Estimation of species misidentification in the commercial landing data of gag groupers and black groupers in the South Atlantic

by

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INTRODUCTION

The main aim of this study was to estimate the percentage of gag groupers misidentified as black groupers in commercial landing records from the South Atlantic. 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 South Atlantic states. Results from this re-analysis should serve as a basis for correcting the historical commercial landing data for gag groupers in the South Atlantic states.

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 in the South Atlantic (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 adjusting ALS landing data.

RESULTS

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

Tables 1 shows the ratios of black groupers to gag groupers in ALS landing records and in TIP data from 1984 to 2004 in the South Atlantic. Figs. 1 shows that the differences in ratios of black groupers to gag groupers between ALS and TIP records were most pronounced before1990 in the South Atlantic. Table 2 shows the sums of ALS landings and TIP samples, and the ratios of black groupers to gag groupers in ALS and TIP records for each state in the South Atlantic and for each year from 1984 to 2004. Table 3 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 state in the South Atlantic. 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 in the South Atlantic. Fig. 2 shows that the differences in ratios of black groupers to gag groupers between ALS and TIP records were most pronounced in Florida counties such as Indian River, St. Lucie, Volusia, Duval and in North Carolina counties such as Brunswick. 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 South Atlantic.

Fig. 3 shows the changes in the ratios of black groupers to gag groupers from 1984 to 2004 in different areas along the South Atlantic coast (see figure legend for definition of areas used in this report).

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 calculate the mean weight for each fish type (gag or black grouper) taken along the South Atlantic coast from 1984 to 2004, and then to derive 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 (1.1558) was obtained by dividing the mean gutted weight of black groupers (18.47 lb) by the mean gutted weight of gag groupers (15.98 lb). The equations used to calculate this adjustment factor were:

(1) equations for deriving total length (inch) from fork length (inch). These equations were calculated from the gag grouper and black grouper TIP samples collected from the Gulf of Mexico (Note: Not enough samples from the South Atlantic had both fork length and total length measurements, so no equation could be derived):

Total length = 1.0125 x fork length + 0.609 (Gag groupers)
Total length = 1.0475 x fork length - 0.6455 (Black groupers)

(2) equations for deriving gutted weight (lb) from total length (inch). These equations were calculated from the gag grouper and black grouper TIP samples collected along the South Atlantic coast:

Gutted weight = 0.0003646 x (total length)$^{3.0619}$ (Gag groupers)
Gutted weight = 0.000516 x (total length)$^{3.003}$ (Black groupers)

The mean gutted weight of black groupers (18.47 lb) calculated from TIP samples collected along the South Atlantic coast is significantly smaller than that (25.98 lb) calculated from TIP samples collected from the Gulf of Mexico (Chih, 2006). This difference is also reflected in the length frequency distributions of black grouper TIP samples collected from the two areas. Fig 4 shows the much higher percentage of larger black groupers in the TIP samples collected from the Gulf of Mexico. One reason for these discrepancies may be small sample sizes. About 80 % of TIP black groupers samples collected from the Gulf of Mexico had sample sizes less than 5, while about 93 % of TIP black groupers samples collected along the South Atlantic coast had sample sizes less than 5. The sampling irregularities caused by small sample sizes may contribute to the differences in the length distributions (Chih, 2004,2005,2006) and mean weights derived from black grouper TIP samples collected from these two areas.

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

Table 7 shows the percentage of black groupers in TIP landing records that were actually gag groupers in TIP samples collected along the South Atlantic coast from1984 to 2003. Table 8 shows the percentage of black groupers in TIP landing records that were actually gag groupers in TIP samples collected from selected counties along the South Atlantic coast from 1984 to 2003. Among these counties, Brunswick, New Hanover and Carteret of North Carolina had the highest

rates of misidentification. 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 gag groupers were misidentified as black groupers by dealers in past landing records.

CONCLUDING REMARKS

The analyses in this paper indicate that there are some discrepancies between TIP sampling records and ALS landing records, particularly those before 1990, and 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. The ratios of black groupers to gag groupers in TIP samples can be converted from numbers to weights by multiplying the ratios by 1.1558.

