

Tab B, No. 6(b)

Greater Amberjack Scoping Options

Secretarial Amendment 2 to the Reef Fish FMP established a rebuilding plan for greater amberjack based on a stock assessment conducted in 2000. That assessment determined that the greater amberjack stock was overfished and undergoing overfishing as of 1998. The effects of management measures to reduce the recreational bag limit from three to one fish (January, 1997) and to close the commercial fishery from March through May (January, 1998) were not incorporated into the assessment because they were too new; however, the projected effects of these management measures were expected to eliminate overfishing. A new stock assessment completed in 2006 (SEDAR 9) determined that greater amberjack is continuing to undergo overfishing as of 2004 and is still overfished.

Biological reference points and status criteria from Secretarial Amendment 2 are:

Maximum Sustainable Yield (MSY) for greater amberjack is the yield associated with $F_{30\% SPR}$ (proxy for F_{MSY}) when the stock is at equilibrium.

Optimum Yield (OY) for greater amberjack is the yield associated with an $F_{40\% SPR}$ when the stock is at equilibrium.

Set $MFMT = F_{30\% SPR}$; The greater amberjack stock would be considered undergoing overfishing if the probability that $F_{current}$ is larger than $F_{30\% SPR}$ is greater than 50 percent.

Set the minimum stock size threshold (MSST) to $(1-M)*B_{MSY}$ or 75 percent of B_{MSY} . Using the proxy of F_{MSY} being $F_{30\% SPR}$, greater amberjack stocks in the Gulf of Mexico will be considered overfished if the probability that $B_{current}$ is less than MSST is greater than 50 percent.

Rebuilding Plan specified in Secretarial Amendment 2 is:

Limit the harvest of greater amberjack for 3-year intervals with the expected harvest set at the yield associated with $F_{40\% SPR}$ for the first year of each interval (Rebuild the stock in 7 years). Expected harvest would be 2.9 mp for 2003-2005, 5.2 mp for 2006-2008, 7.0 mp for 2009-2011, and for 7.9 mp for 2012.

Action 1: Greater Amberjack Rebuilding Plan.

The rebuilding plan established through Secretarial Amendment 2 set TAC as the first year of each three-year interval under an $F_{40\% SPR}$ yield trajectory (Turner and Scott, 2002). Table 7 from that report is reproduced in part below (Table 1). Yield projections from both the 2001 and 2006 assessments are separated into directed yield and yield associated with discard mortality.

Table 1. Historical landings and dead discards through 2005 and projections from the 2001 and 2006 greater amberjack assessments. Yield projections from the 2001 assessment are based on $F_{40\%SPR}$. Yield projections from the 2006 assessment are based on a 40 percent reduction in F_{2004} . Values are in thousands of pounds.

