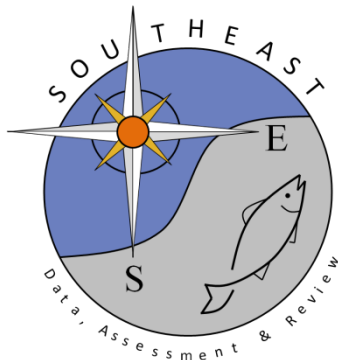


Summary of length data and length frequency distributions for eight data limited species collected in the Gulf of Mexico from 1981 to 2015

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# Summary of length data and length frequency distributions for eight data limited species collected in the Gulf of Mexico from 1981 to 2015

Ching-Ping Chih

## Introduction

This report documents the sampling activities of eight data limited species (almaco jack, red drum, lane snapper, snowy grouper, speckled hind, lesser amberjack, wenchman, yellowmouth grouper) collected from the Gulf of Mexico from 1981 to 2015. Length frequency distributions (LFDs) for some species were estimated by fishing modes and gear types where sample sizes were adequate. Although otolith samples were collected for some species, only a small number of otolith samples were processed, and were not included in this report.

## Materials and Methods

Length samples from commercial fisheries were obtained from the Trip Interview Program (TIP) database housed at the Southeast Fisheries Science Center (SEFSC). Length samples for recreational fisheries were obtained from the Marine Recreational Fisheries Statistics Survey (i.e., the Marine Recreational Information Program, MRIP), the Head Boat Survey, the Texas Parks and Wildlife Department database (TPWD), the Florida Fish and Wildlife Conservation Commission (FWC), the Gulf State Marine Fisheries Commission FIN database (GFIN), and the TIP database.

Lengths were measured in either fork lengths or total lengths. Historically there have been two ways to measure total length. Maximal total lengths were measured by compressing the caudal fin toward the center line of the fish to obtain the maximal possible total length (e.g., total length from historical TIP data

and TPWD data). Natural total lengths were measured without compressing the caudal fin (e.g., total length from the Head boat survey). Equations that converted total length to fork length were derived from data combined from all data sets. Fork lengths in centimeters were used for LFDs analyses.

## Results and Discussion

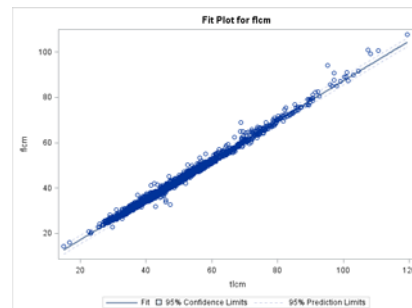
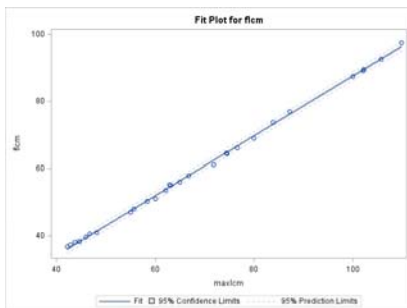
### 1. Length type conversion

Equations for converting total lengths to fork lengths were developed for all species except Wenchman, where no data were available for conversion. Ranges for each conversion equation are shown in the figures below each equation. (flcm- fork length in centimeters, tlcm- natural total length in centimeters, maxlcm- maximal total length in centimeters)

#### (a) Almaco jack

$$\text{flcm} = -1.64 + 0.892 * \text{maxlcm}, n=29, R^2=0.999;$$

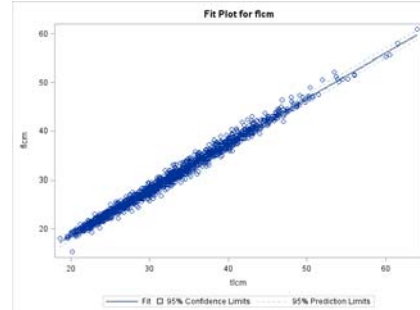
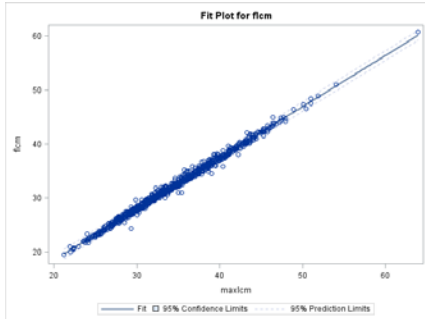
$$\text{flcm} = -0.55 + 0.879 * \text{tlcm}, n=2436, R^2=0.993;$$



