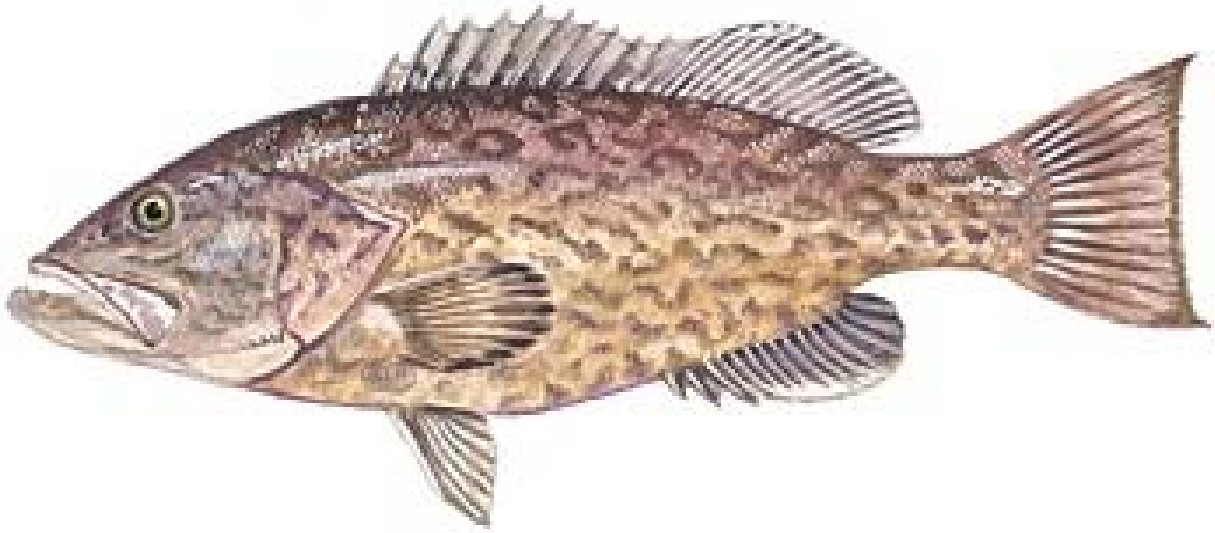
Interstate Fisheries Management Program Implementation for North Carolina

July 2005 – June 2006

The North Carolina Gag Grouper (*Mycteroperca microlepis*) Commercial Fishery



North Carolina Department of
Environment and Natural Resources

Division of Marine Fisheries
Morehead City, NC 28557

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The North Carolina Gag Grouper (*Mycteroperca microlepis*) Commercial Fishery

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For the

North Carolina Division of Marine Fisheries

June 2006

Completion Report For
Atlantic Coastal Cooperative Management Act
Grant NA 05NMF4741003
Segment 1

North Carolina Division of Marine Fisheries
License and Statistics Section
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Morehead City, NC 28577

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Acknowledgements

The completion of this report could not have been accomplished without the cumulative teamwork of the North Carolina Division of Marine Fisheries Trip Ticket Program staff. I wish to thank all of the staff for their diligent and excellent work, including:

Anna Branch
Marty Brill
Roz Camp
Brian Cheuvront
Chuck Davis
Wendy Fulcher
Gina Griffin
Don Hesselman
Jack Holland
Stephanie Hyman
April Kemp
Grace Kemp
Dee Lupton
Douglas Mumford
Joshua Murauskas
Joey Roberts
William Schmidt
Mechelle Stone
Chris Wilson

Many other individuals and sections with the Division of the Marine Fisheries have contributed to the success of the Trip Ticket Program and the collection and dissemination of commercial fisheries statistics including Marine Patrol, Licenses, Fisheries Management, Resource Enhancement and Information Technology. I want to thank Al Schmidt for his technical support and expertise and Whitney Grogan for reviewing drafts of this document. I want to thank Dr. Louis Daniel and John Carmichael for inviting me to the SEDAR 10 Data Workshop. I want to also thank all of North Carolina's commercial fishermen and seafood dealers.

Abstract

The SEDAR 10 data workshop was held in Charleston, SC in January 2006 and concerned South Atlantic and Gulf of Mexico stocks of gag grouper. Gag grouper, on average, composes 34% of North Carolina's commercial grouper fishery and also accounts for 30 to 40% of the total annual landings of gag grouper in the South Atlantic. Gag grouper landings in North Carolina's General Canvas and Trip Ticket data sets were analyzed during the SEDAR 10 data workshop. Landings were then adjusted at the workshop to account for any misidentifications of gag grouper as black grouper and to determine the percent that gag grouper composed of all unclassified grouper landings. The adjusted landings of gag grouper show that the fishery really expanded in the late 1970s and early 1980s. Landings since then have declined overall with a large decrease from 1989 to 1991 and another large decrease from 1998 to 2000. Likewise, the total number of trips, participants and vessels have declined overall since 1994. Gag grouper landings and the number of trips has increased since 2000 but if the stock is determined to be overfished and management regulations are put into effect to protect the stock, it will be unlikely that the commercial landings of gag will reach the levels observed in the mid 1980s and early 1990s. The purpose of this report is to summarize the data analysis that was done prior and during the SEDAR 10 data workshop for North Carolina's commercial fisheries data and to serve as a reference document for fisheries managers.

Introduction

The North Carolina Division of Marine Fisheries Trip Ticket Program (NCTTP) began on 1 January 1994 (Sabo 2001; Watterson 1999; Lupton and Phalen 1996). Prior to the implementation of the NCTTP, commercial statistics and harvest data were collected under the National Marine Fisheries Service: North Carolina Cooperative Statistics Program (Sabo 2001; Lupton and Phalen 1996). The NCTTP was initiated due to a decrease in cooperation in reporting under the voluntary NMFS/North Carolina Cooperative Statistics Program in place prior to 1994, as well as an increase in demand for complete and accurate trip-level commercial harvest statistics by fisheries managers (Sabo 2001; Watterson 1999; Lupton and Phalen 1996). The detailed data obtained through the NCTTP allow for the calculation of effort (i.e. trips, licenses, fishermen, vessels) in a given fishery that was not available prior to 1994 and provide a much more accurate record of North Carolina's seafood harvest.

North Carolina Division of Marine Fisheries (NCDMF) staff biologists, NCDMF marine patrol officers, the North Carolina Marine Fisheries Commission (MFC), the NMFS, the Atlantic States Marine Fisheries Commission (ASMFC), the Mid-Atlantic Fisheries Management Council (MAFMC), the South Atlantic Fisheries Management Council (SAFMC), other United States Government agencies, university faculty and students, fishermen, seafood dealers, and the general public use landings data collected by the NCTTP. Data collected under the NCTTP have also been used for many state-level fisheries management plans, federal fisheries management plans, state and federal stock assessments and for economic assistance programs.

Data obtained from the NCTTP and the NMFS/North Carolina Cooperative Statistics Program were used in the SEDAR 10 data workshop in January 2006 for South Atlantic and Gulf of Mexico gag grouper (*Mycteroperca microlepis*). Landings of gag grouper were analyzed prior and during the workshop to be used in the regional stock assessment of South Atlantic gag grouper. Regional misidentifications of gag grouper as black grouper (*M. bonaci*) were addressed and landings were analyzed by gear type to help determine the relative proportion of gag grouper in North Carolina's mixed grouper landings.

Objective

The purpose of this report is to summarize the data analysis that was done prior and during the SEDAR 10 data workshop for North Carolina's commercial fisheries data and to serve as a reference document for fisheries managers. This report will also describe methodologies used to determine the proportion of gag grouper that is represented in North Carolina's unclassified grouper commercial landing designations.

Methods

The NCTTP

The design of the NCTTP requires that all individuals or businesses that buy seafood from licensed fishermen in the state have a seafood dealer's license. These dealers are mandated, under North Carolina state statute, to report all fish and shellfish landings per trip to NCDMF. Each trip is reported on an individual trip ticket supplied to the dealers by NCDMF or are submitted to NCDMF electronically through a specialized trip ticket software program which is supplied to dealers upon request. Each trip ticket includes the amount in units/pounds of each species landed, the type of gear(s) fished (up

to three can be listed), the water body from which the majority of the catch was harvested, the date of landing, the start date of the trip, and number of crew and license numbers. The county of landing is determined based on the location of the dealer submitting the trip ticket. In addition to the data collected from trip tickets, ex-vessel value data are also collected from the dealers on a voluntary basis.

Trip Tickets for a given month are submitted to NCDMF by the 10th of the following month. The tickets are then screened and double key entered (each field on the trip ticket is entered into the database once and then verified by adding the data into the database again) by NCDMF data clerks and then loaded on NCDMF Fisheries Information Network (FIN). The FIN generates warning reports if an unlikely combination of variables occurs during the data entry process. These tickets are then flagged and edited by NCDMF port agents. The data are then uploaded to the state mainframe so they can be accessed by staff biologists for analysis. Edits and verifications are run against the data to identify any other potential errors.

Data Analysis for the SEDAR 10 Data Workshop

Gag grouper landings in the NCTTP landings database were analyzed with SAS® software (SAS® 1989) prior to the SEDAR 10 data workshop. NCTTP staff reexamined all trip tickets that had landings less than 3.75 pounds or landings greater than 1,500 pounds of gag grouper. The majority of these trips occurred during the earlier years of the NCTTP (1994 to 1996). These trip tickets were examined thoroughly to determine if any corrections needed to be made to the database. Gag grouper landings were also analyzed by gear type and any unlikely gears accounting for landings were also

reexamined and corrected if necessary. Landings for all grouper species were then downloaded from the state mainframe.

Four data sets were analyzed for the SEDAR 10 data workshop. The first data set contains landings of grouper from 1950 to 1961, the second data set contains landings from 1962 to 1971, the third data set is North Carolina's general canvas landings from 1972 to 1993 and the last data set is the NCTTP database that runs from 1994 to current (see Appendix 1 for more details for the data sources). All analyses were done with SAS® software (SAS® 1989) and included analyses of landings and effort annually, by area, by gear, by vessel length and by month. All graphs for these analyses were generated in Microsoft Excel©. All confidential data (data in which less than three dealers, participants or vessels reported landings) were resummarized using broad range categories to maintain the confidentiality of the data when reported in tables.

Estimating the Amount of Gag Grouper in Unclassified Landings at SEDAR 10 Data Workshop

A common method employed by the SAFMC to separate out species landings from all unclassified landings is to break the unclassified landings out proportionately by gear. First the major gear types for that species for the region has to be determined. The major gear types for gag grouper were identified as rod-n-reel, longlines, trawls, diving spears, or other. Then each proportion is calculated with the following formula:

$$P = X / (X + Y)$$

where P is the proportion for that gear type, X is the landings of the species of interest, and Y is the landings of all other identified species (in this case landings of other identified groupers).

All misidentifications of gag grouper as black grouper had to be corrected before the proportions could be calculated. It was determined that all black groupers in the database prior to 1994 should be changed to gag grouper for North Carolina. With these adjustments, proportions were calculated annually starting in the year that first had significant landings of the species of interest (for gag grouper this would be 1981) and stopping in 1994 with the implementation of the NCTTP. The annual proportions were then applied to the unclassified landings and then added to the actual landings of the species of interest to determine the adjusted landings value.

An average of the proportions was used from 1981 to 1991 and then applied to all unclassified landings for years prior to species identifications in the landings database. The years stop at 1991 because in 1992 new gear regulations were put into place that had an effect on the fishery. These proportions were applied to landings of unclassified grouper from 1962 to 1980. Also, a lower bound and upper bound set of landings was calculated by taking two standard deviations above and below the mean. These sets of landings will be used to do sensitivity runs in the stock assessment model. All adjusted landings were calculated in gutted weight for the SEDAR 10 data workshop because of differences between conversions across the southeast states.

Results

Annual Landings and Effort

The North Carolina commercial grouper fishery began to flourish in the mid to late 1970s (Figure 1). A large portion of this fishery is composed of gag grouper (Figure 2). On average, gag grouper composes 34% of North Carolina's commercial grouper fishery (Figure 2; Table 1). North Carolina's

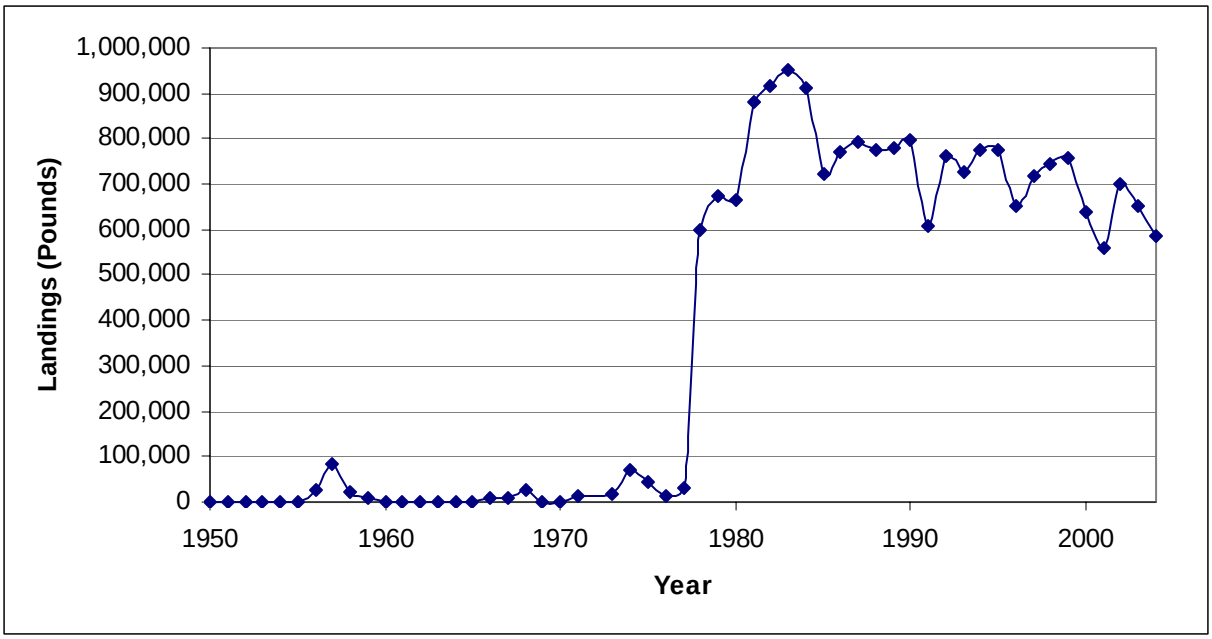

Figure 1. Annual landings of grouper from 1950 to 2004 in North Carolina.

