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Estimation of species misidentification in the commercial landing data of gag groupers and black groupers in the Gulf of Mexico

by

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INTRODUCTION

Before mid-1990, gag groupers had been coded as black groupers in some Gulf regions. Beginning in 1997 to 1998, attempts were made to correct these coding problems. However, coding problems still exist in that some dealers tend to report or sell gag groupers as black groupers because they think that consumers may have a better perception of black groupers. Thus, commercial landings of gag groupers may be underestimated, and landings of black groupers overestimated, in the historical data base, particularly before 1990. The main aim of this study was to estimate the percentage of gag groupers misidentified as black groupers in commercial landing records. Data from the TIP database was used to estimate the ratio of black groupers to gag groupers in commercial landings and to calculate the rate of misidentification of gag groupers as black groupers in different Florida counties. Results from this re-analysis should serve as a basis for correcting the historical commercial landing data for gag groupers.

METHODS

The ratios of black groupers to gag groupers in TIP samples collected from commercial fishing trips were calculated to estimate the actual ratios of black groupers to gag groupers in commercial landings (method 1). The assumptions for calculating these ratios were that TIP sampling trips were randomly selected from all fishing trips, and that TIP samples were randomly selected from the landings of gag and black groupers. In addition, the rates of misidentification were calculated by comparing TIP landing records with TIP sample records (method 2). The species name in TIP landing records were those reported by dealers, while the species name in TIP sample records were those identified by TIP samplers. According to TIP samplers (personal communications), gag groupers can be easily distinguished from black groupers. In this analysis, it is assumed that TIP samplers identified and recorded black groupers and gag groupers more accurately than dealers. It should be noted that not all TIP samplers recorded misidentified species in TIP. Because of the limitations in the data set for method 2, the results from this method can only complement the results of method 1, and may not be used directly for adjustment of ALS landing data.

RESULTS

I. Ratio of black groupers to gag groupers in TIP samples vs in ALS landings (method 1)

Tables 1 to 3 show the ratio of black groupers to gag groupers in ALS landing records and in TIP data from 1984 to 2004 in the Gulf of Mexico, Florida and non-Florida states, respectively. Most landings and samples of black groupers and gag groupers were from Florida (Table 2). Figs. 1 and 2 show that the differences in ratios of black groupers to gag groupers between ALS and TIP records were most pronounced during 1986-1990 in both the Gulf of Mexico and Florida. Table 4 shows the sums of ALS landings and TIP samples, and the ratios of black groupers to gag groupers in ALS and TIP records from 1984 to 2004 for each county along the Gulf of Mexico. Fig. 3 shows that the differences in ratios of black groupers to gag groupers

between ALS and TIP records were most pronounced in counties such as Monroe, Manatee, and Escambia. Differences in the ratios of black groupers to gag groupers between ALS and TIP records from 1984 to 2004 in selected counties are shown in Fig. 4. The pattern of changes varies among these counties. Table 5 shows the sums of TIP samples, and the ratios of black groupers to gag groupers, in records from 1984 to 2004 taken from various fishing grids in the Gulf of Mexico. Fig. 5 shows the changes in the ratios of black groupers to gag groupers from 1984 to 2004 in different areas along the Florida west coast (see figure legend for definition of areas used in this report). Data for handline and longline landings are not presented in the table. It appears that most black grouper samples were collected from the southwest Florida area.

In the above figures and tables, TIP samples are expressed as numbers of fish, while ALS landings are expressed as thousands of pounds. Because black groupers are generally bigger than gag groupers, when the ratios of black groupers to gag groupers obtained from TIP records are used to adjust ALS landings, these ratios of numbers must be converted to ratios of weights. One way to do this is to use the weight-length conversion equations specific to Gulf areas to derive a weight from a length for each TIP sample, and then to calculate the ratio of black groupers to gag groupers for each TIP record based on this weight. However, because the sample sizes for black grouper TIP samples are typically small, larger black groupers tend to be selected in these samples (for a discussion of the effects of sample sizes on size distributions, see Chih, 04, 05, 06). Figs. 7 & 8 illustrate the distinct differences in size distributions for black groupers and gag groupers taken in the Gulf of Mexico in 1998 and in 2000. Both figures suggest that larger black groupers may be over-sampled. Such differences in sampling should be more pronounced in local areas, where sample sizes are smaller. Thus, the ratios of black groupers to gag groupers based on weights and obtained from TIP records can vary greatly because of the potential size bias of black groupers collected in relatively small samples. This problem may be avoided by calculating the mean gutted weight for each fish type (gag or black grouper) taken in the Gulf of Mexico from 1984 to 2004, and by deriving an adjustment factor from this calculation that converts the ratio of black groupers to gag groupers from a number to a weight. Such an adjustment factor (1.8478) was obtained by dividing the mean gutted weight of black groupers (25.98 lb) by the mean gutted weight of gag groupers (14.06 lb). The equations used to derive this adjustment factor are:

(1) Equations for deriving total length (inch) from fork length (inch):

Total length=1.0125 x fork length+0.609. (Gag grouper)

Total length=1.0475 x fork length-0.6455. (Black grouper)

(2). Equations for deriving gutted weight (lb) from total length (inch):

Gutted weight=0.000417 x (total length)$^{3.005}$. (Gag grouper)

Gutted weight=0.000315 x (total length)$^{3.1227}$. (Black grouper)

These equations were derived from gag grouper and black grouper samples collected from the Gulf of Mexico during 1984-2004 by TIP samplers.