REFERENCES

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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).
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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 South Atlantic 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
1980	123.1					
1981	336.9	131.9			0.391	
1982	434.9	122.6			0.282	
1983	441.9	114.5			0.259	
1984	381.6	233.3	3432	3	0.611	0.001
1985	508.1	62.2	3631	4	0.122	0.001
1986	825.7	356.0	2302	3	0.431	0.001
1987	886.9	371.3	3389	6	0.419	0.002
1988	605.5	244.7	1932	71	0.404	0.037
1989	994.0	249.6	1773	14	0.251	0.008
1990	818.0	144.4	1316	15	0.177	0.011
1991	789.7	68.9	1690	7	0.087	0.004
1992	835.4	93.5	2296	73	0.112	0.032
1993	885.6	81.8	2738	41	0.092	0.015
1994	1033.0	55.5	2098	11	0.054	0.005
1995	1077.8	43.5	3437	44	0.040	0.013
1996	994.1	49.8	2563	16	0.050	0.006
1997	779.0	42.3	2143	43	0.054	0.020
1998	919.7	28.4	2246	35	0.031	0.016
1999	752.9	21.0	2832	73	0.028	0.026
2000	578.5	21.5	2658	64	0.037	0.024
2001	627.0	18.9	2443	65	0.030	0.027
2002	627.8	21.7	1609	79	0.035	0.049
2003	644.6	17.4	2415	50	0.027	0.021
2004	634.8	16.2	2405	54	0.026	0.022

Fig 1. The ratios of black groupers to gag groupers (BG/GG) in ALS landing records and TIP sample records in the South Atlantic from 1984-2004.
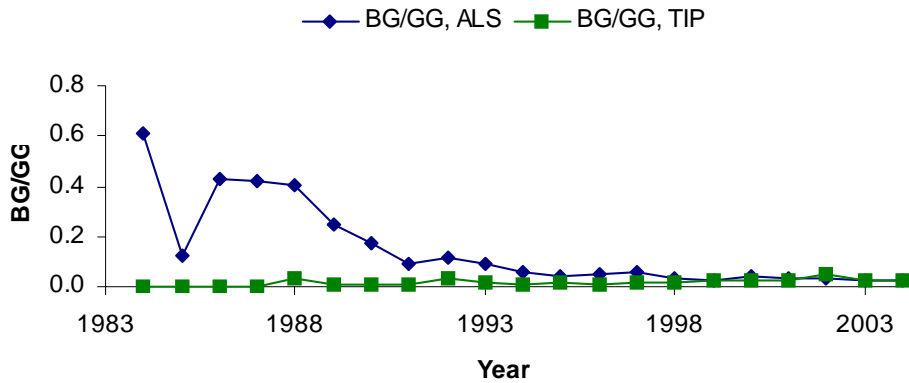
Table 2. Number of TIP samples and ALS landings for gag groupers (GG) and black groupers (BG), and the ratios of black groupers to gag groupers (BG/GG), in the South Atlantic states from 1984 to 2004 (ALS landings are in thousands of pounds).

Year	State	GG, ALS	BG, ALS	GG, TIP	BG, TIP	BG/GG, ALS	BG/GG, TIP
1985	FL			594			
1986	FL	160.3	350.8	71		2.189	
1987	FL	195.6	370.3	16		1.893	
1988	FL	99.8	244.7	53	28	2.452	0.528
1989	FL	245.9	244.3	100		0.994	
1990	FL	237.2	137.0	152	7	0.578	0.046
1991	FL	325.0	67.9	115		0.209	
1992	FL	305.8	82.1	988	54	0.269	0.055
1993	FL	280.4	71.1	1014	22	0.254	0.022
1994	FL	263.6	54.5	423	6	0.207	0.014
1995	FL	309.7	42.7	1479	34	0.138	0.023
1996	FL	327.9	48.3	590	10	0.147	0.017
1997	FL	262.3	41.8	535	23	0.159	0.043
1998	FL	327.4	27.7	212	11	0.085	0.052
1999	FL	254.1	18.2	851	43	0.072	0.051
2000	FL	230.2	21.2	826	35	0.092	0.042
2001	FL	233.5	18.9	675	54	0.081	0.080
2002	FL	177.5	21.3	216	47	0.120	0.218
2003	FL	175.9	17.1	678	19	0.097	0.028
2004	FL	141.5	16.2	282	34	0.115	0.121
1981	GA	19.3					
1982	GA	3.1					
1983	GA	9.1					
1984	GA	79.5		181			
1985	GA	60.9	0.7	107		0.011	
1986	GA	111.6	5.2	141		0.046	
1987	GA	71.9	1.0	227		0.014	
1988	GA	31.2	0.0	130		0.000	
1989	GA	43.3	5.2	92		0.121	
1990	GA	51.2	1.4			0.027	
1991	GA	47.9	0.0	244		0.001	
1992	GA	37.6	0.9	105		0.023	
1993	GA	44.6		204			
1994	GA	48.3	0.7	154		0.014	