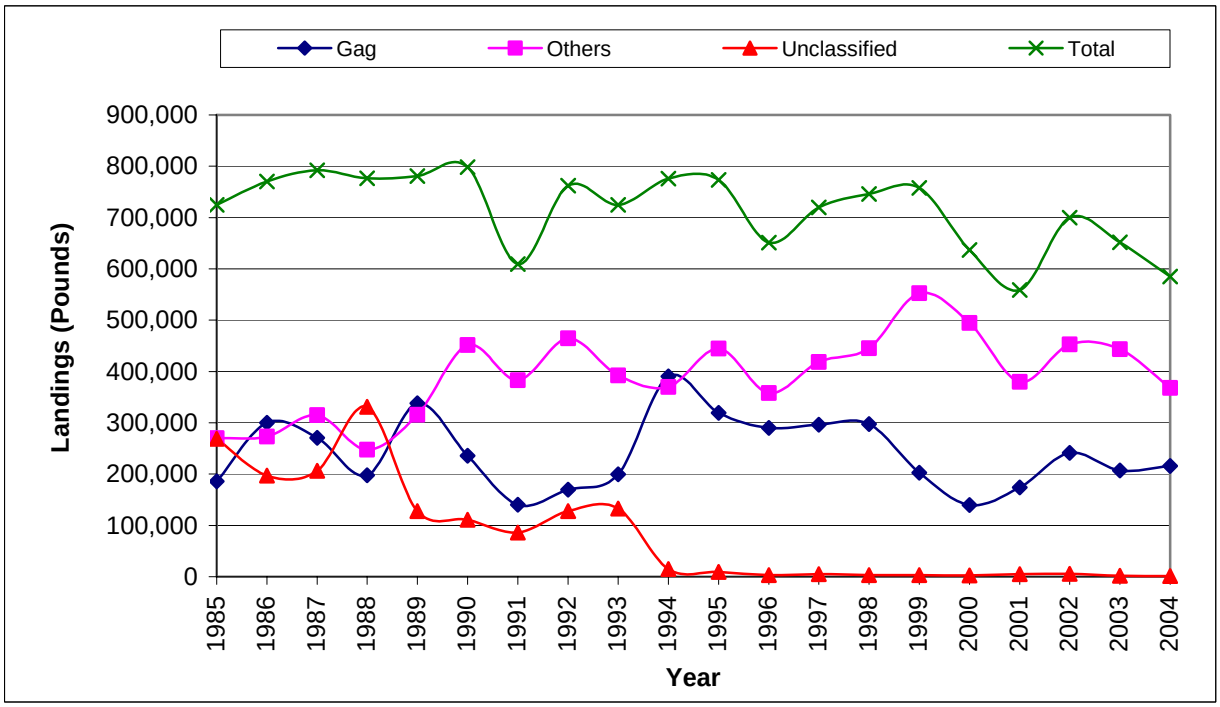

Figure 2. Annual landings of gag grouper, other groupers, unclassified groupers and total grouper from 1985 to 2004.

Table 1. Total landings of gag grouper, other identified groupers, unclassified groupers, total grouper landings and the percent of gag grouper to the total grouper landings for North Carolina from 1985 to 2004.

Year	Gag	Others	Unclassified	Total	% Gag
1981	457	335,761	546,478	882,696	0%
1982	0	294,442	620,054	914,496	0%
1983	0	306,873	642,664	949,537	0%
1984	209	471,928	438,770	910,907	0%
1985	185,635	270,274	268,690	724,599	26%
1986	300,270	273,369	196,893	770,532	39%
1987	270,625	314,988	206,531	792,144	34%
1988	197,460	247,765	331,089	776,314	25%
1989	337,862	315,405	127,644	780,911	43%
1990	236,057	451,635	110,921	798,613	30%
1991	140,454	383,137	85,929	609,520	23%
1992	169,537	464,542	127,830	761,909	22%
1993	199,678	392,360	132,814	724,852	28%
1994	390,488	369,922	15,230	775,640	50%
1995	319,200	444,921	9,382	773,503	41%
1996	289,978	358,148	3,014	651,140	45%
1997	296,229	418,284	5,106	719,618	41%
1998	297,380	445,092	3,206	745,679	40%
1999	202,625	552,382	3,086	758,093	27%
2000	139,547	494,883	2,532	636,962	22%
2001	173,895	379,919	4,820	558,634	31%
2002	241,681	452,587	5,346	699,614	35%
2003	207,229	443,189	1,566	651,984	32%
2004	215,889	367,744	1,283	584,916	37%

gag grouper commercial fishery also accounts for 30 to 40% of the total annual landings of gag grouper in the South Atlantic (Rohde and Coats 2005).

Gag grouper landings in North Carolina fluctuated from 1985 to 1989. Landings of gag grouper then declined from 1989 to 1991 and then increased from 1991 to 1994. Landings of gag grouper reached a maximum in 1994 at 390,000 pounds but then landings declined from 1994 to 2000. Since 2000 landings of gag have increased (Figure 2; Table 1).

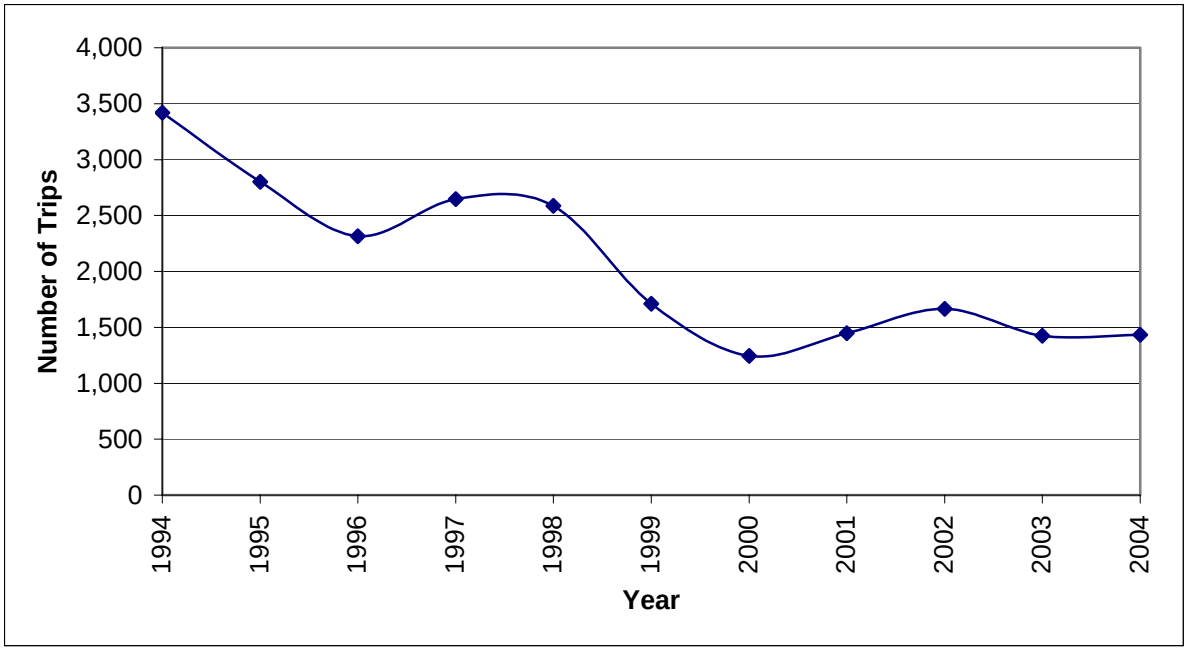

Figure 3. Number of trips landing gag grouper from 1994 to 2004 in North Carolina.

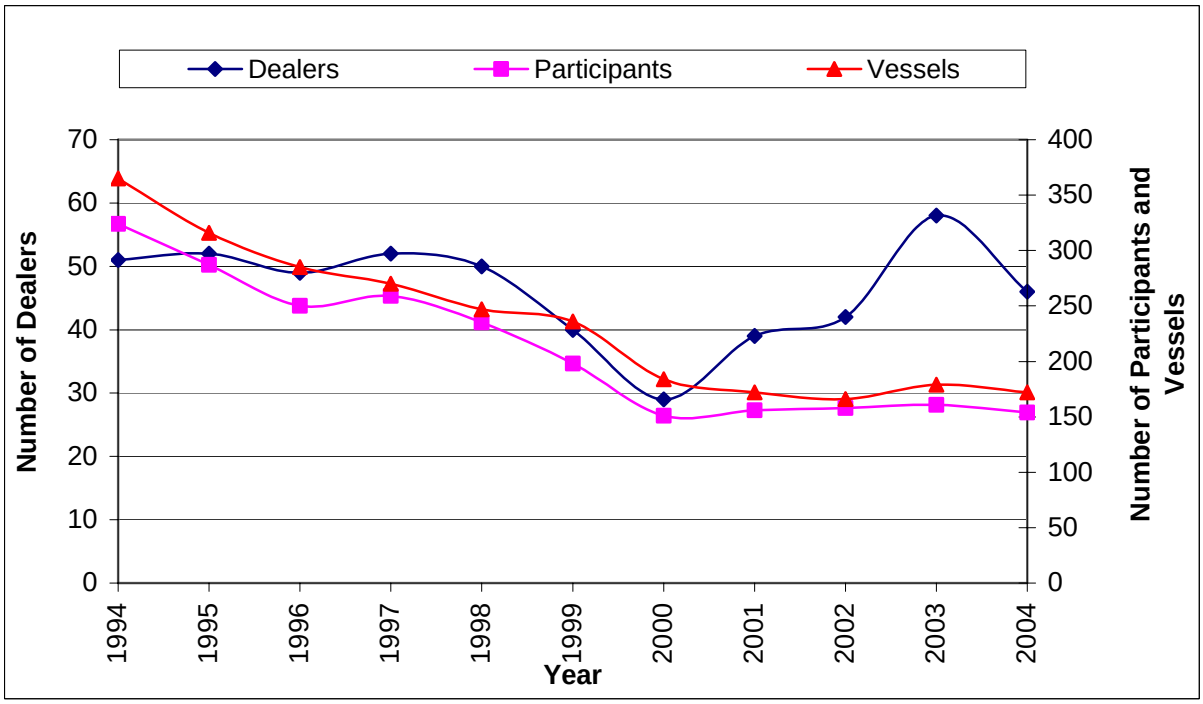

Figure 4. Number of seafood dealers, participants and vessels recording landings of gag grouper from 1994 to 2004.

Table 2. Number of trips, participants, dealers and vessels recording landings of gag grouper from 1994 to 2004.

Year	Trips	Dealers	Participants	Vessels
1994	3,418	51	324	365
1995	2,800	52	287	316
1996	2,315	49	250	285
1997	2,646	52	259	270
1998	2,586	50	235	247
1999	1,710	40	198	236
2000	1,245	29	151	184
2001	1,447	39	156	172
2002	1,665	42	158	166
2003	1,425	58	161	179
2004	1,434	46	154	172

The total number of trips landing gag grouper has declined overall from 1994 to 2004. The total number of trips reached a maximum in 1994 with 3,400 trips reporting landings of gag grouper. By 2004, the total number of trips landing gag grouper had declined to 1,434 (Figure 3 ; Table 2). Total effort has followed a similar trend as

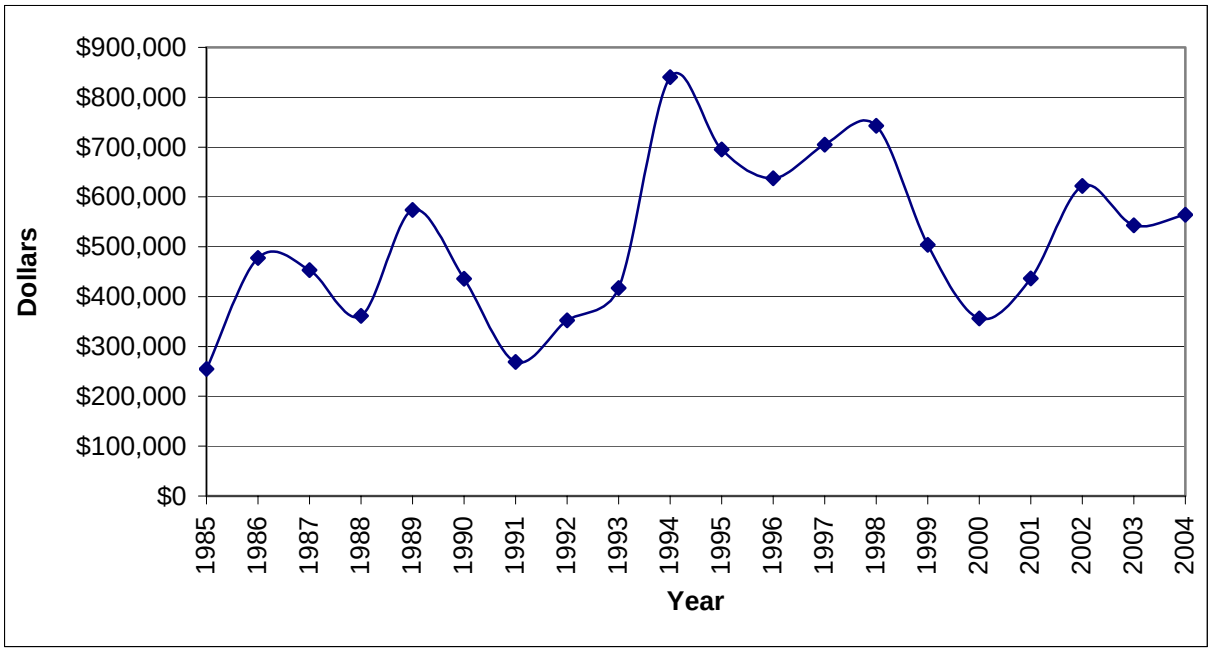

Figure 5. Annual ex-vessel value for gag grouper in North Carolina from 1985 to 2004.

the number of trips, vessels and participants that recorded landings of gag grouper declined from 1994 to 2004 (Figure 4; Table 2).