II. Rate of misidentification of gag groupers as black groupers in TIP samples (method 2)

Table 6 shows the percentage of black groupers in TIP landing records that were actually

gag groupers. All counties except Monroe county have very high rates of misidentification of gag groupers, which helps explain the large differences in the ratios of black groupers to gag groupers between ALS and TIP records recorded in these counties (Fig. 3). Fig. 6 shows that high rates of misidentification of gag groupers in landing records coincided with low percentages of black groupers in TIP sample records, indicating that TIP records are indeed more accurate than ALS landing records. Because not all TIP samplers recorded misidentified fish, and because sample sizes for some years were very small, the results for method 2 cannot be used directly to account for landings of black and gag groupers. However, these results provide additional evidence that many groupers identified as black groupers by dealers in past landing records were erroneously recorded or misidentified as black groupers.

CONCLUDING REMARKS

The analyses in this paper indicate (1) that TIP sampling records and ALS landing records, particularly those before 1990, have large discrepancies in the ratios of black groupers to gag groupers between TIP sample records and ALS landing records, (2) that differences in the ratios of black groupers to gag groupers between TIP sample records and ALS landing records vary among different counties and grids, and (3) that high rates of misidentification of gag groupers in landing records suggest that differences in ratios of black groupers to gag groupers between TIP sample records and ALS landing records were at least partly due to the miscoding and misrecording of records by dealers.

Although it is likely that data recordings and species identifications are more accurate in TIP sample records than in ALS landing records, the assumption that the ratios of black groupers to gag groupers in TIP sample records represent the actual ratios in commercial landings still needs verification. Readers may make their own assumptions and adjust ALS landings accordingly. If the ratios of black groupers to gag groupers in TIP sample records are to be used, then ALS landing data should be adjusted based on TIP data from individual counties. The ratios of black groupers to gag groupers in TIP samples can be converted from numbers to weights by multiplying the ratios by 1.8478.

REFERENCES

1. C.P. Chih, 2004, Some observations concerning the sampling of commercial red snapper fisheries in the Gulf of Mexico (SEDAR7-DW-43).
2. C.P. Chih, 2005, Reevaluation of the Trip Interview Program (in the process of internal review).
3. C.P. Chih, 2006, Effect of Some Variations in Sampling Practices on the Length Frequency Distribution of Gag Groupers Caught by Commercial Fisheries in the Gulf of Mexico (SEDAR10-DW-23).

Table 1. Number of TIP samples and ALS landings for gag groupers (GG)and black groupers (BG), and the ratios of black groupers to gag groupers (BG/GG), in the Gulf of Mexico from 1984 to 2004 (ALS landings are in thousands of pounds).

Year	GG/ALS	BG/ALS	GG/TIP	BG/TIP	BG/GG, ALS	BG/GG, TIP
1984			1288	5		0.004
1985	9.5	0.7	1463	48	0.075	0.033
1986	862.7	1305.8	1534	275	1.514	0.179
1987	745.2	1312.6	1244	214	1.761	0.172
1988	585.7	940.3	451	49	1.606	0.109
1989	752.9	1369.4	233	221	1.819	0.948
1990	935.5	1363.9	2645	412	1.458	0.156
1991	1098.1	884.4	1973	196	0.805	0.099
1992	1415.8	658.4	2151	235	0.465	0.109
1993	1750.8	572.7	2733	318	0.327	0.116
1994	1515.7	507.3	3677	140	0.335	0.038
1995	1572.4	466.9	3456	142	0.297	0.041
1996	1506.5	448.6	4224	172	0.298	0.041
1997	1692.0	285.7	5019	260	0.169	0.052
1998	2784.7	288.4	13287	458	0.104	0.034
1999	2252.5	260.1	11035	568	0.115	0.051
2000	2497.0	285.7	8412	460	0.114	0.055
2001	3449.8	361.0	9878	490	0.105	0.050
2002	3276.9	348.0	8553	426	0.106	0.050
2003	2766.0	470.9	6246	556	0.170	0.089
2004	2962.9	506.0	5586	387	0.171	0.069

Fig 1. The ratios of black groupers to gag groupers (BG/GG) in ALS landing records and TIP sample records in the Gulf of Mexico from 1984 to 2004.

