rev. 2/23/2007

SCOPING DOCUMENT

FOR REEF FISH AMENDMENT 30:

GAG – END OVERFISHING AND SET MANAGEMENT THRESHOLDS AND TARGETS,

RED GROUPER – SET OPTIMUM YIELD TAC AND MANAGEMENT MEASURES,

GREATER AMBERJACK - REVISE REBUILDING PLAN,

GRAY TRIGGERFISH - END OVERFISHING AND SET MANAGEMENT THRESHOLDS AND TARGETS

MARCH 2007

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This is a publication of the Gulf of Mexico Fishery Management Council Pursuant to National Oceanic and Atmospheric Administration Award No. NA05NMF4410003.

Abbreviations Used in This Document

ALS	Accumulated Landings System (commercial fishing statistics)
AP	Advisory Panel
CASAL	(C++ algorithmic stock assessment laboratory)
CFLP	Coastal Fisheries Logbook Program
Florida FWCC	Florida Fish and Wildlife Conservation Commission
FMP	Fishery Management Plan
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
MFMT	Maximum fishing mortality threshold (overfishing threshold)
MRFSS	Marine Recreational Fisheries Statistics Survey
MSFCMA	Magnuson-Stevens Fisheries Conservation and Management Act
MSST	Minimum stock size threshold (overfished threshold)
MSY	Maximum sustainable yield
NMFS	National Marine Fisheries Service (NOAA Fisheries)
NOAA	National Oceanic & Atmospheric Administration
OY	Optimum yield
PSE	Proportional standard error
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast Data, Assessment and Review
SFA	Sustainable Fisheries Act of 1996
SPR	Spawning potential ratio
SSB	Spawning stock biomass
SSC	Scientific and Statistical Committee
TAC	Total allowable catch
TIP	Trip Interview Program
TL	Total length
TPWD	Texas Parks and Wildlife Department
VPA	Virtual population analyses

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1 Purpose and Need

Purpose

Gag were declared to be undergoing overfishing in October 2006[1] based on the results of a stock assessment prepared under the Southeast Data, Assessment and Review (SEDAR) process. It is therefore necessary for the Council to prepare a plan amendment to set a total allowable catch (TAC) and management measures to end overfishing of gag. In addition, other than the overfishing threshold of $F_{30\% SPR}$, management thresholds and targets that comply with the Sustainable Fisheries Act of 1996 (SFA) have not yet been set for gag. Even in the case of the overfishing threshold, a change has been recommended by the SEDAR 10 Assessment Review Panel. The purpose of the amendment with respect to gag is to establish TAC and management measures to end overfishing, and to set management targets and thresholds.

Red grouper were initially determined to be overfished and undergoing overfishing as of 1997 according to a 1999 stock assessment, and have been under a rebuilding plan that was implemented in 2004 (Secretarial Amendment 1). Based on a 2007 stock assessment (SEDAR 12), the rebuilding plan combined with a strong recruitment year class that occurred in 2000 has resulted in a stock that is currently above its maximum sustainable yield (MSY) biomass threshold and slightly above to its optimum yield (OY) target level. As a result, this amendment proposes an increase in red grouper TAC consistent with achieving OY.

Red grouper and gag comprise the major components of the shallow-water grouper aggregate, but until now have been managed separately, with management measures for one stock having consequences for the other stock. A purpose of this amendment is to co-manage gag and red grouper by implementing concurrent management measures.

Greater amberjack have been under a rebuilding plan since 2003. However, a new stock assessment completed in 2006 concluded that the stock is not recovering as projected. It remains overfished and is undergoing overfishing. A purpose of this amendment with respect to greater amberjack is to end overfishing and to adjust TAC and management measures to bring the rebuilding plan back on course for recovery within a ten year time frame.

Gray triggerfish were declared to be undergoing overfishing in October 2006[1] based on a 2006 stock assessment (SEDAR 9). Overfished status could not be determined due to uncertainty about the stock-recruitment relationship, but the Assessment Review Panel stated that the stock appeared to be approaching an overfished condition. In addition, gray triggerfish have not had management thresholds and targets set that comply with the SFA, other than the overfishing threshold. A purpose of this amendment is to set TAC and management measures to end overfishing of gray triggerfish, and to set management targets and thresholds.

[1] Letter from NMFS Regional Administrator Roy Crabtree to Council Chairman Robin Reichers dated October 11, 2006.

Need

Gag are undergoing overfishing based on the 2006 stock assessment (SEDAR 10). Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the Council is required to submit, and NMFS to implement, a plan to immediately end overfishing within two years of being notified of such a determination[2]. An end to overfishing is needed to assure that the gag stock can support major recreational and commercial fisheries for the foreseeable future. Also, management targets and thresholds that comply with the SFA need to be adopted for this stock. Based on the existing overfishing threshold of $F_{30\% SPR}$, the initial reductions in gag harvest needed relative to what would be expected in the absence of any changes are 35 to 37 percent if the stock is managed at the overfishing threshold, or 51 to 52 percent if the stock is managed for optimum yield. Under the change in overfishing threshold recommended by the SEDAR 10 Assessment Review Panel, initial reductions would be 10 to 11 percent if the stock is managed at the overfishing threshold, or 33 to 34 percent if managed for optimum yield.

Red grouper were overfished in 1997, but based on the 2007 stock assessment (SEDAR 12) have now recovered to slightly above their OY biomass target. In order to achieve OY while avoiding overfishing in compliance with National Standard 1 of the MSFCMA, TAC can be increased as much as 15 percent. Therefore an increase in TAC and revised management measures are needed to reflect the current condition of the stock.

Gag and red grouper are both part of the shallow-water grouper aggregate, and fisheries on the two species overlap. Management measures implemented for gag have impacts of red grouper and vice versa. In order to optimize the management of both species, gag and red grouper need to be co-managed in a single amendment.

Greater amberjack are under a rebuilding plan. A 2006 stock assessment (SEDAR 9) concluded that the stock is not recovering as projected. It continues to be overfished and is now undergoing overfishing as well. Adjustments to TAC and management measures are needed to end overfishing and bring the recovery of the greater amberjack stock back into compliance with its ten year rebuilding time frame. Adjustments to end overfishing range from 11 to 30 percent depending on which rebuilding plan is chosen.

Gray triggerfish were determined to be undergoing overfishing based on a 2006 stock assessment (SEDAR 9). Under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), the Council is required to submit, and NMFS to implement, a plan to immediately end overfishing within two years of being notified of such a determination. A 35 percent reduction in landings is necessary to end overfishing.

[2] The Council was previously required to submit a plan to end overfishing within one year of notification, with no requirement as to the time allowed to actually implement and end overfishing. The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 modified the overfishing provisions to require that a plan to end overfishing immediately in the fishery be submitted and implemented within two years.

2 Gag and Red Grouper

2.1 Grouper Assessment Overviews

2.1.1 Gag Stock Assessment (SEDAR 10)

Most of the information in this section is summarized from the SEDAR 10 Advisory Report (NMFS 2006)

Assessment methods and data

The Gulf of Mexico gag stock was assessed using a statistical forward projection catch-at-age model called CASAL (C++ algorithmic stock assessment laboratory) (Bull et al., 2005).

Data sources included both fishery-dependent and fishery-independent indices of abundance. Fishery-dependent abundance indices were available from the commercial handline fishery, the commercial longline fishery, the recreational headboat fishery and a combined index from the recreational charter and private boat fisheries (MRFSS). Two fishery-independent abundance indices were developed from the SEAMAP reef fish video survey. The assessment included data through 2004. These data were used to calculate catch estimates, and total annual size and age composition.

Catch trends

The gag stock assessment included data through 2004. It found that total catches (landings and dead discards) in the last 7 years (1998-2004) have shown an increasing trend since 2000 Table Gag-1). Commercial landings since the late 1990's have increased about 60% compared to the 1980's (Figure Gag-1), while estimated recreational landings have almost doubled. However, the estimated recreational dead discards have roughly tripled during that period (Figure Gag-1). While catches have increased, fishing mortality rates have also generally increased over the period of the assessment. In the last four years the annual fishing mortality rate has increased every year and is currently estimated to be F = 0.49 (in terms of SPR based F, this is approximately equal to $F_{10\% \text{ SPR}}$), far exceeding the $F_{30\% \text{ SPR}}$ overfishing threshold.

Biomass trends

Annual recruitment to the stock (age 1) during the 1980s was estimated to average about 1.4 million fish. Since 1990, subsequent to the minimum size limit, bag limit, and commercial quota adopted in Amendment 1, recruitment has increased to an average of about 3 million fish. This included four strong year classes between 1990 and 2000 which averaged 4.8 million fish each. However, since 2000, recruitment has declined each year, and spawning stock biomass has declined since 2003 (Figure Gag-2).

Table Gag-1. Landings and discards for commercial longline fisheries; longline, handline and others, and for recreational fisheries; private/charter (MRFSS) and headboat in columns 1 to 7. Columns 8 to 11 shows the partition of landed and discards by sector, 1963-2004. All values are in gutted weight pounds. Source: NMFS 2006

							Landings		Dead discards		
Year	Headboat	MRFSS	Longline	Handline	Others	Total	Commercial	Recreational	Commercial	Recreational	Total
1963	-	443,710	-	1,288,786	1,445	1,733,941	1,290,231	443,710	-	-	1,733,941
1964	-	479,243	-	1,632,460	9,088	2,120,792	1,641,549	479,243	-	-	2,120,793
1965	-	517,622	-	1,815,588	573	2,333,783	1,816,162	514,193	-	3,429	2,333,784
1966	-	559,075	-	1,456,566	1,227	2,016,868	1,457,793	546,372	-	12,703	2,016,868
1967	-	603,848	-	1,155,546	9,839	1,769,233	1,165,387	580,407	-	23,441	1,769,234
1968	-	652,205	-	1,192,284	4,414	1,848,904	1,196,699	616,389	-	35,816	1,848,905
1969	-	704,436	-	1,376,520	3,205	2,084,161	1,379,725	654,412	-	50,024	2,084,161
1970	-	760,849	-	1,283,654	2,502	2,047,005	1,286,158	694,572	-	66,277	2,047,007
1971	-	869,493	-	1,376,502	2,782	2,248,777	1,379,285	779,756	-	89,737	2,248,778
1972	-	993,651	-	1,460,381	3,980	2,458,012	1,464,362	875,105	-	118,546	2,458,013
1973	-	1,135,538	-	1,081,222	4,899	2,221,659	1,086,122	981,786	-	153,752	2,221,660
1974	-	1,297,685	-	1,184,110	1,355	2,483,150	1,185,465	1,101,090	-	196,595	2,483,150
1975	-	1,482,652	-	1,446,621	4,465	2,933,737	1,451,086	1,234,168	-	248,483	2,933,738
1976	-	1,697,042	-	1,198,438	9,115	2,904,595	1,207,552	1,385,311	-	311,731	2,904,594
1977	-	1,942,432	-	977,267	7,513	2,927,212	984,780	1,554,358	-	388,074	2,927,212
1978	-	2,225,942	-	875,262	10,952	3,112,156	886,213	1,745,396	-	480,546	3,112,155
1979	-	2,551,406	1,383	1,342,247	9,685	3,904,721	1,353,314	1,959,527	-	591,879	3,904,720
1980	-	2,908,996	89,304	1,317,859	11,866	4,328,024	1,419,030	2,187,337	-	721,659	4,328,026
1981	-	2,458,563	467,068	1,498,744	15,608	4,439,984	1,981,421	1,829,502	-	629,061	4,439,984
1982	-	3,508,922	1,009,998	1,334,617	14,163	5,867,699	2,358,780	3,216,983	-	291,939	5,867,702
1983	-	7,459,833	681,064	1,039,425	17,652	9,197,974	1,738,139	6,379,368	-	1,080,465	9,197,972
1984	-	2,134,042	433,159	1,098,289	18,407	3,683,897	1,549,855	1,950,479	-	183,563	3,683,898
1985	-	6,967,353	380,850	1,396,341	27,879	8,774,423	1,807,070	6,570,911	-	396,442	8,774,423
1986	308,430	4,263,230	517,405	1,155,013	29,022	6,273,100	1,701,441	3,597,491	-	974,168	6,273,101
1987	230,540	2,827,000	656,042	852,579	29,544	4,595,705	1,538,166	2,447,832	-	609,708	4,595,706
1988	164,606	4,223,613	402,244	791,073	23,178	5,604,715	1,216,494	3,747,483	-	640,736	5,604,713
1989	337,797	3,264,214	426,018	1,235,438	31,374	5,294,841	1,692,830	2,314,324	-	1,287,686	5,294,840
1990	307,722	1,990,704	624,659	1,129,877	40,817	4,093,779	1,793,090	1,259,887	2,261	1,038,538	4,093,777
1991	111,374	4,842,904	509,707	992,667	63,090	6,519,743	1,565,320	2,748,231	145	2,206,048	6,519,744
1992	156,438	3,950,703	592,824	1,002,725	68,548	5,771,238	1,663,880	2,245,860	217	1,861,282	5,771,239
1993	211,126	5,874,147	482,328	1,280,529	105,760	7,953,890	1,865,116	2,787,852	3,502	3,297,421	7,953,892
1994	316,998	6,457,563	351,815	1,148,121	119,046	8,393,543	1,618,740	1,999,707	243	4,774,854	8,393,544
1995	196,110	7,250,518	393,648	1,157,606	104,670	9,101,551	1,661,664	2,700,221	4,260	4,745,406	9,101,551
1996	176,888	5,310,846	397,024	1,106,573	67,504	7,058,835	1,566,658	2,353,437	4,444	3,134,296	7,058,834
1997	167,797	6,793,551	419,837	1,101,101	82,634	8,564,921	1,597,645	2,573,108	5,928	4,388,240	8,564,922
1998	427,681	8,597,631	608,998	1,848,718	81,579	11,564,607	2,530,686	3,519,315	8,610	5,505,998	11,564,609
1999	316,278	7,251,549	549,813	1,481,357	68,278	9,666,274	2,097,739	3,721,784	1,709	3,845,042	9,666,274
2000	270,612	8,375,360	636,817	1,605,425	81,260	10,969,475	2,283,311	4,972,529	40,192	3,673,445	10,969,477
2001	166,914	8,766,604	1,052,744	2,088,284	100,916	12,175,463	3,128,510	4,031,469	113,436	4,902,049	12,175,463
2002	145,311	10,640,507	1,059,401	1,933,577	61,659	13,840,455	2,983,506	4,435,518	71,132	6,350,300	13,840,455
2003	240,352	12,219,344	1,189,696	1,476,593	67,095	15,193,079	2,626,122	3,773,139	107,262	8,686,558	15,193,081
2004	327,271	13,718,083	1,190,773	1,756,584	72,808	17,065,519	2,901,692	4,913,422	118,472	9,131,932	17,065,519

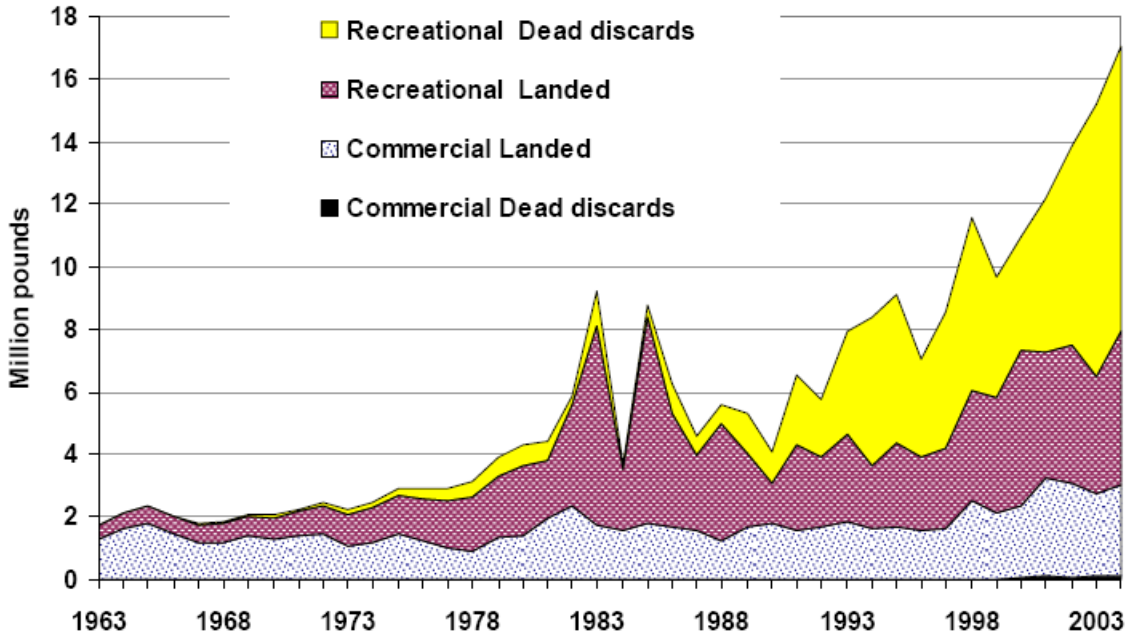

Figure Gag-1. Gulf of Mexico gag landings and dead discards by the commercial and recreational fisheries in pounds gutted weight.