The number of seafood dealers reporting landings of gag grouper declined from 1994 to 2000 (Figure 4; Table 2). However, the number of dealers increased from 2000 to 2004 peaking in 2003 with 58 dealers reporting landings of gag grouper.

The ex-vessel value for gag grouper has fluctuated widely from 1985 to 2004 (Figure 5). The ex-vessel value for gag grouper increased from 1985 to 1989 and then declined from 1989 to 1991. The ex-vessel value for gag grouper then increased from 1992 to a peak in 1994. After 1994, the ex-vessel value declined until 2000. Since 2000, the ex-vessel value has increased through 2004.

Landings by Area

Landings by District

The vast majority of landings for gag grouper occurred in the southern district, which had 78.2% of the total landings and 77.5% of the total ex-vessel value for gag grouper in North Carolina from 1985 to 2004 (Figure6; Table 3). The central district ranked second with a total of 21.6% of the total landings and 22.2% of the ex-vessel value while the northern district ranked last with 0.1% of the total landings and ex-vessel value. The southern district also accounted for 69.7% of the total number of trips from 1994 to 2004 while the central district accounted for 30% of the trips and the northern district accounted for 0.4% of the trips.

Although the southern district dominated the landings of gag grouper, it also showed the most variation in annual landings and ex-vessel value from 1985 to 2004 (Table 4). Landings and ex-vessel value for the central district also ranged widely early

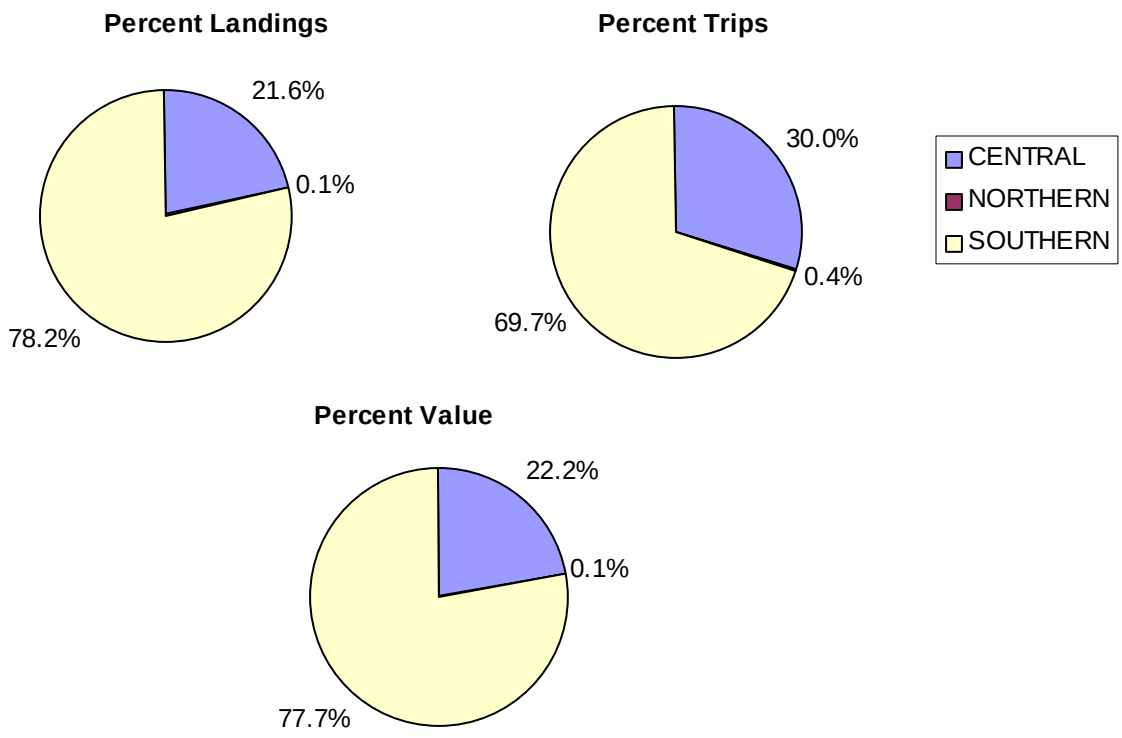

Figure 6. Percent of gag grouper landings and ex-vessel value by district from 1985 to 2004 and trips from 1994 to 2004.

Table 3. Total landings and ex-vessel value of gag grouper by district from 1985 to 2004 and number of trips from 1994 to 2004.

District	Pounds	Value	Trips
Central	1,040,956	$2,274,348	6,803
Northern	6,061	$13,568	81
Southern	3,764,700	$7,953,378	15,807

in the time series from 1985 to 1994 but since 1994 landings have fluctuated from a minimum of 45,000 pounds in 2000 to a maximum of 104,000 pounds in 1994 with the ex-vessel value also following the same type of trend (Table 5). The southern district also dominated the total number of trips landing gag grouper however the number of trips has declined steadily from 1994 to 2000.

Table 4. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in the southern district from 1985 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1985	185,409	$254,472	-	-	-	5
1986	298,860	$474,721	-	-	-	6
1987	270,625	$453,105	-	-	-	9
1988	197,460	$361,286	-	-	-	8
1989	212,440	$378,211	-	-	-	7
1990	176,309	$331,301	-	-	-	8
1991	123,383	$245,292	-	-	-	10
1992	130,936	$267,835	-	-	-	11
1993	140,398	$292,098	-	-	-	13
1994	285,832	$615,110	2,412	241	275	33
1995	255,284	$557,031	1,979	201	238	36
1996	237,274	$521,655	1,702	181	217	35
1997	222,684	$530,573	1,937	182	199	38
1998	227,200	$578,993	1,833	166	181	32
1999	145,943	$369,916	1,190	143	164	27
2000	94,416	$246,129	843	111	132	20
2001	98,242	$252,670	893	113	125	28
2002	163,733	$431,241	1,090	112	118	31
2003	147,019	$390,291	974	117	131	39
2004	151,253	$401,446	954	114	127	31

Table 5. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in the central district from 1985 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1985	Less than 500	Less than $500	-	-	-	1
1986	1,000 to 5,000	$1,000 to $5,000	-	-	-	1
1989	125,422	$195,917	-	-	-	3
1990	59,120	$104,049	-	-	-	3
1991	17,071	$23,971	-	-	-	4
1992	25,000 to 50,000	$50,000 to $100,000	-	-	-	2
1993	50,000 to 75,000	$100,000 to $150,000	-	-	-	2
1994	104,469	$224,831	1,001	89	95	13
1995	63,693	$137,844	813	91	81	13
1996	52,431	$115,272	601	70	69	8
1997	73,140	$173,376	699	76	70	11
1998	67,147	$156,223	740	76	73	14
1999	56,272	$132,849	512	59	77	10
2000	44,950	$109,548	396	44	55	6
2001	75,627	$184,014	553	49	52	10
2002	77,762	$190,073	569	45	49	9
2003	59,884	$151,715	440	48	54	16
2004	64,626	$162,477	479	45	50	14

Table 6. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in the northern district from 1990 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1990	500 to 1,000	$500 to $1,000	-	-	-	1
1992	Less than 500	Less than $500	-	-	-	1
1993	154	$253	-	-	-	3
1994	188	$404	5	5	5	5
1995	223	$486	8	5	5	3
1996	273	$599	12	11	12	6
1997	405	$941	10	8	8	3
1998	3,033	$7,283	13	4	4	4
1999	410	$968	8	4	4	3
2000	180	$439	6	5	5	3
2001	Less than 500	Less than $500	1	1	1	1
2002	Less than 500	Less than $500	6	5	4	2
2003	325	$823	11	4	4	3
2004	Less than 500	Less than $500	1	1	1	1

The number of trips in the southern district has increased slightly since 2000 (Table 4). The number of trips in the central district has also declined but not by the same magnitude as those for the southern district (Table 5). The northern district had minimal landings and trips (Table 6).

The southern district also ranked first in the number of participants, vessels and dealers recording landings of gag grouper from 1994 to 2004 (Tables 4-5). However, like the number of trips, the number of participants and vessels has declined from 1994 to 2000 in both the southern and central districts. The number of participants and vessels has remained relatively constant since 2000. However, the number of seafood dealers has actually increased since 2000 in both the southern and central districts.

Landings by County

Three counties accounted for 83% of the total landings and 82% of the total ex-vessel value of gag grouper from 1985 to 2004; Brunswick, New Hanover and Carteret counties (Figure 7; Table 7). These three counties also accounted for 74% of the total number of trips that landed gag grouper from 1994 to 2004 (Figure 7). Two other counties that accounted for a significant portion of North Carolina's gag grouper landings are Onslow and Pender counties. Onslow accounted for 11% of the total landings while Pender accounted for 6% of the total landings.

Analyzing the annual landings of gag grouper by county, indicate that in the early years from 1985 to 1993 that the majority of gag grouper were landed in Brunswick, New Hanover and Carteret counties (Tables 8-12). Onslow and Pender counties started to show more significant landings of gag grouper in the later years. This may be an artifact of when the NCTTP started in 1994. Near the end of the time frame, landings for Onslow and Pender counties showed a decline (from 2000 to 2004) while landings in the other three counties have showed an increase. The annual ex-vessel value for gag grouper also shows these same types of trends.

The annual number of trips in Onslow and Pender counties has declined since 1994 (Tables 11 and 12). Similarly, the number of trips in Carteret, New Hanover, and Brunswick counties declined from 1994 to 2000 but since 2000 the number of trips in these three counties has increased (Tables 8-10). Following a similar trend to the number of trips, the number of participants and vessels has declined for Pender and Onslow counties. Likewise, the number of vessels and participants has declined for Carteret County

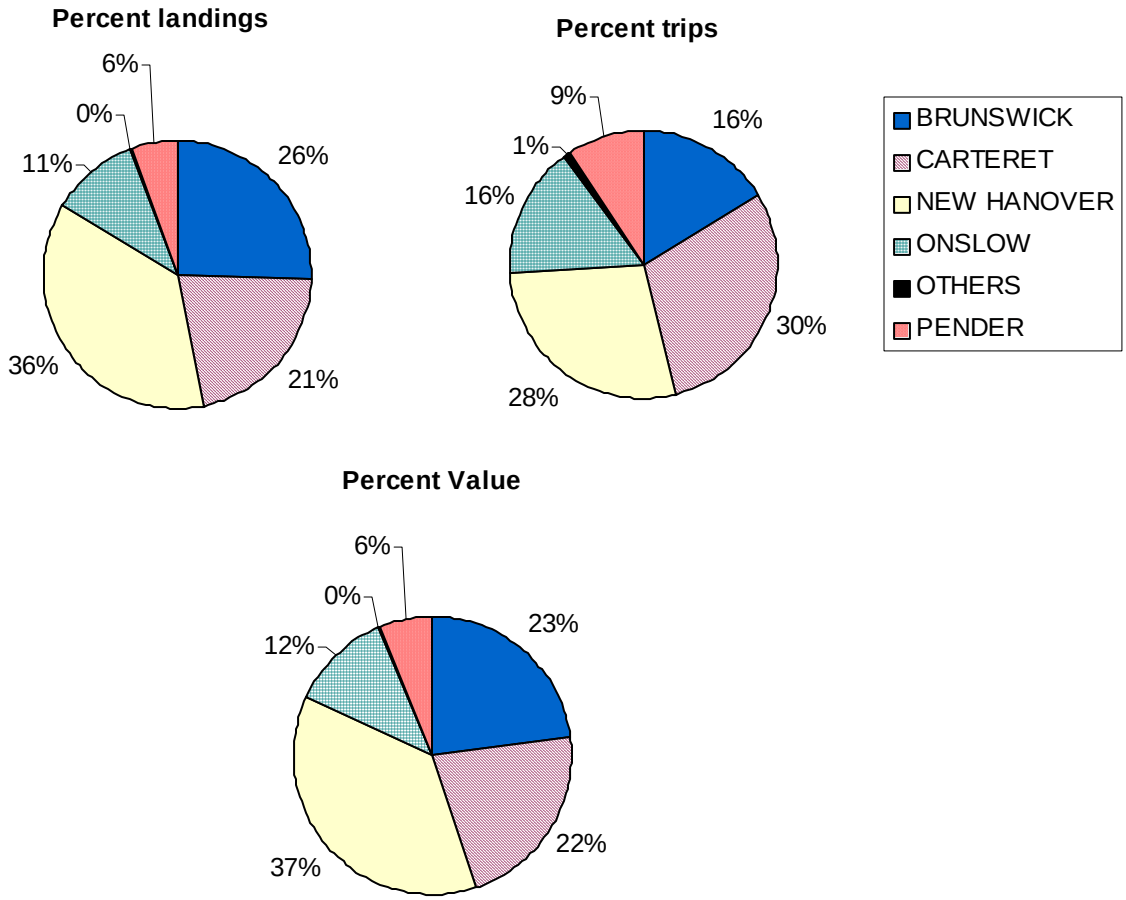

Figure 7. Percent of gag grouper landings and ex-vessel value from 1985 to 2004 and trips from 1994 to 2004 by county.