(b) Lane snapper

$$flcm = -0.412 + 0.947 * maxlcm, n=892, R^2=0.993;$$

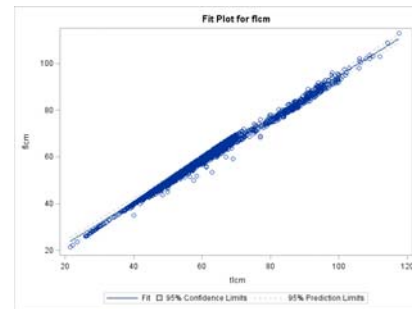
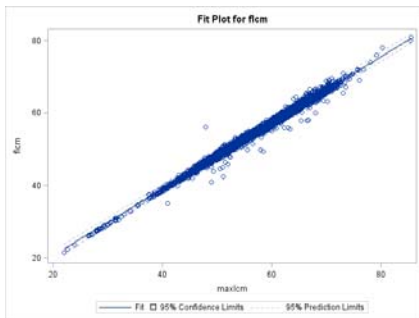
$$flcm = -0.307 + 0.939 * t lcm, n=5452, R^2=0.994;$$



(c) Red drum

$$flcm = 2.325 + 0.915 * maxlcm, n=4511, R^2=0.992$$

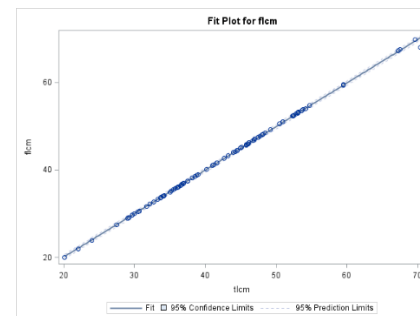
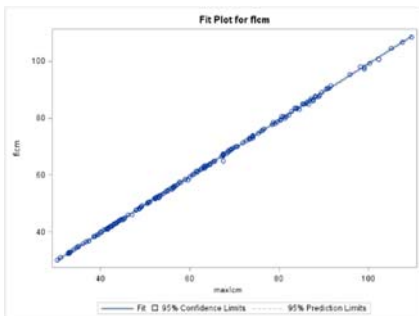
$$flcm = 4.316 + 0.904 * t lcm, n=4898, R^2=0.994;$$



(d) Snowy grouper

$$flcm = 0.165 + 0.99 * maxlcm, n=184, R^2=0.999;$$

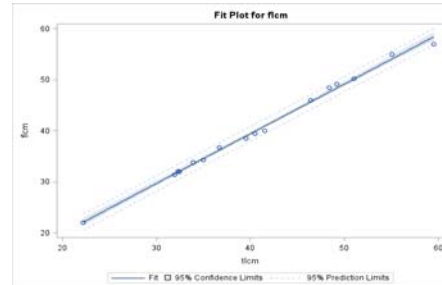
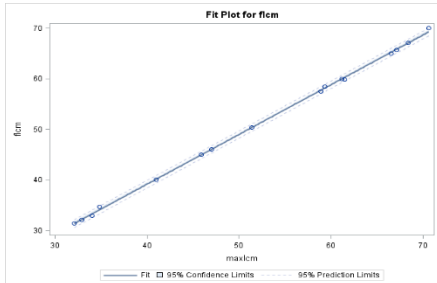
$$flcm = 0.297 + 0.992 * t lcm, n=95, R^2=0.999;$$



(e) Speckled hind

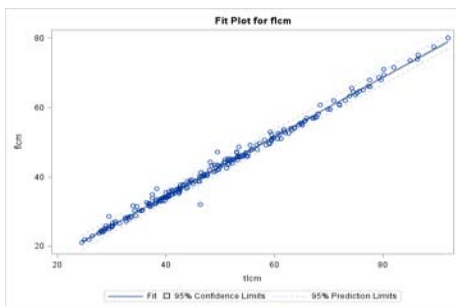
$$flcm = -0.157 + 0.983 * maxlcm, n=16, R^2=0.999;$$

$$flcm = 0.444 + 0.975 * tlcm, n=16, R^2=0.996;$$



(f) Lesser amberjack (no data available for flcm/maxlcm conversion)