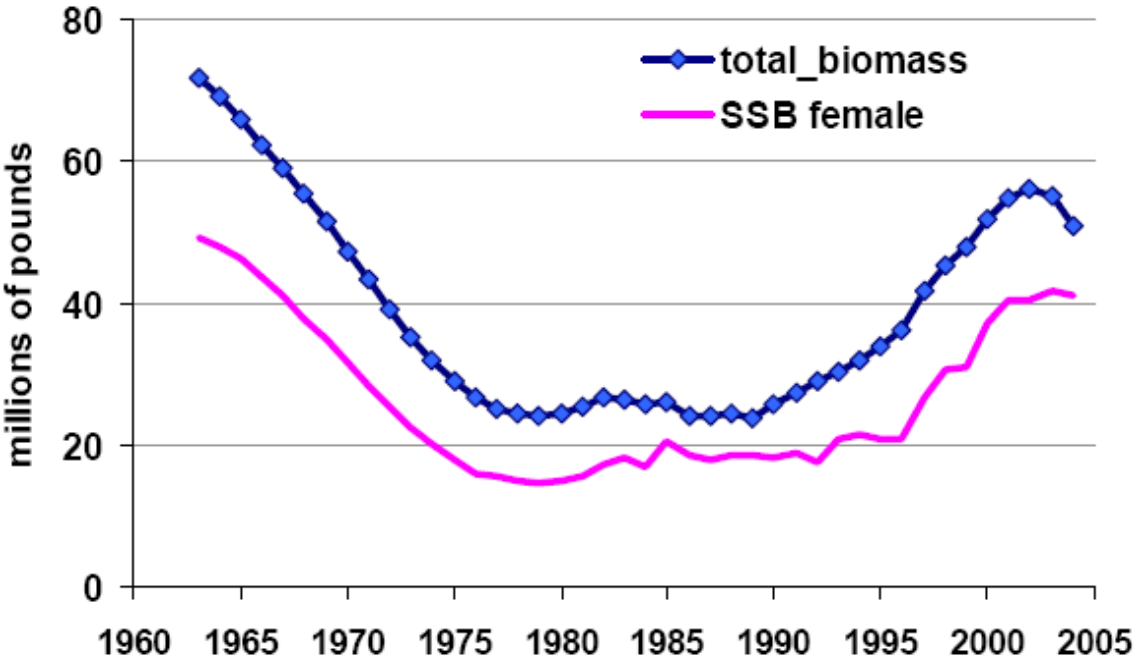

Figure Gag-2. Estimated biomass of Gulf of Mexico showing spawning stock biomass (SSB, mature female) and total biomass in gutted weight.

Historical Biomass Estimates

In its Advisory Report, the SEDAR Review Workshop Review Panel observed, based on Figure Gag-2, that the current stock biomass is near its historical maximum. However, "historical", in this context, refers only to a period going back to the early 1960s, when routine annual monitoring of at least the commercial landings began. There has been a grouper fishery in the Gulf of Mexico back as far as the 1880s, but catches in the early years were only reported on an irregular basis. Following the protocol for reconstructing commercial catch trends of red snapper (SEDAR 7), the Assessment Workshop was able to present estimates of gag Gulf of Mexico biomass from 1880 to 2004 (Figure Gag-3). Given the scarcity of data from the early years, this graph is best used to observe long term trends rather than to estimate specific biomass levels in a given year. Nevertheless, the graph trend shows sharp declines in biomass from about the 1950s to the 1980s, and even with the increase in recent years, gag biomass remains at a fraction of its original levels.

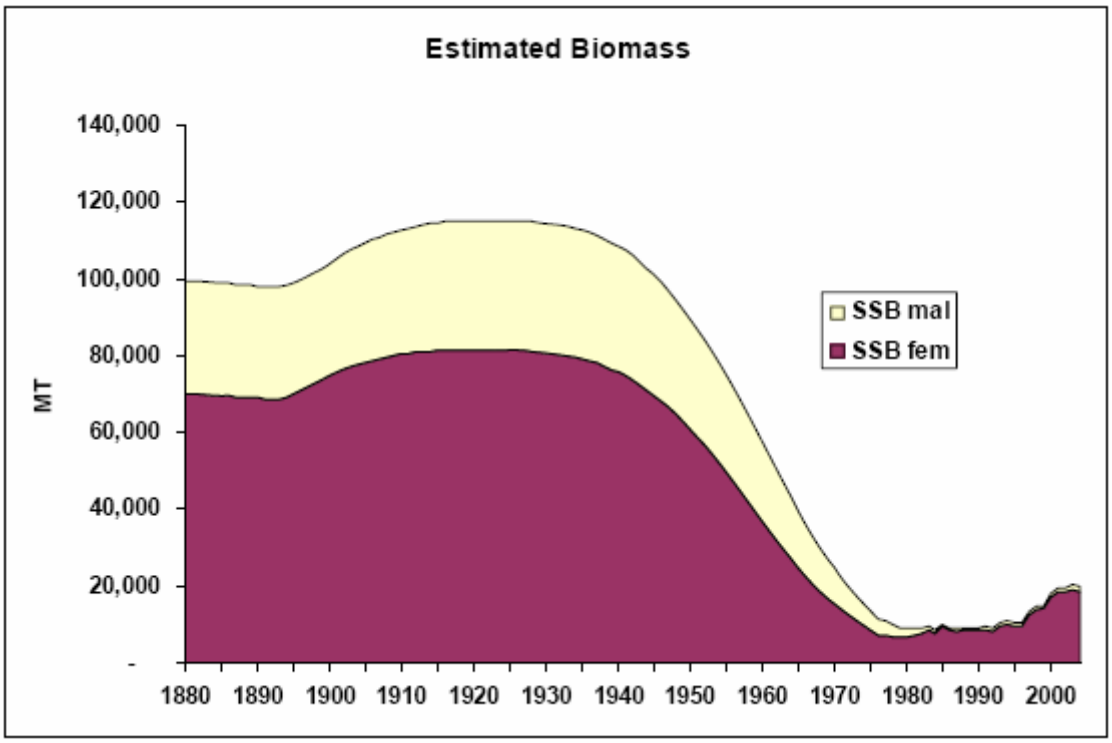

Figure Gag-3. Gag GOM trends of historical stock spawning biomass by sex estimated by the case 3 extended historic catch series 1880-2004. Estimated biomass of Gulf of Mexico showing spawning stock biomass (SSB, mature female) and total biomass in gutted weight. (from Ortiz 2006)

Status of Stock

The current overfishing threshold, or maximum fishing mortality threshold (MFMT), is $F_{30\% SPR}$, which is estimated in this assessment to be F = 0.25, The annual fishing mortality rate has exceeded this threshold every year going back at least to 1995 (Table Gag-2). The most recent 4-year average F is about 0.40. Therefore, the gag stock is considered to be undergoing overfishing.

An overfished, or minimum stock size threshold (MSST), that is compatible with the SFA has not yet been adopted and approved by NMFS. The pre-SFA threshold was 20% SPR, which is estimated by the stock assessment, in terms of equilibrium female spawning stock biomass (SSB), to be about 23.1 million pounds. Since adoption of the SFA, the Council has typically used an MSST based on the formula (1-M)* B_{MSY}, where M is the natural mortality rate and B_{MSY} is the stock size capable of supporting maximum sustainable yield (MSY) on a continuing basis. For gag, the assessment used an estimate of M that varied with age, but average M = 0.14, and the estimate of $B_{30\% SPR}$ (as a proxy for B_{MSY}) in terms of female SSB was 34.6 million pounds. Current (2004) female SSB is estimated to be 40.55 million pounds (Table Gag-2). Since the current estimated biomass is above the threshold regardless of which way it is calculated, the stock would have been determined to be not overfished in 2004. However, the SEDAR Review Workshop Panel felt that, due to high variability in the annual recruitment estimates over a moderate range of spawning stock sizes (Figure Gag-4), there was a high degree of uncertainty with respect to biomass and MSY based benchmarks. Consequently, a determination of overfished status was not made, and the Gag overfished status is classified as unknown.

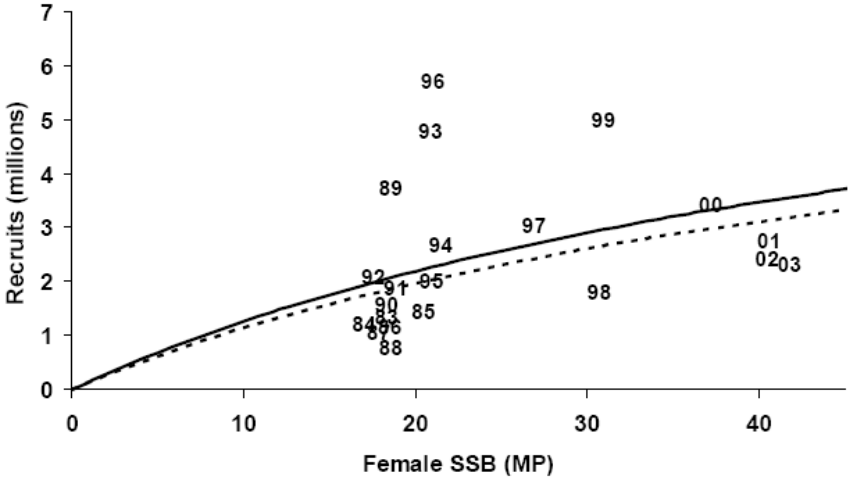

Figure Gag-4. Estimated Beverton-Holt stock-recruitment relationship for Gulf of Mexico gag. Two digit year labels represent estimated recruitment for the 1983-2003 year classes and the associated female spawning stock biomass. The dashed curve is the estimated relationship, and the solid curve is the estimated relationship with lognormal bias correction.

Table Gag-2. Projection trends for Gulf of Mexico gag grouper assuming constant recruitment and various constant fishing mortality rates. "All Removals" includes landings and dead discards and "Landed Yield" landings only. SPR% refers to fishing rates that will achieve the indicated percent SPR under equilibrium conditions.

ALL REMOVALS

SSB mature femate wgt million pounds

Year	SPR20%	SPR30%	SPR40%	F0.1	Fmax	Fmsy	Fcurrent
1995	20.48	20.48	20.48	20.48	20.48	20.48	20.48
1996	20.61	20.61	20.61	20.61	20.61	20.61	20.61
1997	26.81	26.81	26.81	26.81	26.81	26.81	26.81
1998	30.73	30.73	30.73	30.73	30.73	30.73	30.73
1999	31.06	31.06	31.06	31.06	31.06	31.06	31.06
2000	37.67	37.67	37.67	37.67	37.67	37.67	37.67
2001	40.64	40.64	40.64	40.64	40.64	40.64	40.64
2002	40.46	40.46	40.46	40.46	40.46	40.46	40.46
2003	41.78	41.78	41.78	41.78	41.78	41.78	41.78
2004	40.55	40.55	40.55	40.55	40.55	40.55	40.55
2005	33.28	33.28	33.28	33.28	33.28	33.28	33.28
2006	29.16	29.16	29.16	29.16	29.16	29.16	29.16
2007	27.20	30.00	31.81	32.97	30.55	30.55	26.85
2008	25.26	30.26	33.79	36.15	31.32	31.32	24.65
2009	24.49	31.30	36.39	39.93	32.78	32.78	23.72
2010	24.19	32.38	38.90	43.61	34.27	34.27	23.28

F annual mortality rate

Year	SPR20%	SPR30%	SPR40%	F0.1	Fmax	Fmsy	Fcurrent
1995	0.458	0.458	0.458	0.458	0.458	0.458	0.458
1996	0.310	0.310	0.310	0.310	0.310	0.310	0.310
1997	0.315	0.315	0.315	0.315	0.315	0.315	0.315
1998	0.399	0.399	0.399	0.399	0.399	0.399	0.399
1999	0.297	0.297	0.297	0.297	0.297	0.297	0.297
2000	0.309	0.309	0.309	0.309	0.309	0.309	0.309
2001	0.330	0.330	0.330	0.330	0.330	0.330	0.330
2002	0.364	0.364	0.364	0.364	0.364	0.364	0.364
2003	0.400	0.400	0.400	0.400	0.400	0.400	0.400
2004	0.493	0.493	0.493	0.493	0.493	0.493	0.493
2005	0.422	0.422	0.422	0.422	0.422	0.422	0.422
2006	0.375	0.251	0.177	0.132	0.228	0.228	0.392
2007	0.375	0.251	0.177	0.132	0.228	0.228	0.392
2008	0.375	0.251	0.177	0.132	0.228	0.228	0.392
2009	0.375	0.251	0.177	0.132	0.228	0.228	0.392
2010	0.375	0.251	0.177	0.132	0.228	0.228	0.392

Total removals (landed + dead discards)

Year	SPR20%	SPR30%	SPR40%	F0.1	Fmax	Fmsy	Fcurrent
1995	9.11	9.11	9.11	9.11	9.11	9.11	9.11
1996	7.06	7.06	7.06	7.06	7.06	7.06	7.06
1997	8.55	8.55	8.55	8.55	8.55	8.55	8.55
1998	11.55	11.55	11.55	11.55	11.55	11.55	11.55
1999	9.64	9.64	9.64	9.64	9.64	9.64	9.64
2000	10.93	10.93	10.93	10.93	10.93	10.93	10.93
2001	12.13	12.13	12.13	12.13	12.13	12.13	12.13
2002	13.80	13.80	13.80	13.80	13.80	13.80	13.80
2003	15.15	15.15	15.15	15.15	15.15	15.15	15.15
2004	17.03	17.03	17.03	17.03	17.03	17.03	17.03
2005	12.38	12.38	12.38	12.38	12.38	12.38	12.38
2006	9.99	7.00	5.08	3.86	6.42	6.42	10.37
2007	9.39	7.18	5.49	4.31	6.69	6.69	9.64
2008	8.99	7.39	5.91	4.76	6.97	6.97	9.15
2009	8.79	7.62	6.31	5.21	7.27	7.27	8.87
2010	8.66	7.82	6.67	5.61	7.53	7.53	8.70

LANDED YIELD

SSB mature femate wgt million pounds

SPR20%	SPR30%	SPR40%	F0.1	Fmax	Fmsy	Fcurrent
20.48	20.48	20.48	20.48	20.48	20.48	20.48
20.61	20.61	20.61	20.61	20.61	20.61	20.61
26.81	26.81	26.81	26.81	26.81	26.81	26.81
30.73	30.73	30.73	30.73	30.73	30.73	30.73
31.06	31.06	31.06	31.06	31.06	31.06	31.06
37.67	37.67	37.67	37.67	37.67	37.67	37.67
40.64	40.64	40.64	40.64	40.64	40.64	40.64
40.46	40.46	40.46	40.46	40.46	40.46	40.46
41.78	41.78	41.78	41.78	41.78	41.78	41.78
40.55	40.55	40.55	40.55	40.55	40.55	40.55
33.28	33.28	33.28	33.28	33.28	33.28	33.28
30.20	30.20	30.20	30.20	30.20	30.20	30.20
28.06	30.95	32.82	33.57	31.04	31.04	27.69
25.88	31.06	34.67	36.15	31.19	31.19	25.24
24.96	31.92	37.14	39.36	32.11	32.11	24.12
24.49	32.89	39.52	42.44	33.13	33.13	23.55

F annual mortality rate

SPR20%	SPR30%	SPR40%	F0.1	Fmax	Fmsy	Fcurrent
0.46	0.46	0.46	0.46	0.46	0.46	0.46
0.31	0.31	0.31	0.31	0.31	0.31	0.31
0.32	0.32	0.32	0.32	0.32	0.32	0.32
0.40	0.40	0.40	0.40	0.40	0.40	0.40
0.30	0.30	0.30	0.30	0.30	0.30	0.30
0.31	0.31	0.31	0.31	0.31	0.31	0.31
0.33	0.33	0.33	0.33	0.33	0.33	0.33
0.36	0.36	0.36	0.36	0.36	0.36	0.36
0.40	0.40	0.40	0.40	0.40	0.40	0.40
0.49	0.49	0.49	0.49	0.49	0.49	0.49
0.38	0.38	0.38	0.38	0.38	0.38	0.38
0.37	0.25	0.18	0.15	0.25	0.25	0.39
0.37	0.25	0.18	0.15	0.25	0.25	0.39
0.37	0.25	0.18	0.15	0.25	0.25	0.39
0.37	0.25	0.18	0.15	0.25	0.25	0.39
0.37	0.25	0.18	0.15	0.25	0.25	0.39

Total landed yield million pounds

SPR20%	SPR30%	SPR40%	F0.1	Fmax	Fmsy	Fcurrent
4.45	4.45	4.45	4.45	4.45	4.45	4.45
3.89	3.89	3.89	3.89	3.89	3.89	3.89
4.53	4.53	4.53	4.53	4.53	4.53	4.53
6.61	6.61	6.61	6.61	6.61	6.61	6.61
5.91	5.91	5.91	5.91	5.91	5.91	5.91
7.96	7.96	7.96	7.96	7.96	7.96	7.96
6.98	6.98	6.98	6.98	6.98	6.98	6.98
8.01	8.01	8.01	8.01	8.01	8.01	8.01
7.21	7.21	7.21	7.21	7.21	7.21	7.21
7.63	7.63	7.63	7.63	7.63	7.63	7.63
5.81	5.81	5.81	5.81	5.81	5.81	5.81
5.24	3.68	2.67	2.27	3.64	3.64	5.44
4.79	3.69	2.83	2.46	3.66	3.66	4.91
4.53	3.77	3.04	2.69	3.75	3.75	4.60
4.41	3.90	3.26	2.93	3.88	3.88	4.44
4.32	3.98	3.43	3.12	3.96	3.96	4.33

2.1.2 Red Grouper Stock Assessment (SEDAR 12)

Background

The previous red grouper assessment was conducted in 1999 (Schirripa, et al. 1999) and revisited in 2002. Both production models (ASPIC) and forward projection catch-age models (ASAP) were developed to evaluate stock status. Ages were determined for the forward projecting model through the Goodyear (1995) probabilistic approach that also enables estimation of discards. The production model performed reasonably well, but lacked ability to address perceived changes in fishery characteristics (e.g., catchability and selectivity) over time and did not allow inclusion of available information on size or age of capture. The catch-age model provided greater flexibility and incorporated more available data, but was highly parameterized and sensitive to steepness and data series duration. Both models suggested that the stock was overfished and overfishing was occurring in 1997. The RFSAP reviewed the assessment in September 1999 and accepted the methods and results. However, the SSC questioned aspects of the 1999 assessment, including use of the estimates of Cuban catches from the western Gulf. In response to these concerns, NMFS/SEFSC prepared additional analyses that were presented to the RFSAP in August 2000 and September 2002.