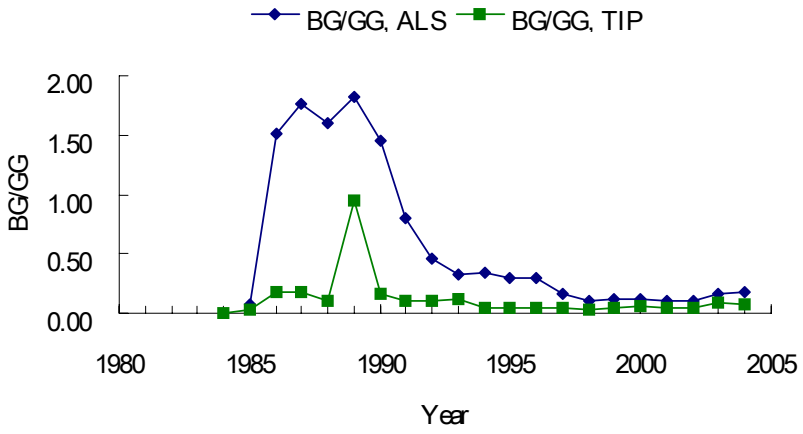


Table 2. Number of TIP samples and ALS landings for gag groupers (GG)and black groupers (BG), and the ratios of black groupers to gag groupers (BG/GG), in Florida from 1984 to 2004 (ALS landings are in thousands of pounds).

year	state	GG/ALS	BG/ALS	GG/TIP	BG/TIP	BG/GG, ALS	BG/GG, TIP
1984	FL			1268	5		0.004
1985	FL			1352	48		0.036
1986	FL	831.0	1304.3	1431	268	1.570	0.187
1987	FL	712.5	1311.9	1230	214	1.841	0.174
1988	FL	574.6	915.4	451	48	1.593	0.106
1989	FL	751.9	1359.8	233	221	1.809	0.948
1990	FL	934.1	1347.3	2600	408	1.442	0.157
1991	FL	1083.6	873.4	1760	193	0.806	0.110
1992	FL	1403.2	654.2	2009	233	0.466	0.116
1993	FL	1730.7	570.8	2492	314	0.330	0.126
1994	FL	1497.7	506.1	3571	136	0.338	0.038
1995	FL	1548.2	464.8	3386	139	0.300	0.041
1996	FL	1485.3	444.4	4144	171	0.299	0.041
1997	FL	1657.1	283.7	4929	259	0.171	0.053
1998	FL	2725.4	285.2	13175	458	0.105	0.035
1999	FL	2208.9	231.4	10989	568	0.105	0.052
2000	FL	2461.0	257.7	8358	460	0.105	0.055
2001	FL	3426.8	341.4	9857	489	0.100	0.050
2002	FL	3245.3	332.7	8528	426	0.103	0.050
2003	FL	2741.5	452.3	6215	553	0.165	0.089
2004	FL	2933.4	478.5	5496	387	0.163	0.070

Fig 2. The ratios of black groupers to gag groupers (BG/GG) in ALS landing records and TIP sample records from the Gulf of Mexico from 1984 to 2004.

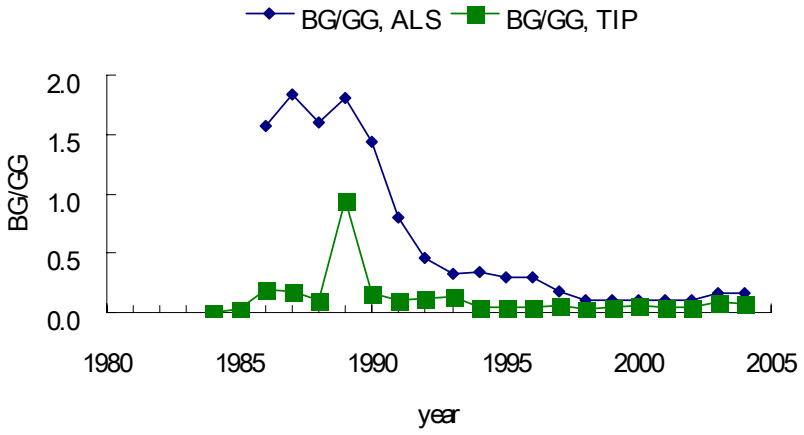


Table 3. Number of TIP samples and ALS landings for gag groupers (GG)and black groupers (BG), and the ratios of black groupers to gag groupers (BG/GG), in Gulf states other than Florida from 1984 to 2004 (ALS landings are in thousands of pounds).

