

# Using Trip Interview Program data to develop Black Grouper ratios to adjust commercial Black Grouper landings

Robert G. Muller and Steve Brown

SEDAR48-DW-06

24 April 2017



*This information is distributed solely for the purpose of pre-dissemination peer review. It does not represent and should not be construed to represent any agency determination or policy.*

Please cite this document as:

Muller, R.G. and Steve Brown Using Trip Interview Program data to develop Black Grouper ratios to adjust commercial Black Grouper landings. SEDAR48-DW-06. SEDAR, North Charleston, SC. 30 pp.

Using Trip Interview Program data to develop Black Grouper ratios to adjust commercial Black Grouper landings.

Robert G. Muller and Steve Brown

Florida Fish and Wildlife Conservation Commission  
Fish and Wildlife Research Institute  
St. Petersburg, Florida

## Introduction

In many areas of the Southeast United States, the term ‘Black Grouper’ commonly is used for Gag, *Mycteropera microlepis*, and ‘Carberita” or ‘true Black’ is used for Black Grouper, *Mycteroperca bonaci*. The misidentification of these species makes compiling commercial landings statistics challenging. The objective of this study is to determine the proportion of Black Grouper to the combined total weight of the adjusted Black Grouper and Gag weights from correctly identified sample weights. Chih and Turner (2006) in SEDAR 10 and Chih (2013) in SEDAR 33 estimated the converse, i.e., the proportion of Gag to the Black Grouper and Gag total by statistical area.

## Methods

We used a number of the National Marine Fisheries Service’s (NMFS) data sources including the Trip Interview Program (TIP), the Reef Fish logbook, and the Accumulated Landings System (ALS) to estimate the actual Black Grouper Landings from the reported landings. The Trip Interview Program (TIP) data was designed to characterize commercial fishing activity in the Southeast United States, especially the length and age structure of the landings. The TIP data provide information on landings by market category and samples of those landed fish that are identified and measured by trained port samplers. The Reef Fish logbooks were used to assign landings and the number of commercial trips to gear types and regions. The ALS provided the reported landings of Black Grouper and Gag. We partitioned the data into gear, geographical region and five-year time blocks. The extent of Black Grouper distribution is from Texas to North Carolina and that area was divided into seven regions: 1 Texas - Levy County in Florida, 2 Citrus – Sarasota Counties, 3 Charlotte -- Collier Counties, 4 Monroe County, 5 Miami-Dade – Indian River Counties, 6 Brevard – Nassau Counties, and 7 Georgia – North Carolina. Gears were grouped into three gear types: longline, hook and line (including traps and other gears), and commercial diving. Landings from trips using traps or other gears were combined with hook-and-line due to their small sample sizes. While the TIP data were too sparse to allow for estimating the annual ratios, we divided years into five-year time periods to capture any possible improvements in species classification by dealers. The ratios for Gag by Chih and Turner (2006) and Chih (2013) were based on the Gulf of Mexico shrimp statistical areas and also by Gulf of Mexico counties, but did not break down the proportions by gear or time periods again probably because of the small sizes. We thought that by using

larger regions, we could retain the geographical differences while allowing for gear and temporal resolution.

The NOAA Fisheries' Southeast Fisheries Science Center provided us with the TIP files that had the TIP Landing file's Market\_Species\_Id field equal to Black Grouper, *Mycteroperca bonaci*, Gag, *Mycteroperca microlepis*, or Red Grouper, *Epinephelus morio*. Since the objective was to characterize the species composition of reported 'Black Grouper' landings, we restricted the analyses to those TIP records associated with the market categories, 'Black Grouper' or 'Gag' (Market\_Species\_Id equals Black Grouper or Gag). There were 7,629 Black Grouper and 21,284 Gag TIP records reporting landing for these species.

Adjustment factors were derived by examining the actual species identifications of the fish from samples that were recorded in the landings as Black Grouper or Gag. This estimation process rests on the assumption that the mix of fish identified by trained port samplers is representative of species composition of the landed fish labeled 'Black Grouper' or 'Gag'. The associated records from the Sample and Observation files were extracted using the Landings\_id field from the TIP Landing file.

The process consisted of combining the Landing portion of the TIP data with the Sample portion to identify which trip interviews had samples of 'Black Grouper' or 'Gag' taken for identification and measurement. Not all of the landings records had samples associated with them. In addition, only samples from identifiable trips were included meaning that dealer sampling or aggregate sampling were omitted as well as samples that were deemed non-random samples. We also omitted records that were either sorted or species that were not groupers of the genera *Epinephelus* and *Mycteroperca*. There were 4,438 species samples associated with the Black Grouper and Gag landings records. Four species comprised 98.9% of the species in the samples: Black Grouper (12.6%), Gag (83.3%), Scamp (1.6%), and Yellowfin Grouper (1.5%). If there were no sample weights but there were length measurements, we calculated gutted weights from the measured lengths in the TIP Observation file. The lengths were standardized to maximum total length in millimeters where necessary using length-length conversion equations (Table 1a) and the maximum total length was used to estimate the fish's gutted weight in pounds (Table 1b). The weights were summed by species to obtain sample weights. The field that indicates whether all of the fish landed were sampled, Is\_Full\_Catch, turned out to not be a very helpful indicator because sometimes the sample weight differed markedly from the landing weight even when the sample comprised all of the sampled fish.

The landing weights and the sample weights were tallied by trip interview (16,169 interviews) for Black Grouper, Gag, and the combined other species. We compared the Black Grouper, Gag, and other species sample weights to the Black Grouper and Gag landings in the TIP Landings file and determined the adjusted weights of Black Grouper and Gag. To account for any rounding differences, we allowed for a 2.0 pound measurement error. The adjusting process by TIP trip interview was to sum the Black Grouper ( $BG_L$ ) and the Gag ( $Gag_L$ ) landing weights and sum the corresponding sample weights ( $BG_S$  and  $Gag_S$ ) and. Equations 1a and b show how the adjusted Black Grouper and Gag TIP landing weights ( $BG_{adj}$  and  $Gag_{adj}$ ) were pro-rated by gear, region, and five-year time period from the combined landing weight and the total sample weight.

$$BG_{adj} = (BG_L + Gag_L) * \frac{BG_S}{(BG_S + Gag_S + Other_S)} \quad \text{Eq. 1a.}$$

and

$$Gag_{adj} = (BG_L + Gag_L) * \frac{Gag_S}{(BG_S + Gag_S + Other_S)} \quad \text{Eq.1b.}$$

where  $Other_S$  is the combined sample weight of the other grouper species. The calculation of the Black Grouper ratio estimator (Cochran 1977) is given in Equation 2.

$$R = \frac{\sum BG_{adj}}{\sum (BG_{adj} + Gag_{adj})} \quad \text{Eq. 2.}$$

And the variance of the ratio is given in Equation 3:

$$s_R^2 = \frac{(1-f)}{n} * (R^2 * S_X^2 + S_Y^2 - 2 * R * S_{XY}) \quad \text{Eq. 3}$$

where  $s_R^2$  is the variance of the ratio of Black Grouper to the combined total of Black Grouper and Gag by stratum,  $n$  is the number of TIP trip interviews,  $f = \frac{n}{N}$  is the sampling fraction and  $N$  is the number of commercial trips from the Reef Fish logbooks by stratum,  $S_X^2$  is the variance of the combined total of Black Grouper and Gag adjusted weights,  $S_Y^2$  is the variance of the Black Grouper adjusted weight,  $S_{XY}$  is the covariance of Black Grouper and the combined weights of Black Grouper and Gag. The standard error of the ratio and its coefficient of variation (CV) were calculated by gear, region, and time period. Ratios for the strata without TIP sample weights were derived from two procedures: if the missing values were from either 2006-2010 or 2011 - 2015, then the adjusted Black Grouper landing was the reported landings for that stratum given the good correspondence in ALS landings and the adjusted Black Grouper landings beginning in 2006. However, if the strata with missing ratios was from 1986-1990 or 2001-2005 then an overall ratio was calculated from the sum of the ALS 2006-2015 Black Grouper landings divided by the corresponding combined total of the ALS Black Grouper and Gag landings.

## Results

The ratios varied by region, gear, and time period (Table 2). There was good correspondence between the reported landings in ALS and the adjusted Black Grouper landings beginning around in -2006 (Fig. 1 and 2). However, there were 23 strata out of 126, that lacked TIP samples for calculating the ratios for diving (12 strata) or long line trips (11 strata, Table 2). The strata with missing adjusted landings for 2006-2010 or 2011-2015 time periods were filled with the ALS landings and the strata from 1986-1990 time period for dive gear and from longlines for the two regions on the Atlantic coast of Florida were calculated using the 2006-2015 overall ratios by stratum. The lack of samples for the 2001-2005 time period and later for longline gear reflects the increasing regulation on longlines in the South Atlantic.