The RFSAP reviewed and accepted the updated assessment in September, 2002. The assessment determined that the stock was overfished but recovering and was undergoing overfishing. These results confirmed the results from the 1999 assessment that the stock was overfished in 1997. However, the new assessment indicated that the stock was recovering faster than previously estimated, most likely due to a strong recruitment year class in 1997. Although still undergoing overfishing, the reductions to end overfishing and rebuild the stock were less (9.4 percent) than those indicated by the 1999 assessment (approximately 45 percent) probably due to the accelerated recovery.

The results of the 2002 assessment and the RFSAP recommendations lead to the development of Secretarial Amendment 1. A rebuilding plan was established which set the TAC at 6.56 mp for 2003 through 2005 based on a stepped constant catch approach. A hard quota of 5.31 mp, representing a 9.4 percent reduction from the previous three-year average was implemented for the commercial fishery. The recreational fishery was reduced to a two – red grouper bag limit within the aggregate grouper bag limit of five fish in order to reduce the recreational catch by 9.4 percent to approximately 1.25 mp.

Subsequent to Secretarial Amendment 1, regulatory amendments were implemented to set and then reduce commercial trip limits designed to extend the commercial fishing season. The recreational bag limit was reduced to one fish and a recreational closed season was implemented to constrain the recreational fishery to its share (1.25 mp) of the 6.56 mp TAC.

Red grouper current stock status

The most recent SEDAR 12 stock assessment for red grouper was completed in early February 2007. The results presented below have not been reviewed by the SSC at the time of this draft.

Therefore, they are still subject to possible change.

The assessment used the ASAP model that was the basis for the 2002 assessment and included data from 1986 through 2005. Table Red-1 lists landings and dead discards by year from the commercial and recreational sectors from 1986 through 2005 as they were input to the stock assessment. Approximately 99 percent of the landings were from the west coast of Florida and the rest were from Alabama. Thresholds MSST and MFMT were defined for red grouper in Secretarial Amendment 1 as (1-M)*SS_{MSY} and F_{MSY} , respectively. The Red grouper estimated spawning stock exceeded MSST starting in 1999 (Figure Red-1). This compares reasonably well with the results of the 2002 assessment which estimated the stock would be rebuilt by 2003 using a stock–recruit relationship of 0.8 which is similar to the 0.84 estimated by the current assessment. Apparently, recovery of the red grouper stock accelerated between 2001 and 2005, probably as a result of another very strong recruitment year class that occurred in 2000 (Figure Red-2). Fishing mortality on red grouper declined below MFMT starting in 1995 and has fluctuated but remained below MFMT with little trend through 2005 (Figure Red-3). Benchmarks and threshold estimates are provided in Table Red-2

Table Red-1. Red grouper landings and dead discards from the Gulf of Mexico from 1986 through 2005 in pounds.

	Landings		Dead Discards		Total
Year	Commercial	Recreational	Commercial	Recreational	
1986	6,312,986	2,400,380	?	20,657	8,734,023
1987	6,717,890	1,464,710	?	19,021	8,201,621
1988	4,742,496	2,476,070	?	34,758	7,253,324
1989	7,367,911	2,761,150	?	81,650	10,210,711
1990	4,809,282	1,131,710	733,671	228,556	6,903,219
1991	5,094,501	1,775,110	1,155,185	407,354	8,432,150
1992	4,463,277	2,658,180	721,264	356,598	8,199,319
1993	6,379,626	2,091,160	732,983	234,183	9,437,952
1994	4,902,862	1,808,240	446,280	224,934	7,382,316
1995	4,746,140	1,862,570	601,308	225,097	7,435,115
1996	4,454,146	893,755	566,243	159,758	6,073,902
1997	4,848,486	562,328	623,516	149,181	6,183,511
1998	3,948,566	643,058	543,057	208,428	5,343,109
1999	5,974,706	1,152,810	734,532	283,487	8,145,535
2000	5,838,300	2,107,730	621,851	300,042	8,867,923
2001	5,964,506	1,327,770	756,182	223,726	8,272,184
2002	5,907,248	1,611,110	726,561	260,670	8,505,589
2003	4,937,970	1,275,830	623,068	283,721	7,120,589
2004	5,749,039	3,000,140	812,431	421,755	9,983,365
2005	5,410,594	1,630,140	894,328	243,491	8,178,553

Source: SEDAR 12 review workshop final report

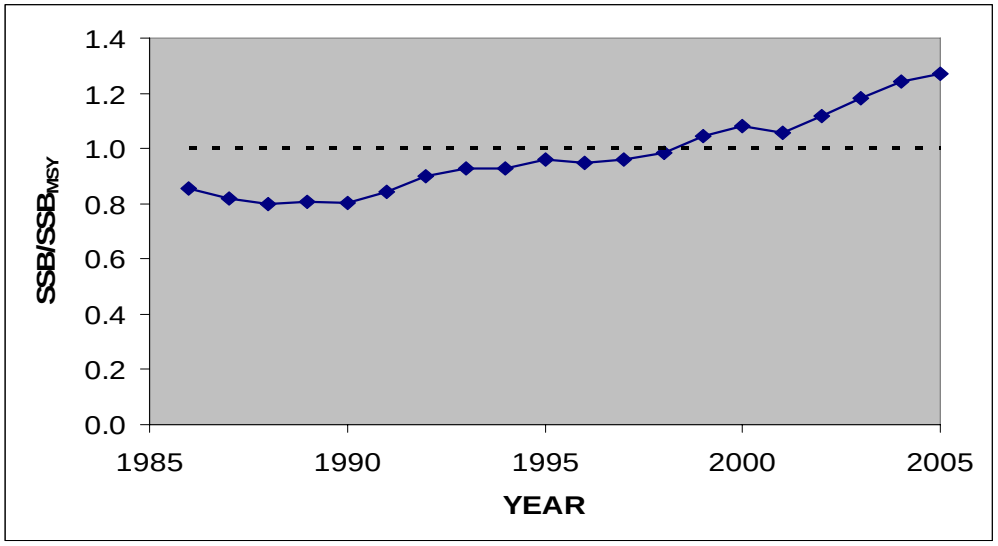

Figure Red-1. Red Grouper spawning stock in relation to the overfished threshold, MSST, from 1986 through 2005. Source: SEDAR 12 Review Workshop Report.

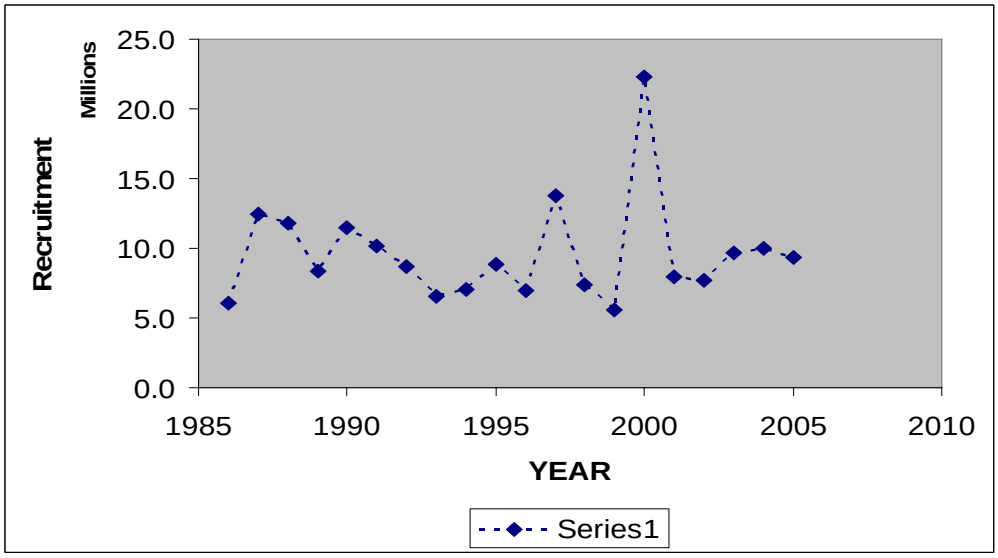

Figure Red-2. Predicted red grouper recruitment (Age 1 fish) from 1986 through 2005. Source: SEDAR 12 Review Workshop Report.

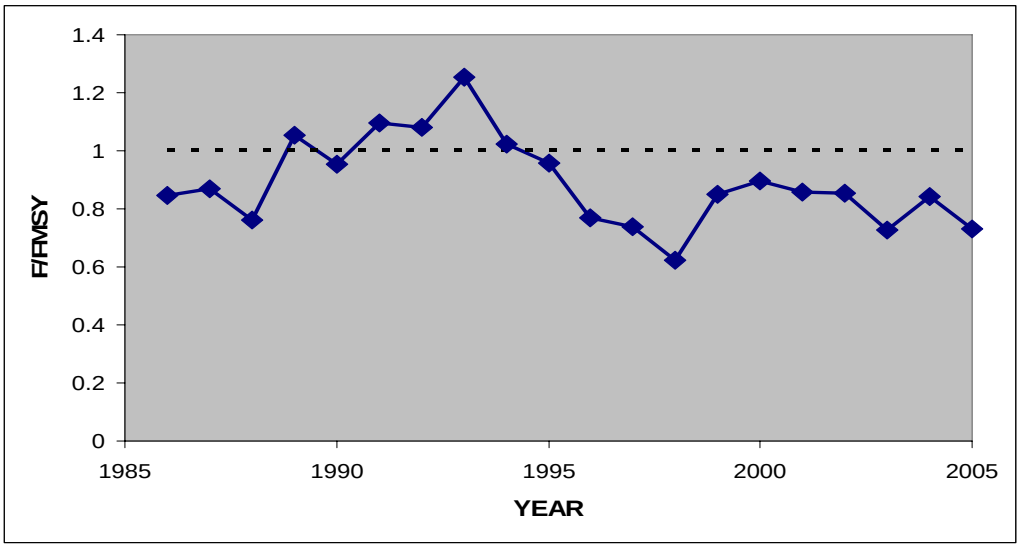

Figure Red-3. Red grouper fishing mortality in relation to overfishing threshold, MFMT, from 1986 through 2005. Source: SEDAR 12 Review Workshop Report.

Table Red-2. Benchmarks and Thresholds for red grouper in the Gulf of Mexico. Source: SEDAR 12 Review Workshop Report.

F-References	
F0.1	0.1353
Fmax	0.2605
F30%SPR	0.3403
F40%SPR	0.2102
Fmsy MFMT	0.2133
Foy 75% of F_{MSY}	0.1600
Fcurrent	0.1556

SSB-References	
SS_F0.1	7.72E+08
SS_Fmax	5.18E+08
SSmsy	5.91E+08
SSoy	7.04E+08
$SS_{CURRENT}$	7.52E+08

DIRECTED YIELD Refs	
Y F0.1	7.35E+06
Y Fmax	7.64E+06
MSY	7.72E+06
OY	7.57E+06

CURRENT STATUS	
F/FMSY	0.7295
SS/SSMSY	1.2711

2.2 Action 1. Gag MFMT, MSST, OY and TAC

Gag currently have an SFA-compliant definition for Maximum Fishing Mortality Threshold (MFMT) of $F_{30\% SPR}$, but a change has been recommended by the SEDAR 10 (gag) Review Workshop Panel. There currently are no SFA-compliant definitions of Minimum Stock Size Threshold (MSST) or Optimum Yield (OY). The selection of TAC for gag is dependent upon the choice of MFMT and whether to base management on MFMT or OY. Bundled alternatives for MFMT, MSST, OY and TAC are presented in the tables below for Alternatives 2 and 3.

Alternative 1. No action. MFMT remains equal to $F_{30\% SPR}$, MSST and OY remain undefined, Gag TAC based on landed yield at MFMT = 3.77 mp (35% reduction)

Alternative 2. Establish MFMT, MSST, OY and a landed yield TAC based on one of the bundles below:

			Equilibrium OY and 2008 TAC based on landed yield		
Alternative Bundle No.	MFMT	MSST (Female SSB)	OY (yield corresponding to 75% of MFMT)	2008 MFMT based TAC	2008 OY based TAC
1a	$F_{30\% SPR}$ = 0.25 STATUS QUO	(1-M)*B_{MFMT} = 32.3 mp	.75*F_{MFMT} = 0.19 = 4.19 mp	3.77 mp (-35%)	3.50* mp (-51%)
1b		20 mp			
2a	$F_{historical}$ = 0.35	(1-M)*B_{MFMT} = 21.5 mp	.75*F_{MFMT} = 0.26 = 4.27 mp	4.42 mp (-10%)	3.88* mp (-33%)
2b		20 mp			
3a	$F_{current}$ = 0.40	½*B_{MFMT} = 18.8 mp**	.75*F_{MFMT} = 0.30 = 4.23 mp	4.66* mp (-3%)	4.10* mp (-22%)
3b		20 mp			

Alternative 3. Establish MFMT, MSST, OY and a total removals TAC (landed yield plus dead discards) based on one of the bundles below:

			Equilibrium OY and 2008 TAC based on total removals		
Alternative Bundle No.	MFMT	MSST (Female SSB)	OY (yield corresponding to 75% of MFMT)	2008 MFMT based TAC	2008 OY based TAC
4a	$F_{30\% SPR}$ = 0.25	(1-M)*B_{MFMT} = 32.3 mp	.75*F_{MFMT} = 0.19 = 8.58 mp	7.39 mp (-37%)	6.08* mp (-52%)
4b		20 mp			
5a	$F_{historical}$ = 0.35	(1-M)*B_{MFMT} = 21.5 mp	.75*F_{MFMT} = 0.26 = 8.62 mp	8.74 mp (-11%)	7.53* mp (-34%)
5b		20 mp			
6a	$F_{current}$ = 0.40	½*B_{MFMT} = 18.8 mp**	.75*F_{MFMT} = 0.30 = 8.53 mp	9.15* mp (-1%)	7.85* mp (-24%)
6b		20 mp			

$F_{historical}$ is slightly less than the 1985-2004 average F of 0.36.
* Estimated values by interpolation or extrapolation of SEDAR provided values.
** Under Alternative Bundles 3a and 6a, an MSST of (1-M)*B_{MFMT} would have equaled 17.9 mp, which is below the minimum allowed threshold of ½ of B_{MFMT} (18.8 MP). Therefore, these alternative bundles set MSST at the

minimum allowed level of ½ of B_{MFMT}.

The existing definition of MFMT is $F_{30\% SPR}$, which was adopted in the Generic Sustainable Fisheries Act Amendment (GMFMC 1999). However, the SEDAR 10 Review Workshop Panel recommended that the definition be changed (NMFS 2006). At present there is no definition of MSST or OY for gag that has been accepted under the Sustainable Fisheries Act.

The above tables in Alternatives 2 and 3 contain sub-alternatives for setting MFMT, MSST, OY and TAC as an interrelated bundle. The bundles are based on making an initial selection of the appropriate level of MFMT from among three choices:

MFMT

$F_{30\% SPR}$ (sub-alternatives 1 and 4) are the status quo alternatives and represent the existing level of MFMT . In the current assessment this was estimated to be F = 0.25. Since 1995, F has been above this level, ranging from 0.30 to 0.49 (Table Gag-2). However, stock biomass has, until recently, continued to increase despite F being consistently above this level (Figure Gag-2).

$F_{historical}$ (sub-alternatives 2 and 5) is the recommended MFMT by the SEDAR 10 Review Workshop Panel. The Panel noted that the gag stock has apparently increased as a result of good recruitment under estimated fishing mortality rates that have averaged F = 0.36 since the early 1980s (i.e., 1985-2004), and therefore they recommended that fishing mortality be reduced to just under that average. This alternative sets MFMT at F = 0.35.