Year	GG, ALS	BG, ALS	GG, TIP	BG, TIP	BG/GG, ALS	BG/GG. TIP
1984			20			
1985	9.5	0.7	111		0.075	
1986	31.8	1.6	103	7	0.049	0.068
1987	32.7	0.8	14		0.024	
1988	11.1	25.0		1	2.251	
1989	1.1	9.6			9.156	
1990	1.5	16.6	45	4	11.365	0.089
1991	14.6	10.9	213	3	0.751	0.014
1992	12.6	4.1	142	2	0.328	0.014
1993	20.0	1.8	241	4	0.092	0.017
1994	18.0	1.1	106	4	0.063	0.038
1995	24.2	2.0	70	3	0.084	0.043
1996	21.2	4.2	80	1	0.200	0.013
1997	34.9	2.0	90	1	0.059	0.011
1998	59.3	3.2	112		0.054	
1999	43.6	28.7	46		0.658	
2000	36.0	28.0	54		0.778	
2001	23.1	19.7	21	1	0.853	0.048
2002	31.6	15.3	25		0.484	
2003	24.4	18.6	31	3	0.761	0.097
2004	29.4	27.5	90		0.934	

Table 4. The sum of TIP samples and ALS landings for gag groupers (GG)and black groupers (BG), and the ratios of black groupers to gag groupers (BG/GG), in counties of Gulf states from 1984 to 2004. (ALS landings are in thousands of pounds).

state	county_name	GG/ALS	BG/ALS	GG/TIP	BG/TIP	BG/GG, ALS	BG/GG,TIP
AL	Baldwin	3.8	4.1	44	2	1.085	0.045
AL	Mobile	7.6	10.5	36	4	1.388	0.111
LA	Calcasieu		0.1				
LA	Cameron	19.4	5.1	8		0.265	
LA	Iberia	1.5					
LA	Jefferson	55.8	11.4	310	6	0.205	0.019
LA	Lafayette	0.2					
LA	Lafourche	245.8	41.9	790	9	0.170	0.011
LA	Orleans	8.6	3.5			0.402	
LA	Plaquemines	25.3	39.4	21	4	1.559	0.190
LA	ST Bernard	1.2	0.0			0.005	
LA	St. Mary		0.5				
LA	Terrebonne	2.2	0.4			0.173	
LA	Vermilion	0.2	0.6	41	1	3.328	0.024
MS	Harrison	1.3		1			
MS	Jackson	20.1	9.0	136	4	0.445	0.029
TX	Aransas	2.3	0.9			0.387	
TX	Brazoria		2.9				
TX	Cameron		11.1	217	4		0.018
TX	Chambers		0.7				
TX	Galveston	1.9	6.2	6		3.236	
TX	Harris		2.6				
TX	Jefferson	0.0	0.4			15.269	
TX	Matagorda		8.2				
TX	San Patricio		1.7	1			
FL	Escambia	344.1	170.9	1167	6	0.497	0.005
FL	Santa Rosa	35.7	5.6	182	1	0.157	0.005
FL	Okaloosa	1118.5	119.7	2942	34	0.107	0.012
FL	Walton	1.4	0.0			0.004	
FL	Bay	6428.4	623.6	19412	14	0.097	0.001
FL	Gulf	30.5	6.6	1		0.215	
FL	Franklin	4253.1	735.4	4412	9	0.173	0.002
FL	Wakulla	1503.2	132.2	1305	5	0.088	0.004
FL	Jefferson	1.2	1.5			1.258	
FL	Taylor	659.1	27.9	2712	1	0.042	0.000
FL	Dixie	152.9	73.3	6		0.480	
FL	Levy	832.2	38.2	1284		0.046	
FL	Citrus	649.2	462.9	1751	83	0.713	0.047
FL	Hernando	81.6	32.7			0.400	
FL	Pasco	501.0	259.1	885	1	0.517	0.001
FL	Pinellas	14947.2	3530.8	50266	2524	0.236	0.050
FL	Hillsborough	212.0	542.5	30		2.559	
FL	Manatee	266.1	1144.8	2847	136	4.302	0.048
FL	Sarasota	131.5	65.2	205	52	0.496	0.254
FL	Charlotte	32.1	152.2	89	18	4.743	0.202
FL	Lee	1442.6	704.7	2477	303	0.488	0.122
FL	Collier	271.9	275.7	261	32	1.014	0.123
FL	Monroe	56.5	3309.9	1220	2779	58.591	2.278

Fig 3. Averaged ratios of black groupers to gag groupers (BG/GG) in ALS landing records and TIP sample records from 1984 to 2004 in selected counties from Gulf states. Only those counties with average ALS landings (BG + GG) more than 10,000 pounds and average TIP samples (BG + GG)more than 30 were included. The scale was set so the differences between the ALS and TIP data can be seen more easily. The BG/GG ratio for the Monroe county (58.59) is off chart.