The adjusted landings from hook-and-line showed a marked decrease until 1996 and then there was a period of reasonably stable landings until another decline in 2007 (Fig. 2). Hook-and-line landings have been stable since 2008. Diving generally increased over the years examined reaching 44,000 pounds in 2015. The adjusted landings from longlines were stable from 1986 until 2000 and then increased

through 2006. Longline landings then declined to a low in 2010 and then returned to levels similar to those back in 1986-1990 (Fig. 2). The region with highest Black Grouper landings was Monroe County, the Florida Keys, followed by the Charlotte-Collier Counties region (Fig. 3 and 4). The landings from the northern Gulf of Mexico (Texas to Levy County, FL) and on the Atlantic coast north of Florida were insignificant especially in recent years.

The range of CV values was from 0 to 1.18 with a median of 0.28. The lowest CVs were in Monroe County and increased as one moved north.

## **Discussion**

This exercise in addition to providing commercial landing estimates for Black Grouper revealed two major insights: there was not a decline in Black Grouper landings from more than 1.5 million pounds in 1986 to 0.3 million pounds in 1997 but rather those high landings of Black Grouper were actually Gag harvested mostly in the Northern Gulf of Mexico and along the upper Florida West Coast (Fig. 3). Landings of Black Grouper have mostly varied without trend around 0.2 to 0.3 million pounds which is more consistent with how fishers have described the Black Grouper fishery. The other point is that in recent years from about 2006 and later, the reported landings and the adjusted landings have tracked each other well across regions and across gears.

This analysis rests on the assumption that the fish sampled for lengths and age structures are representative of the actual species composition of the fish reported as 'Black Grouper', i.e., that the proportions of species in the sample reflect what dealers report as 'Black Grouper'. The uncertainty in the ratio increases with the low numbers of interviews. The CVs of the ratio were variable (range: 0.0 to 1.18, Table 2) except for the Florida Keys. The agreement between the reported landings and the adjusted landings in the past decade gives evidence that the misidentification issue in Black Grouper may be minimal currently.

The uncertainty in the adjusted landings is not fully captured by the CV values because the CV does not capture the uncertainty arising from TIP samples not being representative of a trip's species composition nor does it capture the variability in the strata that used average ratios for adjusting the Black Grouper landings. The time period with the most missing values, 1986 – 1990, was also the time period with the greatest discrepancy between the reported landings and the adjusted landings because the misidentification issue was not recognized back then.

In summary, the adjusted landings probably capture the main signal that Black Grouper landings have been low and variable without any trends.

### **Literature Cited**

Chih, C-P. 2013. Update concerning species misidentifications in the commercial landing data of gag groupers and black two majp in the Gulf of Mexico. SEDAR33-DW17. SEDAR, North Charleston, SC. 7 pp.

Chih, C-P and S. Turner. 2006. Estimation of species misidentification in the commercial landing data of gag groupers and black groupers in the Gulf of Mexico. SEDAR10-DW24. SEDAR, North Charleston, SC. 16 pp.

Cochran, W.G. 1977. Sampling techniques, third edition. John Wiley & sons. New York. 428 pp.

Table 1. Fork length (mm) to maximum total length (tail compressed, mm; a) and maximum total length to gutted weight (kg; b) conversion equations.

a. Fork length (FL) to maximum total length (tail compressed) in millimeters (Max\_TL):  $\text{Max\_TL} = \text{intercept} + \text{slope} * \text{FL}$

Common	Species	n	Intercept	Slope	Mean Square Error	$r^2$
Black grouper	<i>Mycteroperca bonaci</i>	1671	-2.080	1.029	22.8340	0.99
Gag	<i>Mycteroperca microlepis</i>	1936	-0.109	1.035	26.6397	1.00
Scamp	<i>Mycteroperca phenax</i>	679	-22.828	1.139	55.4812	1.00
Yellowfin Grouper	<i>Mycteroperca venenosa</i>	51	-2.905	1.043	239.2981	0.98
Red Grouper	<i>Epinephelus morio</i>	689	-4.734	1.053	77.6096	0.99

b. Maximum total length (Max\_TL) in millimeters to gutted weight (GW) in kilograms  $\text{LN}(\text{GW}) = \text{intercept} + \text{slope} * \text{LN}(\text{max\_TL})$

Common	Species	n	ln (intercept)	slope	Mean Square Error	$r^2$
Black grouper	<i>Mycteroperca bonaci</i>	1581	-18.887	3.120	0.00864	0.99
Gag	<i>Mycteroperca microlepis</i>	89	-24.261	3.885	0.049881	0.93
Scamp	<i>Mycteroperca phenax</i>	17	-18.141	2.965	0.012328	0.97
Yellowfin Grouper	<i>Mycteroperca venenosa</i>	51	-18.427	3.063	0.012283	0.96
Red Grouper	<i>Epinephelus morio</i>	11	-21.119	2.860	0.0043	0.96



Table 2. The ratio of Black Grouper (BG) to the combined total of Black Grouper and Gag (BG+GAG) by gear (DV – diving, HL – hook-and-line, and LL – longline), region (1—Texas to Levy County FL, 2 – Citrus – Sarasota Counties, 3 – Charlotte – Collier Counties, 4 – Monroe County, 5 – Miami-Dade – Indian River, 6 – Brevard - Nassau Counties, and 7 – Georgia – North Carolina), and 5-year time period.

Gear	Region	Time period	Number of interviews	Number of trips	Adj BG sample weight	Adj BG+Gag sample weight	Ratio	SE_ratio	CV
Diving	TX-Levy	1986-1990	.	.	.	.	.	.	.
Diving	TX-Levy	1991-1995	4	51	0	227	0.000	.	.
Diving	TX-Levy	1996-2000	3	10	0	1430	0.000	.	.
Diving	TX-Levy	2001-2005	2	19	0	153	0.000	.	.
Diving	TX-Levy	2006-2010	.	.	.	.	.	.	.
Diving	TX-Levy	2011-2015	6	7	0	4139	0.000	.	.
Diving	Citrus-Sarasota	1986-1990	.	.	.	.	.	.	.
Diving	Citrus-Sarasota	1991-1995	4	94	124	1125	0.110	0.117	1.064
Diving	Citrus-Sarasota	1996-2000	8	8	0	2946	0.000	.	.
Diving	Citrus-Sarasota	2001-2005	2	26	0	269	0.000	.	.
Diving	Citrus-Sarasota	2006-2010	9	23	781	2001	0.390	0.062	0.158
Diving	Citrus-Sarasota	2011-2015	51	51	516	19840	0.026	0.013	0.486
Diving	Charlotte-Collier	1986-1990	.	.	.	.	.	.	.
Diving	Charlotte-Collier	1991-1995	.	.	.	.	.	.	.
Diving	Charlotte-Collier	1996-2000	.	.	.	.	.	.	.
Diving	Charlotte-Collier	2001-2005	.	.	.	.	.	.	.
Diving	Charlotte-Collier	2006-2010	2	1525	48	110	0.435	0.229	0.527
Diving	Charlotte-Collier	2011-2015	5	1815	1465	1800	0.814	0.137	0.168
Diving	Monroe	1986-1990	.	.	.	.	.	.	.
Diving	Monroe	1991-1995	4	1590	452	452	1.000	0.000	0.000
Diving	Monroe	1996-2000	7	2437	190	200	0.950	0.038	0.040

Table 2 continued. The ratio of Black Grouper (BG) to the combined total of Black Grouper and Gag (BG+GAG) by gear (DV – diving, HL – hook-and-line, and LL – longline), region (1—Texas to Levy County FL, 2 – Citrus – Sarasota Counties, 3 – Charlotte – Collier Counties, 4 – Monroe County, 5 – Miami-Dade – Indian River, 6 – Brevard - Nassau Counties, and 7 – Georgia – North Carolina), and 5-year time period.