$F_{current}$ (sub-alternative 3 and 6) sets MFMT at the recent 4-year average (2001-2004) of F = 0.40. Allowing F to remain at this level is functionally equivalent to no-action. However, this represents a recent high in fishing mortality rate, and the recent downtrend in spawning stock biomass estimates (Figure Gag-2) suggests that current yields at this level of fishing mortality rate may not be sustainable.

MSST

Each bundled set of sub-alternatives offers two sub-options for setting MSST. The first sub-option uses a formula of $(1-M)*B_{MFMT}$, not to exceed ½ of B_{MSY}. This is based on the recommendation provided by NMFS (Restrepo et al. 1998), and on the previous practice of the Council in setting MSST for other species (the sub-alternatives in this section use the MSY proxy used in setting MFMT rather than the absolute MSY estimate for consistency with the MFMT threshold). This is a level at which it is considered reasonable to expect to rebuild an overfished stock in 10 years or less. For gag, which has an average natural mortality rate of M = 0.14, this would set the threshold at 86% of the biomass proxy for B_{MSY} except for the alternatives based on $F_{current}$ (Alternatives 3 and 6). For these alternatives, the formula would result in a biomass threshold less than ½ of B_{MSY}. Therefore the $½*B_{MSY}$ level is used in place of the formula.

The SEDAR 10 Review Workshop Panel recommended against using the $(1-M)*B_{MFMT}$ formula

(NMFS 2006) for two reasons. First, the Panel had no confidence in the biomass based benchmarks generated by the stock assessment due to a high degree of variability in the data used in the stock-recruit relationship. Second, they felt that if the biomass based estimates were used, setting MSST at 86% of the MSY level was too close to the MSY level to allow for natural fluctuations, and it would result in stock biomass estimates falling below MSST with a relatively high frequency. In reviewing Figure Gag-2, the Panel noted that the stock recruitment did not appear to be impaired until SSB dropped below 20 million pounds (mp), and therefore suggested that 20 mp SSB be set as a temporary operational definition, to be re-examined at the next stock assessment.

For purposes of setting TAC, the selection of MSST level will not have any immediate impact. First, since the Panel had no confidence in the biomass based benchmarks there is no accepted biomass reference point against which to measure MSST, thus NMFS classified the overfished status of the gag stock as unknown. Second, even if the biomass benchmark estimates are used, the current estimate of female SSB (33.28 mp in 2005. Table Gag-2) is above all of the MSST options (i.e., the stock would be found to be not overfished), although it is projected to drop below MSST in the next few years under the $(1\text{-}M)*B_{MFMT}$ formula for sub-alternatives 1 and 3.

OY

The MSFCMA states (in part) that optimum, with respect to yield, is prescribed on the basis of MSY as reduced by any relevant economic, social or ecological factor (16 U.S.C. 1802). The Council has previously proposed that OY be set equal to the yield corresponding to $F_{0.1}$ (Amendment 11, GMFMC 1995) and the yield corresponding to 40% SPR (Generic SFA Amendment, GMFMC 1999). However, both definitions were disapproved by NMFS. In the bundled sub-alternatives, the level of OY is based on the recommendation in the provided by NMFS (Restrepo et al. 1998). This sets OY at the yield corresponding to the yield when fishing at a mortality rate of 75% of F_{MSY}, which generally produces a yield of about 94% of the F_{MSY} yield at equilibrium. This is intended to provide a safe buffer between current F and MFMT with a minimal reduction in yield from MSY, but it does not explicitly incorporate economic or social factors. Thus, it should be considered an interim measure until an OY can be developed that incorporates all relevant factors.

TAC

For each bundle of sub-alternatives, there are two options for TAC. The MFMT based TAC meets the legal requirement to end overfishing. However, under National Standard 1, conservation and management measures must not only prevent overfishing, but also achieve, on a continuing basis, optimum yield. Therefore, an OY based TAC is also provided as an option.

The sub-alternative bundles are also separated into alternatives with TACs based on landed yield (sub-alternatives 1 – 3) , and alternatives with TACs based on total removals including dead discards (sub-alternatives 4 – 6).

Landed yield is the traditional basis for setting TAC. While dead discards are not explicitly included in the TAC, they are taken into account as part of the overall mortality rate. The

commercial aggregate shallow-water grouper quota is a landed yield quota. Since the commercial portion of the gag TAC must be integrated into the shallow-water grouper quota, this may be the only viable way to set a gag TAC at this time.

Total removals explicitly includes dead discards, and it implies a 1:1 relationship between reductions in dead discards and increases in retained yield.. However, if dead discards can be reduced, and those fish are allowed to survive and grow so that they can be caught at a later time at a larger size and weight, then there should be greater than a 1:1 benefit between reductions in dead discards and later increases in retained yield. A TAC based on total removals would require implementation of a discard monitoring program that could produce estimates of recreational and commercial discards to complement the existing retained catch monitoring.

A third possibility is to set TAC based on landed yield (sub-alternatives 1 – 3), and to set a separate dead discard limit based on the difference between the total removals TAC and corresponding landed yield TAC. This would allow the gag TAC to be integrated into the commercial aggregate shallow-water grouper closure while still providing a basis for managing dead discards, providing that an effective system of monitoring recreational and commercial dead discards can be developed.

There will not be an explicit allocation of the gag TAC made between the commercial and recreational sectors. This will allow for natural fluctuations in harvest by the respective sectors to occur without triggering remedial actions, provided that the overall average harvest does not exceed TAC on a continuing basis. Instead, each sector will have its harvest reduced by an equal percentage from its 2001-2004 average. In order to determine the percent reductions needed for each TAC option, the landed yields and total removals under the target F were estimated for the recent years (2001-2004) and compared to the actual landed yields and total removals during that time period. For the commercial quota, the gag portion of the quota will be reduced from the recent harvest levels by that percentage. The reduced commercial quota will then be managed in one of two ways: 1) Through quota monitoring/closure and a 6,000 pound aggregate grouper trip limit. The Council may elect to make the gag portion of the aggregate quota a hard quota similar to red snapper, so that the commercial fishery closes when either the aggregate quota, red grouper quota, or gag quota is reached, whichever occurs first. 2) Through a grouper IFQ system that is currently under development. For the recreational sector, a combination of management measures will be used (closed seasons, bag limits, or other measures) that are projected to achieve the desired reduction over the course of the year.

In November 2006, NMFS announced the implementation of a February 15 to March 15 recreational closed season on harvest of gag, black grouper and red grouper beginning in 2007. In recent years this time period has accounted for approximately 8 percent of recreational gag landings (before accounting for potential effort shifting reducing the impact). This reduction will be taken into account and credited to the recreational sector when developing measures to reduce recreational gag harvest.

2.3 Action 2. Red Grouper TAC

Alternative 1. No action – Red grouper TAC remains at 6.56 million pounds gutted weight.

Alternative 2. Increase the red grouper TAC to OY (7.57 mp)

Alternative 3. Increase the red grouper TAC to some other value below MSY.

The SEDAR 12 stock assessment for red grouper estimates MSY to be 7.72 mp and OY equal to 7.56 mp. The MSA National Standard 1 specifies that "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." Thus, the target catch level for red grouper based on MSA language and the current stock assessment should be OY or 7.57 mp now that the stock is considered healthy. However, the Council could set a different target if it can be justified based on social or economic conditions. If the 7.57 mp were chosen as the TAC for red grouper, landings overall would be allowed to increase by approximately 15 percent over the currently defined TAC of 6.56 mp.

2.3 Action 3. Commercial Shallow-Water Grouper, Red Grouper and Gag Quota Adjustments

The current shallow-water grouper commercial quota is currently 8.80 million pounds gutted weight.

The baseline period used for recent average commercial catch in the following alternatives is 2001-2004.The baseline average harvest levels from which the percent reductions are calculated are:

red grouper	5.31 mp gutted weight (current red grouper quota)
gag	2.91 mp gutted weight (2001-2004 average)
other shallow-water grouper	0.72 mp gutted weight (Turner 2006)
Total baseline	8.94 mp gutted weight

The above baseline averages produce a proportional harvest of red grouper / gag/ other of 59% red grouper / 33% gag / 8% other.

Alternative 1. Status quo. Do not adjust the shallow-water grouper quota.

Alternative 2. Reduce the gag portion of the shallow-water grouper quota by a percentage equal to the reduction from recent (2001-2004) average gag catch to the TAC selected in Action 1. Increase the red grouper quota by a percentage equal to the increase in TAC from the current TAC selected in Action 2. The new shallow-water grouper quota is the sum of the adjusted gag and red grouper quotas plus the

"other grouper" harvest level. The shallow-water grouper season closes when the shallow-water grouper quota is reached or when either of the following is reached: gag quota, red grouper quota, whichever comes first.

Alternative 3. Adjust the gag, red grouper and shallow-water grouper quotas as described in Alternative 2. The shallow-water grouper season closes when the shallow water grouper quota is reached or when both of the following are reached: gag quota, red grouper quota.

Alternative 4. Adjust the gag, red grouper and shallow-water grouper quotas as described in Alternative 2. The shallow-water grouper season closes when the shallow-water grouper quota is reached.

Note: This scoping document does not currently contain options to change the commercial trip limit, closed season, or size limit. Commercial grouper harvest appears to be adequately constrained by the quota and existing harvest restrictions, and a grouper IFQ amendment is being developed concurrently (Amendment 29).

2.4 Action 4. Alternatives to manage recreational harvest of gag and red grouper

The following discussion provides ranges of possible reductions management measures (bag limits, closed seasons, size limits) can provide to reduce harvest and end overfishing of gag and red grouper. Depending on the maximum fishing mortality threshold (MFMT) selected by the Council for gag, reductions ranging from 1 to 52 percent are needed to end overfishing. Based on the Council's current overfishing benchmark ($F_{30\%SPR}$), harvest must be reduced by 10 to 11 percent to end overfishing, and by 33 to 34 percent to fish at the OY fishing rate.

Any increase in recreational harvest of red grouper will depend on the target TAC set in Action 2. Assuming that TAC is set at OY, the recreational fishery could be increased by approximately 15 percent.

Bag Limits

Gag: Currently there is no species-specific bag limit for gag. Gag are included in the 5-grouper aggregate bag limit, which includes 12 other grouper species. Within the aggregate bag limit, recreational anglers are allowed one red grouper per day, one warsaw grouper per vessel per day, and one speckled hind per vessel per day.

Table Gag-5 summarizes reductions in harvest for under various gag release mortality rates, based on the results of the gag stock assessment, which used a depth-size-release mortality function to estimate gag dead discards (SEDAR 10 2006). For the recreational fishery, the stock assessment estimated an average release mortality over all depths fished of 32 percent. Specifying a 3 or 4 gag bag limit would reduce average harvest by 3.6 and 1.2 percent respectively, indicating few anglers harvest more than three gag currently. If the bag limit is

reduced to 2 or 1 gag per angler per day, then harvest would be reduced by 9.2 and 22.3 percent, respectively. Charter vessels would be most affected by reductions to the bag limit, followed by private anglers and then headboat anglers.

Table Gag-5. Percent reductions in gag harvest by year (2003-2005) for various bag limits.

Bag Limit	Release Mortality Rate			
	rel = 0	rel = 0.2	**rel = 0.32**	rel = 0.4
4	1.8%	1.4%	**1.2%**	1.1%
3	5.3%	4.2%	**3.6%**	3.2%
2	13.5%	10.8%	**9.2%**	8.1%
1	32.8%	26.3%	**22.3%**	19.7%

Red Grouper: Red grouper currently are restricted to one fish within the five grouper aggregate bag limit. The one red grouper bag limit was implemented in August 2005 through interim rule and then continued by Regulatory Amendment starting in July 2006. Because the one-fish bag limit was only implemented for the last five months of the assessment years, it probably had little effect on the assessment. However, recreational landings have averaged at or above the target 1.44 mp over the most recent five years, 1002 through 2005. Therefore, red grouper bag limits could be relaxed to two or possibly as high as five provided that the change could be made without affecting gag grouper discards or harvest levels required to end overfishing.

Aggregate Grouper Bag Limits

The 5-grouper aggregate bag limit has been in effect since implementation of Amendment 1 to the Reef Fish FMP. As described above, the aggregate bag limit includes 13 species of grouper, with additional restrictions on the amount of red grouper, warsaw grouper, and speckled hind that can be harvested.

As mentioned above, the red grouper bag limit within the five-grouper aggregate may be able to be removed or at least increased to two fish; whereas, gag grouper will most likely have to be reduced to a two or one fish bag limit to effect the reductions necessary (Table Gag-4). If the bag limit for gag is set at two fish and the aggregate remains at five fish, there will be some increase in discards of gag as fishers target red grouper for the remainder of their total bag limit. So, it may be necessary to reduce the aggregate bag limit to avoid increasing discards of gag.

Analyses on the effect of changing the aggregate bag limit have not been completed at this writing; however, the effect can be approximated using annual MRFSS landings of gag and red grouper. From 2001 through 2005, recreational fishers landed an average of 2 gag for each red grouper within the combined range of the two species. A three-fish aggregate bag limit would yield two gag and one red grouper if the fisher caught the limit. This assumes that fishers will not change their fishing practices. Likely average catches at other aggregate bag limits are shown in Table Aggregate-1. These values are also applicable to catches per trip lower than the bag limit such as catching three grouper within a five grouper bag limit.

Actual catches of grouper by species are more variable than depicted by the averages presented

in Table Aggregate-1. Red grouper are more abundant in the southwest Florida, gag are more abundant north of central Florida, and actual catch per trip should vary accordingly. Recreational fishers prefer to catch gag grouper and can target them to some extent. Professional fishers (charter) and avid private fishers may be able to limit out on gag most trips; less avid fishers will likely not limit out and catch more red grouper. Availability and therefore catch rates of red grouper and gag change yearly due to changes in recruitment and environmental conditions. Gag and red grouper migrate seasonally. Collectively, these conditions affect what a fisher will catch on any given trip and will infrequently match the averages in Table Aggregate-1.

Table Aggregate-1. Average maximum catch per trip of gag and red grouper at various aggregate bag limits. Based on total annual catch of red grouper and gag from MRFSS 2001-2005

Aggregate Bag Limit	Proportion	
	Gag	Red
5	3.38	1.62
4	2.70	1.30
3	2.03	0.97
2	1.35	0.65

Recreational Closed Season

The first closed season for recreational grouper became effective December 18, 2006 (71 FR 66878). The recreational fishery for gag, black grouper, and red grouper will be closed annually from February 15 to March 15 beginning in 2007. This closed season was implemented to reduce red grouper fishing mortality and prevent or minimize bycatch of gag and black grouper as a result of more restrictive red grouper regulations. The closure will occur simultaneously with the commercial grouper closure and includes important spawning seasons for all three species. The closure is expected to reduce gag harvest by approximately 7.8 percent unless there is effort shifting to the open season by trips that would have occurred in the closed season. There will also be a reduction in red grouper harvest if bag and size limits remain unchanged. Table Gag-5 summarizes the average percent of the annual recreational gag and red grouper harvest by month. These can be used as approximate proxies for estimated reductions from closed seasons, although effort shifting of fishing trips to the open season could reduce the impact of a given closed season. Primary recreational fishing seasons for gag are March through June, and for red grouper are May through August. Gag spawn in the Gulf of Mexico from mid-January until mid-April, with a peak in spawning during March (SEDAR 10 2006). Red grouper spawn from February until mid-July, with peak spawning occurring in March, April and May (Fitzhugh et al. 2006).

Table Gag-5. Percent reduction in gag and red grouper harvest by month. Reductions are based on average recreational landings during 2003-05. MRFSS, headboat and TPWD data used for gag, MRFSS data used for red grouper.

Month	Gag Percent Reduction	Red Grouper Percent Reduction
Jan	6.7%	3.8%
Feb	6.1%	3.8%
Mar	10.5%	8.5%
Apr	10.2%	8.5%
May	10.2%	14.0%
Jun	9.8%	14.0%
Jul	7.0%	14.5%
Aug	6.9%	14.5%
Sep	7.6%	6.2%
Oct	8.0%	6.2%
Nov	8.4%	3.0%
Dec	8.6%	3.0%

Minimum Size Limits

In 1990, a 20-inch total length (TL) minimum size limit was established for gag. This size limit was increased to 22-inches TL for the recreational fishery and 24-inches TL for the commercial fishery in 2000 in order to reduce harvest. Size limits are intended to reduce fishing mortality, increase the size of fish caught, and increase the likelihood fish reach maturity and spawn before being harvested. However, size limits can also negatively affect fisheries by increasing bycatch and dead discards. Currently, the recreational minimum size limit is slightly below the size at 50 percent maturity (i.e., 23 inches TL, SEDAR 10 2006).

Since implementation of the 22-inch minimum size limit in 2000, the number of gag discarded dead by recreational anglers has more than doubled (Figure Gag-5). The 2006 gag stock assessment estimated 1.17 million gag were discarded dead by recreational anglers in 2004. Most discards are assumed to be the result of minimum size limit regulations, although some anglers may discard gag if they have reached their 5-aggregate grouper bag limit or if they believe a larger legal-sized gag could be landed (hi-grade).