Table 7. Total landings, ex-vessel value, and trips of gag grouper by county from 1994 to 2004.

County	Pounds	Value	Trips
Brunswick	1,227,635	$2,340,782	3,727
Carteret	1,031,988	$2,253,807	6,709
New Hanover	1,759,684	$3,791,529	6,315
Onslow	505,639	$1,194,863	3,686
Others	19,815	$46,238	187
Pender	266,955	$614,075	2,067

Table 8. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in New Hanover County from 1985 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1985	93,529	$127,263	-	-	-	4
1986	132,164	$217,911	-	-	-	5
1987	92,707	$161,745	-	-	-	6
1988	73,264	$135,802	-	-	-	7
1989	128,745	$232,766	-	-	-	6
1990	115,271	$220,271	-	-	-	7
1991	82,848	$169,380	-	-	-	7
1992	94,059	$194,022	-	-	-	5
1993	84,545	$176,996	-	-	-	7
1994	101,887	$219,260	1,004	126	141	8
1995	104,774	$231,917	863	106	122	8
1996	106,642	$234,457	680	81	94	10
1997	97,481	$236,636	809	93	97	9
1998	127,564	$339,375	803	78	85	9
1999	60,163	$163,956	490	60	71	8
2000	37,184	$104,331	291	45	49	7
2001	30,789	$85,143	267	44	48	9
2002	71,767	$196,701	389	42	42	11
2003	57,529	$157,670	339	52	56	15
2004	66,773	$185,927	380	56	59	12

Table 9. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Brunswick County from 1985 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1985	90,000 to 100,000	$100,000 to $150,000	-	-	-	2
1986	150,000 to 200,000	$256,810	-	-	-	2
1987	177,918	$291,360	-	-	-	4
1988	100,000 to 150,000	$200,000 to $250,000	-	-	-	2
1989	80,000 to 90,000	$100,000 to $150,000	-	-	-	2
1990	60,000 to 70,000	$100,000 to $150,000	-	-	-	2
1991	30,000 to 40,000	$70,000 to $80,000	-	-	-	2
1992	33,187	$66,433	-	-	-	6
1993	41,486	$85,431	-	-	-	5
1994	54,593	$117,483	481	55	62	11
1995	53,465	$115,484	441	50	58	10
1996	48,285	$106,156	422	44	57	8
1997	34,071	$79,204	378	33	41	8
1998	27,162	$63,291	350	31	38	5
1999	23,767	$56,271	231	30	32	5
2000	16,521	$40,292	220	23	23	3
2001	17,818	$43,513	216	26	29	7
2002	23,275	$58,036	270	35	36	6
2003	54,154	$138,321	345	36	38	10
2004	54,515	$138,528	373	37	42	8

Table 10. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Carteret County from 1985 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1985	Less than 500	Less than $500	-	-	-	1
1986	1,000 to 5,000	$1,000 to $5,000	-	-	-	1
1989	125,422	$195,917	-	-	-	3
1990	59,120	$104,049	-	-	-	3
1991	17,071	$23,971	-	-	-	4
1992	30,000 to 40,000	$80,000 to $90,000	-	-	-	2
1993	50,000 to 60,000	$100,000 to $150,000	-	-	-	2
1994	100,231	$215,711	965	87	94	9
1995	62,303	$134,840	794	88	80	10
1996	52,424	$115,256	600	69	69	7
1997	72,934	$172,898	696	75	70	9
1998	67,048	$155,995	736	75	73	13
1999	56,257	$132,814	511	58	76	9
2000	44,950	$109,548	396	44	55	6
2001	75,600	$183,932	552	48	51	9
2002	77,298	$188,939	566	44	48	7
2003	58,775	$148,858	425	42	48	11
2004	63,214	$158,890	468	42	47	10

Table 11. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Onslow County from 1991 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1991	500 to 1,000 Pounds	$500 to $1,000	-	-	-	2
1992	1,000 to 5,000 Pounds	$5,000 to $10,000	-	-	-	1
1993	10,000 to 20,000 Pounds	$20,000 to $30,000	-	-	-	2
1994	68,798	$148,052	500	48	53	8
1995	68,339	$147,612	447	33	41	7
1996	59,806	$131,485	398	41	49	8
1997	58,504	$138,916	513	40	47	12
1998	46,393	$115,521	448	44	47	12
1999	35,987	$88,042	282	40	44	10
2000	22,054	$55,955	193	33	40	6
2001	35,584	$89,644	279	33	36	8
2002	51,889	$135,345	303	30	34	10
2003	28,068	$75,782	223	32	37	7
2004	11,542	$30,549	100	21	23	8

Table 12. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Pender County from 1994 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	60,555	$130,314	427	35	43	6
1995	28,706	$62,018	228	23	29	11
1996	22,541	$49,558	202	30	33	9
1997	32,628	$75,818	237	27	27	9
1998	26,081	$60,806	232	25	23	6
1999	26,025	$61,648	187	20	24	4
2000	18,659	$45,552	139	17	25	4
2001	14,052	$34,370	131	18	19	4
2002	16,802	$41,160	128	14	13	4
2003	5,641	$14,328	63	13	15	6
2004	10,000 to 20,000	$30,000 to $40,000	93	8	9	2

The number of vessels and participants in Brunswick and New Hanover counties declined but has shown an increasing trend in the last few years of the time frame. The number of dealers has declined for Pender County and has fluctuated widely for Carteret and Onslow counties (Tables 10-12). The number of dealers in Brunswick and New Hanover counties declined until 2000 and since 2000 these counties have seen an increase in dealers (Tables 8 and 9).

Landings by Port (Dealer City)

Analyzing the landings of gag grouper from 1994 to 2004 show that the majority of gag grouper landings, ex-vessel value and trips occur in five main ports; Wilmington/Wrightsville Beach, Morehead City/Beaufort, Sneads Ferry, Southport, and Hampstead (Figure 8; Table 13). Two other ports, Hubert and Carolina Beach, had significant landings but cannot be reported because of confidentiality constraints.

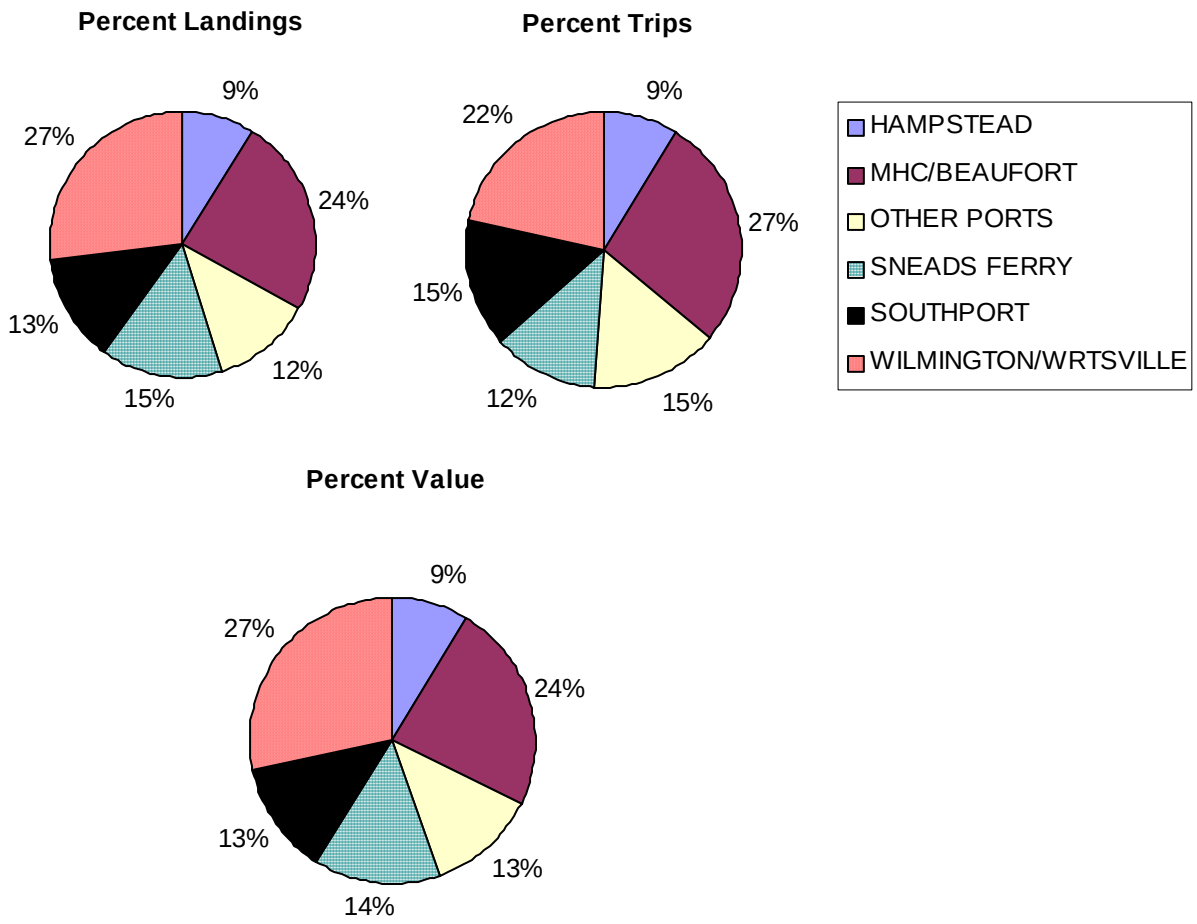

Figure 8. Percent of gag grouper landings, trips and ex-vessel value by port (dealer city), 1994 to 2004.

Table 13. Total landings, ex-vessel value, and trips of gag grouper by port (dealer city) from 1994 to 2004.

Port	Pounds	Value	Trips
Hampstead	246,304	$567,236	1,997
MHC/Beaufort	668,767	$1,566,453	6,210
Other Ports	344,253	$843,023	3,389
Sneads Ferry	404,104	$937,098	2,789
Southport	362,184	$843,096	3,403
Wilmington/Wrtsvlle	748,526	$1,888,871	4,903

Also, in recent years Newport has become a significant port for gag grouper landings.

Annual landings and ex-vessel value for Sneads Ferry, Hampstead and Southport have declined since 1994 while landings and ex-vessel value for MHC/Beaufort and Wilmington/Wrightsville Beach has ranged widely over the time period (Tables 14-18). Although the annual number of trips has declined for all of these port cities, the number of trips for Wilmington/Wrightsville Beach has actually increased since 2001.

The annual number of vessels and participants landing in each of these ports has declined since 1994 (Tables 14-18). The number of dealers reporting landings of gag grouper has declined in Sneads Ferry, Hampstead and Southport and has fluctuated for the MHC/Beaufort area while the number of dealers has increased or the Wilmington/Wrightsville Beach area .

