

A Review of Calculated Gulf of Mexico Red Grouper Discards From Handline and Longline Vessel Discard Logbook Data

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Introduction

Red grouper discards were calculated for the Gulf of Mexico longline and handline fisheries using data reported to the coastal logbook discard program. Those calculations are described in SEDAR 12 DW-17 and addendum. A brief review of the methods and results of the commercial discard calculations is presented here.

Methods

Handline

Methods for calculating red grouper discards from handline vessels were included in McCarthy (2006a). The handline data set included trips from vessels that reported discards between August 1, 2001 and December 31, 2005 in the eastern Gulf of Mexico. Red grouper trips were identified from the coastal logbook data set using the Stephens and MacCall (2004) approach, where trips are subset based upon the reported species composition of the landings. This method is intended to identify trips that fished in locations containing red grouper habitat and, therefore, had the potential of catching red grouper. A generalized linear model (GLM) analysis of the discard rate of successful trips (trips that discarded red grouper) was conducted. Of trips identified as potential red grouper trips, the proportion of positive trips was greater than 90%, therefore, a GLM analysis on proportion positive trips assuming a binomial error distribution was inappropriate. Parameterization of the lognormal model was accomplished using a GLM procedure (GENMOD; Version 8.02 of the SAS System for Windows © 2000. SAS Institute Inc., Cary, NC, USA). In order to properly calculate red grouper discard rates, potential red grouper trips (as identified by the Stephens and MacCall method) that did not report red grouper discards were included in the analyses. Lognormal GLMs model only successful trips, therefore, in order to include trips with no reported red grouper discards, a constant (10% of the mean red grouper CPUE) was added to the red grouper CPUE of each trip. Those data were then used in the GLM analyses.

Once the significant factors were identified, the lsmeans (corrected for log transform bias and with the constant removed) produced from the final model were used to calculate red grouper discards. Significant factors identified in the GLM procedure were used to stratify the coastal logbook trips. Total effort (hook-hours) of trips in each stratum was multiplied by the appropriate lsmean of red grouper discards to calculate total red grouper discards.

Longline

Red grouper longline discard calculations were accomplished using two approaches. The first followed the methods described above for handlines. A GLM analysis was completed to identify factors significantly affecting the discard rate of successful trips (those that reported discards). Again, the proportion of positive trips was greater than 90% of all trips identified as potential red grouper trips. A GLM fit on the proportion positive trips and assuming a binomial error distribution was inappropriate. Red grouper trips, identified by the Stephens and MacCall method, with no reported discards were included in the lognormal analysis after

adding a constant to the red grouper discard CPUE of each trip. The lsmeans produced in the final GLM were used along with longline effort (hooks fished) to calculate total longline discards per stratum.

Calculated discards using the method describe above were much lower than the number of discards calculated for handline vessels (McCarthy, 2006a). Longline vessels reported much higher red grouper landings (approximately 58.5 million pounds from 1990-2005) than did handline vessels (23.5 million pounds reported landed during the same period). At the SEDAR 12 data workshop, concerns were raised about possible underreporting of longline red grouper discards. The issue was investigated by examining discards per pound landed ratios from longline and handline observer and fisheries independent data then comparing those results to discards per pound ratios from the coastal logbook data (McCarthy, 2006b). Handline discards per pound landed ratios were similar among all data sets. Longline discards per pound landed ratios developed from the coastal logbook data were 6-10 times lower than discards per pound landed ratios calculated from other longline data sets. The fisheries independent and observer longline data sets were similar in calculated discards per pound landed ratios to those calculated from handline data, however. In addition, the size frequency of the red grouper catch, including discards, from handline and longline observer data sets were also similar. Those results suggested that longline discards are underreported to the coastal logbook program and that the handline discards per pound landed ratio could be applied to longline landings to calculate longline discards.

Discards of red grouper from longline vessels were calculated by multiplying the coastal logbook handline red grouper discards per pound landed ratio to the red grouper longline landings reported to the coastal logbook program. Data were stratified by area and fishery (targeting or not targeting red grouper as identified by the Stephens and MacCall method). Yearly discards were calculated by summing across strata by year.

