Length frequency distributions and reweighted age frequency distributions for greater amberjacks in the Gulf of Mexico from 1984-2012

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Introduction

This report documents changes in the length frequency distributions of greater amberjacks 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 greater amberjacks are noted. Reweighted age frequency distributions for certain strata/years were also estimated based on the age length relationship derived from the age samples and the length frequency distributions of greater amberjacks.

Materials and Methods

Length samples for commercial fisheries were obtained from the Trip Interview Program (TIP) database. All commercial data were grouped into 2 strata (handline and longline). 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 $1 \le \text{length} < 2$ then length=1). All length values in the original data sets were converted to fork lengths by using the equations derived from SEDAR33 data workshop. Only random length samples were used for the estimation of length frequency distributions.

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. For the reweighting methods, otolith samples from the four strata (including non-random samples) were pooled together to provide an age-length relationship (ALR). Reweighted age frequency distributions for each stratum/year were then estimated by reweighting the ALR with the length frequency distribution (Chih, 2009) for each stratum/year.

Results and Discussion

Sample sizes for both greater amberjack length and age samples collected from commercial fisheries were small, especially before 1991 and after 2005 (Table 1). Recreational head boat samples were also small during 2004-2008 (Table 2). The proportion of commercial fishing trips with small trip sample sizes (n <=5) was also high

(Table 3). The small sample sizes in these years/strata led to high variability in the observed length frequency distributions for greater amberjacks between different years/strata (Figs. 1-4).

Age frequency distributions were not estimated directly from age samples because of the small sample sizes for age samples (Tables 1-2). Reweighted age frequency distributions were estimated when the combined age sample sizes were above 100 (after 2002) and when length samples were larger than 30 (Figs.5-8). Overall, the reweighted age frequency distributions were highly variable due to small sample sizes.

References

Chih, Ching-Ping 2009. Evaluation of the sampling efficiency of three otolith sampling methods for commercial king mackerel fisheries. Transactions of the American Fisheries Society, 138: 990-999.

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

Table 1. Sample sizes for greater amberjack 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
1984	0	153	0	27
1985	0	213	0	96
1986	0	109	0	15
1987	0	25	0	12
1988	0	49	0	17
1989	0	150	0	0
1990	2	591	0	52
1991	0	853	0	44
1992	0	954	0	73
1993	0	825	0	62
1994	0	1158	0	41
1995	0	735	0	59
1996	0	566	0	54
1997	2	571	1	64
1998	2	507	0	103
1999	1	687	0	146
2000	0	707	0	116
2001	18	387	0	58
2002	4	728	0	62
2003	34	468	9	86
2004	17	241	1	77
2005	27	131	1	37
2006	31	53	1	20
2007		119	5	24
2008	29	33	0	10
2009	69	104	11	9
2010	36	50	3	4
2011	89	76	11	12
2012	100	127	0	0

Table 2. Sample sizes for greater amberjack 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	4	0	55
1982	0	30	0	97
1983	0	50	0	103
1984	0	14	0	98
1985	0	30	0	146
1986	0	597	0	280
1987	0	549	0	806
1988	0	366	0	214
1989	1	1292	0	133
1990	28	239	1	39
1991	4	420	2	292
1992	1	424	0	702
1993	1	318	0	130
1994	20	340	0	179
1995	17	277	0	69
1996	28	164	0	155
1997	8	115	0	141
1998	2	128	0	169
1999	1	130	0	542
2000	21	124	4	732
2001	17	217	5	479
2002	17	173	112	1090
2003	43	288	240	1181
2004	15	74	95	793
2005		35	69	400
2006	115	26	63	525
2007	69	62	157	509
2008	1	98	211	317
2009	126	398	363	673
2010	126	300	205	692
2011	73	160	227	761
2012	16	350	381	965

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

Year	No. trips	No. trips with n <=5	Proportion of trips with n <=5
1984	19	13	0.68
1985	41	20	0.49
1986	17	6	0.35
1987	10	7	0.70
1988	9	7	0.78
1989	19		0.37
1990	71	58	0.82
1991	143	109	0.76
1992	168	123	0.73
1993	132	99	0.75
1994	171	127	0.74
1995	124	85	0.69
1996	107	80	0.75
1997	120	86	0.72
1998	90	69	0.77
1999	105	76	0.72
2000	83	63	0.76
2001	68	56	0.82
2002	73	63	0.86
2003	72	51	0.71
2004	47	38	0.81
2005	43	37	0.86
2006	27	24	0.89
2007	23	18	0.78
2008	24	24	1.00
2009	35	32	0.91
2010	20	19	0.95
2011	27	20	0.74
2012	21	16	0.76

Fig 1a. Length frequency distributions for length samples collected from commercial handline fisheries located in the Gulf of Mexico from 1991 to 2001.



Fig 1b. Length frequency distributions for length samples collected from commercial handline fisheries located in the Gulf of Mexico from 2002 to 2012.



Fig 2a. Length frequency distributions for length samples collected from commercial long line fisheries located in the Gulf of Mexico from 1998 to 2005.



Fig 3a. Length frequency distributions for length samples collected from recreational headboat fisheries located in the Gulf of Mexico from 1991 to 2001.



Fig 3b. Length frequency distributions for length samples collected from recreational headboat fisheries located in the Gulf of Mexico from 2002 to 2012.



Fig 4a. Length frequency distributions for length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 1991 to 2001.



Fig 4b. Length frequency distributions for length samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 2002 to 2012.





Fig 5. Reweighted age frequency distributions for greater amberjack samples collected from commercial handline fisheries located in the Gulf of Mexico from 2002 to 2012.

Fig 6. Reweighted age frequency distributions for greater amberjack samples collected from commercial longline fisheries located in the Gulf of Mexico from 2002 to 2005.



Fig 7. Reweighted age frequency distributions for greater amberjack samples collected from recreational head boat fisheries located in the Gulf of Mexico from 2007 to 2012.



Fig 8. Reweighted age frequency distributions for greater amberjack samples collected from recreational charter boat and private boat fisheries located in the Gulf of Mexico from 2002 to 2012.