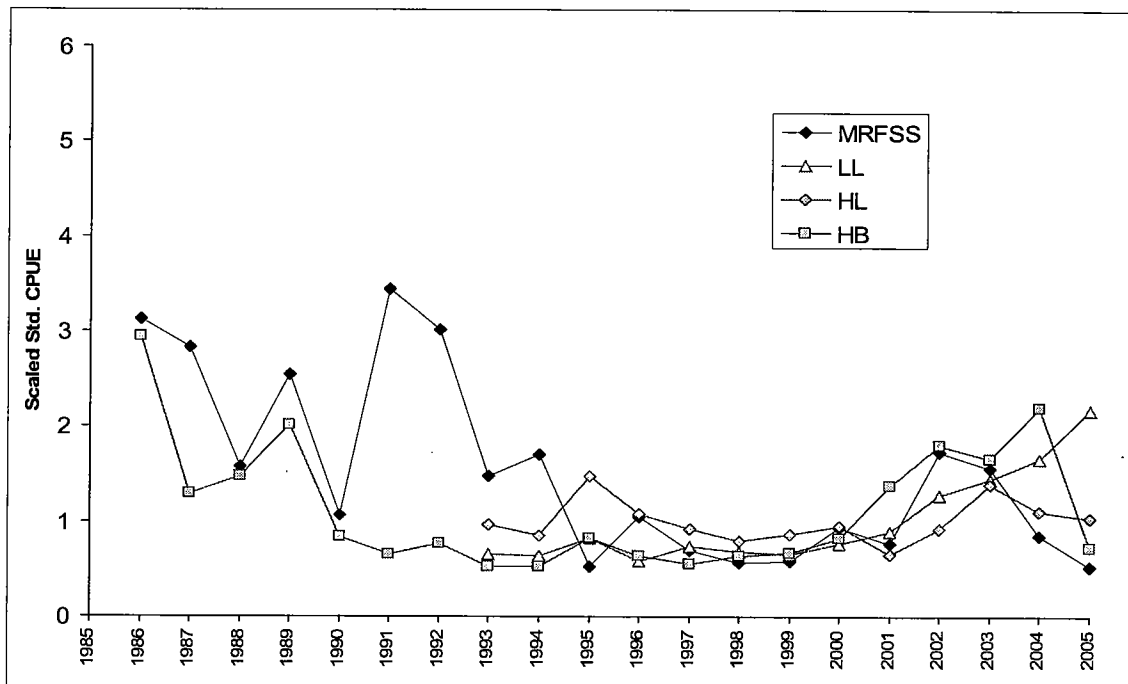
Year	Historical Yield		2001 Assessment		2006 Assessment	
	Directed	Discard	Directed	Discard	Directed	Discard
1986	6,559	808				
1987	6,386	812				
1988	3,589	877				
1989	7,857	1,150				
1990	2,324	613				
1991	4,924	917				
1992	3,643	650				
1993	4,661	923				
1994	3,526	689				
1995	2,115	636				
1996	2,763	650				
1997	2,184	549				
1998	1,435	422				
1999	1,652	446				
2000	1,974	526				
2001	2,059	808	1,988	579		
2002	2,879	649	1,500	436		
2003	3,688	659	2,259	658		
2004	3,095	578	2,788	812		
2005	2,540	474	3,346	974	3,092	577
2006			3,998	1,164	3,089	577
2007			4,605	1,340	2,177	406
2008			5,055	1,472	2,795	522
2009			5,433	1,581	3,305	617
2010			5,732	1,669	3,668	685
2011			5,951	1,732	3,901	728
2012			6,134	1,785	4,039	754
2013					4,118	769
2014					4,162	777
2015					4,186	782
2016					4,199	784

NOTE: values in the shaded boxes were estimated in order to start the projections in 2007, when new regulations were likely to be implemented. Landings and dead discards for 2005 are estimated.

Projected yields at $F_{40\%SPR}$ from the 2001 assessment combined directed yield and dead discards (Turner and Scott, 2002). The new assessment estimated both directed yield and dead discards from 1986 through 2004. The historical yield values for 2005 are estimated based on currently available landings data. Total harvest (directed and dead discards) over the first three-year

