TAB B 6 (c)

Gray Triggerfish Scoping Options

Gray triggerfish is the only Balistid of 40 species of reef fish in the management unit for the Gulf of Mexico Reef Fish FMP, implemented in November, 1984. Two assessments of gray triggerfish were conducted in 2001using different versions of a generalized surplus production model (Valle, et al. 2002; Porch, 2001). Both assessments indicated that the stock was significantly overfished and undergoing overfishing. Fishing mortality rates were 65 to 70 percent too high and biomass estimates were 15 to 42 percent of

Table 1. Status determination criteria and stock status of gray triggerfish. Reproduced from SEDAR 9 Review Workshop Advisory Report, 2006.

Parameter	Base Value	(Low-High Steepness)
Population parameters and management benchmarks		
$F_{20\%SPR}$	0.419	
$F_{30\%SPR}$ = MFMT	0.269	
$F_{40\%SPR}$	0.186	
F_{MSY}	0.45	(0.294-0.525)
SSB_{MSY} (measured as egg production)	1.21t	(1.78t-1.049t)
$SSB_{30\%SPR}$	2.094t	(1.967t-2.109t)
$SSB_{20\%SPR}$ = MSST	1.316t	(1.083t-1.355t)
F_{OY}	Not defined	
MSY (lbs, including shrimp bycatch	1.638m	(1.441m-1.707m)
Stock paramenters in 2004		
F_{2004}	0.435	(0.431-0.435)
F_{2004}/MFMT	1.62	(1.6-1.62)
F_{2004}/F_{MSY}	0.97	(1.47-0.83)
F_{2004}/OY	Not defined	
SSB_{2004} (eggs)	1.345t	(1.323t-1.351t)
SSB_{2004}/MSST	1.02	(1.22-1)
$SSB_{2004}/SSB_{SPR30\%}$	0.642	(0.67-0.64)
SSB_{2004}/SSB_{MSY}	1.11	(0.74-1.29)

B_{MSY}. However, all the models run by Valle, et al. 2001 and Porch, 2001, were highly sensitive to parameter input restrictions and all but one indicated that the stock had been severely overfished from the beginning of the time series. This was considered unrealistic since gray triggerfish was not a desirable target species. Additionally, it was unknown what effect the 12 inch minimum size limit implemented in 1999 would have. So no new regulations were implemented based on the results of these assessments.

A new stock assessment was completed in 2006 using an age-structured production model. The stock was determined to be undergoing overfishing but it was uncertain whether the stock was also overfished (Table 1). Based on the definition of MFMT ($F_{30\%SPR}$), the current fishing mortality rate is about 62 percent too high (Figure 1). The Review Panel also examined biomass based fishing mortality rates which were in the range of F_{MSY} but felt this measure was not acceptable because it was sensitive to the stock-recruitment relationship which is poorly estimated. The Review Panel stated that no conclusion could be made whether the stock is overfished although it appears to be approaching an overfished condition. Based on the definition of MSST ($SSB_{20\%SPR}$), current stock biomass as measured in eggs is slightly above the threshold but may be driven below the threshold in the near future (Figure 2). As reference for the two Figures showing historical stock condition, landings are provided in Table 2.

Figure 1. Gray triggerfish fishing mortality estimates from 1963 through 2004. Fishing mortality at MSY and 30% SPR are shown.

