SEDAR 19-DW05

Evaluation of the 1960, 1965, and 1970 U.S. Fish and Wildlife Service salt-water angling survey data for use in the stock assessment of red grouper (Southeast US Atlantic) and black grouper (Southeast US Atlantic and Gulf of Mexico)

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Introduction

Historical recreational fishing data in the Southeast U.S. is very limited prior to 1981. Recreational landings were recognized as a major source of removals from stocks and the National Survey of Fishing and Hunting was expanded to estimate landings of saltwater species starting in 1960. The recent trend for stock assessment models is to take landings back to the time when there is little exploitation. The Marine Recreational Fisheries Statistics Survey (MRFSS) provides landings starting in 1981, well after initial exploitation of the snapper-grouper complex. Three separate documents exist that provide estimates of recreational grouper landings from 1960, 1965, and 1970 (Table 1). This document evaluates the use of these estimates for red grouper in the Atlantic waters of the Southeast U.S. and for black grouper in the Gulf of Mexico and Atlantic waters of the Southeast U.S.

Survey Methodology

The Salt-Water Angling Survey was conducted adjunct to the National Survey of Fishing and Hunting (NSFH) which consisted of household interviews of a subsample of the Current Population Survey (CPS) conducted by the Bureau of the Census. The CPS identified individuals that participated in hunting and fishing and those households were subsampled by the NSHF. This subsample of substantial participants in saltwater angling was asked to provide the number and average weight for each species or species grouping. The survey also recorded area fished and the method of fishing. These catch estimates were then expanded by the estimated number of saltwater anglers for each sampling area and then pooled over regions to give landings estimates.

Methodology changes

- The 1965 and 1970 the Gulf of Mexico estimates were split into two regions divided at the Mississippi River whereas the 1960 survey considered the Gulf of Mexico one region.
- The NSFH data collection process differed slightly in each year. In 1960 the responsible household member provided information on hunting and fishing. The 1965 survey collected data from each household member. The 1970 NSFH was conducted with a mail-in survey requesting information on many outdoor activities. These changes may have a minor impact on the pool of saltwater anglers that were subsampled for the Saltwater Fishing Survey.
- Annual changes in which species to break out and which to include in groupings

Southeastern US Atlantic Black and Red Grouper

Methods for Splitting out Red and Black Grouper from the Grouper Category

The “groupers” category definition given by Clark (1960) and repeated for 1965 and 1970 is: “Includes those Atlantic members of the family Serranidae which are commonly known as groupers.” Other SEDAR panels have elected to split out individual species from groupings by applying species ratios from the earliest years of the MRFSS and/or headboat survey to the estimated landings by group for earlier years. The Saltwater Angling Survey grouper definition was used to define the grouper complex. Additional species identified as groupers in the Saltwater Angling Survey are listed in a “Common Name Index” in an appendix in each survey report. The other species identified as groupers were included and the entire list of species is given in Table 2. The average ratio of MRFSS and headboat landings to all recreational landings from 1981-1985, 0.185 and 0.815 respectively, were used to split the Salt-water Angling Survey

estimates for comparison to recent survey values. The average ratios of red and black grouper to all groupers for headboat and MRFSS from 1981-1985 were then used to divide the grouper landings estimates from the 1960, 1965, and 1970 Saltwater Angling Survey reports by species. The Saltwater Angling Survey estimates were then divided by 3 to adjust for the large potential bias reported when comparing the 1965 and 1970 California Fish and Game Department party boat logbook records for southern California to estimates in the Saltwater Angling Survey which were 305% and 193% higher respectively (Deuel, 1973). The sporadic MRFSS black grouper estimates from North Carolina and South Carolina (see Figure 8) were assumed to be gag in SEDAR 10 and were excluded in this analysis reducing the overall black grouper ratio in the early years slightly.

Results

Ratios

Red Grouper

The ratio of red grouper to all groupers for the headboat sector was fairly stable with a decreasing trend from the mid-1980's to a low in 1991 and then increasing until the late 1990's and leveling off close to the early values (Figure 1, Table 3). The South Florida (areas 11,12 and 17) ratio was significantly higher than other regions (Figure 2, Table 3). The MRFSS ratio of red grouper to all groupers was more variable than headboat but the values were comparable in the early years of the surveys (Figure 3, Table 3). The MRFSS also showed a higher ratio of red grouper from Florida compared to other states in the early years of the survey (Figure 4, Table 3).

Black Grouper

The ratio of black grouper to all groupers for the headboat sector was small and fairly stable (Figure 5, Table 3). The South Florida (areas 11,12 and 17) ratio was significantly higher than other regions (Figure 6, Table 3). The MRFSS ratio of black grouper to all groupers was highly variable and the ratios for several of the early years were much higher than the headboat ratios (Figure 7, Table 3). The MRFSS also showed a higher ratio of black grouper from Florida compare black to other states in the early years of the survey (Figure 8, Table 3).

Historical Landings Estimates

The average ratio for 1981-1985 for each species and sector is given in Table 4 with the NC and SC landings removed for MRFSS black grouper. The derived values for the Saltwater Angling Surveys and the 1981-2008 estimates as well as a value of 0 for 1946 are shown in Figure 9. The values are suspiciously high and further examination of the data collection process are discussed below.