Table 14. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Wilmington/Wrightsville Beach 1994 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	89,319	$192,215	784	93	107	6
1995	94,113	$208,890	659	83	97	7
1996	92,404	$203,154	499	60	69	9
1997	79,359	$194,444	597	70	74	8
1998	109,818	$297,908	637	56	66	8
1999	54,592	$150,778	419	46	56	6
2000	34,855	$98,656	249	35	38	6
2001	28,330	$79,161	215	32	36	8
2002	70,439	$193,745	362	35	35	11
2003	47,790	$132,943	238	35	38	12
2004	47,506	$136,977	244	38	40	10

Table 15. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Morehead City/Beaufort 1994 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	90,756	$195,320	872	82	85	6
1995	58,521	$126,671	737	84	76	7
1996	51,811	$113,907	579	68	68	6
1997	72,107	$170,949	666	73	68	7
1998	65,794	$153,077	707	72	70	9
1999	56,196	$132,669	510	57	75	8
2000	44,950	$109,548	396	44	55	6
2001	75,600	$183,932	552	48	51	9
2002	72,929	$178,260	533	44	48	6
2003	40,536	$102,664	332	39	44	7
2004	39,567	$99,454	326	37	40	6

Table 16. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Hampstead 1994 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	53,729	$115,624	393	34	41	5
1995	26,356	$56,928	208	21	27	7
1996	22,401	$49,250	198	29	32	7
1997	28,254	$65,653	210	23	23	6
1998	25,845	$60,135	230	25	23	5
1999	25,790	$61,040	185	20	24	3
2000	16,085	$39,279	129	17	24	3
2001	9,952	$24,297	107	18	19	3
2002	13,344	$32,616	118	13	12	3
2003	8,139	$20,655	101	14	16	4
2004	10,000 to 20,000	$40,000 to $50,000	118	11	11	2

Table 17. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Sneads Ferry 1994 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	65,673	$141,327	459	35	43	5
1995	62,202	$134,355	395	23	32	5
1996	55,777	$122,628	340	28	34	5
1997	50,941	$121,145	397	22	27	6
1998	42,133	$104,193	352	22	25	7
1999	31,149	$74,941	208	20	25	6
2000	15,644	$38,352	119	15	20	4
2001	25,569	$62,362	177	17	19	4
2002	32,265	$79,449	174	18	21	6
2003	14,997	$38,585	98	14	14	3
2004	7,756	$19,761	70	11	12	3

Table 18. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper in Southport 1994 to 2004.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	49,269	$106,027	454	50	57	6
1995	52,271	$112,906	429	46	54	6
1996	46,706	$102,685	403	39	51	4
1997	33,210	$77,203	362	31	39	5
1998	27,162	$63,291	350	31	38	5
1999	23,744	$56,217	230	29	31	4
2000	16,521	$40,292	220	23	23	3
2001	16,419	$40,086	196	20	23	4
2002	17,044	$41,793	207	23	25	3
2003	40,504	$103,051	270	27	29	4
2004	30,000 to 40,000	$90,000 to $100,000	282	27	31	2

Landings by Gear (Please refer to Appendix 2 to see how gears were assigned)

The SAFMC passed Amendment 4 in 1992 that forced longlines to be fished in waters deeper than 50 fathoms. Longlines accounted for 12% of the commercial harvest during the 1981 to 1991 period (Figure 9; Tables 19 and 20). Since 1992, longlines have had a minimal impact accounting for only 0.37% of the total landings. However, in both time frames the dominant gear was rod-n-reel, accounting for over 87% of the commercial landings from 1981 to 1991 and over 97% of the commercial landings from 1992 to 2004. In recent years, spear fishing has become a more dominant gear and accounts for 1% of the total landings since 1992.

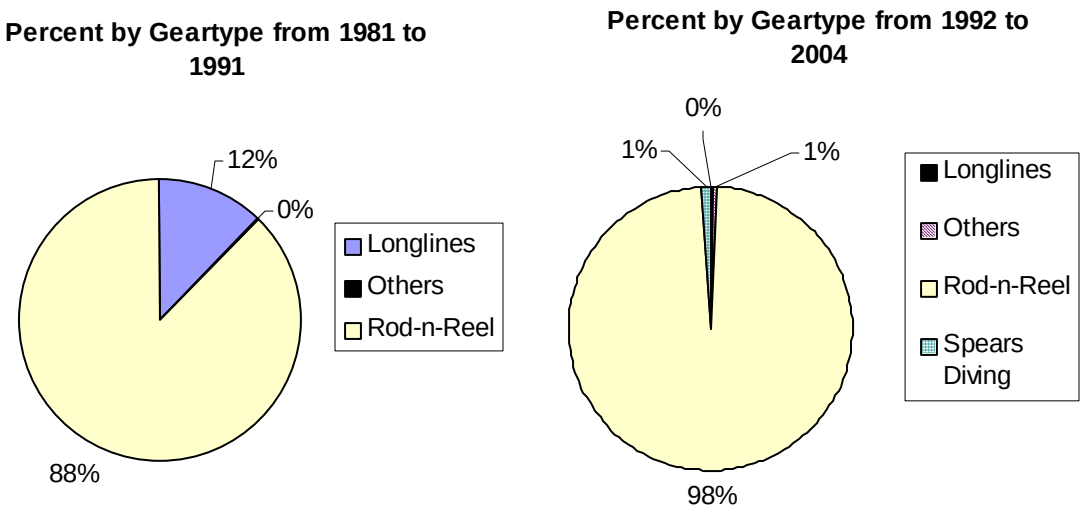

Figure 9. Percent of gag grouper landings by gear from 1981 to 1991 and 1992 to 2004.

Table 19. Total landings of gag grouper by gear type from 1981 to 1991.

Gear	Pounds	Percent
Longlines	203,372	12.19
Others	3,311	0.2
Rod-n-Reel	1,462,346	87.62

Table 20. Total landings of gag grouper by gear type from 1992 to 2004.

Gear	Pounds	Percent
Longlines	11,586	0.37
Others	16,836	0.54
Rod-n-Reel	3,080,215	97.99
Spears Diving	34,718	1.1

Annual landings for rod-n-reel have fluctuated from 1981 to 2004 with the maximum amount of landings occurring in 1994 when almost 376,000 pounds of gag grouper were harvested (Table 21). Since then landings have declined until 2000 when landings begin to once again show an increase. Landings in longlines

Table 21. Annual landings by gear type from 1981 to 2004 for gag grouper.

Year	Rod n Reel	Longlines	Trawls	Spear fishing	Others
1981	457	0	0	0	0
1982	0	0	0	0	0
1983	0	0	0	0	0
1984	209	0	0	0	0
1985	185,635	0	0	0	0
1986	285,919	14,351	0	0	0
1987	173,408	97,217	0	0	0
1988	133,593	63,867	0	0	0
1989	321,373	16,489	0	0	0
1990	230,483	4,040	0	0	1,534
1991	131,269	7,408	0	0	1,777
1992	162,890	4,347	0	2,300	0
1993	197,822	1,635	0	221	0
1994	375,589	753	0	9,174	4,972
1995	311,751	2,165	0	3,292	1,991
1996	285,636	1,016	0	438	2,888
1997	291,461	61	0	1,596	3,111
1998	292,495	1,546	0	958	2,382
1999	201,627	0	0	842	155
2000	138,403	0	0	629	515
2001	171,578	63	0	1,880	374
2002	239,337	0	0	2,057	287
2003	201,967	0	0	5,208	54
2004	209,658	0	0	6,123	107

seemed to be only significant in the late 1980s. The annual ex-vessel value for gag grouper harvested from rod-n-reel gears has also fluctuated widely since 1994 (Table 22).

The annual number of trips harvesting gag grouper has declined for rod-n-reel gears since 1994. The number of spear fishing trips has increased slightly in recent years (Table 24). While the number of trips has declined since 1994, the number of days at sea has actually increased since 1999 for both rod-n-reel gears and spear fishing (Tables 23 and 25).

The number of participants and vessels using rod-n-reel gears to harvest gag grouper has also declined since 1994 (Table 22). However, the number of participants and vessels spear fishing has increased since 2000 (Table 24).

Table 22. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper harvested with rod-n-reel gear.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	375,589	$808,281	3,255	316	355	49
1995	311,751	$679,263	2,691	280	312	52
1996	285,636	$627,982	2,210	242	276	46
1997	291,461	$693,362	2,503	256	266	50
1998	292,495	$730,215	2,515	230	242	48
1999	201,627	$501,274	1,687	191	230	38
2000	138,403	$353,219	1,216	145	178	29
2001	171,578	$431,102	1,403	152	167	39
2002	239,337	$615,671	1,631	153	161	42
2003	201,967	$529,420	1,378	156	173	57
2004	209,658	$548,208	1,362	144	162	44

Table 23. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for gag grouper trips using rod-n-reel gears.

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	115.4	-	-	-	-
1995	115.8	-	-	-	-
1996	129.2	-	-	-	-
1997	116.4	-	-	-	-
1998	116.3	-	-	-	-
1999	119.5	85.5	1.5	2,359	1.4
2000	113.8	62.8	2.0	2,205	1.8
2001	122.3	64.5	2.1	2,662	1.9
2002	146.7	81.2	2.3	2,948	1.8
2003	146.6	73.1	2.1	2,764	2.0
2004	153.9	80.5	2.1	2,605	1.9

The number of dealers reporting landings from rod-n-reel gears decreased from 1994 to 2000 but since then it has increased (Table 22). The number of dealers reporting landings from spears fishing has actually increased from 1994 to 2004 (Table 24).

The annual catch per trip for gag grouper has increased since 1994 for rod-n-reel (Table 23). The catch per trip for fishing spears declined from 1994 to1997 and then increased from 1997 to 2004 (Table 25). Annual catch per trip for longlines has

Table 24. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper harvested with spears gear.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	9,174	$19,743	54	10	9	7
1995	3,292	$7,112	27	8	9	5
1996	438	$962	7	4	4	4
1997	1,596	$3,708	31	7	7	4
1998	958	$2,319	16	5	4	3
1999	842	$2,017	15	8	7	6
2000	629	$1,610	10	4	4	4
2001	1,880	$4,592	26	6	6	4
2002	2,057	$5,393	26	7	7	5
2003	5,208	$13,274	43	7	9	5
2004	6,123	$15,466	64	13	14	10

Table 25. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for gag grouper trips using spears gears.

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	169.9	-	-	-	-
1995	121.9	-	-	-	-
1996	62.5	-	-	-	-
1997	51.5	-	-	-	-
1998	59.9	-	-	-	-
1999	56.2	56.2	1.7	15	1.0
2000	62.9	62.9	1.3	10	1.0
2001	72.3	53.7	1.6	35	1.3
2002	79.1	62.3	2.4	33	1.3
2003	121.1	94.7	2.5	55	1.3
2004	95.7	73.8	3.1	83	1.3

Table 26. Annual landings, ex-vessel value, trips, participants, vessels and dealers for gag grouper harvested with longline gear.

Year	Pounds	Value	Trips	Participants	Vessels	Dealers
1994	753	$1,621	8	5	6	3
1995	2,165	$4,685	9	8	4	4
1996	1,016	$2,234	10	6	6	4
1997	61	$142	2	2	2	2
1998	1,546	$3,822	7	3	3	3
2001	63	$152	1	1	1	1

Table 27. Catch per trip, catch per day, average crew size, trip duration (days), and average trip duration (days) for gag grouper trips using longline gears.

Year	Catch / Trip	Catch / Day	Crew Size	Trip Duration	Average Trip Duration
1994	94.2	-	-	-	-
1995	240.6	-	-	-	-
1996	101.6	-	-	-	-
1997	30.6	-	-	-	-
1998	220.8	-	-	-	-
2001	62.5	15.6	3.0	4	4.0

fluctuated widely since 1994 with no landings occurring since 2001 (Table 26). The annual catch per day of gag grouper for rod-n-reel gears has remained relatively stable since 1999 and has increased for spears fishing since 1999 (Tables 23 and 25). The average crew size for rod-n-reel trips increased from 1999 to 2002 and since then has declined to about two per trip in 2004 (Table 23). The average crew size for fishing spear trips has increased since 1999, going from an average 1.7 to 3.1 people per trip (Table 25). The average trip duration for rod-n-reel gears has increased since 1999 from 1.5 days to almost two days per trip (Table 23). The average trip duration for spear fishing increased from one to almost 1.5 in 2001 and has remained constant since then (Table 25).

Landings by Vessel Length

The vast majority of trips, landings, and ex-vessel value of gag grouper since 1994 has been harvested on vessels ranging from 20 to 40 feet (Figure 10; Table 28). Likewise, since 1999, the vast majority of days at sea occur on vessels ranging from 20 to 40 feet (Table 28). Looking at annual trends, landings, ex-vessel value, and trips have declined for vessels ranging from 20-30 feet but have increased for those vessels ranging from 30-40 feet. Since 1999, the number of days at sea for vessels in the 20-30 foot

range have remained relatively stable while the number of days at sea for vessels in the 30-40 foot range have increased.

From 1999 to 2004 the average crew size has increased across all vessel ranges, though it is not always true that the larger vessels have a larger crew size (Figure 11). It appears that the larger the vessel the longer the vessel stays out at sea. Accordingly, the trip duration for a 30 to 50 foot vessel has increased since 1999 while the trip duration for all of the other vessel size ranges have either remained stable or have declined over time (Figure 12).