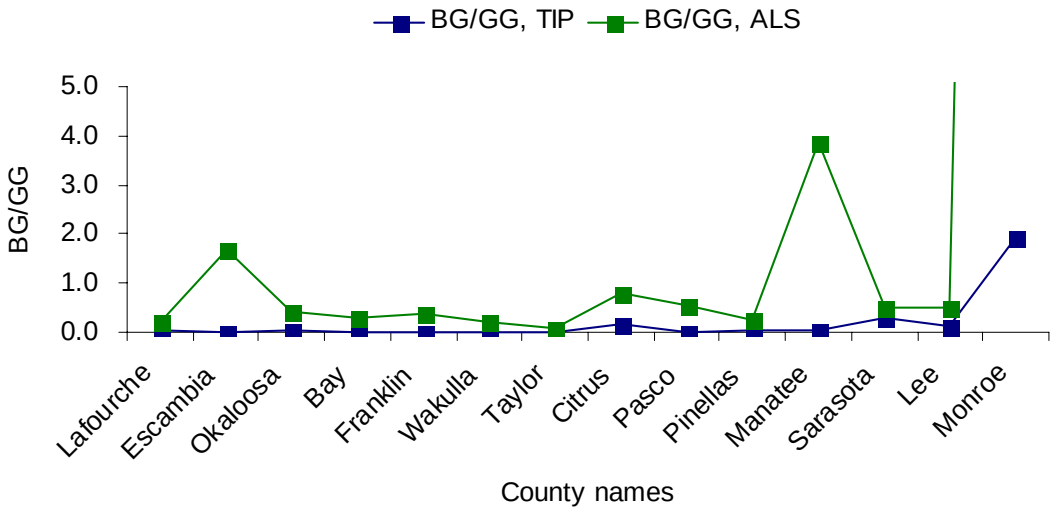


Fig 4. Averaged ratios of black groupers to gag groupers (BG/GG) in ALS landing records and TIP sample records from 1984 to 2004 in selected counties from Florida.

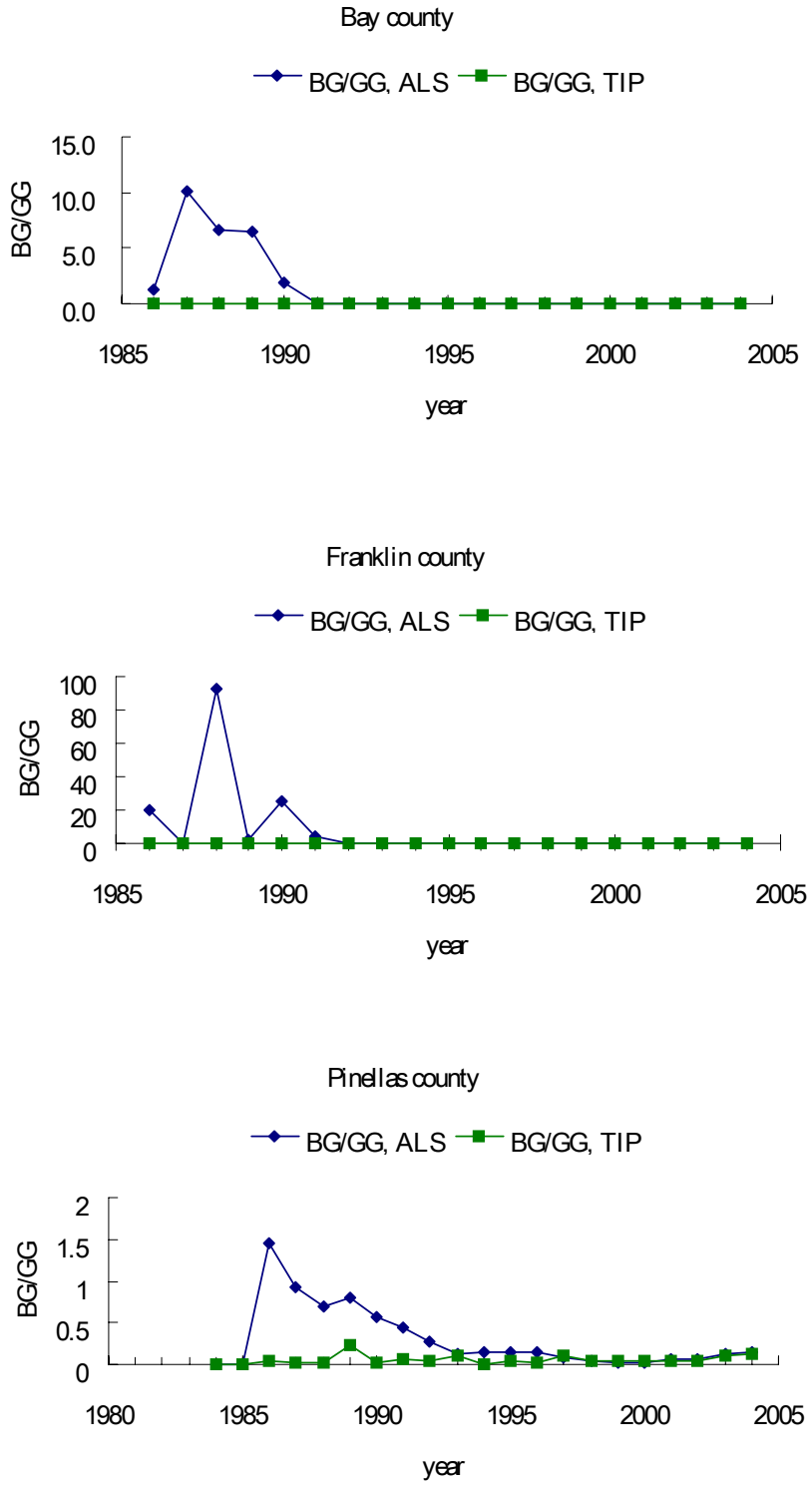
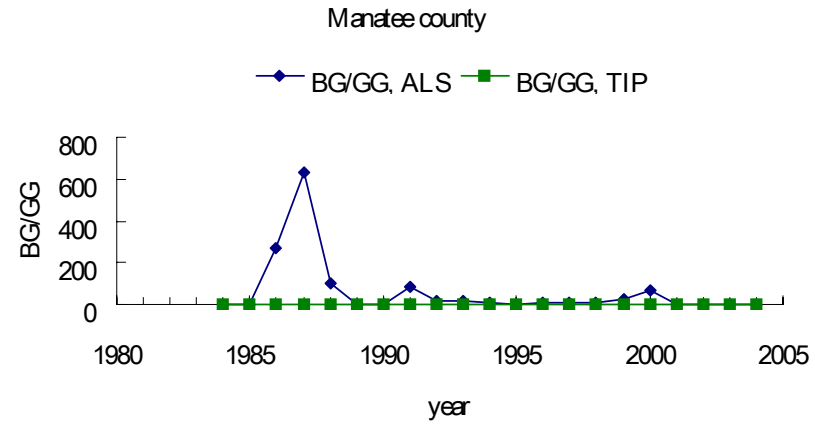
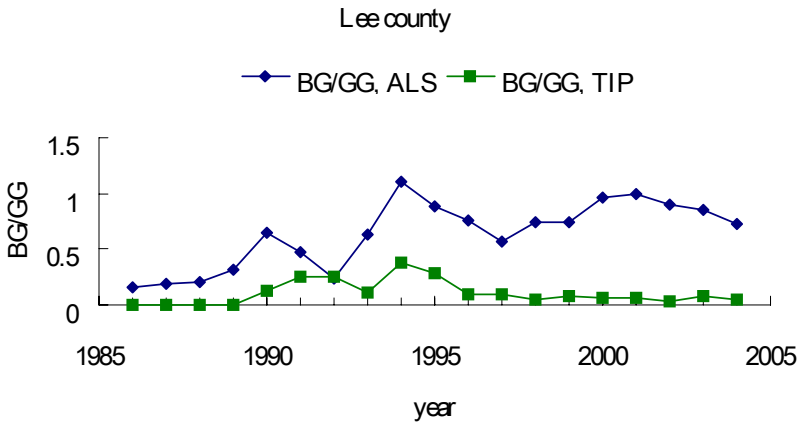


