Gulf of Mexico Greater Amberjack Abundance from Recreational Charter and Private Boat Anglers from 1981-1998

by

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Introduction

Information pertaining to the observed abundance of the Gulf of Mexico greater amberjack was reported by Parrack (1993a,b) for recreational charter and private boat anglers, headboat fishermen, and for commercial vessels. McClellan and Cummings (1996) reported a decline in un-adjusted observed recreational catch per angler through 1995. A non-varying trend in recreational CPUE was reported when the same data were adjusted for the effects due to year, area (state), fishery, and time of year (month) (see Cummings and McClellan 1997).

This report provides updated information on the Gulf of Mexico greater amberjack abundance through 1998 for the recreational charter for hire and private vessel fisheries.

Materials and Methods

Observations of CPUE abundance data for recreational anglers have been collected by the Marine Recreational Fishery Statistics Survey (MRFSS) survey since 1979 from intercepts of recreational anglers fishing from boat modes (private vessels, charterboats, party or headboats (through 1985) and shore modes). Some observations existed for 1979 and 1980 however, in their earlier analyses McClellan and Cummings excluded the 1979 and 1980 data because survey coverage was not as complete in the first year and some geographical strata were not sampled in all months and across all fisheries in the early years. In addition, total estimated recreational catch from MRFSS revised estimations existed only since 1981.

Catch was calculated from the MRFSS angler intercepts as Type A catch (fish caught, retained, and observed by the interviewer) plus Type B1 catch (fish caught and returned dead to the water) plus Type B2 catch (fish returned alive tot he water). Un-adjusted CPUE was calculated as total trip catch divided by effort where effort was either the number of anglers (CPA) or the number of hours fished (CPH). For each intercept the recorded Type B1 and B2 catch was adjusted upwards for cases where the number of interviewed anglers was less than the number of contributers.

In addition to including intercepts of anglers catching greater amberjack on their trips (i.e., positive trips), also included intercepts from trips 1) of anglers who indicated they were targeting greater amberjack or any one of the main amberjack species commonly encountered while fishing for greater amberjack (lesser, almaco or banded rudderfish) whether greater amberjack was caught or not and 2)intercepts from anglers catching (not just targeting) any of the aforementioned amberjack species whether or not greater amberjack was captured. These additional intercepts provided trips with zero catch of greater amberjack that were not part of the previous 1996 analyses. Such trips were considered to be reflective of angler trips that could have caught greater amberjack.

Standardized CPUE trends were derived using general linear model (GLM) regression theory (Robson 1966) to adjust for variation in catch rate from independent factors that have been discussed in the literature on CPUE as potentially affecting CPUE. These factors included year (1981-1998), month(January-December), and area (region of intercept). Several differences

between the analyses of 1996 and those presented in this report exist. The 1996 analyses fitted a GLM model to the aggregated or summed CPUE observations within a stratum (year-month-fishery cell). In this analysis, all models were applied to the un-summed data thus increasing the degrees of freedom. In addition, in this analysis the area term was re-defined based on suggestions from the Reeffish stock assessment Panel (see Cummings and McClellan 1997, Anon 1996 personal communication). The observations were re-classified into five sub regions of the Gulf of Mexico using the county and/or state of intercept. The five sub areas were: 1) Southwest Florida (Collier -Pinellas), 2) Northwest Florida (Pasco-Franklin), 3) Florida Panhandle(Gulf-Escambia) + Alabama, and 4) Louisiana + Mississippi.

The Lo method (Lo et al. 1992) was used to derive abundance trends from the MRFSS CPUE data. This approach fits separate models to the set of positive catches and to the data set of the proportion of positive catches, the latter referred to as successful trips, and combines the results from the two analyses. The analysis utilizing the proportion of positives modeled as the y variate a dummy variable coded as 0 or 1 as to whether greater amberjack was caught or not. In this analysis the model assumed the binomial error assumption for the y variate. The analysis of positive catches modeled as the y-variate, observed catch per angler (Obs_CPA) as in the 1996 analyses of both MRFSS and headboat angler catch rates. As in the 1996 analyses the lognormal error assumption for CPUE was assumed. Lo et al. (1992) reported that in their analyses the effects were minimal on results from different approaches to aggregating the data for estimating proportion positive. For the greater amberjack CPUE analysis the un-aggregated data were used because the overall size of the data set was not large and did not introduce computational or computer resource concerns as reported for Lo's data.