There is an additional problem when trying to reconstruct the recreational landings of *M. bonaci* (black grouper) in the MRFSS time series. Gag (*Mycteroperca microlepis*), a species of grouper similar in appearance to *M. bonaci*, is sometimes referred to as "black grouper" by both recreational and commercial fishers. Except in the Florida Keys, gag is more frequently caught off of Florida's west coast than *M. bonaci*. There is confusion in the identification of these species by some fishers and outdoors writers (see Stock Definition and Description Section in SEDAR 19-DW-09). The recreational landings recorded in the NMFS Marine Recreational

Fishery Statistics Survey (MRFSS) appear to have different percentages of "black grouper" and gag in the earlier portion of the time series than in the later years (e.g, 1981-1987 Florida east coast, and 1981-1989 Florida west coast; fig. 10), and it is probable that some of the interviewers did not distinguish between these two species particularly during the early portion of the time series. These circumstances present additional complexity in the construction of a percentage of grouper landings represented by *M. bonaci* in the 1981-1990 time period. The NMFS Head Boat Survey does not appear to have these issues, although there are occasional instances of black grouper reported from some areas that appear questionable. Also, the NMFS Head Boat Survey did not begin in the Gulf of Mexico until 1986, so there is no other time series of recreational fisheries data available that might help in the evaluation of levels of gag and black grouper landings in the Gulf of Mexico during 1981-1985. Plus, new management regulations (including minimum size limits and bag limits) were implemented in the Gulf of Mexico in 1990, which probably altered the landings of groupers including gag and black grouper. So, the percentages in the time period (1990 – present) when the identifications of gag and black grouper are more certain to be accurate was also affected by management regulations which may have altered how anglers retained these species from their catches compared to previous years. Potential methods to adjust the reported recreational catches of black grouper and gag in the U.S. portion of the Gulf of Mexico were discussed during SEDAR 10 (see Phares et al., 2006).

Considering the uncertainty in the identifications of *M. bonaci* (black grouper) by anglers and even the interviewers, the unadjusted time series of reported landings (commercial and recreational) for black grouper (and gag) are uncertain and inaccurate from the MRFSS from the 1981-1990 period. Therefore, inferring the percentage of *M. bonaci* (black grouper) from the reported recreational fisheries (MRFSS) landings for the 1981-1990 period alone without a rigorous analysis of the underlying data is unwise and not recommended. It is very likely that this is an insoluble problem from the existing MRFSS data alone.

Discussion

Previous SEDAR assessments have varied in the starting year for the data and in the consideration given to the Saltwater Angling Survey estimates. The Atlantic gag assessment, SEDAR 10, used 1962 as the starting date to match the starting date for the commercial landings. The recreational landings for 1962-1971 were determined using a linear regression of recreational landings on commercial landings for years where both were available. The Gulf of Mexico gag assessment, SEDAR 10, used a regression of recreational to commercial landings to develop the 1963-1985 headboat landings and 1963-1980 MRFSS landings. An alternate series of early recreational landings was developed using a linear regression from 0 in 1945 to the first year of estimated landings. Other methods of deriving early recreational landings have been attempted including correlations with the number of private registered vessels.

More recent SEDAR assessments (SEDAR 15 and SEDAR 17) have relied on the Saltwater angling surveys to provide some estimate of early recreational landings. Data and assessment workshop participants carefully reviewed the methods for estimation as well as the estimated number of saltwater anglers and could not find any reasons to refute the estimates. However, the data collection process is a potential point of concern. Clark (1960) listed the lack of uniformity in the names which anglers use for fishes as the most perplexing problem with designing the interview. Confounding the problem of identification is the grouping of species. Only twenty

categories were allowed for each region. Species-level identification was allowed for a few species while many of the species were grouped into general categories. Three lines were available at the end of the survey to write in species not listed in the 20 categories. The grouper category is listed on the data sheet as "Grouper: sea bass, hinds, jewfish" (see Appendix 1). It is not clear where black sea bass would have been classified. Estimates of black sea bass were generated presumably from those who added black sea bass as a write-in at the end of the form. It is likely that many black sea bass were included in the grouper category in the saltwater angling surveys. This brings into question the estimates for species that were not on the form for a given region (possibly underestimated) and those that are on the form (other species grouped instead of written in at the bottom which would lead to overestimates). Estimates were generated for 37, 31, and 40 species or species groups in 1960, 1965, and 1970 respectively from the 20 categories in the South Atlantic plus the write-in values. The Saltwater Angling Survey reports provided examples of the data collection forms for the Southeast US in 1960 and 1965 and for the Northeast in 1970 (Appendix 1). Grouper estimates are even more problematic than other species groupings because of the description as sea basses on the form with no other space provided for black sea bass values.

Gulf of Mexico Black and Red Grouper

The identification of grouper species in the Gulf of Mexico in the 1960, 1965, and 1970 Saltwater Angling Survey are presumed to have the same reporting issues as the South Atlantic. However, data collection forms were not documented for the Gulf of Mexico regions and regional species groupings could not be verified. The SEDAR 19 data workshop decisions on the validity of the Saltwater Angling Survey estimates should apply to the Gulf of Mexico landings estimates. Even if the early landings estimates are closer to expected values given the recent landings they may not be useful due to species grouping issues.

Tables

Table 1. Estimated grouper landings in thousands by region from the Salt-water Angling Survey. (*entire Gulf of Mexico estimate)

Year	South Atlantic	Eastern Gulf	Western Gulf
1960	2286	9346*	--
1965	6905	1691	462
1970	24121	15934	922

Table 2. Species identified as groupers from the Saltwater Angling Survey.

Black Grouper
Comb Grouper
Marbled Grouper
Misty Grouper
Nassau Grouper
Snowy Grouper
Tiger Grouper
Warsaw Grouper
Yellowedge Grouper
Yellowfin Grouper
Goliath Grouper
Gag
Graysby
Red Hind
Rock Hind
Speckled Hind
Scamp
Coney
Blue Hamlet
Butter Hamlet
Muttton Hamlet

Table 3. Ratio of red grouper and black grouper to all groupers for headboat and MRFSS (with NC and SC included for MRFSS black grouper).

