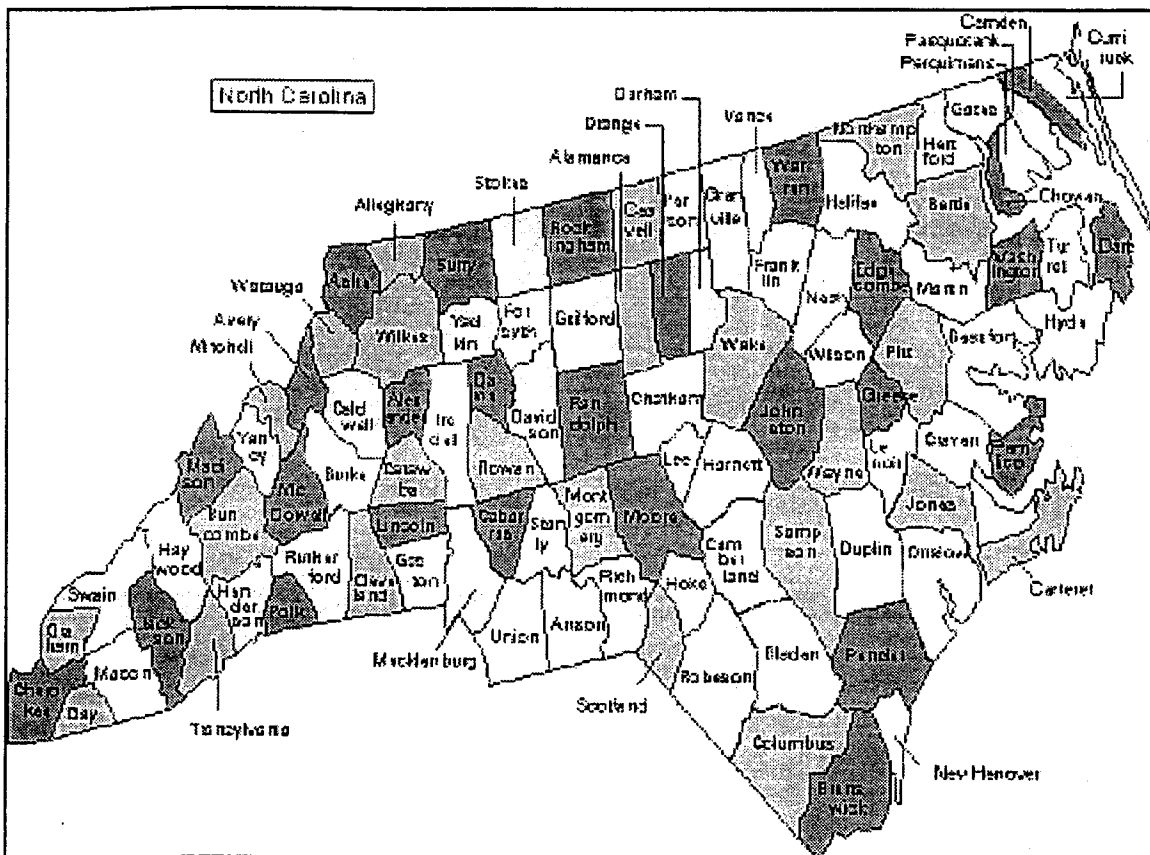


Figure 2. North Carolina Counties. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

Johnson and Orbach (1996) have divided North Carolina into six areas for their research on effort management of North Carolina commercial fisheries. Those areas were determined to be distinct with regard to species/gear combinations in addition to sociological, ecological and environmental differences. The areas defined are as follows:

4.0 Environmental Consequences

Area 1: Albermarle Area - Currituck, Camden, Pasquotank, Perquimans, Chowan, Bertie, Washington, and Tyrell Counties.

Area 2: Dare County

Area 3: Southern Area - Brunswick, Pender, New Hanover, and Onslow Counties

Area 4: Pamlico Area - Craven, Pamlico, Beaufort, and Hyde Counties.

Area 5: Carteret County

Area 6: Inland Counties.

Area 1: Albermarle Area

The Albermarle area includes the following counties: Currituck, Camden, Pasquotank, Perquimans, Chowan, Bertie, Washington and Tyrell. Johnson and Orbach (1997) found that commercial fishermen in this area had two primary gear types, pots and gill nets. They also concluded that fishermen here move in and out of gill netting on an annual basis.

Table 5. Population and Economic Information for Counties included in Area 1. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

Area 1-County		1993	1994	1995
<b>Bertie</b>	Population	20,631	20,665	20,745
	Personal Income (Thousands of \$)	291,226	303,292	328,227
	Per Capita Pers Income (\$)	14,116	14,677	15,822
	Personal Income Fishing (Thousands of \$)	71	75	84
<b>Camden</b>	Population	6,211	6,370	6,399
	Personal Income (Thousands of \$)	92,875	100,012	105,636
	Per Capita Pers Income (\$)	14,953	15,700	16,508
	Personal Income Fishing (Thousands of \$)	0	0	0
<b>Chowan</b>	Population	13,815	13,909	13,958
	Personal Income (Thousands of \$)	226,563	234,453	247,428
	Per Capita Pers Income (\$)	16,400	16,856	17,727
	Personal Income Fishing (Thousands of \$)	128	134	151
<b>Currituck</b>	Population	15,215	15,831	16,285
	Personal Income (Thousands of \$)	251,885	269,871	291,055
	Per Capita Pers Income (\$)	16,555	17,047	17,873
	Personal Income Fishing (Thousands of \$)	358	376	423
<b>Pasquotank</b>	Population	33,220	33,488	33,759
	Personal Income (Thousands of \$)	510,623	534,860	574,433
	Per Capita Pers Income (\$)	15,371	15,972	17,016
	Personal Income Fishing (Thousands of \$)	----	----	----
<b>Perquimans</b>	Population	10,644	10,692	10,737
	Personal Income (Thousands of \$)	148,365	162,627	160,912
	Per Capita Pers Income (\$)	13,939	15,210	14,987
	Personal Income Fishing (Thousands of \$)	----	0	----
<b>Tyrell</b>	Population	3,918	3,875	3,846
	Personal Income (Thousands of \$)	56,056	58,138	52,738
	Per Capita Pers Income (\$)	14,307	15,003	13,712
	Personal Income Fishing (Thousands of \$)	476	500	562
<b>Washington</b>	Population	14,136	14,276	14,138
	Personal Income (Thousands of \$)	220,429	229,038	238,124
	Per Capita Pers Income (\$)	15,593	16,044	16,843
	Personal Income Fishing (Thousands of \$)	225	236	266



Using multidimensional scaling, Johnson and Orbach were able to examine the spatial relationship of various types of fishing in each area. For Area 1, crab potting was the most central fishery. In other words most fishermen in the area do some crab potting. Referring to cliques, they found that for this area fishermen who peeler pot, eel pot, crab pot and gill net flounder differ from those that long haul. Fishermen that long haul will crab pot and gill net flounder but do not engage in peeler pots or eel pots.

In examining the categories which would include fishermen for Area 1 (Table 6) there seems to be no trend regarding either those in Farm/Fish/Forest occupations or the Agriculture, Fishing, Mining Industries. There are both increases and decreases in the number of those within each categories from 1970 to 1990 which varies by county.

Table 6. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for North Carolina Coastal Counties included in Area 1 for 1970, 1980, and 1990 Census.

Source: MARFIN Sociodemographic Database

County	Occupation/Industry	1970	1980	1990
Bertie County	Farm/Fish/Forest	923	1035	839
	Agri.,Fishing,Mining	1050	1038	884
Camden County	Farm/Fish/Forest	203	220	114
	Agri.,Fishing,Mining	220	181	137
Chatham County	Farm/Fish/Forest	740	904	832
	Agri.,Fishing,Mining	927	934	1286
Currituck County	Farm/Fish/Forest	194	247	316
	Agri.,Fishing,Mining	215	296	309
Pasquotank County	Farm/Fish/Forest	444	491	469
	Agri.,Fishing,Mining	552	478	508
Perquimans County	Farm/Fish/Forest	417	513	299
	Agri.,Fishing,Mining	445	524	316
Tyrrell County	Farm/Fish/Forest	197	249	208
	Agri.,Fishing,Mining	225	273	233
Washington County	Farm/Fish/Forest	408	511	551
	Agri.,Fishing,Mining	462	557	526

#### Area 2 : Dare County

Within Dare county the following communities have been described through recent research of the snapper grouper fishery and might be considered fishing communities: Manns Harbor, Manteo, Wanchese, Hatteras, Stumpy Point (Iverson 1997). Johnson and Orbach (1997) found that commercial fishermen in this area had two primary gear types, pots and gill nets. In their analysis of fishery networks for Area 2 they again found crab pots to be central. Another interesting difference revealed was that fishermen who shrimp trawl in this area will gillnet for sharks but do not engage in crab potting.

Dare County shows a higher personal income from fishing over the three years listed (Table 7) than most other coastal counties in North Carolina.

Table 7. Population and Economic Information for Counties included in Area 2. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

Area 2				
County		1993	1994	1995
Dare				
	Population	24,300	25,106	26,074
	Personal Income (Thousands of \$)	429,564	465,011	502,474
	Per Capita Pers Income (\$)	17,678	18,522	19,271
	Personal Income Fishing (Thousands of \$)	5,426	5,688	6,392

Dare County (Table 8) shows a general increase in the number of individuals in the listed occupations and industries over the twenty years from 1970 to 1990.

Table 8. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for Dare County (Area 2) for 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database

County	Occupation/Industry	1970	1980	1990
Dare County	Farm/Fish/Forest	11	376	637
	Agri., Fishing, Mining	181	446	655

### Snapper Grouper Fishing

Most of the snapper grouper permit holders in Area 2 work out of Hatteras and only a small portion of their annual commercial fishing activity is devoted to targeting snapper grouper species. Black sea bass, snowy grouper, and blueline tilefish are the most frequently targeted species by commercial snapper grouper fishermen from this area. Surface longlining for tuna and swordfish is apparently the most productive and profitable style of commercial fishing in the area, and the small towns of Manteo and Wanchese serve as refuge for a large number of both local and non-local longlining boats (Iverson, 1997).

### Area 3: Southern Area

The Southern Area includes the following counties and communities (in parenthesis): Brunswick (Southport). Pender, New Hanover, Onslow (Sneads Ferry). Johnson and Orbach (1997) found that commercial fishermen in this area had four primary gear types: hook-and-line, gill net, hand harvest of shellfish, and trawling. Pot fishing was classified as secondary gear but they report that increasing usage over time could possibly make it a primary gear. It is interesting to note that they also reported that pot fishing showed an increase in all five areas over time. Area 3 showed much more complexity in annual rounds of fishing than Areas 1 or 2 with shrimp trawling, hand clamming and crab potting all central to the network (Johnson and Orbach 1997).

Table 9. Population and Economic Information for Counties included in Area 3. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

Area 3		1993	1994	1995
County				
<b>Brunswick</b>				
	Population	56,350	58,386	60,697
	Personal Income (Thousands of \$)	878,453	941,247	1,024,954
	Per Capita Pers Income (\$)	15,589	16,121	16,886
	Personal Income Fishing (Thousands of \$)	1,595	1,674	1,885
<b>Pender</b>				
	Population	32,554	33,894	33,759
	Personal Income (Thousands of \$)	510,623	534,860	574,433
	Per Capita Pers Income (\$)	15,681	16,341	17,253
	Personal Income Fishing (Thousands of \$)	-----	-----	-----
<b>New Hanover</b>				
	Population	131,091	135,317	139,906
	Personal Income (Thousands of \$)	2,620,539	2,800,024	3,036,665
	Per Capita Pers Income (\$)	19,990	20,692	21,705
	Personal Income Fishing (Thousands of \$)	-----	-----	693
<b>Onslow</b>				
	Population	145,638	144,951	144,259
	Personal Income (Thousands of \$)	1,962,312	2,030,075	2,149,074
	Per Capita Pers Income (\$)	13,474	14,005	14,897
	Personal Income Fishing (Thousands of \$)	667	700	787

Counties included in Area 3 (Table 10.) show a general increase in numbers of individuals within the selected occupations and industries, with the exception of Pender County which shows a decline from 1970-1990.

Table 10. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for North Carolina Coastal Counties included in Area 3 for 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database.

County	Occupation/Industry	1970	1980	1990
Brunswick County	Farm/Fish/Forest	370	668	1028
	Agri.,Fishing,Mining	505	645	971
Pender County	Farm/Fish/Forest	772	562	627
	Agri.,Fishing,Mining	892	669	690
New Hanover County	Farm/Fish/Forest	289	550	782
	Agri.,Fishing,Mining	564	615	984
Onslow County	Farm/Fish/Forest	754	869	996
	Agri.,Fishing,Mining	906	800	987

### Snapper Grouper Fishing

For Area 3, the small community of Sneads Ferry, is unique in that the majority of the commercial reef fishermen fish with sea bass pots. According to the 1993 federal permit list for the South Atlantic region, there were 58 permit holders who indicated that sea bass pots were their primary gear type. Of those, 13 permit holders worked out of Sneads Ferry (Iverson, 1997).

Overall, 72% of fishermen using sea bass pots as their primary gear work out of home ports in North Carolina.

#### Area 4: Pamlico Area.

The Pamlico area includes these counties and communities (in parenthesis): Craven, Pamlico (Vandemere, Oriental), Beaufort (Bellhaven, Washington), Hyde (Ocracoke, Swanquarter, Englehard). Johnson and Orbach (1997) found that commercial fishermen in this area had three primary gear types, pots, gill nets, and trawls. In terms of annual fishing rounds Area 4 is the simplest to understand where two strategies are employed: gill netting and crab potting or trawling and crab potting. They go on to note that this simple strategy may signify few choices for fishermen in this area in the case of environmental or regulatory change (Johnson and Orbach 1997). Possible fishing communities within Area 4 might be: Vandemere and Oriental.

Table 11. Population and Economic Information for Counties included in Area 4.

Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

Area 4		1993	1994	1995
<b>County</b>				
<b>Craven</b>				
	Population	83,595	83,851	85,163
	Personal Income (Thousands of \$)	1,450,296	1,508,353	1,626,657
	Per Capita Pers Income (\$)	17,349	17,988	19,101
	Personal Income Fishing (Thousands of \$)	386	405	----
<b>Pamlico</b>				
	Population	11,772	11,948	12,064
	Personal Income (Thousands of \$)	179,384	186,131	199,576
	Per Capita Pers Income (\$)	15,238	15,578	16,543
	Personal Income Fishing (Thousands of \$)	2,714	2,851	3,211
<b>Beaufort</b>				
	Population	43,446	43,815	43,998
	Personal Income (Thousands of \$)	674,788	711,961	756,048
	Per Capita Pers Income (\$)	15,532	16,249	17,184
	Personal Income Fishing (Thousands of \$)	1,339	1,406	1,580
<b>Hyde</b>				
	Population	5,374	5,339	5,362
	Personal Income (Thousands of \$)	80,982	90,101	80,300
	Per Capita Pers Income (\$)	15,069	16,876	14,976
	Personal Income Fishing (Thousands of \$)	1,860	1,973	2,215

Pamlico county had the highest personal income from fishing for Area 4 from 1993 to 1995 with a steady increase over those three years (Table 11). Hyde county followed with Beaufort next; both showing an increase over time. For most counties in Area 4 (Table 12) the general trend seems to be an increase from 1970 to 1980 and then a decrease from 1980 to 1990 within these occupation and industry categories. Beaufort County shows an overall decrease from 1970-1990.

Table 12. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for North Carolina Coastal Counties included in Area 4 for 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database

County	Occupation/Industry	1970	1980	1990
Craven County	Farm/Fish/Forest	873	1136	832
	Agri.,Fishing,Mining	1129	1222	860
Pamlico County	Farm/Fish/Forest	245	498	442
	Agri.,Fishing,Mining	502	662	477
Beaufort County	Farm/Fish/Forest	1452	1393	1024
	Agri.,Fishing,Mining	2169	2123	1190
Hyde County	Farm/Fish/Forest	295	509	454
	Agri.,Fishing,Mining	442	579	511

#### Area 5: Carteret County

In Area 5 Johnson and Orbach (1997) found that commercial fishermen had three primary gear types, gill nets, trawls and hand harvest of shell fish. In terms of annual fishing rounds Area 5 did not show the clear gear stratification found in other areas. Shrimp trawling is the most central fishery, but pound netting, crab potting, and mechanized clamming also occur with shrimp trawling. (Johnson and Orbach 1997). Possible fishing communities within Area 5: Morehead City and Beaufort.

Table 13. Population and Economic Information for Counties included in Area 5. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

Area 5				
County		1993	1994	1995
Carteret				
	Population	55,747	56,381	57,690
	Personal Income (Thousands of \$)	935,032	985,484	1,076,753
	Per Capita Pers Income (\$)	16,773	17,479	18,664
	Personal Income Fishing (Thousands of \$)	2,783	2,871	3,207

Among North Carolina's coastal counties, Carteret county was second to Dare county (Table 13) in terms of personal income from fishing. In addition, Carteret County (Table 14) shows an marked increase from 1970 to 1980, then a decrease from 1980 to 1990, within the occupations of Farm/Fish/Forest and an overall increase in the number of Agriculture, Fishing and Mining industries.

Table 14. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for Carteret County (Area 5) for 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database.

County	Occupation/Industry	1970	1980	1990
Carteret County	Farm/Fish/Forest	225	1200	1158
	Agri.,Fishing,Mining	731	1234	1260

In a recent report on the importance of commercial fishing in Carteret county, Diaby (1997) found that Carteret county ranked first in poundage (96,652,314 lb) and second in dockside value (\$20,618,486) in terms of commercial landings for North Carolina coastal counties. Finfish represented the 91% of total landings and 46% of total ex-vessel value. The most important species of finfish were: menhaden, flounder, croaker, weakfish and spot. Shellfish and crustaceans accounted for only 9% of all commercial landings but, represented over half of the value of landings during the period from 1974-1994. Employment by the commercial fishing industry, both full and part time for Carteret county was estimated to be 3,232 people for 1994 (Diaby, 1997). This number varies from those reported in the census data and emphasizes the problems in comparing these types of data. Since 1981 there have been about 105 to 140 licensed seafood dealers in Carteret county. The value of processed seafood peaked for the county in 1981 when scallops accounted for almost half of the value with a total value of \$19,737,126. Since that time there has been a general decline in total value of processed seafood attributable to a decline in scallop landings. Menhaden was the most important single processed product over a fifteen year period from 1980 to 1994 (Diaby, 1997).

In estimating the economic impact of Carteret county commercial harvesting sector Diaby (1997) estimated \$27 million in sales of goods and services and \$11.66 million in value added. Total employment from commercial harvesting activities was estimated to be 3,371.

Sales of goods and services for the wholesaling and processing sector were estimated at \$19 million, with \$11 million in value added. There were an estimated 1,563 full and part time jobs created earning \$6.55 million in wages (Diaby, 1997).

Overall, the activities of the commercial fishing industry created \$46 million in sales of goods and services and \$24 million in value added. There were 4,934 full and part time jobs which earned \$14 million in wages (Diaby, 1997).

The recreational fishery spent approximately \$70 million on fishing trips in Carteret county with \$25.23 million in employ compensation and \$47.61 in value added. There were 1,821 full and part time jobs associated with the recreational fishing industry in Carteret County.

The total impact of the coastal fishing industry on the economy of Carteret County was estimated to be \$120.74 million with \$71.32 million in value added. The total number of full and part time jobs was estimated at 6,755 with earnings of \$38.94 (Diaby, 1997).

#### Snapper Grouper Fishing

The Morehead City/Beaufort area is located approximately 50 miles south of Ocracoke in Carteret County. This area is known for its sportfishing activity including several major tournaments each year. There is a small population of full time commercial reef fishermen in Morehead, however the majority of fishermen holding commercial permits are primarily part timers. Many of these fishermen divide their time between charter fishing during the peak tourist season (April through September) and commercial fishing in the winter months. Full time fishermen in this area reported fishing approximately 50 miles straight offshore and fishing from Hatteras to as far south as the South Carolina/Georgia line. Trip lengths vary with the size of the vessel, but the average trip length is 7 days and the larger boats carried up to 3 crew members (Iverson, 1997).

#### King Mackerel Fishery

The king mackerel fishery in North Carolina has grown steadily since 1980 and has leveled with catches repeatedly around one million pounds in recent years. From 1986 to 1990

the number of permits for Atlantic group king mackerel issued in North Carolina ranged from a low of 325 in 1987/88 to a high of 533 in 1989/90. Again, the majority of those permits were granted to hook and line fishermen. Present data indicates there were 448 commercial vessels permitted for king and Spanish mackerel in North Carolina (Vondruska, 1997).

#### 4.3.3.1.3 South Carolina

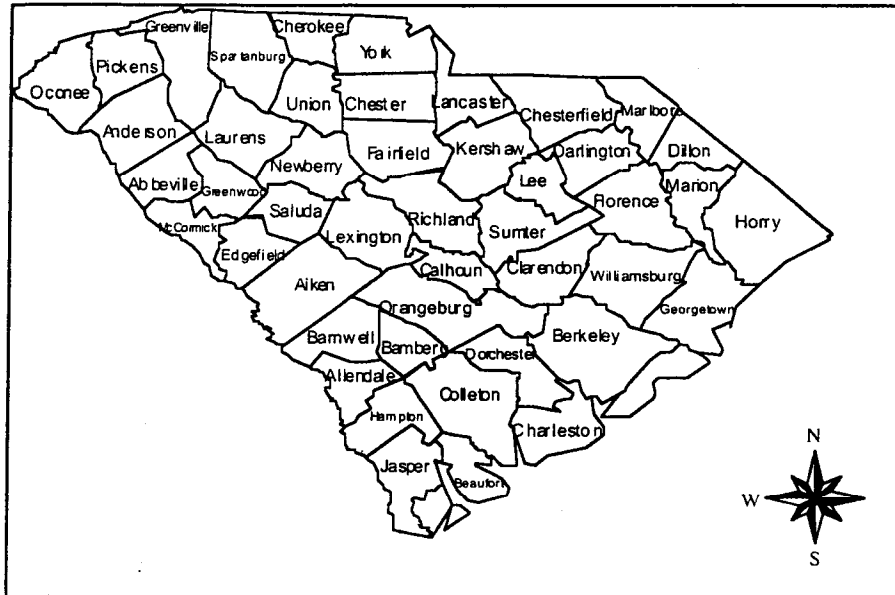


Figure 3. South Carolina Counties Source: Roger Pugliese, SAFMC Staff.

The 1990 Census of Population and Housing provides the following information for South Carolina regarding individuals who reported their occupation as fisher in Table 15. A total of 401 individuals claimed Fisher as their occupational title with less than half indicating it was a year round full time employment. There were few females who indicated such and they had a far lower mean annual income than males in this occupation.

Table 15. Number of Fishers and Mean Annual Income for South Carolina Fishers in 1990. Source: U.S. Bureau of the Census.

	<b>Year Round/Full Time</b>	<b>Other</b>	<b>Total</b>
<b>Number of fishers</b>			
Male	188	193	381
Female	6	14	20
Total	194	207	401
<b>Mean Annual Income (\$)</b>			
Male	28,842	14,489	18,946
Female	750	5,000	2,403
Total	23,710	14,269	18,390

There were a total of 69 individuals who indicated their occupation as captain of a fishing vessel in the 1990 census of population and housing, and 7 of them were female according to Table 16. Again, females had a much lower mean annual income when compared to males.

Table 16. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for South Carolina in 1990. Source: U.S. Bureau of the Census.

	Year Round/Full Time	Other	Total
Number of Captains			
Male	17	45	62
Female	7	0	7
Total	24	45	69
Mean Annual Income (\$)			
Male	18,765	15,022	16,048
Female	9,000	0	9,000
Total	15,917	15,022	15,333

### Horry County

The following descriptions for fishing communities in South Carolina are notes from Kim Iverson of South Carolina Department of Natural Resources. Kim has spent many months interviewing both commercial and recreational fishermen in South Carolina and other parts of the South Atlantic region as part of several research projects. Although the research was not intended to identify fishing communities, her notes represent the best available information on fishing communities for South Carolina.

Little River has a long history of fishing activity, both commercial and recreationally. The headboat operations date back to the 1940's. As of 1996, there were headboats operating in Little River. There are approximately 4 vessels that actively run charters and also commercial fish. Several full time snapper/grouper vessels operate out of the area. Little River also hosts an annual Blue Crab Festival each spring (Kim Iverson, SCDNR pers. comm., 1998).

Murrells Inlet has a large fleet of charter and headboats, with one marina hosting one of the Governor's Cup Billfishing Tournaments. There are several smaller fishing tournaments held in the area. There are fish houses in the community that deal primarily with finfish. There are no shrimp dealers. This area is also noted for its large number of seafood restaurants that target the tourist market from Myrtle Beach (Kim Iverson, SCDNR pers. comm., 1998).

Major fishing tournaments held in Murrells Inlet are: March of Dimes Annual Flounder Tournament - Voyagers View Marina. Registration was by angler with approximately 200 anglers participating. Local tournament with many family participants. Primarily smaller boats < 25' participating. Tournament date May 17.; and the Marlin Quay Governor's Cup Billfish Tournament - Marlin Quay Marina. The last in the series of SC Gov. Cup. Total of 31 boats registered. July 23-26 (Kim Iverson, SCDNR pers. comm., 1998).

Major tournaments in North Myrtle Beach: Dock Holidays Governor's Cup Billfish Tournament - Dock Holiday's Marina. The first tournament in a series of 6 for the SC Governor's Cup. April 30 - May 3. Total of 25 boats entered; Frantic Atlantic King Mackerel Tournaments - North Myrtle Beach - Blue Marlin Yacht & Fishing Club. A two tournament series consisting of the Spring and Fall Classics. Total purse of \$250,000 for the series. Total of 392 paid boat entries with an average of 4.09 anglers per boat. Tournament dates May 9-11, September 26-28; Evinrude Outboard King Mackerel Tournament - Oct. 11-12, Weigh-in



stations at Dock Holidays Marina, Marlin Quay Marina and Georgetown Landing. 147 boats were registered; Yamaha Contender King Mackerel Classic - Weigh in stations at Dock Holidays Marina, Marlin Quay Marina and Georgetown Landing. 125 boats registered; Fall Pier King Tournament - September 19-21 (Kim Iverson, SCDNR pers. comm., 1998).

One of the largest concentration of snapper grouper vessels is located in Murrells Inlet, SC. Most of the reef fishermen in this area are full time commercial fishermen and consider bandit reels to be the most effective way of catching snapper grouper. There is a wide variety of snapper grouper species off of Murrells Inlet, with gag grouper, scamp grouper and vermilion snapper being highly targeted. The average trip length is 5 days with some of the larger boats (>40 ft.) fishing up to 10 days. A few smaller bandit boats may stay out for 2-3- days. The Gulf Stream is approximately 62 miles offshore from Murrells Inlet. Most bandit boats fish between the 20-50 fathom line, concentrating on the 25 fathom curve. Winter weather dictates that fishermen fish shallow, in waters 60-90' deep. Several fishermen switch to sea bass trapping during the winter months (Iverson, 1997).

Horry County has shown a small increase in personal income from fishing that follows the general increase in personal income overall (Table 17).

Table 17. Population and Economic Information for Horry County, South Carolina.  
Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Horry</b>				
	Population	148,385	152,435	157,834
	Personal Income (Thousands of \$)	2,543,793	2,744,260	3,013,059
	Per Capita Pers Income (\$)	17,143	18,177	19,220
	Personal Income Fishing (Thousands of \$)	81	129	169

Vessels in Murrells Inlet will fish an area from Frying Pan Shoals off southern NC, south to Savannah. The average boat has two crew members. It is interesting to note that fishermen stated a crew of 3 plus the captain was ideal for this area, but decreasing catches and increased costs have made it necessary to cut back on crew members (Iverson, 1997).

#### Georgetown County

The community of Georgetown has shrimp dealers who also deal in finfish and shellfish. Georgetown is host to the one of the SC Governor's Cup Billfish Tournaments along with several other smaller fishing tournaments. There are no headboats operating from the area and charter activity is limited. Georgetown is known for it's historic waterfront district (Kim Iverson, SCDNR pers. comm., 1998).

Major fishing tournaments in Georgetown County: Georgetown Landing Governor's Cup Billfishing Tournament - May 21-24, Georgetown Landing Marina. The oldest of the series tournaments with 45 boats participating.

Georgetown County shows an increasing personal income from fishing like Horry County in Table 18 but, personal income from fishing tends to be a larger percentage of overall personal income than in Horry County.

Table 18. Population and Economic Information for Georgetown County, South Carolina. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
Georgetown				
	Population	49,371	49,966	50,835
	Personal Income (Thousands of \$)	822,317	885,024	946,898
	Per Capita Pers Income (\$)	16,656	17,713	18,627
	Personal Income Fishing (Thousands of \$)	246	388	399

### Charleston County

McClellanville is a small community with a long history of commercial shrimping. McClellanville has a large shrimp fleet. At any given time (dependent upon the season) there can be as many as 20 shrimp boats at the docks. Shrimp wholesale dealers are also present within the community. McClellanville hosts an annual Blessing of the Fleet Festival each spring. Shem Creek (Mt. Pleasant) hosts a mixture of commercial and recreational fishing activity along with a number of seafood restaurants, a retail seafood market and a waterfront hotel. There are also headboats operating out of Shem Creek along with charter operations. There is a large permanent shrimp fleet and many shrimp boats visit seasonally. At any give time there are an average of 30 shrimp boats along the creek. Shrimp dealers along the creek also buy and sell finfish from the trawlers. There are several offshore fishing boats including longline and snapper/grouper boats. Several shellfishermen and crabbers do business along the creek. Each spring, Mt. Pleasant hosts an Annual Blessing of the Fleet for the shrimp boats.

In Folly Beach there is a concentration of commercial fishing vessels and several fish houses who handle offshore finfish, shellfish, shrimp and crabs. Rockville is a historical small community located at the south end of Wadmalaw Island. There are commercial dealers who handle shrimp, inshore fish, offshore finfish and some shellfish. On Edisto Island there are several commercial seafood dealers. There are approximately 10 shrimp boats that operate there, fluctuating with the season. The dealers handle primarily shrimp and in-shore species along with shellfish and blue crabs. There is also a large "harvest" of horseshoe crabs. These crabs are "bled" for their blood that is used in cancer research and returned to the water. Edisto Island is also host to the annual SC Governor's Cup Billfish Tournament. Charter activity here is limited. Bennett's Point is a small community south of Edisto with shrimping operations in the community. There are 10-15 small boat shrimpers that live in Walterboro and fish out of Bennett's Point (Kim Iverson, SCDNR pers. comm., 1998).

Table 19. Population and Economic Information for Charleston County, South Carolina. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
Charleston	Population	297,888	287,139	281,068
	Personal Income (Thousands of \$)	5,653,489	5,879,506	6,083,636
	Per Capita Pers Income (\$)	18,979	20,476	21,645
	Personal Income Fishing (Thousands of \$)	3,188	3,809	----

Charleston County (Table 19) has a higher personal income from fishing than the previous two counties, but has a much larger overall dollar value for personal income overall.

Major fishing tournaments in the Charleston County area: SCSSA (South Carolina Saltwater Sportfishing Assoc.) Early Bird - Ashley Marina. Approximately 25 registered boats. April 19. Multi-species tournament; James Island King Mackerel Tournament - James Island Yacht Club, May 24; Wild Dunes Governor's Cup Billfish - June 11-14. Total of 46 registered boats; Bohicket Invitational Governor's Cup Billfish - June 25-28. Total of 48 registered boats. Bohicket Marina on John's Island; Lowcountry Angler's Inshore Tournament - June 28. Multi-species tournament held at the East Cooper Outboard Motor Club on Gold Bug Island in Mt. Pleasant. Registration by angler, with approximately 200 anglers registered; SCSSA Sailfish XV - Ashley Marina in Charleston. Club sponsored tournament with approximately 25 boats registered. Sailfish, tuna, dolphin & wahoo. August 8-10; Fishing For Miracles King Mackerel Tournament - Ripley's Light Marina. Large King tournament with over 200 boats entered. August 14-16; Alison Oswald, Sr. Memorial Tournament - James Island Yacht Club. Local tournament with approximately 75 boats participating. Multi-species. Aug. 23; Edisto Marina Governor's Cup Billfish Tournament - July 16-19. One of the oldest and largest of the Billfish Series. 46 Boats registered. Edisto Island (Kim Iverson, SCDNR pers. comm., 1998).

#### Beaufort County

In Frogmore there are 8 commercial dealers which are home to over 50 shrimpers. This does not include the many individuals with shrimp boats in their back yards. The dealers primarily handle shrimp but others may also handle crabs and shellfish. There is a large blue crab industry on nearby Lady's Island. There are several commercial seafood dealers in the Port Royal area with over 30 shrimp boats. There are also commercial crabbers, shad fishermen and offshore finfishermen here. There are a small number of charter vessels operating out of this area also. Hilton Head Island primarily caters to the tourist trade. There are several headboats operating on Hilton Head. These boats make half-day trips and night trips for shark fishing. There are four major marinas that offer charter fishing. Commercially, Hilton Head had 4 seafood dealers and approximately 12-15 shrimp boats (Kim Iverson, SCDNR pers. comm., 1998).

Data on personal income from fishing in Table 20 for Beaufort County may have been excluded due to confidentiality issues.

Table 20. Population and Economic Information for Beaufort County, South Carolina.  
Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Beaufort</b>				
	Population	94,375	97,293	100,017
	Personal Income (Thousands of \$)	2,057,250	2,194,774	2,373,921
	Per Capita Pers Income (\$)	21,799	22,558	23,774
	Personal Income Fishing (Thousands of \$)	----	----	----

Major fishing tournaments in Beaufort County: 42<sup>nd</sup> Annual Beaufort County Water Festival Fishing Tournament - June 28. Held in conjunction with the annual Beaufort Water Festival; Hilton Head Kingfish Classic - Schillings Marina, Hilton Head Island. July 10-12. Registration by angler with a total of 49 registered; Dottie Dunbar Women's Tournament - Palmetto Bay Marina, Hilton Head. Women's only multi-species inshore tournament. Total of 49 anglers registered. October 4 (Kim Iverson, SCDNR pers. comm., 1998).

4.0 Environmental Consequences

Possible fishing communities in South Carolina: Charleston, Mt. Pleasant, Hilton Head, Port Royal, Frogmore (St. Helena), Bennett's Point, Edisto Beach, Rockville, Folly Beach, Shem Creek, McClellanville, Georgetown Waterfront, Murrell's Inlet, Little River (most of these locations are designated ports of landing)

Counties in South Carolina have seen a general increase in these occupations and industries over the past three decades (Table 21), with the exception of Horry County which has seen a slight decreasing trend.

Table 21. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for South Carolina Coastal Counties for 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database

County	Occupation/Industry	1970	1980	1990
Horry County	Farm/Fish/Forest	2627	2542	2310
	Agri.,Fishing,Mining	2843	2653	2110
Georgetown County	Farm/Fish/Forest	403	558	597
	Agri.,Fishing,Mining	552	856	690
Charleston County	Farm/Fish/Forest	810	1697	2056
	Agri.,Fishing,Mining	1256	1938	2316
Beaufort County	Farm/Fish/Forest	436	938	966
	Agri.,Fishing,Mining	698	1087	1111
Colleton County	Farm/Fish/Forest	532	614	730
	Agri.,Fishing,Mining	787	705	782

For the Charleston, South Carolina MSA (Table 22) there are 113 individuals who indicated fishing as their year round occupation . Another 102 individuals indicated that it is a part time or seasonal occupation for them. This represents over half of those individuals in South Carolina who indicated the occupation as fishing from Table 15. The Charleston, SC MSA includes Berkely, Charleston and Dorchester counties.

Table 22. Number of Individuals in Occupation of Fishing By Work Status and Gender for the Charleston, SC MSA in 1989. Source: 1990 Census Of Population And Housing.

	Year Round Full Time	Other	Total
Male	102	102	204
Female	11	0	11
Total	113	102	215



4.0 Environmental Consequences

Table 23. Number of Fishers and Mean Annual Income for Georgia in 1990. Source: U.S. Bureau of the Census.

	Year Round/Full Time	Other	Total
Number of fishers			
Male	222	295	518
Female	11	7	18
Total	234	302	536
Mean Annual Income (\$)			
Male	19,139	11,082	15,058
Female	8,600	25,000	20,080
Total	18,813	12,024	15,308

Shrimping

In their 1975 report, Nix et. al., found a total of 32 commercial docks in six Georgia coastal counties. Those docks and shrimp trawlers were distributed as follows: Camden Co. - 5 docks and 33 trawlers; Glynn Co. - 5 docks and 74 trawlers; McIntosh Co. - 12 docks and 111 trawlers; Liberty Co. - 1 dock and 18 trawlers; Bryan Co. - 1 dock and 2 trawlers; and finally Chatham Co. - 8 docks and 69 trawlers. This information is outdated and certainly does not represent the current status and location of shrimp trawlers in Georgia. However, the report does represent the kinds of information that can be extremely helpful in identifying fishing communities.

Snapper Grouper Fishing

The coast of Georgia contains a small concentration of full-time reef fishermen that fish primarily with bandit reels. Their fishing patterns are similar to those found in SC with vessels fishing from northern Florida north to the SC/NC line (Iverson, 1997).

Possible fishing communities in Georgia: Savannah, Brunswick, St. Marys, Jekyll Island, and Darien.

Table 24. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for Georgia in 1990. Source: U.S. Bureau of the Census.

	Year Round/Full Time	Other	Total
Number of Captains			
Male	17	21	38
Female	0	0	0
Total	17	21	38
Mean Annual Income (\$)			
Male	25,706	1,976	12,592
Female	0	0	0
Total	25,706	1,976	12,592

Table 25. Population and Economic Information for Chatham County, Georgia. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Chatham</b>	Population (number of persons)	224,050	225,779	226,554
	Personal income (thousands of dollar	4,569,113	4,810,530	5,087,638
	Per capita personal income (dollars)	20,393	21,306	22,457
	Personal Income Fishing (Thousands of \$)	650	(D)	25

Table 26. Population and Economic Information for Bryan County, Georgia. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Bryan</b>				
	Population	18,827	20,008	21,212
	Personal Income (Thousands of \$)	274,738	307,258	342,128
	Per Capita Pers Income (\$)	14,593	15,357	16,129
	Personal Income Fishing (Thousands of \$)	251	359	----

Table 27. Population and Economic Information for Liberty County, Georgia. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Liberty</b>				
	Population	56,625	58,827	58,571
	Personal Income (Thousands of \$)	636,042	669,454	709,468
	Per Capita Pers Income (\$)	11,233	11,380	12,113
	Personal Income Fishing (Thousands of \$)	----	90	97

Table 28. Population and Economic Information for McIntosh County, Georgia. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>McIntosh</b>				
	Population	8,985	9,153	9,372
	Personal Income (Thousands of \$)	110,187	116,171	125,645
	Per Capita Pers Income (\$)	12,263	12,692	13,406
	Personal Income Fishing (Thousands of \$)	3,619	4,486	----

Table 29. Population and Economic Information for Glynn County, Georgia. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Glynn</b>				
	Population	64,759	64,956	65,450
	Personal Income (Thousands of \$)	1,322,745	1,400,544	1,505,337
	Per Capita Pers Income (\$)	20,426	21,558	23,000
	Personal Income Fishing (Thousands of \$)	328	343	351

Table 30. Population and Economic Information for Camden County, Georgia. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
Camden				
	Population	39,712	41,262	40,819
	Personal Income (Thousands of \$)	502,639	542,385	556,622
	Per Capita Pers Income (\$)	12,657	13,145	13,636
	Personal Income Fishing (Thousands of \$)	1,889	2,431	2,484

Georgia coastal counties have seen a general increase in these occupations and industries with the exception of Liberty County which has shown a decrease from 1970-1990.

Table 31. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for Georgia Coastal Counties for 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database

County	Occupation/Industry	1970	1980	1990
Bryan County	Agri.,Fishing,Mining	161	100	200
	Farm/Fish/Forest	121	135	136
Chatham County	Agri.,Fishing,Mining	558	686	1103
	Farm/Fish/Forest	228	704	1062
Liberty County	Agri.,Fishing,Mining	332	146	152
	Farm/Fish/Forest	242	205	157
McIntosh County	Agri.,Fishing,Mining	233	266	169
	Farm/Fish/Forest	27	260	193
Glynn County	Agri.,Fishing,Mining	261	482	593
	Farm/Fish/Forest	84	581	712
Camden County	Agri.,Fishing,Mining	209	126	176
	Farm/Fish/Forest	106	110	205

#### 4.3.3.1.5 Florida

Florida's eastern coastline is made up largely of metropolitan counties. This is primarily due to the increases in population for Florida's coastal counties over the past 50 years. Florida's coastline has become a very popular retirement destination and tourist attraction. Because they are largely metropolitan, fishing communities here may be subsumed into these larger metropolitan areas and difficult to identify. Data presented from the most recent Census will also show that in relation to the larger economy, fishing will contribute very little at the county level for most coastal counties. Over the years, with the demographic changes following the immigration of retirees and tourists and the subsequent economic transition, few fishing communities will have survived as distinct communities.

The data presented in Table 32 shows Florida as having almost 6,000 individuals claiming fisher as their occupation in the 1990 census; 381 of those individuals were female. Mean annual income is highest for those reporting fishing as a full time occupation with women reporting a lower mean annual income in all categories.





4.0 Environmental Consequences

There were over 1100 individuals from Florida who reported their occupation as captain of a fishing vessel during the 1990 census, with 51 of them being female (Table 33). Again, mean annual income was highest for full time workers and females reported lower mean annual income for both full time and other work.

Table 33. Number of Captains of Fishing Vessels and other officers and Mean Annual Income for Florida in 1990 Source: U.S. Bureau of the Census.

	Year Round/Full Time	Other	Total
Number of Captains			
Male	430	633	1,063
Female	26	25	51
Total	456	658	1,114
Mean Annual Income (\$)			
Male	25,993	21,274	23,183
Female	8,487	15,420	11,885
Total	24,995	21,052	22,666

Nassau County (Table 34) showed an increase in personal income from fishing over the time period from 1993 to 1995 which reflects the general increase in population and personal income overall for the county.

Table 34. Population and Economic Information for Nassau County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
Nassau				
	Population	48,355	49,565	50,717
	Personal Income (Thousands of \$)	954,342	1,003,920	1,089,793
	Per Capita Pers Income (\$)	19,736	20,255	21,488
	Personal Income Fishing (Thousands of \$)	1,540	1,918	2,068

Duval County (Table 35) shows slow growth in population over the three years listed, but does show growth in personal income from fishing from 1993 to 1994. There was a slight decrease in personal income from fishing reported from 1994 to 1995.

Table 35. Population and Economic Information for Duval County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
Duval				
	Population	701,267	703,152	705,014
	Personal Income (Thousands of \$)	14,111,822	14,724,897	15,748,121
	Per Capita Pers Income (\$)	20,123	20,941	22,337
	Personal Income Fishing (Thousands of \$)	2,272	3,658	3,335

St John's County (Table 36) had some growth in personal income from fishing from 1993 to 1994 but no data were available for 1995 to indicate whether that trend continued.

Table 36. Population and Economic Information for St. John's County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>St. Johns</b>				
	Population	94,480	98,377	101,966
	Personal Income (Thousands of \$)	2,394,764	2,612,557	2,869,300
	Per Capita Pers Income (\$)	25,347	26,557	28,140
	Personal Income Fishing (Thousands of \$)	432	502	----

According to Table 37, Flagler County had no individuals reporting personal income from fishing for the time period 1993 to 1995. Volusia County also has no personal income from fishing listed in Table 38, but data were not included due to confidentiality issues.

Table 37. Population and Economic Information for Flagler County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Flagler</b>				
	Population	35,868	37,894	40,260
	Personal Income (Thousands of \$)	571,528	631,959	692,269
	Per Capita Pers Income (\$)	15,934	16,677	17,195
	Personal Income Fishing (Thousands of \$)	0	0	0

Table 38. Population and Economic Information for Volusia County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Volusia</b>				
	Population	397,372	405,515	410,115
	Personal Income (Thousands of \$)	6,845,402	7,235,060	7,772,063
	Per Capita Pers Income (\$)	17,227	17,842	18,951
	Personal Income Fishing (Thousands of \$)	----	----	----

Indian River County saw an increase in personal income from fishing from 1993 to 1994 according to Table 39, but saw a decrease from 1994 to 1995. St. Lucie County (Table 40) may have had a similar trend although data from 1993 are missing and the trend is not clear.

Table 39. Population and Economic Information for Indian River County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Indian River</b>				
	Population	94,184	95,374	96,263
	Personal Income (Thousands of \$)	2,686,514	2,827,427	3,065,533
	Per Capita Pers Income (\$)	28,524	29,646	31,845
	Personal Income Fishing (Thousands of \$)	1,340	1,826	1,707

Table 40. Population and Economic Information for St. Lucie County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>St. Lucie</b>				
	Population	165,120	169,284	171,914
	Personal Income (Thousands of \$)	2,719,602	2,840,752	3,051,018
	Per Capita Pers Income (\$)	16,470	16,781	17,747
	Personal Income Fishing (Thousands of \$)	----	1,855	1,303

Table 41. Population and Economic Information for Broward County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Broward</b>				
	Population	1,353,279	1,358,585	1,412,942
	Personal Income (Thousands of \$)	32,716,045	34,273,950	37,007,667
	Per Capita Pers Income (\$)	24,175	24,736	26,192
	Personal Income Fishing (Thousands of \$)	658	816	----

The trend in personal income from fishing for Broward County is not clear as data from 1995 are missing from Table 41 because of confidentiality. Brevard County (Table 42) shows a decrease in personal income from fishing during 1994 to 1995, but overall shows a much larger percentage of personal income coming from fishing than most counties previous.

Table 42. Population and Economic Information for Brevard County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Brevard</b>				
	Population	435,546	443,337	450,238
	Personal Income (Thousands of \$)	8,564,204	8,938,218	9,341,030
	Per Capita Pers Income (\$)	19,663	20,161	20,747
	Personal Income Fishing (Thousands of \$)	3,600	4,690	3,797

Martin County has one of the highest per capita incomes reported over the three year period according to Table 43. There was also a significant increase in personal income from fishing from 1993 to 1994 which decreased in 1995. Palm Beach County, with an even higher per capita income, showed an increase in personal income from fishing from 1993 to 1994 with no data available for 1995 (Table 44).

Table 43. Population and Economic Information for Martin County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Martin</b>				
	Population	107,238	109,194	110,495
	Personal Income (Thousands of \$)	3,406,064	3,521,665	3,815,294
	Per Capita Pers Income (\$)	31,762	32,251	34,529
	Personal Income Fishing (Thousands of \$)	270	1,658	819

Table 44. Population and Economic Information for Palm Beach County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Palm Beach</b>				
	Population	933,644	957,522	976,358
	Personal Income (Thousands of \$)	30,994,531	32,423,719	35,204,121
	Per Capita Pers Income (\$)	33,197	33,862	36,057
	Personal Income Fishing (Thousands of \$)	1,464	1,902	----

Dade County shows a steady growth in personal income from fishing for the time period listed in Table 45. Monroe County shows, by far, the highest personal income from fishing for any Florida county and most likely any county in the South Atlantic according to Table 46.

Table 45. Population and Economic Information for Dade County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Dade</b>				
	Population	1,985,373	2,011,571	2,046,078
	Personal Income (Thousands of \$)	39,110,301	40,344,476	43,087,320
	Per Capita Pers Income (\$)	19,699	20,056	21,058
	Personal Income Fishing (Thousands of \$)	1,247	1,479	1,897

Table 46. Population and Economic Information for Monroe County, Florida. Source: Bureau of Economic Analysis, U.S. Dept. of Commerce.

County		1993	1994	1995
<b>Monroe</b>				
	Population	81,737	81,461	81,152
	Personal Income (Thousands of \$)	1,982,209	2,054,326	2,208,152
	Per Capita Pers Income (\$)	24,251	25,219	27,210
	Personal Income Fishing (Thousands of \$)	13,506	15,558	16,723

Recently, data were compiled from the last three census and placed into a user friendly interface through a MARFIN grant by the Louisiana Population Data Center, Louisiana State University (C. M. Tolbert, et al. 1998). Those data provide a time series of information from the last three census with the ability to compare several variables at the state, county and place level. Census places are incorporated and Census designated places of 2500 or more persons. The tables presented below incorporate the data included in the MARFIN SocioDemographic Database for the coastal counties outlined above with a focus on the occupational classification of Farm/Fish/Forest and the industry classification of Agriculture, Fishing, and Mining. These classifications are inclusive of those within the occupation and industry of fishing, but not exclusive of others, therefore it is difficult to know the exact number of individuals who have indicated their occupation or business is fishing. We can only assume that whatever trend appears over the time corresponds to the occupation of fishing as well as the others.

Data covering Metropolitan Statistical Areas are provided because it includes a more detailed occupational breakdown, but unfortunately geographic boundaries expand as most MSAs encompass more than one county. In some cases, MSAs were not used because the area covered did not correspond with the coastal areas within the South Atlantic region. As mentioned earlier, these data are what is currently available. Further analysis is constrained by

#### 4.0 Environmental Consequences

variety of issues relating to data computability and availability at each place level of analysis. As mentioned before more research on fishing communities will be required before a more complete definition and identification can be accomplished.

Examining census data at the level of Metropolitan Statistical area reveals greater detail for occupation, but the scale changes as MSAs often times encompass more than one county. Metropolitan area (MA) is a large population nucleus, together with adjacent communities that have a high degree of economic and social integration with that nucleus. Metropolitan Areas must contain either a place with a minimum population of 50,000 or a Census Bureau-defined urbanized area and a total MA population of at least 100,000. An MA comprises one or more central counties and also may include one or more outlying counties that have close economic and social relationships with the central county. Metropolitan statistical areas (MSA's) are relatively freestanding MA's and are not closely associated with other MA's. These areas typically are surrounded by nonmetropolitan counties. See Appendix ?? for details on the parameters for the coastal MSAs included in this discussion.

When you look at the occupations of farming, fishing and forestry for Florida coastal counties in Table 47, over the past 20 years there is, in general, a steady increase in the number of individuals within these occupations and industries.

Table 47. Number within Farm/Fish/Forest Occupation and Agriculture, Fishing, Mining Industry for East Florida Coastal Counties from 1970, 1980, and 1990 Census. Source: MARFIN Sociodemographic Database

County	Occupation/Industry	1970	1980	1990
Nassau County	Farm/Fish/Forest	371	427	559
	Agri.,Fishing,Mining	501	462	606
Duval County	Farm/Fish/Forest	1237	2782	3729
	Agri.,Fishing,Mining	2536	2959	4324
St.Johns County	Farm/Fish/Forest	794	813	1002
	Agri.,Fishing,Mining	1012	883	976
Flagler County	Farm/Fish/Forest	145	314	408
	Agri.,Fishing,Mining	186	298	403
Volusia County	Farm/Fish/Forest	1308	3150	4917
	Agri.,Fishing,Mining	2511	3407	5606
Indian River County	Farm/Fish/Forest	991	1907	2042
	Agri.,Fishing,Mining	1454	2361	2217
St. Lucie County	Farm/Fish/Forest	2602	2710	3147
	Agri.,Fishing,Mining	3253	3252	3342
Broward County	Farm/Fish/Forest	1982	7358	9425
	Agri.,Fishing,Mining	5354	7756	10317
Brevard County	Farm/Fish/Forest	764	1772	3369
	Agri.,Fishing,Mining	1394	2279	3585
Martin County	Farm/Fish/Forest	964	1838	1983
	Agri.,Fishing,Mining	1268	2032	2086
Palm Beach County	Farm/Fish/Forest	6552	9676	13261
	Agri.,Fishing,Mining	9791	11780	15155
Dade County	Farm/Fish/Forest	4804	11257	14894
	Agri.,Fishing,Mining	9682	13708	16926
Monroe County	Farm/Fish/Forest	163	1769	1729
	Agri.,Fishing,Mining	920	1932	1860

The following table includes only those individuals who reported their occupation as fishing for the following Metropolitan Statistical Areas (MSA) within Florida.

Table 48. Number of Individuals in Occupation of Fishing By Work Status and Gender for Florida MSA in 1989. Source: 1990 Census Of Population And Housing.

Jacksonville		Year Round Full Time	Other	Total
	Male		151	210
Female		15	49	64
Total		166	259	425
West Palm Beach		Year Round Full Time	Other	Total
	Male		94	47
Female		0	0	0
Total		94	47	141
Miami		Year Round Full Time	Other	Total
	Male		254	254
Female		0	30	0
Total		254	284	538

#### Snapper Grouper Fishery Profile

Concentrations of reef fishermen can be found in the communities of Mayport, Port Orange and New Smyrna, north of Cape Canaveral. Bandit reels are the primary gear used for reef fishing in these areas, although a few bottom longline vessels are present. In northern Florida, bandit fishermen report trips lasting 5-6 days and fish 30-50 miles offshore. They average between 2 to 3 crew members depending on vessel size and gear. Vessels from the Mayport area reported fishing from the Georgia line south to the Daytona area. The larger longline vessels are required by regulations to fish past the 50 fathom line and reported trip lengths of up to 10 days, fishing as far as 100 miles from shore. These bottom long line vessels fish for deep water species such as tilefish in water 600 - 900' deep (Iverson, 1997).

#### King Mackerel Fishery Profile

McKenna (1994) identified the number of fishermen in Florida reporting landings of king mackerel (based on Saltwater Products Licenses) from 1987 to 1993 as varying from 1,500 to 2,222. From 1986 to 1990 the number of commercial permits for Atlantic migratory group king mackerel ranged from a high of 888 in 1989/90 fishing season to low of 785 in the 1987/88 fishing year. The percentage of those permits which were hook and line fishermen for those years ranged from 89% in 86/87 to 78% in 1990. There were 1654 vessels permitted for commercial king mackerel and Spanish mackerel in Florida for the 1993-94 fishing year. The number of permitted vessels was divided with 846 and 808 allocated to the East and West coasts respectively. How many of those vessels landed king mackerel is unknown at this time. Catch per unit of effort data seems fairly consistent for the southeastern region of the Atlantic group king mackerel with an average CPUE of between 200-300 lbs/trip (McKenna, 1994). Most of the commercial landings of Atlantic group king mackerel are made by hook and line fishermen. In addition, because most landings of Atlantic group king mackerel are in Florida and the most



information that exists is on the Florida fishery, the following description will focus primarily on the Florida fishery unless noted otherwise.

#### King Mackerel Hook and Line Fleet

There were approximately 203 full and part time vessels in the hook and line mackerel fleet in 1980. Vessel size ranged from 22-44 feet in length. Today, the Florida South Atlantic troll fishery is composed of about 100 full-time and 100 part-time operations, about 150 of them are dependent upon king mackerel. Full-time fishermen operate primarily out of Jupiter, Port Salerno, Fort Pierce, Sebastian, and Rivera Beach. Normally, there is one fisherman to a boat. Part-time fishermen operate mostly out of Palm Beach, frequently two or three fishermen per boat. Approximately 40 percent of the full time trollers switch to bottom fishing for various reef fish after the Gulf king mackerel season. The remainder of these full time trollers tie up their boats when the Gulf king mackerel season ends. Some engage in various non-fishing jobs, while the majority reportedly wait for the opening of the Atlantic king mackerel season (GMFMC & SAFMC, 1994).

During the peak season about 75 to 100 troll vessels and 16 to 20 net vessels target king mackerel in the Keys. Net vessels usually start fishing late December, although some of these vessels troll for mackerel before net fishing becomes more practicable. Most king mackerel fishermen in the Keys target other species such as stone crab, spiny lobster, and reef fish throughout the year.

#### King Mackerel Net Fishing Fleet

There were approximately 89 large gill net vessels in Florida including full and part time in 1980. The vessels ranged in size from 30-65 feet. These vessels fished Spanish and king mackerel during the winter, but also targeted lobster, swordfish and bait fish during other times of the year. Vessels over 40 feet usually employed a power roller to haul nets. The large gill net fleet was primarily located from Florida's central east coast in Ft. Pierce, throughout the Florida Keys to the central west coast as far north as Cortez. There were also a few large boats in the Panhandle area of Port St. Joseph (Centaur Associates, 1981).

Approximately 87% of captains in the large gill net fleet at that time depended entirely upon fishing for their income. Net fishermen, then as they do today, have the options of participating in the Spanish mackerel fishery, trolling for king mackerel, and fishing with nets or hook and line for Atlantic group king mackerel after March (Centaur Associates 1981).

Today, there are twelve large net boats located in the Keys that may fish Atlantic group king mackerel occasionally. These vessels have a capacity of up to 40,000 pounds per trip and have had large catches of king mackerel in the past. There does not seem to be a small gill net boat sector for Atlantic king mackerel. In Monroe County there are 16 to 20 large net boats currently participating in the king mackerel fishery, some with capacity to land up to 50,000 pounds. There are another 6 to 12 small net boats in south-west Florida ready to enter the fishery when the opportunity arises. These vessels are 30 to 40 feet in length with capacities of 5,000 to 10,000 pounds.

There has been a general decline in net catches along the Florida east coast. This may be attributed to regulations like the prohibition of drift nets and purse seines, but also stems from the recent net ban in Florida state waters.

### King Mackerel Dealers

McKenna (1994) identified over 200 dealers in Florida who had handled king mackerel since 1987. In 1992 there were 240 who reported landings of king mackerel. Most of those dealers purchased king mackerel ten or fewer times per season and handled less than 5000 pounds. There were over twenty dealers who handled 100,000 pounds or more during the 1992 season (McKenna, 1994).

Possible fishing communities in Florida: Mayport, Port Orange, New Smyrna, Sebastian, Port Salerno, Rivera Beach, Ft. Pierce, Jupiter, West Palm Beach, Boyton Beaches, The Keys -- Upper Keys: Key Largo, Tavernier; Middle Keys - Islamorada, Marathon; Lower Keys; and Key West.

#### 4.3.3.1.6 Other Community related Analysis

In a recent survey of snapper grouper fishermen in the South Atlantic questions were posed concerning a fishermen's tenure within a community and attitudes towards community change. The results in Table 49 show that the majority of fishermen feel their community has stayed the same or has changed for the better. A larger percentage of inactive than active snapper grouper fishermen feel that their community has changed for the worse. Well over half of fishermen interviewed had been in their present community for twenty years or more. Over sixty percent of inactive fishermen have lived in their community for twenty years or more, while over fifty percent of active fishermen have lived in their communities for 19 years or less. The mean number of years a fishermen had resided in their present community was twenty years or more for North Carolina, South Carolina and Florida. In comparison Georgia snapper grouper fishermen had an average tenure in their communities of 6.5 years. This may be an artifact of the small sample size in Georgia as only seven fishermen from that state were interviewed, but could also be reflective of the nature of snapper grouper fishing in Georgia (Rhodes et al., 1997).

Table 49. Snapper Grouper Fishermen's Tenure and Attitude toward Change in their Present Community. Source: Socio-demographic Assessment of Commercial Reef Fishermen in the South Atlantic Region. 1997.

	Active (%)	Inactive (%)
Feel Your Community has changed?	(N=201)	(N=26)
For the better	41.8	30.8
For the worse	32.1	46.2
Stayed the same	25.9	23.1
	Active (Yrs)	Inactive (Yrs)
Number of Years in Present Community?	(N=201)	(N=26)
2-12	27.6	25.9
13-19	32.0	11.1
20-35	19.5	33.4
36 <	20.9	29.6

These perspectives on an individual's feelings toward a community become important when that person must face significant changes regarding his/her occupation, as is often the case when limited entry or some other form of fisheries management is implemented. An individual's commitment toward their community and sense of belonging will influence decisions on

whether to stay in fishing or within a particular community. The impacts become important for the community if many individuals face the same decision. When active fishermen were asked what is the likelihood of moving to a new town in the next 2-3 years most responded that it is unlikely, however, over 27% indicated they were not sure or it was likely. When both inactive and active fishermen were asked the likelihood of leaving commercial fishing altogether 46% of inactive fishermen said it was likely or very likely, while only 11% of active fishermen indicated such a likelihood. (Rhodes et al., 1997). These type of data at the community level would contribute much to the understanding of possible impacts of future fisheries management.

#### 4.3.3.1.7 Data Needs

As mentioned earlier, the data presented here is what is currently available and readily accessible. It is very limiting and does not provide a sufficient amount of detail needed to define and identify fishing communities. Therefore, the likelihood of realistic impact assessment of future fishing regulations on fishing communities is not good.

At the present the NMFS does not collect data on fishing communities. Therefore, it is impossible to realistically identify fishing communities in this amendment. There is a tremendous need for research to be conducted on a continuous basis to collect this information. Both state and federal government agencies have access to current information which can inform the process of identifying fishing communities. Permit databases for fishing licenses, wholesale and retail licenses, boat registrations, marina permits, boat landing locations, and many others exist now. Putting that information into one database is a monumental task, but should be undertaken soon. Geographic Information System software is now available and being used to compile much of the data regarding habitat. The same type of databases need to be created regarding fishing communities. Spatial analysis of the variables that help identify and define fishing communities can give useful insight into the changes that affect these coastal communities.

It is unlikely that Council Staff would be able to gather these data. Council staff have in the past, with the cooperation of industry, been able to gather important information about a particular fishery, but were criticized for not following OMB guidelines. The difficulty with following OMB guidelines is that approval of data gathering tools is too time consuming. Councils are often on a timeline to develop FMPs which does not allow for a lengthy approval process. The South Atlantic Council staff has sufficient expertise with this type of data collection that design, implementation and analysis can often take place during an extremely short time period with little burden upon the public. In fact, industry is often eager to provide these type of data for consideration during development of an FMP, but don't have the expertise to offer data a form that can be used by Council staff.

Data collection is critical to the future of impact assessment of fishing communities. Standards must be set and data need to be collected. At present, the ACCSP is attempting to set those standards and has included social and economic data in that program. The ACCSP Technical Source Document IV contains detailed social and economic data needs and draft survey instruments. Social and economic data collection projects should at least collect the minimum data elements. Support of ACCSP can be an important step in meeting the future needs of the councils with regard to fishing communities. In addition, another guideline for the types of data needed can be found in the Southeast Social and Cultural Data Analysis Plan (NMFS, 1994). The plan was designed to address many of the current social and cultural information needs for the three councils in the Southeast.