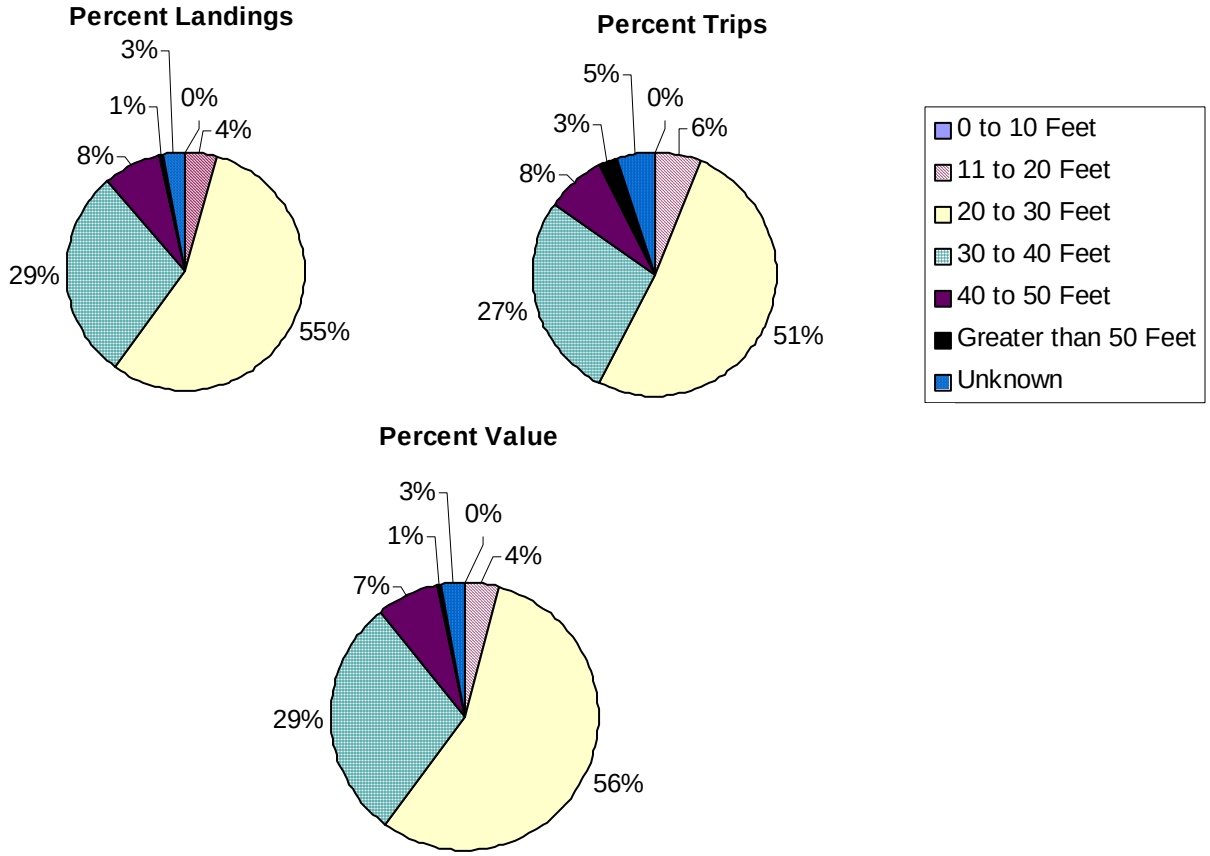

Figure 10. Total gag grouper landings, trips and ex-vessel value by vessel size from 1994 to 2004.

The catch per trip has increased from 1994 to 2004 for vessels ranging from 30 to 40 feet. (Figure 13) Vessels ranging from 40 to 50 feet declined in catch per trip from 1994 to 2000 but then increased from 2000 to 2004. Vessels in the 11 to 20 foot category exhibited a declining trend in catch per trip while the catch per trip for vessels in the 20 to 30 foot range have remained relatively stable. The annual catch per day for vessels in the 30 to 40 foot range increased from 1999 to 2004 (Figure 14). The annual catch per day for vessels in the 20 to 30 foot range has fluctuated slightly since 1999. The annual catch

Table 28. Total landings, ex-vessel value, number of trips of gag grouper by vessel length range from 1994 to 2004, and trip duration (days at sea) from 1999 to 2004.

Length	Pounds	Value	Trips	Trip duration
0 to 10 Feet	734	$1,583	8	8
11 to 20 Feet	116,669	$266,561	1,356	1,474
20 to 30 Feet	1,544,979	$3,720,202	11,695	13,555
30 to 40 Feet	798,572	$1,941,513	6,146	9,894
40 to 50 Feet	214,695	$492,505	1,768	2,886
Greater than 50 Feet	16,705	$37,618	569	577
Unknown	81,786	$185,795	1,149	1,220

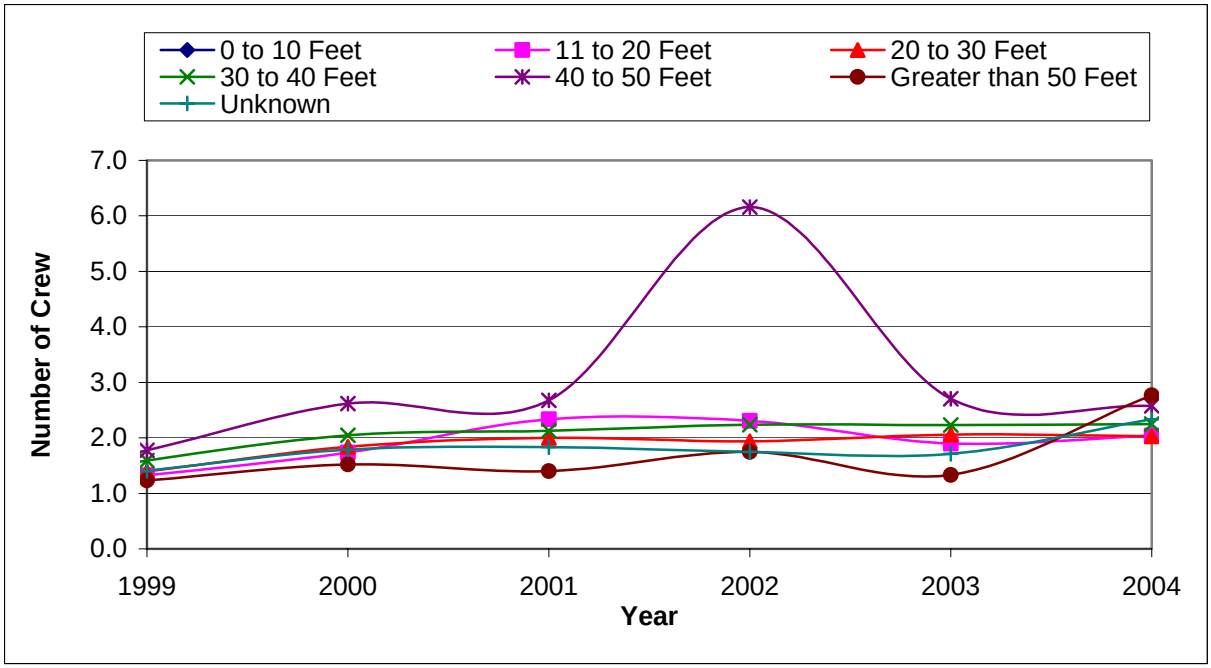

Figure 11. Annual average crew size for gag grouper by vessel size from 1999 to 2004.

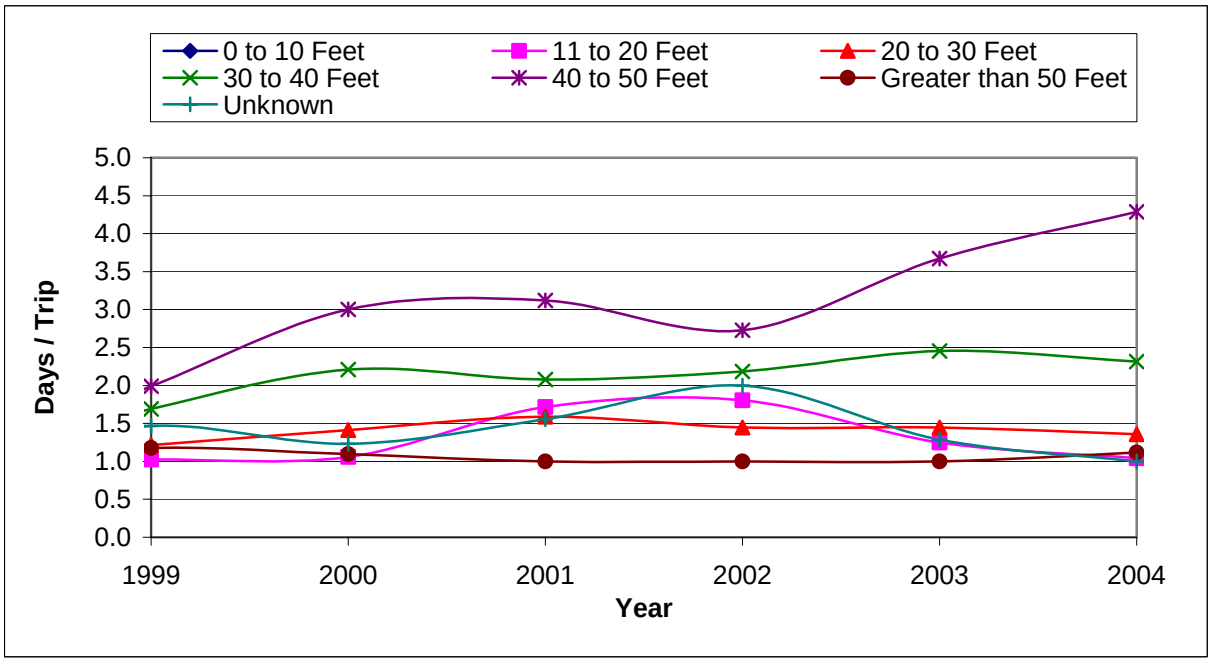

Figure 12. Annual average trip duration for gag grouper by vessel size from 1999 to 2004.

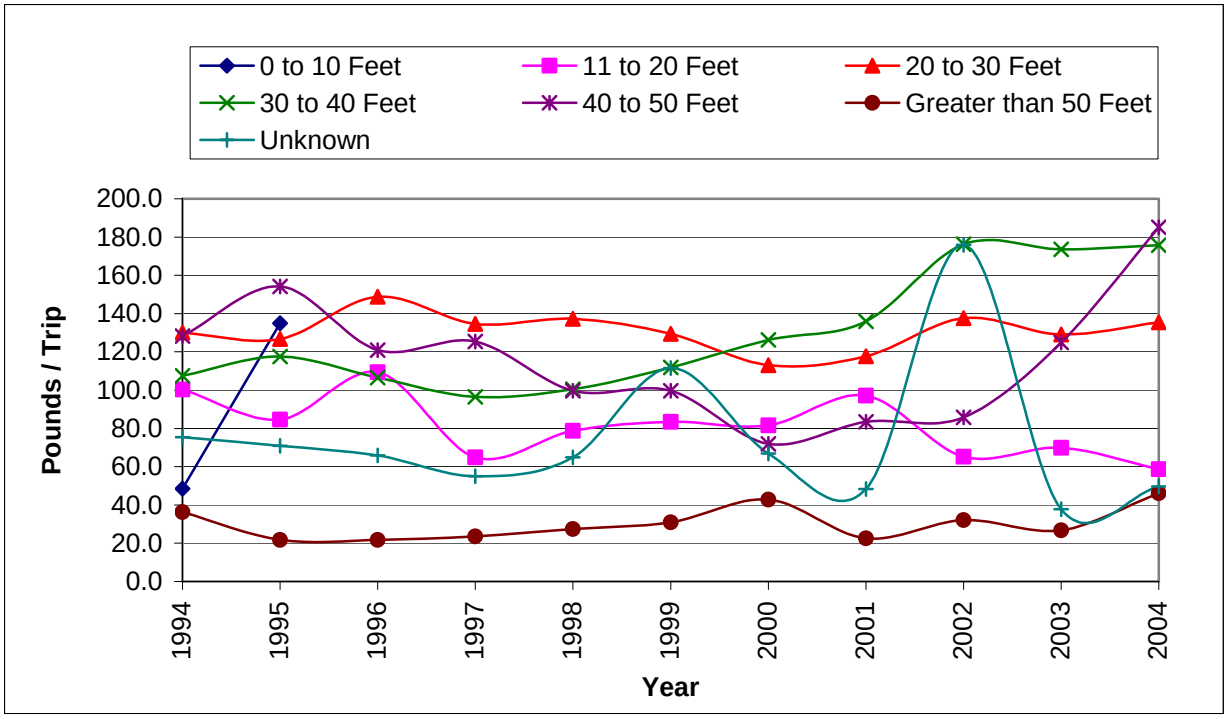

Figure 13. Annual catch per trip for gag grouper by vessel size from 1994 to 2004.

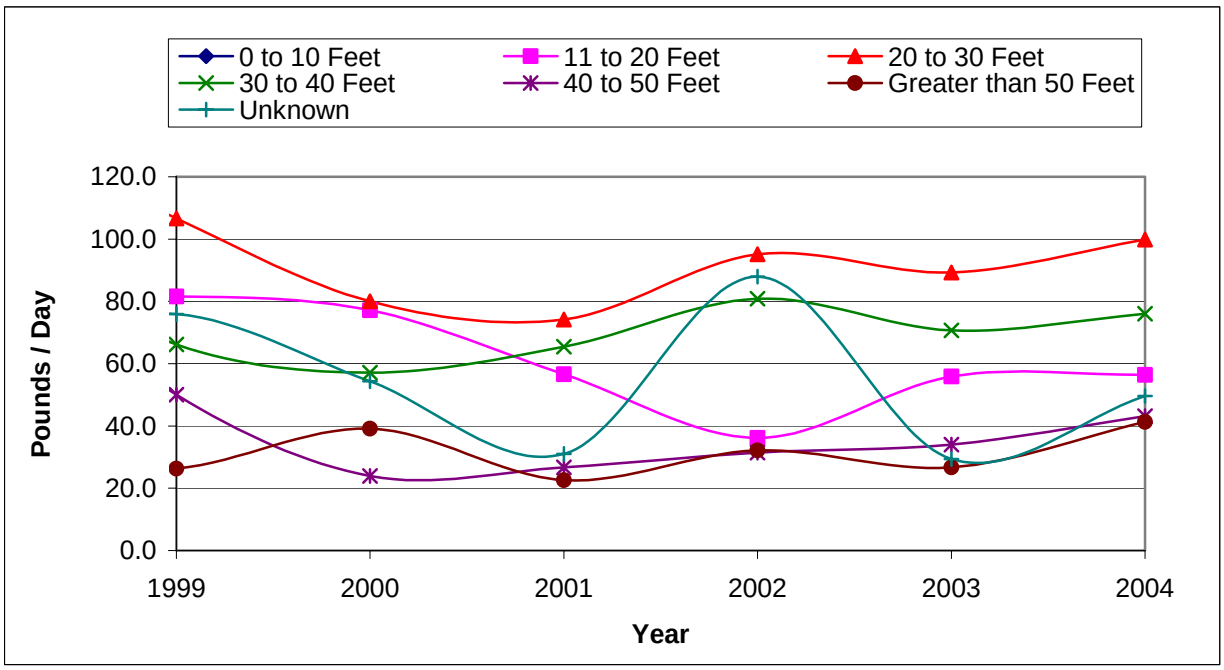

Figure 14. Annual catch per day for gag grouper by vessel size from 1999 to 2004.

per day for vessels in the 11 - 20 foot range has declined since 1999. The annual catch per day for other vessel ranges seemed to remain relatively stable since 1999.