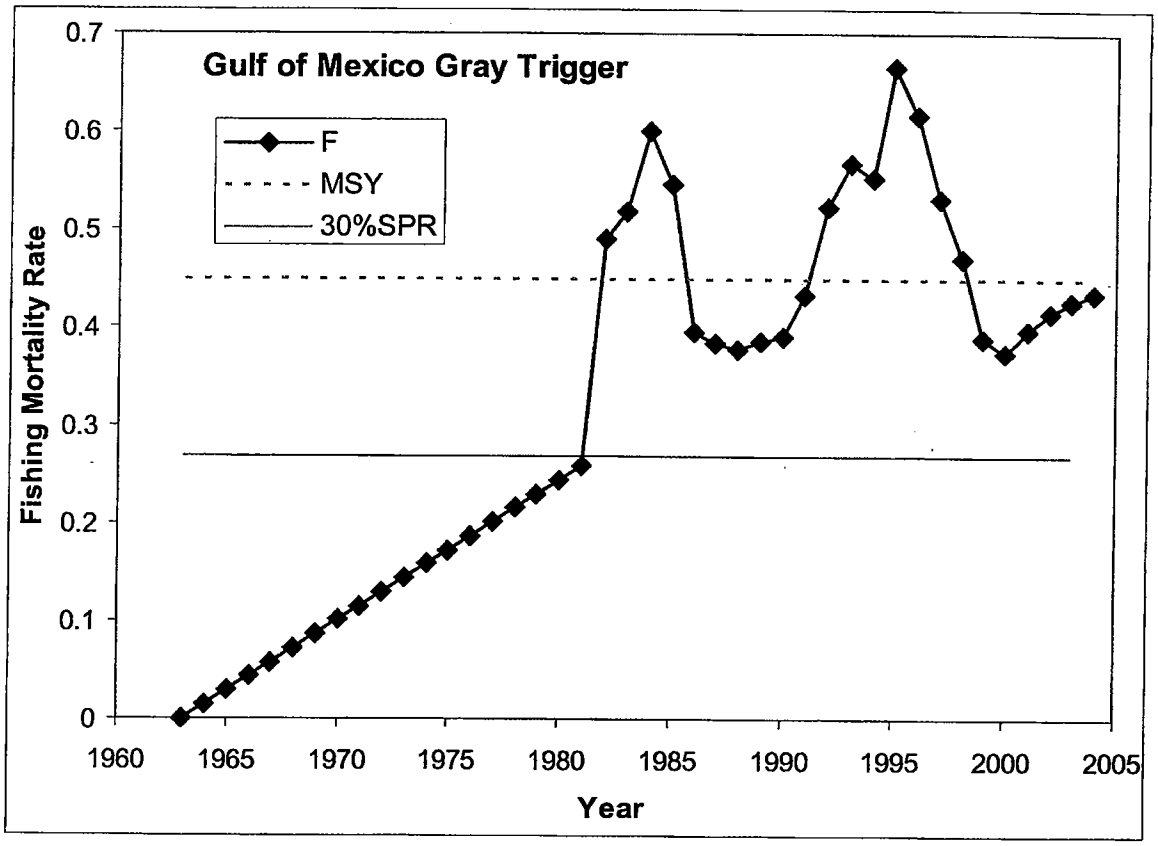

Figure 2. Gray Triggerfish spawning stock biomass estimates from 1963 through 2004. Virgin stock biomass, biomass at MSY and biomass at 20 percent SPR (current definition of MSST) are shown.