#### 4.3.4 Maximum Sustainable Yield (MSY), Optimum Yield (OY), Overfishing and Overfished Levels

##### Introduction

The Sustainable Fisheries Act (SFA) was approved by Congress in September 1996 and signed into law by the President on October 11, 1996. The Act shifted management to a "Maximum Sustainable Yield" (MSY) basis, redefined "overfished" and "overfishing", redefined the definition of "optimum", included a new section on "Rebuilding Overfished Fisheries", and substantially increased the responsibility to provide annual information for management through the "SAFE" report.

NMFS was to provide the Councils with "National Standard Guidelines" by September 1, 1997 (NMFS SFA Implementation Plan) to set standards and give direction for amending FMPs to address overfishing and other provisions. NMFS published proposed guidelines on August 4, 1997. The guidelines interpret and provide guidance for developing fishery management plans. NMFS received many comments by the September 18, 1997 deadline and decided to reopen the comment period for an additional 30 days beginning on December 29, 1997. After considering all public comments, NMFS published the final National Standard Guidelines on May 1, 1998.

Additional guidance was provided by NMFS in July with the publication of "Technical Guidance On the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act" dated August, 1998 (**Appendix A**). This information addresses those aspects of scientific fishery management advice that have biological underpinnings, such as the response of fish populations to exploitation. Based on this technical guidance, NMFS also prepared a "Checklist For FMP Amendments" to assist in making amendments to FMPs in order to comply with National Standard 1. NMFS invited Gregg Waugh, South Atlantic Council staff, to review the draft checklist and provide suggestions on how to make the checklist useful from the Council staff perspective. The initial analyses were based on a draft of the checklist dated July 31, 1998. A preliminary Council staff analysis was provided to NMFS for review and with a request to provide assistance with some of the values (**Appendix B**). Revisions were made after receiving comments from the NMFS Southeast Fisheries Science Center (**Appendix C**) and receiving a more recent draft of the checklist dated August 27, 1998 (**Appendix D**). The revisions are reflected in the material below.

Additional documents used include the following:

1. NMFS Prepared Stock Assessments — prepared for the SAFMC from 1992 through 1997.
2. Report of the Ad Hoc Crustacean Stock Assessment Panel — held June 1-3, 1998. This document (draft dated July 1, 1998) was prepared for the Gulf of Mexico Fishery Management Council.
3. Report of the Ad Hoc Finfish Stock Assessment Panel — chaired by Dr. James H. Cowan, Jr. and held June 22-25, 1998 in Miami, Florida. This document (draft dated July 10, 1998) was prepared for the Gulf of Mexico Fishery Management Council.
4. Report of the Second Ad Hoc Finfish Stock Assessment Panel — chaired by Douglas Gregory, Jr. and held August 24-26, 1998 in Ocean Springs, Mississippi. This document (draft dated August 31, 1998) was prepared for the Gulf of Mexico Fishery Management Council.
5. A Retrospective (1979-1996) Multispecies Assessment of Coral Reef Fish Stocks in the Florida Keys — J.S. Ault, J.A. Bohnsack, and G.A. Meester, Fish. Bull. 96(3):395-414. 1998. This document was reviewed by the SAFMC Snapper Grouper Assessment Panel and SSC; some

of the specific values for natural mortality (M) and M/K ratios were taken from information compiled in this paper.

6. Evaluation of Multiple Survey Indices in Assessment of Black Sea Bass from the U.S. South Atlantic Coast — D.S. Vaughan, B. Zhao, M.R. Collins, J.C. McGovern, and H.S. Meister. Fishery Stock Assessment Models, Alaska Sea Grant College Program, AK-SG-98-01, 1998.

### Evaluation Process

The Technical Guidance Document and The Checklist provide written guidance from the NMFS in interpreting the National Standard Guidelines. The approach used by the Council was to follow this written guidance in evaluating each of the species under management by the Council. Steps using the Checklist with references to the Technical Guidance Document are shown below. Much of the descriptive information under each heading was taken directly from the Technical Guidance Document and/or Checklist; the references can be found in Appendix A. We acknowledge the work by the individuals responsible for these two documents. Readers and reviewers are encouraged to read these two reports. The Technical Guidance Document is very technical and offers leading edge scientific advice; much of the material included and values referenced are not yet available in the published literature. The Checklist is less technical and provides an excellent guide through this process.

## **I. STATUS DETERMINATION CRITERIA (SDC)**

### **1. What is the level of available knowledge for the stock? (Technical Guidance Document, Section 2.2)**

The purpose of developing Status Determination Criteria is to monitor the status of the stock by comparing the results of stock assessments against the definitions of overfishing and overfished condition. The important issue is not so much whether a stock is data-poor or data-rich, but rather to ensure that its status with respect to the Status Determination Criteria can be assessed. The adequacy of the Status Determination Criteria and the ability to monitor the stock will improve by increasing the level of available knowledge to a higher level of data-richness.

The Technical Guidance Document offers three standards for measuring the level of data richness for a stock:

A. “Data-rich cases: Reliable estimates of MSY-related quantities and current stock size are available. Control rules typically involve parameters such as FMSY, BMSY, etc. Stock assessments may be sophisticated, and provide a reasonably complete accounting of uncertainty.”

**No species under management by the South Atlantic Council fall under this standard.**

B. “Data-moderate cases: Reliable estimates of MSY-related quantities are either unavailable or of limited use due to peculiar life history, poor data contrast, or high recruitment variability, but reliable estimates of current stock size and all critical life history (e.g., growth) and fishery (e.g., selectivity) parameters are available. Control rules typically involve parameters such as F35%, B35%, etc., or other proxies for MSY-related benchmarks. Stock assessments may range from simple to sophisticated and uncertainty can be reasonably characterized and quantified.”

**Our initial analysis (Appendix B) indicated the following species under management by the South Atlantic Council would have been included under this standard:** lane snapper, black sea bass, yellowtail snapper, gray snapper, mutton snapper, vermilion snapper, red porgy, gray triggerfish, red snapper, gag, scamp, red grouper, black grouper, greater amberjack, speckled hind, snowy grouper, warsaw grouper, golden tilefish, wreckfish, white grunt, red drum, Atlantic migratory group king and Spanish mackerel, and spiny lobster. **However, based on a review by the NMFS Southeast Fisheries Science Center (Appendix C) only one species, black sea bass, currently is data-moderate.**

C. **“Data-poor cases:** Reliable estimates of MSY-related quantities are unavailable, as are reliable estimates of either current stock size or certain critical life history or fishery parameters. Control rules typically involve parameters such as M, historical average catch, etc. Stock assessments are minimal, and measurements of uncertainty may be qualitative rather than quantitative.”

**The remainder of species under management by the South Atlantic Council fall under this standard (Table 50).** For many of the species, natural mortality is unknown and catch information is limited.

**Based on the information available in the most recent stock assessments for each species and the review by NMFS SEFSC, the proposed listing for species managed by the Council as shown in Table 50 was adopted by the Council.**

**2. What is the shape of the MSY control rule? (Section 2.1.1)**

The MSY control rule is used to define limits to exploitation. It can be thought of as a strategy in which the fishing mortality is controlled so as to achieve maximum long-term yield. The MSY control rule constitutes the Maximum Fishing Mortality Threshold (MFMT) and is used to determine the Minimum Stock Size Threshold (MSST).

We agree with the conclusion in Section 2.1.4 that “specifying an MSY control rule is a flexible process that should involve a great deal of communication between scientists and managers so that the tradeoffs between the relevant performance criteria are understood.” We also agree that given the unfortunate timetable, “it is desirable to propose a limit control rule that can be used as a default for defining SDC in the absence of more detailed analyses.”

**The Council decided to follow the report’s recommendation on page 20, as modified on page 24 for data-moderate species (currently only black sea bass). This will apply to other species as they are moved from data-poor to data-moderate.**

$$F(B) = \frac{F_{MSY} B}{c B_{MSY}} \quad \text{for all } B \leq c B_{MSY}$$

$$F(B) = F_{MSY} \quad \text{for all } B \geq c B_{MSY}$$

where  $c = \max(1-M, 1/2)$ ,  $F_{MSY}$  is the fishing mortality rate that maximizes long-term yield under a constant-F policy, and  $B_{MSY}$  is the equilibrium biomass expected when fishing constantly at  $F_{MSY}$ .

SNAPPER GROUPER FHP		DATA RICHNESS	SHAPE OF MSY RULE	NATURAL (H) MORTALITY	F-HSY PROXY	M/HT	SPRAT F-HSY (Log/Recruit)	MEAN RECRUITMENT	B-HSY PROXY	MSST	STATUS DETERMINATION	MIN TIME TO REBUILD	MAX TIME TO REBUILD	TARGET REBUILDING TRAJECTORY
Line snapper	Poor	Use Default	0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black sea bass	Moderate	Use Default	0.3	F30%	0.72	0.69	7.67M/LB	5.72M/LB	NA	NA	NA	NA	NA	NA
Yellowtail snapper	Poor	Use Default	0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gray snapper	Poor	Use Default	0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hutton snapper	Poor	Use Default	0.214	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vermillion snapper	Poor	Use Default	0.325	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Red porgy	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gray triggerfish	Poor	Use Default	0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hoffish	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Schoolmaster snapper	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Queen snapper	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blackfin snapper	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cubera snapper	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Doog snapper	Poor	Use Default	0.15	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pisgahay snapper	Poor	Use Default	0.333	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silk snapper	Poor	Use Default	0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Red snapper	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Go	Poor	Use Default	0.22	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Scamp (For Length)	Poor	Use Default	0.2	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Red grouper	Poor	Use Default	0.2	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black grouper	Poor	Use Default	0.19	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellowfin grouper	Poor	Use Default	0.15	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellowmouth grouper	Poor	Use Default	0.18	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Greater amberjack	Poor	Use Default	0.18	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Speckled hind	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Warsaw grouper	Poor	Use Default	0.15	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluke grouper	Poor	Use Default	0.08	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellowedge grouper	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Snowy grouper	Poor	Use Default	0.15	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Golden flletish	Poor	Use Default	0.15	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Masou grouper	Poor	Use Default	0.18	F40%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jawfish	Poor	Use Default	0.061	F40%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tomlate	Poor	Use Default	0.335	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blue runner	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wreckfish	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
White grunt	Poor	Use Default	0.25-0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black snapper	Poor	Use Default	0.3	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boni sea bass	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rock sea bass	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Poet hind	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grauphi	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Corey	Poor	Use Default	0.25	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dier grouper	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sheepshead	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gress porgy	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jolthead porgy	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Saucrage porgy	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Whitebone porgy	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Knobbed porgy	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Longpine porgy	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Scup	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Queen triggerfish	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ocean triggerfish	Poor	Use Default	NA	F30%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 50. Parameter estimates for species under management by the SAFMC.

4.0 Environmental Consequences

SNAPPER GROUPER FMP	DATA RICHNESS	SHAPE OF MSY RULF	MATURAL (M) MORTALITY	E-MSY PROXY	FHMT	SPR AT F-MSY (kg/ha/yr)	MEAN RECRUITMENT	B-MSY PROXY	MSST	STATUS DETERMINATION	MIN. TIME TO REBUILD	MAX. TIME TO REBUILD	TARGET REBUILDING FACTORY
Yellow Jack	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creville Jack	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bar Jack	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aimoo Jack	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lesser amber Jack	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Banded rodderfish	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spadefish	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black margate	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Porkfish	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Morgote	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Small mouth grunt	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
French grunt	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spanish grunt	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cattleneck	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Saltwater choise	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blue stripe grunt	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blue line flterfish	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sand flterfish	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Puddingwife	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>SHRIMP FMP</b>													
White Shrimp	Poor	Use Default	0.21-0.56/vk	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Brown Shrimp	Poor	Use Default	0.22-0.33/vk	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pink Shrimp	Poor	Use Default	0.28/vk	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rock Shrimp	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>RED DRUM FMP</b>													
Red Drum - Age 0-5	Poor	Use Default	0.23	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Red Drum - Age 6+	Poor	Use Default	0.11	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>MACKEREL FMP</b>													
Atlantic Migratory Group King Mackerel	Poor	Use Default	0.15	F 50%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atlantic Migratory Group Spanish Mackerel	Poor	Use Default	0.3	F 50%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caro Mackerel	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chiba	Poor	Use Default	0.35	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dolphin-fish	Poor	Use Default	0.66-5.3	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Little Tunny	Poor	Use Default	NA	F 30%	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>GOLDEN CRAB FMP</b>													
Golden Crab	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>SPINY LOBSTER FMP</b>													
Spiny Lobster (Penaeus argus)	Poor	Use Default	0.3	F 20%	NA	NA	NA	NA	NA	NA	NA	NA	NA
Slipper Lobster (Scyllarides mediter)	Poor	Use Default	NA	F 20%	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>CORAL FMP</b>													
Stony Corals and Sea fans	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Decorals (all species except sea fans)	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Live Rock	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>CALICO SCALLOP FMP</b>													
Calico Scallop	Poor	Use Default	12-23%/month	1.5%	5%	NA	NA	NA	NA	NA	NA	NA	NA
<b>SARGASSUM FMP</b>													
Poraglit Sargassum	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 50 (continued). Parameter estimates for species under management by the SAFMC.



Setting  $c = \max(1-M, 1/2)$ , where  $M$  is the natural mortality rate of the exploited age classes, seems reasonable insofar as one would expect a stock fished at  $F_{MSY}$  to fluctuate around  $B_{MSY}$  on a scale related to  $M$  (small fluctuations for low  $M$  and large fluctuations for high  $M$ ). See Figure 6 which is taken from page 20 in the Technical Guidance Document:

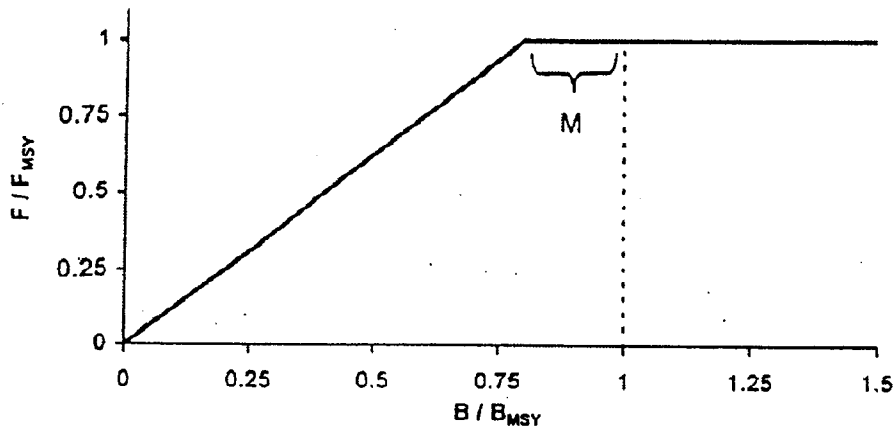


Figure 6. Recommended default MSY control rule. Source: Technical Guidance Document, Figure 4 (included as Appendix A).

This is a three-parameter linear-linear form and the proposed option for the Council to consider is a constant  $F$  management strategy when biomass is greater than  $(1-M) \cdot B_{MSY}$ .

### 3. Parameterize the MSY-control rule.

This step can only be taken for the data-moderate species. Based on the NMFS SEFSC review, only black sea bass are data-moderate.

**For “data-moderate” cases, the Council decided to use proxies for  $F_{MSY}$  based on the recommended data-moderate defaults shown on the bottom of page 24 in Section 2.2.1 of the Technical Guidance Document:** It is recommended that fishing mortality rates in the range of  $F_{30\%}$  to  $F_{60\%}$  be used as general default proxies for  $F_{MSY}$ , when the latter cannot be reliably estimated. In the absence of data and analyses that can be used to justify alternative approaches, it is recommended that  $F_{30\%}$  be used for stocks believed to have relatively high resilience,  $F_{40\%}$  for stocks believed to have low to moderate resilience, and  $F_{35\%}$  for stocks with average resilience. For stocks with very low productivity (such as rockfish and most elasmobranchs), fishing mortality rates in the range  $F_{50\%}$  to  $F_{60\%}$  are recommended.

The GMFMC Report of the Ad Hoc Finfish Panel (June 22-25, 1998 meeting) suggested using  $M/K$  (natural mortality rate/von Bertalanffy growth coefficient) ratios to gauge the potential for impacting species with less compensatory reserve and a lower potential for producing population biomass. “Species with low values of  $M/K$  (high growth with respect to natural mortality) are expected, and have been shown, to be able to sustain higher yields as a fraction of spawning stock biomass than those with high  $M/K$  (high natural mortality with respect to growth). This is largely due to the presence of multiple age classes from which spawning potential can be realized for those long-lived species with low natural mortality rates.” The Panel suggested that for species with  $M/K < 1.0$ , the SPR at  $F_{30\%}$  probably is a good

#### 4.0 Environmental Consequences

proxy for SPR at FMSY; for species with  $M/K > 1$ , fishing mortality rates corresponding to F30%SPR may exceed FMSY and thus the SPR proxies should be increased to values corresponding to SPR at F35%SPR; and for species with  $M/K > 1.5$ , SPRs corresponding to F40%SPR (or higher) may be the best proxies of SPR at FMSY.

The GMFMC Report of the Second Ad Hoc Finfish Panel (August 24-26, 1998 meeting) reexamined use of M/K ratios to gauge the potential for rebuilding: "The M/K ratio has been criticized because the variability observed in available estimates of M and K estimates among species are more likely due to sampling or estimation errors than to actual interspecific differences. They concluded that "while M/K ratios may provide some information on the relative resilience of a population, caution should be taken so that too much reliance is not placed on a given value of the index for any species without careful examination of all aspects of the stock and its fisheries." "The Panel discussed the potential use of other life history parameters/ratios, such as length-at-maturity to maximum length ( $L_{mat}/L_{\infty}$ ), age-at-maturity to maximum age ( $t_{mat}/t_{max}$ ), and other compensation ratios that may be useful in providing a scaling factors (sic) for ranking the relative vulnerability of populations to overfishing, however, no scientific studies or data were available to evaluate the validity of such scaling factors. Estimation of these parameters is also subject to error/uncertainty, and may be affected by fishing on the population, as noted for M/K ratios. Therefore, at the present time, no life history scaling factor, including M/K, can be recommended for ranking populations relative to their vulnerability to overfishing."

In our initial analysis SAFMC staff recommended following this approach (use of M/K ratios) for the data-moderate cases. This approach would also addresses public comments on the need to set levels based on the biology of the species rather than one level for all species. The M/K ratio values presented in the first GMFMC report were used for those species; for others, values of M and K were taken from the most recent stock assessment and the ratio calculated. However, based on the second GMFMC report and examination of available data the SAFMC staff recommendation changed to not ranking populations due to data limitations:

**The Council decided not to rank populations relative to their vulnerability to overfishing due to data limitations. In the interim, the Council decided to use a fishing mortality rate of F30%SPR as a proxy for F-MSY for data-moderate species (currently only black sea bass). When data become available to rank populations relative to their vulnerability to overfishing, the Council will evaluate modifying the MSY proxies.**

For data-poor cases, parameters were available for some of the species such that the M/K ratio was calculated in the initial analysis. For others, no estimates of natural mortality are available. The Technical Guidance Document contains the following in Section 2.2.2 Data-Poor Situations:

"If there are insufficient or inadequate data to conduct YPR and SPR analyses, or if estimates of F and B cannot be obtained for comparison with YPR and SPR reference points, there are few options for defining meaningful targets and limits. Priority should be given to bringing the knowledge base at least up to "data-moderate" standards. The natural mortality rate M has often been considered to be a conservative estimate of FMSY; however, it is becoming more and more frequently advocated as a target or limit for fisheries with a modest amount of

information. In fact, in several fisheries,  $F=0.8*M$  and  $F=0.75*M$  have been suggested as default limits for data-poor cases (Thompson 1993, NMFS 1996)."

**For species with a known natural mortality rate (M), the Council decided to use M as a proxy for FMSY and to indicate there is no known proxy for FMSY for those species indicated with NA on Table 50. The Council is proposing steps to bring these species up to the "data-moderate" level, and as soon as data become available, a FMSY proxy will be specified.**

#### MSY Proxies

The Magnuson-Stevens Act requires the Councils to include estimates of MSY for species under management. The Magnuson-Stevens Act defines overfishing and overfished as "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield on a continuing basis"; MSY is not defined in the act.

The proposed guidelines discuss alternatives to specifying MSY on page 41913 of the Federal Register notice. The statement is made: "...the fishing mortality rate that reduces the long-term average level of spawning per recruit to 30-40 percent of the long-term average that would be expected in the absence of fishing may be a reasonable proxy for the MSY fishing mortality rate." The source for this statement is Rosenberg et al (1994). SAFMC staff reviewed this publication and the related supplemental report (Mace et al, 1996) but could not find such a statement. It appears this is a policy statement by NMFS which can be defended based on a number of scientific papers particularly Clark (1991) in which the author concluded "Calculations made with a range of life history parameter values typical of demersal fish and a range of realistic spawner-recruit relationships show that yield will be at least 75% of maximum sustainable yield so long as the spawning biomass is maintained in the range of about 20-60% of the unfished level, regardless of the form of the spawner-recruit relationship. A relative spawning biomass in this range can be achieved by choosing a fishing mortality rate that will reduce the spawning biomass per recruit to about 35% of the unfished level."

During a meeting of the Snapper Grouper Assessment Group there was consensus for 30-40% static SPR as a proxy for MSY. Longer lived species would be closer to 40% and moderately long lived species, closer to 30%.

**The Council decided to do the following: (1) use a static SPR of 30% as a proxy for MSY for data-moderate species (currently only black sea bass); (2) continue to use the shrimp MSY estimates; and (3) to use static SPR to define levels of threshold, overfishing/MSY, and OY until data become available to use the biomass approach for all other species. Threshold as the Council is using it is explained below (see page 94).**

**4. Specify the Maximum Fishing Mortality Threshold (MFMT).** The MFMT is simply the value(s) of fishing mortality in the MSY control rule.

If the SAFMC chooses a constant-F MSY control rule, the MFMT will be a single value, that is, FMSY.

**For data-poor cases, the Council decided to use static SPR as a proxy for MFMT.**

This conforms to the recommendations contained in the Technical Guidance Document given that data do not exist to use a more precise measure.

**5. Estimate the Biomass at Maximum Sustainable Yield (BMSY).**

According to the National Standard Guidelines, the value of BMSY is to be computed with a constant-F strategy. In some instances, it is possible that values of BMSY for the stock in question are available from the literature, or that reasonable proxies may be defined (Section 2.2.1). Inasmuch as possible, computations of BMSY should take into account the relevant characteristics of the stock and fishery: selectivity, availability, stock-recruitment relationship, reproduction, growth, natural mortality, and natural variability.

For “data-moderate” cases (**currently only black sea bass**), proxies for BMSY should be used as follows:

- (a) the equilibrium or average biomass level corresponding to FMSY could be used as a proxy for BMSY.
- (b) BMSY can also be approximated by the mean recruitment ( $R_{\text{mean}}$ ) multiplied by either
  - (1) the level of spawning per recruit at FMSY — namely  $\text{SPR}(\text{FMSY})$ , or some proxy thereof; or
  - (2)  $30\text{-}60\%\text{SPRF}=0$  (the percentage being determined by the stock’s resilience to fishing).

**The Council decided to use the process outlined in (b) above for data-moderate species (currently only black sea bass).**

Council staff worked with NMFS to get the SSBR at F-MSY proxies of 30%SPR and 35%SPR and a mean recruitment value for black sea bass. B-MSY proxies were then calculated based on the formula:  $\text{BMSY} = \text{Mean Recruitment} * \text{SPRFMSY}$ . These values have been added to Table 49 for black sea bass.

**The Council decided to indicate there is no known proxy for BMSY for those species indicated with NA on Table 50. The Council will propose steps to bring these species up to the “data-moderate” level, and as soon as data become available, a BMSY proxy will be specified. The biomass levels or proxy levels will be added through the framework.**

The following wording was provided by Dr. Brad Brown, NMFS Southeast Center Director: “Evaluations of stock status for southeastern FMP species have generally relied on per recruit estimates of spawning potential (transitional SPR), thus estimates of biomass at MSY (BMSY or proxies thereof) and of current biomass are generally not available. Where the information for calculating (BMSY) are available in the Stock Assessment Working Committee reports, as they are for red snapper and mackerel BMSY can be estimated. For many other stocks an estimate of BSMY (or proxy thereof) can be obtained as the product of the amount of expected spawning biomass per recruit at the MSY fishing mortality (FMSY) and an estimate of expected recruitment levels at BMSY and estimates of current biomass require further evaluation of the available data. This evaluation will take place within the year.” (Source: email 9/11/98.)

The process described above for calculating B-MSY proxies uses the SSBR value in terms of kilograms per recruit at transitional SPR levels multiplied by a mean estimate of recruitment to arrive at a biomass proxy. In the past, we have used the transitional SPR values directly as an indicator of the overfished status (e.g., snapper grouper and mackerel overfishing options contained in this document). The recent changes in the Magnuson-Stevens Act to a MSY-based approach, the National Standards Guidelines, the Technical Guidance Document, and the Checklist all indicate the status determination criteria must specify both a maximum fishing mortality threshold and a minimum stock size threshold. Under this new guidance, we

can no longer use transitional SPR directly as a proxy for the biomass component of the overfishing definition since it is measured on a yield-per-recruit basis and not on a biomass basis.

**6. Specify the Minimum Stock Size Threshold (MSST).**

The MSST will be the greater of (a) one-half BMSY, or (b) the minimum stock size at which rebuilding to the BMSY level would be expected to occur within 10 years if the stock were consistently exploited according to the MFMT. Again, the necessary computations should be made according to the MSY control rule chosen by the Council and taking into account the relevant characteristics of the stock and fishery. Optionally, the Councils may use the recommended default MSY control rule and MSST of Section 2.1.4.

**The Council decided that given we do not have simulation analyses to determine the lowest biomass for which rebuilding to BMSY would take 10 years if fishing at the MFMT, the Council would use the default in Section 2.1.4:**

$$\text{MSTT} = \max(0.5, 1-M) * \text{BMSY}.$$

This formula was used to calculate the MSST values based on the values provided by NMFS for black sea bass. These values have been added to Table 50.

**The Council decided to indicate there is no known MSST for those species indicated with NA on Table 50. The Council is proposing steps to bring these species up to the “data-moderate” level, and as soon as data become available, a MSST will be specified.**

**II. OPTIMUM YIELD (OY)**

**1. What is the shape of the target control rule that defines OY?** (See Section 3 of the Technical Guidance Document.) The MSY control rule is used to define limits to exploitation (the Status Determination Criteria). The Optimum Yield (OY) is a target for management of the fishery, and is constrained to keep the stock at or above BMSY. In many cases, the shape of the target control rule that defines OY will be the same as the shape of the MSY control rule. However, the National Standard Guidelines do not require that this be the case necessarily, and the Councils may wish to select another shape based on additional considerations.

**The Council decided to use the same shape for the target control rule that was recommended for the MSY control rule.**

**2. Parameterize the target control rule?**

(See Sections 3.1, 3.2 and 3.3 of the Technical Guidance Document.) The target control rule that defines OY should be parameterized taking into account the objectives of management (e.g., long-term magnitude of yield, interannual yield variability, socioeconomic considerations). The approaches outlined in Sections 3.1 and 3.2 can be used to carry out the necessary computations. It is not a good idea to avoid making computations by setting the target control equal to the MFMT because, due to variability alone, overfishing ( $F > \text{MFMT}$ ) could take place 50% of the time, or more. The recommended default to be used in the absence of detailed analyses sets the target  $F$  to be 25% below the recommended default MFMT (Section 3.3).

**The Council decided to use F at 40% Static SPR for black sea bass OY. For all data-poor species the Council decided to use static SPR values for OY. The specific values are described below under each FMP discussion.**

The Snapper Grouper Assessment Group suggested that there be a 10% difference between OY and the overfished level so that one would be able to detect the difference scientifically. Black sea bass and red porgy are two species for which we have longer term data sets. Biomass projections are possible for these species but have not been done as of this date. For species that switch sex, it was recommended that SPR be calculated using both sexes and that the overfished level be  $F_{0.1}$  while the threshold level should be  $F_{max}$ .

**3. Is the target control rule precautionary?** The National Standard Guidelines recommend that the target control rule defining OY be precautionary. Once the target is defined, it could be deemed to be precautionary if it adheres to the following characteristics:

- (a) Is  $F$  (target)  $<$  MFMT? Yes for black sea bass (data-moderate) and for the data-poor species for which an estimate of static SPR is available.
- (b) If stock size were reduced below BMSY, would  $F$  (target) also be reduced? Yes it would using the default target in Section 3.3. This determination applies to black sea bass (data-moderate) and for the data-poor species for which  $F$  (target) is specified.
- (c) Is the target risk-averse in the sense that increased uncertainty leads to more conservatism? Yes it would using the default target in Section 3.3. This determination applies to black sea bass (data-moderate) and for the data-poor species for which  $F$  (target) is specified.

It should be noted that the Council is taking a precautionary approach for species in the data-poor category. Regulations concerning size and bag limits for species in the snapper grouper management unit are shown in Table 51. As can be seen, regulations are currently in place and will continue to be in place for a number of data-poor species.

### **III. REBUILDING PLANS (See Section 3.4 of the Technical Guidance Document.)**

A carefully chosen target control rule should incorporate rebuilding elements that prevent the stock size from falling below the MSST. For example, implementing a target that conforms to the three precautionary attributes in item 3, above, should prevent a healthy stock from becoming overfished. Nevertheless, it is certain that many stocks are already overfished, i.e. below the MSST. A special rebuilding plan may be required for these stocks in order to bring them up to or above the B-MSY level.

Rebuilding plans must be designed to achieve the desired result within a specified time period. For this reason, and because different stocks have different population dynamics characteristics, defining rebuilding plans will almost certainly necessitate computations that are not readily available in the literature. Councils should work together with assessment scientists to carry out the necessary computations. Inasmuch as possible, such computations should take into account the relevant characteristics of the stock and fishery: current stock size and its uncertainty,

selectivity, availability, stock-recruitment relationship, growth, natural mortality, and natural variability.

The following items should be addressed in designing a rebuilding plan (Section 3.5):

1. What is the minimum possible time to rebuilding,  $T_{min}$ ?

According to the National Standard Guidelines,  $T_{min}$  is computed by setting  $F$  equal to zero and projecting the stock forward in time. Accounting for uncertainty in current stock size as well as uncertainty in future productivity (e.g., in the stock-recruitment relationship),  $T_{min}$  would be the time elapsed until the B-MSY level is achieved with 50% probability.

**The Council determined this value is not currently available for any species under management by the South Atlantic Council. The Council decided to use this approach to calculate  $T_{min}$  and recommended this be added as a deliverable in all future stock assessments.**

2. What is the maximum allowable time to rebuilding,  $T_{max}$ ?

If  $T_{min}$  is less than 10 years, then  $T_{max}$  is 10 years. Otherwise, the maximum allowable time is  $T_{min}$  plus 1 generation time (See Section 3.4 for the definition of generation time).

**The Council determined this value is not currently available for any species under management by the South Atlantic Council. The Council decided to use this approach to calculate  $T_{max}$  and generation time. Further, these two values be added as deliverables in all future stock assessments.**

3. What is the target rebuilding time period,  $T_{target}$ ?

In general,  $T_{target}$  should be as short as possible and shorter than  $T_{max}$ . Under the very special circumstances detailed in Section 600.310(e)(4) of the National Standard Guidelines, Councils could set the target rebuilding time period to be equal to  $T_{max}$ . The recommended default in Section 3.4 of the technical guidance document is to set  $T_{target}$  below the midpoint between  $T_{min}$  and  $T_{max}$ .

Section 600.301(e)(4) is as follows (taken directly from the National Standard Guidelines):

“(4) Constraints on Council action. (i) In cases where overfishing is occurring, Council action must be sufficient to end overfishing.

(ii) In cases where a stock or stock complex is overfished, Council action must specify a time period for rebuilding the stock or stock complex that satisfies the requirements of section 304(e)(4)(A) of the Magnuson-Stevens Act.

(A) A number of factors enter into the specification of the time period for rebuilding:

- (1) The status and biology of the stock or stock complex;
- (2) Interactions between the stock or stock complex and other components of the marine ecosystem (also referred to as “other environmental conditions”);
- (3) The needs of fishing communities;

#### 4.0 Environmental Consequences

(4) Recommendations by international organizations in which the United States participates; and

(5) Management measures under which an international agreement in which the United States participates.

(B) These factors enter into the specification of the time period for rebuilding as follows:

(1) The lower limit of the specified time period for rebuilding is determined by the status and biology of the stock or stock complex and its interactions with other components of the marine ecosystem, and is defined as the amount of time that would be required for rebuilding if fishing mortality were eliminated entirely.

(2) If the lower limit is less than 10 years, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can result in the specified time period exceeding 10 years, unless management measures under an international agreement in which the United States participates dictate otherwise.

(3) If the lower limit is 10 years or greater, then the specified time period for rebuilding may be adjusted upward to the extent warranted by the needs of fishing communities and recommendations by international organizations in which the United States participates, except that no such upward adjustment can exceed the rebuilding period calculated in the absence of fishing mortality, plus one mean generation time or equivalent period based on the species' life-history characteristics. For example, suppose a stock could be rebuilt within 12 years in the absence of any fishing mortality, and has a mean generation time of 8 years. The rebuilding period, in this case, could be as long as 20 years.

(C) A rebuilding program undertaken after May 1, 1998 commences as soon as the first measures to rebuild the stock or stock complex are implemented.

(D) In the case of rebuilding plans that were already in place as of May 1, 1998, such rebuilding plans must be reviewed to determine whether they are in compliance with all requirements of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act.

(iii) For fisheries managed under an international agreement, Council action must reflect traditional participation in the fishery, relative to other nations, by fishermen of the United States."

**The Council determined this value is not currently available for any species under management by the South Atlantic Council. The Council decided to use the recommended default to set  $T_{target}$  below the midpoint between  $T_{min}$  and  $T_{max}$ .**

The Council's Snapper Grouper Assessment Group discussed the time period for rebuilding? Is it going to be a maximum of 10 years or is it going to be up to 10 years unless the biology of the species justifies longer (e.g., snappers-except red snapper-10 years and groupers & red snapper 15 years as currently applies in the snapper grouper plan)?

The Snapper Grouper Assessment Group concluded that rebuilding to OY should occur within a time period equal to 1.5 times the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production. The generation time for red snapper is 14 years; therefore, the timeframe to rebuild to OY would be 21 years (1.5 times 14 = 21).



The Council will address these recommendations as information becomes available in future stock assessments. The National Standard Guidelines indicate that for species which cannot be rebuilt in less than 10 years, the maximum rebuilding timeframe is 10 years plus 1 mean generation time.

4. What is the target rebuilding trajectory?

The rebuilding plan would best be specified as a target control rule, designed to achieve rebuilding in  $T_{\text{target}}$  years with 50% probability, or higher. The rebuilding trajectory should clearly identify milestones to be met during rebuilding. The technical guidance document does not recommend a default rebuilding trajectory because the rebuilding plans must, by necessity, be stock-specific. They must take into account not only the stock's productivity, but also its current status relative to B-MSY.

Rebuilding overfished stocks will almost certainly require temporary sacrifices in yield relative to current catch levels. A target rebuilding trajectory that delays such sacrifices until the final years in the plan would not be precautionary and may have a low probability of success.

**The Council determined these rebuilding trajectories are not currently available for any species under management by the South Atlantic Council. The Council decided to use a target control rule designed to achieve rebuilding in  $T_{\text{target}}$  years with at least a 50% probability. Further, that target rebuilding trajectories and associated probabilities (presented from 0% to 100% at 10% intervals) be added as a deliverable in all future stock assessments.**

**The Council decided to not change existing rebuilding timeframes given the lack of estimates for any species for  $T_{\text{min}}$ ,  $T_{\text{max}}$ ,  $T_{\text{target}}$ , and simulations to calculate rebuilding trajectories.**

Discussion

The following discussion is included to help explain the Council's determinations as we move from fishery management under an SPR-based approach to the new MSY-based approach:

Rebuilding to a level of 20%-30% SPR within a 10-15 year timeframe is feasible for most species under management; some can be rebuilt sooner, for some a lower SPR level would be sufficient, and some cannot be rebuilt within 10-15 years even if all fishing mortality was removed due to their long-lived, slow growing life history characteristics. If the fishing mortality rate component of the overfished level were to be set at 40% SPR or even 50%-55% SPR for species that switch sex, we are setting the system up for failure.

It is important to separate the indicators of stock status being discussed. The following three levels have been used by the SAFMC in the past. In actual fact, this represents the Council's "control rule". The term "threshold" is best used when describing a level below which one would never want to drive a stock. If data were available to estimate biomass, "threshold" would be specified in terms of biomass. The overfishing, overfished, MSY, and OY were specified in terms of SPR or fishing mortality rate given that data were not available to allow the Council to use biomass.

In the past to determine how overfished was defined, the Council considered the following definitions and table (Note: See Table 53 on page 136 for a summary of the Council's current control rules.):

(a) **Threshold** — if the indicator was less than the threshold level, the Councils would immediately take appropriate action including but not limited to eliminating directed fishing mortality and evaluating measures to eliminate any bycatch mortality in a timely manner.

(b) **Overfished** — if the indicator was above the threshold level but below the overfished level, the mandated timeframe to rebuild to above the overfished level within 10 years (or longer if warranted based on biology) would have been operative.

(c) **Optimum Yield** — if the indicator was less than OY but greater than or equal to the overfished level, the Council would have had more flexibility in specifying the timeframe to achieve OY.

INDICATORS	THRESHOLD	OVERFISHED	OPTIMUM YIELD
Fishing Mortality Rate (F)	F <sub>5%</sub> or F <sub>10%</sub>	F <sub>20%</sub> or F <sub>30%</sub> F <sub>max</sub> or F <sub>msy</sub>	F <sub>30%</sub> , F <sub>40%</sub> or F <sub>50%</sub> F <sub>0.1</sub> or F=M (natural mortality rate)
Stock Biomass (B)	1/4B-MSY	B < B-MSY	B ≥ B-MSY
Spawning Potential Ratio (SPR)*	SPR = 5% to 10%	SPR = 20% - 30%	SPR = 30% - 50%
Others (Eggs/Recruit, Number Pups/Recruit, Relative abundance, etc.)			

**\*Spawning Potential Ratio (SPR)** — The best way to think of the threshold, overfished, and optimum yield SPR definitions is to relate them to the amount of spawners in the water. Research for a number of species has shown as the percentage of spawners is reduced from the number or amount in pounds that would be in the water if there was no fishing, the risk of stock collapse increases. If the amount of spawning fish is reduced below 20% (which the scientists refer to as 20% SPR), the chance of stock collapse becomes a very real possibility. If it is reduced below 10%, you can be pretty sure you are going to see severe declines in numbers of fish and probably see the stock collapse. If we had sufficient information to accurately determine where this level was for each species, we would have the necessary information to avoid any biological problems. The problem is our information is incomplete and we do not know what the specific percentage is for each species to prevent risk of stock collapse. As a result, the South Atlantic Council in the past proposed to aim for having 40% of the spawners in the water that would be there if there was no fishing (scientists call this 40% SPR). In this way, when the stock declines for environmental or other "non-fishing" reasons, the spawners should not have gone below the 20% level. Some years the quantity of spawners would have been above 40% and some years below 40%. The South Atlantic Council wanted to ensure it would have remained above the 20% level thereby avoiding problems and risk of stock collapse.

Under the revised Magnuson-Stevens Act new requirements apply and the above levels must be modified. SPR values cannot be directly used as proxies for biomass based parameters.

**Milestones during the rebuilding time period.**

The Snapper Grouper Assessment Group discussed this and it was recognized that projections could be made but that one would need to make assumptions about future recruitment and future fishing mortality rates.

**5. What mechanisms will be used to monitor progress with respect to the target rebuilding trajectory?**

A rebuilding plan is an agreed set of decisions that should be implemented effectively. Stocks under rebuilding plans must be monitored closely so that adjustments can be made to the trajectory when the rebuilding milestones are not being met due to any reason. For example, if the plan's target  $F_s$  are exceeded due to quota over-runs, subsequent target  $F_s$  should be adjusted downwards in order to put the stock back on the plan's recovery trajectory. A sound rebuilding plan should identify how the monitoring will be carried out (e.g., through annual assessments and tracking of milestones) and ensure that the stock will be maintained at the target trajectory.

**The Council determined that the 1998/99 Operations Plan should reflect that the NMFS SEFSC will provide B-MSY proxies for all species for which SSBR values are available.**

Discussion

The 1997/98 Operations Plan is attached as **Appendix E**. Council staff will add the requirement to provide B-MSY proxies for 1998/99.

**MOVE SPECIES FROM DATA-POOR TO AT LEAST DATA-MODERATE**

Section 2.2.2 of the Technical Guidance Document describes Data-Poor Situations: "If there are insufficient or inadequate data to conduct YPR and SPR analyses, or if estimates of  $F$  and  $B$  cannot be obtained for comparison with YPR and SPR reference points, there are few options for defining meaningful targets and limits. Priority should be given to bringing the knowledge base at least up to "data-moderate" standards."

The National Standard Guidelines also address this expanded responsibility for the Councils to improve the data-base used for management:

"Section 600.315 National Standard 2—Scientific Information.

\* \* \* \* \*

(c) \* \* \*

(2) An FMP should identify scientific information needed from other sources to improve understanding and management of the resource, marine ecosystem, and the fishery (including fishing communities).

(3) The information submitted by various data suppliers should be comparable and compatible, to the maximum extent possible.

\* \* \* \* \*

(e) \* \* \*

(1) The SAFE report is a document or set of documents that provides Councils with a summary of information concerning the most recent biological condition of stocks and the marine ecosystems in the FMU and the social and economic condition of the recreational and commercial fishing interests, fishing communities, and the fish processing industries. It summarizes, on a periodic basis, the best available scientific information concerning the past,

present, and possible future conditions of the stocks, marine ecosystems, and fisheries being managed under Federal regulation.

\* \* \* \* \*

(ii) The SAFE report provides information to the Councils for determining annual harvest levels from each stock, documenting significant trends or changes in the resource, marine ecosystems, and fishery over time, and assessing the relative success of existing state and Federal fishery management programs. Information on bycatch and safety for each fishery should also be summarized. In addition, the SAFE report may be used to update or expand previous environmental and regulatory impact documents, and ecosystem and habitat descriptions.

(3) Each SAFE report should contain a description of the maximum fishing mortality threshold and the minimum stock size threshold for each stock or stock complex, along with information by which the Council may determine:

(i) Whether overfishing is occurring with respect to any stock or stock complex, whether any stock or stock complex is overfished, whether the rate or level of fishing mortality applied to any stock or stock complex is approaching the maximum fishing mortality threshold, and whether the size of any stock or stock complex is approaching the minimum stock size threshold.

(ii) Any management measures necessary to provide for rebuilding an overfished stock or stock complex (if any) to a level consistent with producing the MSY in such fishery.

(4) Each SAFE report may contain additional economic, social, community, essential fish habitat, and ecological information pertinent to the success of management or the achievement of objectives of each FMP.”

**The Council concluded that the Atlantic Coastal Cooperative Statistics Program (ACCSP) should be implemented after approval by the ACCSP Coordinating Council in October 1998. It is the Council’s intent that the ACCSP data program be mandatory within all South Atlantic Council FMPs.**

#### Discussion

The Council has participated in the development of the ACCSP. Council staff serve on/contribute to the ACCSP Coordinating Council, (Bob Mahood), Operations Committee (Gregg Waugh), Technical Committees (Roger Pugliese), Information Work Group (Susan Buchanan), Economic & Social Science Committee (Theo Brainderd and Mike Jepson), and Advisory Panel (Jodie Gay). The ACCSP data program represents a regional, coordinated effort to collect the minimum set of data necessary for managing fisheries on the East Coast of the United States. Close coordination has been maintained with a similar effort in the Gulf of Mexico through the Gulf States Marine Fisheries Commission, RECFIN, and COMFIN. This program will require some level of change by each partner and upon full implementation over the next several years, this effort will provide us with a comprehensive and coordinated data collection and data management program. Catch, effort, bioprofile (size and age information), social, economic, and bycatch information will be available throughout the range of a fishery. As required by the Magnuson-Stevens Act the information will be comparable and compatible across the range of the fishery.

SAFMC staff will work with NOAA General Counsel to determine the appropriate procedure to remove all the varied data reporting requirements in individual FMPs and reference one comprehensive data reporting document. This will be done during 1999.

The Council decided to take the lead in providing SAFE Reports according to the following schedule:

- A. Wreckfish Fishery — February 12, 1999
- B. Mackerel (Including Dolphin) Fishery — May 21, 1999
- C. Golden Crab Fishery — May 21, 1999
- D. Spiny Lobster Fishery — May 21, 1999
- E. Rock Shrimp & Calico Scallop Fisheries — September 3, 1999
- F. Red Drum Fishery — September 3, 1999
- G. Snapper Grouper Fishery — November 12, 1999
- H. Habitat/Sargassum/Coral — November 12, 1999

SAFE Reports will be available from the Council office on or before the above dates. NMFS is responsible for designating a NMFS staff member or members to participate in developing the above SAFE reports. Information required from NMFS and the associated deadlines will be described and agreed to in the annual Operations Plans. SAFMC Staff will present the major findings of the SAFE report at each Council meeting following delivery of the report.

#### Discussion

“Section 304(e) REBUILDING OVERFISHED FISHERIES.--(1) The Secretary shall report annually to the Congress and the Councils on the status of fisheries within each Council’s geographical area of authority and identify those fisheries that are overfished or are approaching a condition of being overfished. For those fisheries managed under a fishery management plan or international agreement, the status shall be determined using the criteria for overfishing specified in such plan or agreement. A fishery shall be classified as approaching a condition of being overfished if, based on trends in fishing effort, fishery resource size, and other appropriate factors, the Secretary estimates that the fishery will become overfished within two years.”

This, if you will, is a similarly tight box Congress put NMFS and the scientific community in; the Councils must rebuild within 10 years (slightly longer for some species) — NMFS must supply the Councils with annual and current information (contained in what is called the SAFE report). The proposed guidelines add this information under National Standard 2 (included above).

The requirement for SAFE reports is not new, however, Magnuson-Stevens significantly increases the scope and importance of these reports. NMFS must provide the Councils with annual SAFE reports which include annual and current (data through the previous fishing year) stock assessments and available economic, social, community and ecological information pertinent to the success of management or the achievement of objectives of each FMP. This is a tremendous undertaking but it is also of paramount importance if the Councils are to achieve rebuilding goals within the specified time period.

Currently the deliverables for the SAFE report have taken the form of a “Table of Contents” merely listing what documents are available. This does not meet the requirements under the Magnuson-Stevens Act, National Standard Guidelines, Technical Source Document, or Checklist. It is absolutely critical the Council have this information on an annual basis. The Council’s position is to have Council staff function in a lead role and incorporate deliverables from NMFS. It should also be recognized that due to the large numbers of species for which annual assessments/evaluations are required, outside assistance through other federal agencies, state agencies, and universities may be necessary to complete this task. Programmatic funding in the Council’s budget would assist greatly in this activity.

**4.3.4.1 ACTION 5. Amend the Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs as required.**

The following management options are organized by existing fishery management plans. New fishery management plans were proposed to be established for Calico Scallops and Sargassum in the public hearing draft of the Comprehensive Habitat Amendment; information on both of these FMPs was contained in the Comprehensive Habitat Amendment and the Comprehensive Amendment Addressing Sustainable Fishery Act Definitions And Other Required Provisions In Fishery Management Plans Of The South Atlantic Region. Based on NOAA General Counsel guidance and the requirements of the Magnuson-Stevens Act, there are now two separate FMPs for these two species. Because of the nature of the options for MSY, OY, and overfishing, the impacts are presented in a format that addresses all of these options in general.

Biological Impacts

Biological impacts will vary depending on the levels selected for MSY, OY, and overfishing. The more conservative the level, the more positive the impacts will be for the resources.

Economic Impacts

A number of options are proposed to define MSY, OY, overfishing, and overfished for the shrimp, red drum, snapper grouper, coastal migratory pelagics, golden crab, spiny lobster, coral, coral reefs and live/hard bottom habitat to meet the mandates of the Magnuson-Stevens Fisheries Management Act. The existing FMPs and amendments contain definitions that should create stable fisheries and maintain economic benefits in the long-term. These measures that define MSY, OY, overfishing, and overfished do not result in any direct economic impacts. It is the other measures that restrict fishing activities to achieve the defined levels of MSY, OY, overfishing, and overfished that impact fishing activities.

However, if the proposed definitions for MSY, OY, overfishing, and overfished in this comprehensive amendment are more restrictive than the current ones, there could be some impact on fishing activities. For example, if the MSY is set lower than the current Spawning Potential Ratio (SPR) level, the Council will have to lower quotas, TACs, etc. for fisheries that have them. This will result in a lower total harvest and could reduce total revenue depending on market conditions. One fishery that this is most likely to happen in is the snapper grouper fishery. In anticipation of this, the Council was conservative in the measures proposed in Snapper Grouper Amendment 9 to reduce fishing mortality for a number of species within the management unit. Thus, any further impacts as a result of this proposed measure, will be minimal. There are no data to determine what the level of impact, if any, would be as a result of these proposed measures.

Social Impacts

The social impacts that come from defining overfishing, maximum sustainable yield, and optimum yield stem from the management measures that are implemented to reach each goal. The choice of an overfishing definition certainly has impacts when stocks reach that level because the Council must implement a program to begin rebuilding stocks above that level. There may be short term negative impacts associated with measures implemented to help stocks recover, but the long term benefits of a healthy fishery depend upon a sustainable resource. The

program determined to best help a stock recover from overfishing must also meet mandated time frame requirements. The associated impacts would surely depend upon the Council's program for stock recovery within that time frame.

Selecting optimum yield is less rigid than overfishing, and economic and social factors are to be incorporated into the selection. This makes selecting optimum yield slightly more uncertain because economic and social information about fisheries is often lacking. There is also no time frame requirement for reaching optimum yield, although the Council is supposed to continuously make progress toward that goal. The impacts from selecting optimum yield will most likely depend upon the time frame chosen to reach optimum yield and the associated benefits that are desired from the fishery.

Choosing a particular percentage SPR for overfishing is primarily a biological decision about stock sustainability. Social impacts should be beneficial if the SPR chosen will ensure that stocks will remain sustainable or reach sustainable levels. Optimum yield at a particular SPR level may have various impacts depending upon which species is being considered. It has been suggested that for some species dropping below 40% SPR may compromise long-term viability for the stock. In such a case, the long-term sustainability might also be affected. Therefore, the Council may wish to choose a risk averse strategy and manage certain fisheries at this level. Other species may be stable at a lower SPR level. Again, the social impacts would come from the associated measures the Council would implement to reach optimum yield. Since most fisheries have been managed at lower SPR levels, there could be considerable impacts if the Council were to try to attain a 40% SPR level in a very short time frame. Because biological management measures are dependent upon the stock assessment which is analyzed using the SPR level chosen as target level (Optimum Yield), the ensuing impacts become tied to the selection of a target and the speed at which that target is to be reached.

Recently the SAFMC deliberated over management measures for the Snapper Grouper FMP. At the same time, NMFS guidelines were published which implied more stringent definitions of overfishing may be required. With that information, the Council revised management measures and approved alternatives which were more stringent and had greater social and economic impacts. Although the setting of MSY, overfishing, and optimum yield may not be directly tied to impacts, the actions will certainly affect the direction of impacts, if not the magnitude.

### Conclusions

A number of options are proposed to define MSY, OY, overfishing, and overfished for the shrimp, red drum, snapper grouper, coastal migratory pelagics, golden crab, spiny lobster, coral, coral reefs and live/hard bottom habitat to meet the mandates of the Magnuson-Stevens Fisheries Management Act. Existing Council FMPs and amendments contain definitions that should create stable fisheries and maintain economic benefits in the long term. If the proposed options selected for MSY, OY, overfishing, and overfished in this comprehensive amendment are more restrictive than the current ones, there could be some impact on fishing activities. For example, if the MSY is set lower than the current Spawning Potential Ratio (SPR) level, the council will have to lower quotas, TACs, etc. for fisheries that have them. This will result in lower total harvest and could reduce total revenue depending on market conditions. One fishery that this is most likely to happen is the snapper grouper fishery. The Council in anticipation of this was conservative in the measures proposed in Snapper Grouper Amendment 9 to reduce fishing effort in a number of species within the management unit. Thus, any further impacts as a

result of this proposed measure could be minimal. There is no data to determine what the level of impact, if any would be as a result of this proposed measure.

#### **4.3.4.1.1 Shrimp FMP**

##### **ACTION 1. Maximum Sustainable Yield (MSY).**

**The Council concluded that No Action is necessary at this time.**

##### Discussion

Because shrimp are annual crops that fluctuate considerably from year to year depending primarily on environmental factors, MSY is not a particularly useful concept (Shrimp FMP (1993), pages 16-17). For management purposes, MSY was considered to be the mean total landings for the southeast region:

White Shrimp	= 14.5 million pounds
Brown Shrimp	= 9.2 million pounds
Pink Shrimp	= 1.8 million pounds

The same methodology was used to generate a MSY proxy for rock shrimp (Shrimp Amendment 1 (1996), pages 32-33):

Rock Shrimp	= 6.8 million pounds
-------------	----------------------

##### Other Possible Options:

**Option 1.** MSY is equal to 30%-40% static SPR (Council to specify).

##### Discussion

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected this option because SPR is not appropriate for shrimp and because the current MSY is based upon the best available data.

**Option 2.** Other modifications to the proxy MSY values. (Note: Under this option, one would have to develop the rationale for any such modification.)

##### Discussion

The Council rejected this option because no other proxies were suggested and because the current MSY is based upon the best available data.

##### **ACTION 2. Optimum Yield (OY).**

**The Council concluded that No Action is necessary at this time.**

##### Discussion

White Shrimp (Shrimp FMP (1993), pages 65-66). OY for the white shrimp fishery is defined as the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction. This level has been estimated only for the central coastal area of South Carolina, and only in terms of subsequent fall production (assumed to represent recruitment). Therefore, in actual application, OY for the white shrimp fishery is the amount of harvest that can be taken by the U.S. fishery during the



fishing season which may vary from year to year based on both state regulations and regulations promulgated pursuant to this plan (i.e., closures due to cold kills).

Rock Shrimp (Shrimp Amendment 1 (1996), page 32). OY is MSY which for the rock shrimp fishery in the south Atlantic EEZ is defined as the amount of harvest that can be taken by U.S. fishermen without reducing the spawning stock below the level necessary to ensure adequate reproduction.

Brown and Pink Shrimp (Shrimp Amendment 2 (1996), pages 59-61). OY for the brown shrimp and pink shrimp fisheries in the south Atlantic EEZ are defined as the amount of harvest that can be taken by U.S. fishermen without annual landings falling two standard deviations below mean landings 1957-1993 for three consecutive years [2,946,157 pounds (heads on) for brown shrimp and 286,293 pounds (heads on) for pink shrimp].

### **Other Possible Options:**

**Option 1.** The South Atlantic Council's target level or Optimum Yield (OY) is 30% to 100% static SPR (Council to specify).

#### **Discussion**

The Council rejected this option because SPR is not appropriate for shrimp and because the current OY is based upon the best available data.

**Option 2.** Other modifications to the Optimum Yield (OY) specifications. Note: Under this option, one would have to develop the rationale for any such modification.

#### **Discussion**

The Council rejected this option because no other proxies were suggested and because the current OY is based upon the best available data.

### **ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

**The Council concluded that No Action is necessary at this time.**

#### **Discussion**

White Shrimp (Shrimp FMP (1993), pages 66-67). Overfishing is indicated when the overwintering white shrimp population within a state's waters declines by 80% or more following severe winter weather resulting in prolonged cold water temperatures. Continued fishing following such a decline may reduce the reproductive capacity of the stock affecting subsequent recruitment and would be considered overfishing. Relative population abundance will be determined by catch per unit effort (CPUE) during standardized assessment sampling.

Brown and Pink Shrimp (Shrimp Amendment 2 (1996), pages 56-58). The South Atlantic brown shrimp and pink shrimp resources are overfished when annual landings fall below two standard deviations below mean landings 1957-1993 for three consecutive years [2,946,157 pounds (heads on) for brown shrimp and 286,293 pounds (heads on) for pink shrimp]. If annual landings fall below two standard deviations of the 1957-1993 mean landings for two consecutive years the Council shall convene the Shrimp Stock Assessment Panel, Shrimp Advisory Panel, and Shrimp Committee to review the causes of such declines and recommend any appropriate Council action to address the problem.

Rock Shrimp (Shrimp Amendment 1 (1996), pages 32-33). The South Atlantic rock shrimp resource is overfished when the annual landings exceed the value which is two standard

#### 4.0 Environmental Consequences

deviations above mean landings 1986-1994. This level, based on the more accurate state data, is 6,829,449 pounds.

##### **Other Possible Options:**

**Option 1.** Modify the overfishing definitions to include fishing mortality rates. Note: Under this option, one would have to develop the rationale for any such modification.

##### **Discussion**

The Council rejected this option because no modifications were suggested and because the current overfishing definitions are based upon the best available data.

**Option 2.** Modify the rock shrimp definition to track brown and pink shrimp.

##### **Discussion**

The Council rejected this option because the current overfishing definition is based upon the best available data.

#### **ACTION 4. Rebuilding Timeframe.**

**The Council concluded that No Action is necessary at this time.**

##### **Discussion**

Shrimp are not overfished and do not require a rebuilding timeframe.

##### **Other Possible Options:**

**Option 1.** Establish a rebuilding timeframe of less than 10 years OR within a time period equal to one to 10 years plus the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production (Council to specify).

##### **Discussion**

A rebuilding timeframe needs to be added to meet Magnuson-Stevens mandates if a species is overfished. White, pink, and brown shrimp are essentially annual crops. Rock shrimp live slightly longer, about 20-22 months. The Council rejected this option because shrimp are not overfished and thus do not require a rebuilding timeframe.

#### **ACTION 5. Overfishing Evaluation to meet the Current Definition.**

None of the South Atlantic shrimp species are listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

#### 4.3.4.1.2 Red Drum FMP

##### **ACTION 1. Maximum Sustainable Yield (MSY).**

Maximum sustainable yield for red drum is unknown. The Council reviewed alternatives and concluded the best available data supports using 30% Static SPR as a proxy for MSY.

##### Discussion

There currently is not an accepted estimate of MSY for Atlantic red drum, due primarily to lack of adequate data (Red Drum FMP (1990), page 19). Following the NMFS written guidelines, the Council is proposing to use SPR as a proxy for MSY.

##### Other Possible Options:

**Option 1.** No Action.

##### Discussion

The Council rejected this option because it would not meet the intent of the Magnuson-Stevens Act.

**Option 2.** MSY is equal to 30%-40% Static SPR (Council to specify).

##### Discussion

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected the upper end of this option because the level of data are poor and because the current MSY is based upon the best available data.

##### **ACTION 2. Optimum Yield (OY).**

**Optimum Yield (OY) for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR.**

##### Discussion

Using static SPR meets the new Magnuson-Stevens Act mandates and is consistent with the NMFS written guidance. The represents a more conservative approach over the current OY level of 30%. This level also meets the Council's desire for a more precautionary approach to management.

##### Other Possible Options:

**Option 1.** No Action. Optimum Yield for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the spawning stock biomass per recruit ratio (SSBR) at or above 30% (Red Drum FMP (1990), pages 76-77).

##### Discussion

This level of OY would not meet the new Magnuson-Stevens Act mandates for a more precautionary approach to management. The Council rejected this option in favor of the preferred level of 40% static SPR.

**Option 2.** Optimum Yield for the Atlantic coast red drum fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the spawning potential ratio (SPR) at or above 40% to 100% Static SPR (Council to specify).

Discussion

This would separate the OY level from the overfished level and update the OY language to reflect SPR. This level of SPR is more conservative than 30% and, based on our experience with snapper grouper and mackerel, should be acceptable to NMFS.

Higher levels within this option were rejected by the Council because 40% is sufficient to be precautionary.

**Option 3.** Other modifications to the Optimum Yield (OY) specification. Note: Under this option, one would have to develop the rationale for any such modification. Optimum Yield for the Atlantic coast red drum fishery must be measured in terms of a mortality rate given the data-poor status of red drum: Based on the written guidance from NMFS, the Council is setting OY equal to 0.75 times the natural mortality rate (M). The NMFS SEFSC recommended using  $M=0.23$  for Ages 0-5 and  $M=0.11$  for Ages 6+. Therefore,  $OY = 0.17$  for Ages 0-5 and  $OY = 0.08$  for Ages 6+.

Discussion

While this option would have met the written guidance provided by NMFS and the requirements of the Magnuson Stevens Act, the Council rejected using M as a proxy for OY in favor of using SPR because SPR is a more rigorous approach.

**ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The National Standards Guidelines provided the following two definitions: (1) "To overfish means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis" and (2) "Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis." The Guidelines go on to indicate that "In all cases, status determination criteria must specify both of the following: (i) A maximum fishing mortality threshold or reasonable proxy thereof, and (ii) A minimum stock size threshold or reasonable proxy thereof."

**Overfishing for red drum is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the red drum MSY proxy.**

**The "threshold level" for red drum is defined as 10% Static SPR.**

Discussion

Biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria. When such data become available, the Council will use the framework procedure to add a biomass based component to the overfished definition. This action meets the written guidance provided by NMFS and meets the requirements of the Magnuson Stevens Act. It also meets the Council's goal of precautionary management.

**Other Possible Options:**

**Option 1.** No Action. Overfishing is defined as a fishing mortality rate that will, if continued, reduce the spawning stock biomass per recruit (SSBR) below 30% of the level that would exist at equilibrium without fishing (Appendix A, Attachment 2: Red Drum FMP (1990), pages 77-78). The Atlantic coast red drum stock will be considered overfished when the SSBR is below 30% of the level that would have existed in the absence of fishing. The 1989 stock assessment report indicated the red drum stock was overfished with a SSBR between 2% and 3%. Subsequently, a stock assessment conducted in March 1996 showed rebuilding had occurred and the SPR had increased to 9% in the northern region and 14% in the southern region.

**Discussion**

This option was rejected by the Council because the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished. The 30% level is currently used for overfishing but is not specified as SPR.

**Option 2.** Specify a threshold level in the range of 1% to 20% Spawning Potential Ratio (SPR), an overfished level in the range of 20% to 55% SPR and the biomass equivalent to 20% to 55% SPR, and a target (OY) level in the range of 30% to 100% SPR.