Gear	Region	Time period	Number of interviews	Number of trips	Adj BG sample weight	Adj BG+Gag sample weight	Ratio	SE_ratio	CV
Diving	Monroe	2001-2005	7	2573	349	373	0.936	0.051	0.055
Diving	Monroe	2006-2010	16	1575	430	506	0.850	0.099	0.116
Diving	Monroe	2011-2015	28	2228	1735	1943	0.893	0.043	0.048
Diving	Miami-Dade - Indian River	1986-1990	.	.	.	.	.	.	.
Diving	Miami-Dade - Indian River	1991-1995	3	1026	0	194	0.000	.	.
Diving	Miami-Dade - Indian River	1996-2000	3	1525	0	367	0.000	.	.
Diving	Miami-Dade - Indian River	2001-2005	19	1118	115	2051	0.056	0.030	0.528
Diving	Miami-Dade - Indian River	2006-2010	.	.	.	.	.	.	.
Diving	Miami-Dade - Indian River	2011-2015	8	980	7	348	0.020	0.024	1.177
Diving	Brevard-Nassau	1986-1990	.	.	.	.	.	.	.
Diving	Brevard-Nassau	1991-1995	21	1019	10	2675	0.004	0.004	1.036
Diving	Brevard-Nassau	1996-2000	30	1806	27	16558	0.002	0.001	0.769
Diving	Brevard-Nassau	2001-2005	19	1427	474	9640	0.049	0.039	0.788
Diving	Brevard-Nassau	2006-2010	19	1506	13	9529	0.001	0.001	1.077
Diving	Brevard-Nassau	2011-2015	24	1438	29	5030	0.006	0.006	1.063
Diving	GA-NC	1986-1990	.	.	.	.	.	.	.
Diving	GA-NC	1991-1995	4	241	0	1980	0.000	.	.
Diving	GA-NC	1996-2000	5	164	0	3139	0.000	.	.
Diving	GA-NC	2001-2005	11	167	0	9139	0.000	.	.
Diving	GA-NC	2006-2010	22	374	731	10499	0.070	0.042	0.599
Diving	GA-NC	2011-2015	66	658	277	28572	0.010	0.006	0.669
Hook-and-line	TX-Levy	1986-1990	52	.	68	9289	0.007	.	.
Hook-and-line	TX-Levy	1991-1995	422	4151	2554	79868	0.032	0.016	0.508
Hook-and-line	TX-Levy	1996-2000	534	534	604	186356	0.003	0.001	0.417

Table 2 continued. The ratio of Black Grouper (BG) to the combined total of Black Grouper and Gag (BG+GAG) by gear (DV – diving, HL – hook-and-line, and LL – longline), region (1—Texas to Levy County FL, 2 – Citrus – Sarasota Counties, 3 – Charlotte – Collier Counties, 4 – Monroe County, 5 – Miami-Dade – Indian River, 6 – Brevard - Nassau Counties, and 7 – Georgia – North Carolina), and 5-year time period.

Gear	Region	Time period	Number of interviews	Number of trips	Adj BG sample weight	Adj BG+Gag sample weight	Ratio	SE_ratio	CV
Hook-and-line	TX-Levy	1996-2000	534	534	604	186356	0.003	0.001	0.417
Hook-and-line	TX-Levy	2001-2005	493	493	709	296847	0.002	0.002	0.674
Hook-and-line	TX-Levy	2006-2010	217	607	936	97788	0.010	0.004	0.434
Hook-and-line	TX-Levy	2011-2015	913	913	1672	189661	0.009	0.004	0.418
Hook-and-line	Citrus-Sarasota	1986-1990	48		1841	39307	0.047		
Hook-and-line	Citrus-Sarasota	1991-1995	155	1290	1467	72227	0.020	0.011	0.519
Hook-and-line	Citrus-Sarasota	1996-2000	343	343	1464	166117	0.009	0.003	0.329
Hook-and-line	Citrus-Sarasota	2001-2005	256	256	2814	226358	0.012	0.004	0.345
Hook-and-line	Citrus-Sarasota	2006-2010	330	330	3717	74339	0.050	0.016	0.312
Hook-and-line	Citrus-Sarasota	2011-2015	602	602	3243	205844	0.016	0.009	0.602
Hook-and-line	Charlotte-Collier	1986-1990	19		716	12940	0.055		
Hook-and-line	Charlotte-Collier	1991-1995	105	38438	2911	21967	0.133	0.036	0.273
Hook-and-line	Charlotte-Collier	1996-2000	176	58034	4010	53928	0.074	0.014	0.191
Hook-and-line	Charlotte-Collier	2001-2005	132	56799	5180	57659	0.090	0.021	0.237
Hook-and-line	Charlotte-Collier	2006-2010	80	35079	2187	17509	0.125	0.034	0.272
Hook-and-line	Charlotte-Collier	2011-2015	132	32176	11412	41646	0.274	0.032	0.117
Hook-and-line	Monroe	1986-1990	18		2388	7102	0.336		
Hook-and-line	Monroe	1991-1995	130	31756	7908	12305	0.643	0.081	0.126
Hook-and-line	Monroe	1996-2000	130	52766	6188	13195	0.469	0.062	0.132
Hook-and-line	Monroe	2001-2005	89	43765	11567	21615	0.535	0.114	0.213
Hook-and-line	Monroe	2006-2010	63	32310	2714	5059	0.536	0.148	0.277
Hook-and-line	Monroe	2011-2015	66	29529	2903	3541	0.820	0.071	0.087
Hook-and-line	Miami-Dade - Indian River	1986-1990	5		0	202	0.000		
Hook-and-line	Miami-Dade - Indian River	1991-1995	56	14191	52	8079	0.006	0.004	0.560

Table 2 continued. The ratio of Black Grouper (BG) to the combined total of Black Grouper and Gag (BG+GAG) by gear (DV – diving, HL – hook-and-line, and LL – longline), region (1—Texas to Levy County FL, 2 – Citrus – Sarasota Counties, 3 – Charlotte – Collier Counties, 4 – Monroe County, 5 – Miami-Dade – Indian River, 6 – Brevard - Nassau Counties, and 7 – Georgia – North Carolina), and 5-year time period.

Gear	Region	Time period	Number of interviews	Number of trips	Adj BG sample weight	Adj BG+Gag sample weight	Ratio	SE_ratio	CV
Hook-and-line	Miami-Dade - Indian River	1996-2000	27	41320	217	777	0.279	0.093	0.333
Hook-and-line	Miami-Dade - Indian River	2001-2005	17	54636	180	1411	0.128	0.075	0.592
Hook-and-line	Miami-Dade - Indian River	2006-2010	6	61437	276	276	1.000	0.000	0.000
Hook-and-line	Miami-Dade - Indian River	2011-2015	14	51022	232	313	0.740	0.143	0.193
Hook-and-line	Brevard-Nassau	1986-1990	6		1129	4501	0.251		
Hook-and-line	Brevard-Nassau	1991-1995	166	4801	441	51227	0.009	0.005	0.564
Hook-and-line	Brevard-Nassau	1996-2000	182	13961	553	43340	0.013	0.004	0.307
Hook-and-line	Brevard-Nassau	2001-2005	80	13847	627	20145	0.031	0.017	0.558
Hook-and-line	Brevard-Nassau	2006-2010	64	16951	282	29078	0.010	0.009	0.933
Hook-and-line	Brevard-Nassau	2011-2015	82	17805	25	25224	0.001	0.001	0.779
Hook-and-line	GA-NC	1986-1990	495		1643	99400	0.017		
Hook-and-line	GA-NC	1991-1995	501	17801	564	73877	0.008	0.002	0.278
Hook-and-line	GA-NC	1996-2000	718	29852	3973	227521	0.017	0.004	0.251
Hook-and-line	GA-NC	2001-2005	891	25908	4445	239527	0.019	0.003	0.179
Hook-and-line	GA-NC	2006-2010	1223	25289	7399	294306	0.025	0.005	0.216
Hook-and-line	GA-NC	2011-2015	849	18138	1430	147731	0.010	0.003	0.345
Longline	TX-Levy	1986-1990	13		0	5856	0.000		
Longline	TX-Levy	1991-1995	37	356	90	17851	0.005	0.005	0.909
Longline	TX-Levy	1996-2000	18	18	0	5561	0.000		
Longline	TX-Levy	2001-2005	42	42	208	31770	0.007	0.007	1.018
Longline	TX-Levy	2006-2010	36	36	0	12791	0.000		
Longline	TX-Levy	2011-2015	73	73	227	40850	0.006	0.006	1.018
Longline	Citrus-Sarasota	1986-1990	106		1983	61163	0.032		
Longline	Citrus-Sarasota	1991-1995	198	358	3607	78309	0.046	0.008	0.175

Table 2 continued. The ratio of Black Grouper (BG) to the combined total of Black Grouper and Gag (BG+GAG) by gear (DV – diving, HL – hook-and-line, and LL – longline), region (1—Texas to Levy County FL, 2 – Citrus – Sarasota Counties, 3 – Charlotte – Collier Counties, 4 – Monroe County, 5 – Miami-Dade – Indian River, 6 – Brevard - Nassau Counties, and 7 – Georgia – North Carolina), and 5-year time period.