Table Gag-6. summarizes reductions in harvest associated with various increased size limits and release mortality rates. Based on a 32 percent release mortality rate, increasing the minimum size limit to 24 inches TL would reduce harvest by 16.6 percent. Although larger size limits may reduce harvest, they may further increase bycatch and potentially could reduce yield-per-recruit (YPR) because of losses due to discard mortality. Additional analyses will be completed to evaluate the effects on YPR if the minimum size limit is increased.

The Council has requested analyses for reducing the 22-inch minimum size limit. Reducing the minimum size limit would decrease dead discards, but would increase fishing mortality and result in less gag becoming mature before harvest, and would likely increase the rate of retained

harvest. To offset increases in fishing mortality, additional regulations would likely be necessary to constrain harvest.

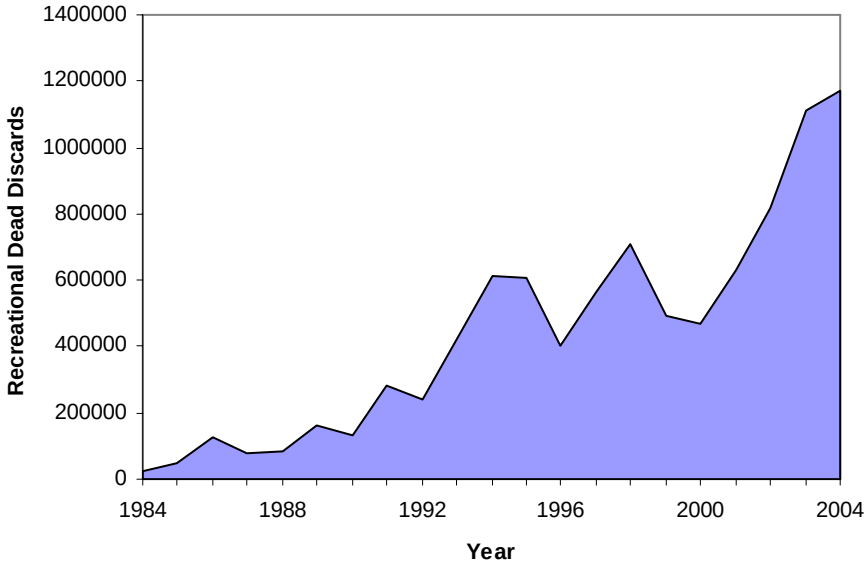

Figure Gag-5. Number of recreational gag dead discards by year, 1984-2004 (source: SEDAR 10 2006).

Table Gag-6. Percent reduction in weight of recreationally harvested gag for various size limits and release mortality rates (2003-05 average).

	Percent Reduction	
Size Limit	rel = 0.0	rel = 0.32
22	0.0	0.0
23	10.4	7.1
24	24.4	16.6
25	36.5	24.9
26	47.7	32.4
27	57.9	39.4
28	65.4	44.5
29	73.0	49.6
30	78.8	53.6

Management Actions to End Overfishing

The management actions discussed above can be used independently or in combination to achieve the necessary reductions in harvest to end overfishing. There is a great deal of flexibility in these combinations. For gag Table Gag-7 shows examples of some combinations to achieve

some of the reductions referenced in Action 1, assuming an average recreational release mortality rate of 32% (as used in the stock assessment):

Table Gag-7. Combinations of management measures to end overfishing of gag. These are only a sample of possible combinations of measures to achieve a given reduction. Other combinations are possible.

Targeted Reduction in Gag Harvest	Closed Season (days closed) (% of reduction)	Bag Limit	Size Limit (inches TL)
10%	Feb 5 - Mar 14 (38) (10%)	5	22
	Feb 10 - Mar 14 (33) (9%)	4	22
	Feb 15 – Mar 11 (25) (7%)	3	22
	Jan 1 – Jan 4 (4) (1%)	2	22
33%	Jan 1 - Mar 17 (76) (19%)	4	24
	Jan 1 - Apr 21 (111) (30%)	3	22
	Jan 1 – Feb 14 (45) (10%)	2	24
	Jan 1 – Jan 24 (24) (5%)	1	23
35%	Jan 1 - Apr 27 (117) (31%)	3	22
	Jan 1 - Feb 27 (58) (11%)	2	24
	Feb 15 – Mar 14 (28) (8%)	1	23
51%	Jan 1 - May 16 (136) (37%)	3	24
	Dec 1 - Apr 7 (128) (33%)	2	24
	Dec 1 – Feb 21 (83) (18%)	1	24

The above are only examples. Many other combinations are possible.

Aggregate bag limit changes will affect red grouper as well as gag if the red grouper specific bag limit is repealed.

2.5 Action 5. Alternatives to reduce discard mortality of grouper

Alternatives to reduce discard mortality of gag would apply to both recreational and commercial fishing and include:

Alternative 1: Require circle hooks when fishing for grouper.

Alternative 2: Require venting tools on board vessels that have grouper on board.

Alternative 3: Require pamphlets or prominently displayed placards on board that provide instructions on venting and proper handling and release methods.

Alternative 4: Require the operators and crew of recreational for-hire and commercial reef fish fishing vessels to participate in mandatory training classes on the proper handling and release of reef fishes, with such classes to be developed and implemented by NMFS. Private recreational fishermen would also be encouraged

to attend such classes on a voluntary basis.

Considered But Rejected – The following alternatives were discussed by the Council for Action 5, but were rejected from any further consideration.

Alternative 5: Prohibit fishing for and possession of grouper on vessels fishing in water less than 30 feet deep.

Alternative 6. Request the Florida FWCC to research and identify areas of juvenile gag aggregations in state waters that could be established as potential seasonal or year-round closed areas to reduce juvenile grouper bycatch.

Discussion: Circle hooks are effective in avoiding hooking a fish in the gut, which greatly reduces the likelihood of survival if released. In addition, educating the public on the proper way to handle a fish when releasing it can help to reduce mortality caused by mis-handling or improper venting of a fish. These alternative would require the use of circle hooks when fishing for grouper, require that venting tools be available on vessels where grouper are caught, and require that appropriate instructions be available on the proper handling and release methods.

Discussion of Grouper Release Mortality by Depth of Capture

In grouper stock assessments prior to the current gag assessment, discard mortality was treated as a fixed proportion of total discards, 20% mortality for recreational discards and 30% mortality for commercial discards. However, studies have established that grouper release mortality increases with depth of capture (Burns and Koenig 2002, Guccione 1999, Wilson and Burns 1996).

The distribution for depth of capture for both the commercial and recreational fisheries was determined in 10 meter (33 feet) intervals using data collected on individual fish by the Trip Interview Program (TIP) on size distribution of gag by depth (62,006 commercial samples and 371 recreational samples) combined with catch-at-size information collected for each sector. As a result, the SEDAR 10 2006 gag stock assessment was able to adopt a variable release mortality that relates mortality rate to depth and a depth distribution of capture for each sector. The range of release mortality ranged from 6% near the surface to 95% for gag caught at depths of 52 fathoms (312 feet) or deeper. The depth of 50% mortality was 25 fathoms (150 feet) (Figure Gag-6) (Ortiz 2006).

For recreational fisheries on average mortality of discards were about 32%, while for the commercial fisheries the average mortality was around 67% (Ortiz 2006).

Nearly all of the dead discards (99%) come from the recreational sector. The recreational size at depth distribution reported by Ortiz (2006) shows that more than 50 percent of the gag caught in depths of 0 to 33 feet are less than 22 inches. The proportion of undersized gag drops to about a third at the 33 to 66 foot depths, and to less than 20 percent at depths of 130 feet and deeper (Figure Gag-6).

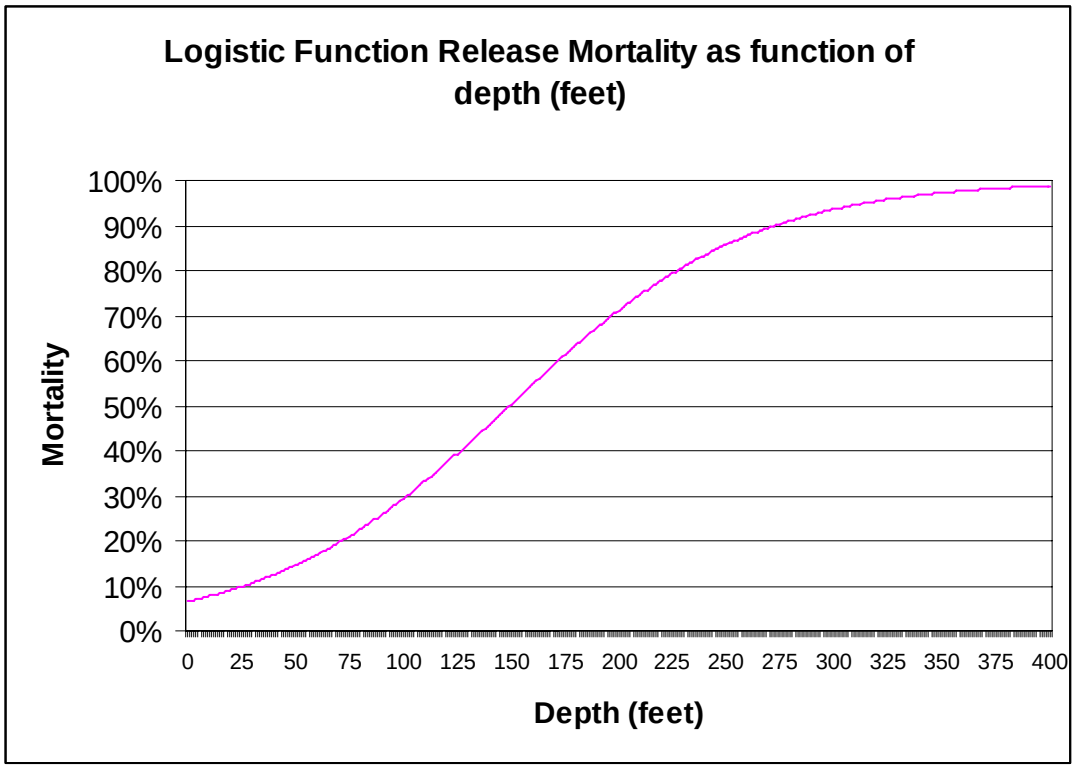

Figure Gag-6. Release mortality of gag as a function of depth, using the logistic function % Mortality = 1/(1+EXP(-0.05865*(depth_m-45.5))). (Depth axis converted from meters to feet for display. Source: Ortiz 2006.

Although bycatch of undersized gag in proportion to legal sized gag is high at shallow depths, the actual number of dead discards from these depths is relatively low, less than 1 percent of all dead gag discards. This is because of the low release mortality rate plus the relatively small numbers of gag caught relative to deeper depths (Table Gag-8). The average size of gag increases with depth; therefore, capture of undersized grouper and subsequent release mortality could be reduced if recreational grouper fishing could be redistributed to deeper depths where the proportion of undersized gag relative to legal sized is lower. Such a reduction could possibly be implemented through a seasonal prohibition on fishing for grouper in depths shallower than a certain depth. However, if fishermen, rather than move to deeper depths to fish for grouper, remain in the shallower depths and target other species, the grouper discards will be 100 percent of the grouper catch rather than just the percentage that is under the minimum size limit. Therefore, any such closure, to be effective, must take into consideration the socioeconomic value of grouper fishing vs. fishing for other species, and the likely reaction of fishermen to a depth boundary.

Table Gag-8. Gag recreational discards by depth, 2001-2004 average (source: Andy Strelcheck, NMFS/SERO)

Depth (feet)	Discards	Discard Mortality	Dead Discards	% Dead by Depth
0 - 33	97,791	9%	8,320	0.9%
34 - 66	391,162	14%	56,023	6.0%
67 – 98	789,847	23%	182,507	19.6%
98 – 131	940,294	35%	329,794	35.4%
132 – 164	488,953	49%	240,892	25.8%
165 – 197	90,268	64%	57,392	6.2%
198 +	75,224	76%	57,046	6.1%

2.6 Action 6. Closed Areas

Alternative 1. Status quo. Do not create any additional marine reserves or closed areas.

Alternative 2. Establish additional marine reserves by selecting from the potential marine reserve sites in Figure Gag-5 and Appendix 1. These new reserves will have the same regulations as exist for the Madison-Swanson and Steamboat Lumps marine reserves, and will expire after June 16, 2010 (to coincide with existing reserves), unless reauthorized in a subsequent amendment.

Closed Areas: Existing marine reserves to protect gag spawning aggregations were established in 1996 at the Madison-Swanson and Steamboat Lumps sites. A number of other locations have also been identified as potential marine reserves off the Florida west coast (Figure Gag-7). Within the Madison-Swanson and Steamboat Lumps reserves the current regulations prohibit all fishing during November through April, which encompasses most of the gag spawning season, and allow only surface trolling during the remainder of the year. Closed areas do not necessarily reduce overall fishing effort, but rather redirect the effort into the remaining open areas. In areas of known spawning, they can reduce localized fishing mortality on spawning aggregations, and may help to increase spawning success within the area by eliminating disruption to spawning behavior from fishing activities. Figure Gag-8 shows a comparison between the potential reserve sites and gag fishing effort.

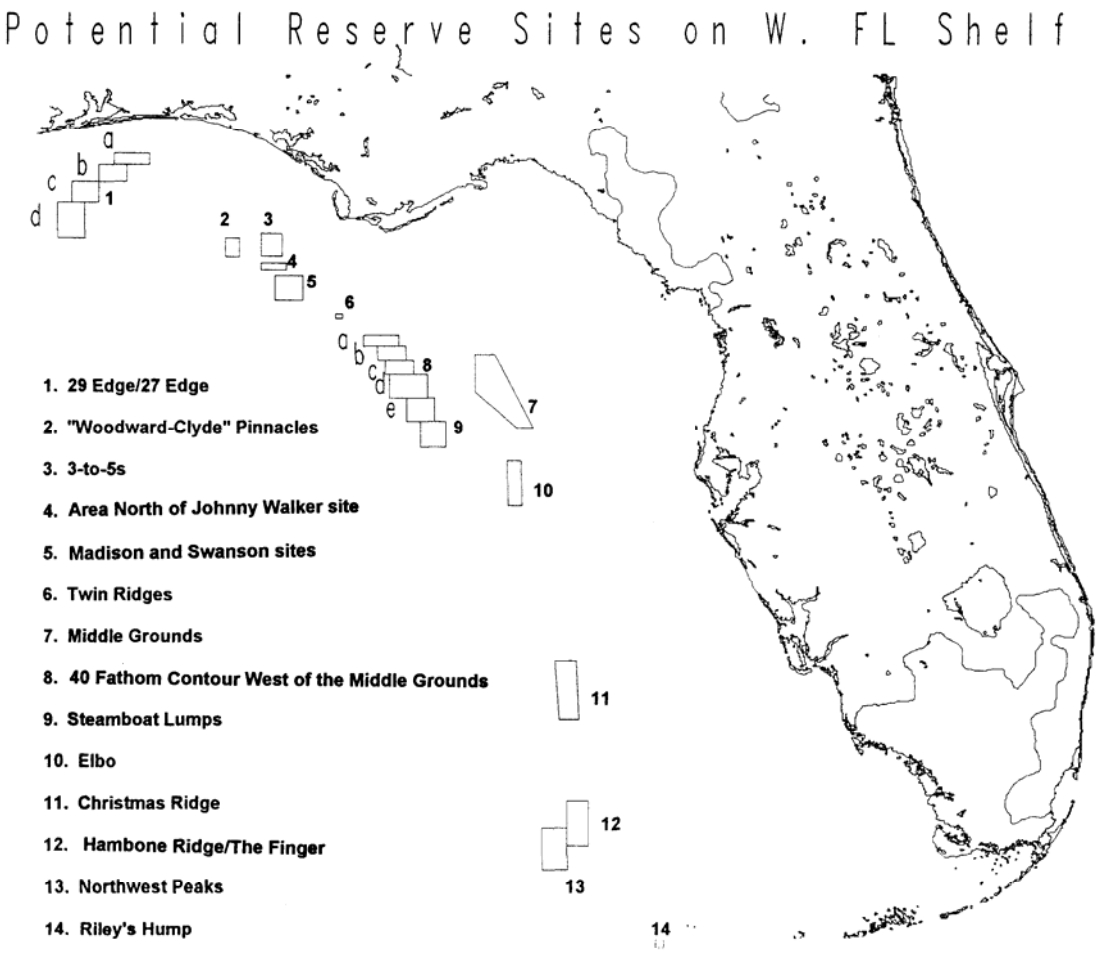

Figure Gag-7. Potential reserve sites on west Florida shelf coast (source: Chris Koenig and Gary Fitzhugh)

- **Where is spawning concentrated?**

- **Where is fishing concentrated?**

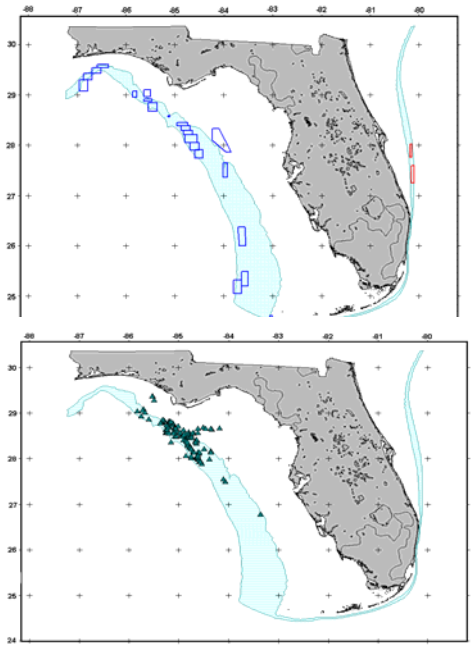

Figure Gag-8. Comparison of fishing effort to spawning locations (source: PowerPoint presentation – Groupers on the Edge, presented by Felicia Coleman and Chris Koenig at the May 2003 Council meeting.)