**Discussion**

This option was rejected by the Council because some of the levels would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 3.** Other modifications to the overfishing definitions. Note: Under this option, one would have to develop the rationale for any such modification. Overfishing for red drum can only be defined in terms of the fishing mortality component given the data-poor status of red drum. Based on the written guidance from NMFS, the Council is setting the overfishing level equal to the natural mortality rate (M). The NMFS SEFSC recommended using  $M=0.23$  for Ages 0-5 and  $M=0.11$  for Ages 6+. Therefore, the overfishing level = 0.23 for Ages 0-5 and OY = 0.11 for Ages 6+.

**Discussion**

While this option would have met the written guidance provided by NMFS and the requirements of the Magnuson Stevens Act, the Council rejected using M as a proxy for overfishing in favor of using SPR because SPR is a more rigorous approach.

**Option 4.** Specify a threshold level of between 2 pounds and 1 million pounds (Council to specify).

**Discussion**

This option was rejected by the Council because biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria. When such data become available, the Council will use the framework procedure to add a biomass based component to the overfished definition. The Council is specifying a threshold level in terms of Static SPR (see the proposed action).

**ACTION 4. Rebuilding Timeframe.**

Rebuilding projections are not available at this time. The Council recommends that projections be incorporated into the next stock assessment to the extent practicable to determine whether red drum can be rebuilt in less than 10 years.

Discussion

This task would be added to the 1998/98 Operations Plan. If red drum cannot be rebuilt within 10 years, NMFS should calculate generation time and present options on a rebuilding timeframe.

**Other Possible Options:**

**Option 1.** Establish a rebuilding timeframe of less than 10 years OR within a time period equal to one to 10 years plus the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production (Council to specify).

Discussion

This option was rejected because rebuilding projections are not available at this time. A rebuilding timeframe will be added through the framework provision as soon as the information is provided during 1999.

**ACTION 5. Overfishing Evaluation to meet the Current Definition.**

Red drum are listed as overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. The Council has prohibited any retention in the EEZ which is the maximum protection that the Council can provide. **The Council concluded no further action by the Council is necessary and the NMFS concurred with this action (see Appendix F).** The FMP included recommendations to the States beginning on page 86. **The Council reiterates these recommendations with the addition of changing the level of 30% SSBR to 40% Static SPR to reflect the Council's new OY level:**

1. The SAFMC recommends that the States adopt a level of escapement needed to achieve the selected SPR level of at least 40%.
2. States are requested, through adoption of an amended ASMFC Red Drum FMP, to achieve 40% escapement of juvenile fish to the adult stock by reducing the rate of fishing mortality through such actions as gear restrictions, closed seasons, quotas, size limits, and bag limits.
3. Secondly, combinations of minimum and maximum size limits would reduce the length of time the fish are exposed to the fishery.
4. States are requested to annually report to the Council the level of escapement of juvenile fish to the adult stock from their State waters and what actions they have taken to achieve the needed level of escapement.

The 1998 NMFS Report to Congress on the Status of Fisheries of the United States has not been provided to the Council as of this date. Results from the 1998 report will be addressed next year.

#### 4.3.4.1.3 Snapper Grouper FMP

##### **ACTION 1. MAXIMUM SUSTAINABLE YIELD (MSY).**

Maximum sustainable yield for species in the snapper grouper management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 40% Static SPR as a proxy for MSY for jewfish and Nassau grouper, and 30% Static SPR as a MSY proxy for the remaining species.

##### Discussion

There currently is not an accepted estimate of MSY for species in the snapper grouper management unit, due primarily to lack of adequate data (Snapper Grouper FMP (1983), page 23). Following the NMFS written guidelines, the Council is proposing to use SPR as a proxy for MSY. A higher level is specified for jewfish given the Council's goal of building a high abundance level of this large species for non-consumptive uses such as diving. The higher level is specified for Nassau grouper given that this species aggregates to very specific sites (more so than other species in the management unit) for spawning. Such behavior has resulted in severe overfishing.

##### **Other Possible Options:**

##### **Option 1. No Action.**

##### Discussion

Maximum yield is comparable to maximum sustainable yield if recruitment is constant (Snapper Grouper FMP (1983), page 23). Until scientific evidence about recruitment patterns indicate otherwise, maximum yield by yield-per-recruit analysis is the best available proxy for MSY for individual species. There are no estimates of maximum yield or MSY for the whole multi-species fishery.

The Council rejected this option because it would not meet the intent of the Magnuson-Stevens Act.

##### **Option 2. MSY is equal to 30%-40% Static SPR (Council to specify).**

##### Discussion

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected the upper end of this option for most species because the level of data are poor and accepted the higher end for jewfish and Nassau grouper.

##### **Option 3. Other modifications to the proxy MSY values. Note: Under this option, one would have to develop the rationale for any such modification.**

##### Discussion

The Council rejected this option because no modification were identified.

**ACTION 2. Optimum Yield (OY).**

Optimum Yield (OY) for the snapper grouper fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR for all species in the snapper grouper management unit except the following:

- A. Hermaphroditic groupers (that is, those that switch sex, generally from females to males as they grow older) will be managed for an OY of 45% Static SPR.
- B. Jewfish and Nassau Grouper will be managed for an OY of 50% Static SPR.

Discussion

Using static SPR meets the new Magnuson-Stevens Act mandates and is consistent with the NMFS written guidance. A higher level is specified for jewfish given the Council's goal of building a high abundance level of this large species for non-consumptive uses such as diving. The higher level is specified for Nassau grouper given that this species aggregates to very specific sites (more so than other species in the management unit) for spawning. Such behavior has resulted in severe overfishing. Species with special life history characteristics (i.e., sex reversal and spawning aggregations require more precautionary management. The Council has specified a higher level for hermaphroditic groupers to address this life history characteristic. This approach represents a more conservative approach over the current OY level and also meets the Council's desire for a more precautionary approach to management of certain species as suggested in the written NMFS Guidance (Technical Source Document, Appendix A, page 41).

Other Possible Options:

**Option 1.** No Action. The South Atlantic Council's target level of Optimum Yield (OY) is 40% static SPR.

Discussion

This level of OY would not meet the new Magnuson-Stevens Act mandates for a more precautionary approach to management for some species. The Council rejected this option in favor of the preferred action with multiple levels which do include 40% Static SPR.

**Option 2.** For snapper grouper species that change sex OR for all snapper grouper species (Council to specify), specify a target or OY level equal to F0.1.

Discussion

The Council rejected this option in favor of the preferred action with multiple levels to address special life history characteristics.

**Option 3.** Other modifications to the Optimum Yield (OY) specifications. Note: Under this option, one would have to develop the rationale for any such modification. SAFMC Staff recommends the following: Optimum Yield for most of the species in the snapper grouper fishery must be measured in terms of a mortality rate given the data-poor status of all species except black sea bass. Based on the written guidance from NMFS, the Council is setting OY equal to 0.75 times the natural mortality rate (M). The NMFS SEFSC recommended using the natural mortality rates shown in Table 50.



### Discussion

While this option would have met the written guidance provided by NMFS and the requirements of the Magnuson Stevens Act, the Council rejected using M as a proxy for OY in favor of using SPR because SPR is a more rigorous approach.

### **ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The National Standards Guidelines provided the following two definitions: (1) “To overfish means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis” and (2) “Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.” The Guidelines go on to indicate that “In all cases, status determination criteria must specify both of the following: (i) A maximum fishing mortality threshold or reasonable proxy thereof, and (ii) A minimum stock size threshold or reasonable proxy thereof.”

**Overfishing for all species in the snapper grouper management unit, except for jewfish and Nassau grouper, is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30% Static SPR) which is the snapper grouper MSY proxy.**

**Overfishing for jewfish and Nassau grouper is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 40% Static SPR (F40% Static SPR) which is the MSY proxy for jewfish and Nassau grouper.**

**Overfishing for black sea bass is defined in terms of the Checklist (Appendix D) and information provided by Dr. Doug Vaughan, NMFS Beaufort Lab (Tables 50 and 51). The two components of the status determination criteria are:**

- A. A maximum fishing mortality threshold (MFMT) — A fishing mortality rate (F) in excess of F30% Static SPR which is 0.72 (Tables 50 and 51).
- B. A minimum stock size threshold (MSST) — The minimum stock size threshold is 3.72 million pounds (Tables 50 and 51).

The “**threshold level**” for all species in the snapper grouper management unit, except for jewfish and Nassau grouper, is defined as 10% Static SPR. For jewfish and Nassau grouper, the “**threshold level**” is defined as 30% Static SPR.

### Discussion

Biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria for the data-poor species. For black sea bass which is data-moderate, the information is available to calculate a biomass proxy. When such data become available for the data-poor species, the Council will use the framework procedure to add a biomass based component to the overfished definition.

The Council concluded this action meets the written guidance provided by NMFS and meets the requirements of the Magnuson Stevens Act.

Table 51. Black sea bass biomass proxy calculations. Source: Dr. Doug Vaughan, NMFS Beaufort Lab.

<b>BLACK SEA BASS — DATA MODERATE CALCULATIONS.</b>				
	<b>1979-85</b>	<b>1986-90</b>	<b>1991-95</b>	<b>AVERAGE</b>
<b>F</b>	1.06	0.89	0.95	0.97
<b>F30</b>	0.73	0.73	0.69	0.72
<b>F35</b>	0.54	0.53	0.51	0.53
<b>R1</b>	7.72	6.47	2.60	7.67*
<b>SSB/R (30)</b>	0.69	0.69	0.69	0.69
<b>SSB (30)</b>	5.34	4.48	1.80	5.31
<b>SSB/R (35)</b>	0.81	0.81	0.81	0.81
<b>SSB (35)</b>	6.24	5.23	2.10	6.19

NOTE: \*BASED ON 1979-87 DATA.  
 SSB/R=SPAWNING STOCK BIOMASS PER RECRUIT; PRESENTED IN POUNDS.  
 SSB=SPAWNING STOCK BIOMASS; PRESENTED IN MILLIONS OF POUNDS OF MATURE FISH.  
 R1=RECRUITMENT; MEASURED IN MILLIONS OF FISH.

SOURCE: DR. DOUG VAUGHAN, NMFS BEAUFORT LAB

**MFMT & MSST CALCULATED USING 30% STATIC VALUES AS PER COUNCIL**  
 MFMT = AVERAGE F30% STATIC SPR FOR YEARS 1979-95  
 MFMT = 0.72

$MSST = \max(0.5, 1-M) * B-msy$   
 M = 0.3 (M=NATURAL MORTALITY)  
 MSST (0.5) = 2.66 MILLIONS OF POUNDS  
 MSST (0.7) = 3.72 MILLIONS OF POUNDS  
 MSST (MAX)= 3.72 MILLIONS OF POUNDS

**Other Possible Options:****Option 1. No Action.**

The current definition for overfishing is as follows (Snapper Grouper Amendment 4 (1991), pages 7-13):

(i) A snapper grouper stock or stock complex is overfished when it is below the level of 30% of the spawning stock biomass per recruit which would occur in the absence of fishing. (Note: For jewfish 40% was used.)

(ii) When a snapper grouper stock or stock complex is overfished, overfishing is defined as harvesting at a rate that is not consistent with a program that has been established to rebuild the stock or stock complex to the 30% spawning stock biomass per recruit level. (Note: For jewfish 40% was used.)

(iii) When a snapper grouper stock or stock complex is not overfished, overfishing is defined as a harvesting rate that, if continued, would lead to a state of the stock or stock complex that would not at least allow a harvest of Optimum Yield (OY) on a continuing basis.

(iv) For jewfish the threshold level is 30% SSBR; below this level, no harvest or possession of jewfish is allowed.

(v) The timeframe for recovery of snappers (excluding red snapper), greater amberjack, black sea bass, and red porgy is not to exceed 10 years. For red snapper and the groupers, the timeframe is not to exceed 15 years. Year 1 was the 1991 fishing year. The recovery time period may be modified by the framework (regulatory amendment) procedure. These timeframes were established in Amendment 4 and are based on the life history characteristics (growth rate, mortality rate, longevity, etc.). Longer lived, slower growing species are more susceptible to overfishing and will rebuild more slowly, hence the 15 year recovery period. Shorter-lived, faster growing species will recover more quickly and was the basis for choosing 10 years.

**Discussion**

The wording could be updated to reflect transitional SPR which should not be considered a significant changes as  $SPR=SSBR$ .

The Snapper Grouper Assessment Group discussed these issues but did not reach any consensus. There was a recommendation to consider  $F_{0.1}$  as the overfished level and  $F_{max}$  as the threshold level for species that switch sex. Also, it was suggested that rather than relying on studies of groundfish in the northeast and other areas, the species in the southeast should be examined and the appropriate levels determined.

This option was rejected by the Council because the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 2. Redefine overfishing (proposed action in Snapper Grouper Amendment 8; Rejected by NMFS).**

A. A snapper grouper species (including jewfish) is considered to be overfished when the transitional spawning potential ratio (SPR) is below 20%.

B. When a stock is overfished (transitional SPR less than 20%), a rebuilding program that makes consistent progress toward restoring stock condition must be implemented and continued until the stock is restored beyond the overfished condition. The rebuilding program must be designed to achieve recovery within an acceptable time frame as specified by the council (generally cannot exceed 10 years). The council will continue to rebuild the stock until the stock is restored to the management target (OY).

C. When a stock is not overfished (transitional SPR equal to or greater than 20%), the act of overfishing is defined as a static SPR that exceeds 20% (i.e.,  $F_{20\%}$ ). If fishing mortality rates that exceed the level associated with the static SPR overfished level are maintained, the stock may become overfished. Therefore, if overfishing is occurring, a program to reduce fishing mortality rates toward management target levels (OY) will be implemented, even if the stock is not in an overfished condition.

D. The threshold level for snapper grouper species is defined as 10% transitional SPR. If the stock(s) were to be overfished to such an extent that their transitional SPR was below the threshold level, the council will take appropriate action including but not limited to eliminating directed fishing mortality and evaluating measures to eliminate any bycatch mortality in a timely manner through the framework procedure.

E. For species where there is insufficient information to determine whether the stock is overfished (transitional SPR), overfishing is defined as a fishing mortality rate in excess of the fishing mortality rate corresponding to a default static SPR of 30%. If overfishing is occurring, a program to reduce fishing mortality rates to at least the level corresponding to management target levels will be implemented.

F. The timeframe for recovery of overfished stocks remains unchanged (see No Action option above for actual wording). For species which were not documented as overfished in Amendment 3, Year 1 is the year in which the species is documented as being overfished. For example, gag were documented as being overfished in the 1996 assessment; therefore, Year 1 = 1996.

#### Discussion

This option was rejected by the Council because the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 3.** Specify a threshold level in the range of 5% to 30% Spawning Potential Ratio (SPR) and a target level in the range of 30% to 50% SPR.

#### Discussion

This option was included as a rejected option in Snapper Grouper Amendment 8. This option was rejected by the Council because the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 4.** Establish species specific definitions of overfishing - target, overfished, and threshold.

For example, jewfish - specify 50% SPR as a target level, 40% SPR as an overfished level, and 20% as the threshold level.

#### Discussion

This option was included as a rejected option in Snapper Grouper Amendment 8. This option was rejected by the Council because portions of the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 5.** Specify a threshold level in the range of 1% to 20% Spawning Potential Ratio (SPR), an overfished level in the range of 20% to 55% SPR, and a target (OY) level in the range of 30% to 100% SPR.

Discussion

Portions of this wording have been incorporated into the preferred action. This specific option was rejected because it would not meet the new Magnuson-Stevens Act mandates of overfished for all species (e.g., black sea bass).

**Option 6.** Specify a threshold level of between 2 pounds and 1 million pounds (Council to specify) for each species.

Discussion

This option was rejected by the Council because biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria. When such data become available, the Council will use the framework procedure to add a biomass based component to the overfished definition. The Council is specifying a threshold level in terms of Static SPR (see the proposed action).

**Option 7.** For snapper grouper species that change sex OR for all snapper grouper species (Council to specify), specify an overfished level equal to  $F_{max}$ .

Discussion

This option was rejected by the Council because the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 8.** Overfishing for species in the snapper grouper FMP (excluding black sea bass) can only be defined in terms of the fishing mortality component given the data-poor status of these species. Based on the written guidance from NMFS, the Council is setting the overfishing level equal to the natural mortality rate ( $M$ ). The NMFS SEFSC recommended using the natural mortality rates shown in Table 50.

Discussion

While this option would have met the written guidance provided by NMFS and the requirements of the Magnuson Stevens Act, the Council rejected using  $M$  as a proxy for overfishing in favor of using SPR because SPR is a more rigorous approach.

**ACTION 4. Rebuilding Timeframe.**

Rebuilding projections are not available at this time. The Council recommends projections be incorporated into the next stock assessment to the extent practicable to determine whether the overfished snapper grouper species can be rebuilt in less than 10 years. Until such time as this information is provided to the Council, the current timeframe for recovery remains in effect.

Discussion

This task would be added to the 1998/99 Operations Plan. If some species cannot be rebuilt within 10 years, NMFS should calculate generation time and present options on a rebuilding timeframe.

A letter from NMFS (Appendix F) indicates that NMFS is of the opinion that the 15 year rebuilding timeframe for Nassau grouper and jewfish is inconsistent with the new Magnuson-Stevens Act. The 15 years is based on the biology of these two long-lived stocks and in the Council's opinion meets the mandate of Magnuson-Stevens.

**The timeframe for recovery of snappers (excluding red snapper), greater amberjack, black sea bass, and red porgy is not to exceed 10 years. For red snapper and the groupers, the timeframe is not to exceed 15 years. Year 1 was the 1991 fishing year.** The recovery time period may be modified by the framework (regulatory amendment) procedure. These timeframes were established in Amendment 4 and are based on the life history characteristics (growth rate, mortality rate, longevity, etc.). Longer lived, slower growing species are more susceptible to overfishing and will rebuild more slowly, hence the 15 year recovery period. Shorter-lived, faster growing species will recover more quickly and was the basis for choosing 10 years.

Other Possible Options:

**Option 1.** The Snapper Grouper Assessment Group concluded that rebuilding to OY should occur within a time period equal to 1.5 times the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production. (Snapper Grouper Amendment 4 (1990), pages 12-13.)

Discussion

This option was rejected because rebuilding projections are not available at this time. A rebuilding timeframe will be added through the framework provision as soon as the information is provided during 1999.

**Option 2.** Establish a rebuilding timeframe of less than 10 years OR within a time period equal to one to 10 years plus the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production (Council to specify).

Discussion

This option was rejected because rebuilding projections are not available at this time. A rebuilding timeframe will be added through the framework provision as soon as the information is provided during 1999.

**ACTION 5. Overfishing Evaluation to meet Current Definition (30% SSBR).**

In the September 1997 NMFS Report to Congress on the Status of Fisheries of the United States, the following species were listed as overfished: (1) black sea bass, (2) vermilion snapper, (3) red porgy, (4) red snapper, (5) gag, (6) scamp, (7) speckled hind, (8) warsaw grouper, (9) snowy grouper, (10) golden tilefish, (11) Nassau grouper, (12) jewfish, and (13) white grunt. These 13 species are the ones the Council must legally specify rebuilding programs to reverse the overfished status.

The 1998 NMFS Report to Congress on the Status of Fisheries of the United States has not been provided to the Council as of this date. Results from the 1998 report will be addressed next year.

The Council's Snapper Grouper Assessment Group met in early February 1998 to review the current status of species in the snapper grouper complex. The Group reviewed last years wreckfish assessment (Vaughan, et al, 1997), the 1998 data summary (Vaughan, 1998), the 1997-1998 wreckfish fishery annual report (Hardy, 1998), the scamp assessment (Manooch, et al, 1997), the updated trends and estimated SPR values for 15 species (Potts, Burton, and Manooch, 1998), and a retrospective (1979-1996) multispecies assessment from the Florida Keys. The Assessment Group drew on results from each of these works, as well as the most recent stock assessment results previously reviewed by the Council. Results are presented in Table 52.

The Council made the determinations shown for each species based on having Snapper Grouper Amendment 8 and Snapper Grouper Amendment 9 in place. The Council is in a difficult situation, particularly for species in the snapper grouper management unit, because these two major amendment have not been implemented and previous amendments have not been incorporated into assessment results for some species. The Council's previous actions will have major impacts on rebuilding overfished species. The Council's conclusions reflect the belief that regulations already approved should be implemented and evaluated before determinations can be made whether additional regulations are required. The Council will continue to monitor the snapper grouper fishery and will use the framework procedure to implement any additional species specific measures as may be necessary following updated stock assessments received through the SAFE process described earlier.

The Council's evaluations are as follows:

1. **Black sea bass** remain overfished. Black sea bass are above the "threshold level" with a static SPR of 26%. Black sea bass are overfished given that the MSST is 3.72 million pounds and the 1995 biomass was estimated to be 1.33 million pounds. Black sea bass are also experiencing overfishing given that the MFMT is 0.72 and the average fishing mortality rate (F) for 1991-1995 was 0.95. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 26%, recreational catch by 36%, and total catch by 30%. **The Council concluded these reductions are sufficient to rebuild black sea bass above the overfished level.**
2. **Vermilion snapper** remain overfished with a static SPR of 21% to 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce headboat catch by 29%, MRFSS catch by 70%, and total catch by 13%. **The Council concluded these reductions are sufficient to rebuild vermilion snapper above the overfished level.**
3. **Red porgy** remain overfished with a static SPR of 14% to 19%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 65%, recreational catch by 50%, and total catch by 59%. **The Council concluded these reductions are sufficient to rebuild red porgy above the overfished level.**

4. **Red snapper** remain overfished with a static SPR of 24% to 32%. The measures proposed through Snapper Grouper Amendment 7 will result in a projected SPR of 35%. **The Council concluded these reductions and the measures contained in Snapper Grouper Amendments 8 and 9 are sufficient to rebuild red snapper above the overfished level.**

5. **Gag** remain overfished with a static SPR of 27%. The measures proposed in Snapper Grouper Amendment 9 will reduce commercial catch by 37%, recreational catch by 13%, and total catch by 27%. **The Council concluded these reductions are sufficient to rebuild gag above the overfished level.**

6. **Scamp** are no longer overfished with a static SPR of 35%. The measures proposed in Snapper Grouper Amendment 9 will provide some additional protection. **The Council concluded no additional measures are necessary to maintain scamp above the overfished level.**

7. **Speckled hind** remain overfished with a static SPR of 8% to 13%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild speckled hind above the overfished level.**

8. **Warsaw grouper** remain overfished with a static SPR of 6% to 14%. The measures proposed through Snapper Grouper Amendment 7 include a limit of 1 fish per vessel per trip, no sale, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild warsaw grouper above the overfished level.**

9. **Snowy grouper** remain overfished with a static SPR of 5% to 15%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild snowy grouper above the overfished level.**

10. **Golden tilefish** remain overfished but the Assessment Group concluded there was inadequate information to update the existing SPR of 21%. The measures proposed through Snapper Grouper Amendment 7 include a quota, trip limit, bag limit, and establishment of the experimental closed area. Measures in Amendment 8 and 9 may provide some additional protection. **The Council concluded these reductions are sufficient to rebuild golden tilefish above the overfished level.**

11. **Nassau grouper** remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. **The Council concluded no further action is required for Nassau grouper at this time.** This position is supported by the letter from NMFS (Appendix F.).

12. **Jewfish** remain overfished but there is insufficient information to calculate a SPR. The measures proposed through Snapper Grouper Amendment 7 allow no retention and establishment of the experimental closed area. **The Council concluded no further action is required for jewfish at this time.** This position is supported by the letter from NMFS (Appendix F.).

13. **White grunt** are no longer overfished with a static SPR of 29% to 39%. The measures proposed in Snapper Grouper Amendments 8 and 9 will provide some additional protection. **The Council concluded no additional measures are necessary to maintain white grunt above the overfished level.**



SPECIES IN SNAPPER GROUPEL FMP	COUNCIL'S ASSESSMENT		DATA THRU (YEAR)	LATEST ESTIMATED SPR %	PROJECTED SPR % WITH REGULATIONS	OVERFISHED DETERMINATION		ASSESSMENT GROUP
	OVERFISHED SPR %	YEAR				NMFS	SAFMC	
<b>I. MINIMUM SIZE = 8" (203 MM) TOTAL LENGTH</b>								
Lane snapper	30%	1992	1990	58%	63%	UNKNOOWN	NO	50% - 59%
Black sea bass (Am. 8 Proposed Cap on *Permits)	30%	1996	1995	26%	>30%	YES	YES	26%
(Am. 9 Proposed 10" TL Rec & Com; Rec Bag=20)								
<b>II. MINIMUM SIZE = 12" (305 MM) TOTAL LENGTH</b>								
Yellowtail snapper	30%	1993	1991	24%	30%	UNKNOOWN	YES	24%
Gray snapper	30%	1993	1991	41%	45%	UNKNOOWN	NO	25% - 41%
Mutton snapper (Rec & Com 16" TL)	30%	1993	1991	43%	45%	UNKNOOWN	NO	43% - 53%
Vermilion snapper (10" Rec & Bag=10; 12" Com) (Am. 8 Proposed Cap on *Permits)	30%	1997	1996	21% - 27%	>30%	YES	YES	21% - 27%
(Am. 9 Proposed 11" TL Rec)								
Red porgy	30%	1994	1992	13%	>30%	YES	YES	14% - 19%
(Am. 8 Proposed Cap on *Permits)								
(Am. 9 Proposed 14" TL Rec & Com; Rec Bag=5; Com closure March & April)								
Gray triggerfish (Rec & Com 12" TL in EEZ off Florida)	30%	1992	1990	27%	>30%	UNKNOOWN	YES	29% - 35%
Hogfish (Rec & Com 12" FL) (Rec Bag = 5 in EEZ off Florida)	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Schoolmaster snapper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Queen snapper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Blackfin snapper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Cubers snapper (Rec & Com = 2/boat for fish >30" TL) (Rec fish <30" TL included in 10 fish snapper bag limit)	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Dog snapper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Mahogany snapper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Silk snapper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
<b>III. MINIMUM SIZE = 20" (508 MM) TOTAL LENGTH</b>								
Red snapper (Bag = 2 within 10 snapper bag limit)	30%	1997	1995	24% - 32%	35%	YES	YES	24% - 32%
Bag	30%	1996	1993	13%	>30%	YES	YES	27%
(Am. 8 Proposed Cap on *Permits)								
(Am. 9 Proposed 24" TL Rec & Com; Rec Bag=2 gsg or black in 5 grouper bag; and (Com closure March & April)								
Scamp (Fork length)	30%	1992	1990	20%	30%	YES	YES	35%
Red grouper	30%	1992	1990	61%	68%	UNKNOOWN	NO	21%
Black grouper	30%	1992	1990	43%	47%	UNKNOOWN	YES	16% - 25%
(Am. 8 Proposed Cap on *Permits)								
(Am. 9 Proposed 24" TL Rec & Com; Rec Bag=2 gsg or black in 5 grouper bag; and Com closure March & April)								
Yellowfin grouper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN
Yellowmouth grouper	30%					UNKNOOWN	UNKNOOWN	UNKNOOWN

Table 52. Updated SPR Values for Snapper Grouper Species with Overfishing Status.

SPECIES IN SNAPPER GROUPEL FMP	COUNCIL'S OVERFISHED SPR %	ASSESSMENT YEAR	DATA THRU (YEAR)	LATEST ESTIMATED SPR %	PROJECTED SPR% WITH REGULATIONS	OVERFISHED DETERMINATION NMFS	OVERFISHED DETERMINATION SAFMC	ASSESSMENT GROUP CONCLUSIONS
<b>IV. MINIMUM SIZE = 28" (711 MM) FORK LENGTH</b>								
Greater amberjack (28" FL rec. & 28" cored/36" FL com.) (Am. 8 Proposed Cap on *Permits)	30%	1996	1995	84%	?	UNKNOWN	NO	58%-71%*
( & Am. 9 Proposed Rec Bag= 1; Com closure March & April, quota & 1,000 lb trip limit)								
<b>V. OTHER SPECIES</b>								
Speckled hind (Rec & Com = 1 fish/vessel/trip)	30%	1992	1990	12%	>30%	YES	YES	8%-13%
Warsaw grouper (Rec & Com = 1 fish/vessel/trip)	30%	1992	1990	6%	>30%	YES	YES	6%-14%
Misty grouper	30%					UNKNOWN	UNKNOWN	UNKNOWN
Yellowedge grouper	30%					UNKNOWN	UNKNOWN	UNKNOWN
Snowy grouper (Com quota & trip limit)	30%	1992	1990	15%	>30%	YES	YES	5%-15%**
(Rec bag = 5 grouper and tilefish)								
Golden tilefish (Com quota & trip limit)	30%	1992	1990	21%	>30%	YES	YES	21%
(Rec bag = 5 grouper and tilefish)								
Nassau grouper (Rec & Com - No retention)	30%			NO SPR	>30%	YES	YES	14%
Jewfish (Rec & Com - No retention)	40%			NO SPR	>30%	YES	YES	15%
Tomtate	30%					UNKNOWN	UNKNOWN	40%
Blue runners	30%					UNKNOWN	UNKNOWN	UNKNOWN
<b>VI. INDIVIDUAL TRANSFERABLE QUOTA (ITQ)</b>								
Wreckfish	30%	1997	1996	8%-22%	?	UNKNOWN	YES	19%-30%

Table 52 (cont.). Updated SPR Values for Snapper Grouper Species with Overfishing Status.

SPECIES IN SNAPPER GROUPEL FMP VII. AGGREGATE 20-FISH RECREATIONAL BAG LIMIT (Applies to all species currently not under a bag limit except tomate and blue runners)	COUNCIL'S OVERFISHED SPR %	ASSESSMENT YEAR	DATA THRU (YEAR)	LATEST ESTIMATED SPR %	PROJECTED SPR% WITH REGULATIONS	OVERFISHED DETERMINATION		ASSESSMENT GROUP CONCLUSIONS
						NTFS	SAFMC	
White Grunt	30%	1992	1990	19%	>30%	YES	YES	29% - 39%
Black snapper	30%					UNK NOWN	UNK NOWN	65%
Bank sea bass	30%					UNK NOWN	UNK NOWN	UNK NOWN
Rock sea bass	30%					UNK NOWN	UNK NOWN	UNK NOWN
Rock hind	30%					UNK NOWN	UNK NOWN	36%
Graysby	30%					UNK NOWN	UNK NOWN	38%
Carney	30%					UNK NOWN	UNK NOWN	36%
Red hind	30%					UNK NOWN	UNK NOWN	28%
Tiger grouper	30%					UNK NOWN	UNK NOWN	UNK NOWN
Sheepshead	30%					UNK NOWN	UNK NOWN	24%
Grass porgy	30%					UNK NOWN	UNK NOWN	UNK NOWN
Joithead porgy	30%					UNK NOWN	UNK NOWN	UNK NOWN
Saucereye porgy	30%					UNK NOWN	UNK NOWN	UNK NOWN
Whitebone porgy	30%					UNK NOWN	UNK NOWN	UNK NOWN
Knobbed porgy	30%					UNK NOWN	UNK NOWN	UNK NOWN
Longspine porgy	30%					UNK NOWN	UNK NOWN	UNK NOWN
Scup	30%					UNK NOWN	UNK NOWN	UNK NOWN
Queen triggerfish	30%					UNK NOWN	UNK NOWN	UNK NOWN
Ocean triggerfish	30%					UNK NOWN	UNK NOWN	UNK NOWN
Yellow jack	30%					UNK NOWN	UNK NOWN	UNK NOWN
Crevalle jack	30%					UNK NOWN	UNK NOWN	UNK NOWN
Bar jack	30%					UNK NOWN	UNK NOWN	UNK NOWN
Almaco jack	30%					UNK NOWN	UNK NOWN	UNK NOWN
Lesser amberjack	30%					UNK NOWN	UNK NOWN	UNK NOWN
Banded rudderfish	30%					UNK NOWN	UNK NOWN	UNK NOWN
Spadefish	30%					UNK NOWN	UNK NOWN	UNK NOWN
Black margate	30%					UNK NOWN	UNK NOWN	UNK NOWN
Porkfish	30%					UNK NOWN	UNK NOWN	20%
Margate	30%					UNK NOWN	UNK NOWN	UNK NOWN
Smallmouth grunt	30%					UNK NOWN	UNK NOWN	UNK NOWN
French grunt	30%					UNK NOWN	UNK NOWN	UNK NOWN
Spanish grunt	30%					UNK NOWN	UNK NOWN	UNK NOWN
Cottonwick	30%					UNK NOWN	UNK NOWN	UNK NOWN
Sailors choice	30%					UNK NOWN	UNK NOWN	90%
Blue striped grunt	30%					UNK NOWN	UNK NOWN	60%
Blue line tilefish	30%					UNK NOWN	UNK NOWN	UNK NOWN
Sand tilefish	30%					UNK NOWN	UNK NOWN	UNK NOWN
Puddingwife	30%					UNK NOWN	UNK NOWN	UNK NOWN
<b>SUMMARY:</b>						<b>NTFS</b>	<b>SAFMC</b>	
NUMBER OF SPECIES = 73						73	73	
NUMBER OVERFISHED = 17						13	17	
NUMBER NOT OVERFISHED = 5						0	5	
NUMBER UNKNOWN = 51						60	51	

Table 52 (cont.).

Updated SPR Values for Snapper Grouper Species with Overfishing Status.

**4.3.4.1.4 Coastal Migratory Pelagics FMP**

**ACTION 1. Maximum Sustainable Yield (MSY).**

**Maximum sustainable yield for species in the coastal migratory pelagics management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 30% Static SPR as a proxy for MSY.**

Discussion

There currently is not an accepted estimate of MSY for species in the coastal migratory pelagics management unit, due primarily to lack of adequate data. Following the NMFS written guidelines, the Council is proposing to use SPR as a proxy for MSY. The 30% level is consistent with the recommendations of the Gulf Council's Assessment Panel (August 1998), Mace et al. (1996), and the Mackerel Stock Assessment Panel's 1997 Report.

**Other Possible Options:**

**Option 1. No Action.**

Discussion

MSY for king mackerel is currently set within the range of 21.9 and 35.2 million pounds with the best current point estimate at 26.2 million pounds for the overall king mackerel stock (Attachment 4: Mackerel Amendment 1 (1985), pages 5-20 to 5-22).

The following information is taken directly from the 1996 Report of the Mackerel Stock Assessment Panel:

"In 1983, the Councils adopted a maximum sustainable yield of 26.2 million pounds that was proportioned by historical landings into 18.5 million pounds for the Gulf migratory group and 7.7 million pounds for the Atlantic migratory group. Maximum sustainable yield is a dynamic quantity that is dependent upon environmental variables and fishery patterns governed by changes in selectivity and availability. In this regard, the Councils have changed the selectivity patterns of king mackerel by raising the minimum size limit from 12 inches to 20 inches fork length. Overall selectivity's are also changed because stock assessments are beginning to include the impact associated with the harvest of mackerels in non-directed fisheries. Furthermore, closures of the commercial mackerel fishery have changed the temporal and geographic distribution of harvest which in turn has affected the age and sex structure of the harvest. Given these changes in the fishery, it is likely that the MSY for the Gulf and Atlantic king mackerel is less than 26.2 million pounds."

The MSY for Spanish mackerel was modified in Mackerel Amendment 2 (Attachment 4: Mackerel Amendment 2 (1987), pages 4-5) to a range of 15.7 to 19.7 million pounds with the best estimate of 18 million pounds. For similar reasons, in 1996 the Mackerel Stock Assessment Panel concluded "the Spanish mackerel MSY is also most likely to be less than the previously estimated value of 18 million pounds".

The Council rejected this option because it would not meet the intent of the Magnuson-Stevens Act.

**Option 2. MSY is equal to 30%-40% static SPR (Council to specify).**

Discussion

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected the upper end of this option because the level of data are poor.

**Option 3.** The South Atlantic Council reviewed the current MSY estimates and comments from the Mackerel Stock Assessment Panel and concluded, based upon the best available information, not to specify a total MSY for the species in the mackerel management unit. As soon as sufficient information becomes available to calculate MSY, the framework procedure will be used to incorporate the MSY figures into the management plan.

Discussion

The Council rejected this option in favor of using a SPR proxy.

**ACTION 2. Optimum Yield (OY).**

**Optimum Yield (OY) for the coastal migratory pelagics fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 40% Static SPR.**

Discussion

This is basically No Action. The letter of approval for Mackerel Amendment 8 indicated that NMFS approved the OY level as 40% static SPR but rejected the overfished level of 20% transitional SPR which leaves the current 30% transitional SPR overfished level in place.

The South Atlantic Council's target level or Optimum Yield for a mackerel stock or migratory group is 40% Static SPR (Mackerel Amendment 8 (1996), pages 38-39). In Amendment 2 (Mackerel Amendment 2 (1987), page 6) the Council specified the long-term goal of optimum yield from mackerels is MSY.

Using Static SPR meets the new Magnuson-Stevens Act mandates and is consistent with the NMFS written guidance. The approach also meets the Council's desire for a more precautionary approach to management.

**Other Possible Options:**

**Option 1.** Specify a target level or Optimum Yield (OY) in the range of 30% to 100% SPR (Council to specify).

Discussion

Depending on the level of OY chosen, this option would meet the new Magnuson-Stevens Act mandates for a more precautionary approach to management. The Council rejected levels above 40% within this option in favor of the preferred action of 40% Static SPR.

**Option 2.** Modifications to the Optimum Yield (OY) specification. Note: Under this option, one would have to develop the rationale for any such modification. Optimum Yield for the species in the coastal migratory pelagics FMP must be measured in terms of a mortality rate given the data-poor status of all species. Based on the written guidance from NMFS, the Council is setting OY equal to 0.75 times the natural mortality rate (M). The NMFS SEFSC recommended using the natural mortality rates shown in Table 49.

Discussion

While this option would have met the written guidance provided by NMFS and the requirements of the Magnuson Stevens Act, the Council rejected using M as a proxy for OY in favor of using SPR because SPR is a more rigorous approach.

**ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The National Standards Guidelines provided the following two definitions: (1) "To overfish means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis" and (2) "Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis." The Guidelines go on to indicate that "In all cases, status determination criteria must specify both of the following: (i) A maximum fishing mortality threshold or reasonable proxy thereof, and (ii) A minimum stock size threshold or reasonable proxy thereof."

**Overfishing for all species in the coastal migratory pelagics management unit is defined as a fishing mortality rate (F) in excess of the fishing mortality rate at 30% Static SPR (F30%Static SPR) which is the coastal migratory pelagics MSY proxy.**

**The "threshold level" for all species in the coastal migratory pelagics management unit is defined as 10% Static SPR.**

Discussion

This is basically No Action for the overfishing component. The threshold level is new.

Amendment 1 (Mackerel Amendment 1 (1985), pages 12-11 and 12-12) specified the following definition. "A stock of fish shall be considered overfished if the fishing mortality rate exceeds  $F_{msy}$  or  $F_{0.1}$ , or spawning biomass is low enough to affect recruitment. The  $F_{0.1}$  fishing rate is the level of fishing mortality at which an increase in effort produces ten percent of the increase in yield that would occur in a lightly fished fishery for a comparable increase in effort. An  $F_{0.1}$  yield per recruit management strategy better protects against growth overfishing and maintains a larger spawning population than does a  $F_{max}$  strategy. If any stock of subgroup is overfished, the assessment group will estimate levels of ABC which would allow that stock to recover in one year, three years, five years, or other period as requested by the Councils."

In Amendment 5 (Mackerel Amendment 5 (1990), pages 10-13) the Council revised the overfishing definition to conform with recently approved guidelines for fishery management plans.

"(a) A mackerel or cobia stock shall be considered overfished if the spawning stock biomass per recruit (SSBR) is less than the target level percentage recommended by the assessment group, approved by the Scientific and Statistical Committee (SSC), and adopted by the Councils. The target level percentage shall not be less than 20 percent.

(b) When a stock is overfished (as defined in (a)), the act of overfishing is defined as harvesting at a rate that is not consistent with a program to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges for recovery periods consistent with a program to rebuild an overfished stock.

(c) When a stock is not overfished (as defined in (a)), the act of overfishing is defined as a harvest rate that if continued would lead to a state of the stock that would not at least allow a harvest of OY on a continuing basis, and the assessment group will develop ABC ranges based upon OY (currently MSY)."

In Amendment 6 (Mackerel Amendment 6 (1992), pages 7-9) the Council revised paragraph (b) to add the following rebuilding timeframe and increase the overfishing level:

"(b) When a stock is overfished (as defined in a), the act of overfishing is defined as harvesting at a rate that is not consistent with programs to rebuild the stock to the target level percentage, and the assessment group will develop ABC ranges based on a fishing mortality rate that will achieve and maintain at least the minimum specified spawning potential ratio (currently

set at 30 percent). The recovery period is not to exceed 12 years for king mackerel beginning in 1985 and 7 years for Spanish mackerel beginning in 1987.”

In Amendment 8 (Mackerel Amendment 8 (1996), pages 27-31), as the result of a NMFS scientific workgroup report, the Council proposed lowering the overfished level to 20% transitional SPR but this was rejected by NMFS. The overfished level remains as specified in Amendment 6.

Biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria for the data-poor species. When such data become available for the data-poor species, the Council will use the framework procedure to add a biomass based component to the overfished definition.

The Council concluded this action meets the written guidance provided by NMFS and meets the requirements of the Magnuson Stevens Act.

### **Other Possible Options:**

**Option 1.** Overfishing for species in the Coastal Migratory Pelagics FMP can only be defined in terms of the fishing mortality component given the data-poor status of these species. Based on the written guidance from NMFS, the Council is setting the overfishing level equal to the natural mortality rate (M). The NMFS SEFSC recommended using the natural mortality rates shown in Table 50.

#### **Discussion**

While this option would have met the written guidance provided by NMFS and the requirements of the Magnuson Stevens Act, the Council rejected using M as a proxy for overfishing in favor of using SPR because SPR is a more rigorous approach.

**Option 2.** Redefine overfishing (proposed action in Amendment 8).

A. A mackerel stock or migratory group is considered to be overfished when the transitional spawning potential ratio (SPR) is below 20%.

B. When a stock or migratory group is overfished (transitional SPR less than 20%), a rebuilding program that makes consistent progress toward restoring stock condition must be implemented and continued until the stock is restored beyond the overfished condition. The rebuilding program must be designed to achieve recovery within an acceptable time frame as specified by the Councils. The Councils will continue to rebuild the stock until the stock is restored to the management target (OY) within an unspecified timeframe.

C. When a stock is not overfished (transitional SPR equal to or greater than 20%), the act of overfishing is defined as a static SPR that exceeds the threshold of 20% (i.e., F20%). If fishing mortality rates that exceed the level associated with the static SPR overfished level are maintained, the stock may become overfished. Therefore, if overfishing is occurring, a program to reduce fishing mortality rates toward management target levels (OY) will be implemented, even if the stock is not in an overfished condition.

D. The Councils have requested the Mackerel Stock Assessment Panel provide a range of possibilities and options for specifying an absolute biomass level which could be used to represent a depleted condition or state. In a future amendment, the Councils will describe a process whereby if the biomass is below such a level, the Councils would take appropriate action, including but not limited to, eliminating directed fishing mortality and evaluating measures to eliminate any bycatch mortality in a timely manner through the framework procedure.

E. For species like cobia, where there is insufficient information to determine whether the stock or migratory group is overfished (transitional SPR), overfishing is defined as a fishing mortality rate in excess of the fishing mortality rate corresponding to a default threshold static SPR of 30%. If overfishing is occurring, a program to reduce fishing mortality rates to at least the level corresponding to management target levels will be implemented.

Discussion

This option was rejected by the Council because the wording would not meet the new Magnuson-Stevens Act mandates concerning overfished.

**Option 3.** Specify a threshold level in the range of 1% to 20% Spawning Potential Ratio (SPR), an overfished level in the range of 20% to 55% SPR, and a target (OY) level in the range of 30% to 100% SPR.

Discussion

Portions of this wording have been incorporated into the preferred action. This specific option was rejected because it would not meet the new Magnuson-Stevens Act mandates of overfished for all species.

**Option 4.** Specify a threshold level of between 2 pounds and 2 million pounds (Council to specify) for each species.

Discussion

This option was rejected by the Council because biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria. When such data become available, the Council will use the framework procedure to add a biomass based component to the overfished definition. The Council is specifying a threshold level in terms of Static SPR (see the proposed action).

**ACTION 4. Rebuilding Timeframe.**

**The Council concluded that No Action is necessary at this time.**

Discussion

None of the Atlantic migratory group mackerels or cobia are overfished; cero, dolphin, and little tunny are listed as unknown in the 1997 Report to Congress on Status of Fisheries. Therefore a rebuilding timeframe is not necessary at this time.



**Other Possible Options:**

**Option 1.** Rebuilding to OY should occur within a time period equal to 1.5 times the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production.

**Discussion**

This option was rejected because rebuilding projections are not available at this time and because one is not required given that none of the species are overfished. Should a species become overfished, a rebuilding timeframe will be added through the framework provision as soon as the information is provided.

**ACTION 5. Overfishing Evaluation to meet the Current Definition (30% SPR)**

None of the Atlantic migratory group mackerels are listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States; cobia are not overfished, and cero, dolphin, and little tunny are listed as unknown.

The 1998 NMFS Report to Congress on the Status of Fisheries of the United States has not been provided to the Council as of this date. Results from the 1998 report will be addressed next year.

**4.3.4.1.5 Golden Crab FMP****ACTION 1. Maximum Sustainable Yield (MSY).**

**The Council concluded that No Action is necessary at this time.**

**Discussion**

The South Atlantic Council reviewed the MSY estimates, the methodology, review comments by the NMFS SEFSC, SSC, and Golden Crab AP and concluded, based upon the best available information, not to specify a total MSY for the golden crab resource within the Council's area of jurisdiction. As soon as sufficient information becomes available to calculate MSY, the framework procedure will be used to incorporate the MSY figures into the management plan (Golden Crab FMP (1995), pages 40-47).

**Other Possible Options:**

**Option 1.** MSY is equal to 30%-40% static SPR (Council to specify).

**Discussion**

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected this option because the level of data is poor.

**ACTION 2. Optimum Yield (OY).**

**The Council concluded that No Action is necessary at this time.**

Discussion

Optimum Yield (OY) is all golden crab that are harvested legally under the provisions of the golden crab fishery management plan which is equivalent to that level of golden crab harvest that would minimize user conflict among vessels, minimize the cost of fishing, produce a stable level of landings that would maximize returns to the fishermen, provide for a stable supply, and minimize management costs (Golden Crab FMP (1995), pages 94-97).

**Other Possible Options:**

**Option 1.** Optimum Yield for the golden crab fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the spawning potential ratio (SPR) at or above 40% static SPR.

Discussion

The Council rejected this option because SPR is not appropriate for golden crab and because the current OY is based upon the best available data.

**Option 2.** Other modifications to the Optimum Yield (OY) specifications. Note: Under this option, one would have to develop the rationale for any such modification.

Discussion

The Council rejected this option because no other proxies were suggested and because the current OY is based upon the best available data.

**ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

**The Council concluded that No Action is necessary at this time.**

Discussion

Overfishing is defined as any rate of fishing mortality in excess of  $F_{msy}$  for golden crab in the South Atlantic Council's management area (Attachment 5: Golden Crab FMP (1995), pages 97-102).

**Other Possible Options:**

**Option 1.** Specify a threshold level of between 2 pounds and 2 million pounds (Council to specify).

Discussion

The Council rejected this option because data on biomass are unavailable given the data-poor status of golden crab and because the proposed action is based on the best available data.

**Option 2.** Specify a threshold level in the range of 1% to 20% Spawning Potential Ratio (SPR), an overfished level in the range of 20% to 55% SPR, and a target (OY) level in the range of 30% to 100% SPR.

Discussion

The Council rejected this option because data on SPR are unavailable given the data-poor status of golden crab and because the proposed action is based on the best available data.

**ACTION 4. Rebuilding Timeframe.**

**The Council concluded that No Action is necessary at this time.**

Discussion

Golden crab is not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. Therefore a rebuilding timeframe is not necessary at this time.

**Other Possible Options:**

**Option 1.** Rebuilding to OY should occur within a time period equal to 1.5 times the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production.

Discussion

This option was rejected because rebuilding projections are not available at this time and because one is not required given that none of the species are overfished. Should a species become overfished, a rebuilding timeframe will be added through the framework provision as soon as the information is provided.

**ACTION 5. Overfishing Evaluation to meet the Current Definition.**

Golden crab is not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States.

The 1998 NMFS Report to Congress on the Status of Fisheries of the United States has not been provided to the Council as of this date. Results from the 1998 report will be addressed next year.

**4.3.4.1.6 Spiny Lobster FMP****ACTION 1. Maximum Sustainable Yield (MSY).**

**Maximum sustainable yield for species in the spiny lobster management unit is unknown. The Council reviewed alternatives and concluded the best available data supports using 20% Static SPR as a proxy for MSY.**

Discussion

There currently is not an accepted estimate of MSY for species in the spiny lobster management unit, due primarily to lack of adequate data. Following the NMFS written guidelines, the Council is proposing to use SPR as a proxy for MSY. The 20% level is consistent with the recommendations of the Gulf Council's Ad Hoc Crustacean Stock Assessment Panel.

**Other Possible Options:**

**Option 1.** No Action.

The original FMP (Spiny Lobster FMP (1982), pages 5-13 to 5-21) defined MSY as follows: A surplus yield model using only recorded catch and effort data for the commercial trap

#### 4.0 Environmental Consequences

fishery in the primary fishing areas was used to estimate a sustainable yield of 5.9 million pounds with the present size limit. After considering other unrecorded harvest and optimum size at recruitment, MSY was estimated as 12.7 million pounds. Size at maximum yield per recruit given present fishing effort was estimated to be between 3.7 and 3.9 inches carapace length (94-99 mm). The present 3.0 inch minimum size was estimated to provide between 85 and 91 percent of the maximum yield per recruit at present effort levels.

Amendment 1 (Spiny Lobster Amendment 1 (1987), pages 22-23) presents the conclusion that the current database is insufficient to quantitatively determine MSY, therefore MSY is set to be the same as OY (see below for OY description).

##### Discussion

There currently is not an accepted estimate of MSY for species in the spiny lobster management unit, due primarily to lack of adequate data. Following the NMFS written guidelines, the Council is proposing to use SPR as a proxy for MSY. Therefore, this option was rejected by the Council.

**Option 2.** MSY is equal to 30%-40% static SPR (Council to specify).

##### Discussion

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected the range under this option because the level of data is poor.

**Option 3.** MSY is probably higher than the 5.9 million pounds currently estimated in the FMP. Also, since the estimate of transitional SPR has been above 30% from 1993-94 to 1996-97, the best proxy for MSY would be a harvest level that maintains a transitional SPR at or above 30%.

##### Discussion

The Crustacean Stock Assessment Panel recommended this option. However, there currently is not an accepted estimate of MSY for species in the spiny lobster management unit, due primarily to lack of adequate data. Following the NMFS written guidelines, the Council is proposing to use SPR as a proxy for MSY. Therefore, this option was rejected by the Council.

**Option 4.** The South Atlantic Council reviewed the current MSY estimates and comments from the Ad Hoc Crustacean Stock Assessment Panel (Appendix G) and could have concluded, based upon the best available information, not to specify a MSY for spiny lobster or other species in the management unit. As soon as sufficient information becomes available to calculate MSY, the framework procedure will be used to incorporate the MSY figures into the management plan.

##### Discussion

The wording suggested by the Crustacean Stock Assessment Panel is not specific enough to be measured at this time and was rejected by the Council in favor of the proposed action.

**ACTION 2. Optimum Yield (OY).**

**Optimum Yield (OY) for the spiny lobster fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the Spawning Potential Ratio (SPR) at or above 30% Static SPR.**

Discussion

The original FMP (Spiny Lobster FMP (1982), pages ) defined OY as follows: OY is specified to be all spiny lobster more than 3.0 inches carapace length or not less than 5.5 inches tail length that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions. OY is estimated at 9.5 million pounds. Tail length measure applies only if legally separated from the body.

Amendment 1 (Spiny Lobster Amendment 1 (1987), pages 22-23) specified the OY for slipper lobster to be all non egg bearing slipper lobster that can be legally harvested by commercial and recreational fishermen given existing technology and prevailing economic conditions.

Amendment 2 (Spiny Lobster Amendment 2 (1989), page 10) modified the first sentence of the statement of OY to read as follows for spiny lobster (OY for slipper lobster is unchanged): OY is all spiny lobster with carapace or tail lengths equal to or larger than the minimum legal lengths that are harvested legally under the provisions of the FMP. Note: Current legal size specified in the regulations is 3.0 inches.

Amendment 4 (Spiny Lobster Amendment 4 (1994), page 10) contains the following restatement of OY: Optimum yield (OY) is all spiny lobster with carapace or tail lengths equal to or larger than the minimum legal lengths that are harvested legally under the provisions of the FMP. OY is estimated at 9.5 million pounds. The current legal size specified in the regulations is lobsters larger than 3.0 inches carapace length or for those fishermen with a tailing permit, lobster tails equal to or larger than 5.5 inches.

The Council is basing OY on a similar approach (SPR-based) as used for MSY. This is consistent with the NMFS written guidelines. The 20% level is consistent with the recommendations of the Gulf Council's Ad Hoc Crustacean Stock Assessment Panel.

Other Possible Options:

**Option 1. No Action.**

Discussion

The Council rejected this option in favor of the SPR-based approach used in the proposed action.

**Option 2. Optimum Yield for the Spiny Lobster fishery is the amount of harvest that can be taken by U.S. fishermen while maintaining the spawning potential ratio (SPR) at or above 40% to 100% (Council to specify).**

Discussion

The Council rejected levels of SPR at or above 40% in favor of 30% Static SPR.

**Option 3. Other Modifications to the Optimum Yield (OY) specification. Note: Under this option, one would have to develop the rationale for any such modification.**

Discussion

The Council rejected this option because no other modifications were suggested.

**ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The National Standards Guidelines provided the following two definitions: (1) "To overfish means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis" and (2) "Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis." The Guidelines go on to indicate that "In all cases, status determination criteria must specify both of the following: (i) A maximum fishing mortality threshold or reasonable proxy thereof, and (ii) A minimum stock size threshold or reasonable proxy thereof."

**Overfishing for species in the Spiny Lobster FMP can only be defined in terms of the fishing mortality component given the data-poor status of these species. Based on the written guidance from NMFS, the Council is setting the overfishing level as a fishing mortality rate (F) in excess of the fishing mortality rate at 20% Static SPR (F20% Static SPR).**

Discussion

This corresponds to the maximum fishing mortality threshold (MFMT). Biomass levels and/or proxies are not available at this time to provide the second part of the status determination criteria (MSST). When such data become available, the Council will use the framework procedure to add a biomass based component to the overfished definition. This action meets the written guidance provided by NMFS and meets the requirements of the Magnuson-Stevens Act. It also meets the Council's goal of precautionary management.

Other Possible Options:

**Option 1.** No Action. Amendment 3 (Spiny Lobster Amendment 3 (1990), pages 4-10) proposed the following definition: Overfishing exists when the eggs per recruit ratio of the exploited population to the unexploited population is reduced below 5% and recruitment of small lobsters into the fishery has declined for three consecutive fishing years. Overfishing will be avoided when the eggs per recruit ratio of exploited to unexploited populations is maintained above 5%.

Discussion

This option was rejected by the Council because it is more difficult to measure than SPR.

**Option 2.** Specify a threshold level in the range of 1% to 20% Spawning Potential Ratio (SPR), an overfished level in the range of 20% to 55% SPR, and a target (OY) level in the range of 30% to 100% SPR.

Discussion

Portions of this option have been incorporated into the preferred action. This specific option was rejected because it contained only ranges and not specific values.

**Option 3.** Specify a threshold level of between 2 pounds and 2 million pounds (Council to specify) for each species.

Discussion

This option was rejected by the Council because biomass levels and/or proxies are not available at this time.

**Option 4.** Have the current overfishing definition OR any modified definition also apply to slipper lobsters.

Discussion

The intent of this option is incorporated into the preferred action, therefore, this specific option was rejected.

**Option 5.** Adopt the following from the Crustacean Stock Assessment Panel (CSAP):  
“Following the precautionary approach, the group decided on an overfishing definition of 20% transitional SPR instead of the present 5% eggs per recruit.

Discussion

The value of 20% was chosen because the lowest transitional SPR for the Florida Keys in the past 10 years was 24% in the 1991-92 season. There were no data to determine the SPR value for the season with lowest landings (1983-84) but the group assumed that it was lower than 24% and chose 20%. The group recommended including a juvenile or pre-recruit index because although the number of recruits cannot be predicted accurately from the number of spawners, the number of recruits entering the fishery can be predicted from the number of juveniles or pre-recruits. Thus the index would allow the Council to prepare the fishery for any downturns if necessary. In the absence of a juvenile index, the CSAP recommended that pueruli settling be monitored.”

The Council rejected this option in favor of the preferred action using Static SPR and because data are not available to allow use of a juvenile or pre-recruit index at this time.

**Option 6.** Overfishing for species in the Spiny Lobster FMP can only be defined in terms of the fishing mortality component given the data-poor status of these species. Based on the written guidance from NMFS, the Council is setting the overfishing level equal to the natural mortality rate (M). The NMFS SEFSC recommended using the natural mortality rates shown in Table 49.

Discussion

The Council rejected this option in favor of the SPR-based approach under the proposed action.

**ACTION 4. Rebuilding Timeframe.**

**The Council concluded that No Action is necessary at this time.**

Discussion

Spiny lobster are not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. Therefore a rebuilding timeframe is not necessary at this time.

**Other Possible Options:**

**Option 1.** Rebuilding to OY should occur within a time period equal to 1.5 times the mean generation time. Generation time is computed as the age at which the average female achieves half of her expected lifetime egg production.

Discussion

This option was rejected because rebuilding projections are not available at this time and because one is not required given that none of the species are overfished. Should a species become overfished, a rebuilding timeframe will be added through the framework provision as soon as the information is provided.

**ACTION 5. Overfishing Evaluation to meet Current Definition.**

Spiny lobster are not overfished as listed in the September 1997 NMFS Report to Congress on Status of Fisheries in the United States; slipper lobster are listed as unknown and have no overfishing definition. The latest assessment conducted by the State of Florida during 1997 indicated the following: "Transitional spawning potential ratios based upon biomass varied between 7% and 19% in the upper Keys during these years. The SPR values in the lower Keys were higher and varied between 20% and 31%. The spawning potential ratios were approximately 2%-4% higher when they were calculated using fecundity instead of biomass." The Council concluded no additional action is required at this time.

The 1998 NMFS Report to Congress on the Status of Fisheries of the United States has not been provided to the Council as of this date. Results from the 1998 report will be addressed next year.



#### 4.3.4.1.7 Coral, Coral Reefs and Live/Hard Bottom Habitat FMP

##### **ACTION 1. Maximum Sustainable Yield (MSY).**

**The Council concluded that No Action is necessary at this time.**

##### Discussion

The original FMP (Coral FMP (1982), pages 5-61 to 5-62) addressed MSY as follows: The lack of sufficient data on biomass and mortality, and the absence of a fishery from which catch and effort data may be obtained, prevents any calculation of MSY for the entire management area. An estimated MSY (MSY\*) has been determined for several species at specific reefs in the Florida reef tract, but cannot be expanded to other corals due to great differences in species, density, growth rates, and other factors. An approximation of MSY was calculated for several communities.

##### Other Possible Options:

**Option 1.** MSY is equal to 30%-40% static SPR (Council to specify).

##### Discussion

NMFS has indicated this is a reasonable proxy for MSY for a number of species. It is important the relationship between the MSY level and the overfished level be clearly specified. The Council rejected the range under this option because the level of data is poor.

##### **ACTION 2. Optimum Yield (OY).**

**The Council concluded that No Action is necessary at this time except the minor adjustment to the wording shown below in bold to incorporate Amendment 2 actions.**

##### Discussion

The original FMP (Coral FMP (1982), pages 12-4 to 12-5) defined OY as follows: OY for all corals is the level of harvest specified or as may be authorized pursuant to the permitting criteria established in this plan. Based on available data it is the Councils' intent to allow the existing level of legal, reported harvest consistent with the objectives of the plan. OY for stony corals and sea fans is to be zero (0) except as may be authorized for scientific and educational purposes **and under live rock aquaculture permits**. The current and expected level of harvest for this purpose is estimated to be about 140 kilograms per year. OY for octocorals is the amount of harvest which is authorized pursuant to this plan. It is to be all octocorals (except sea fans) that are harvested by U.S. fishermen. Octocorals, except for sea fans, are identified as presently being harvested without apparent stock damage. Present and expected level of harvest is estimated to be about 5,845 colonies annually, 1,463 of which come from the EEZ.

Amendment 1 (Coral Amendment 1 (1990), pages 5-7) revised OY to read as follows: OY for coral reefs, stony corals, and sea fans (*Gorgonia ventalina* and *Gorgonia flabellum*), hereafter to be referred to as prohibited corals, in the EEZ is to be zero (0) except as may be authorized for scientific and educational purposes. The level of harvest is expected to be about 140 kilograms per year. Harvest of allowable octocorals (those other than sea fans) in the EEZ is not to exceed 50,000 colonies per year. Fishing for octocorals in the EEZ will cease when the quota is reached.

Amendment 2 (Coral Amendment 2 (1994), pages 26-27) contains the following statement of OY for live rock: Optimum yield (OY) for wild live rock is to be 485,000 pounds annually for the South Atlantic region where harvest is allowed during 1994 and 1995, after which it is to be zero except for that which may be allowed by permit.

Amendment 3 (1995) prohibited octocoral harvest north of Cape Canaveral, Florida.

**Other Possible Options:**

**Option 1.** Other Modifications to the Optimum Yield (OY) specification. Note: Under this option, one would have to develop the rationale for any such modification.

**Discussion**

The Council rejected this option because no other modification were proposed.

**ACTION 3. Overfishing Level to meet Magnuson-Stevens Mandate.**

The National Standards Guidelines provided the following two definitions: (1) "To overfish means to fish at a rate or level that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis" and (2) "Overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis." The Guidelines go on to indicate that "In all cases, status determination criteria must specify both of the following: (i) A maximum fishing mortality threshold or reasonable proxy thereof, and (ii) A minimum stock size threshold or reasonable proxy thereof."