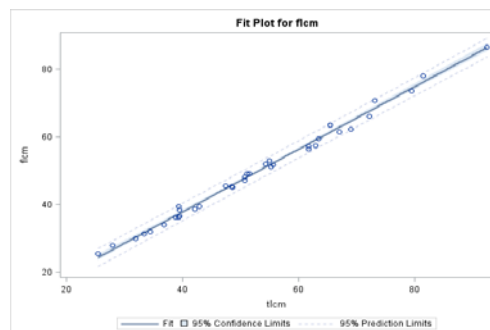
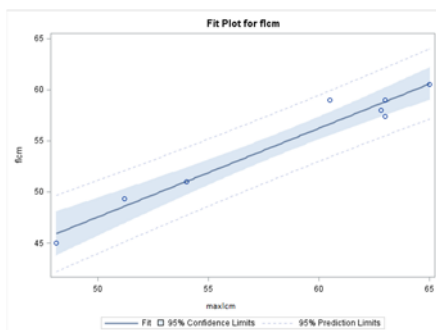
$$flcm = 0.287 + 0.855 * tlcm, n=243, R^2=0.993;$$



(g) Yellowmouth grouper

$$flcm = 4.17 + 0.868 * maxlcm, n=8, R^2=0.96;$$

$$flcm = 0.772 + 0.925 * tlcm, n=37, R^2=0.993;$$



## 2. Length sample sizes

Sample sizes for the eight species were summarized either by mode or by gear types (Tables 1-8). Most length samples from snowy groupers and speckled hind were from commercial fisheries, while most length samples from red drum were from recreational fisheries. Length sample sizes were too small to be used for either LFD or mean length estimations in most years for lesser amberjack, winchman and yellow mouth grouper. Although these eight species were categorized as data limited species due to a lack of age data, otolith samples were collected for some species (e.g., snowy grouper, speckled hind, and lane snapper) but were not processed (except for some snowy grouper samples) for age determination. These otolith samples could be used in the future if a different assessment model is to be used.

## 3. Length frequency distributions

Length frequency distributions were estimated for almaco jack (Figs. 1-2), lane snapper (Figs. 3-4), red drum (Fig. 5), snowy grouper (Figs. 6-7) and speckled hind (Fig. 8), either by fishing mode or by gear type. For the estimation of LFDs for recreational samples, only length samples collected from charter boats, head boats, and private boats were included. There were noticeable differences in LFDs between commercial and recreational samples for almaco jacks and lane snappers (Figs. 1-4). LFDs for commercial samples of snowy groupers and speckled hind were divided into hand line and long line gear types because of the differences in selectivity for other groupers between the two gear types. However, the observed differences in LFDs between hand line and long line gear types vary between years for snowy groupers (Figs. 6-7).

Table 1. Length sample sizes for almaco jacks by fishing mode. (CM- commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	MD	PR	SH	Total
1981		1			2		3
1982					2		2
1984	4	3					7
1985	54	8	4		12		78
1986	16	2	46		9		73
1987	4	6	40				50
1988	29	2	33		2		66
1989		21	182		13		216
1990	204	7	38		2		251
1991	549	21	58		2		630
1992	730	34	49		3		816
1993	275	7	76		2		360
1994	876	24	151		28		1079
1995	1018	3	111		8		1140
1996	699	8	14		5		726
1997	587	46	26		3		662
1998	282	26	49		2		359
1999	277	64	55		12		408
2000	151	156	148		9		464
2001	170	200	119		9		498
2002	135	185	125				445
2003	154	179	118		1		452
2004	86	144	44		1		275
2005	83	49	24	4			160
2006	64	115	55	36	4	1	275
2007	236	133	158	55	2		584
2008	161	88	99		2		350
2009	138	37	68	7	2		252
2010	175	12	42	21			250
2011	245	71	31	15	5		367
2012	338	63	220	49	4		674
2013	549	39	180	5	7		780
2014	391	53	112		23		579
2015	540	45	130		17		732



Table 2(a). Length sample sizes for lane snappers by fishing mode. (CM-commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	MD	PR	SH	Total
1981			4		42		46
1982		1	15		24	12	52
1983		33	19		29	1	82
1984	69	26	22		7	6	130
1985	316	7	3		22		348
1986	224	91	460		13	1	789
1987	5	89	389		102	3	588
1988		41	280		72	9	402
1989	235	1	652		48	4	940
1990	1055	27	756		82		1920
1991	1390	93	519		106	2	2110
1992	668	135	601		119	35	1558
1993	787	119	476		114	3	1499
1994	410	181	638		150		1379
1995	416	39	535		82	7	1079
1996	734	21	371		60	3	1189
1997	786	69	466		87	5	1413
1998	820	207	353		115		1495
1999	1141	167	275		142		1725
2000	708	134	395		105	1	1343
2001	1346	111	297		137	2	1893
2002	892	232	643		144	2	1913
2003	632	297	469		94	1	1493
2004	339	426	447		201		1413
2005	632	388	1134	53	157		2364
2006	657	195	728	202	114		1896
2007	434	135	583	158	139	1	1450
2008	505	168	319		152	4	1148
2009	958	167	387	2	213	1	1728
2010	663	129	237	9	68		1106
2011	591	74	276	7	75		1023
2012	1255	204	602	5	54	1	2121
2013	892	136	653	7	116	2	1806
2014	862	392	599		166	2	2021
2015	1384	265	747		129		2525

Table 2 (b). Length sample sizes for lane snappers by gear types. (HL- hand line, LL- long line, OT- other gears).