Gear	Region	Time period	Number of interviews	Number of trips	Adj BG sample weight	Adj BG+Gag sample weight	Ratio	SE_ratio	CV
Longline	Citrus-Sarasota	1996-2000	603	603	18223	331401	0.055	0.008	0.150
Longline	Citrus-Sarasota	2001-2005	709	709	35485	790955	0.045	0.006	0.125
Longline	Citrus-Sarasota	2006-2010	553	553	24274	273298	0.089	0.012	0.140
Longline	Citrus-Sarasota	2011-2015	400	400	18350	165340	0.111	0.020	0.183
Longline	Charlotte-Collier	1986-1990	33		441	21672	0.020		
Longline	Charlotte-Collier	1991-1995	150	6543	2885	42631	0.068	0.016	0.235
Longline	Charlotte-Collier	1996-2000	245	9543	6829	98059	0.070	0.014	0.200
Longline	Charlotte-Collier	2001-2005	299	9964	27534	252590	0.109	0.013	0.116
Longline	Charlotte-Collier	2006-2010	163	5804	14934	83256	0.179	0.027	0.151
Longline	Charlotte-Collier	2011-2015	138	5568	15152	70668	0.214	0.040	0.188
Longline	Monroe	1986-1990	26		3410	15055	0.226		
Longline	Monroe	1991-1995	70	551	6788	19014	0.357	0.064	0.180
Longline	Monroe	1996-2000	144	992	40617	92250	0.440	0.036	0.082
Longline	Monroe	2001-2005	134	1083	64776	142318	0.455	0.038	0.084
Longline	Monroe	2006-2010	96	721	37750	69438	0.544	0.041	0.076
Longline	Monroe	2011-2015	44	367	15513	24333	0.638	0.066	0.104
Longline	Miami-Dade - Indian River	1986-1990							
Longline	Miami-Dade - Indian River	1991-1995							
Longline	Miami-Dade - Indian River	1996-2000	1	1027	0	60	0.000		
Longline	Miami-Dade - Indian River	2001-2005							
Longline	Miami-Dade - Indian River	2006-2010							
Longline	Miami-Dade - Indian River	2011-2015							
Longline	Brevard-Nassau	1986-1990							
Longline	Brevard-Nassau	1991-1995	26	1108	47	2386	0.020	0.016	0.806

Table 2 continued. The ratio of Black Grouper (BG) to the combined total of Black Grouper and Gag (BG+GAG) by gear (DV – diving, HL – hook-and-line, and LL – longline), region (1—Texas to Levy County FL, 2 – Citrus – Sarasota Counties, 3 – Charlotte – Collier Counties, 4 – Monroe County, 5 – Miami-Dade – Indian River, 6 – Brevard - Nassau Counties, and 7 – Georgia – North Carolina), and 5-year time period.

Gear	Region	Time period	Number of interviews	Number of trips	Adj BG sample weight	Adj BG+Gag sample weight	Ratio	SE_ratio	CV
Longline	Brevard-Nassau	1996-2000	6	1393	129	450	0.287	0.263	0.917
Longline	Brevard-Nassau	2001-2005	2	1049	0	230	0.000	.	.
Longline	Brevard-Nassau	2006-2010	.	.	.	.	.	.	.
Longline	Brevard-Nassau	2011-2015	.	.	.	.	.	.	.
Longline	GA-NC	1986-1990	29	.	1752	37925	0.046	.	.
Longline	GA-NC	1991-1995	20	567	8	2649	0.003	0.003	1.066
Longline	GA-NC	1996-2000	2	1235	0	317	0.000	.	.
Longline	GA-NC	2001-2005	.	.	.	.	.	.	.
Longline	GA-NC	2006-2010	.	.	.	.	.	.	.
Longline	GA-NC	2011-2015	.	.	.	.	.	.	.

Table 3. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings for combined regions by gear and year.

Year	Gear											
	Diving			Hook-and-line			LongLine			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	14,286	10,285	6,714	1,862,061	1,106,424	165,246	618,554	412,818	58,048	2,494,901	1,529,527	230,008
1987	43,114	28,047	15,126	2,403,471	1,032,753	208,854	809,657	567,085	52,584	3,256,242	1,627,885	276,564
1988	15,127	9,787	4,760	2,009,879	868,271	150,731	491,981	281,728	37,094	2,516,987	1,159,786	192,585
1989	28,922	11,392	6,197	2,792,528	1,183,237	214,179	499,569	292,460	36,506	3,321,019	1,487,089	256,882
1990	31,199	9,380	4,557	2,297,427	926,348	172,750	738,418	408,922	47,729	3,067,044	1,344,650	225,036
1991	115,113	20,865	9,042	1,901,985	543,451	124,144	554,875	271,073	39,249	2,571,973	835,389	172,435
1992	162,295	48,292	20,756	1,929,887	407,048	130,262	652,893	216,451	48,003	2,745,075	671,791	199,021
1993	166,182	45,851	36,959	2,242,282	396,897	145,485	506,164	127,829	33,030	2,914,628	570,577	215,474
1994	173,741	33,140	23,232	2,167,364	345,113	139,357	348,784	104,034	24,265	2,689,889	482,287	186,854
1995	152,101	37,344	27,178	2,208,439	321,156	126,409	366,378	78,320	21,799	2,726,918	436,820	175,386
1996	202,637	33,258	17,941	2,014,303	288,910	91,274	370,187	100,182	26,626	2,587,127	422,350	135,841
1997	193,426	28,004	15,506	1,807,849	198,884	77,724	408,638	74,882	27,889	2,409,913	301,770	121,119
1998	202,278	28,123	16,295	2,730,836	230,310	86,422	540,503	106,744	44,037	3,473,617	365,177	146,754
1999	158,474	16,560	8,639	2,141,186	248,196	62,954	557,686	154,220	50,293	2,857,346	418,976	121,886
2000	130,916	25,511	15,131	2,165,689	281,172	66,753	595,609	151,546	43,676	2,892,214	458,229	125,560
2001	158,189	28,391	26,581	2,615,308	259,702	86,442	964,708	158,434	67,087	3,738,205	446,527	180,110
2002	147,412	33,145	32,497	2,424,817	224,848	94,756	1,028,228	152,710	71,098	3,600,457	410,703	198,351
2003	169,825	29,966	31,496	1,986,647	210,734	86,154	1,111,041	217,709	88,275	3,267,513	458,409	205,925
2004	160,872	36,113	35,433	2,385,400	216,761	90,392	1,066,499	187,842	90,921	3,612,771	440,716	216,746
2005	158,713	34,059	34,235	2,131,337	155,528	82,150	874,352	92,472	64,828	3,164,402	282,059	181,213
2006	135,420	19,679	31,467	1,308,624	116,965	106,971	576,637	124,142	98,050	2,020,681	260,786	236,488
2007	189,586	30,542	37,868	1,299,888	87,262	91,354	482,219	80,069	71,921	1,971,693	197,873	201,143
2008	167,859	24,131	32,020	1,317,906	53,913	58,534	364,357	23,438	35,328	1,850,122	101,482	125,882

Table 3 continued. ALS combined Black Grouper Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings for combined regions by gear and year.

Year	Gear											
	Diving			Hook-and-line			LongLine			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
2009	147,439	16,598	27,353	922,826	43,853	51,106	162,626	11,923	20,526	1,232,891	72,374	98,985
2010	163,150	18,761	30,112	694,280	33,715	42,988	109,499	8,202	14,625	966,929	60,678	87,725
2011	148,075	28,498	22,159	595,633	47,128	43,688	96,394	20,092	17,073	840,102	95,718	82,920
2012	142,744	25,091	23,249	681,893	41,789	41,094	145,786	22,363	23,204	970,423	89,243	87,547
2013	119,879	29,784	26,747	727,244	40,517	39,566	200,133	34,584	36,304	1,047,256	104,885	102,617
2014	164,641	41,979	40,584	654,141	51,997	55,032	230,551	36,575	48,770	1,049,333	130,551	144,386
2015	164,723	47,166	44,145	510,659	40,826	43,109	270,845	34,317	51,966	946,227	122,309	139,220



Table 4. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Texas - Levy County, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	2964	1155	17	374463	185087	2741	45080	31048	0	422507	217290	2758
1987	3396	2162	20	365510	220007	2676	188351	188351	0	557257	410520	2696
1988	4331	3763	25	454945	279817	3330	64759	61896	0	524035	345476	3355
1989	1785	0	10	651485	374396	4769	50248	45459	0	703518	419855	4779
1990	1553	1287	9	589889	355684	4318	184262	92287	0	775704	449258	4327
1991	1402	0	0	423822	168225	13553	41241	2790	208	466465	171015	13761
1992	1676	0	0	320712	8959	10256	31427	2801	158	353815	11760	10414
1993	4439	5	0	401605	8074	12843	24013	804	121	430057	8883	12964
1994	4678	53	0	522184	14228	16698	20850	2073	105	547712	16354	16803
1995	3471	6	0	676795	15608	21643	71810	1705	362	752076	17319	22005
1996	4636	9	0	565321	9725	1834	47510	1069	0	617467	10803	1834
1997	16671	0	0	554332	11317	1798	92363	743	0	663366	12060	1798
1998	7660	0	0	1047662	10876	3398	74285	368	0	1129607	11244	3398
1999	8868	20	0	721522	40470	2340	34733	3064	0	765123	43554	2340
2000	4022	57	0	844507	51013	2739	80630	3222	0	929159	54292	2739
2001	9517	33	0	1102993	27718	2633	158098	2673	1037	1270608	30424	3670
2002	4519	33	0	1130521	20870	2699	156953	1294	1029	1291993	22197	3728
2003	4845	129	0	784758	20601	1874	107131	2274	703	896734	23004	2577
2004	13111	69	0	1039761	23192	2482	136939	2932	898	1189811	26193	3380
2005	9506	41	0	860430	13433	2054	136152	406	893	1006088	13880	2947
2006	8065	45	72	379612	8297	3633	80452	508	0	468129	8850	3705
2007	4911	0	44	488927	6060	4679	71142	269	0	564980	6329	4723

