Length frequency distributions for gag groupers in the Gulf of Mexico from 1984-2012

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Introduction

This report documents changes in the length frequency distributions of gag groupers collected from the Gulf of Mexico from 1984 to 2012. Some sampling issues that may have influenced the variability in the length frequency distributions of gag groupers are noted below. Comparisons between length frequency distributions for length and age samples were made to determine whether age samples were randomly sub-sampled from length samples and how age samples should be used.

Materials and Methods

Length samples for commercial fisheries were obtained from the Trip Interview Program (TIP) database. All commercial data were grouped into 3 strata (handline, longline and other gear types). Length samples for recreational fisheries were obtained from (1) the Marine Recreational Fisheries Statistics Survey, (2) the Head Boat Survey, (3) the Texas Parks and Wildlife Department database, (4) the Gulf FIN database, and (5) the TIP database. All recreational length data were grouped into two strata (head boat and charter-private boat). Length samples were grouped into 1 inch bins (e.g., if 1 \leq length < 2 then length=1). All length values in the original data sets were converted to fork lengths by using the equations listed in SEDAR33-DW22.

Age samples for both commercial and recreational fisheries were from the Panama City Laboratory, SEFSC. Age samples were grouped into the same strata as length samples. Only random length and age samples were used for the estimation of length frequency distributions.

Results and Discussion

Variations in the length frequency distributions for gag groupers among different strata and years may be influenced by many factors, such as gear types, fishing regulations (size limit, bag limit, etc.) and year class strength (Figs. 1-4). In addition, there are several sampling issues worth noting for gag groupers length samples. In particular, the sample sizes for recreational fisheries were small in general, which may increase year over year variability (Table 2). Also, the proportions of trips with small trip sample sizes for commercial handline and longline fisheries were large (Tables 3-6). For example, nearly 70% of commercial fishing trips had trip sample sizes less than or equal to five in 2012. The small overall sample sizes in recreational samples and large percentage of trips with small trip sample sizes in commercial samples may have increased the variability of length frequency distributions among different strata and years (Chih, 2010).

Age samples for the strata shown in this report were sub-samples from length samples. The length frequency distributions from these two sample types should be the same if age samples were randomly sub-sampled and sample sizes were adequate. Comparisons of length frequency distributions between length and age samples showed that in earlier years and in some strata, the age samples were not representative either due to insufficient sample sizes or non-random sampling (Figs. 5-8). Around 2004-2005, random otolith sampling methods were used so that otoliths were taken from nearly all length samples. As a result, the sample sizes of age samples were very similar to length samples and the length frequency distributions for the two sample types were very similar. In conclusion, the comparisons of length frequency distributions showed that age frequency distributions estimated from age samples may not be representative in certain year/strata and that the reweighted method (or age length key method) may need to be used to estimate the age composition and growth curve for gag groupers.

References

Chih, Ching-Ping, 2010. Incorporating effective sample sizes into sampling designs for reef fish. Fisheries Research 105: 102-110.

Lombardi, L., G.R. Fitzhugh, and B. Barnett, 2013. Age, length and growth of gag (*Mycteroperca microlepis*) from the northeastern Gulf of Mexico: 1978-2012, SEDAR-DW-22.

Table 1. Sample sizes for gag grouper length and age samples collected from commercial fisheries in the Gulf of Mexico from 1984 to 2012.

Year	Age samples handline	Length samples handline	Age samples longline	Length samples longline	Age samples other gears	Length samples other gears
1984	0	820	0	475	0	4
1985	0	787	0	565	0	78
1986	0	356	0	1133	0	41
1987	0	559	0	685	0	0
1988	0	175	0	276	0	0
1989	0	42	0	129	0	21
1990	0	984	0	1665	0	1
1991	210	770	7	943	0	38
1992	66	1149	22	933	0	73
1993	417	1871	12	791	1	41
1994	439	2858	3	777	2	43
1995	284	2453	31	1001	0	6
1996	197	3140	57	1055	3	39
1997	34	3398	6	1221	2	392
1998	106	8072	101	5063	3	149
1999	145	5926	243	4659	2	306
2000	387	4018	177	4201	6	206
2001	745	5514	867	4159	0	287
2002	809	4114	1085	4149	15	323
2003	520	2213	1117	3908	3	110
2004	894	2826	1480	2672	0	18
2005	740	1844	857	2401	9	113
2006	641	813	527	1761	1	42
2007	408	388	936	1040	2	26
2008	680	1069	506	1315	0	50
2009	1027	894	772	741	0	3
2010	798	1108	883	949	27	21
2011	1436	1486	518	530	11	24
2012	1616	1945	457	500	34	38

Table 2. Sample sizes for gag grouper length and age samples collected from recreational fisheries in the Gulf of Mexico from 1981 to 2012.