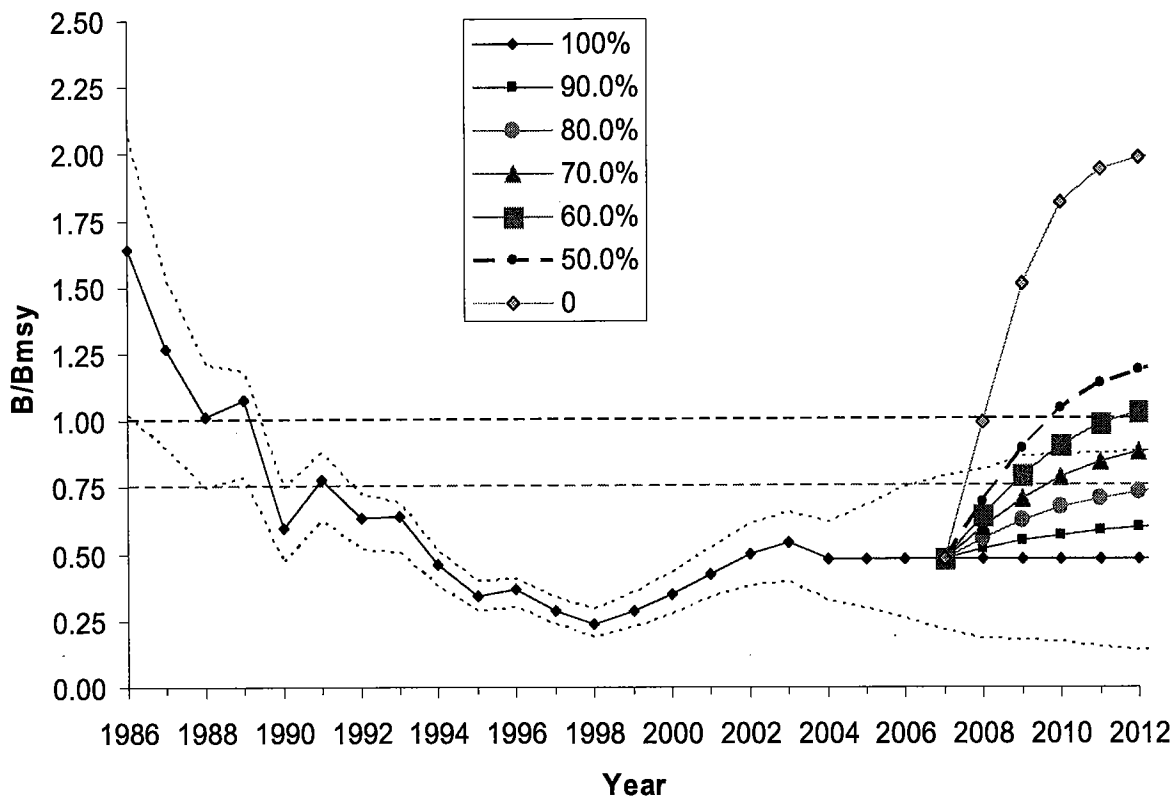
rebuilding period (2003 – 2005) has exceeded the rebuilding plan TACs of 2.9 mp (included both directed harvest and dead discards) by approximately 0.761 mp annually or about 26 percent. Directed yields during this same time period exceeded the directed yield expected (2.25 mp) by approximately 0.862 mp annually or about 38 percent. CPUE estimates have declined significantly during this same time period so it is likely that stock availability has decreased (Figure 1).

Figure 1. Greater Amberjack Catch Per Unit Effort trends from recreational (MRFSS and Headboat) and commercial (Longline and Handline) sectors from 1985 through 2005. Reprinted from a PowerPoint presentation given to the SSC and Reef Fish AP on August 8, 2006 by Guillermo Diaz, SEFSC



The 2006 assessment and projections indicated that a 40% reduction in fishing mortality would be required starting in 2007 in order to eliminate overfishing and rebuild the stock to B_{MSY} by 2012, the date that the regulations specified [check wording of federal regs] (Figure 2). Projected yields for 2005 and 2006 were based on constant $F_{current}$. The reduction in yield corresponding to a 40 percent reduction in F is approximately 29.5 percent based on either the difference between the 2006 and 2007 projected yields or the difference between the average 2004 through 2006 projected yield and the 2007 projected yield.

Figure 2. Greater Amberjack relative biomass trends from 1986 to 2004 and relative biomass projections from 2005 through 2012 using constant fishing mortality rate trajectories at various reductions in the level of F relative to F during 2004. Reprinted from a PowerPoint presentation given to the SSC and Reef Fish AP on August 8, 2006 by Guillermo Diaz, SEFSC



Proposed Alternatives to Modify the Rebuilding Plan

The 2006 stock assessment estimates that a reduction in harvest of approximately 29.5 percent is necessary to rebuild the stock by 2012. Table 2 summarizes the proposed alternatives to rebuild the stock. **Alternative 1** is taken directly from Secretarial Amendment 2 and Amendment 1a is a modified version to indicate what directed yield would be. **Alternative 2 and 3** follow very similar stepped three-year constant catch alternatives in Secretarial Amendment 2 except that the yield streams are from the 2006 assessment projections. Target directed yields for Alternative 4 are those shown under the column labeled Assessment Projections. Alternative 5 does not set TAC but establishes a procedure to determine when an unacceptable level of overage occurs.