	Headboat		MRFSS	
Year	Red Grouper	Black Grouper	Red Grouper	Black Grouper
1981	0.199	0.035	0.225	0.182
1982	0.158	0.047	0.058	0.203
1983	0.193	0.083	0.097	0.275
1984	0.189	0.030	0.193	0.083
1985	0.208	0.029	0.044	0.025
1986	0.141	0.032	0.313	0.261
1987	0.123	0.032	0.182	0.073
1988	0.094	0.042	0.188	0.000
1989	0.083	0.016	0.076	0.042
1990	0.145	0.008	0.123	0.000
1991	0.058	0.008	0.041	0.042
1992	0.100	0.021	0.107	0.063
1993	0.119	0.029	0.210	0.000
1994	0.146	0.031	0.145	0.009
1995	0.123	0.024	0.111	0.091
1996	0.164	0.028	0.188	0.198
1997	0.181	0.012	0.243	0.132
1998	0.224	0.014	0.263	0.112
1999	0.169	0.015	0.163	0.071
2000	0.157	0.017	0.174	0.055
2001	0.159	0.016	0.166	0.080
2002	0.156	0.018	0.326	0.051
2003	0.155	0.024	0.177	0.057
2004	0.239	0.024	0.211	0.045
2005	0.291	0.045	0.248	0.038
2006	0.164	0.033	0.315	0.011
2007	0.110	0.026	0.463	0.023
2008	0.141	0.015	0.524	0.016

Table 4. Average ratio of red and black grouper to all grouper for headboat and MRFSS from 1981-1985 (NC and SC excluded for MRFSS black grouper).

Headboat red grouper	Headboat black grouper	MRFSS red grouper	MRFSS black grouper
0.190	0.045	0.123	0.112

Figures

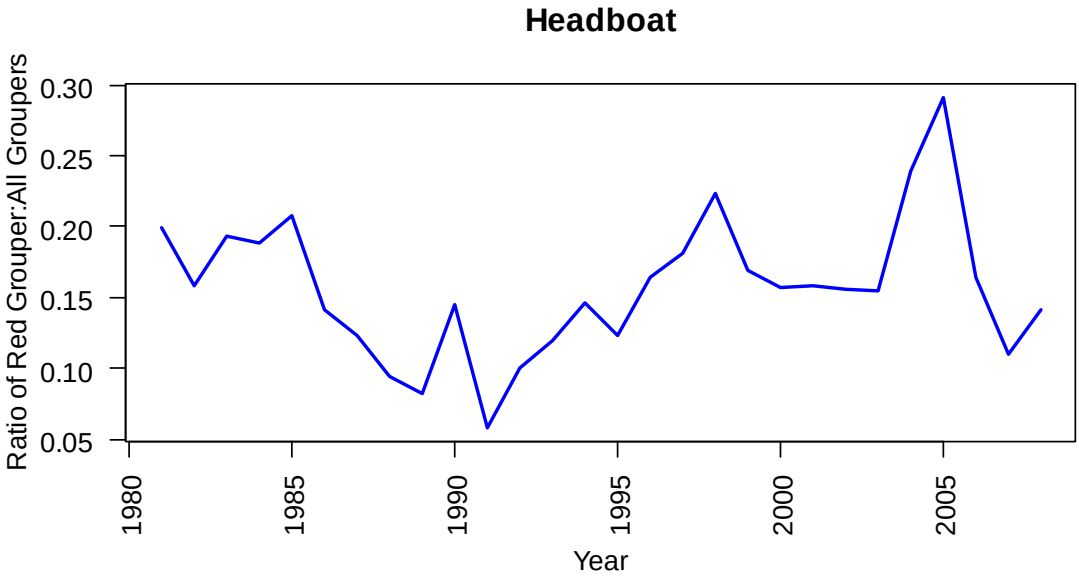


Figure 1. Headboat estimates of the ratio of red grouper to all groupers for 1981-2008.

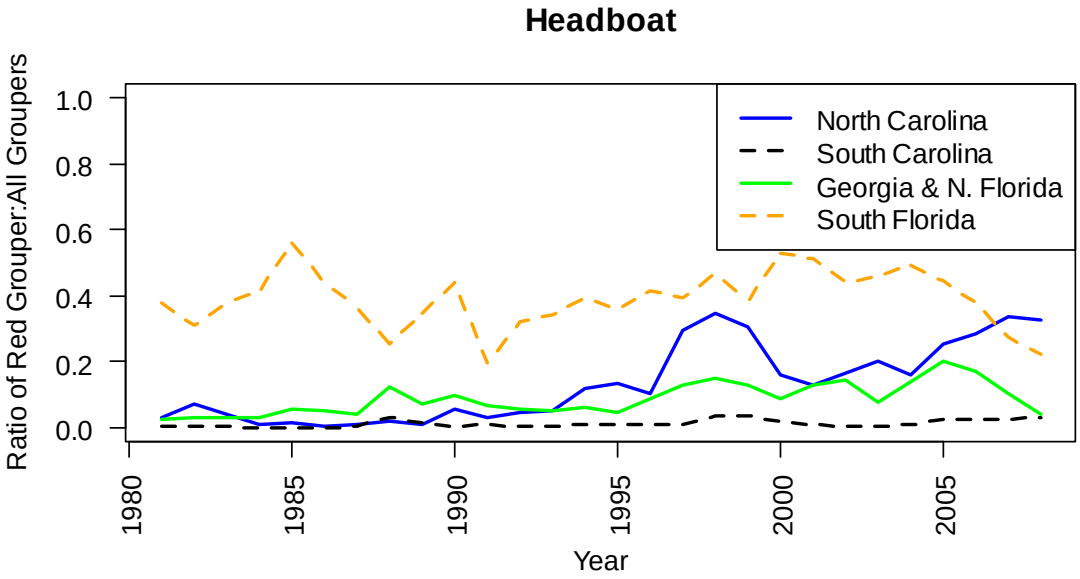


Figure 2. Headboat estimates of the ratio of red grouper to all groupers by region for 1981-2008.