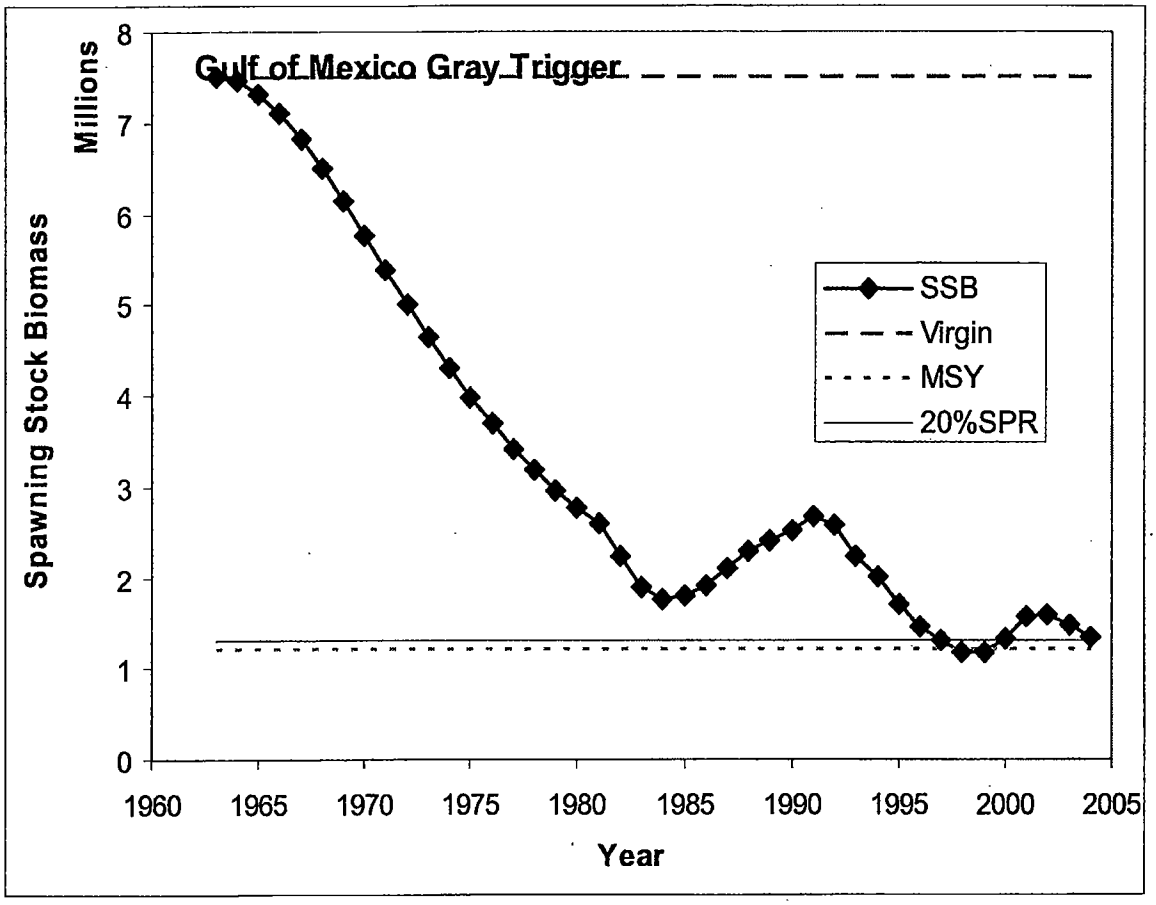

Table 2. Catches. Directed fleet expressed in pounds, while shrimp bycatch is expressed in the number of age - 1 equivalent fish.

Year	Rec-E	Rec-W	Comm-E	Comm-W	Total Directed	Shrimp bycatch
1981	748,779	179,617	64,498	25,362	1,018,256	1,467,734
1982	2,032,601	362,711	62,959	33,714	2,491,985	1,206,518
1983	397,614	387,301	49,588	23,831	858,334	1,462,755
1984	120,970	844,623	37,445	32,749	1,035,787	304,994
1985	280,865	479,950	54,840	37,786	853,441	855,586
1986	898,096	79,077	72,858	22,771	1,072,802	279,374
1987	1,135,998	199,066	89,313	34,290	1,458,667	1,044,555
1988	1,638,073	158,328	137,978	57,084	1,991,464	1,364,168
1989	1,765,965	212,002	230,361	87,271	2,295,599	906,437
1990	2,313,261	184,941	359,686	99,351	2,957,239	1,286,703
1991	1,688,392	399,955	341,319	103,211	2,532,877	523,154
1992	1,434,485	688,825	338,119	112,076	2,573,505	3,100,516
1993	1,317,044	309,425	381,279	177,448	2,185,197	432,660
1994	1,152,103	186,425	251,578	153,141	1,743,248	1,951,471
1995	1,139,967	329,441	207,212	130,664	1,807,284	1,065,855
1996	618,125	226,006	142,185	125,332	1,111,647	1,498,133
1997	664,794	100,211	107,780	76,909	949,694	1,751,775
1998	560,509	93,309	106,153	70,571	830,542	1,004,208
1999	445,430	43,997	116,194	102,826	708,447	242,742
2000	337,241	109,209	63,042	95,095	604,586	1,656,166
2001	487,622	152,572	108,464	67,718	816,375	490,376
2002	721,872	77,016	148,600	86,963	1,034,451	5,115,407
2003	856,626	58,622	166,425	85,385	1,167,059	854,441
2004	951,559	78,092	141,411	77,122	1,248,184	167,162

Action 1: Thresholds and Benchmarks

No benchmarks have been set specifically for gray triggerfish. Amendment 1 to the Reef Fish FMP, implemented in 1990 before the Sustainable Fisheries Act (SFA), was passed, established the Minimum Spawning Stock Biomass (MSST) at 20 percent SPR for all reef fish species. The Generic SFA Amendment proposed SFA definitions for OY, MSST and MFMT for three reef fish species and generic definitions for all other reef fish. The definition of MFMT for other reef fish, $F_{30\%SPR}$, was approved and implemented; however, those for OY and MSST were not. This is the first time that a Reef Fish amendment will address gray triggerfish since the SFA was passed, so Council should establish SFA compliant definitions for the benchmark OY and for the threshold MSST. The Council may also wish to redefine the threshold for MFMT.