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Texas - Levy County, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
2008	7351	196	66	668926	5922	6402	89729	171	0	766006	6289	6468
2009	4024	34	36	320912	7165	3071	28344	121	0	353280	7320	3107
2010	6785	4	61	172300	574	1649	12331	5	0	191416	583	1710
2011	4321	0	0	120659	1033	1064	12605	0	70	137585	1033	1134
2012	5288	91	0	209156	2474	1844	20045	289	111	234489	2854	1955
2013	2154	0	0	228191	1457	2011	32503	1187	181	262848	2644	2192
2014	13364	0	0	185370	2138	1634	16000	26	89	214734	2164	1723
2015	9559	9	0	141883	708	1251	30540	742	170	181982	1459	1421

Region: Citrus-Sarasota Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	0	0	0	735087	461169	34429	334646	233092	10848	1069733	694261	45277
1987	0	0	0	394011	178961	18454	345651	201532	11204	739662	380493	29658
1988	0	0	0	332647	137483	15580	244211	122147	7916	576858	259630	23496
1989	0	0	0	646327	370136	30271	276764	133146	8971	923091	503282	39242
1990	1752	0	49	493950	229269	23135	335572	173989	10878	831274	403258	34062
1991	6299	402	692	552208	177378	11214	292239	138900	13459	850746	316680	25365
1992	14751	1686	1621	629063	186188	12775	437769	117843	20162	1081583	305717	34558
1993	28476	1236	3129	809690	132273	16443	348761	49494	16062	1186927	183003	35634

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Citrus-Sarasota Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1994	34373	2956	3778	572444	100547	11625	207168	36871	9541	813985	140374	24944
1995	24947	4875	2742	495357	129006	10060	184590	35038	8501	704894	168919	21303
1996	34936	3205	0	516709	118334	4553	204903	44718	11267	756548	166257	15820
1997	40421	1871	0	502279	56358	4426	190900	24754	10497	733600	82983	14923
1998	30236	3933	0	832902	86564	7339	277481	43109	15258	1140619	133606	22597
1999	29106	6796	0	736178	114168	6486	314924	78443	17317	1080208	199407	23803
2000	40930	8826	0	715677	121869	6306	331928	84901	18252	1088535	215596	24558
2001	35246	2580	0	902809	98060	11222	589865	78900	26464	1527920	179540	37686
2002	30226	1657	0	622977	58609	7744	610376	60631	27384	1263579	120897	35128
2003	35924	670	0	554010	54184	6886	676953	105079	30371	1266887	159933	37257
2004	39796	1386	0	630341	43681	7835	591480	68801	26536	1261617	113868	34371
2005	48234	326	0	536768	14211	6672	487523	10534	21872	1072525	25071	28544
2006	34691	578	13536	270503	10422	13525	248511	8956	22073	553705	19956	49134
2007	26543	538	10357	186744	3192	9337	208836	8315	18549	422123	12045	38243
2008	27127	441	10585	196831	7858	9841	191903	3798	17045	415861	12097	37471
2009	26898	1101	10495	186119	4125	9306	83424	1471	7410	296441	6697	27211
2010	26975	420	10525	141221	2057	7061	59611	1589	5295	227807	4066	22881
2011	21948	1808	571	71934	454	1133	45734	2877	5076	139616	5139	6780
2012	31823	687	828	127930	1438	2016	70517	7719	7826	230270	9844	10670
2013	21600	458	562	136487	2864	2150	77779	4132	8632	235866	7454	11344
2014	39626	1076	1031	119984	956	1890	87144	4146	9672	246754	6178	12593
2015	39434	1180	1026	87890	1631	1385	104637	4803	11613	231961	7614	14024

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Charlotte-Collier Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	547	547	209	156281	55021	8652	101085	42671	2058	257913	98239	10919
1987	297	297	113	160199	66847	8869	126327	87101	2571	286823	154245	11553
1988	455	455	174	99768	31365	5523	66125	34467	1346	166348	66287	7043
1989	4462	4462	1702	96534	31179	5344	56453	42889	1149	157449	78530	8195
1990	4116	2374	1570	103538	52853	5732	65899	54541	1341	173553	109768	8643
1991	2104	1997	802	108047	35856	14316	185443	105584	12550	295594	143437	27668
1992	3233	2725	1233	98070	26209	12994	130992	66378	8865	232295	95312	23092
1993	1208	774	461	100841	58714	13361	95437	58198	6459	197486	117686	20281
1994	840	518	320	102051	60605	13521	94030	46773	6364	196921	107896	20205
1995	1649	1009	629	59814	21828	7925	85876	24663	5812	147339	47500	14366
1996	837	209	319	67673	25480	5032	94932	38210	6611	163442	63899	11962
1997	932	138	356	68872	14176	5122	98974	34899	6893	168778	49213	12371
1998	426	27	163	89580	20434	6662	142942	36342	9954	232948	56803	16779
1999	219	31	84	59631	13168	4434	156652	40548	10909	216502	53747	15427
2000	1385	175	528	88673	18083	6594	147102	36852	10244	237160	55110	17366
2001	1048	95	400	124766	33414	11208	165456	43777	18036	291270	77286	29644
2002	932	0	356	134630	21550	12094	216317	63404	23580	351879	84954	36030
2003	740	64	282	131431	16660	11807	260620	62781	28409	392791	79505	40498
2004	477	93	182	111573	22244	10023	259856	54738	28326	371906	77075	38531
2005	437	39	167	121658	16078	10929	206248	49979	22482	328343	66096	33578
2006	238	42	103	121579	16924	15189	160311	43591	28757	282128	60557	44049
2007	3923	1555	1705	62842	1922	7851	154504	38372	27715	221269	41849	37271
2008	2598	974	1129	43240	2098	5402	73271	12087	13143	119109	15159	19674

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Charlotte-Collier Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
2009	4094	1254	1779	39405	1179	4923	39889	5093	7155	83388	7526	13857
2010	3930	1009	1708	51996	6351	6496	30297	3267	5435	86223	10627	13639
2011	2360	915	1920	29139	6544	7984	29152	12047	6251	60651	19506	16155
2012	2039	627	1659	43129	12968	11818	47125	9355	10104	92293	22950	23581
2013	2334	724	1899	37023	8380	10145	70601	16004	15138	109958	25108	27182
2014	3412	1269	2777	42394	9782	11616	100530	17530	21555	146336	28581	35948
2015	5845	3370	4757	38654	6098	10592	109446	17582	23466	153945	27050	38815

Region: Monroe County

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	6068	6068	5893	130386	97831	43835	93879	62143	21263	230333	166042	70991
1987	11851	11816	11508	240127	194024	80730	133636	78958	30267	385614	284798	122505
1988	3852	3852	3741	155078	138344	52136	112616	60750	25507	271546	202946	81384
1989	1915	1906	1860	247212	210902	83112	115823	70685	26233	364950	283493	111205
1990	2037	2037	1978	204725	162275	68828	149764	85184	33920	356526	249496	104726
1991	7317	7223	7317	124061	115984	79730	34695	22616	12387	166073	145823	99434
1992	17617	17566	17617	137737	127550	88519	51483	28446	18380	206837	173562	124516
1993	33234	31532	33234	150730	144798	96870	27680	18812	9882	211644	195142	139986
1994	18936	18480	18936	141806	135553	91135	21668	16936	7736	182410	170969	117807

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Monroe County

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1995	23614	23424	23614	124773	123010	80188	18672	16052	6666	167059	162486	110468
1996	18428	18159	17506	97352	95362	45655	18550	15244	8168	134330	128765	71329
1997	15856	15708	15063	89243	83484	41852	21213	13587	9340	126312	112779	66255
1998	16847	16710	16005	89258	83016	41859	40765	26639	17949	146870	126365	75813
1999	8861	8804	8418	65558	58379	30744	49221	31412	21672	123640	98595	60834
2000	15291	15156	14526	71326	66793	33449	33536	26350	14766	120153	108299	62741
2001	23670	23446	22160	88184	76688	47193	45573	32219	20742	157427	132353	90095
2002	30534	30395	28586	110713	99065	59249	40550	26798	18456	181797	156258	106291
2003	28185	28145	26387	99945	96886	53486	62330	47013	28369	190460	172044	108242
2004	34383	34073	32190	105368	104055	56389	76825	61371	34967	216576	199499	123546
2005	33608	33369	31464	90087	89096	48211	42658	31526	19416	166353	153991	99091
2006	17570	17255	14932	76629	65945	41105	86790	71087	47183	180989	154287	103220
2007	26128	25831	22204	66464	60012	35652	47029	32967	25567	139621	118810	83423
2008	19148	18781	16273	34256	31743	18375	9454	7382	5140	62858	57906	39788
2009	12359	12238	10502	24498	22680	13141	10932	5238	5943	47789	40156	29586
2010	15539	15413	13205	15495	14205	8312	7164	3341	3895	38198	32959	25412
2011	20744	20136	18526	25565	24130	20958	8903	5168	5676	55212	49434	45160
2012	22296	21877	19912	18139	17245	14870	8099	5000	5163	48534	44122	39945
2013	26443	25764	23615	18809	17104	15419	19028	13039	12131	64280	55907	51165
2014	40399	38004	36079	29251	25483	23980	25995	13991	16572	95645	77478	76631
2015	42220	40521	37705	23914	22687	19605	26222	11190	16717	92356	74398	74027