Year	State						
1995	GA	71.3		191			
1996	GA	71.1		210			
1997	GA	34.3		133			
1998	GA	64.5		116			
1999	GA	71.3	2.9	66		0.040	
2000	GA	37.6		83			
2001	GA	40.6		48			
2002	GA	41.3	0.0	90		0.000	
2003	GA	29.4		76	1		0.013
2004	GA	33.9		84			
1981	NC	0.5	131.6			288.015	
1982	NC		122.6				
1983	NC		112.6				
1984	NC	0.2	233.3	1550	1	1116.301	0.001
1985	NC	185.6	61.3	1158	4	0.330	0.003
1986	NC	300.3		1234	3		0.002
1987	NC	270.6		1194	6		0.005
1988	NC	197.5		878	43		0.049
1989	NC	337.9		730	14		0.019
1990	NC	236.1		574	5		0.009
1991	NC	140.5		589	6		0.010
1992	NC	169.5	10.3	385	6	0.061	0.016
1993	NC	199.7	10.7	389	19	0.053	0.049
1994	NC	394.0	0.0	616	5	0.000	0.008
1995	NC	340.3	0.8	659	10	0.002	0.015
1996	NC	290.0	1.5	227	1	0.005	0.004
1997	NC	296.3	0.1	146	3	0.000	0.021
1998	NC	297.3	0.8	142	3	0.003	0.021
1999	NC	202.6		300	6		0.020
2000	NC	142.0	0.1	388	2	0.001	0.005
2001	NC	177.1		443			
2002	NC	241.2		393	9		0.023
2003	NC	207.3		368	1		0.003
2004	NC	215.5		1039	12		0.012
1980	SC	123.1					
1981	SC	317.1	0.2			0.001	
1982	SC	431.8					
1983	SC	432.7	1.8			0.004	
1984	SC	301.9		1701	2		0.001

1985	SC	261.5	0.1	1772		0.001	
1986	SC	253.5		856			
1987	SC	348.7		1952			
1988	SC	277.0		871			
1989	SC	367.0		851			
1990	SC	293.5	6.0	590	3	0.020	0.005
1991	SC	276.4	1.0	742	1	0.004	0.001
1992	SC	322.5	0.2	818	13	0.001	0.016
1993	SC	361.0	0.0	1131		0.000	
1994	SC	327.2	0.3	905		0.001	
1995	SC	356.4		1108			
1996	SC	305.0	0.0	1536	5	0.000	0.003
1997	SC	186.1	0.4	1329	17	0.002	0.013
1998	SC	230.5		1776	21		0.012
1999	SC	224.8		1615	24		0.015
2000	SC	168.6	0.2	1361	27	0.001	0.020
2001	SC	175.8		1277	11		0.009
2002	SC	167.8	0.3	910	23	0.002	0.025
2003	SC	232.1	0.3	1293	29	0.001	0.022
2004	SC	243.8		1000	8		0.008

Table 3. 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 the South Atlantic states from 1984 to 2004 (ALS landings are in thousands of pounds).

State	gtotal	btotal	gg	bg	BG/GG, ALS	BG/GG, TIP
FL	4553.5	1896.3	9870	427	0.416	0.043
GA	1155.0	18.0	2682	1	0.016	0.000
SC	6986.0	10.8	25394	184	0.002	0.007
NC	4841.8	685.9	13402	159	0.142	0.012