Proposed Threshold and Benchmark Alternatives.

Alternative 1: Set Minimum Stock Size Threshold (MSST), Maximum Fishing Mortality Threshold (MFMT) and Optimum Yield (OY) based on SPR.

a. Status quo – MSST = $SSB_{20\%SPR}$ measured in number of eggs (1.316 trillion eggs); MFMT = $F_{30\%SPR}$ (0.269); OY = the yield at 75 percent of MFMT (F = 0.202, Yield in pounds not defined).

b. MSST = $SSB_{20\%SPR}$ SSB measured in number of eggs (1.316 trillion eggs); MFMT = $F_{20\%SPR}$ (0.419); OY = the yield at 75 percent of MFMT (F = 0.314, Yield in pounds not defined).

c. MSST = $SSB_{30\%SPR}$ SSB measured in number of eggs (2.094 trillion eggs); MFMT = $F_{30\%SPR}$ (0.269); OY = the yield at 75 percent of MFMT (F = 0.202, Yield in pounds not defined).

Alternative 2: Set Minimum Stock Size Threshold (MSST), Maximum Fishing Mortality Threshold (MFMT) and Optimum Yield (OY) based on biomass. MSST = (1-M)*SSB_{MSY} measured in number of eggs (0.88 trillion eggs); MFMT = F_{MSY} (0.45); OY = the yield at 75 percent of MFMT (F = 0.337), Yield in pounds not defined).

Alternative 1a maintains MSST at $SSB_{20\%SPR}$ which is the second most conservative of the alternatives. The stock is just above $SSB_{20\%SPR}$ and is therefore not overfished. MFMT is specified as $F_{30\%SPR}$, currently estimated to be 0.269. At this level, F is about 62 percent too high. OY is expressed as the yield associated with 75 percent of MFMT. At that level, yield will be about 94 percent of MSY under $F_{30\%SPR}$. OY expressed as 75 percent of MSY is the NMFS recommended definition. **Alternative 1b** maintains MSST at $SSB_{20\%SPR}$ and sets MFMT at $F_{20\%SPR}$ as well. Under these definitions the stock would be neither overfished or undergoing overfishing. OY would remain defined as the yield associated with 75 percent of MFMT. **Alternative 1c** sets MSST at $SSB_{30\%SPR}$ and sets MFMT at $F_{30\%SPR}$. At this level, 2.094 trillion eggs, the stock would be considered overfished as well as undergoing overfishing. This is the most conservative of the alternatives and matches the SPR level currently established for MFMT. However, MSST values based on SPR levels were disapproved by NMFS in the generic SFA Amendment. The reason given at the time was that these were not biomass-based. **Alternative 2** sets MSST at (1-M)*SSB_{MSY} which equates to 0.88 trillion eggs and the stock would not be considered overfished. MFMT is set at F_{MSY}, currently estimated to be 0.45. OY is again defined as the yield associated with 75 percent of MFMT. Most recent thresholds have been biomass based; however, the SEDAR Review Panel felt that since stock – recruitment relationships are poorly known for gray triggerfish, SPR based thresholds are likely to be better known.

Action 2: Management measures.

Projections from the 2006 assessment indicate that fishing mortality will have to be reduced by about 38 percent to prevent further overfishing if MFMT is set to $F_{30\%SPR}$. The following discussion provides ranges of possible reductions that the management tools (bag limits, trip limits, size limits and seasonal closures) can provide.

Bag limits

Recreational catch per angler has been as high as 18 fish but catches per angler above 10 fish represent less than three percent of the landings. Apparently, no fisherman limits out at 20 fish. Private recreational fishermen would be most affected by any reduction in bag limit; charter vessels would be slightly less affected and headboats rarely catch more than two fish and would be unaffected. A bag limit of one fish would be required to reduce recreational landings by 38 percent or more.

Table 2. Weighted percent reduction for various recreational bag limits (All Modes)

	Year			
Bag Limit	2003	2004	2005	2003-05
20	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
18	0.0	0.1	0.0	0.0
17	0.1	0.1	0.0	0.1
16	0.1	0.2	0.0	0.1
15	0.2	0.2	0.0	0.2
14	0.3	0.3	0.0	0.2
13	0.5	0.5	0.0	0.4
12	1.5	0.7	0.0	0.8
11	2.7	1.0	0.0	1.3
10	4.2	1.4	0.1	2.0
9	6.3	2.0	0.6	3.1
8	8.9	3.1	1.3	4.6
7	12.0	4.6	2.2	6.5
6	15.2	6.4	3.4	8.7
5	19.3	9.2	5.3	11.8
4	24.8	12.9	8.4	16.1
3	31.6	20.3	13.9	23.0
2	40.4	31.3	22.6	32.8
1	55.8	51.9	39.7	50.8

Trip Limits

Commercial trip limits have not been analyzed as of this draft. They can be done if the Council chooses.