Fig 4. Continued.





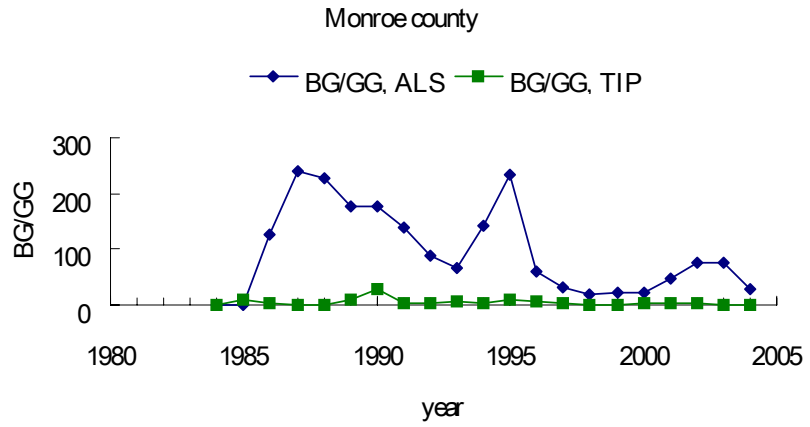


Table 5. Sum of TIP samples for gag groupers (GG)and black groupers (BG, and ratios of black groupers to gag groupers (BG/GG), from 1984 to 2004 in different grid areas in the Gulf states.

Grid	GG, TIP	BG, TIP	BG/GG, TIP
	5948	444	0.075
0	287	10	0.035
1	115	761	6.617
1.1	43	25	0.581
1.9	1	5	5.000
2	1525	1573	1.031
2.1		42	
2.8	68	68	1.000
2.9	1265	1001	0.791
3	3023	650	0.215
3.9	2747	297	0.108
4	6967	268	0.038
4.9	5439	271	0.050
5	10718	119	0.011
5.1	6	7	1.167
5.9	9764	215	0.022
6	17603	137	0.008
6.5	23		
6.9	3902	69	0.018
7	3954	1	0.000
7.1	70		
7.2	15		
7.3	35		
7.9	5728	6	0.001
8	11165	4	0.000
8.9	2		
9	1150	3	0.003
9.9	150		
10	1136	23	0.020
10.1	5		
10.4	15		
10.9	230		
11	466	5	0.011
11.9	14		
12	3		
13	219	6	0.027
14	425	6	0.014
14.9	7		
15	249	6	0.024
16	104	2	0.019
17	212		
18	52	2	0.038
19	15		
20	1	2	2.000
21	206	3	0.015
22	16	1	0.063

Fig 5. Ratios of black groupers to gag groupers (BG/GG) from 1984 to 2004 in TIP sample records in selected areas of the Gulf of Mexico (area 1:all sections in grid 1, area 2: all sections in grid 2, etc.)