Landings by Month

Gag grouper are harvested throughout the year in North Carolina (Figures 15-17). However, most gag grouper appear to be harvested in the late spring through the late fall months.

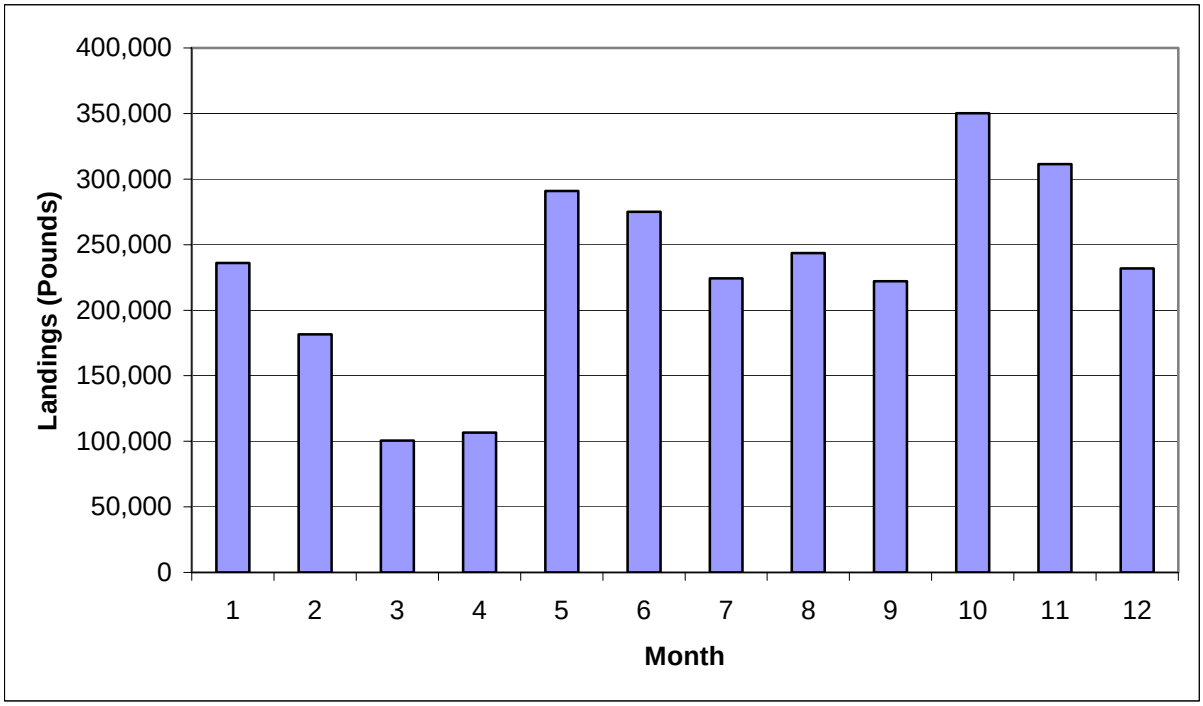

Figure 15. Total monthly landings of gag grouper from 1994 to 2004.

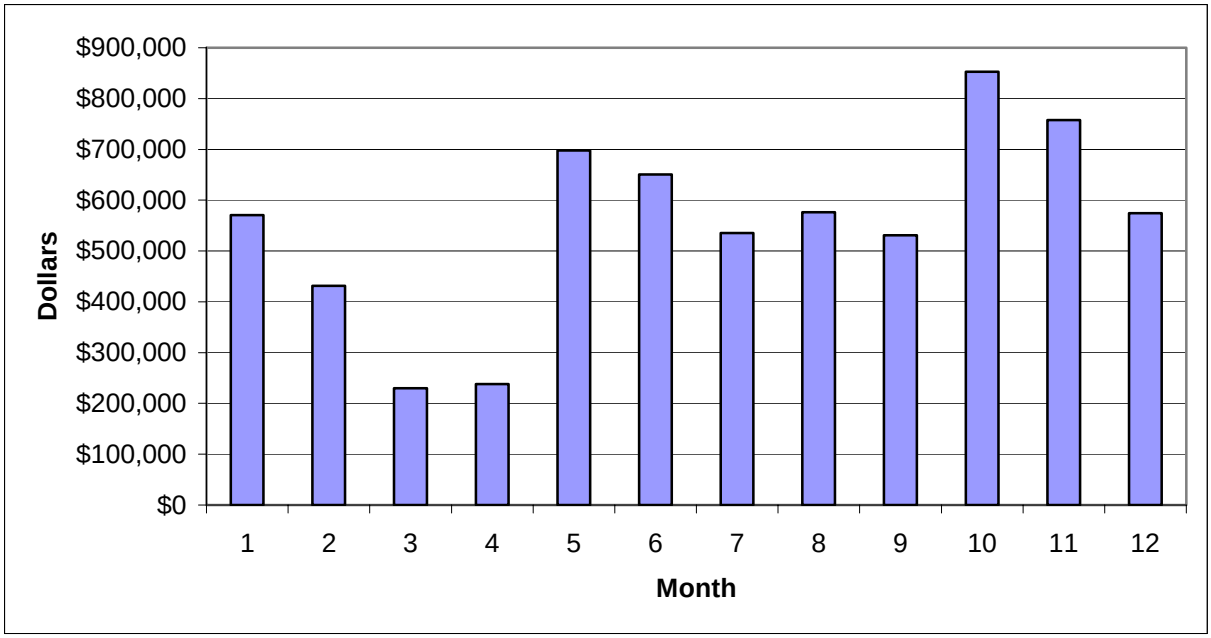

Figure 16. Total ex-vessel value by month for gag grouper from 1994 to 2004.

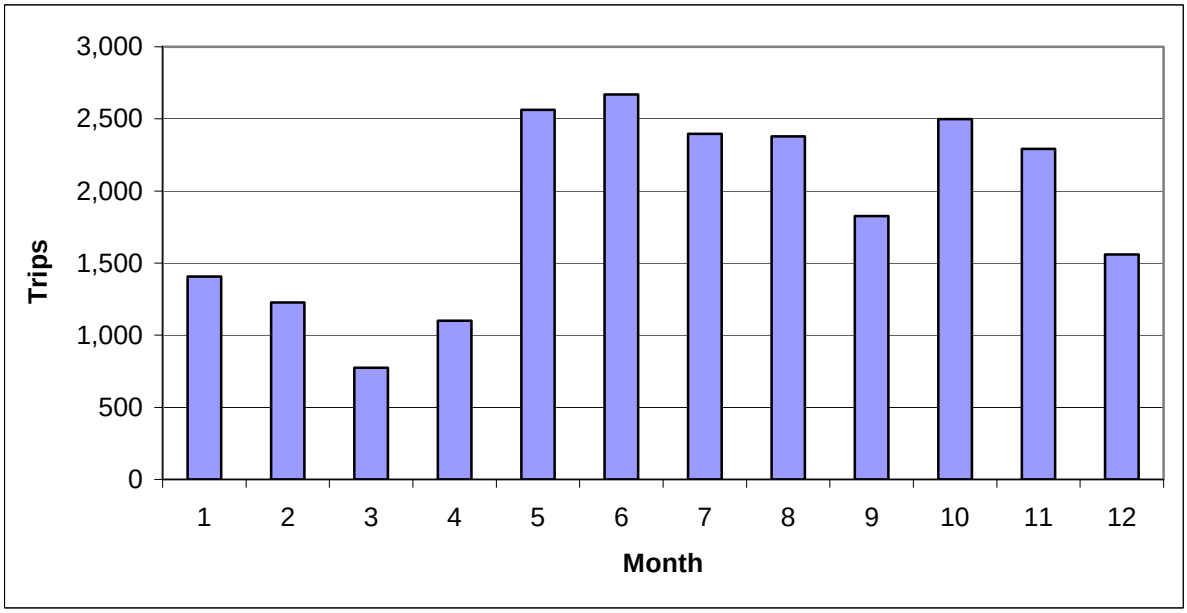

Figure 17. Total number of trips by month of gag grouper from 1994 to 2004.

Estimated Amount of Gag Grouper in Unclassified Landings Determined at SEDAR 10

The adjusted landings and proportions calculated at the SEDAR 10 workshop for gag grouper are presented in the following tables and graphs (Figure 18; Tables 29-34). The adjusted landings from 1994 to 2004 do not vary from the original dataset. It is known that gag grouper comprises very little of the unclassified or mixed categories of grouper and therefore it has been decided that no adjustments will be made to the landings data from 1994 to 2004. Also, all calculations and landings are presented in gutted weight to account for differences in conversion factors across the states.

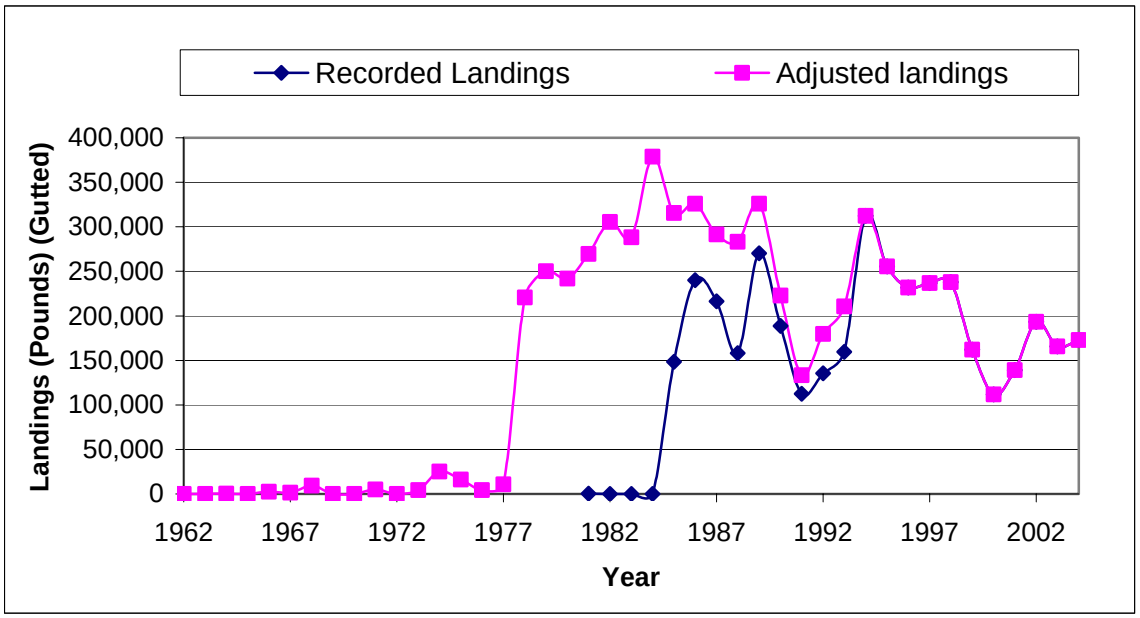

Figure 18. Total recorded landings of gag grouper and total adjusted landings of gag grouper from 1962 to 2004

Table 29. Mean, Standard Deviation, Coefficient of Variation and Upper and Lower bounds for all gear proportions from 1981 to 1991.

	Rod n Reel	Longlines	Trawls	Spears	Others
Mean	0.463	0.166	0.00	0.00	0.166
Std. Dev.	0.090	0.168	0.00	0.00	0.331
CV	19.33	101.16	0.00	0.00	199.57
Lower	0.284	0.000	0.00	0.00	0.000
Upper	0.642	0.503	0.00	0.00	0.827

Table 30. Gag grouper to other identified grouper ratios by gear, 1981-1991.

Year	Rod n Reel	Longlines	Trawls	Spears	Others
1981	0.393	-	-	-	-
1982	0.419	-	0.000	-	0.000
1983	0.390	0.000	-	-	-
1984	0.571	0.160	0.000	-	1.000
1985	0.577	0.000	0.000	-	0.000
1986	0.549	0.279	0.000	-	0.000
1987	0.474	0.446	0.000	-	0.000
1988	0.476	0.393	0.000	-	0.000
1989	0.546	0.259	0.000	-	0.000
1990	0.383	0.051	-	-	0.264
1991	0.314	0.076	-	-	0.227

Table 31. Total gag grouper broken out of unclassified category using proportions by landings.