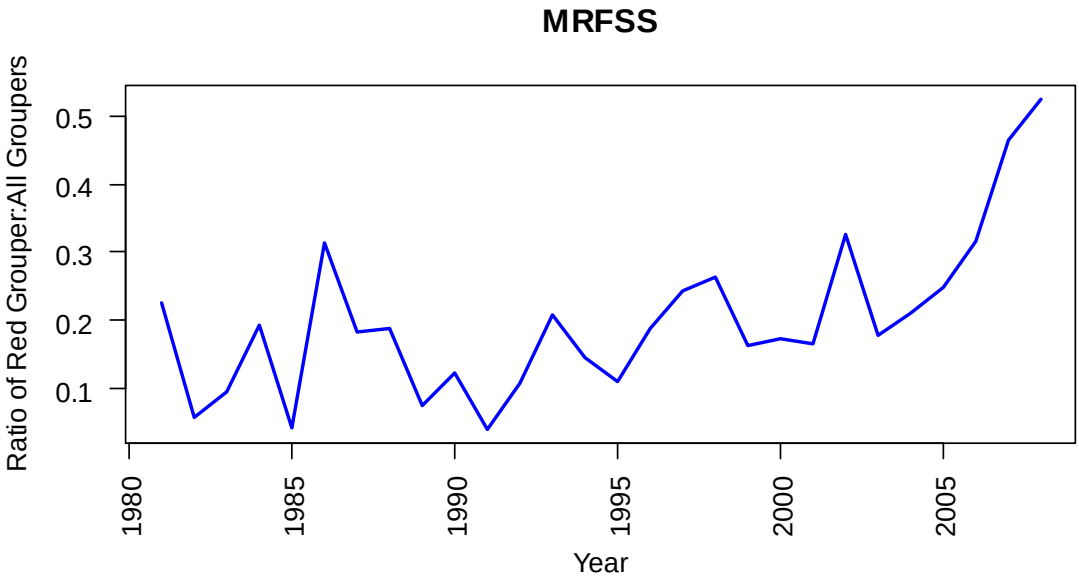


Figure 3. MRFSS estimates of the ratio of red grouper to all groupers for 1981-2008.

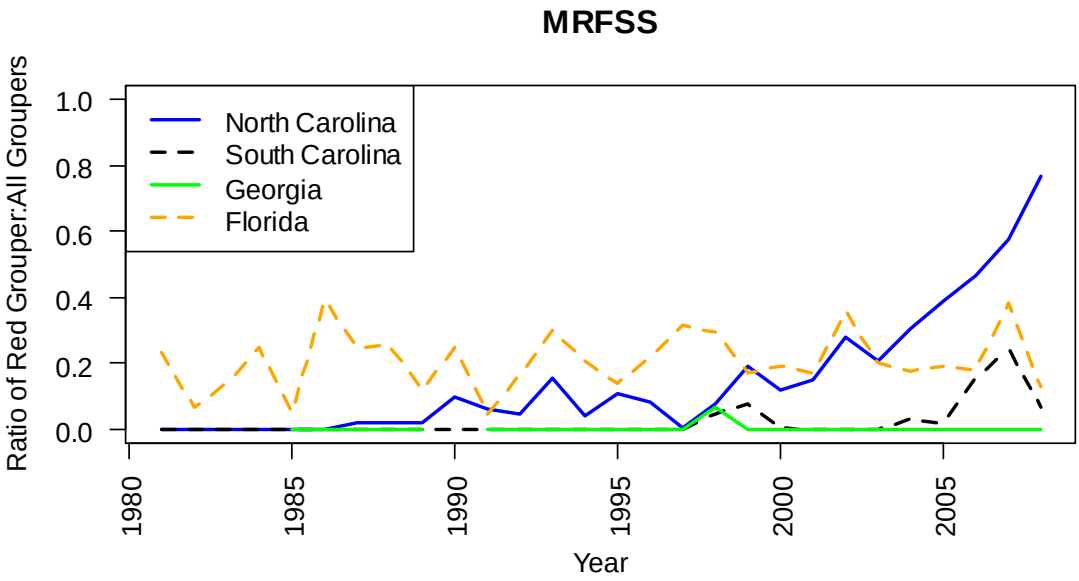


Figure 4. MRFSS estimates of the ratio of red grouper to all groupers by region for 1981-2008.