Year	Age samples headboat	Length samples headboat	Age samples charter boat & private boat	Length samples charter boat & private boat
1981	0	18	0	27
1982	0	19	0	69
1983	0	78	0	42
1984	0	34	0	284
1985	0	116	0	21
1986	0	663	0	171
1987	0	651	0	203
1988	0	381	0	138
1989	0	450	0	92
1990	0	367	0	105
1991	38	165	79	152
1992	131	160	234	551
1993	89	149	281	556
1994	104	239	187	404
1995	101	191	201	244
1996	141	277	448	469
1997	70	320	164	766
1998	66	527	53	1355
1999	11	493	99	2267
2000	23	339	36	1982
2001	31	263	132	1300
2002	17	301	345	1450
2003	74	384	257	1662
2004	39	234	100	2641
2005	127	238	122	1974
2006	57	170	40	856
2007	25	174	53	588
2008	27	223	235	1030
2009	198	307	206	700
2010	219	340	521	1204
2011	24	51	377	562
2012	16	107	256	757

Table 3. Proportion of trips with trip sample sizes less than or equal to five from commercial gag grouper fisheries in the Gulf of Mexico from 1984 to 2012.

Year	No. trips	No. trips with n <=5	Proportion trips with n <=5
1984	56	12	0.21
1985	101	43	0.43
1986	106	30	0.28
1987	58	10	0.17
1988	25	2	0.08
1989	9	•	•
1990	144	46	0.32
1991	225	144	0.64
1992	240	142	0.59
1993	326	196	0.60
1994	310	169	0.55
1995	344	195	0.57
1996	371	190	0.51
1997	397	226	0.57
1998	595	188	0.32
1999	606	225	0.37
2000	511	207	0.41
2001	503	168	0.33
2002	528	176	0.33
2003	525	197	0.38
2004	455	193	0.42
2005	460	196	0.43
2006	368	206	0.56
2007	277	181	0.65
2008	336	181	0.54
2009	302	199	0.66
2010	325	197	0.61
2011	369	242	0.66
2012	530	364	0.69

Table 4. Proportion of trips with trip sample sizes less than or equal to ten from commercial gag grouper fisheries in the Gulf of Mexico from 1984 to 2012.

	Ne	No. trips	Proportion trips
Year	trips	n <=10	n <=10
1984	56	22	0.39
1985	101	55	0.54
1986	106	55	0.52
1987	58	19	0.33
1988	25	10	0.40
1989	9	4	0.44
1990	144	65	0.45
1991	225	177	0.79
1992	240	169	0.70
1993	326	248	0.76
1994	310	215	0.69
1995	344	249	0.72
1996	371	254	0.68
1997	397	282	0.71
1998	595	276	0.46
1999	606	342	0.56
2000	511	289	0.57
2001	503	242	0.48
2002	528	274	0.52
2003	525	314	0.60
2004	455	300	0.66
2005	460	319	0.69
2006	368	286	0.78
2007	277	245	0.88
2008	336	249	0.74
2009	302	264	0.87
2010	325	261	0.80
2011	369	313	0.85
2012	530	482	0.91

Table 5. Proportion of trips with trip sample sizes less than or equal to five and trip landing weight larger than 500 pounds from commercial gag grouper fisheries in the Gulf of Mexico from 1984 to 2012.