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Miami-Dade - Indian River Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS Blk+Gag	ALS BG	Adjusted BG	ALS Blk+Gag	ALS BG	Adjusted BG	ALS Blk+Gag	ALS BG	Adjusted BG	ALS Blk+Gag	ALS BG	Adjusted BG
1986	4707	2515	595	164492	130377	0	43864	43864	23879	213063	176756	24474
1987	27570	13772	3485	191064	135030	0	15692	11143	8542	234326	159945	12027
1988	6489	1717	820	120822	97065	0	4270	2468	2325	131581	101250	3145
1989	20760	5024	2625	102530	75816	0	281	281	153	123571	81121	2778
1990	7248	1913	916	91120	68090	0	2921	2921	1590	101289	72924	2506
1991	36214	11243	0	95539	46008	615	1183	1183	644	132936	58434	1259
1992	48681	7627	0	81982	29830	528	789	660	429	131452	38117	957
1993	40258	11769	0	86851	34953	559	820	44	446	127929	46766	1005
1994	37519	10330	0	58293	23566	375	873	405	475	96685	34301	850
1995	25932	7848	0	59694	28337	384	747	294	407	86373	36479	791
1996	52319	11498	0	81746	35406	22818	1705	753	0	135770	47657	22818
1997	49406	10103	0	56006	31356	15633	599	91	0	106011	41550	15633
1998	61097	7301	0	61001	27633	17028	268	143	0	122366	35077	17028
1999	16891	816	0	36960	18258	10317	664	662	0	54515	19736	10317
2000	10174	1262	0	39927	22349	11145	970	0	0	51071	23611	11145
2001	20538	2222	1155	52428	23306	6687	1029	860	560	73995	26388	8402
2002	13425	1050	755	39395	24384	5025	1192	574	649	54012	26008	6429
2003	37203	939	2091	35921	22272	4581	741	521	403	73865	23732	7075
2004	21069	449	1184	34349	23149	4381	357	0	194	55775	23598	5759
2005	10668	195	600	35932	22026	4583	104	27	57	46704	22248	5240
2006	14602	1692	1546	23025	14681	23025	77	0	37	37704	16373	24608
2007	18618	2588	1971	23009	15473	23009	187	146	90	41814	18207	25070
2008	23236	3490	2460	9970	5658	9970	0	0	0	33206	9148	12430

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Miami-Dade - Indian River Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
2009	26054	1772	2758	12616	5973	12616	37	0	18	38707	7745	15392
2010	23581	1690	2496	12155	8309	12155	0	0	0	35736	9999	14651
2011	28503	5292	573	12867	8201	9517	0	0	0	41370	13493	10090
2012	18990	1724	382	11182	5626	8270	0	0	0	30172	7350	8652
2013	12307	2323	248	9933	7312	7346	0	0	0	22240	9635	7594
2014	13479	1490	271	18463	12196	13655	41	41	41	31983	13727	13967
2015	10627	1960	214	11537	7893	8533	0	0	0	22164	9853	8747

Region: Brevard-Nassau Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	0	0	0	301352	176939	75589	0	0	0	301352	176939	75589
1987	0	0	0	344529	217016	86419	0	0	0	344529	217016	86419
1988	0	0	0	256784	169043	64410	0	0	0	256784	169043	64410
1989	0	0	0	313058	103155	78525	0	0	0	313058	103155	78525
1990	14493	1769	35	244455	47136	61317	0	0	0	258948	48905	61352
1991	61777	0	231	149086	0	1284	74	0	1	210937	0	1516
1992	76337	18688	285	133929	17578	1153	433	323	9	210699	36589	1447
1993	36243	529	135	122197	8117	1052	1862	362	37	160302	9008	1224
1994	53055	802	198	119997	9758	1033	1877	970	37	174929	11530	1268



Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Brevard-Nassau Counties, FL

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1995	51669	173	193	163079	2658	1404	2173	559	43	216921	3390	1640
1996	70837	164	116	124994	3277	1594	2022	181	580	197853	3622	2290
1997	53467	184	87	103269	1742	1317	4044	806	1159	160780	2732	2563
1998	77975	150	127	111098	1144	1417	3056	133	876	192129	1427	2420
1999	83983	92	137	99927	1284	1274	1379	88	395	185289	1464	1806
2000	47336	33	77	119325	809	1521	1443	221	414	168104	1063	2012
2001	58326	15	2866	88542	516	2756	4372	5	0	151240	536	5622
2002	56981	8	2800	61337	87	1909	2840	9	0	121158	104	4709
2003	55687	19	2736	36395	131	1133	3241	41	0	95323	191	3869
2004	38200	43	1877	53468	440	1664	1042	0	0	92710	483	3541
2005	40779	89	2004	53544	463	1667	1530	0	0	95853	552	3671
2006	42730	67	57	32391	96	314	209	0	0	75330	163	371
2007	88368	30	118	67315	534	654	521	0	0	156204	564	772
2008	68076	247	91	40498	508	393	0	0	0	108574	755	484
2009	49357	127	66	31173	471	303	0	0	0	80530	598	369
2010	57038	214	76	16554	217	161	96	0	0	73688	431	237
2011	28204	176	163	24941	122	25	0	0	0	53145	298	188
2012	34639	73	200	41505	168	41	0	0	0	76144	241	241
2013	28202	19	163	43558	54	43	0	0	0	71760	73	206
2014	25389	46	146	28491	137	28	0	0	0	53880	183	174
2015	27746	85	160	29760	349	29	0	0	0	57506	434	189

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG), and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Georgia - North Carolina

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
1986	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	708031	20868	11706	0	0	0	708031	20868	11706
1988	0	0	0	589835	15154	9752	0	0	0	589835	15154	9752
1989	0	0	0	735382	17653	12158	0	0	0	735382	17653	12158
1990	0	0	0	569750	11041	9420	0	0	0	569750	11041	9420
1991	0	0	0	449222	0	3432	0	0	0	449222	0	3432
1992	0	0	0	528394	10734	4037	0	0	0	528394	10734	4037
1993	22324	6	0	570368	9968	4357	7591	115	23	600283	10089	4380
1994	24340	1	0	650589	856	4970	2318	6	7	677247	863	4977
1995	20819	9	0	628927	709	4805	2510	9	8	652256	727	4813
1996	20644	14	0	560508	1326	9788	565	7	0	581717	1347	9788
1997	16673	0	0	433848	451	7576	545	2	0	451066	453	7576
1998	8037	2	0	499335	643	8719	1706	10	0	509078	655	8719
1999	10546	1	0	421410	2469	7359	113	3	0	432069	2473	7359
2000	11778	2	0	286254	256	4999	0	0	0	298032	258	4999
2001	9844	0	0	255586	0	4743	315	0	248	265745	0	4991
2002	10795	2	0	325244	283	6036	0	0	0	336039	285	6036
2003	7241	0	0	344187	0	6387	25	0	20	351453	0	6407
2004	13836	0	0	410540	0	7618	0	0	0	424376	0	7618
2005	15481	0	0	432918	221	8034	137	0	108	448536	221	8142
2006	17524	0	1221	404885	600	10180	287	0	0	422696	600	11401
2007	21095	0	1469	404587	69	10172	0	0	0	425682	69	11641
2008	20323	2	1416	324185	126	8151	0	0	0	344508	128	9567

Table 4 continued. ALS combined Black Grouper and Gag (BG+Gag) landings, ALS Black Grouper (BG),, and adjusted Black Grouper landings in pounds by region, gear and year.

