

Draft Goliath Grouper Rebuilding Plan

**5.6.2 Goliath Grouper Rebuilding Plan**

*Note: This section to be completed following the January 12-15, 2004 Goliath Grouper Assessment SEDAR Review Workshop in Tampa, Florida and subsequent review by the Reef Fish SSC.*

**5.6.2.1 Biological Reference Points and Status Determination Criteria for Goliath Grouper**

5.6.2.1.1 Maximum Sustainable Yield (MSY)

**Alternative 1. Status quo - Do not define an MSY for goliath grouper until such time as an MSY can be estimated in a stock assessment.**

**Alternative 2. Set an interim MSY equal to zero until such time as a non-zero MSY can be estimated in a stock assessment.**

**Alternative 3. Set MSY equal to the average total reported landings (commercial, MRFSS, and headboat) of goliath grouper during the 1980s, 1.45 mp (from various graphs).**

**Alternative 4. Set MSY equal to the yield corresponding to  $F_{MSY}$ , currently estimated at about 0.60 million pounds (see discussion).**

**Alternative 5. Set MSY equal to the yield corresponding to  $F_{50\%SPR}$ , currently estimated at about 0.24 million pounds (see discussion).**

Alternative 1 retains the status quo of not defining an MSY level, due to the paucity of scientific information on which to calculate an MSY. The alternative is worded to make it clear that the selection of an MSY level is only deferred, not rejected, until more information is available on which to base a more scientifically defensible MSY.

Alternative 2 is similar to Alternative 1 in that it defers the ultimate setting of an equilibrium MSY until more information is available. However, rather than leave MSY

undefined, it sets the MSY at zero until this information is obtained. This MSY would prevent the setting of a non-zero TAC until more scientific information is available and is therefore the most conservative alternative presented.

Alternative 3 sets MSY equal to the average total landings (commercial, MRFSS, and headboat) of goliath grouper during the years in the 1980s prior to the moratorium when landings statistics from all three sectors is available, around 1.45 mp. (I don't have the actual numbers, that's from eyeballing various graphs). However, estimating MSY by using an average of the annual landings from the years prior to the fishing moratorium would likely overestimate MSY since those would have been years when overfishing was occurring.

Alternative 4 sets MSY equal to the best current estimate of the equilibrium yield associated with  $F_{MSY}$ . Figure 4 in the goliath grouper assessment, shows that  $F$  during the 1980s was about 2.4 times higher than  $F_{MSY}$ . The average total landings (commercial, MRFSS, and headboat) of goliath grouper during the 1980s was about 1.45 mp (from various graphs). Therefore, MSY can be estimated as  $1.45/2.4 = 0.60$  mp. Since this estimate is based on fishing at  $F_{MSY}$  on an already depleted stock, it probably underestimates true MSY. From this standpoint, it could be considered a conservative estimate of MSY. However, the use of MSY-related statistics as reference points seems rather risky for such a long-lived animal-- they corresponds to an SPR well below 30% and depend on the selectivity of the fishery which is poorly known (personal communication, Clay Porch).

Alternative 5 sets MSY equal to the best current estimate of the equilibrium yield associated with  $F_{50\% SPR}$ . The Council proposed 50% static SPR as a proxy for goliath grouper for both the MSY and OY levels in its 1999 Generic SFA amendment, but SPR-based biomass proxies were rejected by NMFS. However, the Gulf Council's SPR based overfishing threshold for goliath grouper, which was accepted, is a fishing mortality rate equivalent to 50% static SPR. In the event that a spawner-recruit steepness cannot be directly estimated given the data and model, a  $B_{MSY}$  proxy at  $B_{50\% SPR}$  is consistent with the intent of the Council's generic SFA amendment (personal communication, Gerry Scott). The ratio of  $F$  to  $F_{50\% SPR}$  is approximately 6, so the equilibrium catch at  $F_{50\% SPR}$  is about  $1.45/6 = .24$  mp (personal communication, Clay Porch).

#### 5.6.2.1.2 Optimum Yield (OY)

**Alternative 1. Status quo - Do not define an OY for goliath grouper until such time as an MSY can be estimated in a stock assessment.**

**Alternative 2. Set OY equal to zero.**

**Alternative 3. Set OY equal to the yield corresponding to  $F_{50\%SPR}$ , currently estimated at about 0.24 million pounds (see discussion).**

**Alternative 4. Set OY equal to 90% of the MSY level.**

Alternative 1 retains the status quo of not defining an OY level, due to the paucity of scientific information on which to calculate an MSY, and the M-S Act's definition of optimum yield as being based on MSY (as reduced by relevant economic, social, or ecological factors). This alternative would be appropriate if Alternative 1 is selected for MSY, and is worded to make it clear that the selection of an OY level is only deferred, not rejected, until more information is available on which to base a more scientifically defensible MSY.