2.7 Action 7. Grouper Discard Monitoring Program

A grouper discard monitoring program will need to be developed if the TAC selected in Action 1 includes total removals or if a dead discard limit is adopted separately from a landed yield TAC. Reef Fish Amendment 22 directed NMFS to develop such a program for the commercial and recreational for-hire sectors, to be implemented when sufficient funding is obtained.

A small-scale mandatory bycatch observer program was established for the commercial reef fish sector in 2006. The program uses a random selection process stratified by gear and season. It is scheduled to obtain about 300 days of observation per year, which is estimated to be about 2% of the commercial reef fish effort (pers. Comm.., Jim Nance, Elizabeth Scott-Denton). To date, the observer program for the recreational for-hire sector has not been implemented.

Alternative 1: Status quo - no action. For commercial discard monitoring, use the existing bycatch reporting requirements in the NOAA Fisheries Commercial Fishing Logbook Program for commercial reef fish permit holders along with a mandatory bycatch observer program. Charter vessels would be sampled by MRFSS. Headboats and private recreational vessels would not be sampled.

Alternative 2: Implement the mandatory bycatch observer program for the recreational for-hire sector as well as the commercial sector as proposed in Reef Fish Amendment 22.

Alternative 3. Expand the use of the existing supplemental bycatch reporting requirements in the NOAA Fisheries Commercial Fishing Logbook Program for commercial reef fish permit holders to 100 percent and include recreational for-hire vessels in the logbook program.

Alternative 4. Develop a bycatch reporting logbook program for the private sector of the recreational fishery. NOAA Fisheries will develop a random selection procedure, using state licenses or other appropriate sample frame, for determining on an annual basis individuals that will be selected to report in the program. In selecting individuals, the agency will initially use a questionnaire to pre-screen a random selection of licensed fishermen to determine the frequency, geographic location, and type of fishing (inshore. vs. offshore, hook and line vs. spearfishing, etc.) for those fishermen, in order to ensure that the universe of fishermen selected to report is representative of all statistical sub-zones in the Gulf and of the marine recreational fishing community.

The bycatch reporting methods proposed by the Council in Amendment 22 were:

- Develop an observer program managed by NOAA Fisheries for the reef fish fishery. NOAA Fisheries will develop a random selection procedure for determining vessels that will be required to carry observers in order to collect bycatch information. In selecting vessels, the agency will consider the suitability of the vessel for such purpose and ensure that the universe of vessels included are representative of all statistical sub-zones in the Gulf. Vessel permits will not be renewed for vessels that fail or refuse to carry observers in accordance with this process. The requirement for the observer program to be implemented is contingent on NOAA Fisheries obtaining sufficient funding for the program.

- Enhance the MRFSS by including headboats using the same sampling methodology as used for charter vessels. (This alternative was not accepted by NMFS.)

The alternatives in this section are intended to implement and expand on the previously proposed bycatch reporting methodologies.

3 Greater Amberjack

3.1 Assessment Overview

Secretarial Amendment 2 to the Reef Fish Fishery Management Plan (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; therefore, no new management measures were implemented.

A new assessment was conducted in 2006 using a simple surplus production model called A Stock-Production Model Incorporating Covariates (ASPIC) (Prager 2004). Other models, such as the calibrated VPA used in the 2000 assessment and an age-structured surplus production model were built but a lack of good quality ageing data added an unknown amount of uncertainty to these methods and they were not considered adequate (SEDAR 9 Assessment Report 2, 2006). Results from the ASPIC base model are:

Parameter	***Value***
Population parameters and management benchmarks	
MSY (million pounds)	5.039
B_{MSY}	8.873
F_{MSY}	0.568
Stocks parameters in 2004	
F_{2004}	0.863
F_{2004} / F_{MSY}	1.520
B_{2004}	4.250
B_{2004} / B_{MSY}	0.479

Based on the parameter estimates for 2004, the stock was overfished ($B_{2004} / B_{MSY} < 1.0$) and undergoing overfishing ($F_{2004} / F_{MSY} > 1.0$). Stock biomass declined from at least 1986 through 1998 and then increased through 2003 (Figure AJ-1). However, these results were very dependent upon the weighting applied to the catch rate indices by fishing sector. The base case model weighted the indices by the proportion of total catch for each sector over the last eight years. When each catch rate is weighted equally the stock remains overfished but less so than the base case, and is just barely in the overfishing state. (Review Panel Advisory Report in SEDAR 9 Assessment Report, 2006).

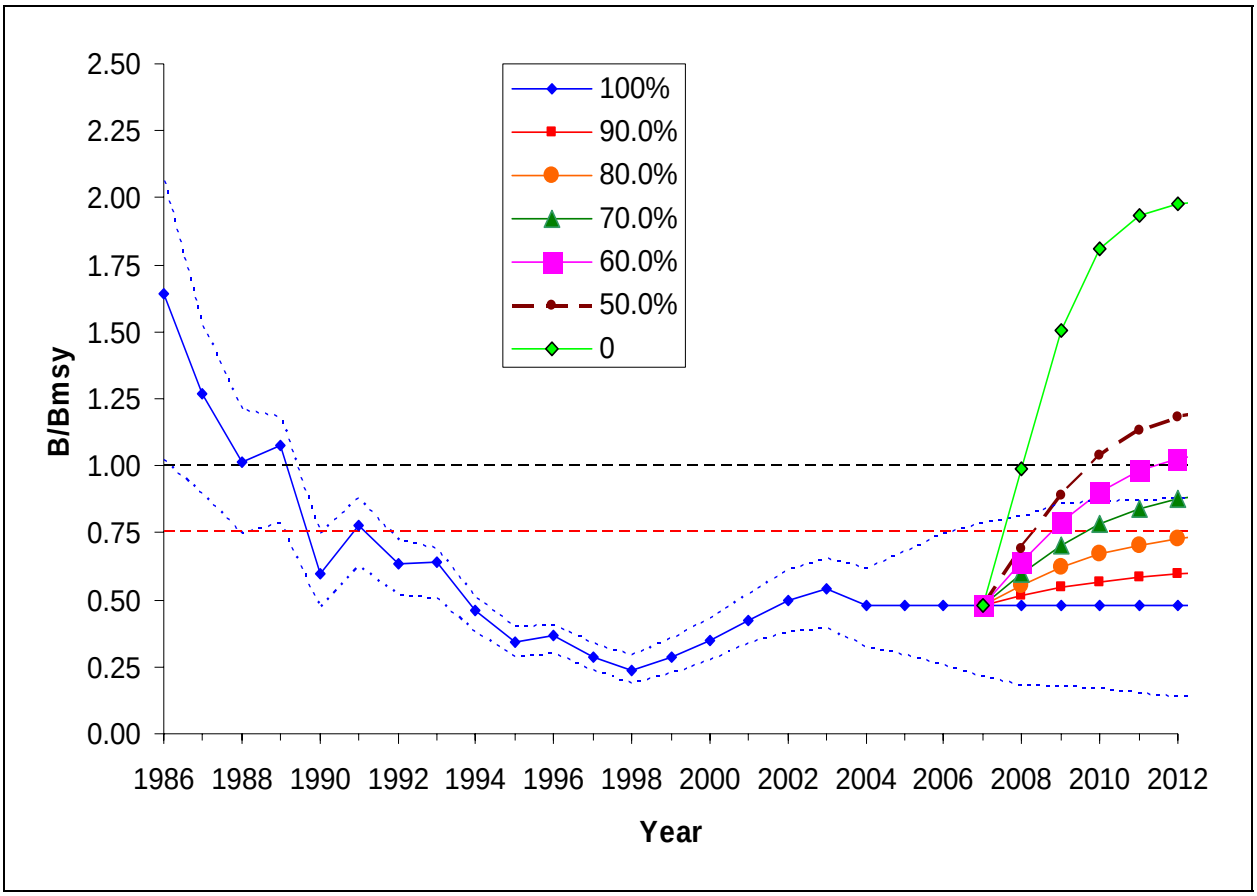

Figure AJ-1. Greater Amberjack relative biomass trends from 1986 to 2004 and relative biomass projections from 2005 through 2012 using constant fishing mortality rate trajectories at various reductions in the level of F relative to F during 2004. Reprinted from a PowerPoint presentation given to the SSC and Reef Fish AP on August 8, 2006 by Guillermo Diaz, SEFSC

Additionally, some of the uncertainty in the stock status derives from the indices of relative abundance being inconsistent between sectors in 2004 (Figure AJ-2). Reasons stated by the Review Panel included: (1) the minor components of the fishery (recreational headboats and commercial longline) exhibited an increase while the major components of the fishery (recreational charter boat and private boats with commercial hand line vessels) exhibited different degrees of decrease and (2) there may be different selectivities between sectors, different fishing locations of each sector with some being more representative of the true stock status than others, or possibly a strong recruitment into the fishery combined with the selectivity by the charter boats for smaller fish. This makes the projections both uncertain and uninformative so the SEDAR 9 Review Panel recommended that an update assessment be conducted in the next few years to determine the stock trajectory with more precision.

Subsequent to the SEDAR 9 report, the indices were updated to include the values for 2005 (Figure AJ-2). The MRFSS and Handline indices, representing 92 percent of the total catch, continued to decline in 2005 and the Headboat index declined significantly in 2005 to near

historical lows. Collectively these three sectors of the fishery represent over 97 percent of the total harvest. Only commercial longline index representing 2.5 percent of the total harvest continued to increase. Therefore, the SEDAR 9 assessment including weighted indices by the proportion of catch by sector appears to be valid; the stock is continuing to undergo overfishing and remains overfished.

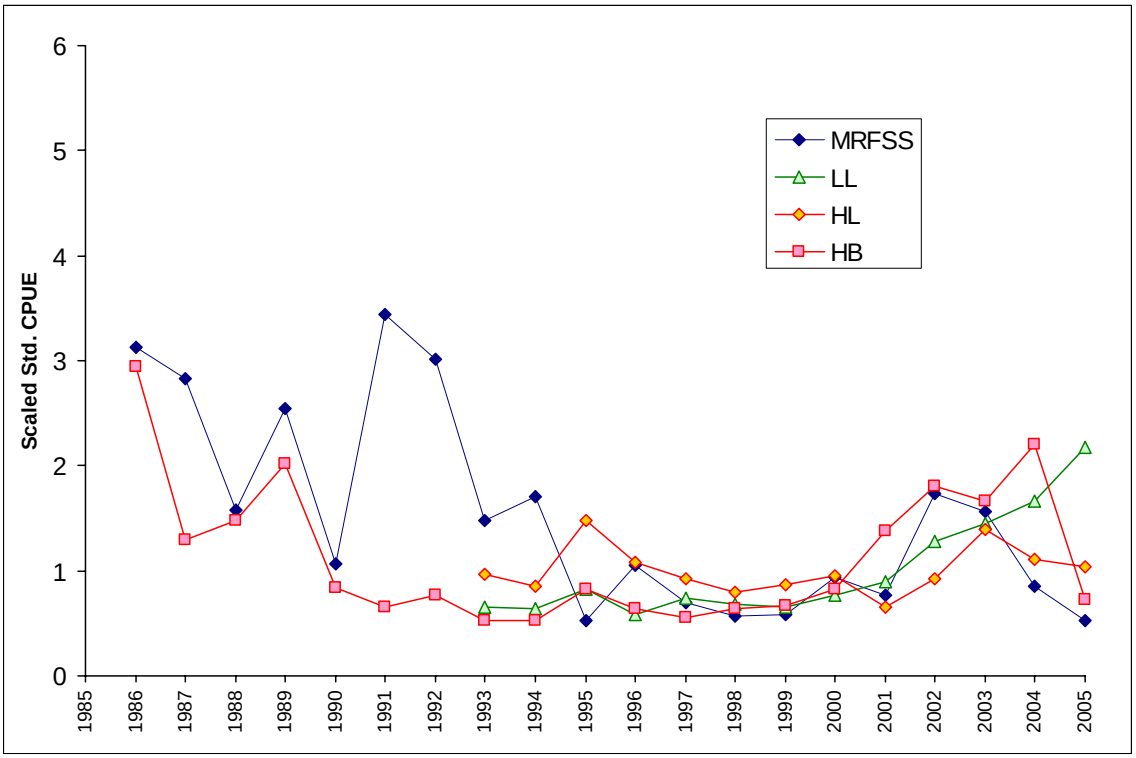

Figure AJ-2. Greater Amberjack Catch Per Unit Effort trends from recreational (MRFSS and Headboat) and commercial (Longline and Handline) sectors from 1985 through 2005. Reprinted from a PowerPoint presentation given to the SSC and Reef Fish AP on August 8, 2006 by Guillermo Diaz, SEFSC

3.2 Management Thresholds and Targets

The Sustainable Fisheries Act compliant thresholds and targets were defined in Secretarial Amendment 2. Maximum fishing mortality threshold (MFMT) is defined as the fishing mortality rate at MSY. Minimum stock size threshold (MSST) is defined as (1-M)*B_{MSY} with natural mortality (M) equal to 0.25. Maximum sustainable yield (MSY) is the yield associated with F_{MSY} when the stock is at equilibrium and optimum yield (OY) is the yield associated with $F_{40\%\ SPR}$ when the stock is at equilibrium. $F_{30\%SPR}$ was defined as the proxy for F_{MSY} for greater amberjack because biomass-based estimates were considered less accurate than SPR-based estimates in the 2000 assessment. However, the more recent SEDAR 9 assessment accepted the biomass-based estimates for these parameters.

3.3 Adjustments to TAC: 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 AJ-1). Yield projections from both the 2001 and 2006 assessments are separated into directed yield and yield associated with discard mortality.

Table AJ-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.

	Historical Yield		2001 Assessment		2006 Assessment	
Year	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). In Table AJ-1 above, 2001 assessment projected yields are separated into directed catch and dead discards. The new assessment estimated 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 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 as the SEDAR 9 assessment suggests (Figure AJ-2).

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 Secretarial Amendment 2 specified. Projected yields for 2005 and 2006 were based on constant $F_{current}$ (Figure AJ-1, Table AJ-1). 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.

3.4 Action 8. Possible 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 AJ-2 summarizes the proposed alternatives to rebuild the stock. **Alternative 1** is taken directly from Secretarial Amendment 2 and a modified version of **Alternative 1** indicates 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 AJ-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 and Alternative 4 60% $F_{CURRENT}$ = 0.518 Directed Yield	Alternative 1 Status Quo Total Yield	Alternative 1 Modified 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. Directed TAC for 2006 – 2008 will be 4.0 mp, directed TAC for 2009 – 2011 will be 5.4 mp and directed TAC thereafter will be 6.1 mp.

This alternative would allow overfishing to continue. The stock would not rebuild by 2012 and likely would decline over time. Estimates of directed yield have been substituted for the original rebuilding plan targets. This would not require a modification of the current management regulations because directed 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 29.5 percent 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.

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 29.5 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 pressure. Large overruns in the early years of each interval would be difficult to overcome by naturally occurring reductions in later years. 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 by as much as 118 percent increases and 70 percent decreases between any two years. Landings in 1989 and 1991 each exceeded the 50 percent cap by more than two times and would have triggered new management measures under this Alternative. 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 allowed directed yield for 2007 would be 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 MRFSS Estimate*(1 - 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 and Texas Parks and Wildlife Department (TPWD) 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 proportional standard error (PSE) in pounds 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. If this Alternative is chosen as a preferred, it would apply to the recreational portion of the directed TAC from whichever Alternative 1 – 3 was preferred. This Alternative would not be used if Alternative 4 is chosen as the preferred because overages are built into Alternative 4.

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.

3.5 Management Actions to Achieve TAC

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

<u>Vessel Limits</u>

The recreational fishery is currently under a one-fish per person bag limit. To reduce the recreational fishery further using this tool would require switching to 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 (50 fish) was on headboats; 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 AJ-3).

Table AJ-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 1,700 pounds gutted weight would be required to reduce commercial landings by 29.5 percent (Table AJ-4).

Table AJ-4. Commercial percent reduction in landings for various trip limits (pounds gutted weight)

	Year			
Trip limit	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 29.5 percent reduction in landings (Table AJ-5). Any increase in size limit will likely increase dead discards although less so than for the commercial fishery.

Table AJ-5. Recreational weighted percent reductions in weight for various size limits and release mortality rates (All Modes, 2003-2005 average.