Table 2. Alternatives for changing the greater amberjack rebuilding plan based on projections from the 2006 stock assessment. Alternatives 1 and 1a are from the 2001 assessment.					
Year	Assessment Projections 60% $F_{CURRENT} = 0.518$ Directed Yield	Alternative 1 Status Quo Total Yield	Alternative 1a Status Quo Directed Yield	Alternative 2 First Year Directed Yield	Alternative 3 3-yr Avg. Directed Yield
2006	3,089	5,162	3,998		
2007	2,177	5,162	3,998	2,177	2,759
2008	2,795	5,162	3,998	2,177	2,759
2009	3,305	7,014	5,433	2,177	2,759
2010	3,668	7,014	5,433	3,668	3,869
2011	3,901	7,014	5,433	3,668	3,869
2012	4,039	7,919	6,134	3,668	3,869
2013	4,118			4,200	4,200
2014	4,162				
2015	4,186				
2016	4,199				
2007-2012 Total	19,884	39,285	30,428	17,534	19,884

Alternative 1: Status quo. Maintain the rebuilding plan as specified in Secretarial Amendment 2. TAC for 2006 – 2008 will be 5.2 mp, TAC for 2009 – 2011 will be 7 mp and TAC thereafter will be 7.9 mp.

This alternative would allow overfishing to continue. The stock would not rebuild by 2012 and likely would decline over time. A substitute alternative would have to be added (Alternative 1a) to increase the TAC from 2.9 mp to 4.0 mp (5.2 mp – dead discards, Table 1). This would not require a modification of the current management regulations because landings have not exceeded 4.0 mp.

Alternative 2: Modify the TAC levels for the 2007 – 2009 and 2010-2012 steps to the first year of each interval as defined by the constant F projection at 60 percent of F_{2004} from the 2006 assessment. TAC is defined as total directed landings. TAC for 2007 through 2009 would be

2.18 mp and TAC for 2010 through 2012 would be 3.67 mp. TAC for 2013 and later would be 4.2 mp.

Yield for 2007-2009 would be the 2007 value of 2.18 mp; however, it is likely that yield for 2007 will be unaffected by any new regulations. New regulations would require reductions in directed yield of approximately 30% as described above. This alternative shifts the three-year constant catch steps forward by one year and adjusts the TACs so that the stock will be rebuilt to B_{MSY} by 2012. Because the short time (five years) remaining to rebuild the stock requires deeper cuts, biomass is expected to increase beyond 2012 and level off by about 2017 allowing a directed yield of approximately 4.2 mp.

Alternative 3: Modify the TAC levels for the 2007 – 2009 and 2010-2012 steps as the average of each three-year interval as defined by the constant F projection at 60 percent of F_{2004} from the 2006 assessment. TAC is defined as total directed landings. TAC for 2007 through 2009 would be 2.76 mp and TAC for 2009 through 2012 would be 3.87 mp. TAC for 2013 and later would be 4.2 mp.

This alternative sets each three-year constant catch step as the average of the three-year constant F increment. This alternative is very similar to a rejected alternative in Secretarial Amendment 2 which used the second value (2.79 mp, 3.9 mp) for each three-year interval. Again, the yield in 2007 will likely be unaffected by any new regulations. Because biomass continues to increase through about 2020, yield can be allowed to increase to 4.2 mp after 2012. This alternative would require reductions in directed yield of approximately 10.7 percent. However, this plan is likely to lead to overruns in the third or possibly in the second year of each step, unless regulations are backed up by hard TACs.

Alternative 4: Modify the TAC levels for the 2007 through 2012 as the directed yield for each year as defined by the constant F projection at 60 percent of F_{2004} . Overrun caps would be set at 50 percent for any single year, 20 percent for any two-year period, and zero percent for each three-year period (2007 – 2009 and 2010 – 2012). TAC for 2013 and later would be 4.2 mp with the same single-year and multiyear caps as the rebuilding period.

Alternative 4 establishes target TACs each year as defined by the constant F projection at 60 percent of F_{2004} from the 2006 assessment. The target yield for the first year would be 2.18 mp and require regulations to reduce directed yield by about 30 percent. However, the 2007 TAC and following year TACs are considered targets, not hard TACs. Therefore, this alternative allows directed yields to vary from target TAC each year provided that the total of directed yields for 2007 – 2009 and for 2010 – 2012 are equal to or below the total of the target TACs. This allows some variation in the landings which is typical of all fisheries without hard quotas on all sectors. Variability is usually associated with changes in availability brought on by recruitment pulses or short-term environmental conditions such as red tide or weather conditions; whereas, trends are usually brought on by long-term environmental conditions or fishing. Large overruns in the early years of each interval would be difficult to overcome by naturally occurring reductions in the final year. To compensate for this possibility, an overrun cap of 50 percent is established for any single-year and a cap of 20 percent overrun is established for any two-year running total. Exceeding either the single-year or the two-year cap would trigger an overfishing