Alternative 2 sets OY equal to zero. This could be either an interim OY if an MSY is left undefined, or an ongoing OY. As an ongoing OY, this would conserve the goliath grouper stock for the benefit of the ecotourism industry. In addition, the very small numbers of goliath grouper that could be potentially harvested under MSY Alternatives 3, 4 and 5 would create difficulties in allocation and enforcement. Assuming an average size of 250 pounds, the maximum numbers of goliath grouper that could be harvested under MSY Alternatives 3, 4, and 5 are 5800, 2400, and 960 fish. These numbers do not take into account incidental mortality of goliath grouper from bycatch and poaching which was of concern to the 2004 SEDAR Assessment Review Workgroup, and would have to be reduced to account for such mortality.

Alternative 3 sets OY equal to the best current estimate of the equilibrium yield associated with  $F_{50\%SPR}$ . The Council proposed 50% static SPR as a proxy for goliath grouper for both the MSY and OY levels in its 1999 Generic SFA amendment, but SPR-based biomass proxies were rejected by NMFS. However, data for directly estimating biomass reference points does not currently exist. Consistent with the intent of the Council's generic SFA amendment, the equilibrium catch at  $F_{50\%SPR}$ , as discussed under MSY alternatives, is about 0.24 million pounds.

Alternative 4 sets OY equal to 90% of the MSY level. This is an arbitrary reduction from MSY to provide a buffer between MSY and OY in order to prevent MSY from being inadvertently exceeded. Under MSY Alternatives 3, 4, and 5, the OY would be 1.305 mp, 0.54 mp, or 0.216 m respectively. In terms of numbers of goliath grouper that could be harvested, at an average weight of 250 pounds, this would be 5220, 2160, and 864 fish. These numbers do not take into account incidental mortality of goliath grouper from bycatch and poaching which was of concern to the 2004 SEDAR Assessment Review Workgroup, and would have to be reduced to account for such mortality.

#### 5.6.2.1.3 Minimum Stock Size Threshold (MSST)

**Alternative 1. MSST for goliath grouper is  $(1-M)*B_{MSY}$  using the lowest estimated value of M (0.04), or  $0.96*B_{MSY}$ .**

**Alternative 2. MSST for goliath grouper is  $(1-M)*B_{MSY}$  using the mean estimated value of M (0.11), or  $0.89*B_{MSY}$ .**

**Alternative 3. MSST for goliath grouper is  $(1-M)*B_{MSY}$  using the highest estimated value of M (0.19), or  $0.81*B_{MSY}$ .**

**Alternative 4. MSST for goliath grouper is  $0.5*B_{MSY}$ .**

It is not possible at present to calculate absolute estimates of  $B_{MSY}$ . However, relative values of  $B_{year}/B_{MSY}$  have been estimated in the 2003 goliath grouper stock assessment and 2004 SEDAR Assessment Review Workshop Report. For purposes of developing these relative biomass levels,  $B_{50\% SPR}$  was used as a proxy for  $B_{MSY}$ .

The SEDAR Assessment Review Workshop Report noted that conclusions of the assessment are applicable to Goliath Grouper within the limited area covered by the available data (waters off of south Florida south of 26° N latitude). However, this region covers the primary area of goliath grouper abundance.

The estimated current status of the stock is dependent on the assumed level of effectiveness of the goliath grouper harvest moratorium. Participants at the 2004 SEDAR Assessment Review Workshop surmised that fishing mortality is continuing to occur as a result of longline by-catch, post-release mortality, and illegal harvest. The workshop had no data from which to estimate the current level of F, and therefore bracketed their advice around assumptions that the moratorium is either 90% or 99% effective.

For 2002 (the current status year in the analyses), the relative biomass of goliath grouper was estimated to be  $0.72*B_{MSY}$  at 90% effectiveness, or  $0.85*B_{MSY}$  at 99% effectiveness. Thus, goliath grouper would be below MSST and classified as overfished under Alternatives 1 or 2. Under Alternative 3, the stock would be overfished at 90% effectiveness, but would be above MSST (not overfished) at 99% effectiveness. Under Alternative 4, the stock would be above MSST and not overfished under either effectiveness assumption. The stock was projected to continue its recovery if the moratorium remains in place, and would reach  $B_{MSY}$  in 2009 at 90% effectiveness or in 2005 at 99% effectiveness. The status estimates and projections are summarized in the table below.