Year	HL	LL	OT	Unknown	Total	
1981		46			46	
1982		44		8	52	
1983		73		9	82	
1984		114	9	7	130	
1985		266	3	2	77	348
1986		234	77		478	789
1987		186		402	588	
1988		113		289	402	
1989		153	3	127	657	940
1990		534	26	538	822	1920
1991		1284	19	282	525	2110
1992		838	61	72	587	1558
1993		641	55	312	491	1499
1994		644	46	59	630	1379
1995		291	27	169	592	1079
1996		681	5	117	386	1189
1997		433	22	500	458	1413
1998		768	15	289	423	1495
1999		669	60	692	304	1725
2000		352	33	496	462	1343
2001		600	10	925	358	1893
2002		600	83	495	735	1913
2003		843	59	55	536	1493
2004		677	81	96	559	1413
2005		1888	54	118	304	2364
2006		1129	82	310	375	1896
2007		875	171		404	1450
2008		541	211		396	1148
2009		1104	129	22	473	1728
2010		607	227	6	266	1106
2011		513	213		297	1023
2012		1349	136	1	635	2121
2013		945	196	16	649	1806
2014		1152	234	7	628	2021
2015		1451	322	5	747	2525

Table 3. Length sample sizes for red drums by fishing mode. (CM- commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	PR	SH	Total
1981		10		354	75	439
1982		21	30	533	333	917
1983		245		4674	296	5215
1984	105	272	24	2346	337	3084
1985	95	323	8	4103	192	4721
1986	1	472	9	7024	81	7587
1987		637	46	6236	96	7015
1988		562	10	5169	48	5789
1989		786	5	4501	81	5373
1990		677	142	3033	68	3920
1991		713	43	3438	123	4317
1992		1199	60	6049	277	7585
1993		1452	173	8608	299	10532
1994		1122	80	8529	231	9962
1995	2	1299	142	7372	197	9012
1996	1	1410	203	7067	186	8867
1997		1395	434	7290	98	9217
1998	1	1692	184	7197	90	9164
1999		2429	349	9326	117	12221
2000	1	2312	525	8879	155	11872
2001	1	2514	473	7570	98	10656
2002	2	2462	437	6859	242	10002
2003		2454	394	9801	165	12814
2004	1	2624		9986	281	12892
2005		2365		9309	296	11970
2006		2704	5	9995	252	12956
2007	1	3469	8	10353	159	13990
2008	10	2904	4	10451	192	13561
2009		3787	30	10923	131	14871
2010	3	3434		11192	172	14801
2011		4483	21	11892	307	16703
2012		4155	47	10063	175	14440
2013		2938	43	9657	248	12886
2014		3237	94	8467	105	11903
2015	125	884	220	2179	34	3442

Table 4(a). Length sample sizes for snowy groupers by fishing mode. (CM-commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	MD	PR	Total
1981		1			10	11
1982		1				1
1983					1	1
1984	145	2				147
1985	446	1			2	449
1986	866	3	10			879
1987	479	2	6			487
1988	200	1	4			205
1989	25		5			30
1990	194	1	4		1	200
1991	829	1	3			833
1992	757	2	1			760
1993	335	1	1			337
1994	790		3			793
1995	559		3			562
1996	819	1			3	823
1997	920					920
1998	1136	17	4			1157
1999	1628	37				1665
2000	1712	15	1		1	1729
2001	1280	27	6			1313
2002	963	9	7		1	980
2003	1224	4				1228
2004	806	29				835
2005	671	11	1			683
2006	701	8			1	710
2007	922	15	3	2		942
2008	881	15	2		1	899
2009	1004	26	1		2	1033
2010	442	6	1		1	450
2011	772	7	2		9	790
2012	1252	3			6	1261
2013	1149	18	1		4	1172
2014	913	23	1		8	945
2015	824	10	39		6	879

Table 4 (b). Length sample sizes for snowy groupers by gear types. (HL- hand line, LL- long line, OT- other gears).