Results

Handline

The factors area fished and fishery (trips identified as red grouper trips versus other trips) had significant effects on red grouper discard rates. The final model for the lognormal on CPUE of successful handline trips was:

$$\mathbf{LN(CPUE) = AREA + FISHERY}$$

The mean number of discards per hook-hour fished by handline vessels reporting discards is presented in Table 1 by area and fishery (targeting red grouper or other handline trips) strata. The total effort in hook-hours of handline vessels and the calculated discards are also provided in Table 1. Calculated yearly handline red grouper discards and total handline hook-hours fished are provided in Table 2.

Longline

Initial Longline Discard Calculations

The final model of the lognormal on CPUE of successful longline trips was:

$$\mathbf{LN(CPUE) = FISHERY + AREA}$$

Table 3 contains mean number of discards per hook fished by longline vessels reporting discards by area and fishery. Total longline effort in each stratum in hooks fished and the total calculated number of red grouper discards are also provided in Table 3. Yearly discards, calculated for longline vessels, and total longline effort in number of hooks fished are provided in Table 4.

Alternate Longline Discard Calculations

Handline discards per pound landed ratios were applied to longline landings to calculate longline discards. The initial analysis of longline coastal logbook discard data had identified targeting and area fished as having significant effects on red grouper longline discard rate. Handline discards to landings ratios were calculated for each targeting/area stratum. Longline landings for each stratum were multiplied by the appropriate handline discards to landings ratio to calculate longline discards (Table 5). Longline discards were also calculated for each year by summing discards for each targeting/area stratum by year (Table 6).

Discussion

Calculated discards of handline and longline vessels varied considerably during 1990-1992. Regardless of gear or calculation method, the highest number of discards calculated for the entire 1990-2005 time series was found during the 1990-1992 period. During those years only 20% of Florida vessels were required to report to the coastal logbook program. Variation in the calculated discards may reflect sampling error during the period.

From 1993 to 2005, the calculated number of handline and longline discards was relatively constant. Longline discards calculated using the handline discards per pound landed ratios are approximately 10 times greater than longline calculations made by multiplying the mean discards per hook by total hooks fished. Given that longline red grouper landings are much greater than handline landings, longline discards calculated using the handline discards per pound landed ratios probably more accurately reflects longline red grouper discards. Overall, calculated discards from longlines using the alternate method are approximately twice the total calculated handline discards.

Literature Cited

- McCarthy, K. 2006a. Calculated red grouper discards by vessels with federal permits in the Gulf of Mexico. SEDAR 12-DW-17. Sustainable Fisheries Division Contribution SFD-2006-030.
- McCarthy, K. 2006b. Calculated red grouper discards by vessels with federal permits in the Gulf of Mexico: Addendum. SEDAR 12-DW-17. Sustainable Fisheries Division Contribution SFD-2006-044.
- Stephens, A. and A. MacCall. 2004. A multispecies approach to subsetting logbook data for purposes of estimating CPUE. *Fish. Res.* 70:299-310.

Table 1. Calculated numbers of red grouper total discards for the Gulf of Mexico handline fishery by Area and Fishery for the period January 1, 1990-December 31, 2005. Fishery denotes trips that were classified as red grouper (Y) or not red grouper (N) trips.

Area	Fishery	Discards/Hook-hour	Handline Hook-hours	Calculated Discards
1-5	N	0.080236	2,751,676	220,784
1-5	Y	0.256661	3,735,880	958,856
6	N	0.306194	649,907	198,998
6	Y	0.525731	2,240,109	1,177,695
7	N	0.283697	519,955	147,510
7	Y	0.463118	1,702,371	788,399
8-11	N	0.084214	14,156,989	1,192,217
8-11	Y	0.194375	2,212,620	430,077
Total			27,969,508	5,114,537

Includes calculated discards from 1990-1992 based upon an expansion factor of 5

Table 2. Calculated numbers of red grouper total discards for the Gulf of Mexico handline fishery by year.