Goliath grouper estimated current status and projected recovery time relative to MSST Alternatives.

	90% Effectiveness	99% Effectiveness
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	Status relative to MSST	Year $B_{MSY}$ projected	Status relative to MSST	Year $B_{MSY}$ projected
Alternative 1	below	2009	below	2005
Alternative 2	below		below	
Alternative 3	below		above	
Alternative 4	above		above	

It should be emphasized that there is a high degree of uncertainty associated with these assessment results. For this reason, the SEDAR Assessment Review Workshop Report recommended that the moratorium be maintained at least until a future assessment shows that the biomass achieves the rebuilding target. The report cautioned that any fishery could risk rapidly depleting the stock, and would require careful monitoring.

#### 5.6.2.1.4 Maximum Fishing Mortality Threshold (MFMT)

**Alternative 1: MFMT for goliath grouper is set equal to the  $F_{MSY}$  proxy of  $F_{50\% SPR}$ , currently estimated at 0.05.**

**Alternative 2: MFMT for goliath grouper is set equal to the  $F_{MSY}$  proxy of  $F_{40\% SPR}$ , currently estimated at 0.07.**

**Alternative 3: MFMT for goliath grouper is set equal to the direct estimate of  $F_{MSY}$ , currently estimated at:**

- a. 0.083 (assuming 90% moratorium effectiveness)
- b. 0.093 (assuming 99% moratorium effectiveness)

Alternative 1 is consistent with the overfishing definition adopted in the Generic SFA Amendment, and is the most conservative estimate of  $F_{MSY}$ .

Alternative 2 is consistent with the overfishing definition adopted by the South Atlantic Fishery Management Council.

Alternative 3 is the directly estimated  $F_{MSY}$ . However, the estimate of  $F_{MSY}$  could not be reliably estimated on account of concerns over selectivity and the exact stock-recruitment relationship (2004 SEDAR Review Workshop Report). In addition, the use of MSY-related statistics as a reference point may be risky for such a long-lived animal, since it corresponds to an SPR well below 30% and depends on the selectivity of the fishery which is poorly known. As a result, SEFSC biologists strongly supported the suggestion to use proxies based on 50% SPR (personal communication, Clay Porch).

## 5.6.2.2 Rebuilding Plan for Goliath Grouper

### 5.6.2.2.1 Rebuilding Target Date

**Alternative 1. 2005 (99% moratorium effectiveness)**

**Alternative 2. 2009 (90% moratorium effectiveness)**

**Alternative 3. 2015 (10-year rebuilding)**

**Alternative 4. 2030 (10 years + 15-year generation time)**

**Alternative 5. 2055 (10 years + 40-year generation time)**

Alternative 1 (target date = 2005) is the estimated year when the goliath grouper stock will be rebuilt to  $B_{50\% \text{ SPR}}$  (as a proxy for  $B_{\text{MSY}}$ ) if the moratorium is 99% effective. However, due to uncertainties about the moratorium effectiveness and the assumptions for biological parameters, this rebuilding target may not be realistic.

Alternative 2 (target date = 2009) is the estimated year when the goliath grouper stock will be rebuilt to  $B_{50\% \text{ SPR}}$  (as a proxy for  $B_{\text{MSY}}$ ) if the moratorium is 90% effective. However, as with Alternative 1, due to uncertainties about the moratorium effectiveness and the assumptions for biological parameters, this rebuilding target may not be realistic.

Alternative 3 (target date = 2015) is 10 years from the expected implementation date of this rebuilding plan of 2005. This is the maximum rebuilding time allowed under the Magnuson-Stevens Act for stocks that can be rebuilt in 10 years or less.

Alternative 4 (target date = 2030) is based on 10 years plus 1 generation time of 15 years (25 years total) from 2005. If the estimates of rebuilding in the absence of fishing are not reliable, rebuilding may take more than 10 years. Since the rebuilding period is unknown in this scenario, 10 years is arbitrarily selected as the minimum rebuilding period, and 15 years is the low-end generation time estimated by Legault and Eklund (1998).

Alternative 5 (target date = 2055) is based on 10 years plus 1 generation time of 40 years (50 years total) from 2005. If the estimates of rebuilding in the absence of fishing are not reliable, rebuilding may take more than 10 years. Since the rebuilding period is unknown in this scenario, 10 years is arbitrarily selected as the minimum rebuilding period, and 50 years is the high-end generation time estimated by Legault and Eklund (1998).