Region: Georgia - North Carolina

Year	Gear											
	Diving			Hook-and-line			Longline			Southeast US		
	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG	ALS BG+Gag	ALS BG	Adjusted BG
2009	24653	72	1717	308103	2260	7746	0	0	0	332756	2332	9463
2010	29302	11	2041	284559	2002	7154	0	0	0	313861	2013	9195
2011	41995	171	406	310528	6644	3007	0	0	0	352523	6815	3413
2012	27669	12	268	230852	1870	2235	0	0	0	258521	1882	2503
2013	26839	496	260	253243	3346	2452	222	222	222	280304	4064	2934
2014	28972	94	280	230188	1305	2229	841	841	841	260001	2240	3350
2015	29292	41	283	177021	1460	1714	0	0	0	206313	1501	1997

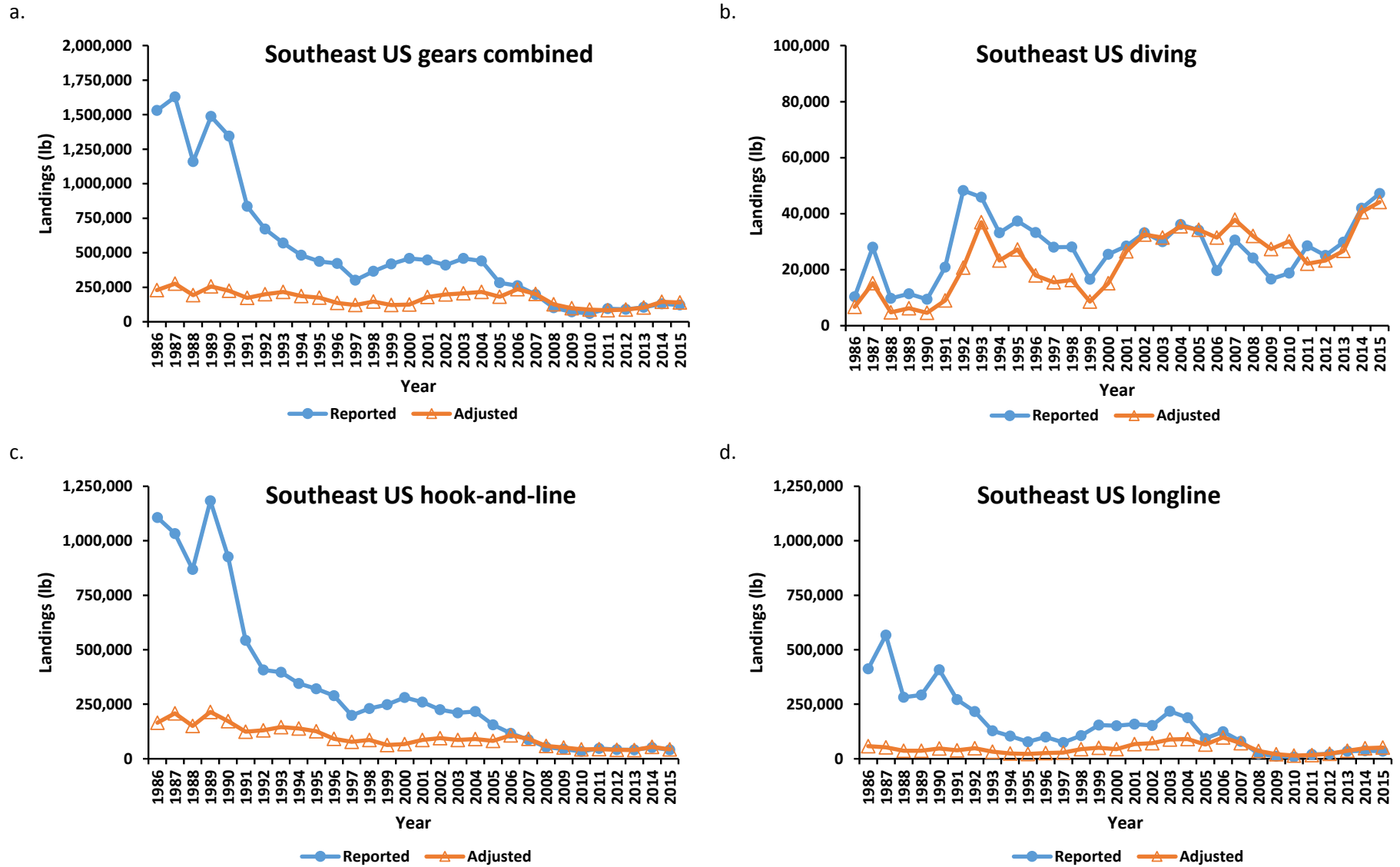


Figure 1. Reported and adjusted landings in pounds of Black grouper by gear, combined and separate, and year.

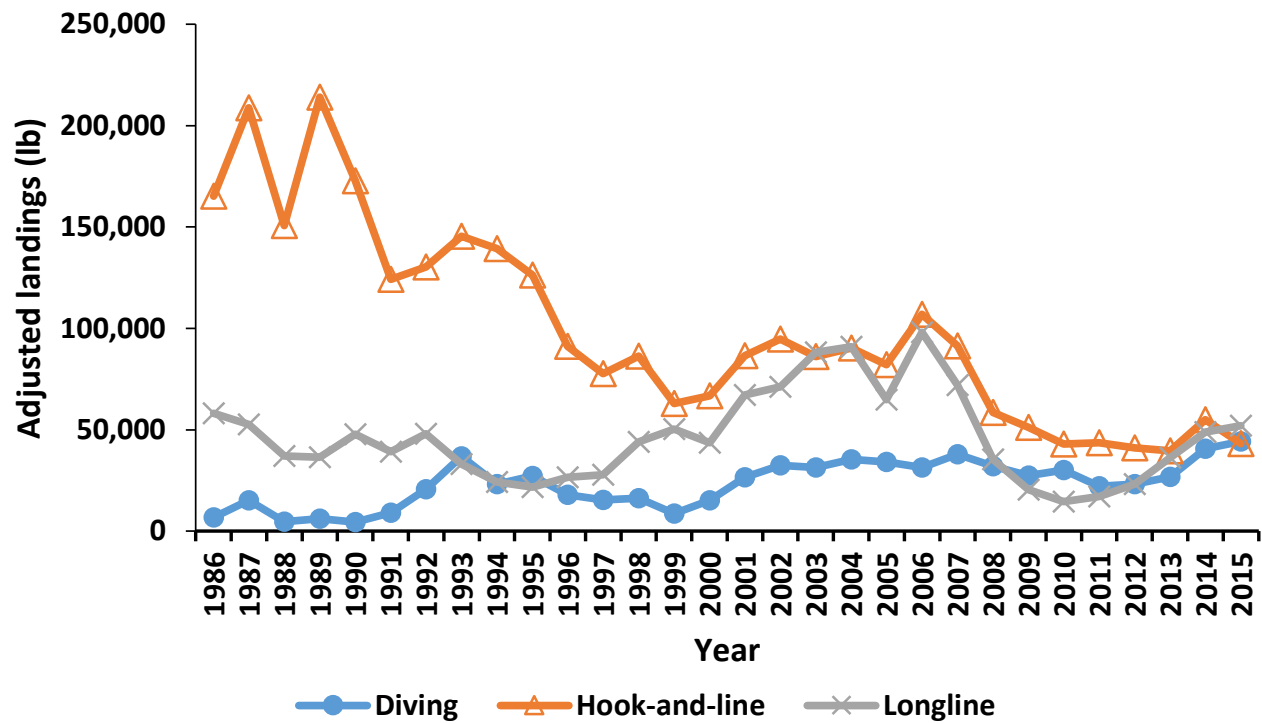


Figure 2. Adjusted landings by gear and year with regions combined. (a) and landings by region with gears combined (b).