condition requiring additional management measures before the three-year increment is complete. Historical landings of greater amberjack have varied with as much as 118 percent increases and 70 percent decreases. Landings in 1989 and 1991 each exceeded the 50 percent cap by more than two times and would have likely triggered new management measures. Historical landings showed increases from 1999 through 2003, consistent with what might be expected under a rebuilding plan that allowed spawning stock biomass to increase linearly. Directed landings were 19 percent above what would have been predicted in 1998 and ten percent above what was expected in 2003. Other years were equal to or below predicted values. None exceeded the 50 or 20 percent caps but the 1998 through 2000 three-year total would have exceeded the predicted total by about three percent. The maximum directed yield for 2007 could be as high as 3.26 mp based on the target yield of 2.177 mp. If the directed yield of 3.26 mp was attained in 2007, then the 2008 maximum directed yield would have to be less than 2.7 mp to not trigger an overfishing condition.

Alternative 5: Modify the TAC levels for 2007 through 2012 as the projected constant F direct yield for each year as defined by the constant F projection at 60 percent of F_{2004} . A recreational overage occurs when the sum of total landings reported by the headboat survey, the Texas Parks and Wildlife survey, and by MRFSS calculated as $\text{MRFSS Estimate} \times (1 - \text{PSE})$ where PSE is the proportional standard error of the estimate associated with MRFSS landings data, exceeds the recreational portion of the projected TAC. If an overage occurs for X consecutive years, then the recreational portion of the TAC would be reduced in the next X years by a percentage equal to the average percent overage during the previous X years.

This alternative is borrowed from the South Atlantic Council's Snapper-Grouper Amendment 15. It incorporates the error in the estimated landings to determine when an overage has occurred. Only MRFSS landings estimates are collected using survey methodology which allows calculation of error estimates. All other landings data collection programs are censuses intended to collect landings data without error. This alternative uses the total recreational landings from all sources, headboat, TPWD, and MRFSS; then subtracts the PSE (one Standard Error) from MRFSS. If this calculated value exceeds the recreational share of TAC, then an overage has occurred. Recent MRFSS landings represent approximately 65 percent of total greater amberjack landings and approximately 90 percent of total recreational landings. The PSE values in recent years have averaged about 10.5 percent allowing about a 10 to 12 percent increase in recreational landings above TAC for X years before an overage is declared.

This method for determining when an overage has occurred in the private recreational and for-hire may be acceptable since MRFSS landings are more than an order of magnitude larger than the rest of the greater amberjack recreational fishery. However, this method does not account for the natural variation in recruitment and other changes in the availability of a stock which typically exceed the PSEs of the estimates. Additionally, the annual PSEs for each year are not known until a month or two into the following year; so, if the landing were to exceed the total allowed yield for X years, management regulations would lag by about two years from the declaration of overfishing.

Action 2: Management Measures

The following discussion provides ranges of possible reductions that the management tools (bag limits, trip limits, size limits and seasonal closures) can provide

Vessel Limits

Recreational catch per vessel trip were derived from MRFSS, Headboat and TPWD data for the period 2003 through 2005 (Strelcheck, personal communication). The highest vessel catch per trip was on headboats and was 50 fish; for MRFSS charter vessels, the highest vessel catch was 10 fish; and for TPWD and MRFSS private recreational, it was 7 and 8 fish respectively. Headboats land less than 10 percent of the harvest but would be the most affected by any vessel limit. The 2006 stock assessment used 20 percent release mortality for all sectors of the fishery. Results indicate that a vessel limit of 2 fish would be required to reduce the harvest enough to accomplish the reduction necessary with a vessel limit only (Table 3).