#### 5.6.2.2.2 Rebuilding Strategy

**Alternative 1. Status quo. Continue the harvest moratorium until a future stock assessment indicates that the stock has recovered to  $B_{MSY}$ .**

**Alternative 2. Establish an incidental take permit with the requirement that goliath grouper retained under such permit much be made available to NMFS or to a recognized research facility. Each permit will be valid for the incidental take of one goliath grouper, and the number of permits issued will be set by NMFS annually prior to the start of the fishing year.**

**Alternative 3. Set a total allowable catch beginning in the year selected as a rebuilding target date in Section 5.6.2.2.1 equal to the OY level selected in Section 5.6.2.1.2. A limit of 1 goliath grouper per vessel would apply to all vessels, recreational or commercial. All vessels that harvest goliath grouper would be required to report their catch to NMFS within 24 hours. The goliath grouper fishery will close when the total allowable catch is taken.**

Alternative 1 continues the existing harvest moratorium, and sets the criteria for lifting the moratorium on a future stock assessment that indicates the stock has achieved  $B_{MSY}$  (or  $B_{MSY}$  proxy). This was the recommendation of the February 2004 Goliath Grouper SEDAR Assessment Review Advisory Report.

Alternative 2 is based on recommendations made by the Reef Fish AP and the Standing and Special Reef Fish SSC at their April 28-29, 2004 meetings. It would establish permits to allow a limited take of goliath grouper in order to provide samples for biological studies. The number of goliath grouper that could be harvested annually would be set by NMFS. Additionally, such permits could be structured geographically and/or seasonally to allow a distribution of samples throughout the year and range of occurrence.

Under Alternative 3, harvest would be scheduled to open in the year 2005, 2009, 2015, 2030, or 2055 depending on the target date selected. The allowable harvest would be set at the OY level, which the stock would presumably be capable of sustaining. Given the small numbers of fish that could be harvested under these OY levels, it may be preferable to express OY in numbers of fish rather than pounds. Assuming an average size of 250 pounds, the possible non-zero harvest levels would be

Possible Goliath Grouper Harvest Levels Under Alternative 3

	Pounds	Numbers of Fish
OY Alt. 4 /w MSY Alt. 3	1.31 mp	5220
OY Alt. 4 /w MSY Alt. 4	0.54 mp	2160
OY Alt. 3	0.34 mp	960
OY Alt. 4 /w MSY Alt. 5	0.22 mp	894

A vessel limit of 1 goliath grouper per vessel is set to avoid rapid depletion of localized populations and to discourage commercial harvest other than as an incidental catch. Vessels would be required to report their catch to NMFS using a reporting system to be developed by NMFS in order to facilitate monitoring of the catch.

#### 5.6.2.2.3 Bycatch and Bycatch Monitoring

**Alternative 1. Status quo. Do not establish goliath grouper specific bycatch reduction or monitoring policies beyond those established for the reef fish fishery in general.**

**Alternative 2. Prohibit the removal of goliath grouper from the water for any reason whatsoever (other than scientific expeditions with appropriate permits). Goliath grouper must be released by removing the hook or cutting the line while the fish is in the water.**

**Alternative 3. Require a vessel permit for catch-and-release fishing of goliath grouper. As a condition for receiving the permit, the vessel operator must agree to keep a logbook of his catch-and-release catches and effort, including the observed fate of released fish.**

Alternative 1 would still require goliath grouper to be subject to any existing bycatch monitoring or reduction rules, or to any adopted for the reef fish fishery in general under Amendment 18 or 22.

Alternative 2 is based on a recommendation made by the Standing and Special Reef Fish SSC at their April 28-29, 2004 meeting. Any handling of the fish out of the water would be prohibited, including photographing. Fishermen would be required to release the fish while still in the water using a method that will cause the least harm to the fish.

Alternative 3 would establish a permit and logbook system to monitor the directed catch-and-



release fishery for goliath grouper. It could help to determine the survival of goliath grouper caught in this fishery, and could provide an additional CPUE index for future stock assessments. However, this would only affect the directed goliath grouper fishery. Incidental take of goliath groupers in other fisheries would remain unmonitored.

Reported spawning season: June, July, August, September  
(references include Florida for all months)

Size and Age of Maturity: 43-53 inches TL, 4-7 years  
Maximum Size and Age: 85 inches TL  
Estimated maximum longevity: 37 years (Eklund 2002),  
40 - 80 years (Legault and Eklund 1998)  
Natural mortality rate (M): 0.037 - 0.19

Generation time for goliath grouper was estimated by Legault and Eklund (1998) to be 15-40 years, but may be much larger than that if M is low and there is a large increase in spawning frequency with age.

Methyl-mercury concentrations exceeding USDA's action level of 1ppm (N=8; large fish caught from 1989-1991) have been found.