**The Council concluded that No Action is necessary at this time.**

**Discussion**

Amendment 1 (Coral Amendment 1 (1990), page 7) proposed the following definition: Overfishing is defined as an annual level of harvest that exceeds OY.

**Other Possible Options:**

**Option 1.** Overfishing occurs if the level of harvest of allowable octocorals (those other than sea fans) in the EEZ exceeds 0 - 25,000 (Council to specify) colonics per year.

**Discussion**

The Council rejected this option because it was specific only to octocorals.

**ACTION 4. Rebuilding Timeframe.**

**The Council concluded that No Action is necessary at this time.**

**Discussion**

Corals are not listed as being overfished in the NMFS September 1997 Report to Congress on Status of Fisheries of the United States. Therefore a rebuilding timeframe is not necessary at this time.

**ACTION 5. Overfishing Evaluation to meet Current Definition.**

South Atlantic Corals are listed as unknown in the September 1997 NMFS Report to Congress on Status of Fisheries in the United States. The Council concluded no additional action is required at this time.

The 1998 NMFS Report to Congress on the Status of Fisheries of the United States has not been provided to the Council as of this date. Results from the 1998 report will be addressed next year.

#### 4.3.4.2 Framework Adjustment Procedures.

**ACTION 6.** Add a provision to all framework procedures in all Council FMPs that allows the addition of biomass levels and age structured analyses as they become available.

##### Discussion

Data are not available to allow the Council to specify biomass levels for the overfished levels. This provision will allow the Council to add specification of biomass levels and/or age structured analyses to address the overfished component of the status determination criteria. Making these adjustments through the framework procedure should be faster than requiring a full plan amendment.

#### 4.3.4.3 Summary of Council's Control Rules.

The Council based their control rules on the NMFS written guidance as provided in the Technical Guidance Document and the Checklist. The three levels or points at which the management measures would change are shown below:

**(a) Threshold** — if the Static SPR is less than the threshold level, the Councils will immediately take appropriate action including but not limited to eliminating directed fishing mortality and evaluating measures to eliminate any bycatch mortality in a timely manner.

**(b) Overfishing** — if the Static SPR is above the threshold level but below the overfishing level, the mandated timeframe to rebuild to above the overfishing level within 10 years (or longer if warranted based on biology) would be operative.

**(c) Optimum Yield** — if the Static SPR is less than OY but greater than or equal to the overfishing level, the Council will have more flexibility in specifying the timeframe to achieve OY. However, the Council must make measurable progress towards achieving the OY level.

This approach is very similar to the approach outlined in Figure 10 on page 38 of the Technical Guidance Document (Appendix A). The point at which the solid line goes to a F of zero is equivalent to the Council's threshold level. Under the Council's control rule there is only one straight line for "b" and the point at which this drops from the target or OY level is equivalent to the Council's overfishing level. The area of the solid line indicated as "c" is equivalent to the Council's Optimum Yield.

The table below presents the specific values (Static SPR and fishing mortality rates at specific Static SPR levels), by species, in the Council's control rules:

Table 53. Specific values for the Council's control rules.

Species/FMP	Threshold	MSY	Overfishing	Overfished	OY
Red drum	10%	30%	F30%	NA	40%
Hermaphroditic groupers	10%	30%	F30%	NA	45%
Jewfish & Nassau groupers	30%	40%	F40%	NA	50%
Black sea bass	10%	30%	MFMT=0.72	MSST=3.72	40%
All other snapper grouper species	10%	30%	F30%	NA	40%
Coastal migratory pelagics	10%	30%	F30%	NA	40%
Spiny lobster	—	20%	F20%	NA	30%
Shrimp	—	WS=14.5MLB	*	*	*
		BS=9.2 MLB	*	*	*
		PS=1.8 MLB	*	*	*
		RS=6.8 MLB	*	*	*
Golden crab	—	NA	FMSY	NA	*
Coral	—	NA	*	NA	*

\*See discussion in test. For Shrimp, WS=White Shrimp, BS=Brown Shrimp, PS=Pink Shrimp, and RS=Rock Shrimp.

#### 4.4 Unavoidable Adverse Effects

The Sustainable Fisheries Act of 1996 established certain requirements and standards the Councils and the Secretary must meet in managing fisheries under the Magnuson-Stevens Act. The following summarizes the short-term losses which will be mitigated by long-term gains of implementing the provisions in the Sustainable Fisheries Act.

##### Consistency with SFA Section 102 Definitions

**Action 1A.** No action to amend FMPs is required except as specified in Action 1B. --- None

**Action 1B.** Minor change to Snapper Grouper FMP - for snowy grouper and golden tilefish (Amendment 6) change "bycatch" to "trip limit". --- None

##### Bycatch - Bycatch Management Measures

**ACTION 2** - No Action to Amend the Bycatch Management Measures in the FMPs is Required. --- None

**Action 2A.** No action to amend the bycatch management measures in the FMPs is required. --- None

**Action 2B.** Amend Shrimp, Red Drum, Snapper Grouper, Coastal Migratory Pelagics, Golden Crab, Spiny Lobster, Coral and Coral Reefs and Live/Hard Bottom Habitat FMPs to include reporting requirements as specified in the Atlantic Coastal Cooperative Statistics Program (ACCSP). --- None

##### Commercial, Recreational and Charter Fishing - Sector Descriptions, Landing Trends and Data Specifications

**Action 3.** No Action to Amend the FMPs is Required. --- None

##### Fishing Communities - Identify and Define

**Action 4.** Amend/Establish FMPs to Include Available Information on Fishing Communities. --- None

##### MSY, OY, Overfishing and Overfished

**Action 5.** Amend/Establish FMPs as Required. --- Unknown at this time, will depend on the flexibility afforded the Councils in addressing MSY, OY, overfishing, and overfished levels under the National Standard Guidelines.

**Action 6.** Framework Adjustment Procedure. --- None

#### 4.5 Relationship of Short-term Uses and Long-term Productivity

The Sustainable Fisheries Act was passed by Congress to stop overfishing and insure the maximum sustainable yield from the nations fisheries resources. Implementing the provisions in the Sustainable Fisheries Act will insure the long-term productivity of these fishery resources.

#### 4.6 Irreversible and Irrecoverable Commitments of Resources

There are no irreversible or irretrievable commitments of resources associated with the proposed actions.

#### 4.7 Effects of the Fishery on the Environment

Not Applicable to these actions.

**4.8 Public and Private Costs**

Preparation, implementation, enforcement, and monitoring of this and any federal action involves expenditure of public and private resources which can be expressed as costs associated with the regulation. Costs associated with the development of the Comprehensive SFA Amendment:

Council costs of document preparation, meetings, scoping meetings, public hearings and information dissemination	\$75,000
NMFS administrative costs of document preparation, meetings and review	\$
NMFS law enforcement costs	\$
Total	----- \$75,000+

**4.9 Effects on Small Businesses: Initial Regulatory Flexibility Analysis**

The Regulatory Flexibility Act requires a determination as to whether or not a proposed rule has a significant impact on a substantial number of small entities. If the rule does have this impact then an Initial Regulatory Flexibility Analysis (IRFA) has to be completed for public comment. The IRFA becomes final after the public comments have been addressed. If the proposed rule does not meet the criteria for "substantial number" and "significant impact" then a certification to this effect must be prepared.

This proposed rule, if promulgated, will :

- (i) Make FMPs and FMP regulations for the managed fisheries under the Council's jurisdiction consistent with SFA Section 102 definitions.
- (ii) Make FMPs and FMP regulations for managed fisheries under the Council's jurisdiction consistent with SFA Section 108 required provisions relative to commercial, recreational and charter fishing.
- (iii) Make FMPs and FMP regulations for managed fisheries under the Council's jurisdiction consistent with SFA Section 108 required provisions relative to bycatch management measures.
- (iv) Identify and define fishing communities.
- (v) Amend/establish FMPs as required to make definitions of MSY, OY, overfishing and overfished consistent with "National Standard Guidelines".
- (vi) Framework Adjustment Procedure.

All of the commercial and recreational (headboats, charter boats, and private / rental boats) entities participating in fisheries under the jurisdiction of the South Atlantic Council affected by the rule will qualify as small business entities because their gross revenues are less than \$3.0 million annually. Hence, it is clear that the criterion of a substantial number of the small business entities comprising the snapper grouper harvesting industry being affected by the proposed rule will be met. The outcome of "significant impact" is less clear but can be triggered by any of the five conditions or criteria discussed below.

The regulations are likely to result in a change in annual gross revenues by more than 5 percent. The discussions under economic impacts in Section 4 details the effects on commercial and recreational entities for each proposed action to the extent possible. Only the proposed options on MSY, OY, overfishing and overfished are likely to result in any economic impact to fishing entities. However, it is expected that any impact would be minimal because of the effects of current regulations that were designed to maintain the long term economic viability of the fisheries by controlling and restricting fishing effort.

Annual compliance costs (annualized capital, operating, reporting, etc.) increase total costs of production for small entities by more than 5 percent. It is not expected that gross revenue from these fisheries would be reduced because of these proposed measures. The Council is recommending taking no action to amend the bycatch management measures in the FMPs. This is the only measure that could have resulted in cost increase to some fishing entities.

Compliance costs as a percent of sales for small entities are at least 10 percent higher than compliance costs as a percent of sales for large entities. All the firms expected to be impacted by the rule are small entities and hence there is no differential impact.

Capital costs of compliance represents a significant portion of capital available to small entities considering internal cash flow and external financing capabilities. The proposed actions do not require any existing fishing entity to acquire new equipment or to completely refit existing equipment for compliance purposes.

The requirements of the regulation are likely to result in a number of the small entities affected being forced to cease business operations. This number is not precisely defined by SBA but a "rule of thumb" to trigger this criterion would be two percent of the small entities affected. The analyses under economic impacts for each proposed action do not indicate that any entity will be forced out of business.

Considering all the criteria discussed above, the conclusion is that small businesses will not be significantly affected by the proposed rule. Hence, the determination is made that the proposed rule will have no significant impact on a substantial number of small business entities and an Initial Regulatory Flexibility Analysis (IRFA) is not required.

The full details of the economic analyses conducted for the proposed rule are contained in the RIR under the heading "Economic Impacts" in Section 4. Some of the relevant results are summarized for the purposes of the IRFA.

Description of the reasons why action by the agency is being considered: The Sustainable Fisheries Act of 1996 established certain requirements and standards the Councils and the Secretary must meet in managing fisheries under the Magnuson-Stevens Act.

Statement of the objectives of, and legal basis for, the proposed rule: The objectives are stated in Section 1.4 The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) as amended through October 11, 1996 provides the legal basis for the rule.

#### 4.0 Environmental Consequences

Description and estimate of the number of small entities to which the proposed rule will apply: The proposed rule will apply to all of the fishing entities that harvest fish within the management units under the jurisdiction of the Council. Section 4.3.3.1.1 provides details on South Atlantic fishing communities based on the available information.

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: The proposed rule will not require any additional reporting or record keeping on the part of commercial and recreational entities. Compliance will be monitored through existing systems established by the National Marine Fisheries Service and the U.S. Coast Guard. The professional skills necessary to meet these requirements will not change relative to the level that all the fishermen are familiar with and have previously used.

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.

Description of significant alternatives to the proposed rule and discussion of how the alternatives attempt to minimize economic impacts on small entities: In Section 4, each proposed action includes a number of options under the heading: "Other Possible Options for Actions 1 - 5". Refer to Sections 4.2 and 4.3: "Management Options" for details of the economic impact assessment on small entities for each option. The status quo or "no action" option was also considered for each proposed action.



## 5.0 LIST OF PREPARERS

Robert K. Mahood, Executive Director, South Atlantic Fishery Management Council  
Gregg T. Waugh, Deputy Executive Director, South Atlantic Fishery Management Council  
Roger Pugliese, Fishery Biologist, South Atlantic Fishery Management Council  
Michael E. Jepson, Fishery Cultural Anthropologist, South Atlantic Fishery Management Council  
Dr. Theophilus R. Brainerd, Fishery Economist, South Atlantic Fishery Management Council

The following individual aided in review of the public hearing document:  
Kerry O'Malley, Technical Assistant, South Atlantic Fishery Management Council

## 6.0 LIST OF AGENCIES AND ORGANIZATIONS

### Responsible Agency

South Atlantic Fishery Management Council  
1 Southpark Circle  
Southpark Building, Suite 306  
Charleston, South Carolina 29407-4699  
(843) 571-4366  
(843) 769-4520 (FAX)  
safmc@noaa.gov (email)

### List of Agencies, Organizations, and Persons Consulted

SAFMC Scientific and Statistical Committee  
North Carolina Coastal Zone Management Program  
South Carolina Coastal Zone Management Program  
Georgia Coastal Zone Management Program  
Florida Coastal Zone Management Program  
Florida Department of Environmental Protection  
Florida Marine Fisheries Commission  
Georgia Department of Natural Resources  
Gulf of Mexico Fisheries Management Council  
North Carolina Department of Environment, Health, and Natural Resources  
South Carolina Department of Natural Resources  
Georgia Department of Natural Resources  
Florida Department of Environmental Protection  
National Marine Fisheries Service  
    - Washington Office  
    - Office of Ecology and Conservation  
    - Southeast Region  
    - Southeast Fisheries Science Center  
National Oceanic and Atmospheric Administration  
    - General Counsel  
United States Coast Guard  
United States Environmental Protection Agency, Region IV  
Center for Marine Conservation  
National Fisheries Institute  
South Atlantic State Sea Grant Offices  
Atlantic Coast Conservation Association  
Atlantic States Marine Fisheries Commission  
North Carolina Fisheries Association  
Organized Fishermen of Florida  
Southeastern Fisheries Association  
Monroe County Commercial Fishermen, Inc.

## **7.0 OTHER APPLICABLE LAW**

### **7.1 Vessel Safety**

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

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

There are no fishery conditions, management measures, or regulations contained in this amendment which would result in the loss of harvesting opportunity because of crew and vessel safety effects of adverse weather or ocean conditions. No concerns have been raised by people engaged in the fishery or the Coast Guard that the proposed management measures directly or indirectly pose a hazard to crew or vessel safety under adverse weather or ocean conditions. Therefore, there are no procedures for making management adjustments in this amendment due to vessel safety problems because no person will be precluded from a fair or equitable harvesting opportunity by the management measures set forth.

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

### **7.2 Coastal Zone Consistency**

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

This amendment is consistent with the Coastal Zone Management Plan of Florida, Georgia, South Carolina, and North Carolina to the maximum extent practicable.

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

### **7.3 Endangered Species and Marine Mammal Acts**

The Sustainable Fisheries Act of 1996 established certain requirements and standards the Councils and the Secretary must meet in managing fisheries under the Magnuson-Stevens Act. Implementing the provisions in the SFA will not have any negative impacts on the listed and protected species under the Endangered Species Act (ESA) and Marine Mammals Protection Act (MMPA) including:

## 7.0 Other Applicable Law

### Whales:

	<u>Date Listed</u>
(1) Northern right whale- <i>Eubalaena glacialis</i> (ENDANGERED)	12/2/70
(2) Humpback whale- <i>Magaptera novaeangliae</i> (ENDANGERED)	12/2/70
(3) Fin whale- <i>Balaenoptera physalus</i> (ENDANGERED)	12/2/70
(4) Sei whale- <i>Balaenoptera borealis</i> (ENDANGERED)	12/2/70
(5) Sperm whale- <i>Physeter macrocephalus</i> (ENDANGERED)	12/2/70
(6) Blue whale- <i>Balaenoptera musculus</i> (ENDANGERED)	

### Sea Turtles:

	<u>Date Listed</u>
(1) Kemp's ridley turtle- <i>Lepidochelys kempii</i> (ENDANGERED)	12/2/70
(2) Leatherback turtle- <i>Dermochelys coriacea</i> (ENDANGERED)	6/2/70
(3) Hawksbill turtle- <i>Eretmochelys imbricata</i> (ENDANGERED)	6/2/70
(4) Green turtle- <i>Chelonia mydas</i> (THREATENED/ENDANGERED)	7/28/78
(5) Loggerhead turtle- <i>Caretta caretta</i> (THREATENED)	7/28/78

### Other Species Under U.S. Fish and Wildlife Service Jurisdiction:

	<u>Date Listed</u>
(1) West Indian manatee- <i>Trichechus manatus</i> (ENDANGERED) (Critical Habitat Designated)	3/67 1976
(2) American crocodile - <i>Crocodylus acutus</i> (ENDANGERED) (Critical Habitat Designated)	9/75 12/79

## 7.4 Paperwork Reduction Act

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

There are no measures proposed that would dictate additional paperwork requirements.

## 7.5 Federalism

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

## 7.6 National Environmental Policy Act: Finding of No Significant Impact

The discussion of the need for this amendment, proposed actions and alternatives, and their environmental impacts are contained in Sections 1.0 and 2.0 of this amendment and the supplemental environmental impact statement. A description of the affected environment is contained in Section 3.0.

The proposed amendment is not a major action and will not have a significant impact on the quality of the marine and human environment of the South Atlantic.

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

Overall, the benefits to the nation resulting from implementation of this amendment are greater than management costs.

#### Environmental Significance and Impact of the Fishery, Proposed Action and Alternatives.

Section 4.0 describes the Council's management measures. Section 1508.27 of the CEQ Regulations list 10 points to be considered in determining whether or not impacts are significant. The analyses presented below are based on the detailed information contained in Section 4.0 Environmental Consequences including the Regulatory Impact Review, Regulatory Flexibility Determination, and Social Impact Assessment.

#### Beneficial and Adverse Impacts

There are beneficial impacts but no adverse impacts from the proposed actions. The impacts are described for each action in Section 4.0 and summarized in Section 2.0.

Summary of Adverse Impacts: None

Summary of Beneficial Impacts: For a detailed discussion of the biological, social, and economic beneficial impacts of the proposed measures refer to the biological, social, and economic impact discussions under each Action in Section 4.2.

#### Public Health or Safety

The proposed actions, and their alternatives, are not expected to have any substantial adverse impact on public health or safety.

#### Unique Characteristics

The proposed actions have no impacts on characteristics of the area such as proximity to historic or cultural resources, park lands, wetlands, or ecologically critical areas.

#### Controversial Effects

The proposed actions are not expected to have significant controversial effects. The Council is providing extensive opportunity for input by holding public hearings, and by providing the opportunity for interested persons to provide written comments. During development of this amendment, the Council has incorporated suggestions from the public.

#### Uncertainty or Unique/Unknown Risks

The proposed actions are not expected to have any significant effects on the human environment that are highly uncertain or involve unique or unknown risks. Benefits from management cannot be quantified but the direction and relative magnitude are known and are positive. If the proposed actions were not implemented there would be a high level of uncertainty as to the future status of the species being impacted.

#### Precedent/Principle Setting

The precedent/principle setting of the proposed actions was established in the Sustainable Fisheries Act of 1996.

#### Historical/Cultural Impacts

The proposed actions are not expected to have any significant effects on historical sites listed in the National Register of Historic Places and will not result in any significant impacts on significant scientific, cultural, or historical resources.

Endangered/Threatened Species Impacts

The Council has concluded that neither the proposed management measures in the SFA Comprehensive Amendment nor the fisheries managed by the Council will adversely affect the recovery of endangered or threatened species, or their critical habitat.

Effects of the Fishery on the Environment

Not Applicable.

Bycatch

Bycatch is addressed as part of the proposed actions.

Effort Directed at or From Other Fisheries

Not Applicable

In compliance with the National Environmental Policy Act, an environmental assessment has been done for the Comprehensive SFA Amendment that fulfills the requirements of the Magnuson-Stevens Act to: (1) Address the consistency with SFA Section 102 definitions, (2) Address bycatch management measures and bycatch reporting requirements to insure consistency with SFA Section 108 required provisions, (3) Address descriptions of each sector and quantify trends in landings and data specified for each sector for the commercial, recreational and charter fisheries to insure consistency with SFA Section 108 required provisions, (4) Address fishery impact statements to insure they incorporate the likely effects of management measures on fishing communities and (5) Address overfishing provisions specifying objective and measurable criteria for identifying whether a fishery is overfished, measures to rebuild overfished stocks and reductions in fishing mortality and fair allocation among harvesters, to insure consistency with SFA Section 108 required provisions.

The proposed Comprehensive SFA Amendment is not a major action and will not have a significant impact on the quality of the marine and human environment of the South Atlantic. Therefore, an Environmental Impact Statement is not required by Section 102 (2) (C) of NEPA or its implementing regulations.

---

Assistant Administrator for Fisheries, NOAA

---

Date

**8.0 REFERENCES**

- Aguirre International 1996. An Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and the Mid-Atlantic Regions. NOAA, 1315 East West Highway, Room 14529, Silver Springs, MD 20912-3282. NOAA Contract Number 50-DGNF-5-00008.
- Centaur Associates, Inc. 1981 Socio-Economic Study of Mackerel Purse Fishery, Task I & II Reports. A report for National Marine Fisheries Service.
- CEQ. 1986. U.S. Council on Environmental Quality. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR 1500-1508). Washington. Government Printing Office, Washington, D.C. 20402.
- Clark, W.G. 1991. Groundfish exploitation rates based on life history parameters. *Can. J. Fish. Aquat. Sci.* 48:734-750.
- Diaby, Souleymane. 1997. Economic Analysis of North Carolina's Coastal Fishing Industry: A Preliminary Assessment for Carteret County.
- ERS-USDA. 1993. Understanding Rural America. 1995. Economic Research Service, United States Department of Agriculture, Agriculture Information Bulletin No. 710. Washington, DC. February 1995.
- Hardy, L.F. 1998. The 1997-1998 Wreckfish Fishery Annual Report. NMFS SEFSC Beaufort Lab, unpub. ms., 8p.
- Interorganizational Committee on Guidelines and Principles for Social Impact Assessments. 1994. Guidelines for Social Impact Assessment. U.S. Dept. of Commerce, NOAA Tech. memo. NMFS-F/SPO-16, 29p.
- Iverson, K. 1997 Profile of Commercial Snapper/Grouper Fishing Regions. Unpublished manuscript. Work completed as part MARFIN research reported in Rhodes, R., K. Backman and G. Hawkins 1997. Socio-demographic Assessment of Commercial Reef Fishermen in the South Atlantic Region. MARFIN No. NA57FF0059 Final Report. Office of Fisheries Management, Division of Marine Resources, SC Department of Natural Resources, P.O. Box 12559, Charleston, SC 29422-2559
- Johnson, J. and M. Orbach. 1996 Effort Management in North Carolina Fisheries: A Total Systems Approach. Fisheries Research Reports to the Fisheries Moratorium Steering Committee. North Carolina Sea Grant College Program, UNC-SG-96-08.
- Mace, P., L. Botsford, J. Collie, W. Gabriel, P. Goodyear, J. Powers, V. Restrepo, A. Rosenberg, M. Sissenwine, G. Thompson, and J. Witzig. 1996. Scientific Review of Definitions of Overfishing in U.S. Fishery Management Plans - Supplemental Report. NOAA Tech. Memo. NMFS-F/SPO-21. 20 pp.

## 8.0 References

- Mackerel Stock Assessment Panel. 1997. 1997 Report of the Mackerel Stock Assessment Panel. Prepared by the Mackerel Stock Assessment Panel, March 31 - April 4, 1997 Miami Laboratory. Available from the South Atlantic Council office.
- Manooch, C.S. III, J.C. Potts, M.L. Burton, and P.J. Harris. 1997. Population Assessment of the Scamp, *Mycteroperca phenax*, from the Southeastern United States. NMFS SEFSC Beaufort Lab, unpub. ms., 57 pp.
- McKenna, J. E., Jr. 1994 Commercial Landings and Quota Monitoring of Florida's 1992-93 King Mackerel Fishery. Florida Marine Research Institute.
- Nix, H.L., Glenn, S. and J.N. Whitted. 1975. Locational Inventory of Docks and Shrimp Trawlers on the Coast of Georgia. Unpublished Manuscript.
- NMFS. 1996. Fisheries of the United States. Current Fishery Statistics No.9600 Fisheries Statistics Division, National Marine Fisheries Service, Silver Springs, MD.
- NMFS. 1996. Environmental Assessment/Regulatory Impact Review for Amendment 44 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area and Amendment 44 to the Fishery Management Plan for the Groundfish Fishery of the Gulf of Alaska to Redefine Acceptable Biological Catch and Overfishing, Appendix B. AKFSC, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115-0070.
- Potts, J.C., M.L. Burton, and C.S. Manooch III. 1998. Trends in Catch Data and Estimated SPR Values for Fifteen Species of Reef Fish Landed Along the Southeastern United States. NMFS SEFSC Beaufort Lab, unpub. ms., 45 pp.
- Rhodes, R.K., K. Backman, and G. Hawkins 1997. Sociodemographic Assessment of Commercial Fishermen in the South Atlantic Region. MARFIN No. NA57FF0059 Final Report. Office of Fisheries Management, Division of Marine Resources, South Carolina Department of Natural Resources, P.O. Box 12559, Charleston, SC 29422-2559.
- Rosenberg, A., P. Mace, G. Thompson, G. Darcy, W. Clark, J. Collic, W. Gabriel, A. MacCall, R. Methot, J. Powers, V. Restrepo, T. Wainwright, L. Botsford, J. Hoenig, and K. Stokes. 1994. Scientific review of definitions of overfishing in U.S. Fishery Management Plans. NOAA Tech. Memo. NMFS-F/SPO-17. 205 pp.
- Thompson, G.G. 1993. A proposal for a threshold stock size and maximum fishing mortality rate. In S.J. Smith, J.J. Hunt, and D. Rivard [eds.] Risk evaluation and biological reference points for fisheries management, p. 303-320. Can. Spec. Publ. Fish. Aquat. Sci. 120.



- Tolbert C. M., F. A. Deseran, and J. Singelmann. 1998. MARFIN Socio-Demographic Database. Louisiana Population Data Center, Louisiana State University, for the National Marine Fisheries Service's Marine Fisheries Initiative (MARFIN). Award No. NA57FF0064.
- U.S. Bureau of the Census. 1998. Census of Population and Housing, 1990: Summary Tape File 3 on CD-ROM [machine-readable data files]/ prepared by the Bureau of the Census.--Washington: The Bureau [producer and distributor], 1992. Available: <http://govinfo.library.orst.edu/stateis.html> [19 Feb. 1998]
- U.S. Dept. of Commerce. 1998. Regional Economic Information System: 1969-1995 on CD-ROM [machine-readable data files]/ prepared by the Bureau of Economic Analysis, U.S. Dept. of Commerce. --Washington: The Bureau of Economic Analysis [producer and distributor]. Available: <http://govinfo.library.orst.edu/stateis.html> [19 Feb. 1998]
- Vaughan, D.S., J.V. Merriner, C.S. Manooch III, and J. Potts. 1997. Assessment of Southeastern U.S. Atlantic Wreckfish Stock for fishing years 1988-1996. NMFS SEFSC Beaufort Lab, unpub. ms., January 17, 1997, 38 pp.
- Vaughan, D.S. 1998. Data Summary of Southeastern U.S. Atlantic Wreckfish Stock for fishing years 1988-1997. NMFS SEFSC Beaufort Lab, unpub. ms., January 30, 1998, 8 pp.
- Vondruska, J. 1997. Some Discussion on the Methods and Potential Use of Federal Fishing Permits Data in Descriptive Fishery Analysis, with Emphasis on Commercial Fishing for Mackerels. SERO-ECON-98-11. National Marine Fisheries Service Southeast Regional Office, 9721 Executive Center Drive N. St. Petersburg, Florida 33702.

**See List of documents on page 80.**

**List of SAFMC Plans and Amendments:**

The Fishery Management Plan for Coastal Migratory Pelagic Resources of the Gulf of Mexico and South Atlantic (1982).

Amendment 1 (1985).

Amendment 2 (1987).

Amendment 3 (1989)./Re submission of Disapproved Measures Amendment 3 (1990).

Amendment 4 (1989).

Amendment 5 (1990).

Amendment 6 (1992).

Amendment 7 (1994).

Amendment 8 (Aug. 1996)

Fishery Management Plan for Coral and Coral Recfs (1982).

Amendment 1 (1990).

Amendment 2 (1994).

Fishery Management Plan for the Golden Crab Fishery of the South Atlantic Region (1995).

Profile of the Atlantic Coast Red Drum Fishery and Source Document for the Atlantic Coast Red Drum Fishery Management Plan (1990).

Atlantic Coast Red Drum Fishery Management Plan (1990).

**REFERENCES (cont.)**

- Profile of the Penaeid Shrimp Fishery in the South Atlantic (1981).
- Shrimp Fishery Management Plan for the South Atlantic Region (1991).  
Amendment 1 (1995).  
Amendment 2 (Bycatch Reduction) (April, 1996)  
Bycatch Reduction Device Testing Protocol Manual (March, 1997)
- Source Document for the Snapper Grouper Fishery in the South Atlantic Region (1983).
- Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region (1983).  
Regulatory Amendment 1 (1987)  
Regulatory Amendment 2 (1988)  
Amendment 1 (1988).  
Regulatory Amendment 3 (1989)  
Amendment 2 (1990).  
Amendment 3 (1990).  
Amendment 4 (1991).  
Amendment 5 (1991).  
Regulatory Amendment 4 (August 1992).  
Regulatory Amendment 5 (December 1992).  
Amendment 6 (1993).  
Amendment 7 (1994).  
Regulatory Amendment 6 (October 1994).  
Amendment 8 (June 1996).  
Amendment 9 (1997).
- Fishery Management Plan for Spiny Lobster in the Gulf of Mexico and the South Atlantic (1982).  
Amendment 1 (1987).  
Amendment 2 (1989).  
Amendment 3 (1990).  
Regulatory Amendment 1 (1992).  
Regulatory Amendment 2 (1993).  
Amendment 4 (December 1994).

**9.0 PUBLIC HEARING LOCATIONS AND DATES.**

**All public hearings begin at 6:00 p.m. at the following locations:**

June 15, 1998  
Ponce de Leon  
4000 U.S. Hwy. 1 North  
St. Augustine, Florida 32095  
904-824-2821

June 22, 1998  
Town & Country Inn  
2008 Savannah Highway  
Charleston, South Carolina  
843-571-1000

June 23, 1998  
Carteret Community College  
3505 Arendell Street  
Morehead City, North Carolina 28557  
919-247-3094

June 24, 1998  
Holiday Inn Savannah  
Highway 17 South at I-95  
Richmond Hill, Georgia  
912-756-3351

June 25, 1998  
Holiday Inn Express  
7151 Okeechobee Road  
Ft. Pierce, Florida 34945  
561-464-5000

June 26, 1998  
Hawk's Cay Resort  
Mile Marker 61  
Marathon, Florida  
305-743-7000

## 10.0 APPENDICES

Appendix A. NMFS Technical Guidance Document on Approaches to Implementing National Standard 1 of the MSFCMA.

# Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act

Prepared by the National Marine Fisheries Service

**V. R. Restrepo (Convener)**  
**G. G. Thompson, P. M. Mace,**  
**W. L. Gabriel, L. L. Low,**  
**A. D. MacCall, R. D. Methot,**  
**J. E. Powers, B. L. Taylor,**  
**P. R. Wade, J. F. Witzig**

NOAA Technical Memorandum  
NMFS-F/SPO-31  
August 1998



U.S. Department of Commerce  
William M. Daley, Secretary  
National Oceanic and Atmospheric Administration  
D. James Baker, Under Secretary for Oceans and Atmosphere  
National Marine Fisheries Service  
Rolland E. Schmitt, Assistant Administrator for Fisheries

# CONTENTS

PREFACE	1
EXECUTIVE SUMMARY	2
1. INTRODUCTION	5
1.1 The MSFCMA and the National Standard Guidelines, 5	
1.1.1 The MSY Control Rule and Status Determination Criteria, 5	
1.1.2 The Precautionary Approach in Specifying Management Targets, 7	
1.2 The Precautionary Approach in Fisheries Management, 8	
1.2.1 Evolution: International Agreements, 8	
1.2.2 The Overall Scope of the Precautionary Approach, 9	
1.3 Control Rules and Reference Points in the Context of the PA, 12	
2. LIMIT CONTROL RULES AND STATUS DETERMINATION CRITERIA	15
2.1 General Approach, 15	
2.1.1 Control Rules, 15	
2.1.2 MSY Control Rules and the SDC, 17	
2.1.3 Choosing an MSY Control Rule, 19	
2.1.4 Recommended Default MSY Control Rule, 19	
2.1.5 The Role of Selectivity, 21	
2.2 Situations Requiring the Use of Proxies, 21	
2.2.1 Data-Moderate Situations, 22	
2.2.2 Data-Poor Situations, 25	
2.3 Multispecies Considerations in Implementing MSY Control Rules, 26	
3. TARGET CONTROL RULES	28
3.1 A Decision-Theoretic Approach, 29	
3.2 A General Simulation Framework, 31	
3.3 Recommended Default Target, 34	
3.3.1 Data-Moderate and Data-Poor Situations, 36	
3.4 Rebuilding from Overfished Status, 36	
3.5 Special Considerations, 39	
3.5.1 Mixed Stock Complexes, 39	
3.5.2 Environmental Fluctuations, 39	
3.5.3 Stock Definition Issues, 40	
3.5.4 Special Life Histories, 41	
3.5.5 Data Issues, 41	
3.5.6 New Fisheries, 43	
3.5.7 Other Precautionary Tactics, 43	
CONCLUDING REMARKS	44
ACKNOWLEDGMENTS	44
REFERENCES	45
APPENDIX A. Equilibrium Implications of Fishing at 75% $F_{MSY}$	49
APPENDIX B. Glossary	51

## PREFACE

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) contains a set of ten National Standards for fishery conservation and management. National Standard 1 states,

*"Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry."*

The MSFCMA requires the Secretary of Commerce to "*establish advisory guidelines (which shall not have the force and effect of law), based on the national standards, to assist in the development of fishery management plans.*" These advisory guidelines, known as the National Standard Guidelines (NSGs), were first published in the *Federal Register* as a proposed rule on August 4, 1997, and revised in the final rule published on May 1, 1998. Section 600.310 of the guidelines contains the text pertaining to National Standard 1. Because the NSGs were written for a non-technical audience, they do not provide detailed guidance for the stock assessment scientists who will ultimately be requested to develop many of the conservation and management measures called for, particularly in the Section relating to National Standard 1, and particularly in light of the widely perceived need to adopt a precautionary approach to the management of marine fisheries. The main purpose of this paper is therefore to provide technical guidance on the use of precautionary approaches to implementing National Standard 1 of the MSFCMA in accordance with the NSGs.

This paper was prepared by a team of scientists from the National Marine Fisheries Service (NMFS) with experience in conducting stock assessments, providing scientific advice for fishery management, and developing precautionary approaches to managing fisheries. The technical guidance provided below is partly the product of their combined expertise. In addition, this guidance also reflects the work and group discussions of over 80 scientists who participated in the Fifth NMFS National Stock Assessment Workshop (February 24-26, 1998, Key Largo, Florida), which focused on the theme "Providing Scientific Advice to Implement the Precautionary Approach under the MSFCMA." Proceedings from that workshop will be published in a complementary NOAA Technical Memorandum.

This technical guidance is provided essentially for those aspects of scientific fishery management advice that have biological underpinnings, such as the response of fish populations to exploitation. The drafting team recognizes that there are many other important aspects to managing fisheries, such as socioeconomic factors, which are key to defining optimum yield, and which Fishery Management Councils must consider. Unfortunately, no formal operational protocol is routinely used to incorporate socioeconomic benchmarks into management advice. As such, the implementation of the MSFCMA would benefit greatly from complementary guidelines that address non-biological aspects of fisheries management in a quantitative framework.

## EXECUTIVE SUMMARY

The 1998 Guidelines for National Standard 1 (Optimum Yield) of the Magnuson-Stevens Fishery Conservation and Management Act, 50 CFR Part 600, state: *"In general, Councils should adopt a precautionary approach to specification of OY."* Because of the technical nature of the task, NMFS convened a panel of scientists to provide technical guidance on specifying OY that is consistent with the Guidelines (NSGs). The technical guidance is contained in this document.

The precautionary approach implements conservation measures even in the absence of scientific certainty that fish stocks are being overexploited. In a fisheries context, the precautionary approach is receiving considerable attention throughout the world primarily because the collapse of many fishery resources is perceived to be due to the inability to implement timely conservation measures without scientific proof of overfishing. Thus, the precautionary approach is essentially a reversal of the "burden of proof".

The precautionary approach in fisheries is multi-faceted and broad in scope. The discussions in this document are not so broad in scope, and are limited to providing guidance to managers and scientists for specifying OY and for developing reference points to guide management decisions.

A common element in the application of the precautionary approach to fisheries management worldwide is the definition of "limits" intended to safeguard the long-term productivity of a stock. Several international agreements and documents that deal with the precautionary approach identify maximum sustainable yield (MSY) levels as a minimum standard for defining management limits. The Magnuson-Stevens Act encompasses this concept in that it constrains OY to be no greater than MSY.

The NSGs identify two limits for fishery management (referred to as "thresholds") that are necessary to maintain a stock within safe levels, capable of producing MSY: A maximum fishing mortality threshold (MFMT) and a minimum stock size threshold (MSST). The MFMT and MSST are intended for use as benchmarks to decide if a stock or stock complex is being overfished or is in an overfished state. In the NSGs, these two limits are intrinsically linked through an "MSY Control Rule" that specifies how fishing mortality or catches could vary as a function of stock biomass in order to achieve yields close to MSY. If the maximum fishing mortality limit is reduced as biomass decreases, then the minimum stock size limit decreases (although the MSST cannot become lower than  $\frac{1}{2}$  of the equilibrium biomass under a constant-fishing mortality MSY control rule). Thus, the shape of the MSY control rule is an important consideration for developing status determination criteria for overfishing.

A default MSY control rule is recommended in Section 2 of this document. Noting that Councils have considerable flexibility in defining the shape of the MSY control rule for each stock under their jurisdiction, and that different control rule shapes pertain to different management objectives, the recommended default could be used in the absence of more specific analyses. The default makes use of estimates of the constant fishing mortality rate resulting in MSY,  $F_{MSY}$ , and of the corresponding average spawning

biomass,  $B_{MSY}$ . The limit  $F$ , MFMT, is set equal to  $F_{MSY}$  at higher stock sizes; if the stock decreases much below  $B_{MSY}$ , the limit  $F$  is reduced proportionately (the reduction starts at a fraction of  $B_{MSY}$  related to the level of natural mortality). It is anticipated that estimates of  $F_{MSY}$  and  $B_{MSY}$  will be either unavailable or unreliable for many stocks. For this reason, Section 2 also presents a discussion of useful proxies.

Another common element in the application of the precautionary approach to fisheries management worldwide is the specification of "targets" that are safely below limits. Setting OY at its limit (MSY in the Magnuson-Stevens Act) would not normally be precautionary because there could be a high probability of exceeding the limit year after year. Under the precautionary approach, the target should be set below the limit taking uncertainty and other management objectives into consideration. Development of control rules requires communication between fisheries managers, scientists, industry and the public. If performance criteria for target control rules can be defined, then a range of alternative control rules can be developed and evaluated in terms of precautionary behavior and other desirable economic or operational characteristics for management, once precautionary constraints have been met.

Control rules are pre-agreed plans for making management decisions based on stock size. The pre-agreed nature of the measures ensures that management actions are implemented without delay, and it is possible to respond rapidly to changing conditions. As with MSY control rules, Councils have considerable flexibility in defining targets. Section 3 presents a recommended default target control rule that could be used in the absence of more specific analyses. The default sets the target fishing mortality rate 25% below the default limit proposed in Section 2. The 25% reduction constitutes a safety margin that may not perform well for all stocks in terms of preventing overfishing. The performance of the default target can only be evaluated on a case-by-case basis and will depend on (a) the accuracy and precision of stock size,  $B_{MSY}$  and  $F_{MSY}$  estimates, (b) natural variability in population dynamics, and (c) errors in the implementation of management regulations. Age-structured deterministic models suggest that, for a large combination of life history parameters, the recommended default can result in high stock sizes (around 130% of  $B_{MSY}$ ) at the expense of relatively small foregone yields (achieving around 95% of MSY). It is recognized that no single policy can fully address all of the considerations to be encountered in the wide variety of fisheries subject to the Magnuson-Stevens Act. Nevertheless, the default target will be useful in a variety of situations and should at least serve to encourage development of more suitable policies for individual fisheries.

The default target control rule may not be applicable for many stocks that are already below the MSST (i.e., that are already overfished). In such cases, the NSGs require that special plans be implemented to rebuild the stocks up to the  $B_{MSY}$  level within a time period that is related to the stock's productivity. This document does not propose a default rebuilding plan, because the time to rebuilding may depend on each stock's current level of depletion. Instead, the document presents the four key elements that should be considered in rebuilding plans: An estimate of  $B_{MSY}$ , a rebuilding time period, a rebuilding trajectory, and a transition from rebuilding to more optimal management. The



default target control rule may be adapted into a rebuilding plan for each overfished stock, for example, by allowing only a very low fishing mortality when the stock is below the MSST in order to rebuild the stock within the rebuilding time period.

This document also discusses a number of special considerations, such as changes in the selectivity of fishing gear, mixed-stock situations, changes in productivity due to the environment, and the appropriateness of various proxies for MSY-related parameters. One consideration of particular importance relates to setting limits and targets for data-poor stocks, i.e., those having very limited information. While the document provides defaults for these cases as well, it is imperative to improve the ability to make informed decisions through enhanced data collection and analyses.

Specification of MSY control rules, status determination criteria, and precautionary target control rules is a challenging exercise. Key to this process is communication between managers, scientists, users and the public. In the face of conflicting objectives (avoiding overfishing while achieving high long-term yields), it is essential to understand the tradeoffs associated with alternative control rules and the importance of the weights assigned to the different objectives or performance criteria. Simulation frameworks can facilitate the necessary interaction. In addition, simulation tools should be used to examine the performance of management systems as a whole, including data collection, assessments, control rules, and implementation of management tactics.

## 1. INTRODUCTION

### 1.1 The MSFCMA and the National Standard Guidelines

#### 1.1.1 The MSY<sup>1</sup> Control Rule and Status Determination Criteria

A brief recap of key points from §600.310 of the NSGs will help to focus the task at hand. In discussing the concept of maximum sustainable yield (MSY), the NSGs include the following definitions in paragraph (c)(1):

*"MSY is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions."*

*"MSY control rule means a harvest strategy which, if implemented, would be expected to result in a long-term average catch approximating MSY."*

*"MSY stock size means the long-term average size of the stock or stock complex, measured in terms of spawning biomass or other appropriate units, that would be achieved under an MSY control rule in which the fishing mortality rate is constant."*

Paragraph (c)(2) expands upon the meaning and importance of the MSY control rule, providing considerable flexibility in the process:

"Because MSY is a theoretical concept, its estimation in practice is conditional on the choice of an MSY control rule. In choosing an MSY control rule, Councils should be guided by the characteristics of the fishery, the FMP's objectives, and the best scientific information available. The simplest MSY control rule is to remove a constant catch in each year that the estimated stock size exceeds an appropriate lower bound, where this catch is chosen so as to maximize the resulting long-term average yield. Other examples include the following: Remove a constant fraction of the biomass in each year, where this fraction is chosen so as to maximize the resulting long-term average yield; allow a constant level of escapement in each year, where this level is chosen so as to maximize the resulting long-term average yield; vary the fishing mortality rate as a continuous function of stock size, where the parameters of this function are constant and chosen so as to maximize the resulting long-term average yield. In any MSY control rule, a given stock size is associated with a given level of fishing mortality and a given level of potential harvest, where the long-term average of these potential harvests provides an estimate of MSY."

Although the MSFCMA mandates use of MSY, paragraph (c)(3) of the NSGs allows for cases in which MSY cannot be estimated directly:

"When data are insufficient to estimate MSY directly, Councils should adopt other measures of productive capacity that can serve as reasonable proxies for

---

<sup>1</sup> MSY and other terms that appear throughout this document are defined in the Glossary (Appendix B).

MSY, to the extent possible. Examples include various reference points defined in terms of relative spawning per recruit. For instance, the fishing mortality rate that reduces the long-term average level of spawning per recruit to 30-40 percent of the long-term average that would be expected in the absence of fishing may be a reasonable proxy for the MSY fishing mortality rate. The long-term average stock size obtained by fishing year after year at this rate under average recruitment may be a reasonable proxy for the MSY stock size, and the long-term average catch so obtained may be a reasonable proxy for MSY. The natural mortality rate may also be a reasonable proxy for the MSY fishing mortality rate. If a reliable estimate of pristine stock size (i.e., the long-term average stock size that would be expected in the absence of fishing) is available, a stock size approximately 40 percent of this value may be a reasonable proxy for the MSY stock size, and the product of this stock size and the natural mortality rate may be a reasonable proxy for MSY."

In discussing the concept of overfishing, the NSGs use the MSY control rule to define a pair of "status determination criteria" (SDC) in paragraph (d)(2):

"Each FMP must specify, to the extent possible, objective and measurable status determination criteria for each stock or stock complex covered by that FMP and provide an analysis of how the status determination criteria were chosen and how they relate to reproductive potential. Status determination criteria must be expressed in a way that enables the Council and the Secretary to monitor the stock or stock complex and determine annually whether overfishing is occurring and whether the stock or stock complex is overfished. In all cases, status determination criteria must specify both of the following:

"(i) A maximum fishing mortality threshold or reasonable proxy thereof. The fishing mortality threshold may be expressed either as a single number or as a function of spawning biomass or other measure of productive capacity. The fishing mortality threshold must not exceed the fishing mortality rate or level associated with the relevant MSY control rule. Exceeding the fishing mortality threshold for a period of 1 year or more constitutes overfishing.

"(ii) A minimum stock size threshold or reasonable proxy thereof. The stock size threshold should be expressed in terms of spawning biomass or other measure of productive capacity. To the extent possible, the stock size threshold should equal whichever of the following is greater: One-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold specified under paragraph (d)(2)(i) of this section. Should the actual size of the stock or stock complex in a given year fall below this threshold, the stock or stock complex is considered overfished."

Section 2 of this document focuses on technical guidance for establishing MSY and limit control rules and the associated minimum stock size and maximum fishing mortality thresholds.

### 1.1.2 The Precautionary Approach in Specifying Management Targets

The MSFCMA does not use the term "precautionary approach" *per se*. However, in discussing the concept of optimum yield (OY), the NSGs call for the use of a precautionary approach in paragraph (f)(5):

"In general, Councils should adopt a precautionary approach to specification of OY. A precautionary approach is characterized by three features:

"(i) Target reference points, such as OY, should be set safely below limit reference points, such as the catch level associated with the fishing mortality rate or level defined by the status determination criteria. Because it is a target reference point, OY does not constitute an absolute ceiling, but rather a desired result. An FMP must contain conservation and management measures to achieve OY, and provisions for information collection that are designed to determine the degree to which OY is achieved on a continuing basis--that is, to result in a long-term average catch equal to the long-term average OY, while meeting the status determination criteria. These measures should allow for practical and effective implementation and enforcement of the management regime, so that the harvest is allowed to reach OY, but not to exceed OY by a substantial amount. The Secretary has an obligation to implement and enforce the FMP so that OY is achieved. If management measures prove unenforceable--or too restrictive, or not rigorous enough to realize OY--they should be modified; an alternative is to reexamine the adequacy of the OY specification. Exceeding OY does not necessarily constitute overfishing. However, even if no overfishing resulted from exceeding OY, continual harvest at a level above OY would violate national standard 1, because OY was not achieved on a continuing basis.

"(ii) A stock or stock complex that is below the size that would produce MSY should be harvested at a lower rate or level of fishing mortality than if the stock or stock complex were above the size that would produce MSY.

"(iii) Criteria used to set target catch levels should be explicitly risk averse, so that greater uncertainty regarding the status or productive capacity of a stock or stock complex corresponds to greater caution in setting target catch levels. Part of the OY may be held as a reserve to allow for factors such as uncertainties in estimates of stock size and DAH. If an OY reserve is established, an adequate mechanism should be included in the FMP to permit timely release of the reserve to domestic or foreign fishermen, if necessary."

Section 3 of this document focuses on technical guidance for specifying precautionary targets that would be consistent with the NSGs. The subsection below provides more comprehensive information on the precautionary approach as it has been and is being considered in different fisheries fora, and discusses elements of the approach that are not identified in the National Standard 1 Guidelines.

## **1.2 The Precautionary Approach in Fisheries Management**

### **1.2.1 Evolution: International Agreements**

The United Nations Convention on the Law of the Sea (1982) provided several mechanisms to promote responsible management of marine fisheries; however, it was not until the 1990s that work began on developing a precautionary approach to fisheries management. In 1991, the Committee on Fisheries (COFI) of the Food and Agriculture Organization (FAO) requested FAO to develop an International Code of Conduct for Fisheries. Subsequently, FAO and the government of Mexico sponsored an International Conference on Responsible Fishing, held in Cancun in May 1992. Resolutions formulated in Cancun were presented at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. The Rio meeting highlighted the importance of the precautionary approach in the Rio Declaration and Agenda 21. For example, Principle 15 of the Rio Declaration states that *“in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”*

Several binding and non-binding agreements embodying the precautionary approach were developed and concluded over the period 1991-1996. The most comprehensive of these is the FAO Code of Conduct for Responsible Fisheries, concluded in late 1995 (FAO 1995a). The Code of Conduct addresses six key themes: Fisheries management, fishing operations, aquaculture development, integration of fisheries into coastal area management, post-harvest practices and trade, and fisheries research. In total, there are 19 general principles and 210 standards in the Code. While a precautionary approach is integral to all themes, it is applied particularly to fisheries management, as detailed in Article 7.5. Paragraph 7.5.1 includes a statement to the effect that:

*“States should apply the precautionary approach widely to conservation, management, and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment.”*

The same paragraph also emphasizes that the absence of adequate scientific information is not a reason for postponing or failing to take conservation and management measures. The remaining paragraphs include similar provisions to those in Article 6 of the UN Straddling Stocks Agreement (see below); for example, determination of stock-specific target and limit reference points (Caddy and Mahon 1995), the need to take action if they are exceeded, and the need to take account of uncertainties and impacts on non-target and associated or dependent species. In addition,

guidelines are given for adopting a cautious approach in the case of new or exploratory fisheries, and for implementing emergency management measures when resources are seriously threatened due to environmental factors or fishing activity.

The Code of Conduct is a voluntary, non-binding agreement. However, it contains sections that are similar to those in two binding agreements: The Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the Compliance Agreement), and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the Straddling Stocks Agreement; UN 1995).

The Compliance Agreement was adopted at the FAO Conference at the 27<sup>th</sup> session in November 1993. The agreement specifies the obligations of Parties whose fishing vessels fish on the high seas, including the obligation to ensure that such vessels do not undermine international fishery conservation and management measures. The Compliance Agreement is considered to be an integral part of the Code of Conduct. The United States implemented the Compliance Agreement through the High Seas Fishing Vessel Compliance Act of 1995.

The Straddling Stocks Agreement was negotiated over a similar period to the Code of Conduct and the content and wording on many issues, including those related to the precautionary approach and General Principles, is similar to that in the Code of Conduct. Although the Straddling Stocks Agreement is strictly applicable to straddling fish stocks and highly migratory fish stocks, much of it is also relevant to fishing within national exclusive economic zones.

Annex II of the Straddling Stocks Agreement (UN 1995) provides guidelines for the application of precautionary reference points. Paragraph 2 states, "Two types of precautionary reference points should be used: conservation, or limit, reference points and management, or target, reference points." Paragraph 5 stipulates, "Fishery management strategies shall ensure that the risk of exceeding limit reference points is very low," and imposes the further constraint that target reference points should not be exceeded on average. Paragraph 7 states that "The fishing mortality rate which generates maximum sustainable yield should be regarded as a minimum standard for limit reference points." This combination of requirements implies that fishing mortality should always be well below the level associated with maximum sustainable yield ( $F_{MSY}$ ).

More detailed treatments of the historical development of the precautionary approach are contained in ICES (1997a), Serchuk *et. al.* (1997), Thompson and Mace (1997), and Mace and Gabriel (in prep.).

### 1.2.2 The Overall Scope of the Precautionary Approach

According to the Code of Conduct (FAO 1995a), precaution is required in development planning, management, research, technology development and transfer, legal and institutional frameworks, fish capture and processing, fisheries enhancement, and aquaculture. Thus the precautionary approach is multi-faceted and broad in scope.

The 1995 FAO Technical Guidelines on the Precautionary Approach (FAO 1995b) groups guidelines on the precautionary approach into three primary subject areas of relevance to capture fisheries: Fisheries management, fisheries research, and fisheries technology. The next three subsections summarize the main issues covered under each area and, while they do not include every aspect of the guidelines, they highlight the large number and diversity of issues involved.

### *Fisheries Management*

The precautionary approach to fisheries management requires:

- prudent foresight;
- taking into account unknown uncertainty by being more conservative;
- establishment of legal or social frameworks for all fisheries, including rules to control access, data reporting requirements, and management planning processes;
- implementation of interim measures that safeguard resources until management plans are finalized;
- avoidance of undesirable or unacceptable outcomes such as overexploitation of resources, overdevelopment of harvesting capacity, loss of biodiversity, major physical disturbances of sensitive biotopes, and social or economic dislocations;
- explicit specification of management objectives including operational targets and constraints;
- prospective evaluation; and
- sound procedures for implementation, monitoring and enforcement.

### *Fisheries Research*

Research needed to implement precautionary management should strive to:

- provide data and analyses of relevance to fisheries management;
- emphasize the roles that fisheries scientists and others must play in helping managers develop objectives;
- provide scientific evaluation of consequences of management actions;
- develop operational targets, constraints and criteria that are both scientifically usable and managerially relevant;
- incorporate both biological and socio-economic elements;
- ensure that data are accurate and complete;
- monitor fisheries;
- conduct research on which management processes and decision structures work best;
- incorporate uncertainty into assessments and management;
- address reversibility and irreversibility in ecosystems;
- formulate implementation guidelines;
- be multi-disciplinary in nature, including social, economic, and environmental sciences, and addressing management institutions and decision-making processes; and
- investigate environmentally-friendly fishing gears.

## *Fisheries Technology*

A precautionary approach to fisheries technology would:

- not use technology to cause capacity to increase further in already overcapitalized fisheries;
- use technology to improve sustainability, prevent damage to the environment, improve economic and social benefits, and improve safety;
- evaluate the effects of new technologies and gears;
- educate fishers and consumers towards responsible practices;
- consider impacts on non-target species and ecosystems;
- evaluate fishing gears with respect to selectivity by size and species, survival of escapees, ghost fishing, effects on habitat, contamination, pollution, generation of debris, safety and occupational hazards, user conflicts, employment, monitoring and enforcement costs, techno-economic factors (infrastructure and service requirements, product quality), and legal factors (existing legislation, international agreements, civil liberties);
- consider proper procedures for introducing new technology or changes to existing technology;
- promote research to encourage improvement of existing technologies and to encourage development of appropriate new technologies, and;
- encourage research into responsible fisheries technology.

From these three lists, it is obvious that biological reference points and control rules are but one part in the overall framework of the precautionary approach. Although in some respects they can be considered a primary focus of any precautionary management strategy, they need to be put in proper perspective. Other needs may be just as important; for example, development of access control systems to ensure that fishing capacity is commensurate with resource productivity, evaluation of alternative management systems and institutions, improvements in the quality and reliability of data, improved monitoring and enforcement, design of "environmentally-friendly" fishing gear, and education of fishers and consumers.

Regarding research in support of management decisions, it is important that decisions made in stock assessments regarding model choice, estimation techniques and selection of parameters be transparent. Care should be taken when using the term "precautionary" in relation to the science underpinning advice to managers. The scientists' primary role is to provide scientifically-based options that managers can use to achieve management goals. It is perfectly reasonable for managers to select a "precautionary" management target (e.g.,  $F =$  lower 80% CI of the probability distribution for  $F_{MSY}$ ) based on advice from scientists that this choice will achieve the management objectives, but it is not reasonable for scientists to add non-transparent conservatism or precaution into the estimation process (e.g., by claiming that the lower 80% CI of the distribution of  $F_{MSY}$  is the best estimate of  $F_{MSY}$ ).



### 1.3 Control Rules and Reference Points in the Context of the Precautionary Approach

According to the Code of Conduct for Responsible Fisheries (FAO 1995a),

*“States and subregional or regional fisheries management organizations and arrangements should, on the basis of the best scientific evidence available, inter alia, determine:*

*“stock specific target reference points, and, at the same time, the action to be taken if they are exceeded; and*

*“stock-specific limit reference points, and, at the same time, the action to be taken if they are exceeded; when a limit reference point is approached, measures should be taken to ensure that it will not be exceeded.”*

Thus, two critical components of precautionary management are the specification of limit and target reference points, and pre-agreed management measures to be implemented as a function of stock conditions relative to those reference points. The pre-agreed nature of the measures ensures that management actions are implemented without delay, and it is possible to respond rapidly to changing conditions. Otherwise, management actions could be dependent on the achievement of consensus while stock conditions continue to deteriorate. The MSFCMA makes it clear that effective management actions must be implemented promptly.

Limit reference points are intended to constrain harvests so that the stock remains within safe biological limits, and is capable of producing maximum sustainable yield. Management should proceed so that the risk of exceeding the limit reference points is very low. The minimum standard for limit reference points should be the fishing mortality rate that generates MSY, according to Annex II of the Straddling Stocks Agreement. This is consistent with the revised MSFCMA, which states that the terms “overfishing” and “overfished” mean a rate or level of fishing mortality that jeopardizes the stocks’ capacity to produce MSY. Thus, the MSFCMA definition of overfishing and the Annex II standards for precautionary limit reference points both imply that  $F_{MSY}$  should be an upper bound on fishing mortality, although the MSFCMA does not define  $F_{MSY}$  as an undesirable outcome to be avoided.

[NOTE: Nomenclature within the National Standard Guidelines differs somewhat from that in various FAO documents. *Limit* reference points in the FAO text correspond to *threshold* levels in the National Standard Guidelines and in some literature, such as the review of overfishing definitions by Rosenberg *et. al.* (1994). In the FAO text and much of the international literature, the word threshold is used in the context of establishing “buffers”, to trigger action before limit reference points are reached. Such buffers are not equivalent to the thresholds defined in the NSGs, but are analogous to the “interim thresholds” referred to in the preamble to the final rule issuing the NSGs. This document uses the word limit in the same sense as the FAO text. However, in order to maintain consistency with the language of the NSGs, “threshold” is used when referring specifically to the limit reference points that define the act overfishing and an overfished state in the NSGs --the Maximum Fishing Mortality Threshold, MFMT, and the Minimum Stock Size Threshold, MSST--]

Target reference points are intended to achieve management objectives, and represent desirable outcomes to be attained. Target reference points should not be exceeded more than 50% of the time, nor on average. A target biomass level for stocks that require rebuilding could be the biomass that would produce MSY. The FAO guidelines on the precautionary approach (FAO 1995b) indicate that the constraints of limit reference points have precedence over targets, and target reference points may require adjustment so that the probability of violating the constraints while meeting the target would be small. The idea that limits have precedence over targets is consistent with the revised MSFCMA, in which OY corresponds to a target level, but is constrained to be less than or equal to MSY.

A control rule describes a variable over which management has some direct control as a function of some other variable(s) related to the status of the stock. In many discussions of the topic, a control rule describes a reference fishing mortality rate as a function of stock size, and such is the main focus of Sections 2 and 3 of this paper. In general, however, control rules do not have to be cast in terms of fishing mortality rates or biomass levels. Simply put, a control rule seeks to identify measures of “good” and “bad” stock condition (by comparing perceived stock status with biological reference points), as well as the actions that will make the stock condition change from “bad” to “good.” There are two types of precautionary elements that can be considered in implementing a control rule for management targets: The reference points to be used, and the type of management reaction to be implemented. The degree of precaution achieved in implementing such a control rule is determined by a combination of the probability of going from a “good” stock condition to a “bad” one (overfishing), and the action to be taken when the stock is overfished. Naturally, the current stock condition affects the probability of overfishing, and hence the degree of precaution.

Development of control rules requires interaction between fisheries managers and scientists. In addition, public participation is important because the public and fishing industry are more inclined to support management measures on which they have been consulted and which they understand clearly (FAO 1995b). If managers can define acceptable performance criteria for target control rules, then a range of alternative control rules can be developed and evaluated in terms of precautionary behavior and other desirable economic or operational characteristics for management, once precautionary constraints have been met (this approach is explained in Section 3.2). For example, performance criteria could be formulated as the application of a target control rule with “probability of less than X% of reducing the resource below Y% of K within a period of Z years” (Butterworth and Bergh 1993). The effects of other criteria, e.g., “no more than W% change in catch from year to year” could also be evaluated once precautionary constraints were met. An alternative to maximizing performance, constrained by the degree of precaution defined by managers, is to define performance itself in terms of precaution (i.e., the approach in Section 3.1) so that precaution is built directly into optimizing the management objective. With either approach, it is clear that the nature of tradeoffs between the various performance criteria of interest requires substantial interaction between managers and scientists, and open consultation with the public.

Target control rules will vary depending on the quality and quantity of available

data, as well. Thus, it is unreasonable to expect that target control rules will be perfectly uniform over all stocks. Specification of objectives and performance criteria will enable the development of control rules that will have more acceptable operational implications and still meet precautionary criteria.

Rebuilding plans are special forms of target control rules, to be implemented when stocks have fallen below limit biomass levels. Rebuilding plans should include quantifiable milestones to measure progress toward recovery during the plan's implementation. The precautionary approach counsels that rebuilding action be undertaken immediately, rather than deferred to the end of the proposed rebuilding period.

## 2. LIMIT CONTROL RULES AND STATUS DETERMINATION CRITERIA

This section provides technical guidance for specifying what the National Standard Guidelines refer to as "MSY control rules" (Section 1.1.1), which are used to set the criteria for determining whether a stock is being overfished or the stock is in an overfished state. Also included are recommended defaults for cases lacking detailed analyses, and guidance on the use of proxies. In presenting these defaults, our intention is not to inhibit the use of other control rules, but rather to suggest a useful starting point or a "fall-back" position.

### 2.1 General Approach

#### 2.1.1 Control Rules

A control rule describes a variable over which management has some direct control as a function of some other variable(s) related to the status of the stock. That is, the control rule represents a pre-agreed plan for adjusting management actions depending on the condition of the stock. In broad terms, the management actions may be designed as strategies to achieve (a) a fixed exploitation rate (to harvest a constant fraction of the stock each year), (b) constant escapement (e.g., to maintain a constant spawning stock size), or (c) constant catch. However, control rules do not have to adhere strictly to any of these three strategies, and managers may prefer control rules that achieve different results depending on the condition of the stock.