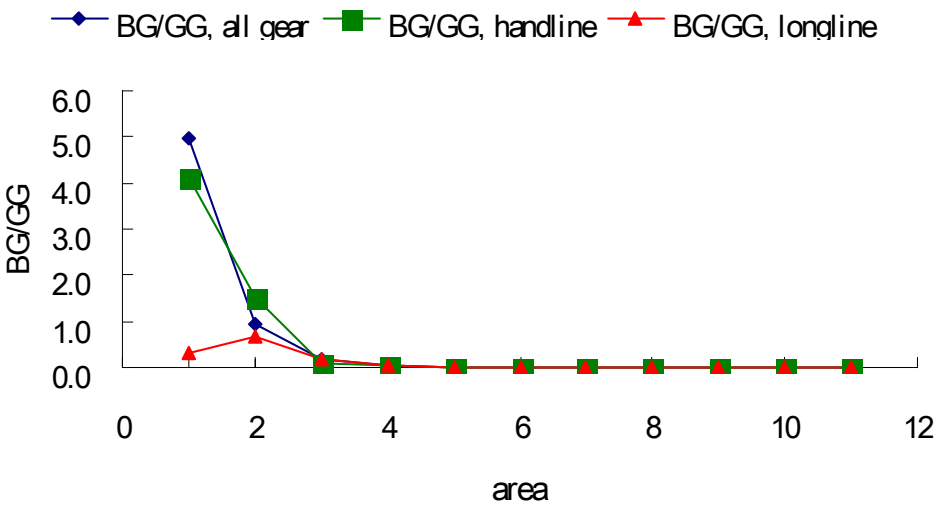


Table 6. Sum of gag groupers misidentified as black groupers, and the percent of misidentification, from 1984 to 2003 in selected counties in Florida (note: not all samplers record species misidentification in TIP, so data are only available for selected counties).

State	county_name	SUM GG misidentified as BG	SUM BG in landing record	percent
FL	Escambia	12	12	100.00%
FL	Okaloosa	33	49	67.35%
FL	Bay	51	52	98.08%
FL	Gulf	1	1	100.00%
FL	Franklin	114	115	99.13%
FL	Pasco	91	91	100.00%
FL	Pinellas	3913	4742	82.52%
FL	Manatee	505	537	94.04%
FL	Sarasota	146	227	64.32%
FL	Charlotte	63	75	84.00%
FL	Lee	484	660	73.33%
FL	Collier	17	17	100.00%
FL	Monroe	143	2140	6.68%

Fig 6. Averaged ratios of black groupers to gag groupers (BG/GG) from 1984 to 2004 in TIP sample records, and the percentage of misidentification of black groupers, in selected counties from Florida.