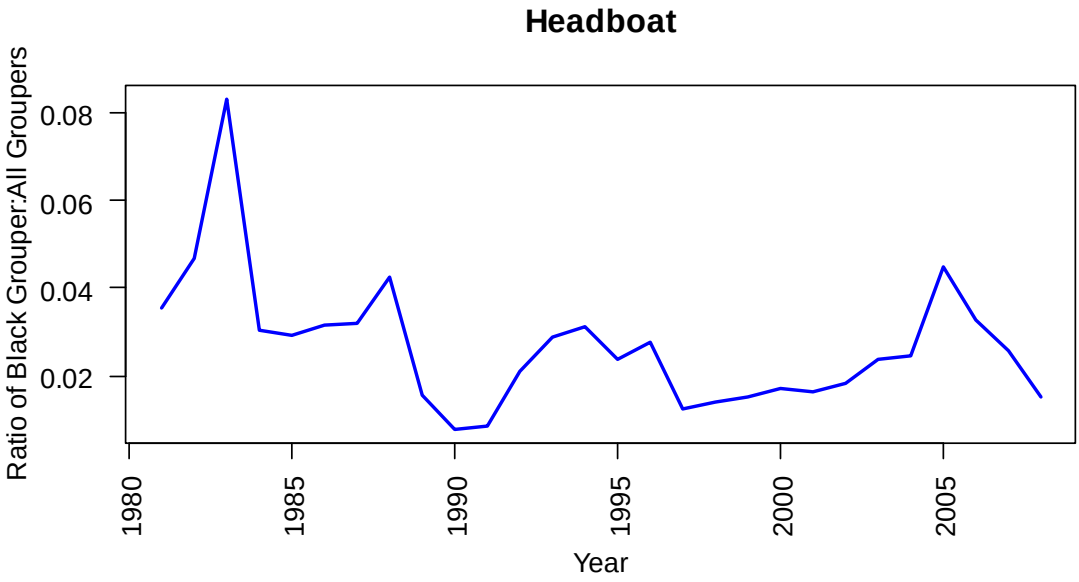


Figure 5. Headboat estimates of the ratio of black grouper to all groupers for 1981-2008.

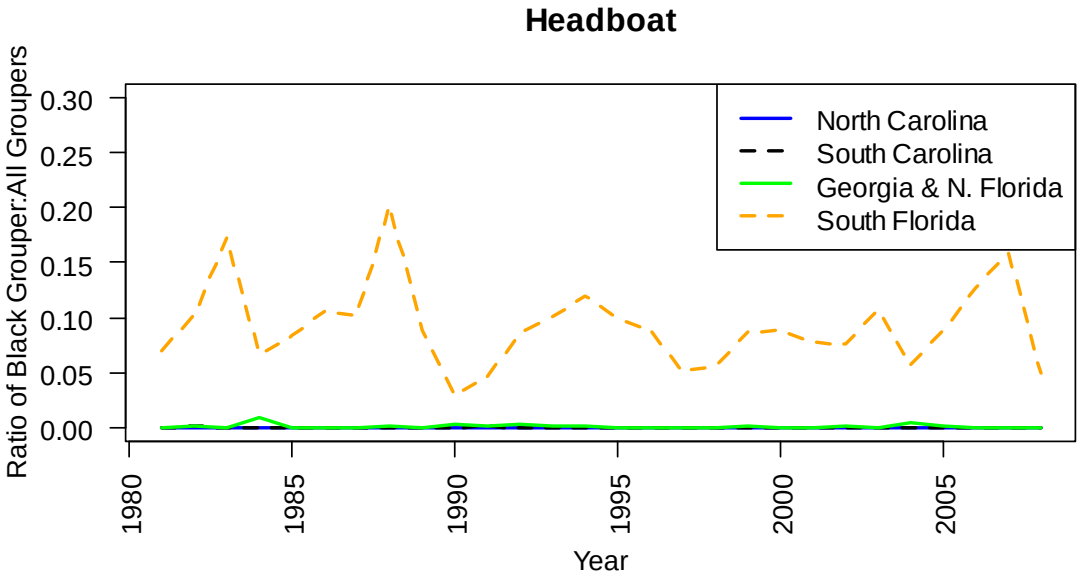


Figure 6. Headboat estimates of the ratio of black grouper to all groupers by region for 1981-2008.

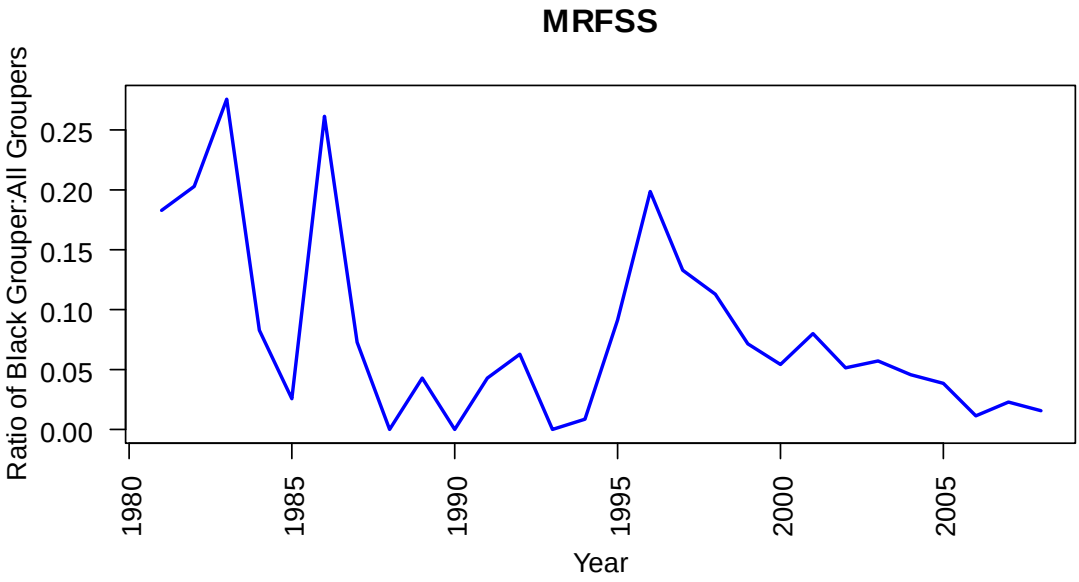


Figure 7. MRFSS estimates of the ratio of black grouper to all groupers for 1981-2008.