In many discussions of the topic, a control rule describes a reference fishing mortality rate  $F$  as a function of stock size  $B$ , although it is also possible to use catch as the dependent variable. In fact, either option can be expressed in terms of the other, and it is useful to present both. Figure 1 illustrates three possible functional forms for target control rules in terms of both fishing mortality and catch: The two-parameter "logarithmic" form

$$F(B) = a + b \ln(B),$$

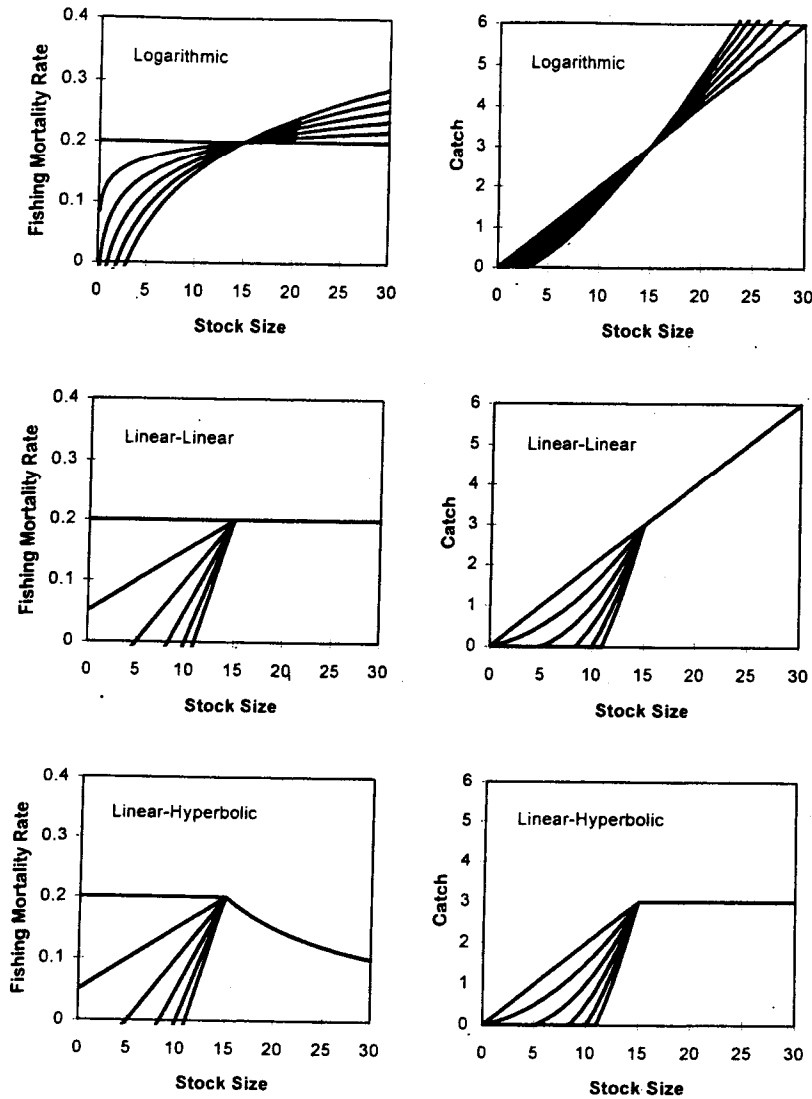
the three-parameter "linear-linear" form

$$F(B) = a + b \min(0, B - c),$$

and the three-parameter "linear-hyperbolic" form

$$F(B) = \frac{ac}{\max(B, c)} + b \min(0, B - c),$$

where  $a$ ,  $b$  and  $c$  are parameters that determine the magnitude of  $F$  depending on the value of  $B$ .



**Figure 1.** Some families of control rules. Each panel shows a family of control rules conforming to a particular functional form and passing through a common (arbitrary) point.

The logarithmic form forces the fishing mortality rate to vary smoothly with stock size. The linear-linear form forces the fishing mortality rate to be constant when the stock exceeds a specified size. The linear-hyperbolic form forces the catch to be constant when the stock exceeds a specified size (for the special case where catch is computed as the product of stock size and the fishing mortality rate). Figure 1 shows six examples for each form of control rule, where the six examples of the linear-linear form (middle panels of Figure 1) are indistinguishable from one another at values of  $B > c$ , as are the six examples of the linear-hyperbolic form (lower panels of Figure 1).

The control rules shown in Figure 1 are only a subset of the many shapes possible

that could be specified. For instance, an asymptotic (mono-molecular) equation would be an alternative to the smooth logarithmic control rule in which  $F$  would be capped at high levels of biomass.

### 2.1.2 MSY Control Rules and the Status Determination Criteria

A special case of control rule is the MSY control rule. Referring to control rules of the type described above and illustrated in the left half of Figure 1, NMFS' guidelines for National Standard 1 state that such an MSY control rule gives

*"...fishing mortality rate as a continuous function of stock size, where the parameters of this function are constant and chosen so as to maximize the resulting long-term average yield."*

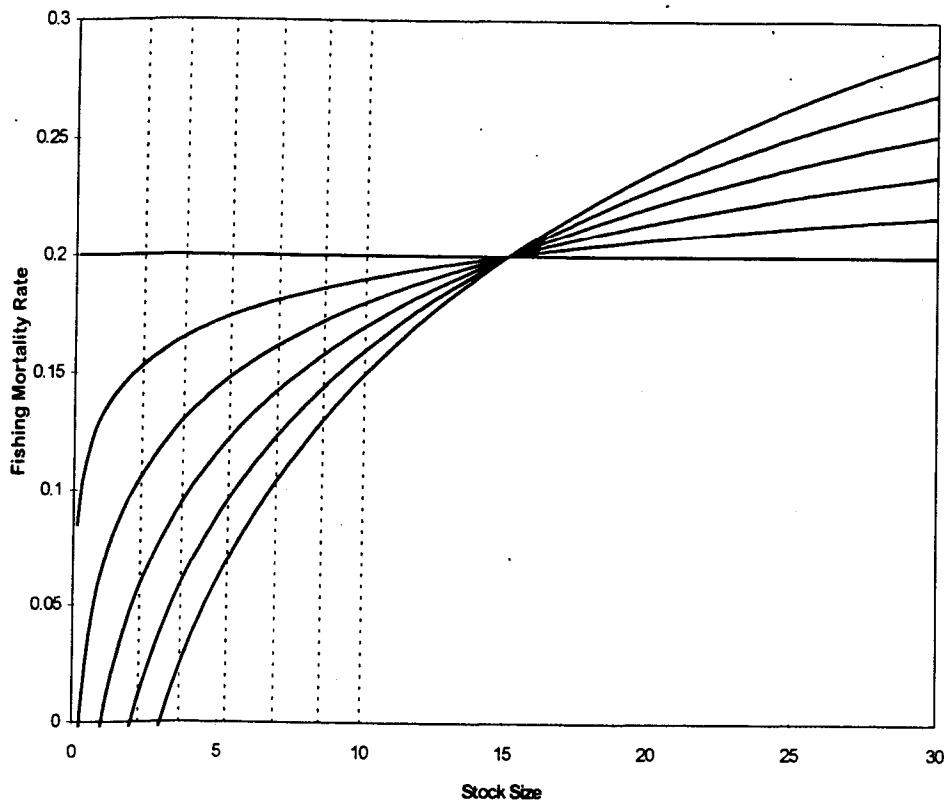
For example, any of the control rules listed above could be transformed into an MSY control rule by fixing the value of one or perhaps two of the control parameters (say,  $b$  in the case of the logarithmic control rule or  $b$  and  $c$  in the case of the linear-linear or linear-hyperbolic control rules) independently and setting the remaining control parameter (say,  $a$ ) at the value that maximizes long-term average yield, conditional on the value of the independent control parameter(s) (see Section 3.1). For example, in either the logarithmic or linear-linear forms, setting  $b=0$  gives a control rule in which the fishing mortality rate is equal to the constant  $a$  (i.e., a control rule in which fishing mortality is independent of stock size). Setting  $a$  at the value that maximizes long-term average yield for this special case results in a very simple form of MSY control rule. However, substituting the same value of  $a$  into a control rule where  $b>0$  would generally *not* result in an MSY control rule, because the yield-maximizing value of one control parameter will typically be dependent on the value of the other(s) (Thompson in prep.).

Under the guidelines for National Standard 1, the MSY control rule serves two important purposes: (1) It constitutes the maximum fishing mortality threshold (MFMT), above which overfishing is considered to be occurring; and (2) it determines the minimum stock size threshold (MSST), below which the stock is considered overfished. Thus, the MSY control rule is key to defining limit reference points. The role of the MSY control rule in determining the MSST can be seen in the following definition:

*"To the extent possible, the stock size threshold should equal whichever of the following is greater: One-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold ..."*

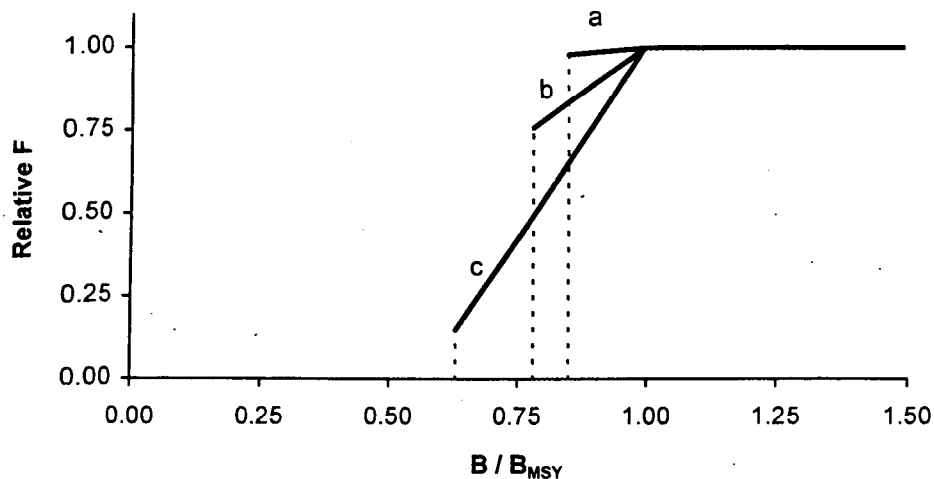
For example, all of the logarithmic control rules shown in the upper-left panel of Figure 1 happen to constitute MSY control rules under a particular model (Thompson in prep.). These control rules are reproduced in Figure 2 together with a set of vertical dotted lines, each of which indicates the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock were consistently exploited according to the corresponding MSY control rule. The vertical dotted line labeled "A" corresponds to the control rule labeled "A," the vertical dotted line labeled

"B" corresponds to the control rule labeled "B," and so forth. The more the control rule departs from the horizontal (control rule "F"), the lower the stock can fall and still be expected to recover within 10 years. This result conforms with intuition, because curves with greater departure from the horizontal exert less fishing pressure at low stock sizes, thus increasing the rate of rebuilding at those stock sizes.



**Figure 2.** Example MSY control rules (solid curves) and associated stock sizes at which rebuilding would be expected within 10 years (dotted lines). The curve labeled "A" is associated with the line labeled "A," etc.

The dependence of the MSST on the MSY control rule is also illustrated in Figure 3 for a linear-linear type of control rule. Here, the MSY control rule sets MFMT constant for biomass levels above  $B_{MSY}$  and decreases it linearly with biomass below  $B_{MSY}$ . The solid lines labeled a, b and c represent three such MSY control rules and the dashed lines indicate the corresponding MSST levels (shown in relative units), i.e., the values of biomass at which rebuilding to  $B_{MSY}$  would take 10 years when fishing at the MFMT (in reality, the actual position of these levels will vary with the life-history characteristics of the species in question). The ascending parts of these example control rules can be interpreted as built-in plans for rebuilding from the MSST to  $B_{MSY}$  — for a fixed rebuilding time period (e.g., 10 years), the stronger reductions in limit fishing mortality at low biomass allow for rebuilding from lower biomass limits.



**Figure 3** Hypothetical example illustrating the relationship between Minimum Stock Size Threshold (intersection of the dashed lines with the X-axis) and a linear-linear MSY control rule (solid lines, which define the Maximum Fishing Mortality Threshold). Each of the three rules labeled a, b and c, is scaled relative to its own maximum.

### 2.1.3 Choosing an MSY Control Rule

One factor that might go into choosing an MSY control rule is the resulting location of the MSST. For example, if a Council wished to minimize the range of stock sizes within which special rebuilding plans would be required, it would probably opt for an MSY control rule that afforded a good deal of "built-in" rebuilding, that is, an MSY control rule in which fishing mortality was greatly decreased at low stock sizes. Of course, in no case could the MSST fall below one-half of the MSY level.

Another factor that might go into choosing an MSY control rule is the tradeoff between magnitude of yield and constancy of yield. In general, a horizontal MSY control rule (e.g., control rule "F" in Figure 2) would be expected to result in a lower long-term average yield but a less variable yield than an MSY control rule in which fishing mortality was strongly related to stock size (e.g., control rule "A" Figure 2). Councils have considerable flexibility in choosing how to weight their preferences for these and other performance criteria. NMFS' guidelines for National Standard 1 give the following advice:

*"In choosing an MSY control rule, Councils should be guided by the characteristics of the fishery, the FMP's objectives, and the best scientific information available."*

### 2.1.4 Recommended Default MSY Control Rule

As implied above, specifying an MSY control rule is a flexible process that should involve a great deal of communication between scientists and managers so that the tradeoffs between the relevant performance criteria are understood. Due to the demands



imposed by the timetable of required FMP amendments or other factors, it is desirable to propose a limit control rule that can be used as a default for defining SDC in the absence of more detailed analyses.

We recommend a default MSY control rule of the form (see Figure 4):

$$F(B) = \frac{F_{MSY} B}{c B_{MSY}} \quad \text{for all } B \leq c B_{MSY}$$

$$F(B) = F_{MSY} \quad \text{for all } B \geq c B_{MSY},$$

where  $c = \max(1-M, 1/2)$ ,  $F_{MSY}$  is the fishing mortality rate that maximizes long-term yield under a constant- $F$  policy, and  $B_{MSY}$  is the equilibrium biomass expected when fishing constantly at  $F_{MSY}$ . Setting  $c = \max(1-M, 1/2)$ , where  $M$  is the natural mortality rate of the exploited age classes, seems reasonable insofar as one would expect a stock fished at  $F_{MSY}$  to fluctuate around  $B_{MSY}$  on a scale related to  $M$  (small fluctuations for low  $M$  and large fluctuations for high  $M$ ).

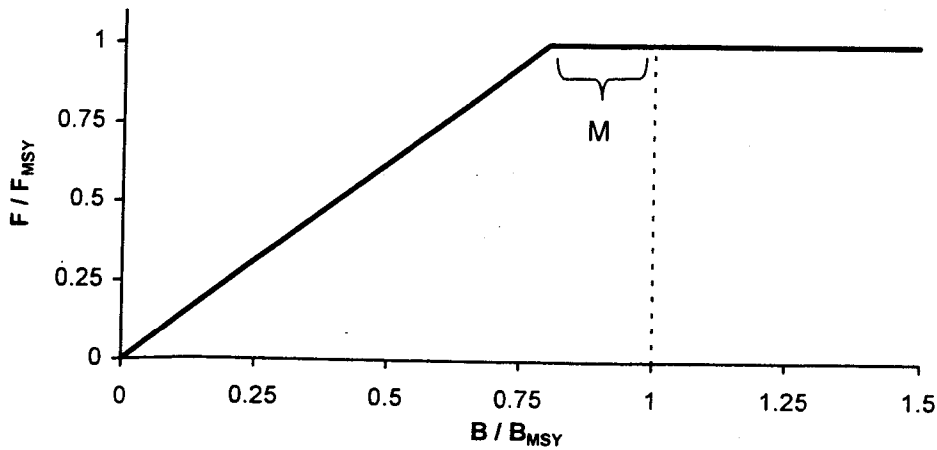


Figure 4. Recommended default MSY control rule.

Note that a control rule of this shape, and parameterized as suggested, may not exactly achieve the maximum long-term yield. The reason for this is that, in an MSY control rule of this form,  $F(B)$  would be somewhat larger than  $F_{MSY}$  in the flat part of the function (the degree of departure from  $F_{MSY}$  is likely to be small in many cases, but is unknown *a priori* in the absence of detailed analyses). Nevertheless,  $F(B)$  can be used to define an approximate MFMT.

As noted in Section 2.1.2, the MSST is determined in part by the MSY control rule and is constrained to be greater than  $1/2 B_{MSY}$ . However, for a given MSY control rule, the precise location of the MSST with respect to  $B_{MSY}$  may depend on the dynamics of the

particular stock. Estimating the location of the MSST with respect to the MSY stock size can be fairly difficult in some situations and may require the use of simulation tools. If needed, we recommend that the point  $cB_{MSY}$  in the default MSY control rule be used as a default proxy for the MSST.

### 2.1.5 The Role of Selectivity

A fact often overlooked is that the enumeration of MSY depends on partial recruitment patterns. In theory, assuming no variability in life-history parameters, there could be a "global" MSY that can be achieved by totally avoiding fishing until each cohort reaches the age (size) at which losses due to natural mortality exceed contributions from growth and reproduction, and then harvesting all fish of that age (size) instantaneously. However, such knife-edge selection and deterministic life-history parameters are unrealistic, such that the "global" MSY referred to by the NSGs should be treated as a purely theoretical concept.

Calculations of MSY are generally based on the current partial recruitment pattern exhibited by the fishery. "Partial recruitment" patterns reflect both the relative *availability* of fish of different ages or sizes (i.e., their distribution in time and space relative to that of the fishery) and of the relative *selectivity* of fish of different ages or sizes exhibited by the mix of gears used in the fishery. For any particular partial recruitment pattern, there is a unique estimate of MSY (all other things being constant). What this means is that estimates of MSY will change if management actions or environmental factors alter the partial recruitment of the fishery in any way. Management actions that can affect MSY include reallocation of quotas between sectors, increases or decreases in size limits, gear modifications and seasonal changes in the fishery. Environmental factors that can alter MSY include those that influence growth rates and other life history characteristics, and those that influence fish movements and distribution, and therefore availability. Estimates of MSY can vary over a large range due to these factors. It is often possible to substantially increase sustainable yields by changing the selectivity pattern to improve yield per recruit. Similarly, potential sustainable yield is dissipated when the fishery is managed in such a way that yield per recruit is reduced, even though management may still be based on "MSY."

Clearly, the magnitude of MSY is an important management issue, as is the exploitation pattern, since it affects the magnitude of MSY. Indeed, these are important issues in developing rebuilding plans for overfished stocks. However, initial specification of control rules should be based upon existing partial recruitment patterns, i.e., the existing mix of gears, allocation decisions and management regulations. If the partial recruitment pattern used for defining the MFMT is substantially different from that in the fishery, then the Councils and the Secretary will be unable to monitor and evaluate the condition of the stock relative to the definition of overfishing.

## 2.2 Situations Requiring the Use of Proxies

As noted in Section 1.1, the MSFCMA allows for the use of proxies in situations where there is insufficient knowledge to implement approaches such as that in Section 2.1. In general, proxies will be needed when MSY-related parameters cannot be

estimated from available data, or when their estimated values are deemed to be unreliable for various reasons (e.g., extremely low precision, insufficient contrast in the data, or inadequate models). This document refers to “data-moderate” and “data-poor” situations as those that require the use of proxies.

There are no standards for measuring the level of data richness for a stock. This document offers the following guidance to categorize stocks (note that cases involving a stock complex are likely to be of mixed data richness):

Data-rich cases: Reliable estimates of MSY-related quantities and current stock size are available. Control rules typically involve parameters such as  $F_{MSY}$ ,  $B_{MSY}$ , etc. Stock assessments may be sophisticated, and provide a reasonably complete accounting of uncertainty.

Data-moderate cases: Reliable estimates of MSY-related quantities are either unavailable or of limited use due to peculiar life history, poor data contrast, or high recruitment variability, but reliable estimates of current stock size and all critical life history (e.g., growth) and fishery (e.g., selectivity) parameters are available. Control rules typically involve parameters such as  $F_{35\%}$ ,  $B_{35\%}$ , etc., or other proxies for MSY-related benchmarks. Stock assessments may range from simple to sophisticated and uncertainty can be reasonably characterized and quantified. (It should be noted that there may be cases when proxies would be useful in “data-rich” situations, i.e., when the proxies are believed to be more robust or reliable than the estimates of MSY parameters. Thus, the term “data-moderate” might be better interpreted as meaning “information-moderate”).

Data-poor cases: Reliable estimates of MSY-related quantities are unavailable, as are reliable estimates of either current stock size or certain critical life history or fishery parameters. Control rules typically involve parameters such as  $M$ , historical average catch, etc. Stock assessments are minimal, and measurements of uncertainty may be qualitative rather than quantitative.

The list of proxies presented in the following sections is not all-inclusive and scientists are encouraged to develop and examine alternatives.

### 2.2.1 Data-Moderate Situations

The most widely used biological reference points are those derived from age-structured stock-recruitment models or surplus production models ( $MSY$ ,  $F_{MSY}$ ,  $f_{MSY}$ ), yield per recruit analysis ( $F_{0.1}$  and  $F_{max}$ ), spawning per recruit analysis (various percentages of maximum SPR and associated fishing mortality rates such as  $F_{20\%}$ ,  $F_{30\%}$ ,  $F_{35\%}$ , and  $F_{40\%}$ ), and stock-recruitment relationships (slope at the origin, or the spawning biomass below which recruitment markedly drops) (Caddy and Mahon 1995). In general, reference points from YPR and SPR analyses are the simplest to calculate because they require fewer inputs (stock recruitment data in particular). For this reason, YPR and SPR reference points are often used as proxies for other reference points that do require stock and recruitment data.

### Proxies for $F_{MSY}$

$F_{max}$  was one of the earliest measures used as a proxy for  $F_{MSY}$ . However, it was often believed to be an overestimate of  $F_{MSY}$ , because it does not account for the fact that recruitment must decline at some point for low spawning stock sizes, and because  $F_{max}$  is unreasonably large (or even infinite) for some sets of growth and mortality parameters. Computer models have also demonstrated that  $F_{max}$  typically overestimates  $F_{MSY}$  if a Beverton-Holt (1957) stock-recruitment relationship applies, although  $F_{MSY}$  can sometimes exceed  $F_{max}$  with a Ricker (1958) curve.  $F_{0.1}$  (Gulland and Boerema 1973) was developed as an alternative to  $F_{max}$  which could result in nearly the same yield per recruit but with lower levels of exploitation. Today,  $F_{0.1}$  is commonly interpreted as a conservative or cautious proxy for  $F_{MSY}$ , although this is not always the case (Mace 1994; Mace and Sissenwine 1993).

Another class of reference points that has gained prominence are those based on  $F_{\%SPR}$ . In particular, values in the range  $F_{20\%}$  to  $F_{30\%}$  have frequently been used to characterize recruitment overfishing thresholds (Rosenberg *et al.* 1994), while values in the range  $F_{30\%}$  to  $F_{40\%}$  have been used as proxies for  $F_{MSY}$ . These uses are supported by Goodyear (1993); by Mace and Sissenwine (1993), who advocated  $F_{20\%}$  as a recruitment overfishing threshold for well-known stocks with at least average resilience and  $F_{30\%}$  as a recruitment overfishing threshold for less well-known stocks or those believed to have low resilience; and by Clark (1991; 1993), who advocated  $F_{35\%}$  as a robust estimator of  $F_{MSY}$  applicable over a wide range of life histories, or  $F_{40\%}$  if there is strong serial correlation in recruitment. Note, however, that much of the work on  $F_{\%SPR}$  has presupposed a moderate amount of resilience to fishing pressure. Moderate resilience may not be a viable assumption for long-lived species and those with low reproductive output. For example, recent analyses of west coast rockfish (*Sebastes* spp.) stocks are showing the high SPR levels in the range of 50% to 60% are needed to sustain these fisheries (A. MacCall, personal communication). Similar high SPR levels may be necessary to protect many species of sharks and other species that have low productivity.

$F_{med}$  (Sissenwine and Shepherd 1987) may be a useful proxy for different biological reference points, depending on the level of exploitation of the stock from which the stock-recruitment data were estimated. If the stock has been maintained near  $B_{MSY}$ , then  $F_{med}$  may be considered a reasonable proxy for  $F_{MSY}$ .

### Proxies for $B_{MSY}$

The equilibrium biomasses corresponding to the above-mentioned fishing mortality reference points can be used as proxies for  $B_{MSY}$ . In addition,  $B_{MSY}$  has been approximated by various percentages of the unfished biomass,  $B_0$ , usually in the range 30-60%  $B_0$  (higher percentages being used for less resilient species, and lower percentages for more resilient species). Referring (in the preamble) to estimates based on two shapes of production models, the NSGs recommend  $0.4B_0$  as a reasonable proxy for  $B_{MSY}$ . However, this value may be too low for species with low fecundity such as many species of sharks.

$B_{MSY}$  can also be approximated by the mean recruitment ( $R_{mean}$ ) multiplied by either (a) the level of spawning per recruit at  $F_{MSY}$  — namely  $SPR(F_{MSY})$ , or some proxy

thereof; or (b) 30-60%  $SPR_{F=0}$  (the percentage being determined by the stock's resilience to fishing). The danger with using the first approach to develop an MSY control rule of the type in Section 2.1.4 is that, if  $F_{MSY}$  is overestimated, then  $SPR(F_{MSY})$  and  $B_{MSY}$  will both be underestimated. Thus, the MFMT could be too high and the MSST too low.

If catch and CPUE data are available, production models may provide useful proxies, such as  $CPUE_{MSY}$ , which can be used as a relative index of  $B_{MSY}$  (in addition, the nominal effort (e.g., in boat-months) corresponding to  $F_{MSY}$  can be used as a relative index of  $F_{MSY}$ ).

#### *Proxies for $B_0$*

Where  $B_0$  is unknown, it can be approximated by the product of average recruitment and  $SPR_{F=0}$  (Myers *et al.* 1994). However, this approximation may be unrealistic because it assumes that there have been no density-dependent changes in growth, survival, or age at maturity during the "fishing down" period.

#### *Proxies for MSY*

The equilibrium yield corresponding to the above-mentioned  $F$  and/or  $B$  reference points can be used as a proxy for MSY.

#### *Inadequate proxies for $F_{MSY}$ and $B_{MSY}$*

The literature offers a number of estimators of, or approximations to, the "ultimate" limit reference point at which a stock is likely to collapse (variously called  $F_{extinction}$ ,  $F_{ext}$ ,  $F_r$  (Mace 1994),  $F_{crash}$  (ICES 1997a)). In terms of fishing mortality, these estimators include  $F_{med}$  (if calculated from data collected during a period when the stock was overexploited),  $F_{high}$  (the fishing mortality corresponding to the 90th percentile of survival ratios),  $F_{20\%}$ , and  $F_{loss}$  (the fishing mortality corresponding to the lowest observed spawning stock — Cook in press). In terms of biomass, these estimators include some definitions of MBAL (the minimum biologically acceptable level of spawning biomass; Serchuk and Grainger 1992),  $B_{50\%R}$  (the spawning biomass corresponding to 50% of the maximum recruitment in a stock recruitment relationship; Mace 1994; Myers *et al.* 1994),  $B_{90\%R,90\%RS}$  (the biomass corresponding to the intersection of the 90th percentile of observed recruitment and the 90th percentile of survival; Serebryakov 1991; Shepherd 1991), and  $B_{loss}$  (the biomass corresponding to the lowest observed spawning stock; ICES 1997a). In the absence of a reasonable basis for it, the use of these estimators as proxies for  $F_{MSY}$  or  $B_{MSY}$  should be avoided because they are likely to be poor approximations.

#### *Recommended data-moderate defaults*

The recommended data-moderate default MSY control rule is that of Section 2.1.4, using proxies for  $F_{MSY}$  and  $B_{MSY}$  as described below.

It is recommended that fishing mortality rates in the range  $F_{30\%}$  to  $F_{60\%}$  be used as general default proxies for  $F_{MSY}$ , when the latter cannot be reliably estimated. In the absence of data and analyses that can be used to justify alternative approaches, it is recommended that  $F_{30\%}$  be used for stocks believed to have relatively high resilience,  $F_{40\%}$  for stocks believed to have low to moderate resilience, and  $F_{35\%}$  for stocks with "average" resilience (Mace and Sissenwine 1993). For stocks with very low productivity (such as

rockfish and most elasmobranchs), fishing mortality rates in the range  $F_{50\%}$  to  $F_{60\%}$  are recommended as proxies for  $F_{MSY}$ . Less-preferred alternatives (in order of preference) are to use  $F_{0.1}$ ,  $M$ ,  $F_{max}$ , or  $F_{med}$  (however, if  $F_{med}$  is calculated from data collected when the stock was fluctuating around  $B_{MSY}$ , then it would be a good proxy for  $F_{MSY}$ ). The equilibrium or average biomass levels corresponding to these fishing mortality rates should then be used as proxies for  $B_{MSY}$  in the same order of preference. The default limit control rule would then be defined with fishing mortality set to this default level when biomass exceeds  $(1-M)*B_{MSY}$  or  $\frac{1}{2} B_{MSY}$ , whichever is greater, and would decline linearly to zero for biomass levels below this level (see Figure 4). The recommended default MSST corresponds to  $\frac{1}{2} B_{MSY}$  (the absolute lowest limit triggering the need for a rebuilding plan) for species with  $M \geq 0.5$ ; but occurs at a larger biomass for species with smaller  $M$ .

### 2.2.2 Data-Poor Situations

If there are insufficient or inadequate data to conduct YPR and SPR analyses, or if estimates of  $F$  and  $B$  cannot be obtained for comparison with YPR and SPR reference points, there are few options for defining meaningful targets and limits. Priority should be given to bringing the knowledge base at least up to "data-moderate" standards.

#### *Proxies for $F_{MSY}$*

The natural mortality rate  $M$  has often been considered to be a conservative estimate of  $F_{MSY}$ ; however, it is becoming more and more frequently advocated as a target or limit for fisheries with a modest amount of information. In fact, in several fisheries,  $F=0.8*M$  and  $F=0.75*M$  have been suggested as default limits for data-poor cases (Thompson 1993, NMFS 1996).

#### *Proxies for $B_{MSY}$*

The equilibrium biomass corresponding to  $F=M$  or  $F=0.8*M$  can be used as a proxy for  $B_{MSY}$ . However, in most data-poor situations, it will not be possible to calculate this quantity.

#### *Proxies for $B_0$*

Some function of CPUE might conceivably be used as a relative index of initial biomass. If information (perhaps anecdotal) exists on resource conditions prior to or shortly after the onset of fishing, some inferences of initial biomass ( $B_0$ ) may be possible. Because the geographic area occupied by a stock may contract with declines in abundance, the contrast between present and early geographic distributions of the resource may be used to obtain a rough approximation of pre-fishery abundance. Early sport fishing records may provide useful information on resource conditions prior to intense exploitation (MacCall 1996). Estimates of early CPUE may relate to  $B_0$ , but care must be taken to correct for the general tendency for CPUE to underestimate declines in resource abundance. For example, this may require geographic stratification, correction for temporal changes in fleet composition (e.g., loss of less efficient vessels as catch rate declines) and a variety of behavioral and biological interactions (see Section 3.5.5). Nonequilibrium production modeling (Hilborn and Walters 1992; Prager 1994) also may provide an inference of initial CPUE for the fishery.

## Proxies for MSY

If there is no reliable information available to estimate fishing mortality or biomass reference points, it may be reasonable to use the historical average catch as a proxy for MSY, taking care to select a period when there is no evidence that abundance was declining.

### Recommended data-poor defaults

In data-poor cases it is recommended that the default limit control rule be implemented by multiplying the average catch from a time period when there is no quantitative or qualitative evidence of declining abundance ("Recent Catch") by a factor depending on a qualitative estimate of relative stock size:

Above $B_{MSY}$ :	Limit catch = 1.00*(Recent catch).
Above MSST but below $B_{MSY}$ :	Limit catch = 0.67*(Recent catch).
Below MSST (i.e., overfished):	Limit catch = 0.33*(Recent catch).

The multipliers 1.0, 0.67 and 0.33 were derived by dividing the default precautionary target multipliers in Section 3.3.1 by 0.75, in order to maintain the 0.75 ratio recommended as the default distance between the limit and target reference points for stocks above  $(1-M)*B_{MSY}$ . Since it probably will not be possible to determine stock status relative to  $B_{MSY}$  analytically, an approach based on "informed judgement" (e.g., a Delphi approach) may be necessary.

### 2.3 Multispecies Considerations in Implementing MSY Control Rules

Under the National Standard Guidelines, MSY is to be specified for each stock in a mixed-stock fishery, and if this is not possible, then "*MSY may be specified on the basis of one or more species as an indicator for the mixed stock as a whole or for the fishery as a whole.*"

Because productivity (growth, recruitment and mortality) of each species in a stock complex is likely to be different, there will be no single value of  $F_{MSY}$  that applies to all species within the assemblage. Likewise, catchability (vulnerability) of each co-occurring species by the gear is likely to be different. Thus, fishing rates for co-occurring species are not going to be reduced by equal amounts if effort within the fishery is reduced. Consequently, it will be difficult if not impossible to obtain  $F_{MSY}$  and  $B_{MSY}$  for several species simultaneously. Depending on which stock (or stocks) within the mixed-stock complex serve as indicators for the complex as a whole, remaining stocks within the complex may be variously over- or under-exploited with respect to their individual MSY levels. If the indicator stock is more productive than other species within the mixed-stock complex, some stocks within the complex may not be able to withstand the same level of fishing effort associated with the MSY control rule for the indicator species, and a precautionary approach becomes warranted in the face of uncertainty about productivity of non-indicator stocks (Section 3.5.1). Those stocks may be potentially at risk for protection under the Endangered Species Act (ESA) if the fishery continues to overfish those stocks, while maintaining productive indicator stocks at MSY levels.

The National Standard Guidelines allow exceptions to the requirement to prevent overfishing in the case of a mixed-stock complex. If one species in the complex is harvested at OY, overfishing of other components in the complex may occur if (1) long-term net benefits to the Nation will be obtained *and* (2) similar long-term net benefits cannot be obtained by modification of fleet behavior or gear characteristics or other operational characteristics to prevent overfishing *and* (3) the resulting fishing mortality rate will not cause any stock or ecologically significant unit to require protection under the ESA.



### 3. TARGET CONTROL RULES

NMFS' guidelines for National Standard 1 state,

*"Target reference points, such as OY, should be set safely below limit reference points, such as the catch level associated with the fishing mortality rate or level defined by the status determination criteria."*

They also state,

*"...target harvest levels may be prescribed on the basis of an OY control rule similar to the MSY control rule ... but designed to achieve OY on average, rather than MSY. The annual harvest level obtained under an OY control rule must always be less than or equal to the harvest level that would be obtained under the MSY control rule."*

The words "safely below" in the first quotation have a clear precautionary connotation as elaborated in the National Standard 1 text cited in Section 1.1.2. This section provides technical guidance for developing target control rules. As noted in the Preface, this technical guidance for defining management targets does not incorporate socioeconomic considerations other than aversion to the risk of overfishing.

In terms of accounting for uncertainty, two main approaches have been proposed for establishing a target control rule. Both employ probabilistic treatments of uncertainty, but differ in how probability is used. The first approach can be viewed as "decision-theoretic" because it uses the principles of decision theory to establish a target, given a specified level of relative risk aversion. The greater the level of relative risk aversion, the more conservative the precautionary target control rule will be. For example, if a substantial over-estimate of allowable harvest is perceived to be much more undesirable than an under-estimate of equal magnitude, the implied level of relative risk aversion is higher, and the resulting target fishing mortality will be lower, than if the two mis-estimates were perceived to be equally undesirable. In this approach, risk is defined as "expected loss" and is viewed as an objective function to be minimized. A risk-averse target control rule established under a decision-theoretic approach will also necessarily imply some probability of exceeding the limit, but this probability will generally vary on a case-by-case basis, even under a fixed level of relative risk aversion.

The second approach can be considered as "frequentist" because it uses the frequency of violating the limit to establish a target, given a specified time frame and a critical frequency level. The lower the critical frequency level, the more conservative the target control rule will be. For example, if it is unacceptable to have more than a 5% chance of violating the limit at any time within a 20-year period, the resulting target control rule will be more conservative than if it were acceptable to have a 10% chance of violating the limit within the same time period. In this approach, risk is defined as "frequency of violation" and is viewed as a constraint to be satisfied. A target control rule established under a frequentist approach will also necessarily imply some level of relative risk aversion, but this level will generally vary on a case-by-case basis, even under a fixed critical frequency level.

In Section 3.1 below, an example of a precautionary target control rule developed under the decision-theoretic approach is given. In Section 3.2, a general simulation framework, applicable to both the decision-theoretic and frequentist approaches, is presented.

### 3.1 A Decision-Theoretic Approach

The distinction between limit and target control rules can be thought of as a distinction between levels of relative risk aversion, and development of both limit and target control rules considered as an optimization problem in a decision-theoretic context. For example, a limit control rule might be defined by the optimum derived under a risk-neutral attitude, while a target control rule might be defined by the optimum derived under a risk-averse attitude. A simple and intuitive way to characterize this difference is in terms of stationary (i.e., long-term) yield: A risk-neutral solution maximizes the expectation of stationary yield (MESY) while a risk-averse solution maximizes the expectation of log stationary yield (MELSY; Thompson 1992 and 1996). When computing these expectations, uncertainty in parameter values should be considered along with uncertainty due to recruitment variability and other natural processes.

In the absence of fishing, stock size  $B$  at time  $t$  can theoretically range anywhere from zero to infinity, with some stock sizes being more probable than others. Stock size can be modeled as a probability density function (pdf) with parameter vector  $\theta$  and an initial condition  $B_0$  (in this section,  $B_0$  is not used to denote pristine stock size, but rather the stock size at the start of a population projection). Thus, given an initial condition  $B=B_0$ , the probability that stock size falls between  $B_1$  and  $B_2$  at time  $t$  may be written in terms of the "transition distribution"  $g_B(B|\theta;B_0;t)$  as follows:

$$Pr(B_1 \leq B(t) \leq B_2) = \int_{B_1}^{B_2} g_B(B|\theta;B_0;t) dB.$$

As  $t$  approaches infinity,  $g_B$  describes the "stationary distribution" of stock size, which can be written as  $g_B(B|\theta)$ .

Next, consider a function which uses a parameter vector to map stock size  $B$  into a fishing mortality rate  $F$ . Such a function constitutes a control rule. A simple but useful control rule may be specified by two parameters,  $c$  and  $d$  (for example, the logarithmic form  $F(B) = c + d \ln(B)$ ). For any control rule, yield  $Y$  will be a function of stock size conditional on the parameters of the control rule. The stationary distribution of stock size will also be conditional on the same control rule parameters. In the case of the two-parameter control rule, yield can be written as  $Y(B|c,d)$ , the transition distribution of stock size as  $g_B(B|c,d;\theta;B_0;t)$ , and the stationary distribution of stock size as  $g_B(B|c,d;\theta)$ .

#### *Risk-neutral Optimization*

A risk-neutral approach can be useful in defining a limit control rule. A risk-neutral solution maximizes the expectation of stationary yield (MESY) for one of the

parameters of the control rule (for example  $c$ ), conditional on the other parameters (for example  $d$ ) being fixed, while simultaneously accounting for parameter uncertainty. The solution can be denoted by  $c_{MESY}(d)$ , meaning the optimum value of parameter  $c$  of the control rule that maximizes long-term yield conditional on parameter  $d$ . Mathematically, the solution is found by maximizing the marginal arithmetic mean long-term yield,  $A_Y(c,d)$  with respect to  $c$ . This is achieved by differentiating the marginal arithmetic mean yield with respect to  $c$ , setting the resulting expression equal to zero, and solving with respect to  $c$ . The arithmetic mean yield can generally be computed by projecting the population over a long time horizon. Analytical expressions for arithmetic mean yield can also be obtained for some simple models; in many cases, the solution for  $c_{MESY}(d)$  will need to be found numerically.

### *Risk-averse Optimization*

A risk-averse approach can be useful for defining a target control rule. A risk-averse solution maximizes the expectation of log stationary yield (MELSY) for one of the parameters of the control rule conditional on the other parameters being fixed, while also accounting for parameter uncertainty.

Continuing with the example of optimizing  $c$  in a two-parameter control rule, the solution can be denoted by  $c_{MELSY}(d)$ , and is found by maximizing the marginal geometric mean yield,  $G_Y(c,d)$  with respect to  $c$ . As with  $A_Y(c,d)$ , the geometric mean yield can be computed by means of simulation, or, in some simple cases, analytically.

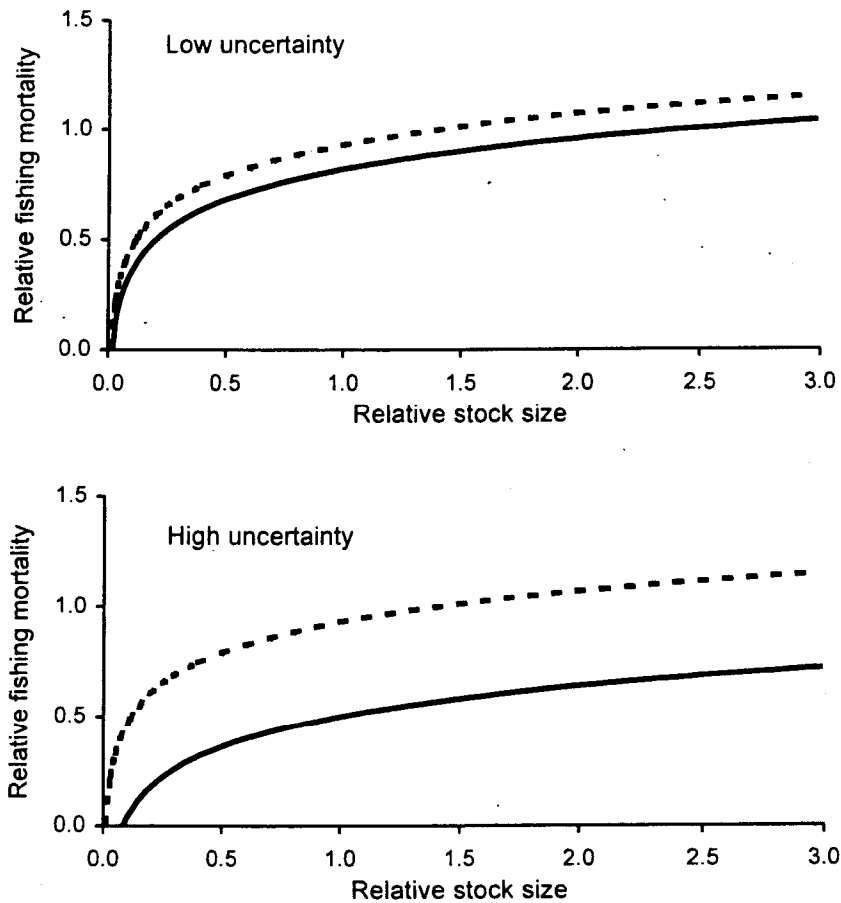
### *An Example*

Thompson (in prep.) provides a detailed example of using the decision-theoretic approach to define limit and target control rules based on maximizing the expected stationary yield or expected log stationary yield. In the deterministic case of that example, the population dynamics of the stock are regulated by a Gompertz-Fox model. The control rule is the two-parameter logarithmic form, giving the expression for change in population size as

$$\frac{dB}{dt} = aB \left( 1 - \ln \left( \frac{B}{b} \right) \right) - (c + d \ln(B)) B,$$

where  $a$  is a growth rate and  $b$  is a scale parameter.

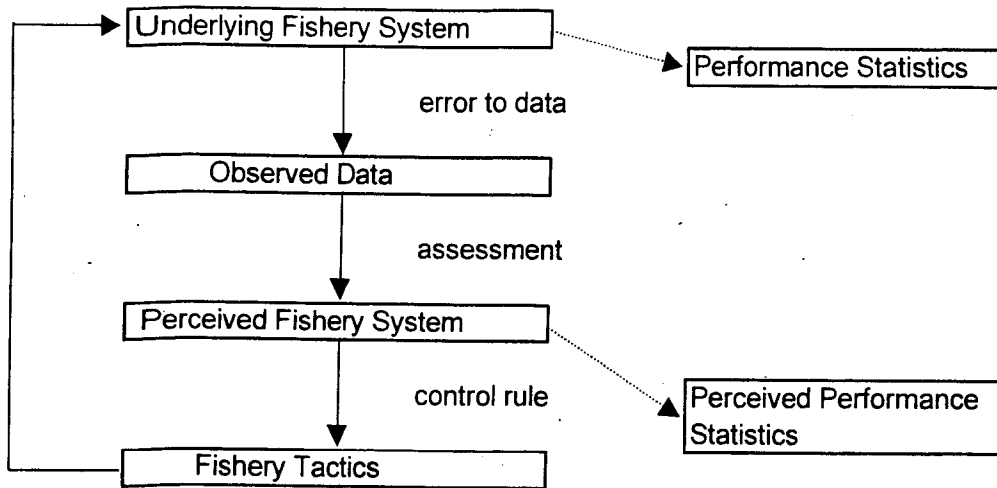
By recasting the model as a stochastic differential equation that incorporates natural variability, analytical expressions can be derived for the risk-neutral and risk-averse solutions presented above (note, however, that the decision-theoretic approach is not limited to cases where an analytical solution is available, as the same approach can be followed using simulation tools such as those of Section 3.2). Figure 5 presents examples of limit and target control rules developed with the decision-theoretic approach for two levels of parameter uncertainty. The control rules shown in Figure 5 have the desirable precautionary property that the buffer between the limit and the target fishing mortality increases as the level of uncertainty surrounding parameter estimates increases.



**Figure 5.** Example limit (dashed lines) and target (solid lines) control rules in a particular model derived with a decision-theoretic approach. The size of the buffer between the limit and target control rules is dictated by the amount of parameter uncertainty (compare upper and lower panels).

### 3.2 A General Simulation Framework

A fishery management strategy is the combination of data collection, stock assessment, control rules, and technical measures for implementing the harvest controls. Considerable work has been undertaken to develop simulation methods to evaluate the performance of management strategies (e.g., de la Mare 1986; see Kirkwood and Smith 1996), with much attention often given to the way the various components of a strategy may interact with each other over time. For example, in a recent review of stock assessment methods, the National Research Council stated that *“Both harvesting strategies and decision rules for regulatory actions have to be evaluated simultaneously to determine their combined ability to sustain stocks”* (NRC 1998).

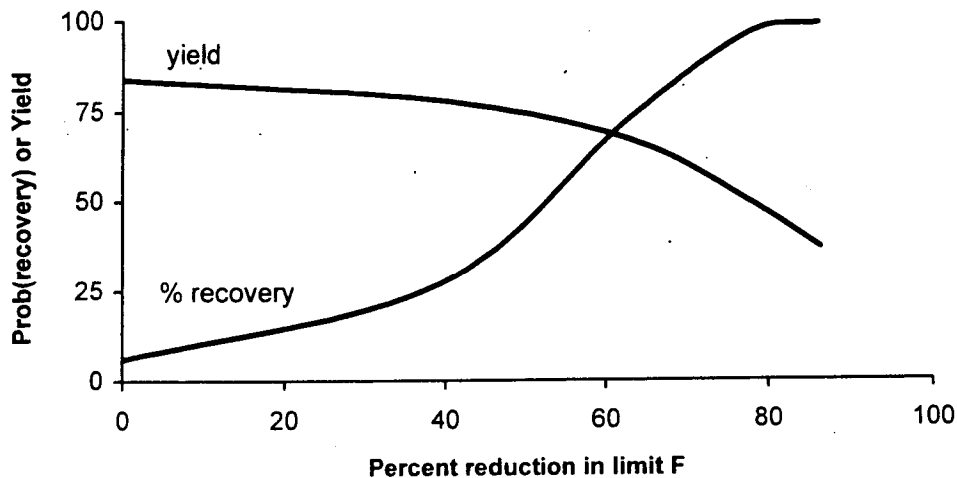


**Figure 6.** Schematic representation of a simulation framework for evaluating management strategies. Modified, with permission, from Section 4 of ICES (1997b).

The conceptual framework depicted in Figure 6 (taken from ICES 1997b), illustrates a flexible simulation approach for evaluating management strategies. The general technique is to simulate a “true” underlying fishery system of known characteristics, including natural variability. Monte Carlo simulation is used to sample observations with measurement error from the underlying system, and the sample observations are then used in a stock assessment. This allows repeated realizations of the “perceived” system, which may or may not differ substantially from the “true” system (depending partly on the degree of similarity between the true population dynamics and those assumed in the assessment procedure). Using a pre-specified target control rule (e.g., to set the Total Allowable Catch equal to the catch obtained by harvesting the perceived population at the  $F_{MSY}$  rate), a regulatory strategy can then be translated into specific fishery tactics (e.g., catch allocations for different fishing sectors). These tactics in turn affect the real underlying system in the next iteration, and so on.

A key step in the evaluation process is to identify the performance criteria that will be examined (see also Section 1.3). In the case of rebuilding an overfished stock, an important performance criterion might be the probability that  $B \geq B_{MSY}$  after X years (e.g., 10 years) of implementing a target control rule (a similar approach was used in the guidelines for estimating “potential biological removals” [PBR] for the implementation of the 1996 amendments to the Marine Mammal Protection Act; Wade and Angliss 1997). In most applications, multiple criteria will probably need to be examined, such as the probability that the stock remains above MSST, the average annual yield, and the interannual variability in yield. Inclusion of multiple criteria is particularly useful when there are conflicting goals, such as preventing the stock from falling below  $B_{MSY}$  while at the same time achieving yields as close to MSY as possible. Figure 7 depicts an example from ICES (1997b), in which simulation starts with a stock at an equilibrium biomass

equal to  $\frac{1}{2}B_{MSY}$ , the limit  $F$  is set to  $F_{MSY}$ , and the precautionary target  $F$  is set below  $F_{MSY}$  by a given percentage. The figure illustrates the tradeoffs between increasing the chances of rebuilding in a 10-year period and sacrificing average yield.



**Figure 7** Tradeoffs between two conflicting performance criteria: Rebuilding an overfished stock and maximizing average yield during a 10-year period. Hypothetical example taken from ICES (1997b), data set 7, with limit  $F = F_{MSY}$ .

Simulation results such as those depicted in Figure 7 can be used to infer the degree of precaution required to achieve a desired outcome. In the example above, if at least a 50% probability of rebuilding to  $B_{MSY}$  was desired, then the rebuilding target  $F$  should be set at about  $\frac{1}{2}F_{MSY}$ . Thus, the simulation approach can help determine how far apart (or how "safely below") targets have to be from limits to achieve management goals. In general, simulations should be conducted on a case-by-case basis to account for:

- Growth, reproductive and recruitment dynamics of the stock, including variability (process error);
- Initial conditions, including age-structure;
- Selectivity of the fishing gear(s);
- Types of observations sampled (e.g., age-structure data) and their variability;
- Stock assessment method used;
- Estimation of biological reference points (e.g., limit  $F$ ) and their uncertainty; and
- Potential biases in the implementation of regulations determined by the control rule.

The simulation approach can also be used to evaluate the benefits to management from reduced uncertainty (Powers and Restrepo 1993). Figure 8 shows that the probability-of-rebuilding curve (from the previous example) is shifted upwards when there is increased in precision regarding current stock status and  $F_{MSY}$ .

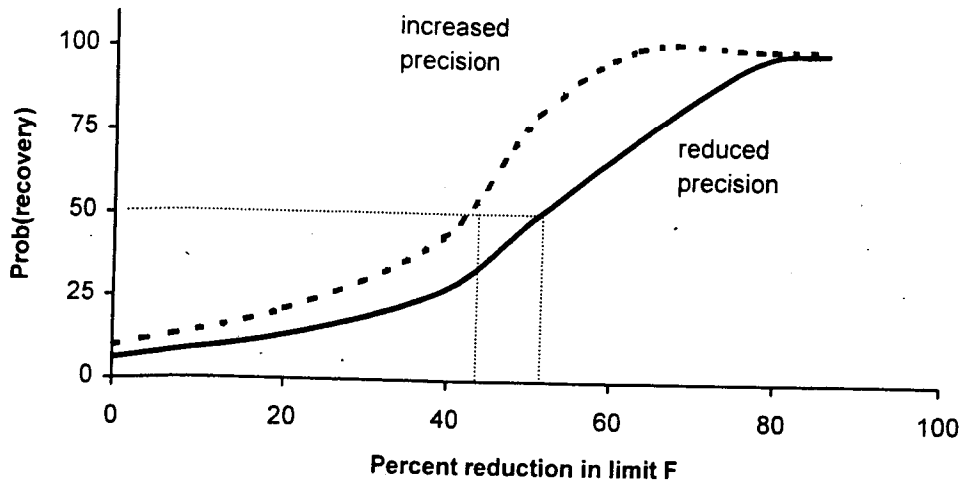


Figure 8 The effect of increased precision on the rebuilding example of Figure 7.

### 3.3 Recommended Default Target

Ideally, target control rules should be developed using approaches such as those in Sections 3.1 or 3.2. In setting a precautionary target control rule by means of the "frequentist" approach (Sections 3 and 3.2), we recommend that the probability of exceeding the MFMT be not greater than 20%-30%, and certainly smaller than 50%. Absent such analyses or a risk-averse solution as explained in Section 3.1, the following default target control rule is recommended.

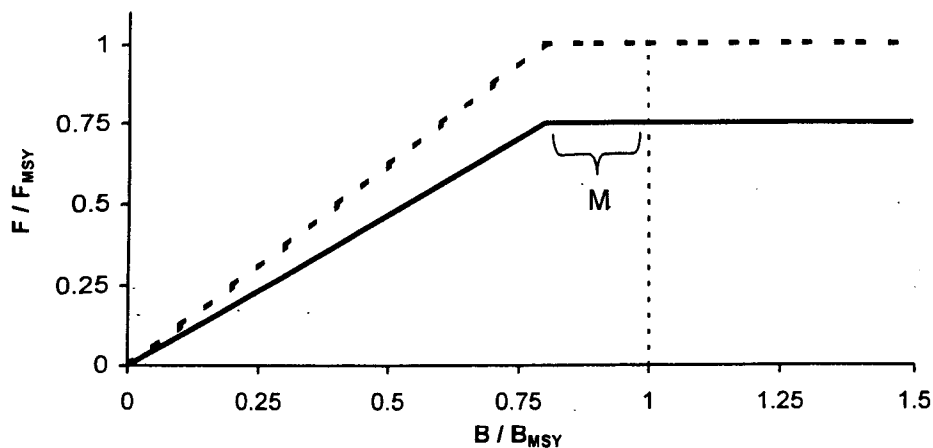
The recommended target control rule (Figure 9) sets the target fishing mortality rate 25 percent below the limit fishing mortality (MFMT) recommended in Section 2.1.4. In equation form, the recommended default target is:

$$F(B) = \frac{0.75 F_{MSY} B}{c B_{MSY}} \quad \text{for all } B \leq c B_{MSY}$$

$$F(B) = 0.75 F_{MSY} \quad \text{for all } B \geq c B_{MSY}$$

where  $c$ ,  $F_{MSY}$  and  $B_{MSY}$  are as defined in Section 2.1.4.

The default provides a safety margin (or buffer) to ensure that the realized  $F$  does not exceed MFMT. The default target control rule also facilitates rebuilding of stocks by reducing  $F$  proportionately at stock sizes below  $(1-M)B_{MSY}$ . In some cases, however, the rebuilding rate from the default target will be insufficient to rebuild an overfished stock to  $B_{MSY}$  within the time period allowed by the NSGs (depending on the life history characteristics of the stock and the level of depletion). In such cases, stronger conservation measures will be required, as explained in Section 3.4.



**Figure 9.** Recommended target (solid line) and limit (dashed line) control rules. The target may only be applicable for biomass levels at or above the minimum stock size threshold because it may not allow for sufficient rebuilding for stocks that are already overfished. Such stocks may require a more conservative target control rule for rebuilding (Section 3.4).

The equilibrium consequences of fishing at the default 75%  $F_{MSY}$  were evaluated using the deterministic model of Mace (1994) (see Appendix A). The results of this exercise indicate that fishing at 75%  $F_{MSY}$  would result in equilibrium yields of 94% MSY or higher, and equilibrium biomass levels between 125% and 131%  $B_{MSY}$  -- a relatively small sacrifice in yield for a relatively large gain in biomass (Table A1). Although it is likely that results would diverge for more complex models (e.g., those in which the ages of maturity and recruitment differed substantially, or those incorporating stochasticity), the calculations indicate that relatively small sacrifices in yields will result in relatively much larger gains in stock biomass. Increased biomass should in turn result in a number of benefits to the fishery, including increased CPUE, decreased costs of fishing, and decreased risk to the stock. Relative to fishing at  $F_{MSY}$ , fishing at 75%  $F_{MSY}$  will reduce the probability that a stock will decline to  $\frac{1}{2} B_{MSY}$ .

The deterministic simulation results presented in Appendix A should not be taken as being strictly applicable to every situation. Variability in the population dynamics parameters of a stock will affect the performance of fishing at 75%  $F_{MSY}$ . As well, the evaluation only pertains to cases where  $F_{MSY}$  can be reliably estimated. As such, the performance of the default target will depend on the robustness with which  $F_{MSY}$  can be estimated or approximated. Simulation tools such as those discussed in Section 3.2 could be used to investigate these issues.

It is recognized that no single policy can fully address all of the considerations to be encountered in the wide variety of fisheries subject to the MSFCMA. To the extent that this default target control rule may be inappropriate, it should at least serve to encourage development of more suitable policies for individual fisheries.



### 3.3.1 Data-Moderate and Data-Poor Situations

In data-moderate cases, the default target control rule may require the use of appropriate proxies for reference points such as those presented in Section 2.2.

In data-poor cases, the default policy may be interpreted qualitatively as follows:

Above $B_{MSY}$	Target catch = 0.75*(Recent catch).
Above MSST but below $B_{MSY}$	Target catch = 0.50*(Recent catch).
Below MSST (i.e., overfished)	Target catch = 0.25*(Recent catch).

Determination of the status of biomass relative to  $B_{MSY}$  preferably involves quantitative analysis, but in data-poor cases, applicable analytic methods may not be particularly sophisticated and include a variety of stock assessment methods developed in the 1960s and 1970s (e.g., Gulland 1983). In cases of severe data limitations, qualitative approaches may be necessary, including expert opinion and consensus-building methods (see also Section 2.2.2).

### 3.4. **Rebuilding from Overfished Status**

The National Standard 1 guidelines indicate that once biomass falls below the minimum stock size threshold (MSST), then remedial action is required "*to rebuild the stock or stock complex to the MSY level within an appropriate time frame.*" Therefore, recommendations are presented here for determining the adequacy and efficacy of rebuilding plans.

A rebuilding plan is a strategy of selecting fishing mortality rates or equivalent catches that are expected to increase the stock size to the MSY level within a specified period of time. Components for a rebuilding plan typically include: (a) an estimate of  $B_{MSY}$ , (b) a rebuilding period, (c) a rebuilding trajectory, and (d) a transition from rebuilding to more "optimal" management (Powers 1996). Specifying a control rule in terms of fishing mortality rate and biomass incorporates these components.

Species life history characteristics will affect rebuilding plans in several ways. Some stocks may possess low productivity and will be incapable of recovering within 10 years<sup>2</sup>, even in the absence of fishing mortality. Alternatively, a stock may be highly productive, in which case a rebuilding plan of 10 years will not be precautionary, i.e. the stock has the capability of reaching  $B_{MSY}$  well before 10 years.

Often productivity is correlated with the mean generation time of a stock (defined below), which is why the final rule issuing the NSGs link the maximum rebuilding time period to generation time when rebuilding cannot be achieved in 10 years. The minimum possible rebuilding period is constrained by a stock's status relative to  $B_{MSY}$  and its biological productivity. Linking the rebuilding period with generation time is important because it highlights the time span in the future during which recruitment will begin to

---

<sup>2</sup> The MSFCMA requires that the rebuilding time period be as short as possible and not to exceed 10 years with a few exceptions, including cases where the biology of the stock or other environmental conditions dictate otherwise.

depend primarily upon fish that have yet to be born, as opposed to spawners that already exist.

Rebuilding rates will also be affected by the partial recruitment pattern. Generally, greater rebuilding rates are possible by reducing mortality rates on juveniles than by equal mortality rate reductions on adult fish. However, this depends upon the relative growth and natural mortality between the age groups.

For all overfished resources, the overarching principle is that initial actions must provide a very high probability of preventing further stock declines and have a high probability of immediate improvement. Delaying action is not precautionary.

#### *Generation time*

Although the NSGs do not provide a definition of generation time, various definitions exist in the scientific literature (Caswell 1989). In the context of stock rebuilding time horizons, the definition of generation time used could refer to an unfished state. We recommend that the default definition of generation time,  $G$ , be (Goodyear 1995):

$$G = \frac{\sum_{a=1}^A a E_a N_a}{\sum_{a=1}^A E_a N_a},$$

where  $a$  denotes age,  $A$  is the oldest age expected in a pristine (unfished) condition,  $E_a$  is the mean fecundity at age of females, and  $N_a$  is the average number of females per recruit alive at age  $a$  in the absence of fishing, i.e.,

$$N_a = N_1 \exp\left(-\sum_{j=1}^{a-1} M_j\right),$$

where  $M$  is the natural mortality rate. These expressions should be computed on an equilibrium per-recruit basis, i.e., setting  $N_1 = 1$ . When fecundity data are not available,  $G$  can be computed by replacing  $E_a$  with an age-specific vector of maturity ratios times body weight (as commonly used to compute spawning biomass).