Standardized indices were developed by fitting the two type models described above to the CPUE data and adjusting the data for factors from considered to have an affect on catch rates. The main effects or independent variables (the X's in the model) considered as possible affects on CPUE were the year, the time of year (i.e., month), and the geographical area of fishing (subregion). These variables were all found to be significant in explaining the variation in CPUE in the previous analyses for greater amberjack using GLM. Models were applied with these factors included as fixed effects. Then a model was fitted to the same data with these same factors as main effects and first order interactions between year, month, and season were included in the model. The relative importance of each factor in the overall model was evaluated by the amount of that factor contributed to the total deviance.

Results

The majority of the available MRFSS recreational intercepts of CPUE for the Gulf of Mexico greater amberjack were from anglers fishing in Florida (n=1337 intercepts or 62 %, Table 1). Intercepts from anglers fishing in Alabama ranked next highest with 26 % of the total intercepts (n=566). About 12 % (n=262) of the MRFSS intercepts were from recreational anglers in Louisiana or Mississippi and after 1988 this proportion declined. MRFSS estimates of the total recreational catch of greater amberjack however, indicates that substantial catches also were made by recreational anglers in Louisiana (Cummings and McClellan 2000). Most of the

MRFSS intercepts were from charterboat trips (72% or 1548).

Analyses made using the proportion positives from all the observations 1981-1998 were not successful because singularities resulted in the estimation. It was necessary to restrict the analysis to the 1986-1998 data for this reason. In the analysis of only fixed effects all factors (year, area, month) included in the model were found important in explaining the variation in CPUE and year and area were more important than was time of year in explaining CPUE (p=0.05 level). This was the case with the analysis of proportion positives and in the analysis of positive catches. In addition, in the analysis which included interactions terms for year*area and year * month none of the individual terms were significant except for calendar year=1986 * area =Florida southwest. The simpler model without interactions was chosen over the more complicated model. About 16% of the total variation in the positive CPUE data set was explained by the three main effects year, area, month. The standardized index derived from the 1986-1998 data from the model accounted for variation in CPUE from these three factors. The mixed model analysis including terms for main effects and interactions produced results which had higher coefficients of variation about the yearly indices. The standardized index is provided in Table 5.

Acknowledgments

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Table 1. Observed catch per angler (Obs_CPA) of greater amberjack from MRFSS intercepts of charterboats and private vessels in the Gulf of Mexico by calendar year and state. Blanks indicate no data.

	La		Ms		Al		FlW			
	OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA	
YEAR	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN
81	4	3.15	.	.	4	2.04	15	1.68	23	2.00
82	16	1.17	.	.	4	0.75	46	3.02	66	2.43
83	30	4.59	.	.	.	.	63	2.06	93	2.88
84	30	3.48	.	.	.	.	10	1.35	40	2.95
85	3	3.84	.	.	.	.	85	1.68	88	1.76
86	25	0.61	.	.	8	0.84	183	4.72	216	4.10
87	16	2.09	.	.	38	2.55	153	3.83	207	3.46
88	3	0.44	.	.	42	5.16	74	2.15	119	3.17
89	9	1.67	.	.	46	2.83	95	3.13	150	2.95
90	2	0.74	.	.	19	1.63	14	3.30	35	2.25
91	27	1.90	3	1.39	49	2.23	43	5.19	122	3.18
92	32	1.66	4	4.00	129	1.95	89	3.77	254	2.58
93	8	0.81	.	.	33	1.72	90	2.40	131	2.13
94	12	0.86	1	0.11	41	1.76	42	1.90	96	1.69
95	6	1.33	1	0.17	29	2.48	14	2.17	50	2.21
96	9	0.76	.	.	40	1.56	19	1.17	68	1.34
97	9	2.33	2	1.78	14	0.58	42	1.88	67	1.66
98	4	2.11	1	0.33	26	0.73	82	1.69	113	1.47
99	5	0.88	.	.	44	1.04	178	1.23	227	1.19
ALL	250	2.08	12	2.03	566	2.10	1337	2.80	2165	2.53

Table 2. Observed Catch per angler (Obs_CPA) of greater amberjack from MRFSS intercepts of charterboats and private vessels in the Gulf of Mexico by calendar year and month. Blanks indicate no data.