			Proportion
			tripolition
	No. trips	NO. Trips	trips
Year	landing > 500 lb	n <=5	n <=5
1984	23	1	0.04
1985	32	2	0.06
1986	18	2	0.11
1987	26		
1988	9		
1989	3		
1990	57	1	0.02
1991	30		
1992	35	3	0.09
1993	46	6	0.13
1994	49		
1995	54	3	0.06
1996	61	5	0.08
1997	70	8	0.11
1998	198	1	0.01
1999	156	6	0.04
2000	137	11	0.08
2001	202	19	0.09
2002	221	20	0.09
2003	184	22	0.12
2004	214	49	0.23
2005	232	42	0.18
2006	138	49	0.36
2007	90	43	0.48
2008	95	25	0.26
2009	54	18	0.33
2010	47	12	0.26
2011	22	3	0.14
2012	54	22	0.41

Table 6. Proportions of trips with trip sample sizes less than or equal to ten and trip landing weight larger than 500 pounds from commercial gag grouper fisheries in the Gulf of Mexico from 1984 to 2012.

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Year	No. trips landing > 500 lb	No. trips n <=5	Proportions trips n <=5
1984	23	3	0.13
1985	32	8	0.25
1986	18	7	0.39
1987	26	1	0.04
1988	9	2	0.22
1989	3	-	
1990	57	7	0.12
1991	30	8	0.27
1992	35	4	0.11
1993	46	14	0.30
1994	49	5	0.10
1995	54	6	0.11
1996	61	16	0.26
1997	70	19	0.27
1998	198	9	0.05
1999	156	15	0.10
2000	137	17	0.12
2001	202	39	0.19
2002	221	64	0.29
2003	184	60	0.33
2004	214	109	0.51
2005	232	116	0.50
2006	138	77	0.56
2007	90	73	0.81
2008	95	45	0.47
2009	54	34	0.63
2010	47	18	0.38
2011	22	8	0.36
2012	54	42	0.78

Fig 1a. Length frequency distributions of length samples collected from commercial handline fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 1b. Length frequency distributions of length samples collected from commercial handline fisheries located in the Gulf of Mexico from 1998 to 2004.





Fig 1c. Length frequency distributions of length samples collected from commercial handline fisheries located in the Gulf of Mexico from 2005 to 2012.

Fig 2a. Length frequency distributions of length samples collected from commercial long line fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 2b. Length frequency distributions of length samples collected from commercial longline fisheries located in the Gulf of Mexico from 1998 to 2004.



Fig 2c. Length frequency distributions of length samples collected from commercial long line fisheries located in the Gulf of Mexico from 2005 to 2012.



Fig 3a. Length frequency distributions of length samples collected from recreational head boat fisheries located in the Gulf of Mexico from 1991 to 1997.





Fig 3b. Length frequency distributions of length samples collected from recreational head boat fisheries located in the Gulf of Mexico from 1998 to 2004.

Fig 3c. Length frequency distributions of length samples collected from recreational head boat fisheries located in the Gulf of Mexico from 2005 to 2012.





Fig 4a. Length frequency distributions of length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 4b. Length frequency distributions of length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 1998 to 2004.

Fig 4c. . Length frequency distributions of length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 2005 to 2012.



Fig 5a. Comparisons of length frequency distributions for age and length samples collected from commercial handline fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 5b. Comparisons of length frequency distributions for age and length samples collected from commercial handline fisheries located in the Gulf of Mexico from 1998 to 2004.



Fig 5c. Comparisons of length frequency distributions for age and length samples collected from commercial handline fisheries located in the Gulf of Mexico from 2005 to 2012.



Fig 6a. Comparisons of length frequency distributions for age and length samples collected from commercial longline fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 6b. Comparisons of length frequency distributions for age and length samples collected from commercial longline fisheries located in the Gulf of Mexico from 1998 to 2004.



Fig 6c. Comparisons of length frequency distributions for age and length samples collected from commercial longline fisheries located in the Gulf of Mexico from 2005 to 2012.



Fig 7a. Comparisons of length frequency distributions for age and length samples collected from recreational head boat fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 7b. Comparisons of length frequency distributions for age and length samples collected from recreational head boat fisheries located in the Gulf of Mexico from 1998 to 2004.



Fig 7c. Comparisons of length frequency distributions for age and length samples collected from recreational head boat fisheries located in the Gulf of Mexico from 2005 to 2012.



Fig 8a. Comparisons of length frequency distributions for age and length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 1991 to 1997.



Fig 8b. Comparisons of length frequency distributions for age and length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 1998 to 2004.



Fig 8c. Comparisons of length frequency distributions for age and length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 2005 to 2012.