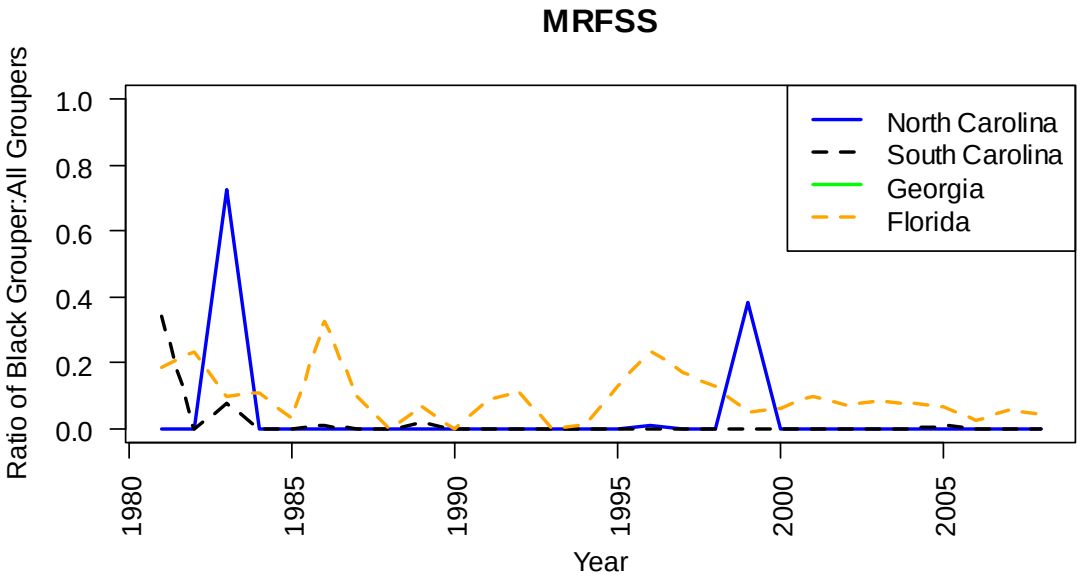


Figure 8. MRFSS estimates of the ratio of black grouper to all groupers by region for 1981-2008 (NC and SC included).