8

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 South Atlantic 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
FL	Brevard	672.4	79.1	485	9	0.118	0.019
FL	Broward	54.6	387.5		8	7.101	
FL	Duval	1289.8	351.8	2362	33	0.273	0.014
FL	Flagler	1.3					
FL	Indian River	76.1	117.2	61	1	1.539	0.016
FL	Martin	165.9	16.8	106	14	0.101	0.132
FL	Miami-Dade	50.3	254.8	3	38	5.062	12.667
FL	Nassau	58.6	5.4	25		0.092	
FL	Palm Beach	567.1	172.8	2325	209	0.305	0.090
FL	St. Johns	227.4	11.5	225	5	0.051	0.022
FL	St. Lucie	254.6	152.2	297	19	0.598	0.064
FL	Volusia	1135.3	347.3	3876	90	0.306	0.023
GA	Bryan	11.5		21			
GA	Chatham	245.0	0.0	328		0.000	
GA	Glynn	34.1	2.1			0.061	
GA	Mcintosh	864.4	15.9	2325	1	0.018	0.000
NC	Beaufort	0.1		3			
NC	Brunswick	1225.7	503.1	5756	127	0.410	0.022
NC	Carteret	1062.4	22.4	6058	27	0.021	0.004
NC	Craven	6.3					
NC	Dare	4.7	0.8			0.175	
NC	Hyde	1.4	0.4			0.290	
NC	Mecklenburg	4.8					
NC	New Hanover	1741.3	159.0	1096		0.091	
NC	Onslow	505.6					
NC	Pamilico	1.5					
NC	Pender	286.9	0.1			0.000	
NC	Pitt	0.1					
NC	Wake	1.0					
SC	Beaufort	46.2					
SC	Berkeley	13.7	0.5			0.039	
SC	Charleston	575.9	2.1	1869	11	0.004	0.006
SC	Colleton	119.6	0.1	80		0.000	
SC	Dorchester	15.6					
SC	Georgetown	5566.1	1.9	22874	153	0.000	0.007
SC	Horry	647.3	6.2	571	20	0.010	0.035
SC	Lexington	1.4					
SC	Richland	0.1					
SC	York	0.2					

Fig 2. 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 South Atlantic states. Only those counties with sums of ALS landings more than 20,000 pounds are included. The axes were set so that differences between the ALS and TIP data can be seen more easily.   The BG/GG ratio for Miami Dade county is off the chart.
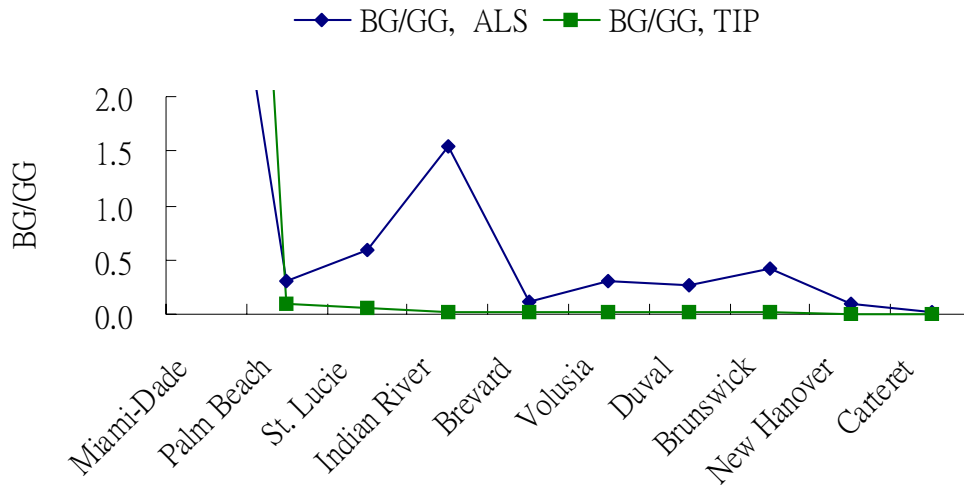
Table 5. Sum of TIP samples for gag groupers (GG) and black groupers (BG), and ratios of black groupers to gag groupers (BG/GG), from 1984 to 2004 in different grid areas in the South Atlantic.