	MONTH																							
	1		2		3		4		5		6		7		8		9		10		11		12		ALL	
	OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA	
	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN
YEAR																										
81	.	.	.	.	.	.	.	.	1	3.67	5	0.85	2	5.42	5	1.24	2	3.00	4	1.38	4	2.38	.	.	23	2.00
82	.	.	.	.	12	2.32	14	3.20	6	4.21	14	1.35	15	1.88	3	4.00	1	3.00	1	0.50	.	.	.	.	66	2.43
83	2	0.63	3	1.89	6	3.31	3	2.00	5	8.45	26	3.22	10	1.72	23	2.65	11	2.27	4	1.44	.	.	.	.	93	2.88
84	.	.	.	.	9	1.44	1	1.00	11	3.19	.	.	10	5.50	5	1.15	.	.	4	2.00	.	.	.	.	40	2.95
85	5	1.00	4	1.50	14	1.29	1	1.00	6	1.00	1	0.27	5	3.37	1	0.33	15	2.87	10	1.20	18	1.72	8	1.88	88	1.76
86	3	9.33	2	26.3	2	2.17	2	0.88	18	4.72	10	0.76	7	1.34	23	2.88	65	4.56	62	3.74	21	4.82	1	1.00	216	4.10
87	.	.	3	3.23	7	4.20	26	5.54	27	3.31	35	4.10	30	2.89	48	2.35	14	2.96	16	3.48	1	3.33	.	.	207	3.46
88	1	5.50	2	2.70	1	1.67	4	2.24	8	2.31	18	2.73	17	1.05	9	3.29	17	1.68	27	7.33	13	1.00	2	0.42	119	3.17
89	3	1.25	2	3.59	1	4.00	22	3.53	7	1.82	10	1.89	11	1.60	29	4.97	36	1.78	16	3.28	13	3.06	.	.	150	2.95
90	.	.	1	14.0	1	17.0	3	0.12	4	0.86	2	1.35	2	0.33	1	0.13	11	1.97	8	2.06	1	2.00	1	0.25	35	2.25
91	.	.	2	6.50	.	.	7	0.48	14	2.58	10	8.22	15	2.73	13	3.04	15	4.75	20	2.42	18	1.57	8	3.09	122	3.18
92	5	0.58	15	2.12	15	2.59	43	4.82	40	3.32	25	1.32	30	3.87	15	1.24	7	0.99	40	1.29	12	0.72	7	1.03	254	2.58
93	.	.	.	.	6	3.22	2	1.65	12	2.58	22	1.51	19	2.78	23	2.68	24	1.99	16	1.40	5	1.33	2	0.53	131	2.13
94	1	0.10	1	1.50	4	1.84	3	0.75	16	1.66	17	2.46	16	2.13	7	1.20	19	1.31	.	.	12	1.27	.	.	96	1.69
95	.	.	11	3.99	2	3.00	3	3.13	5	1.46	11	1.20	.	.	3	0.46	2	0.65	.	.	7	2.56	6	1.67	50	2.21

Table 2.(cont.)

	MONTH												
	1	2	3	4	5	6	7	8	9	10	11	12	ALL
	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA	OBS_CPA
	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN	N MEAN
YEAR													
96	1 0.20	6 0.72	4 0.78	7 1.07	13 1.14	13 2.24	8 2.39	10 0.85	1 0.19	4 1.10	1 0.14	. .	68 1.34
97	. .	1 1.00	. .	2 0.86	7 0.88	6 0.41	13 2.24	4 1.29	16 2.30	9 1.49	5 1.82	4 1.61	67 1.66
98	5 1.08	2 2.15	5 2.36	5 3.33	36 2.10	8 0.86	14 0.94	7 0.80	4 0.56	9 0.61	8 0.56	10 1.42	113 1.47
99	2 0.60	10 3.03	7 0.73	19 0.90	36 1.27	19 1.04	14 0.70	32 0.94	24 1.21	36 1.33	22 1.26	6 1.03	227 1.19
ALL	28 1.90	65 3.55	96 2.36	167 3.32	272 2.56	252 2.34	238 2.42	261 2.36	284 2.64	286 2.73	161 1.97	55 1.58	2165 2.53

Table 3. Observed Catch per angler (Obs_CPA) of greater amberjack from MRFSS intercepts of charterboats and private vessels in the Gulf of Mexico by county and by state. Blanks indicate no data.