Year	Handline Hook-Hours	Calculated Discards
1990	1,291,153	253,082
1991	2,216,730	403,453
1992	2,534,915	495,706
1993	1,247,868	222,057
1994	1,496,248	263,099
1995	1,232,466	244,543
1996	1,788,615	316,766
1997	1,672,711	305,480
1998	1,661,657	301,903
1999	2,089,282	377,218
2000	1,809,033	343,245
2001	1,952,560	361,651
2002	2,009,180	351,833
2003	1,921,667	327,169
2004	1,653,992	290,903
2005	1,391,433	256,428
Total	27,969,508	5,114,537

Highlighted years include calculated discards based upon an expansion factor of 5

Table 3. Calculated numbers of red grouper total discards for the Gulf of Mexico longline fishery by Area and Fishery for the period January 1, 1990-December 31, 2005. Fishery denotes trips that were classified as red grouper (Y) or not red grouper (N) trips.

Area	Fishery	Discards/Hook	Longline Hooks Fished	Calculated Discards
1-4	N	0.000513	45,507,068	23,328
1-4	Y	0.001531	183,258,987	280,484
5	N	0.000739	30,356,479	22,434
5	Y	0.002782	147,110,299	409,289
6	N	0.000538	15,388,529	8,277
6	Y	0.002269	57,328,442	130,075
7-10	N	0.000619	37,716,006	23,350
7-10	Y	0.00322	23,987,859	77,240
Total			540,653,669	974,476

Includes calculated discards from 1990-1992 based upon an expansion factor of 5

Table 4. Calculated numbers of red grouper total discards for the Gulf of Mexico longline fishery by year.

Year	Longline Hooks Fished	Calculated Discards
1990	34,912,585	52,489
1991	60,327,355	87,446
1992	34,392,610	60,841
1993	27,193,873	49,764
1994	34,124,151	60,492
1995	30,466,739	46,246
1996	32,928,479	61,743
1997	37,498,471	69,474
1998	33,117,476	62,706
1999	33,625,178	65,944
2000	33,568,068	61,665
2001	32,260,977	61,994
2002	29,539,584	60,521
2003	32,750,065	64,865
2004	31,083,199	62,178
2005	22,864,859	46,110
Total	540,653,669	974,476

Highlighted years include calculated discards based upon an expansion factor of 5

Table 5. Longline calculated discards by area fished and fishery for the period January 1, 1990-December 31, 2005. Fishery denotes trips that were classified as red grouper (Y) or not red grouper (N) trips. Calculated discards are in number of red grouper; landings are in pounds (whole weight) of red grouper. Discards/lb landed ratios are those calculated from handline data in the appropriate area/fishery stratum.

Area	Fishery	Longline Landings	Discards/Lb Landed	Calculated Discards
1-5	N	3,698,347	0.093177960	344,604
1-5	Y	42,345,456	0.129267559	5,473,894
6	N	779,620	0.153061539	119,330
6	Y	8,216,348	0.175972040	1,445,847
7	N	216,058	0.188771494	40,786
7	Y	1,471,537	0.219894515	323,583
8-10	N	177,194	2.995051121	530,704
8-10	Y	1,505,186	0.427376476	643,281
Total		58,409,746		8,922,029

Includes calculated discards from 1990-1992 based upon an expansion factor of 5

Table 6. Longline calculated yearly discards; landings are in pounds (whole weight) of red grouper, calculated discards are reported as number of red grouper.

Year	Landings	Calculated Discards
1990	2,973,347	392,423
1991	5,416,980	823,212
1992	2,694,136	368,905
1993	3,570,115	526,157
1994	2,806,842	410,837
1995	2,698,092	524,889
1996	3,489,131	581,653
1997	3,758,160	627,643
1998	3,533,230	539,625
1999	4,681,540	668,593
2000	3,603,542	551,148
2001	4,030,249	620,265
2002	3,865,969	584,435
2003	3,635,568	538,007
2004	4,023,130	594,490
2005	3,629,712	569,746
Total	58,409,746	8,922,029

Highlighted years include calculated discards based upon an expansion factor of 5