#### *The rebuilding plan*

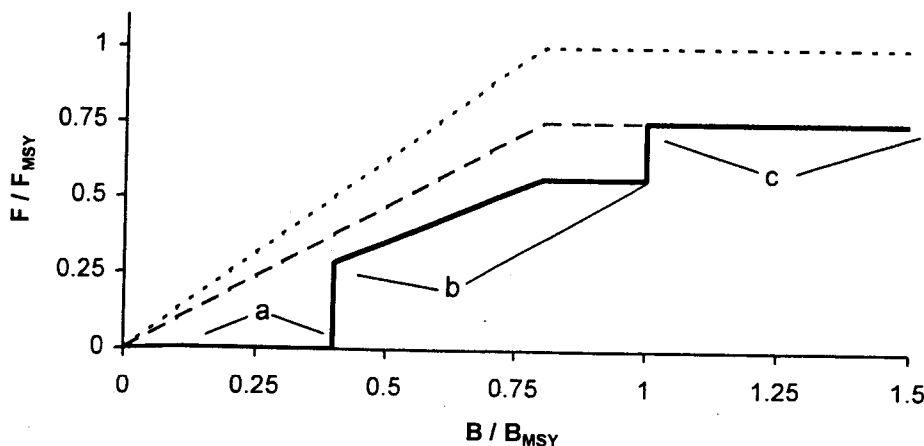
In the absence of data and analyses that can be used to justify alternative approaches, we recommend that a default rebuilding plan for stocks below the MSST be based upon the precautionary target control rule of Section 3.3 with the following extensions:

- 1) The maximum rebuilding period,  $T_{max}$ , should be 10 years, unless  $T_{min}$  (the

expected time to rebuilding under zero fishing mortality) is greater than 10 years, when  $T_{max}$  should be equal to  $T_{min}$  plus one mean generation time.

- 2) The target rebuilding time period,  $T_{target}$ , should be as short as possible and lower than  $T_{max}$  (although it could be adjusted up to  $T_{max}$  under the circumstances described in §600.310(e)(4) of the NSGs). We suggest that  $T_{target}$  not exceed the midpoint between  $T_{min}$  and  $T_{max}$ ; and,
- 3) If the stock is well below the MSST (e.g.,  $B \leq \frac{1}{2}MSST$ ), it may be necessary to set the fishing mortality rate as close to zero as possible (i.e., to that associated with unavoidable levels of bycatch) for a number of years.

Figure 10 illustrates what a rebuilding plan might look like for a severely-overfished stock. In region a, the rebuilding plan's  $F$  is set to zero. In region b, between  $\frac{1}{2}MSST$  and  $B_{MSY}$ , the rebuilding  $F$  is set to 75% of the target  $F$  in the control rule of Section 3.3. In region c, the stock is rebuilt and the  $F$  is set again to the target of Section 3.3. Whether or not a zero  $F$  in region a and a 75% reduction in region b satisfy the requirement for rebuilding within the target time period largely depends on the initial level of stock depletion and the stock's productivity.



**Figure 10.** Example of a rebuilding plan (solid line) for a severely-overfished stock. The dotted and dashed lines represent the recommended default limit and target control rules of Sections 2.1.4 and 3.3, respectively. The regions a, b and c represent three phases in the rebuilding plan: part a is designed to initiate rebuilding with high probability; part b is designed to accelerate rebuilding compared to the rate of rebuilding that is built into the target control rule of Section 3.3; part c represents a transition to more "optimal" management.

### *The role of uncertainty*

Accounting for uncertainty in stock dynamics, current stock status and recruitment variability is important in developing rebuilding plans (Rosenberg and Restrepo 1994). As such, we suggest that the rebuilding plan should be designed to

possess a 50% — or higher — chance of achieving  $B_{MSY}$  within  $T_{target}$  years, and a 90% — or higher — chance of achieving  $B_{MSY}$  within  $T_{max}$  years.

The intent of the MSFCMA is that overfished stocks be rebuilt quickly. For this reason, stock rebuilding should be monitored closely so that adjustments can be made when rebuilding milestones are not being met for whatever reason. For example, if target rebuilding  $F$ s are exceeded due to quota over-runs, subsequent target  $F$ s should typically be adjusted downwards to put the stock back on the rebuilding time table.

The magnitude and variability of future recruitment will affect the realized rebuilding trajectory. In cases when one or more very large year classes appear, it may be tempting to utilize them to increase short-term yield at the expense of slower stock rebuilding, hoping that subsequent year classes will be of similar — or at least average — magnitude. Such action would not be precautionary. Furthermore, the resulting change in fishing mortality would depart from the pre-agreed nature of the rebuilding control rule and therefore be inconsistent with the rebuilding plan.

### **3.5 Special Considerations**

#### **3.5.1 Mixed-Stock Complexes**

The National Standard Guidelines provide for specification of a fishery-wide OY for a mixed-stock fishery, where management measures for separate target harvest levels for individual stocks may be specified, but are not required. Although the guidelines recommend that the sum of individual target levels be less than the fishery-wide OY, if individual OY levels are not specified, the entire OY could be removed from one or a few unproductive stock components and overfishing of these components would occur. Clearly, a precautionary approach should be used to minimize the risk of removing the least productive components in the mixed-stock fishery.

Biological reference points (or proxies) and precautionary target control rules for each stock in a mixed-stock complex should be developed whenever possible, even though information may be limited. At a minimum, fishing mortality should not exceed the limit (MFMT) for any individual stock in a mixed-stock complex, except as provided under the very stringent criteria specified in §600.310(d)(6) of the NSGs. The relevant target control rule should be implemented, regardless of the level of information from which the rule was developed. This should lessen the possibility of reducing less-productive stocks to levels at which they would require protection under the ESA, especially if relatively little were known about those stocks.

#### **3.5.2 Environmental Fluctuations**

Fish stocks undergo natural fluctuations in abundance. These fluctuations are principally due to year-to-year changes in recruitment which are often environmentally induced. Environmental influences can be inter-decadal in nature, with a low level of predictability. Harvest policies should prepare for these natural swings in abundance, which may be greater than half to double the target level of abundance.

It is convenient to classify the impacts of recruitment variability (independent of

stock size) on implementation of target control rules into one of three types:

A. Short-term (year-to-year) fluctuations in recruitment are frequently difficult to measure until the fish have been in the population for several years. This causes uncertainty in the estimation of current stock abundance, thus introducing some random error in the implementation of the control rule.

B. Medium-term (3-10 year; Francis and Hare 1994, Jacobson and MacCall 1995) fluctuations in recruitment can impact rebuilding time frames. While the expected time to rebuilding may be calculated to be, say, less than 10 years, the actual time to rebuilding will be shorter or longer depending on the actual sequence of recruitments over the 10-year period. When recruitment is highly variable, the actual time to rebuilding will usually also be highly variable. This is one of the reasons why it is important to account for future recruitment uncertainty in developing rebuilding plans.

C. Longer-term (decadal) climate conditions appear to impact recruitment dynamics (Alheit and Hagen 1997, MacCall 1996), producing prolonged periods with above-average (or below-average) recruitment. In an evolutionary sense, fish stocks have adapted to this pattern, and harvest policies should attempt to preserve this adaptation. It may be therefore necessary to design control rules that conserve spawning stock abundance during prolonged periods of poor recruitment to preserve a stock's capability to produce higher recruitment when environmental conditions improve. In some cases, environmental effects may be directly integrated into the stock assessment and the control rule. However, one should be cautious in interpreting a long run of good or poor recruitments as indicative of an environmentally-driven change in stock productivity. In particular, for a period of declining abundance, the "burden of proof" should initially rest on demonstrating that the environment (as opposed to fishing) caused the decline, and that, therefore, the target control rule should be modified. However, if productivity has in fact declined, more conservative limit and target reference points will be needed.

### 3.5.3 Stock Definition Issues

A "stock" or "stock complex" is a management unit in the sense of the Magnuson-Stevens Act's first definition of the term "fishery": *"One or more stocks of fish that can be treated as a unit for purposes of conservation and management and that are identified on the basis of geographic, scientific, technical, recreational, or economic characteristics."*

Defining a "stock" on a scientific basis is a very difficult task. Many types of information are used to identify stocks: Distribution and movements, population trends, morphological differences, genetic differences, contaminants and natural isotope loads, parasite differences, and oceanographic habitat differences. Evidence of morphological or genetic differences in animals from different geographic regions normally indicates that the populations are reproductively isolated. Separate management is usually appropriate when such differences are found. Failure to detect differences experimentally, however, does not mean the opposite. Dispersal rates, though sufficiently high to homogenize morphological or genetic differences detectable experimentally between putative populations, may still be insufficient to deliver enough recruits from an

unexploited population (source) to an adjacent exploited population (sink) to prevent local extinctions leading to contraction or fragmentation of range.

When the distribution of fishing effort corresponds spatially with the density of the target species, management errors caused by improper stock definition are likely to be small. However, for multispecies fisheries and particularly for by-caught species, fishing effort may be concentrated in only a portion of a species' range. The risk of local depletion leading to range contraction or fragmentation is particularly high for long-lived species with high site fidelity.

Careful consideration needs to be given to how stocks are defined scientifically. In the absence of adequate information on stock structure, a species' range within an ocean should be divided into stocks that represent useful management units. Examples of such management units include distinct oceanographic regions, semi-isolated habitat areas, and areas of higher density of the species that are separated by relatively lower density areas.

#### 3.5.4 Special Life Histories

Delayed maturity, where fish become vulnerable to fishing before they are reproductively mature, can pose a risk of recruitment overfishing. Proxy policies such as  $F_{0.1}$  and  $F=M$  may be too high in such cases. SPR-based policies such as  $F_{35\%}$  account for impacts on spawning potential and tend to provide more precaution in this respect (Clark 1991; Goodyear 1993). Protandric hermaphrodites may be considered as cases of late sexual maturity, and an SPR approach based on female maturity schedules should be adequate.

Species with life stages or behaviors that are highly vulnerable to fishing merit precautionary management. Groupers may be protogynous hermaphrodites, and form very large and predictable spawning aggregations that render them highly vulnerable to fishing, risking both depletion and disturbed population structure due to targeting on large males (Bannerot *et. al.* 1987). Precaution might require severe reductions in fishing pressure, and perhaps a ban on fishing during these vulnerable time periods. No-fishing areas (a.k.a. Marine Protected Areas) could also be appropriate for these species.

Fishes with low frequency variability in recruitment or with rare large recruitments may also require a precautionary reduction in fishing. Clark (1993) showed that an  $F_{10\%}$  SPR-based fishing rate is preferable to his generally recommended  $F_{35\%}$  policy if there is high serial correlation in annual recruitment. Management of rarely-recruiting species should adopt a very high SPR so that sufficient biomass survives the intervals between major recruitment events. Similarly, certain taxa (e.g., elasmobranchs) that are highly vulnerable to fishing due to their low productivity should be managed to ensure very high SPR.

#### 3.5.5 Data Issues

The precautionary approach dictates that greater caution be used in the face of greater uncertainty. Thus, improved knowledge of stock dynamics and of the effects of fishing should result in higher benefits to the Nation through higher yields and lower risks of stock depletion (the relative benefits and costs of enhanced research can be evaluated

with the methods presented in Sections 3.1 and 3.2).

As noted by FAO (1995b, section 4.2), a precautionary approach “*requires explicit specification of the information needed to achieve the management objectives, taking account of the management structure, as well as of the processes required to ensure that these needs are met.*” Data should be collected to improve data quality from a lower tier to a higher tier level of data richness. Logbooks from commercial fishing operations may be useful, whereby daily fishing logs would record target catch and bycatch amount, by species, by fishing statistical area, by gear type, and by units of fishing effort. Any self-report information, such as that contained in logbooks, should be verifiable. Improved data collection systems should also be implemented for recreational fisheries. Scientific observer coverage should also be encouraged, whenever feasible, for independent scientific sampling of commercial and recreational catches.

Scientific (fishery-independent) surveys should also be conducted to estimate the distribution, relative or absolute abundance, age/length frequency, and other relevant biological characteristics of the stocks to improve data quality to a higher data quality tier. An important aspect of fishery-independent monitoring is that it can form the basis for addressing issues and questions that are not necessarily of immediate concern but may become important in the future.

Another important data issue is that of the appropriateness of certain types of data for use in assessment models. Although catch per unit of effort (CPUE) has a long history of use as a fishery-based index of abundance, it also has often proved insensitive to changes in true abundance, particularly when not properly standardized, and its uncritical use has contributed to the collapse of major world fisheries, including the northern cod (Hutchings 1996). Walters and Ludwig (1994) go so far as to say “We flatly recommend that catch/effort data never be used as a direct abundance index (assumed proportional to stock size).” Given the dangers of unvalidated CPUE, the precautionary approach would call for the burden of proof to be placed on demonstrating that CPUE is linearly related to abundance. Patterns such as that shown in Hutchings (1996) and other studies suggest that CPUE often varies approximately in proportion to the square root of abundance. Thus, in cases where a nonlinear relationship between catchability and stock biomass is suspected, it may be necessary to transform CPUE (e.g., by squaring it) before using it as an index of abundance (MacCall in prep.). In addition, standardization of CPUE series may fail to account for increases in fishing power due to the unavailability of appropriate data on gear/vessel configuration and fishing tactics for use in the analyses. In such cases, it is risky to assume that catchability remains constant over time and it may be necessary to adjust CPUE (e.g., by assuming a 3%-5% increase in fishing power per year) before using it as an index of abundance. Such adjustments to CPUE data, while difficult to justify in the absence of direct evidence, may be necessary to reduce the chances of overly-optimistic perceptions of stock status. These risks should be clearly communicated to managers and the public so that they understand that the CPUE adjustments may be necessary in order to avoid serious biases in the assessment. Of course, the preferred remedial action to take is to develop accurate fishery-independent indices of stock abundance.

### 3.5.6 New Fisheries

New fisheries should be viewed as data-poor cases. Initially, fishing should be largely exploratory in nature, and aimed at gathering sufficient information to bring the level of information content up to at least data-moderate standards. New fisheries present opportunities to estimate life history parameters such as natural mortality, which should be considered when planning for data collection. It is precautionary to develop new fisheries gradually from an unexploited state to a fully-exploited state over a period of more than one generation time in order to obtain information from intermediate stock sizes that may be vital to determining  $B_{MSY}$ . FAO (1995b, section 3.5) contains other recommendations for a precautionary approach to managing new fisheries.

### 3.5.7 Other Precautionary Tactics

A number of fishery management tools (or tactics) possess precautionary properties and may be useful mechanisms to ensure that limit reference points are not exceeded. For example, allowing fish to spawn at least once before becoming vulnerable to the fishing gear adds a measure of protection against biased estimates of stock status (Myers and Mertz 1998).

Marine Protected Areas (MPAs), wherein all fishing is prohibited, are an extension of area closures, and include precautionary properties (Bohnsack 1996). MPAs may allow a segment of the resource to preserve its unexploited life history, age structure, ecological relationships, etc., in the presence of exploitation. MPAs have limited benefit for highly mobile resources such as pelagic fishes. Somewhat analogous to an MPA is a "biomass reserve", where a fixed amount of the resource is set aside before applying a target management measure such as  $F_{35\%}$ . This alternative approach may reduce the need for precise specification of SPR in  $F_{\%SPR}$  policies, offsets imprecision in stock assessments, and may be especially useful in managing rarely recruiting species that are easily subject to depletion.

Other tactics that may have precautionary properties include: (a) Use of "clean" gear types to minimize impacts of fisheries on the stocks, (b) restrictions on the physical characteristics of gear (such as mesh size, hook size, and other physical characteristics) to minimize impacts of fisheries on the stocks and damage to the habitat, (c) modifying fishing characteristics to minimize impacts of fisheries on the stocks and damage to the habitat, and (d) modifying fishing seasons to achieve conservation goals.

Adoption of any of the above or similar conservative tactics into an FMP does not guarantee that the NSGs' recommendations for achieving National Standard 1 will be satisfied. Nevertheless, it is important to consider these as management options that possess desirable conservation properties.



## **CONCLUDING REMARKS**

Specification of status determination criteria and target control rules is a challenging exercise. Key to this process is communication among managers, scientists, industry and the public. In the face of conflicting objectives, it is essential to understand the tradeoffs associated with alternative control rules and the importance of the weights assigned to the different objectives or performance criteria. Simulation frameworks of the type highlighted in Section 3.2 can facilitate these interactions. Simulation tools should also be used to examine the performance of management systems as a whole, including data collection, assessments, control rules, and implementation of management tactics.

## **ACKNOWLEDGMENTS**

The authors are grateful to M. Fogarty, P. Goodyear, L. Kell, F. Serchuk and K. Stokes for their detailed reviews of earlier drafts.

## REFERENCES

- Alheit, J. and E. Hagen. 1997. Long-term climate forcing of European herring and sardine populations. *Fish. Oceanogr.* 6:130-139.
- Bannerot, S., W. W. Fox, Jr., and J. E. Powers. 1987. Reproductive strategies and the management of snappers and groupers in the Gulf of Mexico and Caribbean. pp. 561-603 In: J. J. Polovina and S. Ralston [eds.] *Tropical snappers and groupers: Biology and fisheries management*. Westview Press, 659p.
- Beverton, R. J. H., and S. J. Holt. 1957. On the dynamics of exploited fish populations. *Fish. Invest. Ser. 2*, vol. 19. U.K. Ministry of Agriculture, Food and Fisheries, London.
- Bohnsack, J. A. 1996. Maintenance and recovery of reef fishery productivity. Pp. 283-313 In N. V. C. Polunin and C. M. Roberts [eds.] *Reef Fisheries*. Chapman and Hall, London.
- Butterworth, D. S. and M. O. Bergh. 1993. The development of a management procedure for the South African anchovy resource. p. 83-99 in S. J. Smith, J. J. Hunt and D. Rivard [ed.]. *Risk evaluation and biological reference points for fisheries management*. Can. Spec. Publ. Fish. Aquat. Sci. 120.
- Caddy, J. F., and R. Mahon. 1995. Reference points for fishery management. *FAO Fish. Tech. Pap.* 347. 82 p.
- Caswell, H. 1989. *Matrix population models*. Sinauer Associates, Sunderland, MA. 328 p.
- Clark, W. G. 1991. Groundfish exploitation rates based on life history parameters. *Can. J. Fish. Aquat. Sci.* 48:734-750.
- Clark, W. G. 1993. The effect of recruitment variability on the choice of a target level of spawning biomass per recruit. Pp. 233-246 In G. Kruse, D. M. Eggers, R. J. Marasco, C. Pautzke and T. Quinn II [eds.] *Proceedings of the International Symposium on Management Strategies for Exploited Fish Populations*. Alaska Sea Grant College Program, P. O. Box 755040, Fairbanks AK.
- Cook, R. M. in press. A sustainability criterion for the exploitation of North Sea cod. *ICES J. Mar. Sci.* (1998).
- de la Mare, W.K. 1986. On the management of exploited whale populations. Ph.D. Thesis, University of York.
- Food and Agriculture Organization (FAO). 1995a. Code of conduct for responsible fisheries. *FAO Mimeo*. Rome, FAO. 14 p.
- Food and Agriculture Organization (FAO). 1995b. Precautionary approach to fisheries. Part I: Guidelines on the precautionary approach to capture fisheries and species introductions. Elaborated by the Technical Consultation on the Precautionary Approach to Capture Fisheries (Including Species Introductions). Lysekil, Sweden, 6-13 June 1995. *FAO Tech. Pap.* 350, Part 1. 52 p.
- Francis, R. C. And S. R. Hare. 1994. Decadal-scale regime shifts in the large marine ecosystems of the North-east Pacific: a case for historical science. *Fish. Oceanogr.* 3:279-291.
- Goodyear, C.P. 1993. Spawning stock biomass per recruit in fisheries management: foundation and current use. P. 67-81 in S.J. Smith, J.J. Hunt, and D. Rivard [eds.] *Risk evaluation and biological reference points for fisheries management*. Can. Spec. Publ. Fish. Aquat. Sci. 120.
- Goodyear, C.P. 1995. Red snapper in U.S. waters of the Gulf of Mexico. *NMFS/SEFSC Contribution MIA-95/96-05*.

- Gulland, J. A. 1983. Fish stock assessment: A manual of basic methods. John Wiley and Sons, New York. 223p.
- Gulland, J.A. and L.K. Borema. 1973. Scientific advice on catch levels. *Fish. Bull.* 71:325-335.
- Hilborn, R., and C. J. Walters. 1992. Quantitative fisheries stock assessment: choice, dynamics and uncertainty. Chapman and Hall, N.Y. 570 p.
- Hutchings, J. A. 1996. Spatial and temporal variation in the density of northern cod and a review of hypotheses for the stock's collapse. *Can. J. Fish. Aquat. Sci.* 53:943-962.
- International Council for the Exploration of the Sea (ICES) 1997a. Report of the study group on the precautionary approach to fisheries management. ICES CM 1997/Assess:7. 37pp.
- International Council for the Exploration of the Sea (ICES). 1997b. Report of the Comprehensive Fishery Evaluation Working Group. ICES CM 1997/Assess:15. 140 pp.
- Jacobson, L. D. And A. D. MacCall. 1995. Stock-recruitment models for Pacific sardine (*Sardinops sagax*). *Can. J. Fish. Aquat. Sci.* 52:566-577.
- Kirkwood, G.P., and A.D.M. Smith. 1996. Assessing the precautionary nature of fishery management strategies. *FAO Fish. Tech. Pap.* 350(2): 141-158.
- MacCall, A.D. 1996. Patterns of low-frequency variability in fish populations of the California Current. *CalCOFI Reps.* 37:100-110.
- MacCall, A.D. In prep. Use of decision tables to develop a precautionary approach to problems in behavior, life history and recruitment variability. Proceedings of the 5th National Stock Assessment Workshop, V. Restrepo [ed.]. NOAA Tech. Memo. NMFS-F/SPO-##. NMFS, Office of Science and Technology, 1315 East-West Highway, Silver Spring, MD 20910.
- Mace, P.M. 1994. Relationships between common biological reference points used as thresholds and targets of fisheries management strategies. *Can. J. Fish. Aquat. Sci.* 51:110-122.
- Mace, P.M. and W. Gabriel. In prep. Evolution, scope and current applications of the precautionary approach in fisheries. Proceedings of the 5th National Stock Assessment Workshop, V. Restrepo [ed.]. NOAA Tech. Memo. NMFS-F/SPO-##. NMFS, Office of Science and Technology, 1315 East-West Highway, Silver Spring, MD 20910.
- Mace, P.M. and M.P. Sissenwine. 1989. Biological reference points for New Zealand fisheries assessments. *New Zealand Fish. Assess. Res. Doc.* 89/11. 11pp.
- Mace, P.M. and M.P. Sissenwine. 1993. How much spawning per recruit is enough? In S.J. Smith, J.J. Hunt and D. Rivard [eds.] Risk evaluation and biological reference points for fisheries management. *Can. Spec. Publ. Fish. and Aquat. Sci.* 120:101-118.
- Myers, R.A., and G. Mertz. 1998. The limits of exploitation: A precautionary approach. *Ecol. Appl.* 8: S165-S169.
- Myers, R.A., A.A. Rosenberg, P.M. Mace, N. Barrowman, and V.R. Restrepo. 1994. In search of thresholds for recruitment overfishing. *ICES J. Mar. Sci.* 51:191-205.
- National Marine Fisheries Service (NMFS). 1996. Environmental Assessment/Regulatory Impact Review for Amendment 44 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area and Amendment 44 to the Fishery Management Plan for the Groundfish Fishery of the Gulf of Alaska to Redefine Acceptable Biological Catch and Overfishing, Appendix B. AKFSC, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115-0070.
- National Research Council (NRC). 1998. Improving Fish Stock Assessments. National Academy

- Press, Washington D.C. 177 pp.
- Powers, J.E. 1996. Benchmark requirements for recovering fish stocks. *N. Amer. J. Fish. Manage.* 16:495-504.
- Powers, J.E., and V.R. Restrepo. 1993. Evaluation of stock assessment research for Gulf of Mexico king mackerel: Benefits and costs to management. *N. Amer. J. Fish. Manage.* 13: 15-26.
- Prager, M. H. 1994. A suite of extensions to a nonequilibrium surplus-production model. *Fish. Bull.* 92: 374-389.
- Ricker, W. E. 1958. Handbook of computations for biological statistics of fish populations. *Fish. Res. Bd. Canada, Bull. No.* 119.
- Rosenberg, A., P. Mace, G. Thompson, G. Darcy, W. Clark, J. Collie, W. Gabriel, A. MacCall, R. Methot, J. Powers, V. Restrepo, T. Wainwright, L. Botsford, J. Hoenig, and K. Stokes. 1994. Scientific review of definitions of overfishing in U.S. Fishery Management Plans. NOAA Tech. Memo. NMFS-F/SPO-17. 205 pp.
- Rosenberg, A.A., and V.R. Restrepo. 1994. Uncertainty and risk evaluation in stock assessment advice for U.S. marine fisheries. *Can. J. Fish. Aquat. Sci.* 51: 2715-2720.
- Serchuk, F.M. and R.J.R. Grainger. 1992. Development of the basis and form of ICES fisheries management advice: historic background (1976-1990) and the new form of ACFM advice. *ICES C.M. 1992/Assess:20.* 13pp.
- Serchuk, F., D. Rivard, J. Casey and R. Mayo. 1997. Report of the ad hoc working group of the NAFO Scientific Council on the precautionary approach. NAFO SCS Document 97/12.
- Serebryakov, V.P. 1991. Predicting year-class strength under uncertainties related to survival in the early life history of some North Atlantic commercial fish. *NAFO Sci. Council. Stud.* 16:49-56.
- Shepherd, J.G. 1991. Report of special session. *NAFO Sci. Council. Stud.* 16:7-12.
- Sissenwine, M.P., and J.G. Shepherd. 1987. An alternative perspective on recruitment overfishing and biological reference points. *Can. J. Fish. Aquat. Sci.* 44: 913-918.
- Thompson, G. G. 1992. A Bayesian approach to management advice when stock-recruitment parameters are uncertain. *Fish. Bull.* 90:561-573.
- Thompson, G. G. 1993. A proposal for a threshold stock size and maximum fishing mortality rate. In S. J. Smith, J. J. Hunt, and D. Rivard [eds.] *Risk evaluation and biological reference points for fisheries management*, p. 303-320. *Can. Spec. Publ. Fish. Aquat. Sci.* 120.
- Thompson, G. G. 1996. Risk-averse optimal harvesting in a biomass dynamic model. Environmental Assessment/Regulatory Impact Review for Amendment 44 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area and Amendment 44 to the Fishery Management Plan for the Groundfish Fishery of the Gulf of Alaska to Redefine Acceptable Biological Catch and Overfishing, Appendix B. AKFSC, NMFS, 7600 Sand Point Way NE., Seattle, WA 98115-0070.
- Thompson, G. G. In prep. Optimizing Harvest Control Rules in the Presence of Natural Variability and Parameter Uncertainty. Proceedings of the 5th National Stock Assessment Workshop, V. Restrepo [ed.]. NOAA Tech. Memo. NMFS-F/SPO-##. NMFS, Office of Science and Technology, 1315 East-West Highway, Silver Spring, MD 20910. National Marine Fisheries Service, Office of Science and Technology, 1315 East-West Highway, Silver Spring, MD 20910.

- Thompson, G. G., and P. M. Mace. 1997. The evolution of precautionary approaches to fisheries management, with focus on the United States. NAFO SCR Doc. 97/26.
- United Nations (UN). 1995. Agreement for the implementation of the provisions of the United Nations convention on the law of the sea of 10 December 1982 relating to the conservation and management of straddling fish stocks and highly migratory fish stocks. United Nations Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks. Sixth session. New York, 24 July - 4 August 1995. A/CONF. 164/37 8 September 1995.
- Wade, P. R., and R. P. Angliss. 1997. Guidelines for assessing marine mammal stocks: report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. NOAA Tech. Memo. NMFS-OPR-12, 93 p.
- Walters, C. And D. Ludwig. 1994. Calculation of Bayes posterior probability distributions for key population parameters. Can. J. Fish. Aquat. Sci. 51:713-722.

## APPENDIX A

### Equilibrium Implications of Fishing at 75% $F_{MSY}$

The simple, deterministic model described in Mace (1994) was used to evaluate the consequences of fishing at the default target of 75%  $F_{MSY}$ . Since the calculations were deterministic and the equilibrium biomass associated with a fishing mortality rate below  $F_{MSY}$  will always exceed  $B_{MSY}$ , it was not necessary to take explicit account of the behavior of the default target at biomass levels below  $B_{MSY}$ . This model is age-structured with natural mortality constant over all ages, knife-edge recruitment and maturity, growth rates represented by a von Bertalanffy growth function, and recruitment represented by either a Beverton-Holt relationship or a Ricker relationship. The procedures used to run the model were the same as those described in Mace (1994), except that the outputs of primary interest were the equilibrium yield at 75%  $F_{MSY}$  (abbreviated Y75), the equilibrium biomass at 75%  $F_{MSY}$  (B75), the ratio Y75/MSY, and the ratio B75/ $B_{MSY}$ . Since the biomass is calculated as the average level present during the course of the fishing year, the ratio B75/ $B_{MSY}$  is equivalent to 1.333\*(Y75/MSY). These calculations were performed for all combinations of natural mortality ( $M$ ) = 0.1, 0.2, and 0.3; Brody growth coefficient in von-Bertalanffy equation ( $K$ ) = 0.1, 0.2, and 0.3; age of recruitment ( $t_r$ ) equal to age of maturity ( $t_m$ ), both knife-edged at ages 3, 5, 7, and 9 years; and extinction parameter ( $\tau$ ) = 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, 0.45, 0.50 (where 100\* $\tau$  represents the level of %SPR corresponding to the slope at the origin of a stock-recruitment relationship) with a Beverton-Holt stock-recruitment relationship for which maximum (asymptotic) recruitment was fixed at  $10^8$  recruits for all parameter combinations. Additional runs combining  $M$  and/or  $K$  = 0.4 with the other parameter values were also conducted.

Even though some of these parameter combinations resulted in rather unlikely sets of life history characteristics, the ratios calculated were remarkably consistent across parameter combinations: Y75/MSY ranged between 0.949 and 0.983 and B75/ $B_{MSY}$  ranged between 1.265 and 1.311. Selected results for these and other variables are shown in Table A1.

Similar calculations were conducted for a Ricker stock-recruitment function with maximum recruitment fixed at  $10^8$ . Parameter values and combinations were the same as those used with the Beverton Holt stock-recruitment function, except that only one age of recruitment was used ( $t_r$  = 5). For this formulation, Y75/MSY ranged between 0.940 and 0.963, and B75/ $B_{MSY}$  ranged between 1.253 and 1.284 (Table A1).

**Table A1.** Equilibrium yield and biomass levels corresponding to  $F_{MSY}$  and  $0.75 F_{MSY}$  (selected results from 600 parameter and model combinations). SRR: stock-recruitment relationship (B-H = Beverton-Holt, R = Ricker).

SRR	M	K	$\tau$	$t_r$	0.75*				Y75/	B75/	
					FMSY	FMSY	MSY	BMSY	Y75	MSY	BMSY
B-H	0.1	0.1	0.05	5	0.091	0.068	12096	133565	11770	0.973	1.298
B-H	0.1	0.1	0.20	5	0.051	0.038	7223	141068	6941	0.961	1.281
B-H	0.1	0.1	0.50	5	0.022	0.016	2279	105381	2175	0.955	1.273
B-H	0.1	0.2	0.05	5	0.147	0.110	30719	209012	30007	0.977	1.302
B-H	0.1	0.2	0.20	5	0.074	0.056	17594	237692	16946	0.963	1.284
B-H	0.1	0.3	0.05	5	0.200	0.150	45966	229351	45008	0.979	1.306
B-H	0.1	0.3	0.20	5	0.091	0.068	25388	278511	24494	0.965	1.286
B-H	0.2	0.1	0.05	5	0.189	0.141	7042	37333	6873	0.976	1.301
B-H	0.2	0.1	0.20	5	0.099	0.075	4120	41422	3964	0.962	1.283
B-H	0.2	0.2	0.05	9	0.501	0.375	45113	90125	44315	0.982	1.310
B-H	0.2	0.2	0.05	5	0.300	0.225	23231	77558	22744	0.979	1.306
B-H	0.2	0.2	0.05	3	0.194	0.145	13215	68123	12873	0.974	1.299
B-H	0.2	0.2	0.20	9	0.195	0.146	23811	122170	23012	0.967	1.289
B-H	0.2	0.2	0.20	5	0.141	0.106	13090	92667	12619	0.964	1.285
B-H	0.2	0.2	0.20	3	0.107	0.080	7831	73125	7529	0.961	1.282
B-H	0.2	0.2	0.50	9	0.069	0.052	6897	99668	6568	0.952	1.270
B-H	0.2	0.2	0.50	5	0.055	0.041	3961	72352	3764	0.950	1.267
B-H	0.2	0.2	0.50	3	0.045	0.034	2456	54969	2331	0.949	1.266
B-H	0.2	0.3	0.05	5	0.405	0.304	39200	96819	38446	0.981	1.308
B-H	0.2	0.3	0.20	5	0.175	0.131	21411	122555	20667	0.965	1.287
B-H	0.3	0.1	0.05	5	0.329	0.246	5447	16579	5331	0.979	1.305
B-H	0.3	0.1	0.20	5	0.159	0.119	3105	19555	2992	0.964	1.285
B-H	0.3	0.2	0.05	5	0.499	0.374	20371	40864	19984	0.981	1.308
B-H	0.3	0.2	0.20	5	0.217	0.163	11226	51639	10833	0.965	1.287
B-H	0.3	0.3	0.05	9	0.926	0.695	61113	65962	60059	0.983	1.310
B-H	0.3	0.3	0.05	5	0.651	0.489	36410	55889	35756	0.982	1.309
B-H	0.3	0.3	0.05	3	0.395	0.297	19438	49150	19011	0.978	1.304
B-H	0.3	0.3	0.20	9	0.337	0.253	31391	93032	30363	0.967	1.290
B-H	0.3	0.3	0.20	5	0.264	0.198	19555	73941	18888	0.966	1.288
B-H	0.3	0.3	0.20	3	0.195	0.146	11114	57070	10707	0.963	1.285
B-H	0.3	0.3	0.50	9	0.115	0.087	8917	77240	8492	0.952	1.270
B-H	0.3	0.3	0.50	5	0.096	0.072	5738	59609	5458	0.951	1.268
B-H	0.3	0.3	0.50	3	0.077	0.058	3399	44086	3228	0.950	1.267
R	0.2	0.2	0.05	5	0.669	0.502	30262	45243	29096	0.962	1.282
R	0.2	0.2	0.20	5	0.190	0.142	23630	124380	22459	0.950	1.267
R	0.2	0.2	0.50	5	0.061	0.045	9037	149062	8522	0.943	1.257
R	0.3	0.3	0.05	5	1.458	1.094	50728	34784	48840	0.963	1.284
R	0.3	0.3	0.20	5	0.358	0.268	35826	100105	34121	0.952	1.270
R	0.3	0.3	0.50	5	0.107	0.080	13120	122951	12385	0.944	1.259

## APPENDIX B

### Glossary

- Availability.** Refers to the distribution of fish of different ages or sizes relative to that of the fishery.
- B.** Biomass, measured in terms of spawning capacity (in weight) or other appropriate units of production.
- $B_0$ .** Virgin stock biomass, i.e. the long-term average biomass value expected in the absence of fishing mortality. In Section 3.1,  $B_0$  is used as the biomass at the start of a population projection.
- $B_{MSY}$ .** Long-term average biomass that would be achieved if fishing at a constant fishing mortality rate equal to  $F_{MSY}$ .
- BRP (Biological Reference Point).** Benchmarks against which the abundance of the stock or the fishing mortality rate can be measured, in order to determine its status. BRPs can be categorized as limits or targets, depending on their intended use (see also Reference Points). There are also socio-economic reference points, but those are not treated in any detail in this document.
- Catchability.** Proportion of the stock removed by one unit of effective fishing effort (typically age-specific due to differences in selectivity and availability by age).
- Control Rule.** Describes a plan for pre-agreed management actions as a function of variables related to the status of the stock. For example, a control rule can specify how  $F$  or yield should vary with biomass. In the NSGs, the “MSY control rule” is used to determine the limit fishing mortality, MFMT. Control rules are also known as “decision rules” or “harvest control laws” in some of the scientific literature.
- CPUE (Catch per Unit of Effort).** Measures the relative success of fishing operations, but is also sometimes used a proxy for relative abundance based on the assumption that CPUE is linearly related to stock size. The use of CPUE that has not been properly standardized for temporal-spatial changes in catchability is highly undesirable.
- DAH (Domestic Annual Harvest).**
- ESA (Endangered Species Act).**
- $F$ .** Instantaneous fishing mortality rate. Measures the effective fishing intensity for a given partial recruitment pattern.
- $F_{0.1}$ .** Fishing mortality at which the slope of equilibrium yield per recruit (YPR) is reduced to 10% of the slope when  $F=0$ .
- $F_{high}$ .** Fishing mortality rate corresponding to an equilibrium SPR equal to the inverse of the 90<sup>th</sup> percentile observed survival ratio.
- $F_{low}$ .** Fishing mortality rate corresponding to an equilibrium SPR equal to the inverse of the 10<sup>th</sup> percentile observed survival ratio.
- $F_{max}$ .** Fishing mortality at which the slope of equilibrium yield per recruit (YPR) is zero (may be undefined in some cases where the YPR- $F$  curve is asymptotic).
- $F_{med}$ .** Fishing mortality rate corresponding to an equilibrium SPR equal to the inverse of the median observed survival ratio.
- $f_{MSY}$ .** Effective fishing effort corresponding to  $F_{MSY}$ .



- $F_{MSY}$ . Fishing mortality rate which, if applied constantly, would result in MSY.
- $F_{\tau}$  (also  $F_{extinction}$   $F_{crash}$ ). Fishing mortality rate corresponding to an equilibrium SPR equal to the inverse of the survival ratio at the origin of the stock-recruitment relationship. A stock fished at or above this level for a prolonged period of time is expected to collapse.
- $F_{x\%}$ . Fishing mortality rate that results in x% equilibrium spawning potential ratio.
- FMP** (Fishery Management Plan). A plan containing conservation and management measures for fishery resources, and other provisions required by the MSFCMA, developed by the Fishery Management Councils or the Secretary of Commerce.
- Generation Time**. In the context of the NSGs, generation time is a measure of the time required for a female to produce a reproductively-active female offspring for use in setting maximum allowable rebuilding time periods. Several estimators of generation time are available in the literature, and one is presented in Section 3.4.
- Limit Reference Points**. Benchmarks used to indicate when harvests should be constrained substantially so that the stock remains within safe biological limits. The probability of exceeding limits should be low. In much of the NSGs, limits are referred to as thresholds. In much of the international literature (e.g., FAO documents), "thresholds" are used as buffer points that signal when a limit is being approached.
- M**. Instantaneous natural mortality rate.
- MESY** (Maximum expected stationary yield). Maximum statistical expectation of long-term yield, considering uncertainties in parameter values and natural (process) variability.
- MELSY** (Maximum expected log stationary yield). Maximum statistical expectation of the logarithm of long-term yield, considering uncertainties in parameter values and natural (process) variability.
- MFMT** (Maximum Fishing Mortality Threshold). SDC for determining if overfishing is occurring. It will usually be equivalent to the  $F$  corresponding to the MSY Control Rule.
- MSFCMA** (Magnuson-Stevens Fishery Conservation and Management Act). U.S. Public Law 94-265, as amended through October 11, 1996. Available as NOAA Technical Memorandum NMFS-F/SPO-23, 1996.
- MSST** (Minimum Stock Size Threshold). The greater of (a)  $\frac{1}{2}B_{MSY}$ , or (b) the minimum stock size at which rebuilding to  $B_{MSY}$  will occur within 10 years of fishing at the MFMT. MSST should be measured in terms of spawning biomass or other appropriate measures of productive capacity.
- MSY** (Maximum Sustainable Yield). Largest long-term average yield (catch) that can be taken from a stock (or stock complex) under prevailing ecological and environmental conditions. Any estimate of MSY depends on the population dynamics of the stock, the characteristics of the fisheries (e.g. gear selectivity), and the control rule used. In much of the traditional fisheries literature, MSY is estimated with a control rule in which  $F$  is independent of stock size. In the language of the NSGs, estimates of MSY will change depending on the shape of the control rule, but  $B_{MSY}$  and  $F_{MSY}$  pertain only to a constant- $F$  control rule.
- NSGs** (National Standard Guidelines). Advisory guidelines developed by NMFS, based on the National Standards of the MSFCMA, intended to assist in the development of FMPs.

Published in the Federal Register<sup>3</sup> first as proposed rule on August 4, 1997, and then revised as final rule on May 1, 1998.

- Overfished.** According to the NSGs, an overfished stock or stock complex is one “whose size is sufficiently small that a change in management practices is required in order to achieve an appropriate level and rate of rebuilding.” A stock or stock complex is considered overfished when its size falls below the MSST. A rebuilding plan is required for stocks that are overfished.
- Overfishing.** According to the NSGs, “overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce MSY on a continuing basis.” Overfishing is occurring if the MFMT is exceeded for 1 year or more.
- OY (Optimum Yield).** The amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems. MSY constitutes a “ceiling” for OY. OY may be lower than MSY, depending on relevant economic, social, or ecological factors. In the case of an overfished fishery, OY should provide for rebuilding to  $B_{MSY}$ .
- Partial Recruitment.** Patterns of relative vulnerability of fish of different sizes or ages due to the combined effects of selectivity and availability.
- Rebuilding Plan.** A plan that must be designed to recover stocks to the  $B_{MSY}$  level within 10 years when they are overfished (i.e. when  $B < MSST$ ). Normally, the 10 years would refer to an expected time to rebuilding in a probabilistic sense.
- Recent Catch.** In the context of this document, this term should be interpreted as the average catch during a time period (e.g., 5 years) for which there is evidence of stable abundance. As this type of information is unlikely to be available in many data-poor cases, scientists could carefully consider defining Recent Catch as the median catch during the last 5, 10 or 15 years.
- Reference Points.** Values of parameters (e.g.  $B_{MSY}$ ,  $F_{MSY}$ ,  $F_{0.1}$ ) that are useful benchmarks for guiding management decisions. Biological reference points are typically limits that should not be exceeded with significant probability (e.g. MSST) or targets for management (e.g. OY).
- Risk.** The probability of an event times the cost associated with the event (loss function). Sometimes “risk” is simply used to denote the probability of an undesirable result (e.g. the risk of biomass falling below MSST).
- SDC (Status Determination Criteria).** Objective and measurable criteria used to determine if a stock is being overfished or is in an overfished state according to NSGs.
- Selectivity.** Measures the relative vulnerability of different age (size) classes to the fishing gears(s).
- SPR (1).** Spawning output Per Recruit: Amount of per-capita spawning biomass (or other appropriate measure of reproductive output) obtained at a given value of  $F$ , conditional on values of partial recruitment, growth, maturity (and/or fecundity) and natural mortality. (2). Spawning Potential Ratio: The expected lifetime spawning output per recruit relative to the spawning output that would be realized in the absence of fishing, often expressed as a percentage. Throughout this document, references to the second

---

<sup>3</sup> Copies of the NSGs and other relevant documents that have appeared in the Federal Register can be obtained in the Web at <http://www.nmfs.gov/sfa>.

definition are associated with a percentage (%) sign.

**Survival Ratios.** Ratios of recruits to spawners (or spawning biomass) in a stock-recruitment analysis.

**Target Reference Points.** Benchmarks used to guide management objectives for achieving a desirable outcome (e.g. OY). Target reference points should not be exceeded on average.

**Uncertainty.** Uncertainty results from a lack of perfect knowledge of many factors that affect stock assessments, estimation of reference points, and management. Rosenberg and Restrepo (1994) identify 5 types: Measurement error (in observed quantities), process error (or natural population variability), model error (mis-specification of assumed values or model structure), estimation error (in population parameters or reference points, due to any of the preceding types of errors), and implementation error (or the inability to achieve targets exactly for whatever reason).

**YPR (Yield per Recruit).** Amount of per-capita yield obtained at a given value of  $F$ , conditional on values of partial recruitment, growth and natural mortality.

Appendix B. Preliminary Staff Analysis: MSY, OY, and Overfishing

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL



ONE SOUTHPARK CIRCLE, SUITE 306  
CHARLESTON, SOUTH CAROLINA 29407-4699  
TEL 843/571-4366 FAX 843/769-4520  
email: safmc@noaa.gov

Benjamin C. Harig, Chairman  
Pete Moffitt, Vice-Chairman

Robert K. Mahood, Executive Director

August 6, 1998

Dr. Andrew J. Kemmerer  
Regional Administrator  
Southeast Regional Office  
9721 Executive Center Drive N.  
St. Petersburg, Florida 33702

Dear Andy:

I want to thank you for providing an opportunity for Council staff to have input on the draft checklist. Gregg has informed me the process was very beneficial and the resulting document will be most useful in finalizing the Magnuson-Stevens Comprehensive Amendment.

Gregg and I will be attending the September 1- 2, 1998 meeting in the Regional Office and look forward to a productive session. Based on the draft checklist, Gregg has prepared some preliminary staff recommendations for the Council to consider. We need assistance from the NMFS Center scientists to complete Table 1 in the attached document and we need guidance from you and your staff on some of the determinations Gregg has proposed. I am requesting a two-part approach: (1) please have the appropriate Center assessment scientists provide the necessary information from existing stock assessments as indicated in the attached document and Table 1 (it would be most helpful if we could receive this information within two weeks) and (2) please have the appropriate NMFS personnel review the preliminary decisions, determinations, and value selections indicated in the attached material and Table 1. NMFS guidance could then be provided during the second part of our meeting on September 1 and 2, 1998.

Andy, we appreciate all the time demands currently placed on NMFS personnel and hope the work that Gregg has done will help expedite this process. We have gone about as far as we can go on this without further direction and guidance from you. We must all work cooperatively in order for the amendments to be approved by the Council in September, revised and sent to the Secretary of Commerce for formal review in early October. I look forward to your cooperation.

If you or any of your staff have any questions, please call me or Gregg.

Sincerely yours,

Robert K. Mahood  
Executive Director

cc: Jim Weaver  
Mike McLemore  
F/SEC - Brad Brown, Alex Chester, Gerry Scott  
F/SEC7 - John Merriner, Chuck Manooch  
F/SEC4 - Tom McIlwain  
F/SF3 - Gary Matlock, George Darcy  
F/ST - Bill Fox  
Wayne Swingle  
Miguel Rolon

**MAGNUSON-STEVENSONS COMPREHENSIVE AMENDMENT  
MSY, OY, & OVERFISHING  
BASED ON THE RECENTLY PROVIDED TECHNICAL GUIDANCE  
DOCUMENT & DRAFT CHECKLIST FOR FMP AMENDMENTS**

August 1998

Prepared by: Gregg T. Waugh

The Sustainable Fisheries Act (SFA) was approved by Congress in September 1996 and signed into law by the President on October 11, 1996. The Act shifted management to a "Maximum Sustainable Yield" (MSY) basis, redefined "overfished" and "overfishing", redefined the definition of "optimum", included a new section on "Rebuilding Overfished Fisheries", and substantially increased the responsibility to provide annual information for management through the "SAFE" report.

NMFS published proposed guidelines on August 4, 1997. The guidelines interpret and provide guidance for developing fishery management plans. NMFS received many comments by the September 18, 1997 deadline and decided to reopen the comment period for an additional 30 days beginning on December 29, 1998. After considering all public comments, NMFS published the final National Standard Guidelines on May 1, 1998.

Additional guidance was provided by NMFS in July with the publication of "Technical Guidance On the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act" dated July 17, 1998 (**Attachment 1**). This information addresses those aspects of scientific fishery management advice that have biological underpinnings, such as the response of fish populations to exploitation. Based on this technical guidance, NMFS also prepared a "Checklist For FMP Amendments" to assist in making amendments to FMPs in order to comply with National Standard 1. NMFS invited me to review the draft checklist and provide suggestions on how to make the checklist useful from the Council staff perspective. The following material is based on a draft of the checklist dated July 31, 1998 (**Attachment 2**). [Note: This will be replaced with the final information when it becomes available.]

Additional documents used include the following:

1. NMFS Prepared Stock Assessments — prepared for the SAFMC from 1992 through 1997.
2. Report of the Ad Hoc Crustacean Stock Assessment Panel — held June 1-3, 1998. This document (draft dated July 1, 1998) was prepared for the Gulf of Mexico Fishery Management Council.
3. Report of the Ad Hoc Finfish Stock Assessment Panel — chaired by Dr. James H. Cowan, Jr. and held June 22-25, 1998 in Miami, Florida. This document (draft dated July 10, 1998) was prepared for the Gulf of Mexico Fishery Management Council.

4. A Retrospective (1979-1996) Multispecies Assessment of Coral Reef Fish Stocks in the Florida Keys — J.S. Ault, J.A. Bohnsack, and G.A. Meester, Fish. Bull. 96(3):395-414. 1998. This document was reviewed by the SAFMC Snapper Grouper Assessment Panel and SSC; some of the specific values for natural mortality (M) and M/K ratios were taken from information compiled in this paper.

Steps using the Checklist with references to the Technical Guidance Document are shown below. Much of the descriptive information under each heading was taken directly from the Technical Source Document and/or Checklist.

## **I. STATUS DETERMINATION CRITERIA (SDC)**

### **1. What is the level of available knowledge for the stock? (Technical Guidance Document, Section 2.2)**

The purpose of developing Status Determination Criteria is to monitor the status of the stock by comparing the results of stock assessments against the definitions of overfishing and overfished condition. The important issue is not so much whether a stock is data-poor or data-rich, but rather to ensure that its status with respect to the Status Determination Criteria can be assessed. The adequacy of the Status Determination Criteria and the ability to monitor the stock will improve by increasing the level of available knowledge to a higher level of data-richness.

The Technical Guidance Document offers three standards for measuring the level of data richness for a stock:

A. **“Data-rich cases:** Reliable estimates of MSY-related quantities and current stock size are available. Control rules typically involve parameters such as FMSY, BMSY, etc. Stock assessments may be sophisticated, and provide a reasonably complete accounting of uncertainty.”

**No species under management by the South Atlantic Council fall under this standard.**

B. **“Data-moderate cases:** Reliable estimates of MSY-related quantities are either unavailable or of limited use due to peculiar life history, poor data contrast, or high recruitment variability, but reliable estimates of current stock size and all critical life history (e.g., growth) and fishery (e.g., selectivity) parameters are available. Control rules typically involve parameters such as F35%, B35%, etc., or other proxies for MSY-related benchmarks. Stock assessments may range from simple to sophisticated and uncertainty can be reasonably characterized and quantified.”

**The following species under management by the South Atlantic Council fall under this standard (Table 1):** lane snapper, black sea bass, yellowtail snapper, gray snapper, mutton snapper, vermilion snapper, red porgy, gray triggerfish, red snapper, gag, scamp, red grouper, black grouper, greater amberjack, speckled hind, snowy grouper, warsaw grouper, golden tilefish, wreckfish, white grunt, red drum, Atlantic migratory group king and Spanish mackerel, and spiny lobster.

C. “Data-poor cases: Reliable estimates of MSY-related quantities are unavailable, as are reliable estimates of either current stock size or certain critical life history or fishery parameters. Control rules typically involve parameters such as M, historical average catch, etc. Stock assessments are minimal, and measurements of uncertainty may be qualitative rather than quantitative.”

**The remainder of species under management by the South Atlantic Council fall under this standard (Table 1).** For many of the species, natural mortality is unknown and catch information is limited.

Based on the information available in the most recent stock assessments for each species, the proposed listing is shown in Table 1.

**NMFS is requested to review this listing and provide any suggested revisions prior to, or during, our September 1-2, 1998 meeting in St. Petersburg, Florida.**

**2. What is the shape of the MSY control rule? (Section 2.1.1)**

The MSY control rule is used to define limits to exploitation. It can be thought of as a strategy in which the fishing mortality is controlled so as to achieve maximum long-term yield. The MSY control rule constitutes the Maximum Fishing Mortality Threshold (MFMT) and is used to determine the Minimum Stock Size Threshold (MSST).

I agree with the conclusion in Section 2.1.4 that “specifying an MSY control rule is a flexible process that should involve a great deal of communication between scientists and managers so that the tradeoffs between the relevant performance criteria are understood.” I also agree that given the unfortunate timetable, “it is desirable to propose a limit control rule that can be used as a default for defining SDC in the absence of more detailed analyses.” I am recommending that the SAFMC follow the report’s recommendation on page 20, as modified on page 24 based on the data-moderate status.

$$F(B) = \frac{F_{MSY} B}{c B_{MSY}} \quad \text{for all } B \leq c B_{MSY}$$

$$F(B) = F_{MSY} \quad \text{for all } B \geq c B_{MSY}$$

where  $c = \max(1-M, 1/2)$ ,  $F_{MSY}$  is the fishing mortality rate that maximizes long-term yield under a constant-F policy, and  $B_{MSY}$  is the equilibrium biomass expected when fishing constantly at  $F_{MSY}$ . Setting  $c = \max(1-M, 1/2)$ , where  $M$  is the natural mortality rate of the exploited age classes, seems reasonable insofar as one would expect a stock fished at  $F_{MSY}$  to fluctuate around  $B_{MSY}$  on a scale related to  $M$  (small fluctuations for low  $M$  and large fluctuations for high  $M$ ). See Figure 4 on the next page; taken from page 20 in Technical Guidance Document.

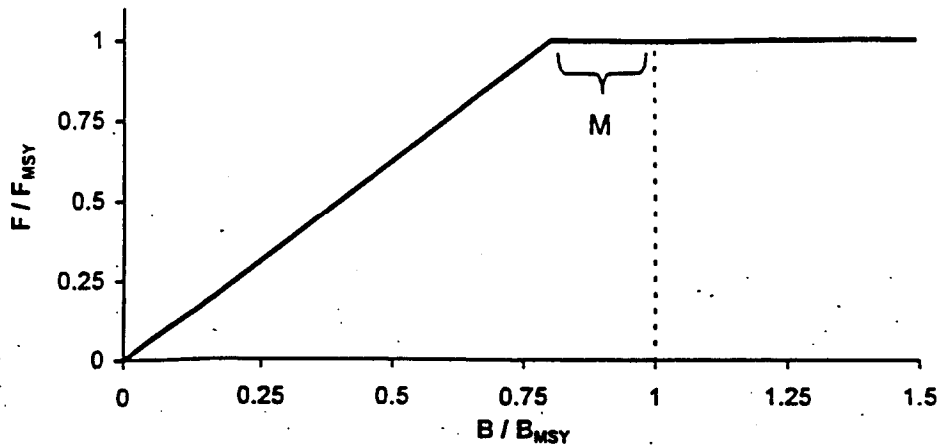


Figure 4. Recommended default MSY control rule.

This is a three-parameter linear-linear form and the proposed option for the Council to consider is a constant  $F$  management strategy when biomass is greater than  $(1-M) \cdot B_{MSY}$ .

### 3. Parameterize the MSY-control rule.

This step can only be taken for the data-moderate species. For “data-moderate” cases, I am recommending the Council use proxies for  $F_{MSY}$  based on the recommended data-moderate defaults shown on the bottom of page 24 in Section 2.2.1 of the Technical Guidance Document:

(a) fishing mortality rates in the range of  $F_{30\%}$  to  $F_{60\%}$  be used as general default proxies for  $F_{MSY}$ , when the latter cannot be reliably estimated. In the absence of data and analyses that can be used to justify alternative approaches, it is recommended that  $F_{30\%}$  be used for stocks believed to have relatively high resilience,  $F_{40\%}$  for stocks believed to have low to moderate resilience, and  $F_{35\%}$  for stocks with average resilience. For stocks with very low productivity (such as rockfish and most elasmobranchs), fishing mortality rates in the range  $F_{50\%}$  to  $F_{60\%}$  are recommended.

(b) The GMFMC Report of the Ad Hoc Finfish Panel suggested using  $M/K$  (natural mortality rate/von Bertalanffy growth coefficient) ratios to gauge the potential for impacting species with less compensatory reserve and a lower potential for producing population biomass. “Species with low values of  $M/K$  (high growth with respect to natural mortality) are expected, and have been shown, to be able to sustain higher yields as a fraction of spawning stock biomass than those with high  $M/K$  (high natural mortality with respect to growth). This is largely due to the presence of multiple age classes from which spawning potential can be realized for those long-lived species with low natural mortality rates.” The Panel suggested that for species with  $M/K < 1.0$ , the SPR at  $F_{30\%}$  probably is a good proxy for SPR at  $F_{MSY}$ ; for species with  $M/K > 1$ , fishing mortality rates corresponding to  $F_{30\%}$  may exceed  $F_{MSY}$ , and thus the SPR proxies should be increased to values corresponding to SPR at  $F_{35\%}$ ; and for species with



M/K > 1.5, SPRs corresponding to F40%SPR (or higher) may be the best proxies of SPR at FMSY.

I am recommending that we follow this approach for the data-moderate cases. This approach also addresses public comments on the need to set levels based on the biology of the species rather than one level for all species. The M/K ratio values presented in the GMFMC report were used for those species; for others, values of M and K were taken from the most recent stock assessment and the ratio calculated.

For data-poor cases, parameters were available for some of the species such that the M/K ratio could be calculated. For others, no estimates of natural mortality are available. The Technical Guidance Document contains the following in Section 2.2.2 Data-Poor Situations:

“If there are insufficient or inadequate data to conduct YPR and SPR analyses, or if estimates of F and B cannot be obtained for comparison with YPR and SPR reference points, there are few options for defining meaningful targets and limits. Priority should be given to bringing the knowledge base at least up to “data-moderate” standards. The natural mortality rate M has often been considered to be a conservative estimate of FMSY; however, it is becoming more and more frequently advocated as a target or limit for fisheries with a modest amount of information. In fact, in several fisheries,  $F=0.8*M$  and  $F=0.75*M$  have been suggested as default limits for data-poor cases (Thompson 1993, NMFS 1996).”

I am recommending to the Council that we indicate there is no known proxy for FMSY for those species indicated with NA. The Council will propose steps to bring these species up to the “data-moderate” level, and as soon as data become available, a FMSY proxy will be specified.

**NMFS is requested to review these values/categories/conclusions and provide any suggested revisions prior to, or during, our September 1-2, 1998 meeting in St. Petersburg, Florida.**

**4. Specify the Maximum Fishing Mortality Threshold (MFMT).** The MFMT is simply the value(s) of fishing mortality in the MSY control rule.

If the SAFMC chooses a constant-F MSY control rule, the MFMT will be a single value, that is, FMSY. For data-poor cases, I am recommending the Council use the natural mortality rate as a proxy for MFMT. This conforms to the recommendations contained in the Technical Guidance Document.

I am recommending to the Council that we indicate there is no estimate of MFMT for those species indicated with NA. The Council will propose steps to bring these species up to the “data-moderate” level, and as soon as data become available, a MFMT will be specified.

TABLE 1. PARAMETER ESTIMATES FOR SPECIES UNDER MANAGEMENT BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL.