Year	Rod n Reel	Longlines	Trawls	Spears	Others
1962	148	0	0	0	0
1963	148	0	0	0	0
1964	519	0	0	0	0
1965	0	0	0	0	0
1966	2,333	0	0	0	66
1967	741	0	0	0	848
1968	9,148	0	0	0	40
1969	0	0	0	0	0
1970	0	0	0	0	0
1971	5,185	0	0	0	0
1973	0	0	0	0	0
1974	3,591	0	0	0	900
1975	24,927	0	0	0	359
1976	16,106	0	0	0	187
1977	4,302	0	0	0	29
1978	10,832	0	0	0	17
1979	220,559	117	0	0	0
1980	250,253	0	0	0	0
1981	240,499	1,278	0	0	20
1982	163,868	0	0	0	0
1983	207,369	0	0	0	0
1984	198,056	0	0	0	0
1985	188,586	3,239	0	0	240
1986	117,968	0	0	0	0
1987	85,621	126	0	0	0
1988	70,775	4,368	0	0	0
1989	122,484	2,810	0	0	0
1990	55,434	66	0	0	0
1991	33,891	13	0	0	9
1992	20,592	204	0	0	101
1993	35,695	3	0	0	0

Table 32. Total adjusted gag grouper landings (gag grouper landings + unclassified proportions, gutted weight).

Year	Rod n Reel	Longlines	Trawls	Spears	Others	Total
1962	148	0	0	0	0	148
1963	148	0	0	0	0	148
1964	519	0	0	0	0	519
1965	0	0	0	0	0	0
1966	2,333	0	0	0	66	2,400
1967	741	0	0	0	848	1,589
1968	9,148	0	0	0	40	9,188
1969	0	0	0	0	0	0
1970	0	0	0	0	0	0
1971	5,185	0	0	0	0	5,185
1972	0	0	0	0	0	0
1973	3,591	0	0	0	900	4,490
1974	24,927	0	0	0	359	25,286
1975	16,106	0	0	0	187	16,293
1976	4,302	0	0	0	29	4,331
1977	10,832	0	0	0	17	10,850
1978	220,559	117	0	0	0	220,676
1979	250,253	0	0	0	0	250,253
1980	240,499	1,278	0	0	20	241,797
1981	269,532	0	0	0	0	269,532
1982	305,443	0	0	0	0	305,443
1983	288,172	0	0	0	0	288,172
1984	364,054	14,424	0	0	400	378,878
1985	315,538	0	0	0	0	315,538
1986	314,356	11,607	0	0	0	325,963
1987	209,501	82,142	0	0	0	291,643
1988	229,358	53,904	0	0	0	283,262
1989	312,533	13,257	0	0	0	325,790
1990	218,278	3,245	0	0	1,236	222,759
1991	125,607	6,131	0	0	1,522	133,260
1992	174,235	3,481	0	1,840	0	179,555
1993	208,997	1,308	0	177	0	210,482
1994	300,471	603	0	7,339	3,978	312,391
1995	249,401	1,732	0	2,634	1,593	255,360
1996	228,509	813	0	350	2,310	231,982
1997	233,169	49	0	1,277	2,488	236,983
1998	233,996	1,236	0	766	1,906	237,904
1999	161,302	0	0	674	124	162,100
2000	110,723	0	0	503	412	111,637
2001	137,263	50	0	1,504	300	139,116
2002	191,470	0	0	1,645	229	193,344
2003	161,573	0	0	4,167	43	165,783
2004	167,727	0	0	4,899	86	172,711

Table 33. Total lower bound adjusted gag grouper landings (gag grouper landings + unclassified proportions, gutted weight).

Year	Rod n Reel	Longlines	Trawls	Spears	Others
1962	91	0	0	0	0
1963	91	0	0	0	0
1964	318	0	0	0	0
1965	0	0	0	0	0
1966	1,431	0	0	0	0
1967	454	0	0	0	0
1968	5,611	0	0	0	0
1969	0	0	0	0	0
1970	0	0	0	0	0
1971	3,180	0	0	0	0
1972	0	0	0	0	0
1973	2,202	0	0	0	0
1974	15,289	0	0	0	0
1975	9,878	0	0	0	0
1976	2,639	0	0	0	0
1977	6,644	0	0	0	0
1978	135,278	0	0	0	0
1979	153,491	0	0	0	0
1980	240,499	1,278	0	0	20

Table 34. Total upper bound adjusted gag grouper landings (gag grouper landings + unclassified proportions, gutted weight).

Year	Rod n Reel	Longlines	Trawls	Spears	Others
1962	205	0	0	0	0
1963	205	0	0	0	0
1964	719	0	0	0	0
1965	0	0	0	0	0
1966	3,236	0	0	0	331
1967	1,027	0	0	0	4,233
1968	12,686	0	0	0	198
1969	0	0	0	0	0
1970	0	0	0	0	0
1971	7,190	0	0	0	0
1972	0	0	0	0	0
1973	4,979	0	0	0	4,490
1974	34,565	0	0	0	1,790
1975	22,333	0	0	0	932
1976	5,965	0	0	0	144
1977	15,020	0	0	0	87
1978	305,839	353	0	0	0
1979	347,015	0	0	0	0
1980	333,490	3,863	0	0	101

Summary

Commercial landings of gag grouper in North Carolina have declined since the early and mid 1980s and total number of trips, participants and vessels have declined since 1994. Since 2000, gag grouper landings and the number of trips have increased overall but, if the stock is determined to be overfished and management regulations are put into effect to protect the stock, it is unlikely that the commercial landings of gag grouper will reach levels previously observed in the mid 1980s and early 1990s. The adjusted landings of gag grouper show that the fishery expanded in the late 1970s and early 1980s. Landings rose dramatically from 1977 at around 10,000 pounds to over 364,000 pounds in 1984. Landings since then have declined overall with a large decrease from 1989 to 1991 and another large decrease from 1998 to 2000.

The majority of gag grouper harvest occurs in the southern and central districts with most landings being recorded in the Wilmington/Wrightsville Beach, Southport, Hampstead, Sneads Ferry, Carolina Beach and Morehead City/Beaufort areas.

The vast majority of gag grouper is harvested with rod-n-reel gears. In the early 1980s, longline gears also composed a significant portion of the catch however after 1992, with the implementation of the management measures in Amendment 4, gag grouper landings from longlines dropped significantly. In recent years, spear fishing has accounted for approximately 1% of the total landings for gag.

The majority of gag grouper harvest and trips comes from vessels that range from 20 to 40 feet; these vessels also account for the majority of days at sea harvesting gag grouper. Vessels in the 40 to 50 feet range tend to have the largest annual average crew size and annual average trip duration. So if any new regulations are needed, participants

who operate or work on vessels within the 20 to 40 foot range will be affected more than the other size ranges.

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SAS®. 1989. SAS/STAT® User's Guide, Version 6, Fourth Edition, Volume 1, Cary, North Carolina: SAS Institute Inc. 943 pp.

Watterson, J. C. 1999. Interstate Fisheries Management Program Implementation for North Carolina: North Carolina Commercial Statistics System Enhancement, April 1996-March 1999. North Carolina Division of Marine Fisheries, Morehead City, North Carolina. 182 pp. + appendix.

Appendix 1: Landings Data Sources

Landings data for this analysis came from four primary data sets. This analysis includes landings of grouper dating back to 1950. Landings from 1950 to 1961 were generated from a dataset that was provided to us by David Gloeckner at the NMFS Southeast Fisheries Science Center Beaufort Laboratory. Due to the way the data were collected, data in this file are extremely limited in scope and should be used cautiously.

Similarly, landings from 1962 to 1971 were derived from another file provided by the NMFS. The data in this file are also subject and may not be very accurate because of how the data were collected at the time. Landings from 1972 to 1993 came from the request file (which should mirror NC landings in the general canvas data set of the SEFSC). This data set is far better than the other two in accuracy and in coverage.

Data from 1994 to present were derived from the trip ticket program. These data are by far the most reliable and the most accurate. The trip ticket program collects landings data at a trip level and you can see an immediate drop in the amount of unclassified landings of grouper after its implementation in 1994.

Appendix 2: Gear assignments for the Gag Grouper Landings Data

The following gear groupings were used to determine landings of gag grouper and other grouper species by gear for the landings data from the 1950 to 1962 file, the 1962 to 1971 file, and the request file:

```
Length Geartype $ 15;
*If Gear=345 Then Geartype='Pots';
If Gear in (610,660) Then Geartype='Rod-n-Reel';
Else if Gear in (675,676,677) Then Geartype='Longlines';
Else if Gear in (210,214,215) Then Geartype='Trawls';
Else if Gear in (760,943) Then Geartype='Spears Diving';  *Note:
Gigs assigned to spears;
Else if Gear in (425,275,345) Then Geartype='Others';
Else Geartype='OOOOOPPPPPS';
```

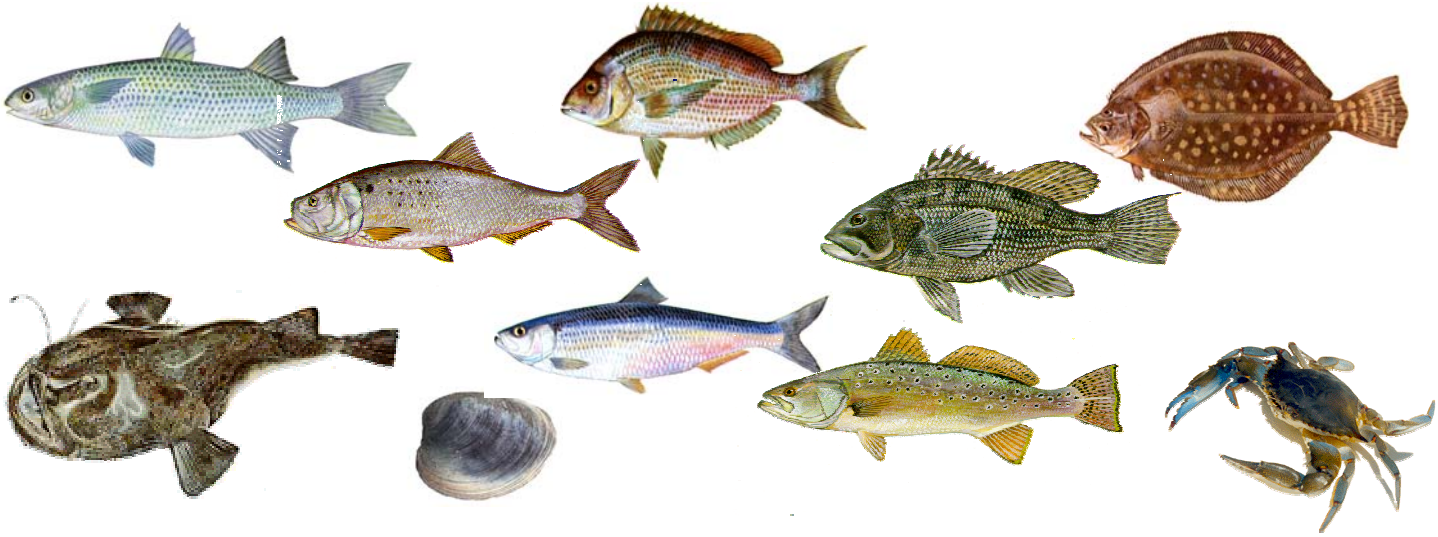
For trip ticket data the following set of coding was used to assign the landings to the most appropriate gear when looking at multi-gear trips.

```
*** Gag Grouper Gear classifcations***;

If spcode in (310,311) and Gear1=215 and Gear2=610 Then Gear1=610;
If spcode in (310,311) and Gear1=480 and Gear2=610 Then Gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=. and Gear3=. Then
Gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=345 Then Gear1=345;
If spcode in (310,311) and Gear1=660 and Gear2=345 and Gear3=610 then
gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=480 Then Gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=610 Then Gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=675 Then Gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=676 and Gear3=677 then
gear1=610;
If spcode in (310,311) and Gear1=660 and Gear2=943 then Gear1=943;

**** Grouper Unclassified****;

If spcode in (260,261) and Gear1=660 and Gear2=. and Gear3=. Then
Gear1=610;
If spcode in (260,261) and Gear1=660 and Gear2=345 Then Gear1=345;
If spcode in (260,261) and Gear1=660 and Gear2=610 Then Gear1=610;
If spcode in (260,261) and Gear1=660 and Gear2=676 Then Gear1=610;
If spcode in (260,261) and Gear1=660 and Gear2=943 Then Gear1=943;
If spcode in (260,261) and Gear1=680 and Gear2=215 Then Gear1=610;

**** Other Groupers***;
```

```
If spcode not in (260,261,310,311) and Gear1=480 and Gear2=610 Then
Gear1=610;
If spcode not in (260,261,310,311) and Gear1=660 and gear2=. and
gear3=. then gear1=610;
If spcode not in (260,261,310,311) and Gear1=660 and Gear2=610 then
gear1=610;
If spcode not in (260,261,310,311) and Gear1=660 and Gear2=345 Then
Gear1=345;
If spcode not in (260,261,310,311) and Gear1=660 and Gear2=345 and
Gear3=610 then gear1=610;
If spcode not in (260,261,310,311) and Gear1=660 and Gear2=676 then
gear1=610;
If spcode not in (260,261,310,311) and Gear1=660 and Gear2=676 and
Gear3=677 then gear1=610;
If spcode not in (260,261,310,311) and Gear1=660 and Gear2=943 Then
gear1=943;

Length Geartype $ 15;
*If Gear1=345 Then Geartype='Pots';
If Gear1=610 Then Geartype='Rod-n-Reel';
Else if Gear1 in (675,676,677) Then Geartype='Longlines';
Else if Gear1 in (210,214,215,230) Then Geartype='Trawls';
Else if Gear1=943 Then Geartype='Spears Diving';
Else if Gear1 in (425,275,475,480,30,330,345) Then Geartype='Others';
Else Geartype='OOOOOPPPPPS';
```