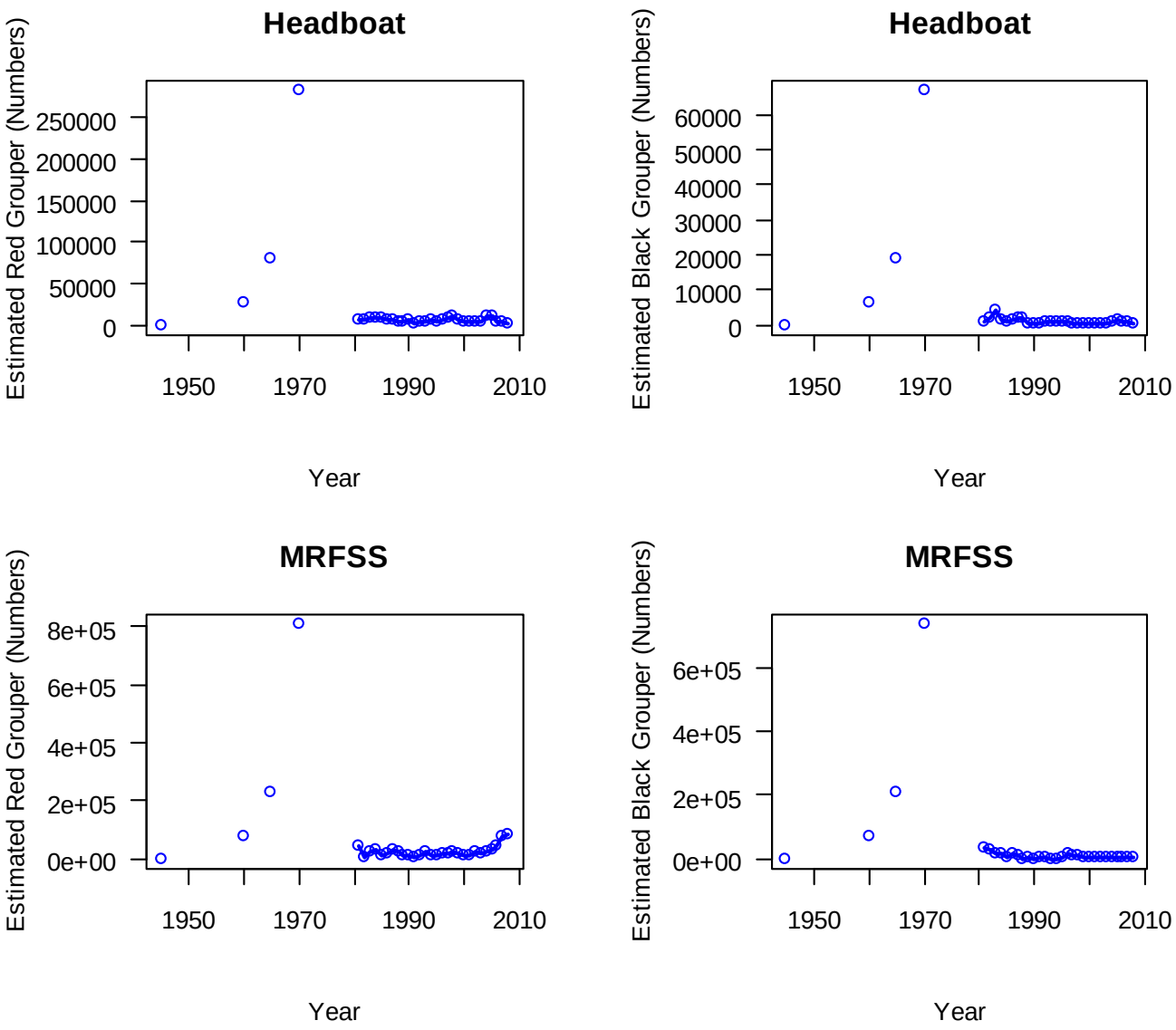
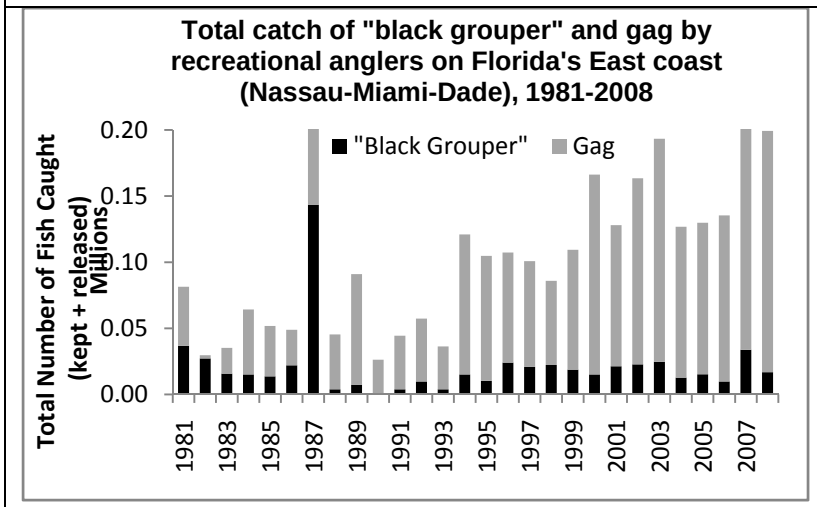
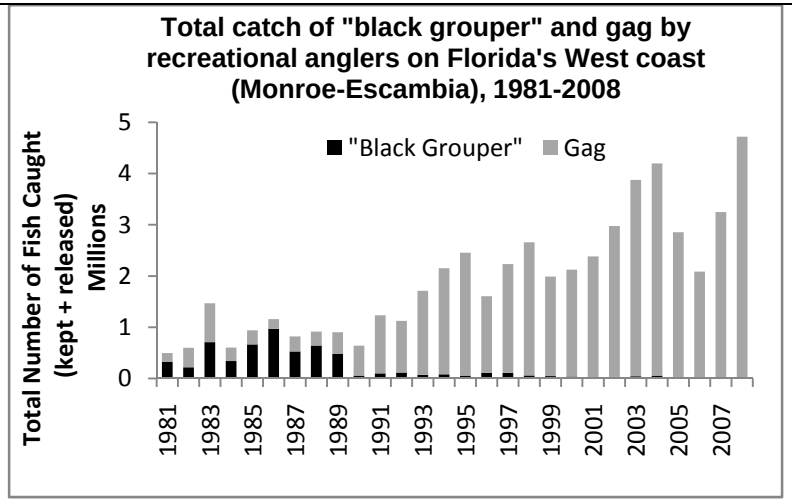


Figure 9. Estimates of landings for red and black grouper from headboat and MRFSS. A value of 0 was assigned to 1946 as in other grouper assessments. The 1960, 1965, and 1970 grouper estimates were split out by species and adjusted as described above.

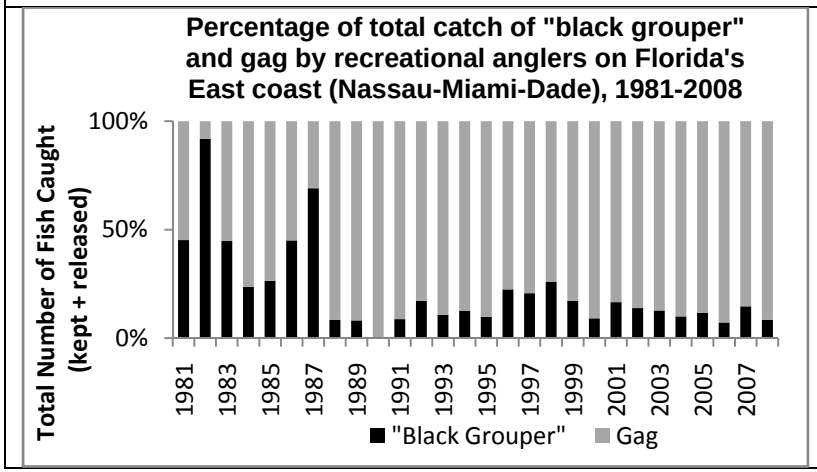
a. East coast total catches of “black grouper” and gag