Size Limits

Recreational landings by size were derived from MRFSS, Headboat and TPWD data for the period 2003 through 2005. Recreational size limits are currently set at 12 inches TL. 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. Release mortality is estimated to be 1.5 percent so the effective reduction should be based on that release mortality. The size limit for the recreational fishery would have to be increased to 15 inches TL to obtain a 38 percent reduction in landings (Table 3). Any increase in size limit will likely increase dead discards.

Table 3. Percent reduction in weight of recreationally harvested gray triggerfish for various size limits and release mortality rates (2003-05 avg)

	Weighted Reduction	
Size Limit	rel = 0%	rel = 1.5%
12	0.0	0.0
13	8.0	7.9
14	22.9	22.6
15	39.7	39.1
16	56.1	55.2
17	68.1	67.0
18	77.2	76.0
19	83.7	82.5
20	87.8	86.5

Commercial sizes of fish landed were derived from the TIPs sampling program. Size limits are currently set at 12 inches TL for the commercial fishery. Results indicate that while longline gear catch only about ten percent of the commercially caught gray triggerfish, they also catch the largest fish, averaging 23 inches TL versus about 16.5 inches for other gears. Vertical line fishermen which land 90 percent of commercial gray triggerfish will be affected most by any change in minimum size. The size limit would have to be increased to 17 inches TL to attain a 30 percent reduction in commercial landings (Table 4).

Table 4. Percent reduction in weight of commercially harvested gray triggerfish for various size limits and release mortality rates (2003-05 avg)		
	Weighted Reduction	
Size Limit	rel = 0%	rel = 1.5%
12	0.0	0.0
13	2.2	2.1
14	7.7	7.5
15	16.5	16.2
16	28.2	27.8
17	43.0	42.4
18	56.7	55.8
19	70.1	69.0
20	79.6	78.4

Season Closures

Landings by month from the ALS for the commercial fishery and from the MRFSS for the recreational fishery were averaged for the years 2003 through 2005 in Table 5. Landings from the commercial fishery seem to peak during May and July. Primary seasons for gray triggerfish fishing are March through June for charter vessels and May through October for August for private recreational and the headboat fishery. Using a seasonal closure to reduce the landings by 38 percent from the recreational fishery would require closing a minimum of three months; whereas, for the commercial fishery, about four months in the prime season would be required.

Table 5. Recreational and commercial landings by month (2003 - 2005)		
Month	Recreational	Commercial
Jan	2.1%	6.3%
Feb	2.0%	7.4%
Mar	8.5%	8.9%
Apr	8.5%	9.1%
May	13.8%	11.5%
Jun	13.8%	11.8%
Jul	12.2%	6.0%
Aug	11.7%	8.8%
Sep	9.7%	5.2%
Oct	10.2%	8.4%
Nov	3.7%	9.0%
Dec	3.7%	7.5%

Proposed Alternatives to reduce directed yield.

Any one of the possible management tools can be used independently to affect a 38 percent reduction in gray triggerfish landings. However, percent reduction using a single management tool is a drastic change. It may be more acceptable to use a combination of measures to produce the required reductions and the combinations that could work are many. Table 6 offers examples of alternative ways that would accomplish the 38 percent reductions. This document does not currently specify specific Alternatives for the recreational or commercial fisheries. Many options are available and once the Council selects which tools they prefer to use, specific alternative can be developed.

Table 6. Alternatives for reducing landings of gray triggerfish in the commercial and recreational fishery

	Initial reduction = 38%
Management Options	
Recreational	
Bag limit	1 fish 50.8% reduction
Size limit	15 inches TL 39.1% reduction
Season closure	April - July 38.4% reduction
Bag & Size	3 fish & 14" TL 40.4% reduction
Bag & Season	3 fish & April-May 39% reduction
Commercial	
Size limit	17 inches TL 42.4% reduction
Season	May - July 39.8% reduction
Size & Season	15" TL & June-July 38% reduction