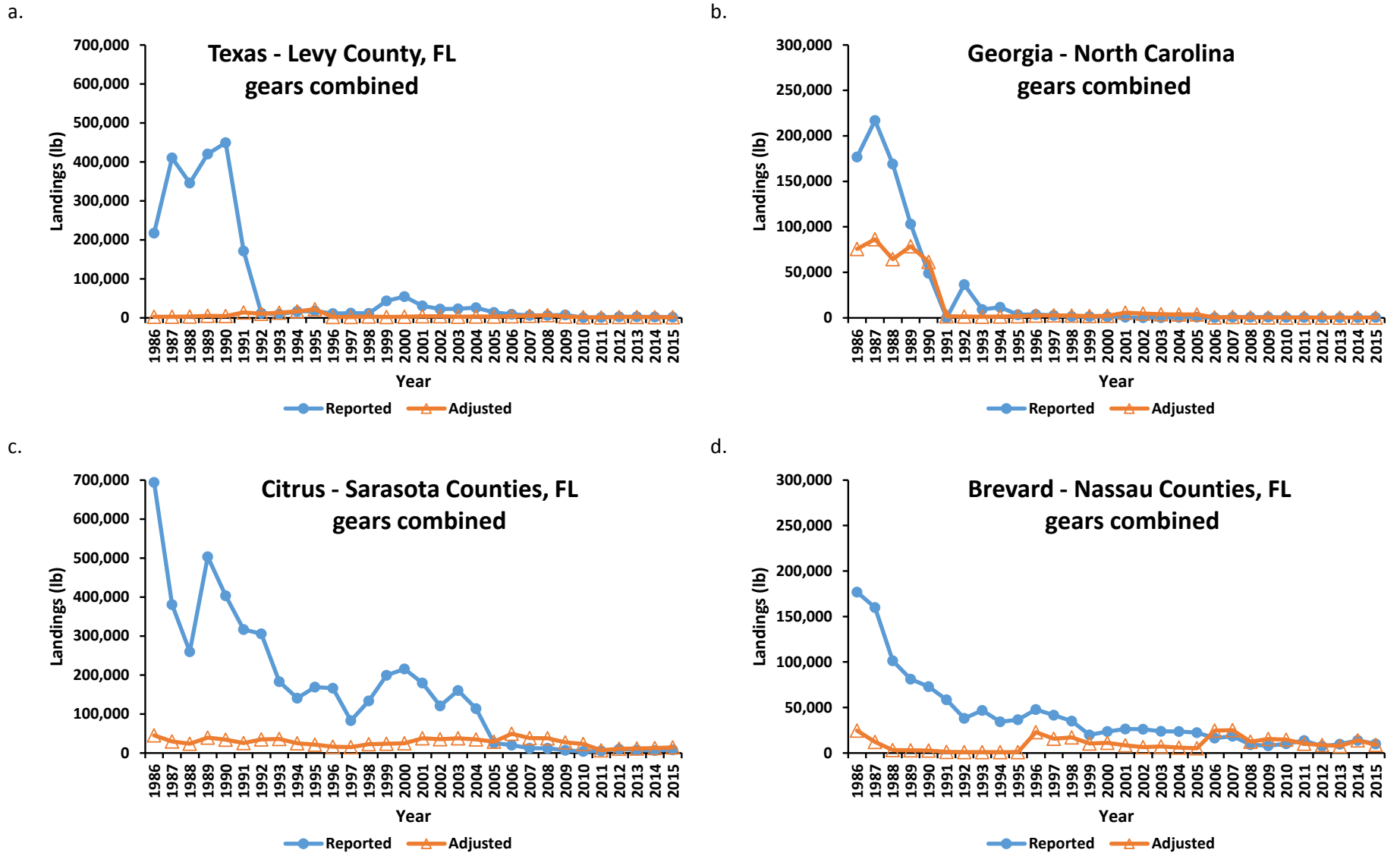
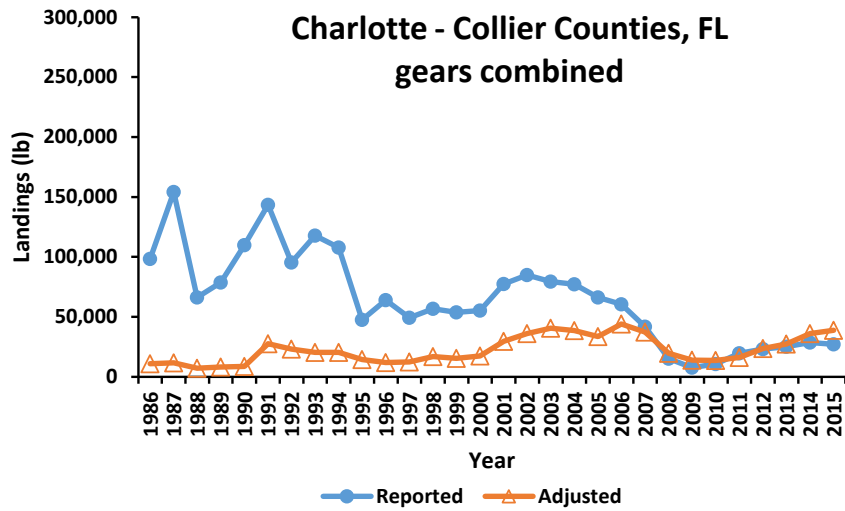
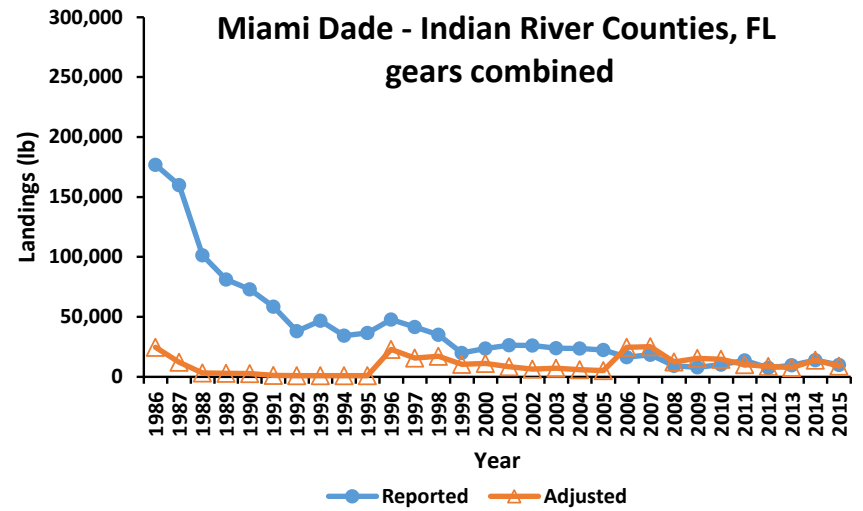


Figure 3. Reported and adjusted landings in pounds of Black grouper by region, combined gears, and year.

e.



f.



g.

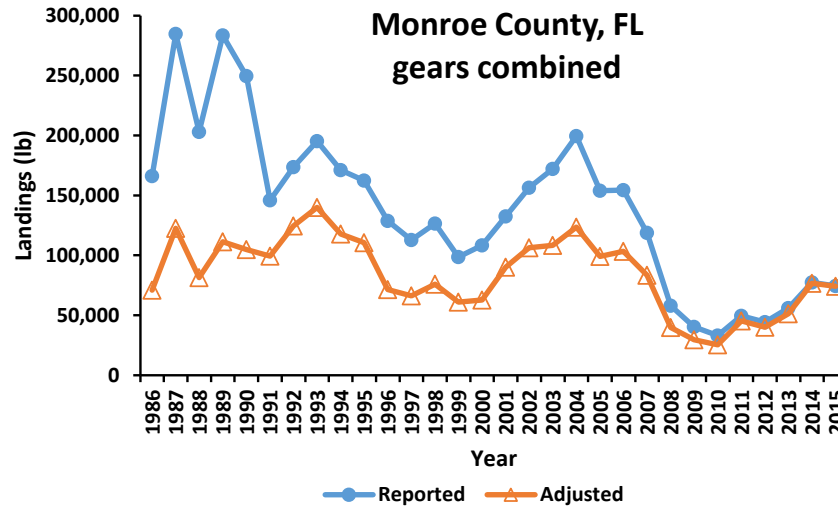


Figure 3 continued. Reported and adjusted landings in pounds of Black grouper by region, combined gears, and year.

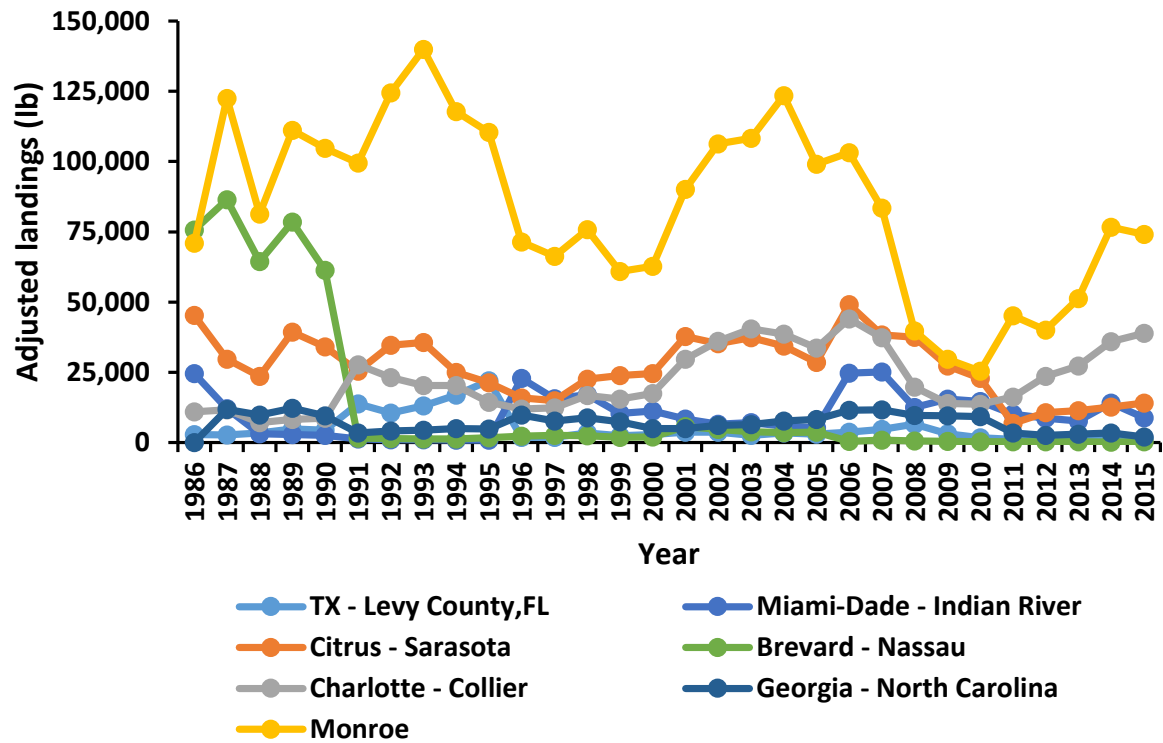


Figure 4. Adjusted landings by regions and year with gears combined.