	Percent Reduction			
Size Limit	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 TIP sampling program (Strelcheck, pers. comm.). Size limits are currently set at 36 inches FL for the commercial fishery. Vertical line fishermen which land 90 percent of commercial greater amberjack will be affected most by any change in minimum size; while longline gear catch only about ten percent of the commercially caught greater amberjack and also catch the largest fish, averaging 40 inches FL versus about 31 inches for other gears. The size limit would have to be increased to 40 inches FL to attain a 29.5 percent reduction in commercial landings (Table AJ-6).

TableAJ- 6. Commercial weighted percent reductions in weight for various size limits and release mortality rates (2003-2005 Average)

	Weighted Reduction			
Size limit	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

Season Closures

Landings by month from the Accumulated Landings System (ALS) for the commercial fishery and from the MRFSS for the recreational fishery were averaged for the years 2003 through 2005 in Table AJ-7. There is currently a closed season from March – May for the commercial fishery. Landings from the commercial fishery seem to peak before and after the closed season; whereas, overall recreational landings peak during May and June. A 29.5 percent reduction in landings from the commercial fishery could be obtained by adding February and June to the closed season. Primary seasons for greater amberjack fishing are March through June for charter vessels, May through August for private recreational fishermen, and April through June for the headboat fishery. Using a seasonal closure to reduce the landings from the recreational fishery would require closing more than three months except during the peak season of May and June.

Table AJ-7. Percent landings by month for greater amberjack (2003-2005 average)

Month	Commercial	Recreational
1	10.4%	5.9%
2	10.6%	6.7%
3	0.8%	10.2%
4	0.2%	10.5%
5	0.6%	18.0%
6	19.0%	16.7%
7	14.4%	9.9%
8	16.6%	9.6%
9	8.1%	4.9%
10	6.4%	5.1%
11	6.5%	1.2%
12	6.5%	1.2%

Quotas

Quotas could be established for either the commercial or recreational sectors; however, typically, they are only applied to the commercial fishery. During 2001 through 2004, the commercial fishery harvested an average of 29.7 percent of total landings. The commercial quota would be 0.646 mp if the Alternative 2 rebuilding plan were chosen and 0.819 mp if Alternative 3 were chosen.

If a quota was to be considered for the recreational fishery, it would likely have to be a closed season expected to reduce harvest to the target quota. Data collection in the recreational fishery is not timely enough to consider closures based on in-season analyses. Annual estimates of catch could be used to adjust the closure for the following season. This process would be equivalent to establishing a new closed season each year. If the Alternative 2 rebuilding plan were chosen, the 2008 fishing season would end on July 7 and if Alternative 3 were chosen, the 2008 season would end on September 11, assuming no additional management measures were used.

3.6 Action 9. Management Options to reduce directed yield and achieve TAC.

Any one of the possible management tools can be used independently to affect a 10.7 percent reduction in greater amberjack landings. However, if the constant F scenario is chosen, the 29.5 percent reduction using a single management tool is a significant 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 AJ-8 offers examples of alternative ways that would accomplish the 10.7 or 29.5 percent reductions. Alternatives using size limit increases have not been offered for the commercial fishery because dead discards in the commercial fishery are roughly half of the total commercial harvest under the current 36 inch FL size limit. Trip limits or additional closed seasons could be used to reduce the size limit and subsequently reduce dead discards but the analyses have not been done. 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 AJ-8. Alternatives for reducing landings of greater amberjack in the commercial and recreational fishery

Rebuilding Alternative	Alternative 2 Initial reduction = 29.5%	Alternative 3 Initial reduction = 10.7%
Management Options		
Recreational		
Vessel limit	2 fish 31% reduction	5 fish 10% reduction
Size limit	32" 31.9% reduction	30" 14.3% reduction
Season closure	March 1 - May 15 29.7% reduction	April 10.5% reduction
Season+Vessel limit	March-April & 5 fish 29% reduction	
Season+size	February-March & 30" 29% reduction	September & 29" 10.9% reduction
Commercial		
trip limit	1,600 pounds 30.6% reduction	4,400 10.4% reduction
Season	Add June 1 - July 23 29.6% reduction	Add February 10.6% reduction
Trip & Season	3,700 pounds & June 29.7% reduction	
Trip & Season	2,500 pounds & February 29.1% reduction	
Quota	0.647 mp 29.5% reduction	0.819 mp 10.7% reduction

4 Gray Triggerfish

4.1 Assessment Overview

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 B_{MSY}. However, all the models run by Valle, et al. 2002 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 total length (TL) minimum size limit implemented in 1999 would have. So no new regulations were implemented based on the results of these assessments.

Table GT-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 parameters 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)

A new stock assessment was completed in 2006 using an age-structured production model (SEDAR 9, Assessment Report 1, 2006). The stock was determined to be undergoing overfishing but it was uncertain whether the stock was also overfished (Table GT-1). Based on the definition of MFMT ($F_{30\%SPR}$), the current fishing mortality rate is about 62 percent too high (Figure GT-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 GT-2). As reference for the two Figures showing historical stock condition, landings are provided in Table GT-2. Table GT-3 shows commercial and recreational landings by State from 2001 through 2004. Alabama and West Florida account for 84 percent of all Gulf landings; and more specifically, Alabama and the Panhandle Counties of Florida through Jefferson County account for 69 percent of all Gulf gray triggerfish landings.

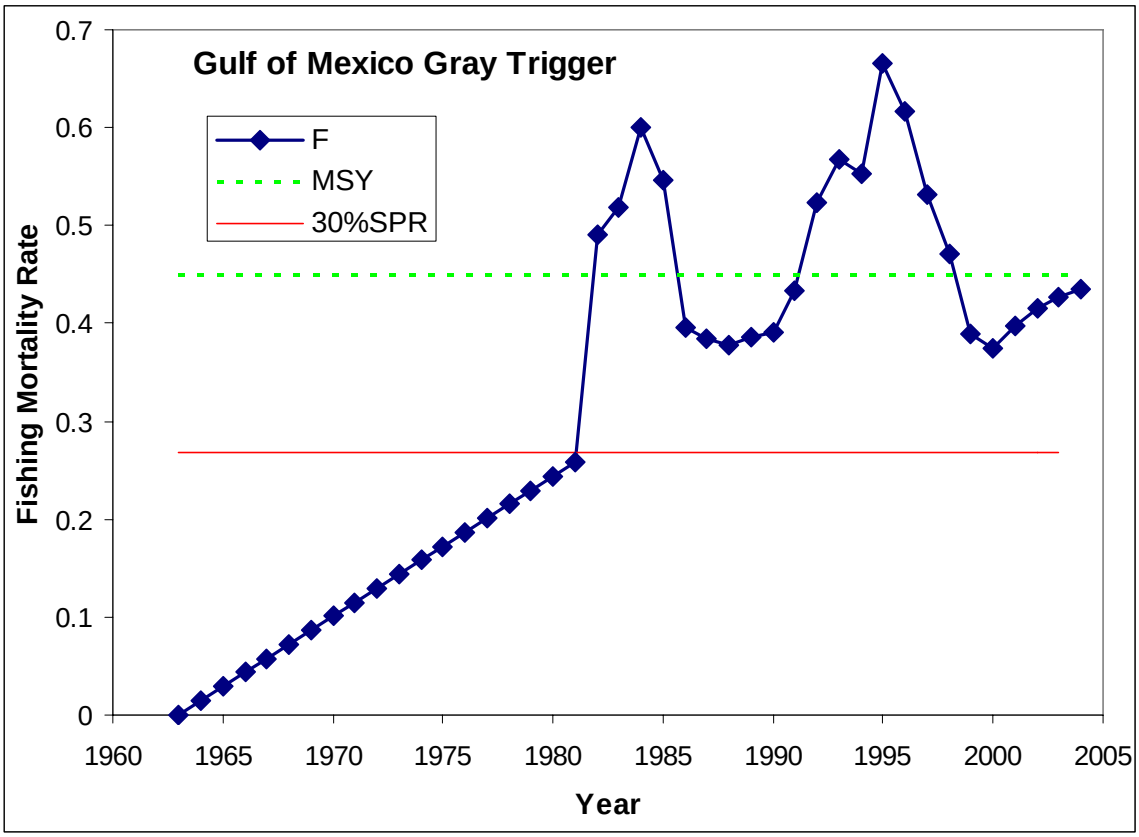

Figure GT-1. Gray triggerfish fishing mortality estimates from 1963 through 2004. Fishing mortality at MSY and 30% SPR are shown.

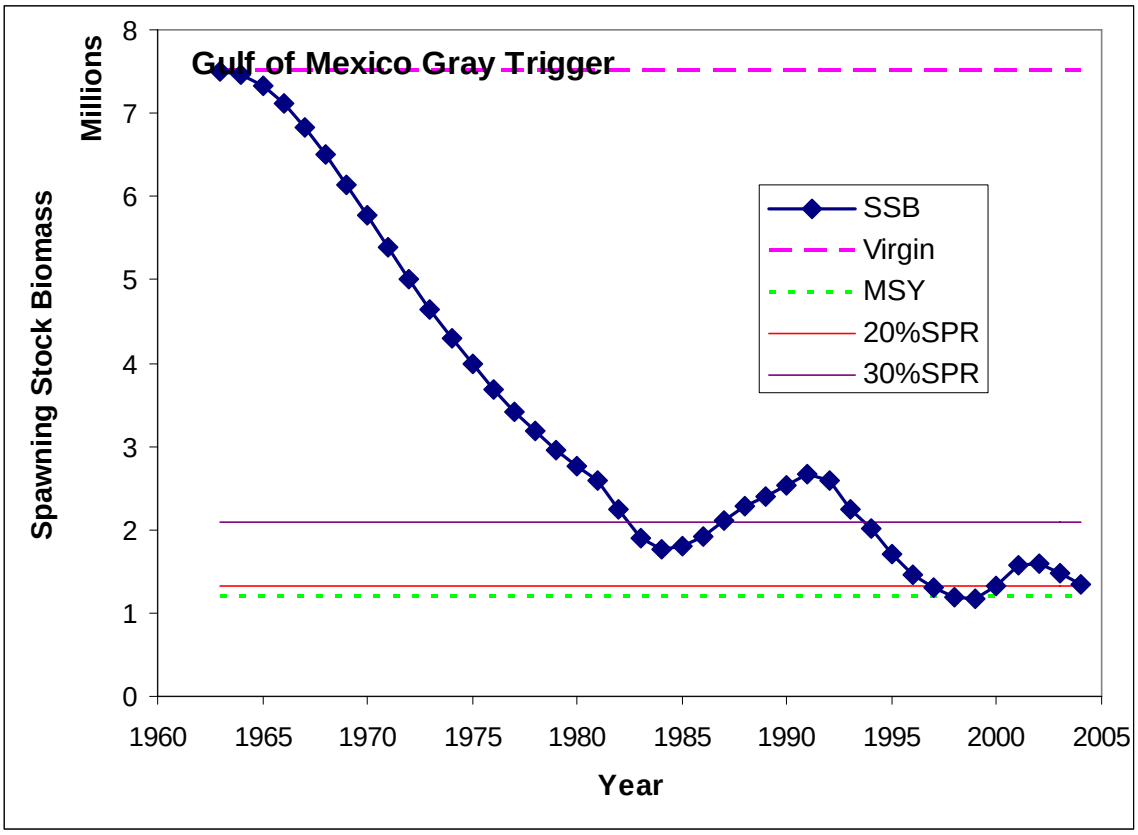

Figure GT-2. Gray Triggerfish spawning stock biomass estimates from 1963 through 2004. Virgin stock biomass, biomass at MSY and biomass at 30 and 20 percent SPR (current definition of MSST) are shown.

Subsequent to the completion of the SEDAR 9 assessment and review of gray triggerfish, the Council requested an evaluation of the catch per unit effort (CPUE) indices using only trips which caught gray triggerfish rather than all trips that targeted reef fish typically caught with vermilion snapper. The Council's Reef Fish AP believed that gray triggerfish must be targeted using smaller hooks than would be used for typical reef fish fishing. The CPUE indices were rebuilt using only positive trips and then the base SEDAR 9 stock assessment model was rerun with the new indices (Sladek Nowlis, 2006a). Results using the new indices improved the biomass estimates slightly (3.6 percent) and moved the status of the stock further above the overfished condition. The estimate of current F (2004) decreased by 10 percent which decreased the estimate of overfishing from 62 percent too high to 53 percent too high. However, Sladek Nowles (2006a) recommends that the original bases assessment with zero trip identified by the Stevens and McCall method to identify target trips (SEDAR9-AW-07, 2006) is the most defensible method because there are times when fishers use methods that are capable of catching gray triggerfish but do not. Adding those zero trips improves the likelihood that the CPUE indices are a reasonable representation of relative stock abundance. Also, since the inclusion of zero trips had a small effect on the overall outcome of the assessment, it would appear that vermilion snapper are more ubiquitous in overall reef fish fishery catches than might be expected if only specific gear could catch them.

Table GT-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

NOTE: E = statistical grids 1-12 and W = statistical grids 13 - 21

Table GT-3. Commercial and Recreational landings of gray triggerfish by State, 2001-2004

Recreational Landings (MRFSS and Headboat)				
	TX	LA	MS	AL&WFL
2001	20,938	35,942	23,728	407,225
2002	23,212	17,246	40,348	667,193
2003	27,867	32,558	31,004	758,749
2004	25,510	86,932	53,763	820,867
Commercial Landings (ALS)				
	TX	LA	MS	AL&WFL
2001	15,202	51,317	2,241	107,422
2002	14,548	71,144	1,538	148,126
2003	20,810	62,259	1,780	166,975
2004	27,695	48,740	1,690	140,430

4.2 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; having MSST and MFMT thresholds based on different levels disconnects them to some extent. Based on a MFMT threshold of $F_{30\%SPR}$, fishing mortality has been from 30 percent to 147 percent too high over the years with observed catch data (1981 – 2004); whereas, under the current MSST threshold of $SSB_{20\%SPR}$, the stock has only been overfished during a short period in 1998 and 1999. Ideally, a stock should not be able to undergo significant overfishing for very long before the biomass is reduced to an overfished condition. All the following Alternatives, except the status quo, use a common base SPR or MSY level.

4.3 Action 10. Proposed Threshold and Benchmark Alternatives.

Alternative 1: Set minimum stock size threshold (MSST), maximum fishing mortality threshold (MFMT), maximum sustainable yield (MSY), and optimum yield (OY) based on SPR.

a. Status quo – MSST = $SSB_{20\%SPR}$, MFMT = $F_{30\%SPR}$, and OY = the yield at $F_{20\%SPR}$.

b. MSST = (1-M)*$SSB_{20\%SPR}$; MFMT = $F_{20\%SPR}$; and OY = the yield at 75 percent of MFMT.

c. MSST = (1-M)*$SSB_{30\%SPR}$, MFMT = $F_{30\%SPR}$; and OY = the yield at 75 percent of MFMT.

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}, MFMT = F_{MSY}, and OY = the yield at 75 percent of MFMT.

Alternative 1a maintains MSST at $SSB_{20\%SPR}$ which is the second most conservative of the alternatives. The base $SSB_{20\%SPR}$ level was defined in Amendment 1 to the Reef Fish FMP and has not been replaced with a SFA compliant definition; so, it is questionable whether this definition is still valid. 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. This definition was approved through the Generic Sustainable Fisheries Act Amendment in 1999. F is about 62 percent too

high with this definition. OY is expressed as the yield associated $F_{20\%SPR}$ based on Amendment 1 and may not be valid for the same reason as for MSST. OY expressed as the yield at 75 percent of MFMT is the NMFS recommended definition. **Alternative 1b** sets MSST at (1-M)*$SSB_{20\%SPR}$ and sets MFMT at $F_{20\%SPR}$ as well. Under these definitions the stock would be neither overfished or undergoing overfishing. However, the Council has never set MFMT below $F_{30\%SPR}$ and the 20%SPR level is also below that recommended by NMFS. OY would be defined in terms of MFMT. **Alternative 1c** sets MSST at (1-M)*$SSB_{30\%SPR}$ and sets MFMT at $F_{30\%SPR}$. At this level, the stock would be considered overfished as well as undergoing overfishing. This is the most conservative of the SPR-based alternatives and matches the SPR level currently established for MFMT. OY would be defined in terms of MFMT. However, MSST and OY 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} and the stock would not be considered overfished. MFMT would be set at F_{MSY}, and the stock would not be considered undergoing overfishing. OY would be defined in terms 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 better known.

4.4 TAC to end overfishing.

Projections to determine the level of reductions necessary to end overfishing of the Gulf of Mexico gray triggerfish (*Balistes capriscus*) stock (SEDAR 9-Stock Assessment Report 1) received little attention at the time of the review workshop, and two questions have come up since. In Table 7 of the Post-Review Workshop, the spawning stock biomass ratios and fishing mortality ratios in the pre-2005 years of the table do not agree with the base run discussed earlier in the document and the catches in the table were reported as the estimated values, not the observed values. Updated projections have been provided (Sladek Nowlis 2006b) Projections indicate that substantial reductions in catch are necessary in 2007 to end overfishing, but more limited reductions would be sufficient to avoid a future overfished condition (Table GT-4). Fishing rates equal to 75% of F_{MSY} would be sufficient to maintain a population above the overfished threshold of B_{20SPR}; however, this rate is well above the overfishing threshold of F_{30}. Catches would have to be reduced by 35 percent in 2007 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.