SNAPPER GROUPEL FWP	DATA RICHNESS	SHAPE OF MSY RULE	NATURAL (M) MORTALITY	F:MSY F:POKY	MFIT	SPR AT F:MSY (kg/recruit)	MEAN RECRUITMENT	B:MSY F:POKY	MSST	STATUS DETERMINATION	MIN. TIME TO REBUILD	MAX. TIME TO REBUILD	TARGET REBUILDING TRAJECTORY
Lane snapper	Moderate; Use Default	Use Default	0.3	F40%									
Black sea bass	Moderate; Use Default	Use Default	0.3	F35%									
Yellowtail snapper	Moderate; Use Default	Use Default	0.214	F30%									
Gray snapper	Moderate; Use Default	Use Default	0.3	F40%									
Mutton snapper	Moderate; Use Default	Use Default	0.214	F35%									
Vermilion snapper	Moderate; Use Default	Use Default	0.325	F35%									
Red porgy	Moderate; Use Default	Use Default	0.28	F40%									
Gray triggerfish	Moderate; Use Default	Use Default	0.2	F30%									
Hogfish	Poor; Use Default	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Schoolmaster snapper	Poor; Use Default	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Queen snapper	Poor; Use Default	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blackfin snapper	Poor; Use Default	Use Default	0.23	F40%	0.23	NA	NA	NA	NA	NA	NA	NA	NA
Cubera snapper	Poor; Use Default	Use Default	0.15	F30%	0.15	NA	NA	NA	NA	NA	NA	NA	NA
Dog snapper	Poor; Use Default	Use Default	0.333	F40%	0.333	NA	NA	NA	NA	NA	NA	NA	NA
Mahogany snapper	Poor; Use Default	Use Default	0.3	F40%	0.3	NA	NA	NA	NA	NA	NA	NA	NA
Silk snapper	Poor; Use Default	Use Default	0.23	F40%	0.23	NA	NA	NA	NA	NA	NA	NA	NA
Red snapper	Moderate; Use Default	Use Default	0.22	F30%	0.22	NA	NA	NA	NA	NA	NA	NA	NA
Gag	Moderate; Use Default	Use Default	0.2	F35%									
Scamp (Fork Length)	Moderate; Use Default	Use Default	0.175	F30%									
Red grouper	Moderate; Use Default	Use Default	0.18	F30%									
Black grouper	Moderate; Use Default	Use Default	0.15	F30%									
Yellowfin grouper	Poor; Use Default	Use Default	0.18	F35%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Yellowmouth grouper	Poor; Use Default	Use Default	0.18	F40%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Greater amberjack	Moderate; Use Default	Use Default	0.3	F30%									
Speckled hind	Moderate; Use Default	Use Default	0.2	F40%									
Warsaw grouper	Moderate; Use Default	Use Default	0.08	F35%									
Misty grouper	Poor; Use Default	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellowedge grouper	Poor; Use Default	Use Default	0.16	F35%	0.16	NA	NA	NA	NA	NA	NA	NA	NA
Snowy grouper	Moderate; Use Default	Use Default	0.13	F35%									
Golden tilefish	Moderate; Use Default	Use Default	0.16	F40%									
Nassau grouper	Poor; Use Default	Use Default	0.16	F35%	0.16	NA	NA	NA	NA	NA	NA	NA	NA
Jewfish	Poor; Use Default	Use Default	0.081	F35%	0.081	NA	NA	NA	NA	NA	NA	NA	NA
Tomiate	Poor; Use Default	Use Default	0.333	F40%	0.333	NA	NA	NA	NA	NA	NA	NA	NA
Blue runners	Poor; Use Default	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wreckfish	Moderate; Use Default	Use Default	0.125	F40%									
White Grunt	Moderate; Use Default	Use Default	0.375	F40%									

TABLE 1. PARAMETER ESTIMATES FOR SPECIES UNDER MANAGEMENT BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

SNAPPER GROUPER FMP (CONTINUED)	DATA POORNESS	SHAPE OF MSY RULE	NATURAL (M) MORTALITY	FMSY PROXY	MFMT	SPR AT F-MSY (kg/recruti)	MEAN RECRUITMENT	B-MSY PROXY	MSST	STATUS DETERMINATION	MIN. TIME TO REBUILD	MAX. TIME TO REBUILD	TARGET REBUILDING TRAJECTORY
Black snapper	Poor	Use Default	0.3	F40%	0.3	NA	NA	NA	NA	NA	NA	NA	NA
Bank sea bass	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rock sea bass	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rock hind	Poor	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Graysby	Poor	Use Default	0.2	F40%	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Coney	Poor	Use Default	0.18	F35%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Red hind	Poor	Use Default	0.18	F30%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Tiger grouper	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sheepshead	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grass porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jolthead porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Saucereye porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Whitebone porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Knobbed porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Longspine porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Scup	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Queen triggerfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ocean triggerfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellow jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Crevalle jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bar jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Almaco jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lesser amberjack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Banded rudderfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spadefish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black margate	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Porkfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Margate	Poor	Use Default	0.374	F40%	0.374	NA	NA	NA	NA	NA	NA	NA	NA
Smeltmouth grunt	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
French grunt	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spanish grunt	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cottonwick	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sailors choice	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blue striped grunt	Poor	Use Default	0.428	F40%	0.428	NA	NA	NA	NA	NA	NA	NA	NA
Blueline fliefish	Poor	Use Default	0.5	F35%	0.5	NA	NA	NA	NA	NA	NA	NA	NA
Sand fliefish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Puddingwife	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 1. PARAMETER ESTIMATES FOR SPECIES UNDER MANAGEMENT BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

	DATA RICHNESS	SHAPE OF MSY RULE	NATURAL (M) MORTALITY	FMSY PROXY	MFMT	SPRAT FMSY (kg/recrui)	MEAN RECRUITMENT	BMSY PROXY	MSST	STATUS DETERMINATION	MIN. TIME TO REBUILD	MAX. TIME TO REBUILD	TARGET REBUILDING TRAJECTORY
<b>SHRIMP FMP</b>													
White Shrimp	Poor	Use Default	0.21-0.56/wk			NA	NA	NA	NA				
Brown Shrimp	Poor	Use Default	0.22-0.33/wk			NA	NA	NA	NA				
Pink Shrimp	Poor	Use Default	0.28/wk			NA	NA	NA	NA				
Rock Shrimp	Poor	Use Default	NA			NA	NA	NA	NA				
<b>RED DRUM FMP</b>													
Red Drum	Moderate	Use Default	0.489	F30%			NA	NA	NA				
<b>MACKEREL FMP</b>													
Atlantic Migratory Group King Mackerel	Moderate	Use Default	0.15	F35%			NA	NA	NA				NA
Atlantic Migratory Group Spanish Mackerel	Moderate	Use Default	0.3	F35%			NA	NA	NA				NA
Cero Mackerel	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
Cobia	Poor	Use Default	0.35	F30%			NA	NA	NA				NA
Dolphin-fish	Poor	Use Default	0.66-3.3	F40%			NA	NA	NA				NA
Little Tunny	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
<b>GOLDEN CRAB FMP</b>													
Golden Crab	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
<b>SPINY LOBSTER FMP</b>													
Spiny Lobster ( <i>Paralurus argus</i> )	Moderate	Use Default	0.3	F30%			NA	NA	NA				NA
Slipper Lobster ( <i>Scyllarides nodifer</i> )	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
<b>CORAL FMP</b>													
Stony Corals and Sea Fans	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
Octocorals (all species except sea fans)	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
Live Rock	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA
<b>CALICO SCALLOP FMP</b>													
Calico Scallops	Poor	Use Default	12-13%/month				NA	NA	NA				NA
<b>SARGASSUM FMP</b>													
Pelagic Sargassum	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA				NA

## Appendix C. NMFS Review of SAFMC Plan for Implementing the SFA for MSY, OY,



UNITED STATES DEPARTMENT OF COMMERCE  
 National Oceanic and Atmospheric Administration  
 NATIONAL MARINE FISHERIES SERVICE  
 Silver Spring, Maryland 20910  
 Southeast Fisheries Science Center  
 75 Virginia Beach Dr.  
 Miami, FL 33149

August 28, 1998

MEMORANDUM FOR: F/SE - Andrew J. Kemmerer

FROM: F/SEC - Bradford E. Brown

SUBJECT: Review of the SA Council's Plan for Implementing the SFA for  
 MSY, OY and Overfishing based on recent Technical Guidance  
 Supplied by NMFS

After review of the South Atlantic Council's plan for implementing the SFA for MSY, OY and Overfishing, dated August 6, 1998, my staff have reviewed the materials and provide the following brief comments:

1. Species specific parameter recommendations, including alternative values for M, are provided in the annotated spreadsheet (see attached Table 1).
2. SEFSC believes, contrary to the Data Richness column in Table 1 provided by the Council, that most species classified as "Data Moderate" should instead be classified as "Data Poor". In fact, SEFSC believes that only black sea bass is "Data Moderate". One could subdivide the "Moderate" and "Poor" groups further ("Marginally Moderate"?), but, regardless, species-specific information deficiencies are substantial:
  - Very short period of species specific landings
  - Spotty or variable sampling of catches for size, sex, etc.
  - Aging variable or spotty. Need Annual Age Length Key by gear, area and/or temporal period. Various "pooled" age length keys now are used for many species.
  - Incomplete biostatistical data - growth, sex ratio, maturity, sex reversal, etc.
  - Maturity schedules poorly known for many species,

and, probably do not warrant a "Data Moderate" designation, except in the case of black sea bass. For red porgy, vermilion snapper, red snapper, and scamp our knowledge is somewhat better than poorly known, but the data have deficiencies as applied in our analyses. Notably, although some VPAs have been run, the number of years for which data are available are too few. (see 4 below). The balance of snapper-grouper species listed in Table 1 should be classified as "Data Poor" because they have been analyzed with simple catch curves as part of the screening process provided in summary documents designed to guide research and management priorities.



08/28/98 FRI 13:57 [TX/RX NO 5578] 001

3. Management policy will have to be set in determining the degree of risk to be cited in MFMT. If one can assume  $F=M$  or  $F=0.8M$  for the species for which SEFSC has very little information, then values can be entered in TABLE 1. SAFMC assumed  $F=M$  in arriving at the handwritten values in the MFMT column.

4. Based on the data deficiencies cited above, MSY proxies should be used for all species. Surplus production models (using PRODFIT, ASPIC, GENMOD, etc.) or Spawner Recruit Models (Ricker, Beverton-Holt, Shepherd, etc.) Generally require a longer time series of data than SEFSC has available. As a general "rule of thumb", these kinds of analyses require a time series 3X the life expectancy to obtain a statistically valid estimate.

5. The general knowledge of the life history parameters and harvest of stony corals, sea fans and octocorals in general is indeed "Poor." It would be possible to make qualitative statements such as "octocorals have higher recruitment rates (faster growth rates) than stony corals" or "brooding stony corals have higher recruitment rates than broadcast-spawning stony corals", but it does not seem likely that this would provide significant benefit in the present context.

7. In other regions of the country, there is strong sentiment that the control rules should be SSB-based rather than SPR-based. The SPR calculations may be converted to SSB given that recruitment during an appropriate period is known. The SAFMC Table 1 indicates that recruitment series are not available. However, a surrogate for this might be yield divided by yield-per-recruit (for an appropriate time period). Thus, SSB at MSY is approximated by  $(SSB/R \text{ at } F_{msy}) \times (\text{yield} / (Y/R \text{ at } F_{msy}))$ . There are several assumptions in this approach, but it is a starting point.

8. The red drum estimate of  $M$  of 0.489 probably includes offshore migration. This probably should be made comparable to Gulf red drum  $M$ .

#### Attachments

CC: Joe Powers

Gerry Scott/John Poffenberger

Alex Chester/Kim Newlin

Steve Swartz/Jim Bohnsack/Doug Harper/

Don Hoss/John Merriner/Doug Vaughn/Chuck Manooch

Tom McIlwain

Roger Zimmerman

Jim Weaver/Joe Kimmel/Pete Eldridge

SAFMC

USE  
M=F  
ON F=8M for PRECAUTIONARY

TABLE 1. PARAMETER ESTIMATES FOR SPECIES UNDER MANAGEMENT BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

SNAPPER GROUPER PMP	DATA RICHNESS	SHAPE OF MSY RULE	NATURAL (M) MORTALITY	FMSY FRODY	MEWT	SPRAT F.MSY (kg/rectuit)	MEAN RECRUITMENT	BMSY FRODY	MSST	STATUS DETERMINATION	MIN. TIME TO REBUILD	MAX. TIME TO REBUILD	TARGET REBUILDING FACTORY
Lane snapper	Moderate	Use Default	0.3	F40%	0.5	NA	NA	NA	NA	NA	NA	NA	NA
Black sea bass	Moderate	Use Default	0.3	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Yellowtail snapper	Moderate	Use Default	0.3	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Gray snapper	Moderate	Use Default	0.3	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Atlantic snapper	Moderate	Use Default	0.214	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Vermilion snapper	Moderate	Use Default	0.325	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Red porgy	Moderate	Use Default	0.25	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Gray triggerfish	Poor	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Hogfish	Poor	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Schoolmaster snapper	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Queen snapper	Poor	Use Default	0.23	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Blackfin snapper	Poor	Use Default	0.15	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Cubera snapper	Poor	Use Default	0.333	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Dog snapper	Poor	Use Default	0.3	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Whogany snapper	Poor	Use Default	0.23	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Silk snapper	Moderate	Use Default	0.22	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Red snapper	Moderate	Use Default	0.2	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Gag	Moderate	Use Default	0.18	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Scamp (Fork Length)	Moderate	Use Default	0.2	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Red grouper	Moderate	Use Default	0.18	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Black grouper	Moderate	Use Default	0.15	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Yellowfin grouper	Poor	Use Default	0.18	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Yellowmouth grouper	Poor	Use Default	0.18	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Greater amberjack	Moderate	Use Default	0.25	F30%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Spotted hind	Moderate	Use Default	0.15	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Warsaw grouper	Moderate	Use Default	0.08	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Utility grouper	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellowedge grouper	Poor	Use Default	0.18	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Bonny grouper	Moderate	Use Default	0.18	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Golden flounder	Moderate	Use Default	0.18	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Nassau grouper	Poor	Use Default	0.18	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Jewfish	Poor	Use Default	0.08	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Tomtate	Poor	Use Default	0.333	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Blue winners	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wreckfish	Moderate	Use Default	0.125	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
White Grunt	Moderate	Use Default	0.25-0.3	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA

\*LEGEND: X = POOR  
changes based on PDT COMMENTS +/-OR  
TROPIC COMPARATIVE VALUES

TABLE 1. PARAMETER ESTIMATES FOR SPECIES UNDER MANAGEMENT BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

SNAPPER GROUP/SPR FMP (CONTINUED)	DATA PRO-NESS	SHAPE OF MSY RULE	NATURAL (M) MORTALITY	FMSY PROXY	MEAT (kg/recruit)	SPRAT FMSY (kg/recruit)	MEAN RECRUITMENT	MSY PROXY	MSST	STATUS DETERMINATION	MIN TIME TO REBUILD	MAX TIME TO REBUILD	TARGET REBUILDING TRAJECTORY
Bank snapper	Poor	Use Default	0.3	F40%	0.7	NA	NA	NA	NA	NA	NA	NA	NA
Bank sea bass	Poor	Use Default	0.25 NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rock sea bass	Poor	Use Default	0.25 NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rock hind	Poor	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Grayby	Poor	Use Default	0.25	F40%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Coney	Poor	Use Default	0.25	F35%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Redhead	Poor	Use Default	0.25-0.48	F30%	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Tiger grouper	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sheepshead	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Grass porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jailhead porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Saucepote porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Whitbone porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Knobbed porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Longspine porgy	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Scup	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Queen triggerfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ocean triggerfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yellow jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Creville jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bar jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Almaco jack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lesser amberjack	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Blended snapper	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spadefish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Black margate	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Weakfish	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mergate	Poor	Use Default	0.25 NA	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Simulmouth grunt	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
French grunt	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Spanish grunt	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coltonwick	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sea bass choice	Poor	Use Default	0.25	F40%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Blue striped grunt	Poor	Use Default	0.25	F35%	0.25	NA	NA	NA	NA	NA	NA	NA	NA
Bluefin flounder	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sand flounder	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Puddingwife	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA



TABLE 1. PARAMETER ESTIMATES FOR SPECIES UNDER MANAGEMENT BY THE SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

Species	DATA FEEDBACK	SHAPE OF MORTALITY	NATURAL (M) MORTALITY	FARMY PROXY	MFMT	SPRAT FISHY (kg/recruit)	MEAN RECRUITMENT	BMSY PROXY	MSST	STATUS DETERMINATION	MIN TIME TO REBUILD	MAX TIME TO REBUILD	TARGET REBUILDING TRAJECTORY
<b>SHRIMP FMP</b> White Shrimp Brown Shrimp Pink Shrimp Rock Shrimp	Poor Poor Poor Poor	Use Default Use Default Use Default Use Default	0.21-0.58/yr 0.22-0.33/yr 0.28/yr NA			NA NA NA NA	NA NA NA NA	NA NA NA NA	NA NA NA NA				
<b>RED DRUM FMP</b> Red Drum	Moderate	Use Default	0.66	F30%									
<b>MACKEREL FMP</b> Atlantic Migratory Group King Mackerel Atlantic Migratory Group Spanish Mackerel Cero Mackerel	Moderate Moderate Poor	Use Default Use Default Use Default	0.15 0.3 NA	F35% F35% NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>DOLPHIN-FISH</b> Dolphin-fish Little Tunny	Poor Poor Poor	Use Default Use Default Use Default	0.33 0.68-3.3 NA	F30% F40% NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<b>GOLDEN CRAB FMP</b> Golden Crab	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA		NA		NA
<b>SPINY LOBSTER FMP</b> Spiny Lobster ( <i>Paralithes argus</i> ) Slipper Lobster ( <i>Scyllarides nodosus</i> )	Moderate Poor	Use Default Use Default	0.3 NA	F30% NA	NA	NA	NA	NA	NA		NA		NA
<b>CORAL FMP</b> Stony Corals and Sea Fans Diplonaria (all species except sea fans) Live Rock	Poor Poor Poor	Use Default Use Default Use Default	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA	NA NA NA		NA NA NA		NA NA NA
<b>CALICO SCALLOP FMP</b> Calico Scallops	Poor	Use Default	18-19%/month				NA	NA	NA	NA	NA	NA	NA
<b>SARGASSUM FMP</b> Purple Sargassum	Poor	Use Default	NA	NA	NA	NA	NA	NA	NA		NA		NA

SOURCE:  
VAUGHN, 1996 S.A.S.  
TECH MEMO SEFSC 380

Red DRUM 2 values Age 0-5 M=.23  
6+ M=.11

Appendix D. Checklist for Amending FMPs to Comply with SFA



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE  
1335 East-West Highway  
Silver Spring, MD 20910  
THE DIRECTOR

AUG 27 1998

MEMORANDUM FOR: Fishery Management Councils

FROM:

*for* Rolland A. Schmitt *R. Schmitt*

SUBJECT:

Questions and answers relating to "Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act"

I am pleased to provide a copy of questions and answers (Q&As) that can be used as guidance to understanding and implementing the Technical Memorandum (TM), "Technical Guidance On the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act sent to you earlier this month. These Q&AS were supplied by a wide assortment of internal and external peers to the team of scientists from the National Marine Fisheries Service (NMFS).

Please direct any questions or comments concerning these Q&As to Dr. John T. Everett, Chief of the Research Division, Office of Science and Technology, National Marine Fisheries Service, 1315 East-West Highway, Silver Spring, Maryland 20910.

Attachment (1)

RECEIVED

SEP 02 1998

SOUTH ATLANTIC FISHERY  
MANAGEMENT COUNCIL

THE ASSISTANT ADMINISTRATOR  
FOR FISHERIES



# Checklist for FMP Amendments

Associated with Technical Guidance on  
the use of Precautionary Approaches to  
Implementing National Standard 1 of the  
Magnuson-Stevens Fishery Conservation  
and Management Act

Developed by the Office of Science and Technology.  
National Marine Fisheries Service

August, 1998

# CHECKLIST FOR FMP AMENDMENTS

This checklist addresses questions that should be considered in making amendments to FMPs in order to comply with National Standard 1 of the SFA, following NMFS' National Standard Guidelines. Most items in the checklist make reference to specific sections in the document "Technical Guidance on the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act" (NOAA Technical Memorandum F/SPO, 1998), which should be consulted for further elaboration.

At least 2 topics should be discussed in developing the required FMP amendments:

- (1) Status Determination Criteria (SDC), and
- (2) Optimum Yield (OY).

In the case of overfished stocks, Councils will also need to address a third topic:

- (3) Rebuilding plans.

Annex 1 provides a hypothetical example that addresses SDC and OY.

## (1) Status Determination Criteria

### 1. What is the level of available knowledge for the stock? (Section 2.2)

The level of "data-richness" or "information-richness" for a stock is an important consideration. The purpose of developing Status Determination Criteria is to monitor the status of the stock by comparing the results of stock assessments against the definitions of overfishing and overfished condition. Therefore, it would be impractical to develop the SDC as if the stock's dynamics were well understood, when, in fact, the information provided by the stock assessment could be viewed as "data-poor" or "data-moderate". The three levels of data-richness identified in Section 2.2 are meant as a guide to classify stocks into rough categories. The important issue is not so much to decide whether a stock is data-poor or data-rich, but rather to ensure that its status with respect to the SDC can be assessed. Of course, the adequacy of the SDC and the ability to monitor the stock will be improved by increasing the level of available knowledge to a higher level of data-richness.

## 2. What is the shape of the MSY control rule? (Section 2.1.1)

The MSY control rule is used to define limits to exploitation. It can be thought of as a strategy in which the fishing mortality is controlled so as to achieve maximum longterm yield. The MSY control rule constitutes the Maximum Fishing Mortality Threshold, MFMT, and is used to determine the Minimum Stock Size Threshold, MSST (Section 2.1.2), and its shape can be an important consideration (e.g., Sections 2.1.2 and 2.1.3 explain how the value of the MSST may depend on the shape of the MSY control rule).

## 3. Parameterize the MSY-control rule

Once the shape of the MSY control rule is chosen, the values of the parameters that define the control rule need to be specified. As a simple example, consider an MSY control rule in which  $F$  is to be set constant, independently of the stock size. The only parameter that needs to be defined in this case is  $F_{MSY}$ , the single value of  $F$  that maximizes longterm yield. In other cases, when the MSY control rule is specified as an  $F$  that varies with stock size, the parameters of that relationship which maximize longterm yield need to be determined (Section 2.1.2). Note that, with the exception of constant  $F$  strategies, it is very unlikely that such parameterizations can be found in the literature, and Councils should work together with assessment scientists to carry out the necessary computations. Inasmuch as possible, such computations should take into account the relevant characteristics of the stock and fishery: selectivity, availability, stock-recruitment relationship, reproduction, growth, natural mortality, and natural variability. Optionally, Councils may adopt the default MSY control rule recommended in Section 2.1.4.

## 4. Specify MFMT

The maximum fishing mortality threshold, MFMT, is simply the value(s) of fishing mortality in the MSY control rule. The MFMT will be a single value ( $F_{MSY}$ ) only in the case of a constant- $F$  MSY control rule. Otherwise, the MFMT should be expressed as a function of stock size.

## 5. Estimate $B_{MSY}$

According to the NSGs, the value of  $B_{MSY}$  is to be computed with a constant- $F$  strategy. That is, even if the shape of the MSY control rule chosen by the Council is not a constant- $F$  one, computations should be made with a constant- $F$  control rule for the purpose of defining  $B_{MSY}$ . In some instances, it is possible that values of  $B_{MSY}$  for the stock in question are available from the literature, or that reasonable proxies may be defined (Section 2.2.1). Inasmuch as possible, computations of  $B_{MSY}$  should take into account the relevant characteristics of the stock and fishery: selectivity, availability,

stock-recruitment relationship, reproduction, growth, natural mortality, and natural variability.

## 6. Specify MSST

The minimum stock size threshold, MSST, will be the greater of (a) one-half  $B_{MSY}$ , or (b) the minimum stock size at which rebuilding to the  $B_{MSY}$  level would be expected to occur within 10 years if the stock were consistently exploited according to the MFMT. Again, the necessary computations should be made according to the MSY control rule chosen by the Council and taking into account the relevant characteristics of the stock and fishery. Optionally, Councils may use the recommended default MSY control rule and MSST of Section 2.1.4.

## (2) Optimum Yield

### 1. What is the shape of the target control rule that defines OY?

The MSY control rule in (1), above, is used to define limits to exploitation (the Status Determination Criteria). The OY is a target for the management of the fishery, constrained to keep the fishing mortality at or below MFMT. In many cases, the shape of the target control rule that defines OY will be the same as the shape of the MSY control rule. However, the NSGs do not require that this be the case necessarily, and Councils may wish to select another shape based on additional considerations. For instance, a Council may choose a constant- $F$  MSY control rule to define the MSST and MFMT, but may wish to harvest the stock instead following a constant catch strategy. Thus, OY should not be equated with MSY.

### 2. Parameterize the target control rule

The target control rule that defines OY should be parameterized taking into account the objectives of management (e.g., longterm magnitude of yield, interannual yield variability, socioeconomic considerations). The approaches outlined in Sections 3.1 and 3.2 can be used to carry out the necessary computations. It is not a good idea to avoid making computations by setting the target control equal to the MFMT because, due to variability alone, overfishing ( $F > MFMT$ ) could take place 50% of the time, or more. The recommended default to be used in the absence of detailed analyses sets the target  $F$  to be 25% below the recommended default MFMT (Section 3.3).

### 3. Is the target control rule precautionary?

The NSGs recommend that the target control rule defining OY be precautionary. Once

the target is defined, it could be deemed to be precautionary if it adheres to the following characteristics:

- (a) Is  $F(\text{target}) < MFMT$ ?
- (b) If stock size were reduced below  $B_{MSY}$ , would  $F(\text{target})$  also be reduced?
- (c) Is the target risk-averse in the sense that increased uncertainty leads to more conservatism?

Note, however, that a precautionary target does not necessarily have to meet all three conditions. For example, if  $F(\text{target})$  is substantially lower than  $F_{MSY}$ , attribute (b) may not be an essential condition to protect the stock from overfishing.

### (3) Rebuilding Plans

A carefully chosen target control rule should incorporate rebuilding elements that prevent the stock size from falling below the MSST. For example, implementing a target that conforms to the three precautionary attributes in item 3, above, should prevent a healthy stock from becoming overfished. Nevertheless, it is certain that many stocks are already overfished, i.e. below the MSST. A special rebuilding plan may be required for these stocks in order to bring them up to or above the  $B_{MSY}$  level.

Rebuilding plans must be designed to achieve the desired result within a specified time period. For this reason, and because different stocks have different population dynamics characteristics, defining rebuilding plans will almost certainly necessitate computations that are not readily available in the literature. Councils should work together with assessment scientists to carry out the necessary computations. Inasmuch as possible, such computations should take into account the relevant characteristics of the stock and fishery: current stock size and its uncertainty, selectivity, availability, stock-recruitment relationship, growth, natural mortality, and natural variability.

The following items should be addressed in designing a rebuilding plan (Section 3.4):

#### 1. What is the minimum possible time to rebuilding, $T_{min}$ ?

According to the NSGs,  $T_{min}$  is computed by setting  $F$  equal to zero and projecting the stock forward in time. Accounting for uncertainty in current stock size as well as uncertainty in future productivity (e.g., in the stock-recruitment relationship),  $T_{min}$  would be the time elapsed until the  $B_{MSY}$  level is achieved with 50% probability.

**2. What is the maximum allowable time to rebuilding,  $T_{max}$ ?**

If  $T_{min}$  is less than 10 years, then  $T_{max}$  is 10 years. Otherwise, the maximum allowable time is  $T_{min}$  plus 1 generation time (see Section 3.4 for the definition of generation time).

**3. What is the target rebuilding time period,  $T_{target}$ ?**

In general,  $T_{target}$  should be as short as possible and shorter than  $T_{max}$ . Under the very special circumstances detailed in §600.310(e)(4) of the NSGs, Councils could set the target rebuilding time period to be equal to  $T_{max}$ . The recommended default in Section 3.4 of the technical guidance document is to set  $T_{target}$  below the midpoint between  $T_{min}$  and  $T_{max}$ .

**4. What is the target rebuilding trajectory?**

The rebuilding plan would best be specified as a target control rule, designed to achieve rebuilding in  $T_{target}$  years with 50% probability, or higher. The rebuilding trajectory should clearly identify milestones to be met during rebuilding. The technical guidance document does not recommend a default rebuilding trajectory because the rebuilding plans must, by necessity, be stock-specific. They must take into account not only the stock's productivity, but also its current status relative to  $B_{MSY}$ .

Rebuilding overfished stocks will almost certainly require temporary sacrifices in yield relative to current catch levels. A target rebuilding trajectory that delays such sacrifices until the final years in the plan would not be precautionary and may have a low probability of success.

**5. What mechanisms will be used to monitor progress with respect to the target rebuilding trajectory?**

A rebuilding plan is an agreed set of decisions that should be implemented effectively. Stocks under rebuilding plans must be monitored closely so that adjustments can be made to the trajectory when the rebuilding milestones are not being met due to any reason. For example, if the plan's target  $F$ s are exceeded due to quota over-runs, subsequent target  $F$ s should be adjusted downwards in order to put the stock back on the plan's recovery trajectory. A sound rebuilding plan should identify how the monitoring will be carried out (e.g., through annual assessments and tracking of milestones) and ensure that the stock will be maintained at the target trajectory.



## Annex 1 — Hypothetical Example

### (1) Status Determination Criteria

#### 1. What is the level of available knowledge for the stock?

The hypothetical example stock is classified as being at the lower end of the “data-moderate” scale. Natural mortality is assumed to be 0.2 based on life history considerations, and growth and maturity are known fairly well. This has not been a high-priority stock historically, so stock assessments have been infrequent and rudimentary. The last assessment made three years ago used a “separable VPA” which resulted in estimates of selectivity at age, fishing mortality and stock sizes for a 6-year series of catch data. The series is too short to infer anything about a stock-recruitment relationship. No indices of relative abundance are available, although one could be developed by standardizing CPUE data. No efforts have been made to evaluate the sensitivity of the results to different assumptions and models. Figure A1 depicts the growth, maturity and selectivity information, as well as the relationship between spawning biomass per recruit and fully-selected fishing mortality.

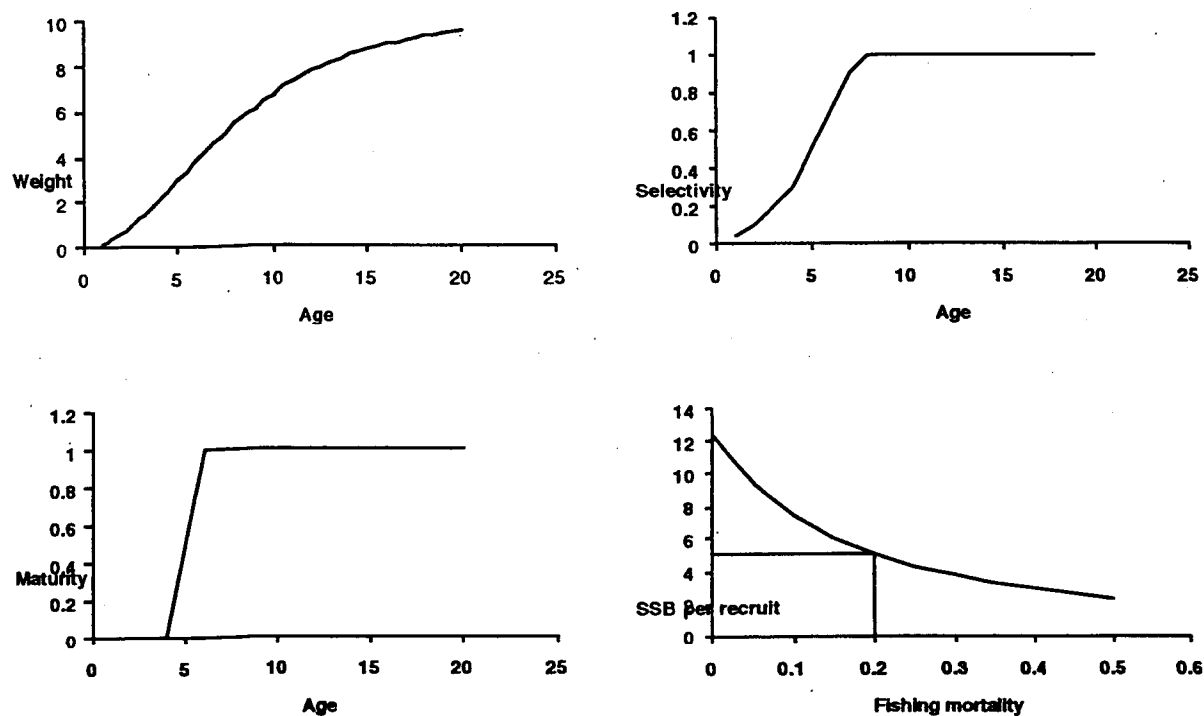


Figure A1. Growth, maturity and selectivity information for the hypothetical stock. The panel in the lower right shows the relationship between SSB per recruit and fishing mortality.

## 2. What is the shape of the MSY control rule?

Given the timetable for the FMP amendment, the Council chooses to use the default recommended in Section 2.1.4:

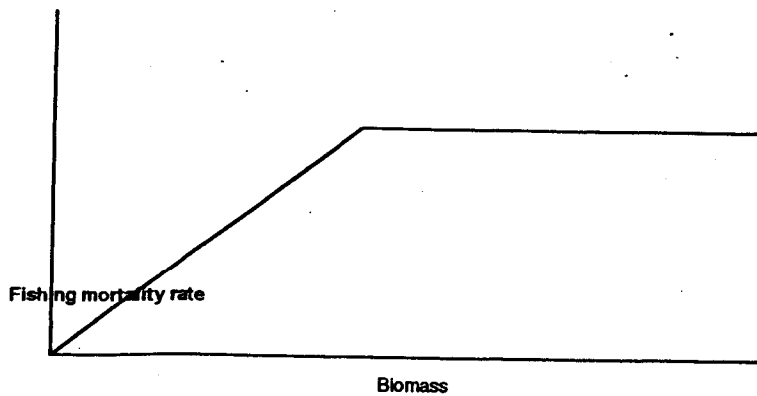


Figure A2. Shape of the MSY control rule selected.

## 3. Parameterize the MSY-control rule

The Council chooses to parameterize the MSY control rule as recommended in Section 2.1.4. Use of proxies is necessary because estimates of  $F_{MSY}$  and  $B_{MSY}$  are not available. The Council's Stock Assessment panel recommends using a proxy of the type  $F_{x\%SPR}$  for  $F_{MSY}$ . Based on discussions about the likely resilience of the species to fishing, thought to be "low to moderate", the Panel decides on using  $F_{40\%}$  according to the recommendations in Section 2.2.1. Given the available information (see Figure A1), 40%SPR is obtained with a fully-selected  $F$  of 0.2 per year. Thus far, the Y-axis in the MSY control rule is given by:

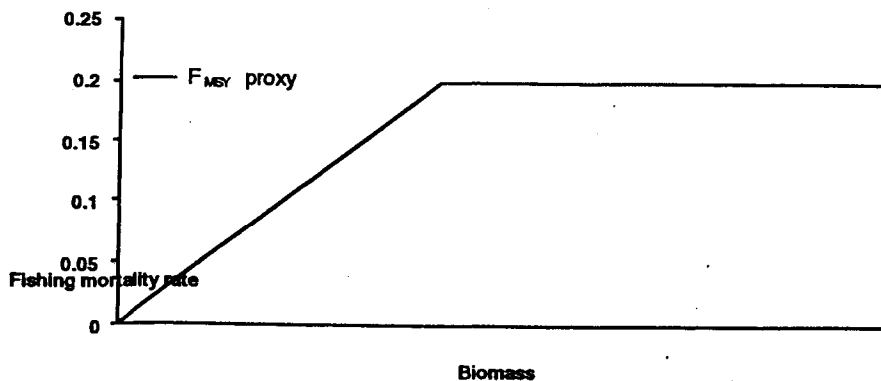


Figure A3. Parameterization of the Y-axis in the MSY control rule.

#### 4. Specify MFMT

The MFMT is given by the function in Figure A3. The X-axis in the figure needs to be parameterized before determining at what level of biomass the MFMT drops from  $F_{40\%}$  to the origin.

#### 5. Estimate $B_{MSY}$

The Stock Assessment Panel uses a default recommended in section 2.2.1: " $B_{MSY}$  can also be approximated by the mean recruitment ( $R_{mean}$ ) multiplied by either (a) the level of spawning per recruit at  $F_{MSY}$  ..." The SPR at  $F_{40\%}$  is 5.0852 Kg/recruit. The mean recruitment estimated from the assessment is 620,000 fish. Therefore, the current estimate of  $B_{MSY}$  is  $(5.0852)(620) = 3152.8$  tons of spawning biomass (SSB). Note, however, that a new assessment (based on a new model or a longer time series) may result in a different estimate of  $B_{MSY}$ ; FMPs must be sufficiently flexible to accommodate such changes.

#### 6. Specify MSST

The Stock Assessment Panel did not have time to carry out simulation analyses to determine the lowest biomass for which rebuilding to 3152.8 tons would take 10 years if fishing at the MFMT depicted in Figure A3. Therefore, the Panel decided to use the recommended default of Section 2.1.4:  $MSST = \max(0.5, 1-M) * B_{MSY} = (1-0.2)(3152.8) = 2522.24$  tons of SSB. The fully-parameterized MSY control rule is shown in Figure A4.

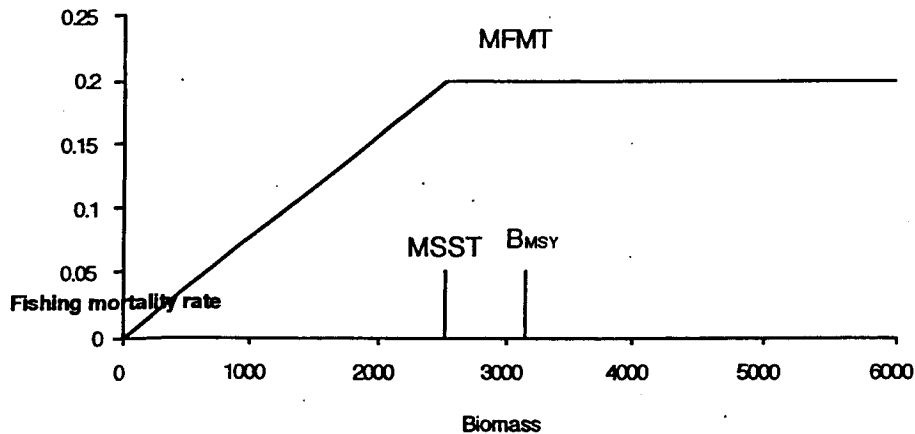


Figure A4. The MSY control rule and status determination criteria (MSST and MFMT).

## (2) Optimum Yield

### 1. What is the shape of the target control rule that defines OY?

The Council chooses a control rule with the same shape as the MSY control rule.

### 2. Parameterize the target control rule

The Council chooses the default recommended in Section 3.3 of setting the target 25% below the limit (Figure A5):

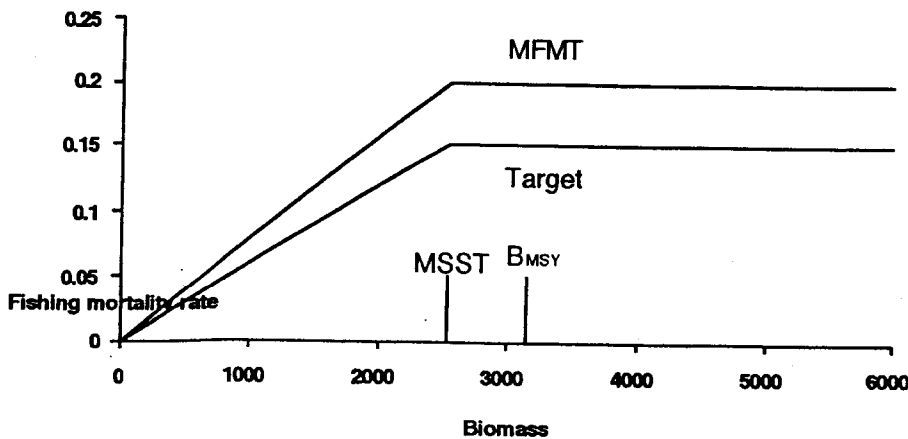


Figure A5. Target control rule and Status Determination Criteria.

### 3. Is the target control rule precautionary?

Question: Is  $F(\text{target}) < \text{MFMT}$ ? Answer: Yes, it is 25% lower.

Question: If stock size were reduced below  $B_{MSY}$ , would  $F(\text{target})$  also be reduced? Answer: Yes, but not until stock size falls below  $0.8B_{MSY}$ .

Question: Is the target risk-averse in the sense that increased uncertainty leads to more conservatism? Answer: Not really. The target is 25% below the limit, independent of the level of uncertainty.

Overall, the target control rule appears to be precautionary. However, its performance depends on the reliability of the various inputs used to develop MSY-related proxies and parameterize the control rules.

Appendix E. 1997/1998 SAFMC/NMFS Operations Plan



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office  
9450 Koger Boulevard  
St. Petersburg, FL 33702

NOV 4 1997

F/SERx1:RCR

Mr. Robert Mahood, Executive Director  
South Atlantic Fishery Management Council  
1 Southpark Circle  
Charleston, SC 29407

Dear Mr. Mahood:

This is to follow up on the Operations Plan for the South Atlantic with a hard copy and this letter. You have already received an advance electronic copy for use in making copies for the briefing book for your November Council meeting. We consider the document as final and will use it for both Region and Center planning for the balance of the year.

I also want to confirm that John Merriner and Richard Raulerson will be the contacts with Council staff for individual items listed on the Operations Plan.

Sincerely yours,

*Andrew J. Kennerer*  
RECEIVED  
NOV 13 1997

Andrew J. Kennerer  
Regional Administrator  
SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

Attachment: South Atlantic Council Operations Plan

- cc: F/SEC - Bradford Brown/Nancy Thompson
- F/SECx1 - Albert Jones
- F/SEC7 - John Merriner/Bud Cross
- F/SER2 - Rod Dalton/Joe Kimmel/Ed Burgess
- F/SERx1 - Richard Raulerson



NMFS ACTIVITIES/COMMENTS ARE SHOWN IN BOLD. REFERENCES TO SAFE REPORTS ARE RECAST AS ACTIVITIES UNDER THE OPERATIONS PLAN. HENCE, THE SAFE ITEMS NOW APPEAR AS INDIVIDUAL ACTIVITIES AND THE SET OF ACTIVITIES HAS BEEN RENUMBERED WHERE APPROPRIATE TO ACCOMMODATE THE EXPANDED NUMBER OF ACTIVITIES. THERE ARE NO COMMENTS MADE ON ITEMS LISTED UNDER RESEARCH NEEDS. IMPORTANT RESEARCH NEEDS WERE INCLUDED IN THE MARFIN FR ANNOUNCEMENT.

SAFMC/NMFS  
1997/98 OPERATIONS PLANS

Prepared by:  
Gregg Waugh, SAFMC Deputy Executive Director

The Magnuson-Stevens Act as modified in 1996, significantly expanded both the scope and importance of the SAFE report. This also applies to the deliverables defined in the operations plans which form the SAFE report. It is imperative someone in NMFS be charged with tracking the deliverables and ensuring all material is provided prior to the agreed upon deadlines. The SAFMC should be contacted prior to each briefing book deadline to ensure all materials have been provided.

Richard Raulerson has the continuing overall responsibility for SAFE reports and has sent a memorandum to the partners in the SAFE process. That memorandum outlines the SAFE process and relates the agreements as to the responsibilities of the Councils and NMFS.

John Merriner and Richard Raulerson are responsible for tracking the Center and Regional Office activities listed in the Operations Plan and ensuring that reports are available by the agreed upon time. In particular, they will serve as the NMFS contact points for staff-to-staff communications as necessary if products cannot be delivered on schedule for the purpose of inclusion in Council briefing books or for use by Council staff in developing FMP amendment language. Similarly, they will be the NMFS contacts for the purpose of clarifying contents of activities and for other routine discussions regarding NMFS activities listed in the

## **Operations Plan.**

### **I. ATLANTIC RED DRUM**

- 1. Updated detailed landings and harvest data.**

**This information will be provided by SERO/SEFSC in October 1998 to accompany the status report on MARFIN research.**

- 2. Stock status and determination with respect to overfishing.**

**Information on Atlantic red drum stock status will be included in NMFS Report to Congress in September 1998 . Oral reports on status of research conducted under MARFIN will be scheduled for the September 1998 SAFMC meeting.**

**An analytical assessment of Atlantic red drum is planned for November 1999, after the completion of the major MARFIN research efforts by NC, SC, and GA.**

- 3. Summary of available social and economic data including an economic evaluation of the commercial and recreational fisheries.**

**This information will be provided by SERO in October 1998 to accompany the status report on MARFIN research.**

- 4. Report on the status of the coastwide MARFIN red drum research project (include summary of other state red drum research if available).**

**See item 2 above.**

### **Research Needs:**

**A. Specific research items: (a) calculate adult spawning stock biomass; (b) estimate escapement rates on a state-by-state basis; (c) continued standardized sampling of subadults to develop long term indices of recruitment; (d) adult tagging - encourage expansion of South Carolina's directed adult tagging effort to other South Atlantic States; (e) stock structure - adult movement and genetic analyses; (f) determination if red drum can be used as a bio-indicator of the health of southeast estuaries and (g)**

identification of critical spawning areas.

B. General research items: (a) continue tag-recapture studies to provide parallel information on fishing mortality rates, estimates of natural mortality, and possible estimates of emigration rates at age; (b) improve catch statistics; (c) improve coast-wide coverage for age-length keys; (d) determine fecundity as a function of Atlantic red drum length and weight; (e) develop fishery independent index of spawning stock; (f) develop long-term indices of recruitment; and (g) continue standardized sampling of subadults.

## II. SHRIMP

1. Updated detailed landings and harvest data by area of harvest as well as where landed.

SERO will provide a summary of South Atlantic landings and prices in June 1998 or at other periods of time if necessary for management changes to the Shrimp FMP. Level of detail will be determined by current data collections under the State-Federal Cooperative Statistics Agreements.

2. Stock status and determination with respect to overfishing.

Information will be provided in NMFS' report to Congress in September 1998.

3. Price of landings by size class.

Price information by size class is not available.

4. Summary of available social and economic data.

If new information becomes available, SERO will provide a summary in June 1998 or at other periods of time if available and needed for management changes to the Shrimp FMP.

5. Summary of South Atlantic state and federal BRD regulations.



Completed.

6. Bycatch in the rock and royal red shrimp fisheries: (a) Quantify the bycatch - NMFS SEFSC; February 16, 1998 (Magnuson-Stevens Requirement).

The NMFS National Bycatch Initiative will include these fisheries. Preliminary data for rock shrimp (one trip), available from GSAFDF, will be summarized. No FY 1998 plans to put observers on vessels to assess bycatch in the rock and royal red shrimp fisheries.

7. Update king & Spanish mackerel bycatch estimates for the South Atlantic shrimp fishery for use in the 1998 mackerel stock assessment. - NMFS SEFSC; April 1998. (Magnuson-Stevens Requirement)

SEFSC will utilize updated shrimp catch and effort data to provide updated king and Spanish mackerel bycatch estimates for the 1998 mackerel stock assessments. (Beaufort and Galveston, March 1998)

8. Provide an integrated permit database to accommodate a stratified random selection process for administering surveys.

Completed. Contact Ed Burgess for access and details.

9. Evaluation of social and economic impacts of the areas closed to the rock shrimp fishery.

An evaluation of impacts has to be based on knowledge of decreases in rock shrimp catches in the closed area and knowledge of the ability of fishermen to switch to alternative areas and/or species. To the extent that some of the underlying data can be obtained, it may be possible to describe the economic effects to some degree. Answers to questions of this nature eventually depend on the development of logbooks or similar data-gathering methods that will allow tracking of the fishermen by area/season/species/gear. If the Council requires an update during FY98, even if only a qualitative report, a contact with Richard Raulerson is appropriate.

10. Develop and implement a monitoring program to determine the social and economic effects of the BRD requirement on fishermen and other sectors of the industry.

The primary data required to address this question for shrimp is monitoring of the effectiveness of BRDs in terms of the level of shrimp loss and the cost effects of BRD use, including increased costs associated with BRD purchase, installation and maintenance and perhaps offsetting gains via lower sorting costs and/or less broken shrimp. Effects on the bycatch species will depend on bycatch reduction rates and the management systems in effect for the bycatch species. In general, a large portion of the potential positive effects of bycatch reduction cannot be captured in the absence of ITQ or similar management systems.

11. Quantify the actual reduction in bycatch from requiring use of BRDs. - NMFS SEFSC/SERO; \_\_\_\_\_  
(Magnuson-Stevens Requirement)

This will be addressed to the extent possible in the National Bycatch Initiative.

BRD performance will be included in the NMFS report to Congress (SFA Task N-10.04) in October 1998.

"Bycatch/Incidental harvest research " SEFSC Pascagoula and Galveston have the lead role in this effort..

#### Research Needs:

A. Determine the possible impacts on indigenous shrimp species of inadvertent introductions of exotic shrimp species and diseases from mariculture operations, and develop methods and protocol to prevent such introductions.

B. Assess the potential utility of releasing maricultured shrimp into the environment to supplement natural reproduction, especially following cold kills.

C. Assess the potential of controlled closures and other measures to enhance the production and economics of the south Atlantic white shrimp fishery.

D. Determine the effects of beach renourishment projects on subsequent shrimp production.

E. Evaluate the impacts of habitat and water quality alteration on shrimp growth, survival, and productivity.

F. Investigate the costs, benefits, and utility of

limited entry programs in the shrimp fishery of the south Atlantic.

G. Determine the impact of shrimp trawl bycatch on the habitat and all non-target species of fish and invertebrates (i.e., expand the mandated study to include impacts on habitat and all incidental species, not just the impact on other "fishery resources").

H. Determine the relationship between absolute number of adults (or adult biomass) and subsequent recruitment to allow development of a threshold level of population size to serve as a trigger to request a closure of the EEZ.

I. Determine the biological, economic, and sociological status of the rock shrimp fishery. This should include procedures to sample the rock shrimp fishery.

J. Evaluate alternative mesh sizes in the rock shrimp fishery.

K. Cost/returns survey for the rock shrimp fishery.

L. Characterization of bycatch in the royal red shrimp fishery.

M. Standardization of effort units (vessel size, gear size, etc.).

N. Conduct a comparable sociocultural survey on implementation of BRDs in the South Atlantic Shrimp Fishery (similar to MARFIN Project #NA37FF0049). - NMFS SERO; September 30, 1997.

O. Cost/returns survey for South Atlantic Shrimp Fishery. - NMFS SERO; September 30, 1997.

The following research needs are summarized from recommendations presented in the draft bycatch characterization report for the south Atlantic region (SEAMAP 1996):

A. Shrimp effort data needs to be collected to provide estimates based on time fished (or number of tows), rather than at the trip level. Future sampling needs to be improved with respect to collection of both shrimp effort and bycatch characterization data.

B. Future characterization effort should be expanded to include important strata for which no observer data are available and strata which have low sample sizes.

C. Bycatch monitoring should be conducted regularly if data are to be used in stock assessments. Conduct

characterization 5 years after implementation of state and federal bycatch reduction regulations to determine the effectiveness of the gears used, and to establish new baseline bycatch estimates for stock assessments.

D. Long-term characterization data sets should be funded.

### III: CORAL/HABITAT

1. Octocoral and live rock report: (a) updated detailed octocoral landings and harvest data by area of harvest as well as where landed (b) stock status and determination with respect to overfishing, (c) report on live rock aquaculture industry for South Atlantic state and federal waters and a permit review summary (include tracking the number of live rock permits, culture areas, volume of material placed, harvest quantities and price, and types and cost of culture material.) and (d) summary of available social and economic data.

The second annual report on live rock is scheduled for November 1997. A separate report will be made on landings of octocorals using data from the octocoral monitoring program. Octocoral is not considered overfished.

2. Continue coordination between SAFMC staff, NMFS/SERO and NMFS/SEFSC in providing technical support for project review, habitat policy statement development, and input on development of a Habitat FMP.

This is a continuing activity.

3. Report on harvest and utilization of Sargassum. - NMFS SEFSC/Beaufort.

SEFSC-Beaufort is working with industry to monitor harvest amount and bycatch.

Report is scheduled for November 1998. Data summary was provided to the EFH Sargassum workshop in October 1997.

4. Work with NOAA Coastal Services Center to evaluate methods for determining the distribution of Sargassum - NMFS SEFSC; \_\_\_\_\_.

Research proposal has been prepared ; currently seeking funding. Discussed at EFH Sargassum workshop in October 1997.

5. Coordinate with NMFS/NOAA to develop research needs to be included in the FMP. - NMFS SEFSC/SERO; \_\_\_\_\_

SEFSC is available to coordinate with Council staff on developing research needs section of FMP. September 1998 is target date for FMP amendment.

6. NMFS/NOAA Representatives continuing participation in workshops and meetings.  
This activity is planned.

7. NMFS/NOAA Representatives to assist in writing Habitat FMP documents. - NMFS SEFSC Beaufort Lab; September '97 through June '98.

SAFMC staff discussions with Beaufort are ongoing to determine writing teams and assignments. Teams yet to be named.

8. NMFS SERO provide GIS System capability SAFMC.

NMFS SERO will ensure that SAFMC staff are provided with GIS capability.

#### Research Needs:

- A. Collect social awareness data and usage data on the HAPC in the South Atlantic.
- B. Collect data on attitudes towards marine fishery reserves and closed areas.
- C. Determine usage of Sargassum by adult, juvenile and larval stages of FMP species.

#### IV. SNAPPER GROUPE

1. Stock assessment - NMFS SEFSC; November 3, 1997. Include some time for additional analyses that may be necessary after the assessment. These assessments would use

data through 1996, use new maturity schedule information, and incorporate implications of sex change. Estimates of MSY should be provided. Species:

- A. Vermilion Snapper
- B. Red Porgy
- C. Gag

In addition, annual stock assessments should be performed for all overfished species in the snapper grouper management unit. Timing would have to be developed: e.g., all presented in November or split between other times. - NMFS SEFSC; \_\_\_\_\_.

Analytical stock assessments (meaning VPA if data permit) will be provided as follows:

Vermilion snapper	November 1997	Beaufort
Scamp	December 1997	Beaufort
Red Porgy	November 1998	Beaufort
Gag	November 1998	Beaufort
Greater amberjack	November 1998	Miami, revisit with most recent data.

As done in 1997, a Trends Report for selected species will be prepared by SEFSC-Beaufort (January 1998).

2. Reserve some hours for work during development of Amendment 10 to the FMP (e.g., additional logbook analyses).

Yes. Efforts will be made to provide SAFMC staff access to the data bases and familiarity/training in their use.

3. Wreckfish

A. Track individual quota, track transactions of percentage share, and track transactions of individual quota (coupons). - NMFS SERO/SEFSC.

This is a routine activity. Encourage SAFMC staff access/use landings data for monitoring if desired.

B. Final report on 1997 wreckfish fishing year quota due by January 31, 1998.

C. Written report to Council on wreckfish permits and percentages share and quota transactions for 1996/97. - NMFS SERO/SEFSC; February 16, 1998.

D. Periodic written reports tracking individual wreckfish quotas and landings/exvessel price of roe. Reports to be received by the Council at least 2 weeks prior to each Council meeting (due dates prior to Council meetings are: November 3, 1997; February 16, 1998; June 1, 1998; September 7, 1998 and November 16, 1998). - NMFS SEFSC.

Data summary and other reports on wreckfish will be combined into one annual report for the Council (SERO and SEFSC-Beaufort). The report will be provided to the SAFMC's Wreckfish Assessment Panel meeting in late January-early February 1998 for discussion and inclusion in their report to the Council.

Note: 1998 report is a status of fishery type report, not an assessment report. See E below.

E. Complete VPA for wreckfish. - NMFS SEFSC; January 31, 1998.

SEFSC-Beaufort will provide a status of fishery summary type report (not a VPA report) in February 1998. 1999 is the next scheduled year for VPA. Wreckfish Panel will meet in late January/early February 1998 to review the fishery and develop a report for the SAFMC.

F. Demand analysis for wreckfish and factors influencing exvessel price. - NMFS SERO;

SERO will continue to follow the progress of research at UNC-Greensboro and a progress report will be included in the annual wreckfish report scheduled for January 1998.

G. Socio-economic survey of wreckfish fishermen (e.g., examine reasons for shares not being used or traded; attitudes towards ITQ programs; crew turnover as compared to catch production). - NMFS SERO;

In concert with previous item, SERO will summarize available information on the topic and include the summary in the annual wreckfish report.

4. Snowy grouper and golden tilefish (NMFS SEFSC/SERO):

A. Track total catches for quota management using logbooks and dealer reports.

B. Periodic written reports tracking. Reports to be received by the Council at least 2 weeks prior to each Council meeting (due dates prior to Council meetings are: November 3, 1997; February 16, 1998; June 1, 1998; September 7, 1998 and November 16, 1998).

Quota information will be available to the SAFMC in memo form or through staff query of the landings data files on SEFhost before each Council meeting. Coordination through J. Merriner to decide on the means and timing of quota monitoring reports.

New species from snapper grouper complex coming under a quota will be monitored by procedures developed at that time.

5. Continue routine monitoring activities (catches, size frequency, effort & biological information; CPUE & size frequency data from commercial, charter and headboats; implement minimum sizes and bag limits; issue wreckfish and snapper grouper permits; review SMZ requests; enforcement report, monitor FMP compliance; inform constituents & affected management entities of significant actions).

This element of the Operations plan represents a major commitment of the SEFSC's human and fiscal resources available to reef fish activities. These are the core fishery data collection and fishery management efforts. These items are on NMFS's high priority list and will be scheduled to the extent resources are available.

6. Provide one database with commercial, headboat, and MRFSS data. This data base would allow Council staff to look at catches and changes in average size/CPUE over time. The first step will address species included in the last assessment and cover from 1986 onwards. Data to be included at a minimum are catch in weight and numbers (or average weight if available), MRFSS data, commercial data, and headboat data. NMFS SEFSC; will be included in ORACLE data base; \_\_\_\_\_.



This is a goal under the ACCSP, presently targeted for implementation in 1998. Presently multiple data sets are accessible for analysis. Council staff access to and training on use of these databases is encouraged.

7. Assessment review group to meet first week in February to review wreckfish information prepared by NMFS Beaufort and develop a report for setting wreckfish TAC for the 1998 fishing year. - NMFS Beaufort/SERO and Council Assessment Group; week of February 2-6 or 9-13, 1998 in Charleston.

This item is covered under Wreckfish (item 3 above) and should be deleted here.

8. Economic assessment of commercial and recreational fishery, including updated detailed landings and harvest data by area of harvest as well as where landed and a summary of available social and economic data.

Economics information, including logbook information, has historically been provided on an as needed and time available basis. Staff to staff consultation may be in order for specialized requests.

9. Analysis of logbook reported catch by gear based on 1997 data - NMFS Beaufort; November 16, 1998. This report is to be based on the logbook data collected during the 1997 fishing year. Catch is to be separated by each gear type (including but not limited to hook & line, longline, diving, powerheads, and black sea bass pots). The written report should among other things list the number of participants by gear type by state, their catch by species by month by gear type by state of landings, and an indication of average size of fish in the catch by gear by state of landings. Compliance of fishermen with logbook reporting is to be included.

Access to computerized database and information on how to access (e.g., codes, etc.). - NMFS SEFSC; \_\_\_\_\_.

A report on the 1996 logbook data is to be presented to the Council in November 1997 (SEFSC-Beaufort). Please note that size information is not available from logbook records and there is insufficient time this year to analyze size data

from other sources for the 1997 report. Compliance information to be included.

The logbook report for the 1997 fishing season is scheduled for November 1998 (SEFSC-Sustainable Fisheries Division, Miami). Information on compliance with logbook reporting requirements will be included; inclusion of average size data in the 1998 report is being investigated.

Council staff are encouraged to obtain training on the SEFhost and use of databases available to them. Target date- November 1998.

10. Report on compliance with minimum size regulations - NMFS SERO/SEFSC; November 16, 1998. This written report should include a review of the 1997 TIP and MRFSS size frequency data as related to minimum size for all species with a minimum size limit; sample sizes should also be report.

This report will be provided by SEFSC-Beaufort, November 1998.

11. Snapper grouper cost and returns survey. NMFS SERO/SAFMC Staff/SCWMRD.

A. Access to computerized database and information on how to access (e.g., codes, etc.). - NMFS SERO; \_\_\_\_\_.

B. Report of final results. - NMFS SERO; November 3, 1997.

Access to data has been worked out with Council staff. The final report should be completed and available in November 1997.

12. Snapper grouper sociocultural survey. NMFS SERO/SAFMC Staff/SCWMRD.

A. Access to computerized database and information on how to access (e.g., codes, etc.). - NMFS SERO; \_\_\_\_\_.

The final report is completed. Data and programs will be available in December, 1998.

13. Conduct snapper grouper sociocultural survey in Monroe County. NMFS SERO/SAFMC Staff/Contractor;

---

SERO recommends that this item be listed in the Research Needs section and deleted from this section.

14. Provide an integrated permit database to accommodate a stratified random selection process for administering surveys. - NMFS SERO; \_\_\_\_\_.

Completed. Contact Ed Burgess for access and details. A report will be provided to the Council in June 1998 on the number of permits issued under the limited entry program.

15. Preparation of economic and social assessments for the south Atlantic snapper grouper fishery. (Note: This would parallel the mackerel information provided to the Gulf Council's Socio-Economic Panel, Volumes 1 & 2, April 13, 1995.) - NMFS SERO; \_\_\_\_\_.

Refer to item # 8.

16. Experimental Closed Area (Oculina HAPC):

A. Identify and map habitat distribution within the HAPC. Provide detailed Oculina habitat distribution data for incorporation into the overall SEAMAP Database. - NMFS SEFSC; October 6, 1997.

B. Identify spawning sites within the Experimental Closed Area.

C. Calculate the gag (and if possible other important species) sex ratio within the Experimental Closed Area during 1994 and document change over time.

D. Quantify species diversity and abundance within the Experimental Closed Area during 1994 and document change over time.

E. Determine current usage prior to implementation of closed area (aerial overflights, public input, survey of current permit holders, other methods?)

F. Revise and update research plan. NMFS SEFSC; November 3, 1997.

Reports on this element (Oculina HAPC) are consolidated into action F.

SEFSC-Panama City will prepare a DRAFT Revised Research Plan for the Oculina HAPC (November 1997). Council and S-G PDT inputs sought and final document expected in January 1998.

Reports:

A. Status report (including a list of ongoing projects) and summary of past work. NMFS SEFSC/Snapper Grouper PDT; November 3, 1997.

The PDT has met infrequently and membership may need review. We encourage a meeting of the group to consider various snapper grouper issues. SAFMC's Marine Reserves Committee is now formed.

Status of research was presented to SAFMC in August 1997. Above draft plan, available in November 1997, will refer to ongoing work.

B. Progress reports - June 1, 1996; June 1, 1997; June 1, 1998; June 1, 1999; and June 1, 2000.

C. Interim report - June 1, 2001.

D. Continue monitoring and annual progress reports - June 1, 2002 and June 1, 2003.

E. Final report - June 1, 2004 (end of 10 year authorization).

A progress report will be prepared by SEFSC-Panama City (June 1, 1998).

The above dates for reports were cited in the documents creating the experimental area and do not require repeating in the annual Operations Plan.

Research Needs:

Some of the following research needs are being addressed by ongoing research under MARFIN, S-K, Sea Grant and other programs. Council staff will be furnished with updated list of federal grants projects.

1. Survival rates by gear by depth for species under minimum size regulations.
2. Gag
  - A. Effect on fishing mortality from prohibiting fish traps and limiting bottom longlines to waters deeper than 50 fathoms.
  - B. Examine existing data bases and/or develop an index of juvenile recruitment.
  - C. Identify spawning areas.
  - D. Determine stock structure.
  - E. Define movement patterns through additional tagging.
  - F. Incorporate sex change into the stock assessment models.
3. Greater amberjack
  - A. Determine stock structure.
  - B. Define movement patterns through additional tagging.
  - C. Collect the necessary size data so that an adequate stock assessment may be completed.
4. Estimate the sale of recreationally (private/rental and for-hire sectors) caught fish by gear by state, particularly for fish harvested by diving/powerheads.
5. Effect on fishing mortality for species other than gag from allowing bottom longlines only in waters deeper than 50 fathoms.
6. Quantify the economic value of jewfish from nonconsumptive usage versus harvest by recreational and commercial fishermen.
7. Document the current reproductive biology of hogfish.
8. Incorporate implication of sex change for protogynous hermaphrodites into stock assessment models.
9. Determine the stock structure of wreckfish.
10. Effects of powerheads on fish behavior (e.g., spawning aggregations).

#### V. MACKEREL

Items for 1997/98 In Addition to those on the attached memo from the GMFMC. The SAFMC supports the requests in the attached memo for both the Gulf and South Atlantic fisheries:

1. Detailed review of the underlying information used in the Atlantic migratory group king mackerel assessment. The intent of the Mackerel Stock Assessment Panel is to convene a 7-10 day workshop sometime in late 1997 to further evaluate the data and methods used in the assessment. Workshop results would then be incorporated into the 1998 full stock assessment; and at that time new recommendations of ABC for the Atlantic migratory group would be provided. - NMFS SEFSC & MSAP; \_\_\_\_\_.

This workshop is not a planned activity due to limited time available and funding constraints. Topics of concern will be considered for incorporation into the MSAP meeting agenda.

2. NMFS to develop updated estimates of MSY for Atlantic and Gulf migratory groups of king and Spanish mackerel. - NMFS SERO/SEFSC; April 1998.

This would be addressed in the assessments for 1998.

3. Calculate ABC ranges for a fixed boundary for king mackerel at the separation of the Gulf and South Atlantic Councils and at the Dade/Monroe County border (same as Spanish Mackerel). - NMFS SEFSC; April 1998.

Gulf Council has requested four mackerels assessments (Gulf and Atlantic king and Spanish mackerels). A decision on this request is pending further discussion between NMFS and Councils.