b. West coast total catches of “black grouper” and gag



c. East coast percentage of “black grouper” + gag catches



d. West coast percentage of “black grouper” + gag catches

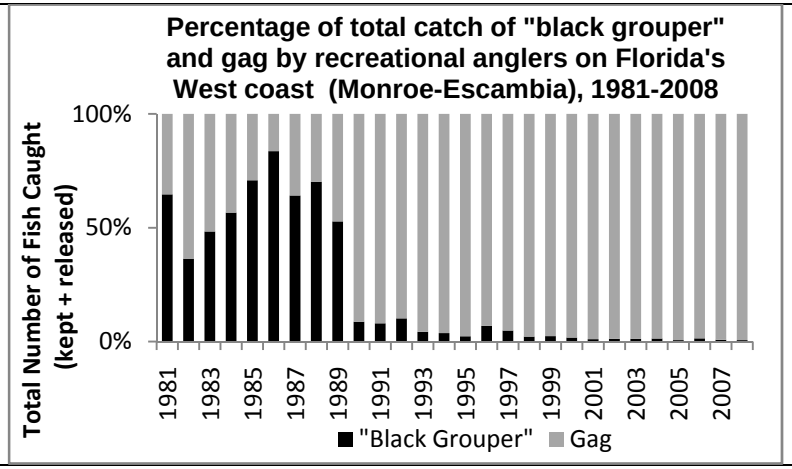


Figure 9. Recreational catches of “black grouper” and gag in Florida. Total catches (harvests and releases) of these two species from the NMFS Marine Recreational Fishery Statistics Survey, 1981-2008 for Florida: (a) East coast, (b) West coast; Percentage of “black grouper” and gag in the total catch of “black grouper”+gag: (c) East coast, (d) West coast.

Appendix 1. Data forms for the “South Atlantic” region of the Salt-water Angling Survey for 1960 and 1965.

Please enter the desired information for each of the areas in which YOU did SALT-WATER fishing in 1960

If you do not have exact figures, a careful estimate will be acceptable. If you do not recall some of the information, please enter "Don't know" in the appropriate column.

C. AREA III. - CAPE HATTERAS, NORTH CAROLINA, TO FLORIDA KEYS

1. Please check the kinds of salt-water fish you caught in 1960	(Check)	2. Total number caught in 1960	3. Method chiefly used (Check ONLY one)			
			Fishing from a boat		Fishing from shore	
			Bottom fishing	Casting, trolling, etc.	Bottom fishing	Casting, etc.
Tarpon	1		1	2	3	4
Bonefish	2		1	2	3	4
Barracuda	3		1	2	3	4
Tunas: Bluefin, Yellowfin, Blackfin, Big-eye	4		1	2	3	4
Mackerels: Spanish Mackerel, Cero, Kingfish	5		1	2	3	4
Spearfishes: Sailfish, Marlins, Swordfish	6		1	2	3	4
Sea Trouts: Gray Trout, Spotted Trout	7		1	2	3	4
Redfish (Channel Bass, Red Drum)	8		1	2	3	4
Whitings	9		1	2	3	4
Jacks: Crevalles, Runners, Amberjacks, Pompanos	10		1	2	3	4
Bluefish	11		1	2	3	4
Dolphin	12		1	2	3	4
Snook	13		1	2	3	4
Porgies: Sheepshead, Pinfish (Bream)	14		1	2	3	4
Drum (Black Drum)	15		1	2	3	4
Sea Catfishes	16		1	2	3	4
Cobia (Crab Eater)	17		1	2	3	4
Groupers: Sea Bass, Hinds, Jewfish	18		1	2	3	4
Snappers: Schoolmaster, Muttonfish	19		1	2	3	4
Grunts: Margates, Pigfish	20		1	2	3	4
Any others (Please list each kind)			1	2	3	4
			1	2	3	4
			1	2	3	4
			1	2	3	4
			1	2	3	4

FORM FH-5 (12-10-60)

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Figure 1.--Sample page of the questionnaire used in the national survey of salt-water angling.

Please enter the desired information for each of the areas in which YOU did SALT-WATER fishing in 1965. If you do not have exact figures, a careful estimate will be accepted. If you do not recall some of the information, please enter "Don't know" in the appropriate column.

C. AREA 3 – CAPE HATTERAS, NORTH CAROLINA TO FLORIDA KEYS

1. Please check the kinds of salt-water fish you caught in 1965	Check	2. Total number caught in 1965	3. Average weight of fish caught in 1965	4. Principal area of fishing (Check only one)		5. Principal type of fishing (Check only one)			
				Sounds, rivers, bays	Ocean	Party or charter boat	Private or rented boat	Bridge, pier, jetty	Beach or bank
Grouper (Sea Bass, Hind, etc.)	01			1	2	1	2	3	4
Grunt (Margate, Pigfish, etc.)	02			1	2	1	2	3	4
Striped Bass (Rockfish)	03			1	2	1	2	3	4
Pinfish (Bream)	04			1	2	1	2	3	4
Whiting (King Whiting)	05			1	2	1	2	3	4
Spanish Mackerel	06			1	2	1	2	3	4
King Mackerel (Kingfish)	07			1	2	1	2	3	4
Mullet	08			1	2	1	2	3	4
Speckled Trout (Spotted Sea Trout)	09			1	2	1	2	3	4
Snook	10			1	2	1	2	3	4
Black Drum	11			1	2	1	2	3	4
Redfish (Red Drum, Channel Bass)	12			1	2	1	2	3	4
Bluefish	13			1	2	1	2	3	4
Spot	14			1	2	1	2	3	4
Croaker	15			1	2	1	2	3	4
Sea Catfish	16			1	2	1	2	3	4
Bluefin Tuna	17			1	2	1	2	3	4
Tarpon	18			1	2	1	2	3	4
Yellowtail Snapper	19			1	2	1	2	3	4
Pompano	20			1	2	1	2	3	4
Any others – For example Blowfish, Flounder, Swordfish, etc. *(Specify)*				1	2	1	2	3	4
				1	2	1	2	3	4
				1	2	1	2	3	4
				1	2	1	2	3	4

FORM FH-5 (1-3-66)

Page 4

Figure 1.--Sample page of the interview form used for the 1965 Angling Survey.