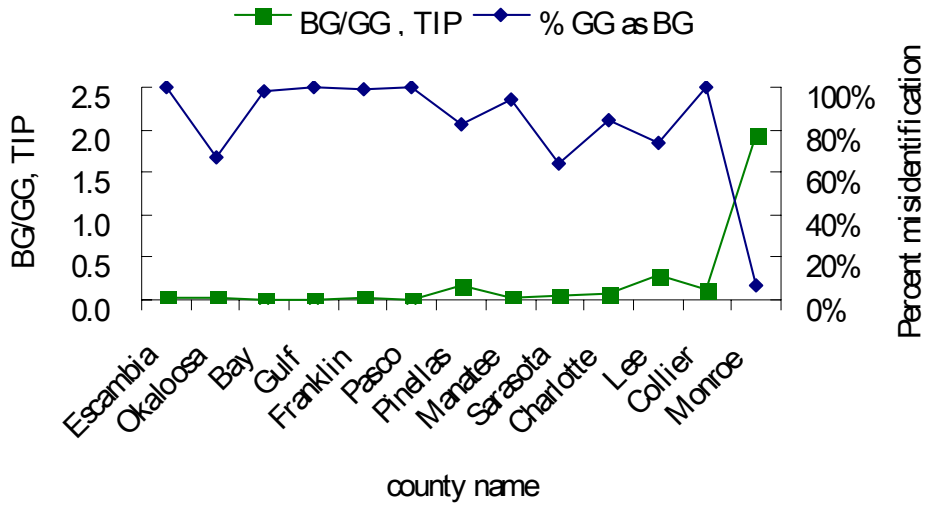
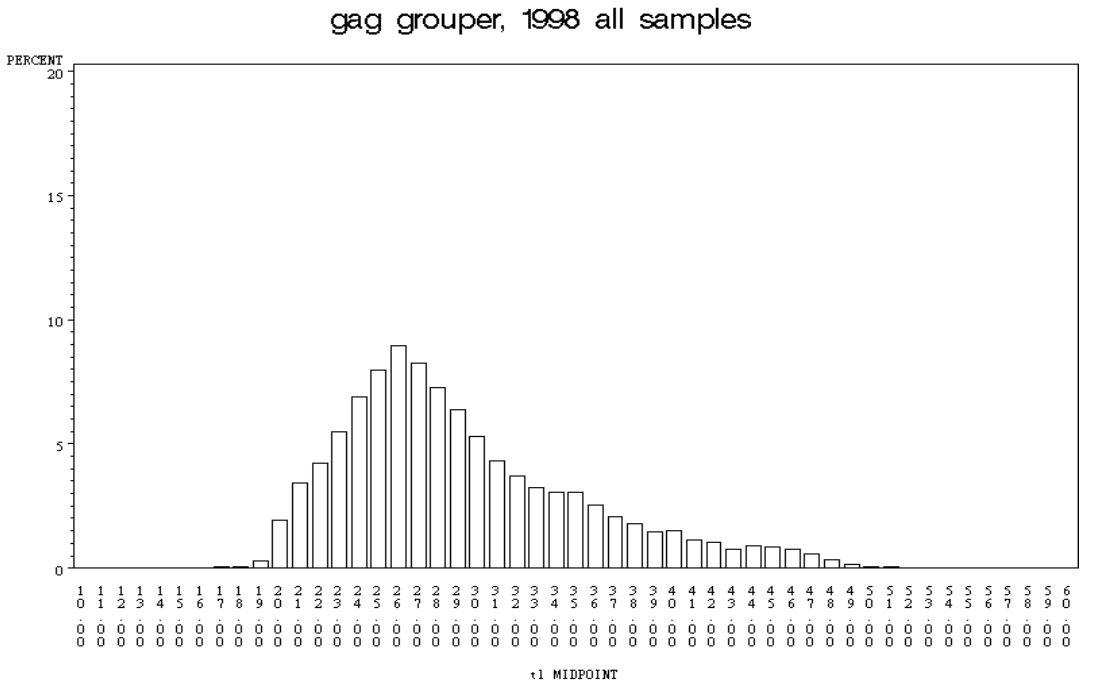


Fig 7. Comparison of size distributions for gag groupers and black groupers collected from the Gulf of Mexico in 1998 (TIP program).



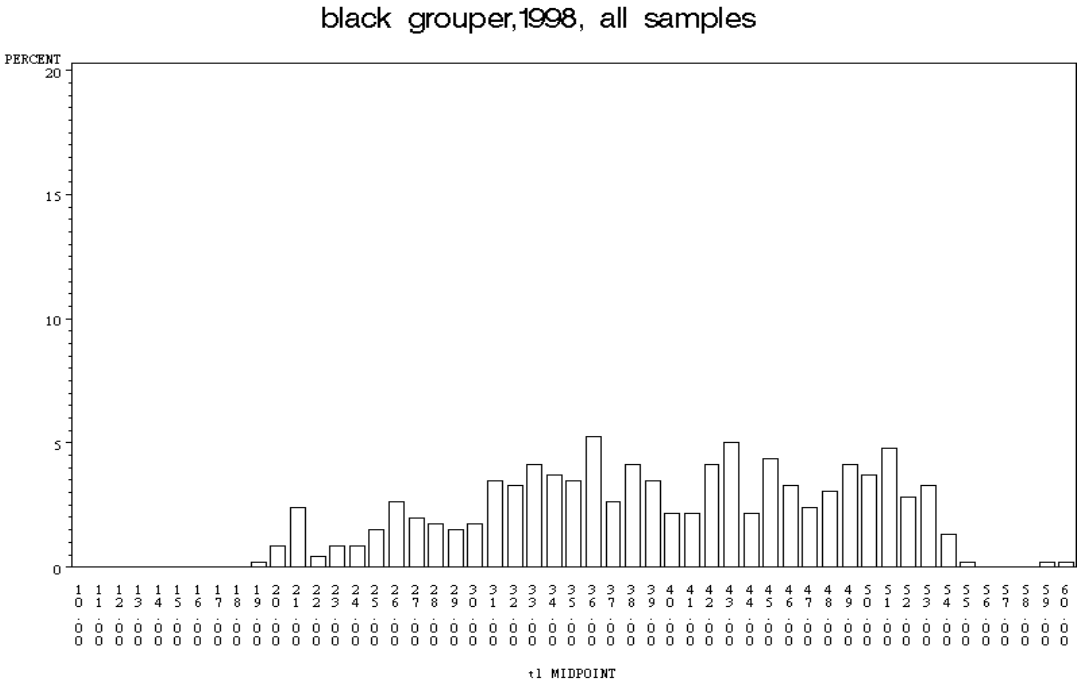


Fig 8. Comparison of size distributions of gag groupers and black groupers collected from the Gulf of Mexico in 2000 (TIP program).