Grid	GG, TIP	BG, TIP	BG/GG, TIP
	3697	42	0.011
0	32	1	0.031
635	3	2	0.667
700	1069	8	0.007
701	3998	14	0.004
702	412	2	0.005
703	2	4	2.000
704	17		
707	10382	25	0.002
708	10624	207	0.019
709	688	8	0.012
712	64		
713	5491	18	0.003
713.9	30	1	0.033
714	3160	71	0.022
715	17		
717	114		
717.9	99		
718	587	1	0.002
718.8888	112	2	0.018
719	1467		
719.9998	21	1	0.048
720	28		
721	9		
722	113		
722.5	3		
722.9	1543	24	0.016
723	545	1	0.002
724	106		
725	162		
726	20		
728	2028	27	0.013
728.1	1		
728.9	484	12	0.025
729	254	1	0.004
732	920	4	0.004
732.9	53	4	0.075
733	198	8	0.040
736	1387	60	0.043
736.1	12	1	0.083
736.9	61	10	0.164
737	61	2	0.033
739	13		
740	883	139	0.157
741	292	30	0.103
744	3	35	11.667
744.1		1	
744.9		1	

11

Table 6. Ratios of black groupers to gag groupers (BG/GG) for handline, longline and all types of gear from 1984 to 2004 in selected grid areas in the South Atlantic. Only those areas with sums of black groupers and gag groupers samples more than 30 are included.

Grid area	BG/GG, all gear	BG/GG,handline	BG/GG, longline
700-705	0.005	0.005	0.013
706-711	0.011	0.011	0.034
712-716	0.010	0.009	0.131
717-721	0.002	0.002	
722-726	0.010	0.010	
727-731	0.014	0.014	0.020
732-735	0.014	0.013	0.052
736-739	0.048	0.058	0.333
740-743	0.144	0.144	
748-751	12.333	10.000	

Fig 3. Ratios of black groupers to gag groupers (BG/GG) for handline, longline and all types of gear, from 1984 to 2004 in selected grid areas in the South Atlantic.
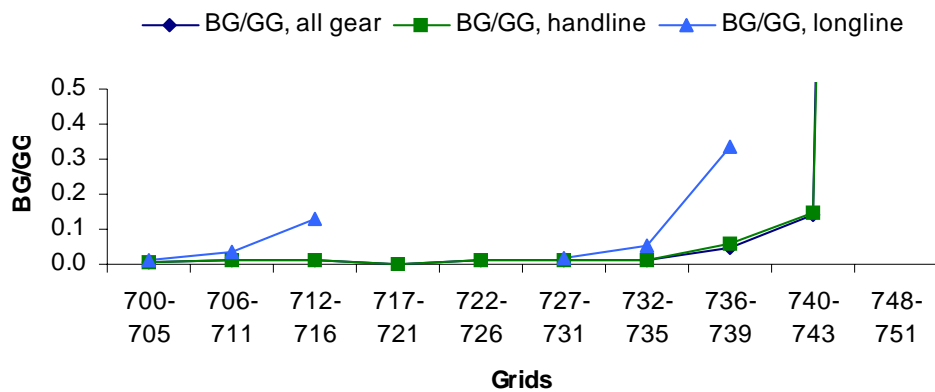
Table 7. Sum of gag groupers misidentified as black groupers, and the percent of misidentification, from 1984 to 2003 in the South Atlantic.

YEAR	GG misidentified as BG	BG in TIP landing record	Percent
1984	1165	1166	99.91%
1985	1084	1087	99.72%
1986	1126	1132	99.47%
1987	1181	1195	98.83%
1988	840	925	90.81%
1989	909	947	95.99%
1990	663	682	97.21%
1991	661	711	92.97%
1992	365	438	83.33%
1993	423	473	89.43%
1994	480	501	95.81%
1995	587	653	89.89%
1996	215	228	94.30%
1997	47	74	63.51%
1998	47	62	75.81%
1999	123	170	72.35%
2000	224	261	85.82%
2001	267	319	83.70%
2002	102	146	69.86%
2003	25	54	46.30%

Table 8. Sum of gag groupers misidentified as black groupers, and the percent of misidentification, from 1984 to 2003 in selected counties from South Atlantic states.

State	County name	GG misidetnified as BG	BG in TIP landing record	Percent
10	Palm Beach	5	40	12.50%
10	Duval	16	22	72.73%
36	Brunswick	5016	5134	97.70%
36	New Hanover	649	649	100.00%
36	Carteret	4839	4985	97.07%
36	Beaufort	3	3	100.00%
36	Bertie	6	7	85.71%

Fig 4. Comparison of length distributions for gag groupers and black groupers collected from the Gulf of Mexico and the South Atlantic from 1984 to 2004.