	STATE									
	La		Ms		Al		FLW		ALL	
	OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA	
COUNTY	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN
Calcasieu	8	1.23	.	.	.	.	.	.	8	1.23
Cameron	7	1.38	.	.	.	.	.	.	7	1.38
Vermilion	5	2.73	.	.	.	.	.	.	5	2.73
Terrebonne	13	2.15	.	.	.	.	.	.	13	2.15
LaFourche	156	1.94	.	.	.	.	.	.	156	1.94
Jefferson	21	1.28	.	.	.	.	.	.	21	1.28
plaquemines	32	0.76	.	.	.	.	.	.	32	0.76
Harrison	.	.	14	1.30	.	.	.	.	14	1.30
Jackson	.	.	6	1.03	.	.	.	.	6	1.03
Mobile	.	.	.	.	104	1.10	.	.	104	1.10
Baldwin	.	.	.	.	553	1.89	.	.	553	1.89
Escambia	.	.	.	.	.	.	90	1.50	90	1.50
Santa Rosa	.	.	.	.	.	.	13	0.83	13	0.83
Okaloosa	.	.	.	.	.	.	602	2.55	602	2.55
Bay	.	.	.	.	.	.	226	2.83	226	2.83
Gulf	.	.	.	.	.	.	15	1.53	15	1.53
Franklin	.	.	.	.	.	.	61	2.47	61	2.47

Table 3 . (cont.)

	STATE									
	La		Ms		Al		FLW		ALL	
	OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA	
COUNTY	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN
Wakulla/Jefferson	.	.	.	.	.	.	8	0.63	8	0.63
Taylor	.	.	.	.	.	.	7	1.72	7	1.72
Dixie	.	.	.	.	.	.	4	2.04	4	2.04
Levy	.	.	.	.	.	.	1	2.00	1	2.00
Hernando	.	.	.	.	.	.	3	2.67	3	2.67
Pasco	.	.	.	.	.	.	17	0.99	17	0.99
Pinellas	.	.	.	.	.	.	97	3.52	97	3.52
Hillsborough	.	.	.	.	.	.	2	1.00	2	1.00
Manatee	.	.	.	.	.	.	9	0.47	9	0.47
Sarasota	.	.	.	.	.	.	48	2.35	48	2.35
Charlotte	.	.	.	.	.	.	3	1.00	3	1.00
Lee	.	.	.	.	.	.	23	6.67	23	6.67
Collier	.	.	.	.	.	.	13	1.44	13	1.44
ALL	242	1.72	20	1.22	657	1.77	1242	2.56	2161	2.21

Table 4. Observed Catch per angler (Obs_CPA) of greater amberjack from MRFSS intercepts of charterboats and private vessels in the Gulf of Mexico by fishery (mode) and state.

	STATE									
	La		Ms		Al		FLW		ALL	
	OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA		OBS_CPA	
Mode	N	MEAN	N	MEAN	N	MEAN	N	MEAN	N	MEAN
Charter	198	1.88	8	1.90	486	1.91	856	2.93	1548	2.47
Private	44	1.01	12	0.76	171	1.36	386	1.75	613	1.57
ALL	242	1.72	20	1.22	657	1.77	1242	2.56	2161	2.21

Table 5. Standardized abundance of the Gulf of Mexico greater amberjack from MRFSS intercepts of charterboats and private vessel anglers from 1986-1998.

Calendar Year	Index Value	Coefficient of Variation Of Index
1986	2.69682	0.23510
1987	2.49884	0.11460
1988	0.95658	0.28451
1989	1.31739	0.25195
1990	0.48580	0.46531
1991	1.72735	0.16957
1992	1.40695	0.11778
1993	1.04690	0.20307
1994	1.24008	0.21515
1995	0.48728	0.44599
1996	0.98779	0.21308
1997	0.85554	0.30174
1998	0.64219	0.30946

Figure 1. Gulf of Mexico greater amberjack abundance indices from MRFSS charterboat and private vessel fishery intercepts.