TABLE GT-4—Projections Under Various Fishing Mortality Scenarios All projections based on new management measures starting in 2007. Catches (*1000 lbs)						
Year	No F	Current F	F_{MSY}	75% F_{MSY}	$F_{30\%SPR}$	75%$F_{30\%SPR}$
2004	1,248	1,248	1,248	1,248	1,248	1,248
2005	1,100	1,100	1,100	1,100	1,100	1,100
2006	1,060	1,060	1,060	1,060	1,060	1,060
2007	0	1,023	1,081	841	686	526
2008	0	996	1,031	873	750	605
2009	0	979	996	903	809	681
2010	0	968	972	929	860	749
2011	0	961	956	950	902	806
2012	0	956	946	966	935	853
2013	0	953	939	976	958	888
2014	0	951	934	983	975	913
2015	0	949	930	988	986	932
2016	0	948	928	992	994	945

Trip Limits

Reductions obtained from commercial trip limits are shown in Table GT-5. A 135 - 140 pound trip limit would be required for the commercial fishery to attain a 35 percent reduction in harvest.

Table GT-5. Percent reduction of Commercial landings based on various trip limits. Source: Commercial logbooks 2003-2005		
Trip Limit	Lost Catch	
	Pounds	Percent
0	209,489	100
20	160,129	76.4
40	132,042	63.0
60	112,920	53.9
80	98,966	47.2
100	88,026	42.0
120	79,290	37.8
140	72,104	34.4
160	66,070	31.5
180	60,917	29.1
200	56,386	26.9
220	52,349	25.0
240	48,714	23.3
260	45,463	21.7
280	42,566	20.3

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 (Table GT-6). 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 two fish would reduce recreational landings by 33 percent and a one-fish bag limit would be required to obtain a minimum 35 percent reduction.

Table GT-6. 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

Size Limits

Recreational landings by size were derived from MRFSS, Headboat and TPWD data for the period 2003 through 2005 (Table GT-7). 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 or 13 inches FL to obtain a 35 percent reduction in landings. Any increase in size limit will likely increase dead discards.

Commercial sizes of fish landed were derived from the TIP sampling program. Size limits are currently set at 12 inches TL (Table GT-4). 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 16 inches TL or 14 inches FL to attain a 31 percent reduction or 17 inches TL, 15 inches FL, to attain more than a 35 percent reduction in landings.

Table GT-7. Percent reduction in weight of recreationally and commercially harvested gray triggerfish for various size limits and release mortality rates (2003-05 avg)

		Recreational Weighted Reduction		Commercial Weighted Reduction	
FL in	TL in	rel = 0%	rel = 1.5%	rel = 0%	rel = 1.5%
10.44	12.0	0.0	0.0	0.0	0.0
11	12.7	5.2	5.1	0.9	0.9
12	13.9	21.8	21.4	6.6	6.5
13	15.0	43.1	42.4	17.1	16.8
14	16.2	60.9	60.0	31.3	30.8
15	17.4	74.8	73.7	48.8	48.1
16	18.6	84.0	82.8	64.3	63.3
17	19.8	88.6	87.3	77.3	76.1
18	21.0	91.9	90.5	86.1	84.8
19	22.2	93.9	92.5	89.5	88.2
20	23.4	95.6	94.1	92.9	91.5

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 GT-8. Landings from the commercial fishery seem to peak during April through June. 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 35 percent from the recreational fishery would require closing a minimum of two to three months; whereas, for the commercial fishery, three to four months in the prime season would be required.

Table GT-8. 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%

4.5 Action 12. Management Actions to End Overfishing

Any one of the possible management tools can be used independently to affect a 35 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 GT-9 offers examples of alternative ways that would accomplish the 35 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 GT-9. Alternatives for reducing landings of gray triggerfish in the commercial and recreational fishery

	Initial reduction = 35%
Management Options	
Recreational	
Bag limit	2 fish 33% reduction
Size limit	13 inches FL 42% reduction
Season closure	May 1 – July 19 35% reduction
Bag & Size	4 fish & 12" FL 34% reduction
Bag & Season	5 fish & May-June 36% reduction
Commercial	
Size limit	14 inches FL 31% reduction
Season	April 1- July 13 35% reduction
Size & Season	12" FL & April 20 – June30 35% reduction

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6 APPENDIX 1 - Reef Fish Habitat Sites Off of Gulf Coast of Florida

The following are descriptions of habitat sites identified by Dr. Chris Koenig and Chris Gledhill on Figure Gag-5. Most of these sites are far offshore and generally in 20 to 50 fathoms. Site locations are identified both by latitude/longitude boundaries and by USGS lease blocks and the discussion is that of Chris Gledhill and Chris Koenig. The size of each area in square nautical miles was calculated by Kathy Scanlon, U.S. Geological Survey.

1. 29 Edge/27 Edge, North and West rim of the DeSoto Canyon (several sites within the same area - total area = 367 sq. naut. mi.)

Area A (62 sq. naut. mi), USGS lease blocks 853-857, 897-901;
boundaries: N= 30° 09'N, S= 30° 04'N, E=86° 43'W, W=86° 58'W;
Area B (75 sq. naut. mi), USGS lease blocks 939-942; 983-986, 15-18;
boundaries: N=30° 04'N, S=29° 57'N, E=86° 53'W, W=87° 05'W;
Area C (86 sq. naut. mi), USGS lease blocks 57, 58, 101, 102, 145, 146;
boundaries: N=29° 57'N, S=29° 48'N, E=87° 05'W, W=87° 16'W;
Area D (144 sq. naut. mi), USGS lease blocks 185-188, 229-232, 273-276, 317-320, 361-364.
boundaries: N=29° 48'N, S=29° 33'N, E=87° 11'W, W=87° 22'W.

Discussion: This area includes a site that has been slated for oil and gas development (proposed Chevron Development unit 56). It is a high relief area which has been significant in reef fish fishery production but due to proximity from shore has historically received high fishing pressure (Moe 1963). The area is large, but the most significant habitat occurs between 50 and 150 meters. A ridge extends about 8 km (5 miles) thru the Chevron site in lease blocks 99, 56, and 57. We broke the area into four discrete blocks, each covered by smaller (5x5 km) lease blocks.

The following sites (on charts) are arranged from north to south along the West Florida Shelf:

2. "Woodward-Clyde" Pinnacles (42 sq. naut. mi)
Destin Dome USGS lease blocks 473, 474, 516, 517, 518, 562.
boundaries: NW= 29° 33'N, 86° 11'W NE= 29° 33'N, 86° 05' W
SW= 29° 25'N, 86° 11'W SE= 29° 25'N, 86° 05'W

Discussion: These are high relief (up to 11 m) pinnacles on the 90 m contour reported in the Eastern Gulf of Mexico Marine Habitat Study (vol. 1, 1979) by Woodward-Clyde consultants.

3. "3-to-5s" area (76 sq. naut. mi)
Destin Dome USGS lease blocks 434, 478, 522, 566, Apalachicola USGS lease blocks 397, 398, 441, 442, 485, 486, 529, 530.
boundaries: NW= 29° 35'N, 85° 56'W NE= 29° 35'N, 85° 47'W
SW= 29° 25'N, 85° 56'W SE= 29° 25'N, 85° 47'W

Discussion: This is a rugged area along the 20 fathom contour just off Panama City. This was listed in Martin Moe's 1963 survey of offshore fishing in Florida and has similar features to the Middle Grounds. The bottom is mostly sand with irregular reef relief of three to four fathoms.

4. Area North of Johnny Walker site (denoted as Mud Banks by Moe 1963) (28 sq. naut. mi) Apalachicola USGS lease blocks 654, 617, 618, 619.

boundaries: NW= 29° 22'N, 85° 56'W NE = 29° 22'N, 85° 45'W
SW = 29° 19'N, 85° 45'W SE = 29° 19'N, 85° 5'W

Discussion: This area is a 7-8 mile rock ledge with a steep seaward slope just north of the Johnny Walker, Madison and Swanson sites. The depth is about 30 fathoms.

5. Madison and Swanson sites (denoted as Whoopie Grounds by Moe 1963) (115 sq. naut. mi). Apalachicola USGS lease blocks 706, 707, 708, 709, 750, 751, 752, 753, 794, 795, 796, 797, 838, 839, 840, 841.

boundaries: NW= 29° 17'N, 85° 50'W NE= 29° 17'N, 85° 38' W
SW= 29° 06'N, 85° 50'W SE= 29° 06'N, 85° 38'W

Discussion: This area is denoted in Moe's (1963) fishing survey as having rock ledges with relief up to five fathoms (9 m). There is also plenty of recent anecdotal fishing information from port samplers (Debbie Fable, pers. Comm.). This site also shows confirmed outcrops of limestone and reef fish habitat from the reef fish survey (Chris Gledhill, Pascagoula NMFS lab, pers. comm.). Also, (2) transects through this area by Ludwick and Walton (1957) showed pinnacle trends. Some of these formations have names- Madison and Swanson's Rocks. **This site was established as a marine reserve in 1996.**

6. Twin Ridges site (5 sq. naut. mi).
USGS lease block 979 bordering Apalachicola and Florida Middle Ground bathymetric maps.

boundaries: NW= 29° 00'N, 85° 24'W NE= 29° 00'N, 85° 21'W
SW= 28° 58'N, 85° 24'W SE= 28° 58'N, 85° 21'W

Discussion: This is the rugged double ridge line that was mapped with side-scan sonar during the spring 1997 cruise (NMFS Panama City, Pascagoula/USGS Woods Hole) showing notable reef fish habitat features at 70-80 meters (233-262 feet) depths. This site covers about one lease block and is embedded in a larger area marked by Moe (1963). This area was originally picked for survey by NMFS because it enclosed a concentrated area of gag/copperbelly catches recorded from recent at-sea reports. **This site is used by researchers as a control site to compare the impacts of the Madison-Swanson and Steamboat Lumps marine reserves.**

7. Florida Middle Grounds. (340 sq. naut. mi).
Large area (irregular polygon) on the 20 fathom isobath that covers about 40 USGS lease blocks

boundaries:: (A). 28° 42.5'N, 84° 24.8'W;
(B). 28° 42.5'N, 84° 16.3'W;
(C). 28° 11'N, 84° 0'W;
(D). 28° 11'N, 84° 07'W;
(E). 28° 26.6N, 84° 24.8'W.

Discussion: This area was designated in 1982 int the Coral Reef Fishery Management Plan as a HAPC (habitat areas of particular concern). Its coordinates are therefore already fixed. Current

restrictions apply to gear--no bottom longlines, traps, pots or bottom trawls. It is thought that many species of grouper and snapper spawn in this area.

8. 40 Fathom Contour West of the Middle Grounds (denoted as The Edges by Moe 1963) (several sites within the same area - total area = 436 sq. naut. mi.)

Area A (61 sq. naut. mi), Florida Middle Grounds USGS lease blocks 147, 148, 149, 150,151, 191, 192, 193, 194, 195;
boundaries: NW= 28° 51'N, 85°12'W NE= 28° 51'N, 84° 57'W,
SE= 28° 46'N, 84° 57'W SW= 28° 46'W, 85° 12'W;
Area B (67 sq. naut. mi), Florida Middle Grounds USGS lease blocks 237, 238, 239, 240, 281, 282, 283, 284;
boundaries: NW= 28° 46'N, 85°06'W NE= 28° 46'N, 84° 54'W,
SE= 28° 40'N, 84° 54'W SW= 28° 40'W, 85° 06'W;
Area C (57 sq. naut. mi), Florida Middle Grounds USGS lease blocks 326, 327, 328, 329, 370, 371, 372, 373;
boundaries: NW= 28° 40'N, 85°03'W NE= 28° 40'N, 84° 51'W,
SE= 28° 34'N, 84° 51'W SW= 28° 34'W, 85° 03'W;
Area D (143 sq. naut. mi), Florida Middle Grounds USGS lease blocks 415, 416, 417, 418, 419, 459, 460, 461, 462, 463, 503, 504, 505, 506, 507, 547, 548, 549, 550, 551;
boundaries: NW= 28° 34'N, 85°01'W NE= 28° 34'N, 84° 45'W,
SE= 28° 24'N, 84° 45'W SW= 28° 24'W, 85° 01'W;
Area E (108 sq. naut. mi), Florida Middle Grounds USGS lease blocks 593, 594, 595, 596, 637, 638, 639, 640, 681, 682, 683, 684, 725, 726, 727, 728;
boundaries: NW= 28° 24'N, 84°54'W NE= 28° 24'N, 84° 42'W,
SE= 28° 14'N, 84° 42'W SW= 28° 14'W, 84° 54'W;

Discussion: Although this site is of low relief, we directly observed a gag and scamp spawning aggregations with an ROV on a R/V Chapman survey in 1994. A Fishery Acoustic System (FAS) survey was conducted by NMFS Panama City and Pascagoula in 1996. This site is also listed in Moe's 1963 survey as an extensive linear area along the 40 fathom isobath scattered high relief rocky outcrops of limestone rock extending parallel to the coastline. At-sea fishing surveys also revealed this is currently an active region of commercial grouper fishing.

9. "Steamboat lumps". (104 sq. naut. mi.)
Florida Middle Grounds USGS lease blocks 771, 772, 816, 860, 861, 862, 906
boundaries: NW= 28 14'N, 84 48'W NE= 28 14'N, 84 37'W
SW= 28 03'N, 84 48'W SE= 28 03'N, 84 37'W

Discussion: This area is due W. of Clearwater, Fla. and SW of the Middle Grounds at a depth of 40-50 fathoms. These are prominent features reported to be low relief areas with limestone rock. **This site was established as a marine reserve in 1996.**

10. " The Elbo". (107 sq. naut. mi).

Elbo USGS lease blocks 36, 37, 80, 81, 124, 125, 168, 169, 212, 213, 256, 257, 300, 301;

boundaries NW= 27 57'N, 84 11'W NE= 27 57'N, 84 05'W
SW= 27 38'N, 84 11'W SE= 27 38'N, 84 05'W

Discussion: This is a large ridge as wide as three nautical miles composed of limestone rock (Moe 1963). It rises 4-8 fathoms above the bottom and can be seen on the bathymetric map by the 30 fathom isobath due west of Tampa Bay.

11. "Christmas Ridge". (191 sq. naut. mi).

Charlotte Harbor USGS lease blocks 444, 445, 446, 488, 489, 490, 532, 533, 534, 576, 577, 578, 620, 621, 622, 664, 665, 666, 708, 709, 710, 752, 753, 754, 796, 797, 798;

boundaries: NW= 26° 31'N, 83° 51'W NE= 26° 31'N, 83° 41'W
SW= 26° 06'N, 83° 49'W SE= 26° 06'N, 83° 42'W

Discussion: The main features of this area are rock ridges of several fathoms in relief at about 45 fathom depths. These ridges follow the depth contours.

12. "Hambone Ridge/the Finger". (153 sq. naut. mi).

Pulley Ridge USGS lease blocks 445, 446, 447, 489, 490, 491, 533, 534, 535, 577, 578, 579, 621, 622, 623, 665, 666, 667, 709, 710, 711;

boundaries: NW= 25° 31'N, 83° 46'W NE= 25° 31'N, 83° 37'W
SW= 25° 12'N, 83° 46'W SE= 25° 12'N, 83° 37'W

Discussion: Moe (1963) describes these as well defined rock ridges rising 4-5 F above a flat sand bottom along the 40 fathom contour.

13. " Northwest Peaks". (182 sq. naut. mi).

Pulley Ridge USGS lease blocks 617, 618, 619, 620, 661, 662, 663, 664, 705, 706, 707, 708, 749, 750, 751, 752, 793, 794, 795, 796, 837, 838, 839, 840, 881, 882, 883, 884.

boundaries: NW= 25° 20'N, 83° 57'W NE= 25° 20'N, 83° 46'W
SW= 25° 02'N, 83° 57'W SE= 25° 02'N, 83° 46'W

Discussion: This is a relatively deep site with depths below 50 fathoms. This area is northwest of the Tortugas and has high rock pinnacles with one peak rising to 25 fathoms, but it is not depicted on the bathymetric chart.

14. "Riley's Hump". (11 sq. naut. mi).

boundaries: NW= 24° 32.2'N, 83° 08.7'W NE= 24° 32.2'N, 83° 05.2'W
SW= 24° 28.7'N, 83° 05.2' W SE= 24° 28.7'N, 83° 08.7'W

Discussion: This area is a rise between the 20 and 30 fathom isobaths southwest of the Dry Tortugas and it covers about one lease block of area This area was designated as a mutton snapper spawning grounds in Amendment 5 (supplement) of the Reef Fish FMP (1993), and no fishing was allowed in May and June. The area was subsequently encompassed by the Tortugas South marine reserve (60 sq. naut. miles) which was implemented in July 2001 by Reef Fish Amendment 19 (also known as the Generic Amendment Addressing the Establishment of the Tortugas Marine Reserves).

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