Table 3. Weighted recreational percent reduction for various vessel limits and release mortality rates (2003-2005 average)		
Vessel limit	Release mortality 0%	Release mortality 20%
10	3	3
9	4	3
8	5	4
7	7	5
6	8	7
5	13	10
4	19	14
3	30	22
2	44	31
1	63	43

Trip Limits

Commercial catch per vessel were obtained from the NMFS logbook data from 2003 through 2005 (Strelcheck, pers. com.). Catches were not separated by gear type but about 90 percent of the landings are from vertical line gear so it is assumed that they will be most affected by any trip limit. Approximately two percent of the trips land in excess of 3,500 pounds gutted weight, but those trips account for about 12.8 percent of the landings. A trip limit of approximately 1,600 pounds gutted weight would be required to reduce commercial landings by 30 percent (Table 4).

Table 4. Commercial percent reduction in landings for various trip limits (pounds gutted weight)				
Trip limit	Year			
	2003	2004	2005	2003-05

200	73.1	73.8	70.0	72.6
400	61.0	62.2	57.8	60.6
600	52.8	54.1	49.4	52.4
800	46.6	47.8	43.1	46.2
1000	41.9	42.8	38.0	41.2
1200	37.9	38.7	33.7	37.2
1400	34.5	35.2	30.2	33.7
1600	31.3	32.4	27.0	30.6
1800	28.5	29.9	24.2	27.9
2000	26.0	27.7	21.7	25.5
2200	23.7	25.7	19.6	23.4
2400	21.5	24.0	17.8	21.5
2600	19.7	22.5	16.2	19.8
2800	18.1	21.1	14.6	18.3
3000	16.6	19.9	13.3	17.0
3200	15.3	18.7	12.3	15.8
3400	14.2	17.7	11.3	14.7
3600	13.1	16.7	10.5	13.7
3800	12.1	15.7	9.7	12.8
4000	11.2	14.9	8.9	12.0
4200	10.3	14.1	8.2	11.1
4400	9.5	13.4	7.6	10.4
4600	8.7	12.7	7.0	9.7
4800	8.0	12.1	6.6	9.1
5000	7.4	11.6	6.2	8.6
6000	4.9	9.7	5.0	6.6
7000	3.2	8.2	4.0	5.2
8000	2.1	6.9	3.2	4.1
9000	1.5	5.7	2.8	3.3
10000	0.9	4.6	2.5	2.6

Size Limits

Recreational landings by size were derived from MRFSS, Headboat and TPWD data for the period 2003 through 2005 (Strelcheck, pers. com.). Recreational size limits are currently set at 28 inches FL. There was little difference in the size of fish caught by Mode (private recreational, charter, headboat) or by TPWD surveys so all sectors and regions should be affected similarly. Again, results should be based on 20 percent release mortality. The size limit for the recreational fishery would have to be increased to 32 inches FL to obtain 30 percent reduction in landings (Table 5). Any increase in size limit will likely increase dead discards although less so than for the commercial fishery.

Table 5. Recreational weighted percent reductions in weight for various size limits and release mortality rates (All Modes, 2003-2005 average).				
Size Limit	Percent Reduction			
	rel = 0%	rel = 10%	rel = 20%	rel = 30%
28	0.0	0.0	0.0	0.0
29	7.8	7.0	6.2	5.4
30	17.9	16.1	14.3	12.5
31	28.8	25.9	23.0	20.1
32	39.9	35.9	31.9	27.9
33	49.4	44.4	39.5	34.5
34	54.9	49.4	43.9	38.4

Commercial sizes of fish landed were derived from the TIPs sampling program (Strelcheck, pers. comm.). Size limits are currently set at 36 inches FL for the commercial fishery. Results indicate that while longline gear catch only about ten percent of the commercially caught greater amberjack they also catch the largest fish, averaging 40 inches FL versus about 31 inches for other gears. Vertical line fishermen which land 90 percent of commercial greater amberjack will be affected most by any change in minimum size. The size limit would have to be increased to 40 inches FL to attain a 30 percent reduction in commercial landings (Table 6).

Table 6. Commercial weighted percent reductions in weight for various size limits and release mortality rates (2003-2005 Average)				
Size limit	Weighted Reduction			
	rel =0%	rel =10%	rel =20%	rel =30%
36	0	0	0	0
37	8	7	6	5
38	19	17	15	13
39	27	25	22	19
40	37	34	30	26
41	48	43	38	33
42	57	52	46	40
43	65	59	52	46
44	72	65	58	50