4. Stock assessment updates for king mackerel, Spanish mackerel, dolphin and cobia. This should include evaluation of overfishing. - NMFS SEFSC; April 1998.

Mackerel assessment updates are covered in item 2 above. Cobia was done last year and additional work is not planned in 1998. Dolphin is addressed in a separate element below.

5. Economic assessment of commercial and recreational fisheries to include estimates of the number of Atlantic

migratory group king and Spanish mackerel fishermen and vessels over time. - NMFS SERO; Date: one week after stock assessment.

Next annual report is scheduled for March 1998. This report will contain a progress report on the MRFSS economic add-on survey, a progress report on MARFIN studies of the for-hire industry and a progress report on any new developments in planning for a commercial cost and returns study. If logbooks are implemented in 1998, the beginning of a time series of information on actual fishery participants can be initiated.

6. Provide an integrated permit database to accommodate a stratified random selection process for administering surveys. - NMFS SERO; \_\_\_\_\_.

Completed. Contact Ed Burgess for access and details.

7. Provide one database with commercial, headboat, and MRFSS data. This data base would allow Council staff to look at catches and changes in average size/CPUE over time. Data to be included at a minimum are catch in weight and numbers (or average weight if available), MRFSS data, commercial data, and headboat data. NMFS SEFSC; will be included in ORACLE data base; completion year unknown.

See same item under the snapper-grouper list.

8. Preparation of economic and social assessments for Atlantic mackerels, cobia, and dolphin fisheries. (Note: This would parallel the mackerel information provided to the Gulf Council's Socio-Economic Panel, Volumes 1 & 2, April 13, 1995.) - NMFS SERO; \_\_\_\_\_.

See item # 5.

9. Complete the MRFSS economic add-on survey and provide access to the data.

Data collection will end in February 1998. Current plans

are for all the data to be accessible via the MRFSS website and the data should be available shortly after final edits are completed.

10. Socioeconomic survey for the commercial Atlantic king and Spanish mackerel fisheries.

The Southeast Region has applied for FY98 funding from NMFS HQ. If that does not materialize, the item will be listed as high priority for MARFIN.

11. Economic and social survey of the for-hire sector.

Two coordinated MARFIN projects were approved and are scheduled to begin in January 1998. The projects will cover all species pursued by the for-hire fleet. Council staff will be advised regarding a planning session to develop details of the questionnaire(s) to be used in the survey. Among other things, this study should provide information on the amount or percent of crew salary related to sale of the customer's catch.

Research Needs:

A. Determine the stock structure of king mackerel

## VI. DOLPHIN/WAHOO FMP

1. Stock status report. This should include an estimate of MSY and an evaluation of overfishing. - NMFS SEFSC; February 16, 1998.

SEFSC is preparing a literature review and status of stock report on dolphin, available for the March 1998 meeting. No activity on wahoo is scheduled at this time.

2. Economic assessment. Include detailed landings and harvest data; (b) stock status and determination with respect to overfishing, © summary of available social and economic data, (d) economic and social assessments, and (e) estimates of the number of commercial fishermen and vessels over time. - NMFS SERO; Date: one week after stock assessment.



Dolphin data are routinely provided in concert with the mackerel economic assessment.

3. Provide an integrated permit database to accommodate a stratified random selection process for administering surveys. - NMFS SERO; \_\_\_\_\_.

If a plan is implemented with a permit system, the information will become part of an existing database. Contact Ed Burgess for access and details on this database.

4. Provide one database with commercial, headboat, and MRFSS data. This data base would allow Council staff to look at catches and changes in average size/CPUE over time. Data to be included at a minimum are catch in weight and numbers (or average weight if available), MRFSS data, commercial data, and headboat data. NMFS SEFSC; will be included in ORACLE data base; completion year unknown.

See earlier responses to this item under snapper-grouper and mackerel.

5. Access to computerized logbook data and information on how to access (e.g., codes, etc.). - NMFS SEFSC;  
\_\_\_\_\_.

SEFSC encourages Council staff to become trained in the access and use of the SEFhost databases. Contact with SEFSC-Miami Sustainable Fisheries Division encouraged (complete November 1998).

6. Socioeconomic survey for the recreational and commercial dolphin and wahoo fisheries. - NMFS SERO;  
\_\_\_\_\_.

Not planned.

7. Costs and returns survey for commercial and for-hire sectors. NMFS SERO;

Not planned.

8. Quantify bycatch in the fishery. NMFS SEFSC;

\_\_\_\_\_ (Magnuson-Stevens Act Requirement.)

Current knowledge will be included in item 1 above. Also, the National Bycatch Initiative would include this fishery.

Research Needs:  
To be developed in FMP.

#### VII. CALICO SCALLOP FMP

1. Stock status report. This should include an estimate of MSY and an evaluation of overfishing. - NMFS SEFSC; February 16, 1998.

**Not a planned activity.**

2. Economic assessment. Include detailed landings and harvest data; (b) stock status and determination with respect to overfishing, © summary of available social and economic data, (d) economic and social assessments, and (e) estimates of the number of commercial fishermen and vessels over time (identify individual vessels and levels of production if possible). - NMFS SERO; Date: one week after stock assessment.

**Not planned.**

3. Provide an integrated permit database to accommodate a stratified random selection process for administering surveys. - NMFS SERO; \_\_\_\_\_.

If a plan is implemented with a permit system, the information will become part of an existing database. Contact Ed Burgess for access and details on this database.

4. Provide one database with commercial. This data base would allow Council staff to look at catches and changes in average size/CPUE over time. NMFS SEFSC; will be included in ORACLE data base; completion year unknown.

See references to Council staff access to SEFhost and other data for use in FMP development. Also applies to item 5 below.

5. Access to computerized data and information on how to access (e.g., codes, etc.). - NMFS SEFSC;  
\_\_\_\_\_.

6. Socioeconomic survey. - NMFS SERO; \_\_\_\_\_.

Not planned.

7. Costs and returns survey. NMFS SERO;  
\_\_\_\_\_.

Not planned.

8. Quantify bycatch in the fishery. NMFS SEFSC;  
\_\_\_\_\_. (Magnuson-Stevens Act Requirement.)

National Bycatch Initiative would cover data collection from this fishery. No planned activity at this time.

Research Needs:

To be developed in FMP.

#### VIII. SPINY LOBSTER

1. Stock status report including: (a) MSY, (b) overfishing, and © stock status. - NMFS SEFSC (& Florida?);  
\_\_\_\_\_.

Florida recently completed a spiny lobster stock assessment. SEFSC-SERO will provide input relative to SFA requirements and include in NMFS report to Congress in September 1998.

2. Economic assessment. - NMFS SERO; \_\_\_\_\_.

An economic assessment for FY98 is not planned.

3. Document/estimate recreational harvest in states north of Florida. - NMFS SEFSC; \_\_\_\_\_.

Data provided during public hearings suggested small amounts taken by divers or entangled in headboat anglers' lines. No quantitative data base available. No activity planned; low priority need.

4. Quantify bycatch in the fishery. NMFS SEFSC; \_\_\_\_\_ . (Magnuson-Stevens Act Requirement.)

Part of National Bycatch Initiative program.

Research Needs:

1. Gear loss from turtles damaging spiny lobster traps.

#### IX. GOLDEN CRAB

1. Stock status report including: (a) MSY, (b) overfishing, and (c) stock status - NMFS SEFSC; May 1, 1998. Include some time for additional analyses that may be necessary after the stock status report.

Report will be prepared by SEFSC-Miami (May 1998) for June Council meeting.

#### 2. Permit Transactions:

- A. Track transactions of permits. - NMFS SERO/SEFSC.
- B. Periodic written reports tracking permit transactions for 1996 fishing year. Reports to be received by the Council at least 2 weeks prior to each Council meeting: November 3, 1997; February 16, 1998; June 1, 1998; September 7, 1998 and November 16, 1998).
- C. Final written report to Council on permit transactions for 1997 - NMFS SERO/SEFSC; February 16, 1998.

Propose the combination of items 1&2 into single report (May 1998) with joint tasking of SEFSC and SERO. The fishery is small and developing; fishery monitoring data will be available for basic annual trends, but analytical work will be a longer term activity. Comments/memos on the landings can be provided if required.

3. Demand analysis for golden crab and factors influencing exvessel price - NMFS SERO; \_\_\_\_\_.

No additional major effort is currently planned. Earlier investigations showed that golden crab is a substitute for snow and tanner crab and that the supply of the other species drives the golden crab market price. A report due in May of 1998 will show price and landings information in a graphical display and a simple regression analysis to show any price/quantity relationship will be done.

4. Begin routine monitoring activities (catches, size frequency, effort & biological information; CPUE & size frequency data; implement regulations; issue permits; enforcement report, monitor FMP compliance; inform constituents & affected management entities of significant actions).

Golden crab are on the list for TIP sampling; logbooks are in place. Continuing activity.

5. Assessment review group to meet to review golden crab stock status report. - NMFS Beaufort/SERO and Council Assessment Group; May 19-20, 1998 in Charleston.

Meeting schedule is OK, but SAFMC's Assessment Review Panel may need additional members to cover increasing diversity of fisheries tasked.

6. Economic assessment report. This would include preparation of economic and social assessments for the south Atlantic golden crab fishery. (Note: This would parallel the mackerel information provided to the Gulf Council's Socio-Economic Panel, Volumes 1 & 2, April 13, 1995.) - NMFS SERO; \_\_\_\_\_. - NMFS SERO; June 1, 1998.

See also item #3. The economic assessment will be provided in May 1998 to coincide with the stock status update.

7. Analysis of landings based on 1997 data - NMFS SEFSC; May 1, 1998. This report is to be based on the logbook data collected during the 1997 fishing year. The written report should among other things list the number of participants by

gear type by zone and state, their catch by species by month by gear type by state of landings, and an indication of average size of golden crabs in the catch by gear by month by state of landings.

Compliance of fishermen with logbook reporting is to be included.

Status of the fishery report will incorporate these elements, see item 1 above.

8. Quantify bycatch in the fishery. NMFS SEFSC; \_\_\_\_\_ (Magnuson-Stevens Act Requirement.)

Space is provided on the log books for reporting of other catch; summary of information available will be included in the status of stock report (item 1 above). No planned observer activity.

9. Provide an integrated permit database to accommodate a stratified random selection process for administering surveys. - NMFS SERO; \_\_\_\_\_.

Completed. Contact Ed Burgess for access and details.

10. Examine the extent of territoriality and the potential for conflicts with effort expansion (particularly in the southern zone). NMFS SERO; \_\_\_\_\_.

This will be included in the economic assessment (see item # 6).

11. Golden crab cost and returns survey. NMFS SERO/SAFMC Staff.

Not planned.

12. Golden crab sociocultural survey. NMFS SERO/SAFMC Staff.

Not planned.

Research Needs:

The following research needs (Items 1-8 taken from Lindberg and Wenner, 1990) are listed in no particular priority order:

1. Recruitment processes and life history strategy.
2. What are the settlement patterns of juveniles with respect to depth? What are the subsequent development and mortality rates, and how do they vary across depths?
3. Growth rates. Accurate, detailed molt staging should be incorporated into future sampling regimes, while controlled laboratory experiments to test effects of ecological variables are particularly desirable.
4. Reproductive cycle. Age at first reproduction is poorly known. Comparative studies and experimentation are needed to resolve questions of this basic life history trait.
5. Seasonal movements, encounter rates among potential mates and competitors, movement by mated pairs, and takeover attempts all need to be documented to test golden crab mating strategies.
6. Habitat preferences. Basic ecological questions concerning physiological ecology, refuges and foraging habits, trophic dynamics and community relationships remain largely unanswered.
7. Home ranging versus nomadism needs to be examined.
8. Questions of basic physiology of deep-dwelling organisms, biogeography and systematics, or parasitology and symbiosis.

Additional fishery management related items include:

9. Estimate potential yield.
10. Document economic and social information of fishermen and dealers.
11. Document information on market structure, development, and consumer acceptance of product.
12. Determine whether there is any substitutability with other crustaceans.
13. Identification of existing bottom habitat suitable for golden crabs in the South Atlantic Council's area would be useful.
14. Biodegradable panel research - determine the rate at which the specified material degrade and evaluate materials/methods to degrade within 14-30 days.

## X. MISCELLANEOUS

1. Bioprofile Sampling. NMFS SEFSC is to develop a table with species and target numbers of samples (size & biological data) to be collected by month. All species included in fishery management plans should be included. This table will be included in each briefing book and is to be updated through the previous month. Due dates prior to Council meetings are: November 3, 1997; February 16, 1998; June 1, 1998; September 7, 1998 and November 16, 1998.

Collection targets(n) and species lists are provided to Headboat samplers and to the samplers of commercial catch. A general table and annual summary of accomplished collections of lengths are found in the snapper-grouper compliance report for example.. Other species groups/ FMPs could be reported. MRFSS provides target numbers of dockside interviews, not biostatistical collections. Receipt of the data is not amenable to monthly cumulations and reporting. More discussion of this issue/species included/reporting etc. is needed before tasking and schedule set.

2. Overfished Species. NMFS SEFSC is to develop a table listing all species under South Atlantic Council-related fishery management plans with a determination of overfished versus not overfished. This table will be included in each briefing book and is to be updated for each overfished species each year. Due dates prior to Council meetings are: November 3, 1997; February 16, 1998; June 1, 1998; September 7, 1998 and November 16, 1998.

Table of species status will be provided one time per year, this is related to the SFA reporting requirement of the Secretary of Commerce to Congress (September 1997 and annually thereafter). The revised 1997 table (September



1998) will be based on current conditions of the resources; it is to be an update of the initial species list (September 1997-NMFS Report to Congress).

\*\* Council requests that NMFS provide a revised 1997 species status reflecting NMFS current interpretation of MSY (=30% SPR? suggested in the draft guidelines on SFA), most recent estimate of SPR in assessment documents.

\*\* For overfished species, NMFS to provide an interpretation of the species recovery status (within the SFA timeframe of 10 years) given current or proposed management actions for the species. And if 10 year recovery not met, NMFS to suggest actions (further reductions in F) that would insure the species recovery within the SFA 10 year target timeframe.

This task is not attainable in the time frame requested (November 3, 1997), but NMFS will provide information at the November 1997 Council meeting.

3. Assessment Input Parameters. Assessment results vary greatly depending on the values used for input parameters. For example, with  $M=0.1$  gag  $SPR=13\%$ ; however, if  $M=0.2$  gag  $SPR=30\%$ . In addition, trust in assessment results is seriously undermined when different values are used in different areas (e.g., gag  $M=0.1$  in South Atlantic Assessment and  $M=0.2$  in Gulf Assessment).

NMFS is to convene a review group to establish a range for all input parameter that reflects the current level of knowledge. This range is to be used for ALL assessments in the southeast unless there is compelling and documented biological data to support use of different values. The resulting SPR status will be presented as a range reflection our level of knowledge and/or adequacy of data.

These requirements are to apply to all assessments done from September 1, 1997 onwards.

NMFS agrees that a meeting of a work group needs to be convened to address several questions that have developed relative to SFA and FMPs within the SER and assessments for species occurring in the jurisdiction of two or more Councils. The scope of the group discussion should be national. The group would be tasked to address:

1. Re SFA. What is to be used as the proxy for MSY , %SPR? And what general level (s) are appropriate?
2. What is guidance relative to reef fish (are there groups of species that should be at 30%, 40%, or 20% SPR)? Are protogynous species a special case? If so, give the groupings and %SPR targets for MSY and rationale. Are there other fishery resources in the SER where %SPR for MSY should differ, like shrimp, golden crab calico scallop, etc.? If so, what level and rationale?
3. What would the group recommend for general use in SER stock assessment inputs and outputs, e.g., M and approaches to estimate M? And the suite of biological reference points to be provided in the general case assessment, F20, F30, F40% SPR, F0.1, Fmax, etc. The intent is to develop a guide or framework for consistency ( standards) of assessments performed in the SER.

SE-RA and SEFSC Director will confer and schedule. (Report by November 1998 if possible).

4. Monroe County (Florida) Data. The Council boundary was changed from the Dade/Monroe line to the current line in 1980. Unfortunately NMFS has not altered their data collection and/or data management programs to reflect this change. This results in confusion and potential errors in all data requests and assessments involving species harvested in Monroe County.

NMFS is to change commercial and data collection programs to recognize this boundary change. In the interim, data management programs may solve the problem on the commercial side by including a species-specific data extraction capability. The MRFSS survey will have to be addressed separately.

Council staff should work with Statistics personnel (SEFSC-Miami Sustainable Fisheries Division)..

General canvass landings data system in Florida has been changed to rely on Florida Fish Ticket information. Fish tickets provide information on area of catch and NMFS SEFhost files apportion these catch data to water body areas

that are in accord with Councils' boundary line. The requested data extraction capability exists and Council requests for data in this format are being supplied.

#### XI. FISHERY IMPACT STATEMENT & GENERAL DATA NEEDS

1. Our understanding is that the Fishery Impact Statement (FIS) is to include (a) profiles of the commercial, recreational and for-hire fisheries, (b) RIR, © SIA, and (d) Fishery Community analyses.

NFMS IS TO PROVIDE GUIDANCE ASAP.

Guidance of this nature is to be provided by NMFS HQ.

2. Examine all existing permit systems and limited entry systems and determine levels of participation in various fisheries. The intent is to link a vessel's production across all fisheries in which that vessel participates. This information will be used to evaluate a comprehensive limited entry program. - NMFS SEFSC/SERO;

---

A concerted effort was conducted during 1996 and 1997 to determine if this was feasible. Unfortunately, the basic answer is that this type of information will not be available to economists and other users unless the reporting systems are made compatible and reporting of all fishing activities becomes mandatory.

The following general social and economic data are also needed:

##### Commercial fisheries:

1. Sociodemographic characteristics: Number of participants, Age & distribution, Gender, Ethnic/Race, Education, Religion, Marital Status, Children - age & gender, Residence, Household Size, Household Income, Dependence upon commercial fishing, Any change in that dependence upon commercial fishing, What other sources of income, Occupational Skills, Past work history, and Association with vessels & firms (role & status).

2. Historical participation, Vessel size past and present, Type of gear used past and present, Gear numbers (nets, reels, etc.), Description of work patterns, Species fished annually, Geographical range of harvest patterns, Organization & affiliation, Patterns of communication and cooperation, Competition and conflict, Spousal and household processes, and Communication and integration.

3. Emic culture: Motivation and satisfaction, Attitudes and perceptions concerning management, Constituent views of their personal future of fishing, Psycho-social well-being, and Cultural traditions related to fishing (identity and meaning).

These needs are identified in the Southeast Social and Cultural Data and Analysis Plan which is to be implemented whenever the funding is available.

#### Recreational Fisheries:

1. Sociodemographic characteristics: age & distribution, gender, ethnic/race, education, religion, marital status, children - age & gender, residence, household size, household income, employment status, days worked per week, hours worked per week, annual number of vacation days, and annual number of holidays.

A portion of this information will be collected via the add-on survey.

2. Money costs (recreational private only; e.g., vessel & maintenance costs, trip costs, etc.): number and relationship of people in party, gear rental, tackle, license, bait, and travel expenses by category (gas, lodging, food, etc.).

Information via add-on survey.

3. Trip identification (Charter boat and party boat): vessel number, port, date and time departed, gears used, length of trip, hours fished, areas fished, and targeted species.

4. Cost & Returns survey (Charter boat and party boat): number of customers, fee schedule, total revenue from fees, gear rental, tackle, sale by species by captain, sale by species by mate, revenue from filleting, tips, and consumer goods.

**Information via approved MARFIN projects.**

5. Crew (Charter boat and party boat, including captain): number, crew share formula, crew status, Ages, years fishing experience, ethnic/racial identity, marital status, children, religious affiliation, town of residence, membership in fishing associations, work history and occupational training.

**Identified in Social and Cultural plan mentioned earlier.**

6. Preferences: reasons for fishing and relative importance, satisfaction with the trip, maximum willingness to pay for trip, fishing experience (years), participation in fishing associations, subscription to fishing periodicals, and alternative use of time.

**Information via add-on survey.**

**Fishing Communities:**

1. Fishing community information might include but not necessarily limited to: identifying communities, dependence upon fishery resources (this includes recreational use), identifying businesses related to that dependence, number of employees within these businesses.

**Information via Social and Cultural Plan mentioned earlier.**

**Appendix F. NMFS Correspondence to SAFMC: Rebuilding plans for jewfish, red drum, and Nassau grouper**



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL MARINE FISHERIES SERVICE  
Southeast Regional Office  
9721 Executive Center Drive North  
St. Petersburg, FL 33702

F/SER2:JJK:bsa

FEB 3 1998

RECEIVED

FEB 05 1998

SOUTH ATLANTIC FISHERY  
MANAGEMENT COUNCIL

Mr. Benjamin C. Hartig, Chairman  
South Atlantic Fishery Management Council  
Southpark Building, Suite 306  
#1 Southpark Circle  
Charleston, SC 29407

Dear Ben:

The next few months are going to be busy for both NMFS and the Councils due partly to requirements outlined in section 304(e) of the Magnuson-Stevens Fishery Conservation and Management Act (Act). As you are aware the Act mandates that each Council (or the Secretary) has the responsibility to implement conservation and management measures for all stocks considered overfished, or approaching an overfished condition, that would end overfishing and result in a speedy recovery of those stocks to a non-overfished status. This letter is to clarify that NMFS understands and agrees that the South Atlantic Council has already taken the most restrictive, but appropriate, action for jewfish, *Epinephelus itajara*, red drum, *Scieanops ocellata*, and Nassau grouper, *Epinephelus striatus* by implementing a total closure in both the recreational and commercial fisheries. The rebuilding plans for these species, however, are not consistent with the Act and need to be modified to specify a time period for ending overfishing and rebuilding the fisheries that shall be as short as possible, not to exceed 10 years, except in cases where the biology of the stocks or other environmental conditions dictate otherwise. By doing so, the Council does not need to further address rebuilding in these fisheries in its efforts to comply with the Magnuson-Stevens Act at this time.

Please be aware, however, that this letter does not authorize any change to liberalize the current restrictions. The current FMPs would need revising (i.e., inclusion of a rebuilding program for the above species) to be consistent with the Act before any fishing on these species could be allowed.

Sincerely yours,

Andrew J. Kemmerer  
Regional Administrator

cc: R. Mahood, Executive Director  
F/SF  
GCF



**Appendix G. Report of the GMFMC Ad Hoc Crustacean Stock Assessment Panel**

7/1/98

**REPORT OF THE AD HOC CRUSTACEAN STOCK  
ASSESSMENT PANEL**

Prepared by the Ad Hoc Crustacean Stock Assessment Panel  
at the Panel Meeting Held June 1 - 3, 1998



Gulf of Mexico Fishery Management Council  
The Commons at Rivergate  
3018 U.S. Highway 301 North, Suite 1000  
Tampa, Florida 33619-2266  
813-228-2815

This is a publication of the Gulf of Mexico Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No. N7-17FC0003

**REPORT OF THE CRUSTACEAN STOCK ASSESSMENT PANEL  
TABLE OF CONTENTS**

I.	INTRODUCTION .....	1
II.	REVIEW OF STOCK ASSESSMENT INFORMATION .....	1
III.	CRUSTACEAN STOCK ASSESSMENT PANEL RECOMMENDATIONS AND CONCLUSIONS	
	SHRIMP FISHERY MANAGEMENT PLAN .....	2
	Genus - <i>Penaeus</i> .....	2
	Royal Red Shrimp - <i>Pleoticus robustus</i> .....	4
	STONE CRAB FISHERY MANAGEMENT PLAN .....	5
	SPINY LOBSTER FISHERY MANAGEMENT PLAN .....	9
IV.	REVIEW OF THE LITERATURE .....	13
	LIST OF PANEL MEMBERS AND ATTENDEES .....	15



## I. INTRODUCTION

The charge to the Crustacean Stock Assessment Panel (Panel) was to address the new provisions of the Sustainable Fisheries Act (SFA) that apply to National Standard 1, which provides that management measures shall prevent overfishing while achieving optimum yield (OY) from each fishery for the U.S. fishing industry. These changes require the Panel to reassess statements in the fishery management plans (FMPs) for Maximum Sustainable Yield (MSY), OY, and thresholds defining overfishing and overfished conditions for each stock or stock complex. In carrying out this task, the Panel was guided by the provisions of the National Standard Guidelines for National Standard 1 that are set forth in 50 CFR 600.310 and include the alternatives for specifying these parameters. The Panel utilized the best available scientific information in formulating its recommendations which included, but were not limited to, those documents discussed in Section II of this report and listed in Section IV. In the case of the Spiny Lobster FMP, the Panel deferred making recommendations until a subpanel could be convened to analyze more recent information and develop a separate report for that fishery.

## II. REVIEW OF STOCK ASSESSMENT INFORMATION

The Panel reviewed the documents presented in Section IV (Review of the Literature). To fulfill its charge for shrimp, the Panel paid particular attention to the existing definitions for MSY, OY, and overfishing for the 3 *Penaeus* species discussed in Amendments 5 and 7 to the Fishery Management Plan for the Shrimp Fishery of the Gulf of Mexico, United States Waters and for royal red shrimp discussed in Amendment 8. The Panel also considered the findings from a series of workshops on overfishing of shrimp from 1989 through 1993, the recent overfishing reports by the National Marine Fisheries Service (NMFS), and conclusions regarding estimates of MSY for royal red shrimp.

With regard to stone crabs, the Panel particularly reviewed the current definitions for overfishing (contained in Amendment 4 to the Fishery Management Plan for the Stone Crab Fishery of the Gulf of Mexico) and current definitions of MSY. In addition to the catch, effort, and other stock assessment information available in these documents, a 1997 update of stock parameters regarding this species prepared by the Florida Department of Environmental Protection was most helpful to the Panel's review and conclusions.

As noted below, there was insufficient participation by Panel members with particular experience in assessments of spiny lobster stocks for the Panel to fully address its charge with regard to this species. Additionally, a recent paper (Muller et al. 1997) was presented at the Panel meeting, and members felt that there was insufficient time to fully review the document and determine the most appropriate application of the data to the Panel's charge.

### III. CRUSTACEAN STOCK ASSESSMENT PANEL RECOMMENDATIONS AND CONCLUSIONS

#### Shrimp Fishery Management Plan

##### Genus - *Penaeus*

The three species of *Penaeus*, comprising the bulk of the Gulf of Mexico shrimp fisheries, are essentially annual crops. Annual harvests vary considerably due to fluctuations in environmental conditions experienced by larvae and juveniles. MSY estimates have been reported, based on analytical models of catch and effort. Such MSY values are near observed maximum catches. However, the Panel stresses that due to the environmental fluctuations seen to date, catches above MSY, even if persisting over several years, must not of themselves be taken as evidence of overfishing.

The Panel agrees with the findings of Nance et al. (1989), Klima et al. (1990), and the Shrimp Stock Assessment Panel (1993), that the best way to define overfishing for the three species of *Penaeus* is in terms of spawning population size. Empirical comparisons of over 30 years of landings data with the indices of spawning population size determined by VPA stock assessment were used by Nance et al. (1989), Klima et al. (1990), and the Shrimp Stock Assessment Panel (1993) to define minimum levels of spawning stock believed to be compatible with maximum productivity under current conditions. The Panel recommends these values as the most meaningful proxy for MSY. Maintaining parent stock numbers above these levels should be sufficient to prevent overfishing. The Panel proposes retention of the scientific review scenarios proposed by Nance et al. (1989), Klima et al. (1990), and the Shrimp Stock Assessment Panel (1993) ('response to potential overfishing,' below) as the proper response to reduction of parent stocks below the MSY proxy targets.

##### Maximum Sustainable Yield (MSY):

The definition of MSY with respect to the status of the existing fishery was a contentious issue during the original development of the shrimp FMP because the annual harvest levels upon which any point estimate of MSY was based varied by up to 30%, due to environmental factors affecting survival in the nursery grounds. The authors of the plan wanted to stress the dependence of harvest on the environment, but objections were raised because the plan would allow yields above any stated MSY. The plan authors, therefore, presented point estimates of MSY, the maximum probable catch under optimum environmental conditions, and an estimate of maximum effort for a sustainable fishery. With the increased experience with FMPs, it should now be recognized that shrimp harvests can exceed a long-term average MSY for perhaps several years without damage to stock productivity, and conversely, that harvests below MSY might be excessive during periods of low recruitment. The Panel believes that maintaining sufficient spawning stock is much more appropriate for shrimp management than comparing catches to MSY values.

The Panel recommends that the minimum MSY spawning stock size be defined as the parent stock numbers (as indexed from current VPA procedures) for the three penaeid species of shrimp in the Gulf of Mexico at or above the following levels:

Brown Shrimp - 125 million individuals, age 7+ months during the November through February period.

White Shrimp - 330 million individuals, age 7+ months during the May through August period.

Pink Shrimp - 100 million individuals, age 5+ months during the July through June year.

#### Optimum Yield (OY):

There are no known biological considerations that would require the setting of OYs at levels below those attaining the MSY proxies. Under current management practices, OY is actually a consequence, not a target, of the varied strategies to obtain shrimp at different desired sizes in different regions of the Gulf. Using spawning population to define overfishing has the advantage of separating the essentially economic decisions about utilization of a given recruitment from more serious biological concerns about compromising possible future recruitments.

#### Overfishing Threshold:

Overfishing is defined as a level of fishing that results in the parent stock number for any of the penaeid species being reduced below the MSY minimum levels listed above.

#### Response to Possible Overfishing::

If overfishing persists for 2 consecutive years, the Panel recommends that the appropriate committees and/or panels (e.g. stock assessment panels [SAPs], Advisory Panels [APs], or Scientific and Statistical Committee [SSC]) be convened to review changes in the parent stock size, changes in fishing effort, potential alterations in habitat or other environmental conditions, fishing mortality, and other factors that may have contributed to the decline. If excessive fishing is determined to be the source of, or a contributor to the reduced parent stock sizes, reduction in fishing pressure should be recommended.

#### Overfished Threshold:

A stock is considered to be overfished when the parent stock number for any of the penaeid species drops to some level below the MSY minimum levels listed above. The guidelines provide that a value as low as one-half the MSY target spawning population size could be used, *i.e.*:

Brown Shrimp - 63 million individuals, age 7+ months during the November through February period.

White Shrimp - 165 million individuals, age 7+ months during the May through August period.

Pink Shrimp - 50 million individuals, age 5+ months during the July through June year.

The Panel expressed some concern with setting values at 50 % of the MSY target spawning population size; however, the Panel noted that white shrimp populations in the early 1960s recovered rapidly from below one-half the MSY minimum. The Council may, however, want to specify an overfished threshold above the one-half MSY level as a precautionary approach.

#### Current Status:

Parent stocks for all three species have remained well above the MSY parent stock minimum for about 30 years. Even during the recent reduction of pink shrimp recruitment in south Florida, the stock maintained adequate spawning potential. Overfishing does not appear imminent for any of the three species of *Penaeus*.

#### Research Recommendations

For purposes of stock assessment, and for assessing stock conditions relative to overfishing, current information is considered adequate. The most serious omission in data collection for assessment purposes could be the lack of annual estimates of recreational, bait, and commercial harvest not marketed through traditional dealers. There are several contentious issues involving impacts of management actions on the shrimp fisheries that do call for further data collection and analysis, but these are not directly related to the basic stock assessments. The most important, active area for biological research on shrimp at present is in defining habitat requirements for shrimp.

#### **Royal Red Shrimp - *Pleoticus robustus***

The fishery for royal red shrimp in the Gulf of Mexico could be characterized as experimental. Fishing effort has varied greatly from year-to-year, and because of the lack of meaningful estimates of effort, the current estimate of MSY (392,000 pounds) has not been considered to be a truly realistic one. To obtain additional data upon which to calculate a more precise estimate of MSY, the Council has, in the past, proposed allowing the MSY level to be exceeded by up to 30 percent for up to two consecutive years to test the resilience of the stock to increased fishing effort (Amendment 8). Because of the current legal definitions of MSY, OY, and overfishing, a harvest level above MSY is not allowed. Additionally, although the harvest of royal red shrimp approached the MSY level in 1993 and 1994, catches have since declined, presumably with a decline in effort.

Condrey (1995) re-examined the modeling decisions with regard to calculating the current MSY. He concluded that had he used a generalized surplus production model (GSPM) with a natural mortality value (M) of 0.5, which he felt was more appropriate, the estimated value of MSY for royal red shrimp would be about 650,000 pounds. He concluded, however, that based on the current data and statistical reasons there was no defensible basis to select one model over the other.

### Maximum Sustainable Yield MSY:

MSY for royal red shrimp is best considered undetermined. The current MSY point estimate is 392,000 pounds. However, recent analyses have shown that an MSY estimate of 650,000 pounds is as scientifically defensible as 392,000 pounds (Condrey 1995). The Panel therefore recommends that MSY be reported as a range from 392,000 to 650,000 pounds. The Panel notes that, as discussed in Amendment 8 to the Shrimp Fishery Management Plan, a more adequate accounting of the biology and distribution of this species is needed before improvement in the quality of MSY estimates can be expected. Simply allowing catches to rise to the upper end of the MSY range may not provide sufficient information to specify MSY more accurately.

### Optimum Yield (OY):

The Panel had no recommendations for specifying OY, except that it not exceed MSY.

### Overfishing Threshold:

Overfishing is defined as a harvest level that exceeds the Council's established level of OY, expected to be within the MSY range.

### Overfished Threshold:

The Panel noted that there was insufficient data to specify an overfished level.

### Current Status:

No annual harvests have exceeded the lower range limit of MSY. The stock is not believed to be overfished, and overfishing is not occurring. The current fishery may be exploiting only a small part of the stock's spatial distribution.

## **Stone Crab Fishery Management Plan**

The stone crab fishery is one that harvests only the claws; the crabs are returned to the water. Claws regenerate over time, and it has been observed that approximately 10% of the claws sampled in fish houses have been regenerated. Male crabs grow faster than females, and the majority of the claws taken are from males.

In the opinion of the Panel, the stone crab fishery in the Gulf of Mexico is at or near full exploitation. Landings have increased since the 1960s, to a 1990-1997 average level of about 3.0-3.5 million pounds (claw weight). Effort (in number of traps) has also increased considerably, resulting in currently low catch per unit effort (CPUE) values; however, the stock does not show indications of overfishing and appears to be able to sustain the current levels of production.

The Panel believes that an egg production per recruit ratio is a definable, quantitative measure that is appropriate for measuring stock condition, MSY values, and overfishing/overfished definitions for stone crabs. The minimum claw size regulation (70 mm propodus length [PL]), probably originally set as a market requirement, assures that female crabs spawn at least once before they are subject to harvest and results in a relatively high (~80%) egg production per recruit ratio. The Panel also believes that the current claw size regulation that produces this egg production per recruit ratio can both produce an MSY harvest and provide a high level of protection against overfishing.

#### Maximum Sustainable Yield (MSY):

MSY is defined as the harvest that results from a realized egg production per recruit at or above 70% of potential production. This harvest capacity is currently estimated at between 3.0 and 3.5 million pounds of claws (minimum 70 mm PL).

The Panel reviewed the analyses for stone crabs from the NMFS SEFSC Overfishing Workshop, held February 12-14, 1990, and concluded that at the current minimum claw length of 70 mm PL recruitment overfishing is unlikely. This conclusion was based on the fact that, on average, males and females mature at age 2 (50% maturity), the male crusher and pincer claws reach legal length between age 2 and age 3, and female claws reach legal lengths one to two years later. Therefore, females spawn for at least one or more years before entering the fishery. Restrepo (1989) suggested that the egg production potential is largely independent of the male/female ratio in the population since a single copulation fertilizes a female for the season and males can copulate with several females. The fact that males enter the fishery at earlier ages and their numbers may be reduced relative to the number of females does not appear to impact the egg production potential. Females are capable of producing up to 13 batches of eggs after a single copulation (four to five batches on the average) during the reproductive season. Fecundity is linearly related to size, and large females produce upwards of 350,000 eggs per batch. At the present minimum claw length of 70 mm PL, more than 70% of potential egg production will be maintained over a wide range of fishing mortality rates, both higher and lower than the present mortality rate. The current fishing mortality rates produce between 3.0 and 3.5 million pounds of claws annually, and this range is considered to be the best estimate for MSY.

#### Optimum Yield (OY):

There are no known biological considerations that would require the setting of OY at a level below MSY, and the stock is adequately protected at this level. Although overfishing should not occur under the existing minimum claw size regulation, Ehrhardt and Restrepo (1989) and Restrepo (1989) concluded that yield per recruit (YPR) in terms of weight could be increased by reducing the existing minimum claw size. Bert et al. (1986) suggested that stone crabs live to be about 6 years old. Also, females do not fully enter the fishery until age 5. Consequently, there is a potential for reducing the minimum claw size to obtain a greater YPR. On the other hand, Restrepo (1989) indicated that such a reduction may affect the reproductive capacity of the stone crab population.

Another consideration of reducing the minimum claw size is the economic impacts on the fishery. Although there would probably be an increase in pounds landed, such an increase could result in losses with regard to total ex-vessel value because there is a significant price differential between claw sizes. For example, during the 1988-89 season, the percentage of claws landed were classified as follows: 5% - jumbo, 48% - large, 25% - medium, 9% - small, and 13% - unclassified (Sutherland 1989). Ex-vessel prices per pound for the 1989-90 season were as follows: \$6.55 - jumbo, \$6.13 - large, and \$5.49 - small. Since the small classification includes claws only slightly larger than the current minimum size limit (70 mm PL), a reduced size limit would probably create a new market classification below this size, and it would probably have a lower ex-vessel value that would have to be contrasted against the gains in poundage.

#### Overfishing Threshold:

Overfishing for the stone crab fishery is defined as a realized egg production per recruit of below 70% of potential production.

A minimum claw length of 70 mm PL equates to an egg production per recruit ratio >70%. Catch statistics show that the stock has supported the MSY catch levels of 3.0 to 3.5 million pounds under this management rule. Minimum claw lengths below 70 mm PL would reduce egg production per recruit and would define an overfishing situation. Although overfishing will probably be avoided when there is a minimum claw length that assures survival of crabs to achieve the 70% egg production per recruit potential, there is an unlikely possibility that the 70% ratio might not be achieved due to incidental mortality of sublegal size crabs. Although the Panel recommends a strategy that will probably produce an egg production per recruit ratio of 70% or more, it is noted that this level is probably much larger than what is needed to maintain the stock. It is likely that a strategy that would produce a 40% level would be adequate.

#### Overfished Threshold:

The overfished condition would occur when the realized egg production per recruit ratio is reduced below 40% of potential production. As noted above, there is some likelihood that this level might also be an overfishing threshold, if incidental mortality of sublegal-size crabs is significant.

An egg production per recruit ratio of 40% was chosen to represent the overfished threshold because it represents a ratio of egg production per recruit that is approximately one-half of that at MSY. The Council may want to specify an overfished threshold above the one-half MSY level as a precautionary approach.

#### Current Status of the Stock (from Muller and Bert 1997):

Landings in terms of claw weight have been increasing for more than 30 years, and annual landings fluctuate around a linear trend line. Landings for the 1981-82 and 1982-83 seasons were above the trend line; however, landings in 1983-84 and 1984-85 were below it. More recently, landings from

1990-91 through 1994-95 were above the trend line, but landings for 1995-96 and preliminarily 1996-97 were below it.

Effort, in terms of the number of traps, has increased from about 14,000 in 1962-63 to about 798,000 in 1995-96. The number of trips has also increased since 1985-86 (the first year for which trip data are available) from about 19,000 to approximately 34,000 in 1995-96. Landings have not increased commensurate with either of these measurements of effort.

As the number of traps being fished increased, catch per trap per year declined considerably, dropping from more than 20 pounds per trap in the early 1960s to less than 10 pounds in the mid 1970s and less than 5 pounds by the mid 1980s. Since the mid 1980's, catch per trap per year has remained low and both this index and the more recently available index of standardized catch per trip per year are presently (1995-96 and 1996-97, respectively) at their lowest historical levels. Additionally, landings have not increased with effort (in terms of catch per trap).

In 1989-90, the Florida Department of Environmental Protection (FDEP) implemented a fishery-independent, juvenile monitoring project in Tampa Bay. The juvenile indices were used to predict commercial catch rates approximately 3 years later when crabs enter the fishery. Although the first year's prediction (1992-93 commercial season) did not fit the juvenile index well, juvenile catch rates from 1990 through 1993 have correlated well with catch per trap in 1993-94 to 1996-97. The study also showed that some juveniles enter the fishery at approximately 27 months after settlement (presumably males) while others do not enter the fishery until 38 months later (principally females). The 1996-97 juvenile catch rates were not significantly different from zero. If this index is indicative of the future adult population, there could be a serious shortage of stone crabs in the Tampa Bay area in 1999-2000. The utility of these comparisons in predicting catch rates over extended periods of time and in other areas remains to be evaluated; if valid, they could serve as an early indicator of potential problems for the fishery.

#### Research and Data Needs:

1. Expand juvenile monitoring program currently being conducted in Tampa Bay by the FDEP to other areas of the fishery (e.g., Monroe-Collier and Citrus-Pasco Counties).
2. Monitor claw size composition in the commercial catch.
3. Monitor CPUE in the fishery (catch per trip, catch per trap).
4. Evaluate impact of incidental mortality of sublegal size crabs by the fishery.
5. Estimate the annual recreational catch.



## Spiny Lobster Fishery Management Plan

### Preface:

At their meeting in New Orleans, Louisiana, the Panel examined recently available data including a handout of a paper by Muller et al. 1997. The Panel did not have sufficient time or expertise to fully review the stock assessment information for spiny lobster; however the Panel believes that some form of stock potential value (eggs per recruit, SPR, SSBR, etc.) is the best proxy for MSY. The Panel also believes that sufficient data exist to calculate these various levels. The Panel concluded that once this analysis is performed, a Subgroup of the Panel should be convened to evaluate the results and recommend MSY levels, overfishing threshold definitions, overfished criteria, and the current status of the stock.

The analysis should include review of egg per recruit values, recent SPR and SSBR values in Muller et al. (1997), and investigation of the differences in the fishing mortality rates used by Powers and Sutherland (1989) and Muller et al. (1997).

The sub-group of the CSAP for spiny lobster met in St. Petersburg at the Florida Marine Research Institute on June 18, 1998 with a teleconference link to John Hunt and Dr. Mark Butler in Marathon. In addition to Mr. Hunt and Dr. Butler; Chairman, Dr. James Nance; Dr. Bob Muller and staff members, Wayne Swingle and Rick Leard attended the sub-group meeting.

The FMP for spiny lobster, *Panulirus argus*, was implemented in 1982 as a joint plan regulating that stock in the jurisdiction of the GMFMC and the SAFMC. The domestic commercial fishery is principally located in the waters surrounding Monroe County, Florida, associated with the Florida Keys reef tract. Historical commercial landings from 1950 showed the development of the fishery, the expansion into Florida Bay and the Bahamas after the change of the minimum size to 3.0 inches carapace length (CL) (76.2 mm) in 1968, and the closure of Bahamian waters to Florida fishers in 1974. From 1975 to date, the fishery and its regulations have not changed and the annual landings have varied from 4.3 MP to 7.9 MP with an average of 6.4 MP. Less than 10 percent of commercial harvest is taken off these east coast counties.

Similarly, recreational landings are predominantly from the Florida Keys area. The Florida Marine Research Institute (FMRI) has monitored this fishery since 1991. Since 1991, the number of licenses for this fishery has remained fairly stable at about 110,000, and landings were stable at about 1.7 million lobsters (FMRI 1997).

### Maximum Sustainable Yield (MSY):

The CSAP sub-group considered that MSY was going to difficult to define in this fishery because the Trap Reduction Program has been reducing effort and the population is increasing in response; plus, there has been a reduction in the mortality of sub-legal lobsters. The historical landings do not provide information on the level of MSY after the fishery has had time to re-equilibrate.

The MSY for the FMP (GMFMC/SAFMC 1981) was derived by using the Fox surplus yield model and the effort and landings data for the Monroe County fishery, which resulted in an estimate of 5.9 MP. That was adjusted by adding the average east coast landings and estimated unreported recreational and commercial landings and estimated mortality of sublegal lobsters, which resulted in an estimate of 12.0 MP. That was adjusted by the YPR relation for an estimate of 12.7 MP at a carapace length (CL) of 3.5 inches. The minimum size of 3.0 inches CL was estimated to provide between 85 and 91 percent of the maximum YPR.

Compounding the problem of estimation of MSY is the fact that the source of Florida's recruitment is unknown at this time. Spiny lobster have an extensive planktonic stage (6 to 9 months) prior to settlement at 6 to 7 mm. Consequently, the origin of the larvae could be from the Caribbean Sea, Cuba, Mexico, the northern Gulf, the Florida Keys, or a combination of these potential sources. Because of these complications, the CSAP determined that the spawning-recruit relationship was probably insignificant; however, the CSAP noted that the precautionary approach would be to assume that recruitment is dependent on local spawning.

Since the highest landings from 1987-88 through 1996-97 occurred in 1996 (9.9 million pounds) and since the number of traps in the fishery have been reduced from about 939,000 in 1993-94 to around 582,000 in 1996, the CSAP concluded that MSY is probably higher than the 5.9 million pounds currently estimated in the FMP. Also, since the estimate of transitional SPR has been above 30% from 1993-94 to 1996-97, the CSAP believes that the best proxy for MSY would be a harvest level that maintains a transitional SPR at or above 30%.

#### Optimum Yield (OY):

The CSAP did not address OY; however, there are no known biological considerations that would require the setting of OY at a level below the above considerations of MSY.

#### Overfished Threshold:

The CSAP did not address an overfished threshold; however, as discussed below, overfishing was discussed in a precautionary sense to be a transitional SPR based on biomass (SSBR) of 20%. Logically, a transitional SPR that corresponds with the overfished threshold would be lower than 20%. The federal guidelines for National Standard 1 of the Magnuson-Stevens Act suggest using a biomass of one-half of the MSY expressed in terms of spawning biomass or other measure of productive capacity.

#### Overfishing Threshold:

Following the precautionary approach, the group decided on an overfishing definition of 20% transitional SPR instead of the present 5% eggs per recruit. The value of 20% was chosen because the lowest transitional SPR for the Florida Keys in the past 10 years was 24% in the 1991-92 season. There were no data to determine the SPR value for the season with lowest landings (1983-84) but

the group assumed that it was lower than 24% and chose 20%. The group recommended including a juvenile or pre-recruit index because although the number of recruits cannot be predicted accurately from the number of spawners, the number of recruits entering the fishery can be predicted from the number of juveniles or pre-recruits. Thus the index would allow the Council to prepare the fishery for any downturns if necessary. In the absence of a juvenile index, the CSAP recommended that pueruli settling be monitored.

#### Current Status of the Stock:

Muller et al. (1997) conducted an age-structured analyses of the status of the Florida fishery in examining the effects of the trap reduction program. The number harvested, population size, fishing mortality rates, and transitional SPRs were computed by age for the seasons 1987-88 through 1995-96. These parameters were computed for females and males (excluding SPR) from the upper and lower Florida Keys. The upper Florida Keys was defined as Key Largo to Big Pine Key, and lower Florida Keys from Big Pine Key to Dry Tortugas. The analyses included both commercial and recreational fishery statistics, and indicated that lobsters landed are primarily from 2 to 7 years old. The estimated abundance of age-1 and older lobsters in the Florida Keys prior to 1993 was approximately 30 million individuals, but had increased to 33 million lobsters in subsequent years. Recruitment estimated by age-2 lobsters varied from 7.8 million to 10.7 million lobsters, and was more variable in the upper Florida Keys. Fishing mortality rates on the fully recruited ages (age-3 in females and age-2 in males) varied two-fold. Average fishing mortality rate ( $F=0.59$  per year) was higher in the upper Florida Keys than the lower Florida Keys ( $F=0.33$  per year). Fishing mortality rates before the 1993-94 season (average  $F=0.47$  per year) was higher than for subsequent seasons (average  $F=0.39$  per year) for the entire Florida Keys.

Transitional SPRs based on biomass (SSBR) varied by season between 7 and 19 percent in the upper Florida Keys and between 20 and 31 percent in the lower Florida Keys. SPRs were approximately 2 to 4 percent higher when based on fecundity rather than biomass, i.e., 23 to 34 percent for the lower Florida Keys (Muller et al. 1997). Bob Muller conducted additional analyses during the CSAP sub-group meeting that combined data from the upper and lower Florida Keys. In terms of biomass, SPRs ranged from a low of 23% in 1991-92 to a high of 35% in 1994-95. Again, SPR estimates based on fecundity were 2% to 3% higher, 24% in 1991-92 and 37% in 1994-95.

Muller et al. (1997) and his additional calculations above indicate a larger stock size than when Powers and Sutherland (1989) assessed the condition; however, part of the difference is due to the different growth models employed in the analyses. Powers and Sutherland did not separate sexes and they used a composite von Bertalanffy growth curve (first year after 50 mm CL  $L_{\infty} = 155$ ,  $K = 0.2$  and thereafter  $L_{\infty} = 190$ , and  $K$  between 0.2 and 0.3) that estimated an average fishing mortality of approximately  $F=2.0$  per year, i.e. spiny lobsters were mostly caught within a year of recruiting. The stochastic growth model (Muller et al. 1997) that considered sexes, time of the year, location in the Florida Keys, and carapace length produced slower growth and lower estimated fishing mortality rates. Muller et al. (1997) also noted that landings in the upper Florida Keys fishery were more variable because the fishery operated mostly on recruits with fluctuations in recruitment

not buffered by multiple year classes in the fishery; whereas the landings from the lower Florida Keys fishery were more stable and that fishery operated on more year classes.

Muller et al. (1997) indicated that since 1993 the fishing mortality rate decreased by 16 percent, even as landings increased, but cautioned that this may be due to natural fluctuations rather than the reduction in traps. Based on the analyses of Muller et al. (1997) and additional analysis from the sub-group, the CSAP concluded that the spiny lobster fishery is not overfished nor was it undergoing overfishing because the biomass transitional SPR (SSBR) is above 20%. The fishery is probably currently operating at or near MSY; and the continuation of the Trap Reduction Program should provide increased protection against overfishing.

#### IV. REVIEW OF THE LITERATURE

- Bert, T. M., J. Tilmant, J. Dodrill, and G. E. Davis. 1996. Aspects of the population dynamics and biology of the stone crab (*Menippe mercenaria*) in Everglades and Biscayne National Parks as determined by trapping. National Park Service, Report SFRC-86/04. 77pp.
- FMRI. 1997. Status of the spiny lobster, 1997. Rpt. to FMFC. FDEP. FMRI. St. Petersburg, Florida. 10pp.
- GMFMC. 1979. FMP/EIS for the Gulf of Mexico stone crab fishery. GMFMC. Tampa, Florida. 138pp. (MSY section).
- GMFMC. 1981. FMP/EIS for the Gulf of Mexico spiny lobster fishery. GMFMC. Tampa, Florida. 187pp. (MSY section).
- GMFMC. 1981. FMP for the Gulf of Mexico shrimp fishery (Revised). GMFMC. Tampa, Florida. 236pp. (MSY section).
- GMFMC. 1990. Amendment 4 to the stone crab FMP. GMFMC. Tampa, Florida. 23pp.
- GMFMC/SAFMC. 1990. Amendment 3 to the FMP for spiny lobster. GMFMC. Tampa, Florida. 16pp.
- GMFMC. 1991. Amendment 5 to the Shrimp FMP. GMFMC. Tampa, Florida. 32pp.
- GMFMC. 1994. Amendment 7 to the Shrimp FMP. GMFMC. Tampa, Florida. 30pp.
- GMFMC. 1995. Amendment 8 to the Shrimp FMP. GMFMC. Tampa, Florida. 31pp.
- GMFMC. 1998. Preliminary draft options paper for generic SFA amendment. (Section 8.1). memo file rpt. 15pp.
- SAFMC. 1998. Comprehensive amendment addressing the SFA provisions. (Section 4.3.4). memo. file rpt. p.69-95.
- SSAP. 1993. Gulf of Mexico shrimp fishery recruitment overfishing definition workshop 2. GMFMC. Tampa, Florida. 12pp.
- Bertelson, R., J. Hunt. 1996. Spiny lobster spawning potential and population assessment: a monitoring program for the south Florida area. Final completion rpt: first year. MARFIN Grant 0518. FDEP. Marathon, Florida. 22pp.

- Bertelson, R., J. Hunt. 1997. Spiny lobster spawning potential and population assessment: a monitoring program for the south Florida area. Final completion rpt: second year. MARFIN Grant 0518. FDEP. Marathon, Florida. 25pp.
- Condrey, R., 1995. Personal communication to Terry Leary on royal red shrimp MSY computations. memo. rpt. 9pp.
- Gregory, D.R., R.F. Labisky and C.L. Combs. 1982. Reproductive dynamics of the spiny lobster, *Panulirus argus*, in south Florida. Trans. Amer. Fish. Society. 111:575-584.
- Klima E., J. Nance, E. Martinez and T. Leary. 1990. Workshop on the definition of shrimp recruitment overfishing. NOAA Tech. Memo. NMFS-SEFC-264. NMFS. Galveston, Texas. 18pp.
- Mace, P., L. Botsford, J. Collie, W. Gabriel, P. Goodyear, J. Power, V. Restrepo, A. Rosenberg, M. Sissenwine, G. Thompson and J. Witzig. 1996. Scientific review of definitions of overfishing in U.S. fishery management plans - Supplemental report. NMFS, Silver Spring, Maryland. 20pp.
- Muller, R., and T. Bert. 1997. 1997 update on Florida's stone crab fishery. Rpt. to FMFC. FDEP. FMRI. St. Petersburg, Florida. 23pp.
- Muller, R., J. Hunt, T. Matthews and W. Sharp. 1997. Evaluation of effort reduction in the Florida Keys spiny lobster, *Panulirus argus*, fishery using age-structured population analysis. CSIRO Australia Mar. Freshwater Res. 1997. 48, 1045-1058.
- Nance, J., E. Klima and T. Czaplá. 1989. Gulf of Mexico Shrimp Stock Assessment Workshop. NOAA Tech. Memo SEFC-NMFS-239. NMFS. Galveston, Texas. 43pp.
- Nance, J., 1995. Shrimp recruitment overfishing analysis for 1995. memo. rpt. prepared for GMFMC. NMFS. Galveston, Texas. 6pp.
- Restrepo, V.R., 1989. Population dynamics and yield-per-recruit assessment of southwest Florida stone crabs, *Menippe mercenaria*. Ph.D. dissertation, University of Miami, Coral Gables, Florida. 224pp.
- Rosenberg, A., P. Mace, G. Thompson, G. Darcy, W. Clark, J. Collie, W. Gabriel, A. MacCall, R. Methot, J. Powers, V. Restrepo, T. Wainwright, L. Botsford, J. Hoening and K. Stokes. 1994. Scientific review of definitions of overfishing in U.S. fishery management plans. NMFS, Washington, DC. 205pp.

## V. LIST OF PANEL MEMBERS AND ATTENDEES

### Panel Members:

James Nance, Chairman  
Ken Heck, V. Chairman  
Claude Boudreaux  
Albert Jones  
Scott Nichols  
Gilmore Pellegrin

### Others:

Pete Aparicio  
Bob Shipp  
Wayne Swingle  
Rick Leard  
Tom McIlwain  
Pete Eldridge  
Clay Porch

**Appendix H. Classification Codes and Definitions from the U.S. Census Bureau and Department of Commerce Bureau of Economic Analysis.**

**OCCUPATION CLASSIFICATION CODES**

497-502 Fishers, Hunters, and Trappers

497 Captains and other officers, fishing vessels (part 8241)

498 Fishers (583)

499-502 Hunters and trappers (584)

**Fishers and Related Fishing Workers**

Use nets, fishing rods, traps, or other equipment to catch and gather fish or other aquatic animals from rivers, lakes, or oceans, for human consumption or other uses. May haul game onto ship. Include aquacultural laborers who work on fish farms with "Agricultural Workers, All Others."

**Personal Income by major source and Earnings by industry**

Personal income (Table CA05) is a measure of income received; therefore, estimates of State and local area personal income reflect the residence of the income recipients. The adjustment for residence is made to wages and salaries, other labor income, and personal contributions for social insurance, with minor exceptions, to place them on a place-of-residence (where-received) basis. The adjustment is necessary because these components of personal income are estimated from data that are reported by place of work (where earned). The estimates of proprietors' income, although presented on the table as part of place-of-work earnings, are largely by place of residence; no residence adjustment is made for this component. Net earnings by place of residence is calculated by subtracting personal contributions for social insurance from earnings by place of work and then adding the adjustment for residence, which is an estimate of the net inflow of the earnings of interarea commuters. The estimates of dividends, interest, and rent, and of transfer payments are prepared by place of residence only.

Estimates of earnings by place of work are provided in CA05 at the two-digit Standard Industrial Classification (SIC) level. The principal source data for the wage and salary portion of REMD's earnings estimates are from the Bureau of Labor Statistics (BLS) ES-202 series. The ES-202 series provides monthly employment and quarterly wages for each county in four-digit SIC detail. REMD restricts its earnings estimates to the SIC Division ("one-digit") and two-digit levels and suppresses these estimates in many individual cases in order to preclude the disclosure of information about individual employers.

Greater detail of REMD income methodology is located in the Methods Section

**METROPOLITAN AREA (MA)**

The general concept of a metropolitan area (MA) is one of a large population nucleus, together with adjacent communities that have a high degree of economic and social integration with that nucleus. Some MA's are defined around two or more nuclei. The MA classification is a statistical standard, developed for use by Federal agencies in the production, analysis, and



publication of data on MA's. The MA's are designated and defined by the Federal Office of Management and Budget, following a set of official published standards. These standards were developed by the interagency Federal Executive Committee on Metropolitan Areas, with the aim of producing definitions that are as consistent as possible for all MA's nationwide.

Each MA must contain either a place with a minimum population of 50,000 or a Census Bureau-defined urbanized area and a total MA population of at least 100,000 (75,000 in New England). An MA comprises one or more central counties. An MA also may include one or more outlying counties that have close economic and social relationships with the central county. An outlying county must have a specified level of commuting to the central counties and also must meet certain standards regarding metropolitan character, such as population density, urban population, and population growth. In New England, MA's are composed of cities and towns rather than whole counties.

The territory, population, and housing units in MA's are referred to as "metropolitan." The metropolitan category is subdivided into "inside central city" and "outside central city." The territory, population, and housing units located outside MA's are referred to as "nonmetropolitan." The metropolitan and nonmetropolitan classification cuts across the other hierarchies; for example, there is generally both urban and rural territory within both metropolitan and nonmetropolitan areas.

To meet the needs of various users, the standards provide for a flexible structure of metropolitan definitions that classify an MA either as a metropolitan statistical area (MSA) or as a consolidated metropolitan statistical area (CMSA) that is divided into primary metropolitan statistical areas (PMSA's). Documentation of the MA standards and how they are applied is available from the Secretary, Federal Executive Committee on Metropolitan Areas, Population Division, U.S. Bureau of the Census, Washington, DC 20233.

### Central City

In each MSA and CMSA, the largest place and, in some cases, additional places are designated as "central cities" under the official standards. A few PMSA's do not have central cities. The largest central city and, in some cases, up to two additional central cities are included in the title of the MA; there also are central cities that are not included in an MA title. An MA central city does not include any part of that city that extends outside the MA boundary.

### Consolidated and Primary Metropolitan Statistical Area (CMSA and PMSA)

If an area that qualifies as an MA has more than one million persons, primary metropolitan statistical areas (PMSA's) may be defined within it. PMSA's consist of a large urbanized county or cluster of counties that demonstrates very strong internal economic and social links, in addition to close ties to other portions of the larger area. When PMSA's are established, the larger area of which they are component parts is designated a consolidated metropolitan statistical area (CMSA).

### Metropolitan Statistical Area (MSA)

Metropolitan statistical areas (MSA's) are relatively freestanding MA's and are not closely associated with other MA's. These areas typically are surrounded by nonmetropolitan counties.

### Metropolitan Area Title and Code

The title of an MSA contains the name of its largest central city and up to two additional city names, provided that the additional places meet specified levels of population, employment, and commuting. Generally, a city with a population of 250,000 or more is in the title, regardless of other criteria.

The title of a PMSA may contain up to three place names, as determined above, or up to three county names, sequenced in order of population. A CMSA title also may include up to three names, the first of which generally is the most populous central city in the area. The second name may be the first city or county name in the most populous remaining PMSA; the third name may be the first city or county name in the next most populous PMSA. A regional designation may be substituted for the second and/or third names in a CMSA title if such a designation is supported by local opinion and is deemed to be unambiguous and suitable by the Office of Management and Budget.

The titles for all MA's also contain the name of each State in which the area is located. Each metropolitan area is assigned a four-digit FIPS code, in alphabetical order nationwide. If the fourth digit of the code is a "2," it identifies a CMSA. Additionally, there is a separate set of two-digit codes for CMSA's, also assigned alphabetically.

### MSAs in the South Atlantic Region

1440				Charleston-North Charleston, SC MSA
1440	45	015	1	Berkeley County
1440	45	019	1	Charleston County
1440	45	035	1	Dorchester County
2020				Daytona Beach, FL MSA
2020	12	035	2	Flagler County
2020	12	127	1	Volusia County
2710				Fort Pierce-Port St. Lucie, FL MSA
2710	12	085	1	Martin County
2710	12	111	1	St. Lucie County
3600				Jacksonville, FL MSA
3600	12	019	1	Clay County
3600	12	031	1	Duval County
3600	12	089	2	Nassau County
3600	12	109	2	St. Johns County

Appendix H

4900		Melbourne-Titusville-Palm Bay, FL MSA				
4900	12	009	1	Brevard County		
4992		56	Miami-Fort Lauderdale, FL CMSA			
4992	2680	56	Fort Lauderdale, FL PMSA			
4992	2680	56	12	011	1 Broward County	
4992	5000	56	Miami, FL PMSA			
4992	5000	56	12	025	1 Dade County	
5330		Myrtle Beach, SC MSA				
5330	45	051	1	Horry County		
7520		Savannah, GA MSA				
7520	13	029	2	Bryan County		
7520	13	051	1	Chatham County		
7520	13	103	2	Effingham County		
8960		West Palm Beach-Boca Raton, FL MSA				
8960	12	099	1	Palm Beach County		
9200		Wilmington, NC MSA				
9200	37	019	2	Brunswick County		
9200	37	129	1	New Hanover County		