Year	HL	LL	OT	Unknown	Total
1981		11			11
1982		1			1
1983				1	1
1984	36	97	2	12	147
1985	99	327		23	449
1986	73	791		15	879
1987	180	301		6	487
1988	161	40		4	205
1989	24	1		5	30
1990	69	123	4	4	200
1991	212	618		3	833
1992	415	344		1	760
1993	86	249	1	1	337
1994	398	388	4	3	793
1995	382	177		3	562
1996	644	176		3	823
1997	746	172	2		920
1998	474	679		4	1157
1999	746	919			1665
2000	277	1449	1	2	1729
2001	148	1159		6	1313
2002	180	784	9	7	980
2003	92	1135	1		1228
2004	252	583			835
2005	74	582	27		683
2006	86	619		5	710
2007	118	822		2	942
2008	264	633		2	899
2009	143	890			1033
2010	161	288		1	450
2011	283	505		2	790
2012	424	837			1261
2013	391	780		1	1172
2014	344	600		1	945
2015	380	476		23	879

Table 5 (a). Length sample sizes for speckled hinds by fishing mode. (CM-commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	MD	PR	Total
1984	102	3				105
1985	178					178
1986	254	1	15			270
1987	188	6	16		1	211
1988	96		8			104
1989	32		8			40
1990	210		1			211
1991	259	3	1			263
1992	306	3	3		1	313
1993	184					184
1994	287		1			288
1995	196		3			199
1996	141		1			142
1997	394					394
1998	1082	2	1			1085
1999	1098	1	1		2	1102
2000	1402	5	3			1410
2001	1050	12	7			1069
2002	785	7	2			794
2003	1475	9				1484
2004	849	1			1	851
2005	835					835
2006	556	1			1	558
2007	530	2	1		1	534
2008	433	2	4			439
2009	650	3	1			654
2010	244	4				248
2011	373	3	3			379
2012	457	1	3	1	1	463
2013	362	1	2			365
2014	409	3	1			413
2015	402	3	3			408

Table 5 (b). Length sample sizes for speckled hinds by gear types. (HL- hand line, LL- long line, OT- other gears).

Year	HL	LL	OT	Unknown	Total
1984	101	4			105
1985	125	51		2	178
1986	72	177	6	15	270
1987	93	101		17	211
1988	4	92		8	104
1989	10	22		8	40
1990	45	165		1	211
1991	24	238		1	263
1992	64	244	2	3	313
1993	45	139			184
1994	70	217		1	288
1995	30	166		3	199
1996	50	91		1	142
1997	65	329			394
1998	92	990	2	1	1085
1999	142	953	6	1	1102
2000	91	1315	1	3	1410
2001	137	919	7	6	1069
2002	83	697	13	1	794
2003	108	1342	34		1484
2004	53	797	1		851
2005	40	795			835
2006	74	484			558
2007	36	496		2	534
2008	21	416		2	439
2009	60	593		1	654
2010	87	161			248
2011	179	198		2	379
2012	248	212		3	463
2013	177	187		1	365
2014	161	248	3	1	413
2015	192	215		1	408

Table 6. Length sample sizes for lesser amberjacks by fishing mode. (CM-commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	PR	SH	Total
1982			1			1
1984				12		12
1985		2		10		12
1986			67	1		68
1987		9	30	1		40
1988			13			13
1989			43	11		54
1990		1	1	5		7
1991		52				52
1992		300	3			303
1993		43	1		53	97
1994		285				285
1995		168	1			169
1996		116	2			118
1997		57	15			72
1998		65	12	12		89
1999		33	103	9		145
2000			2	5		7
2001			4	3		7
2002		3	3	10	1	17
2003			4	32	1	37
2004		1	10		4	15
2005		7	1	3		11
2006		8	1			9
2007		28	1		1	30
2008		18		2	1	21
2009		21				21
2010		31				31
2011		9	1			10
2012		3		4	3	10
2013		8	5	3	2	18
2014		18	1	3	9	31
2015		45	1	6		52



Table 7. Length sample sizes for wenchman by fishing mode. (CM- commercial, CP-charter boat, HB-headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	PR	Total
1982			2		2
1987				3	3
1988				1	1
1990	10				10
1991	31				31
1992	57				57
1993	58				58
1994	31				31
1995	4				4
1996	70				70
1997	2				2
1998	6				6
1999	8				8
2000	5				5
2001	4				4
2002	10				10
2003	131				131
2004	40				40
2005	1				1
2007	5				5
2008	19	1			20
2009	3				3
2010	1				1
2011	14				14
2012	140				140
2013	27				27
2014	23				23
2015	2				2

Table 8. Length sample sizes for yellow mouth groupers by fishing mode. (CM-commercial, CP-charter boat, HB-headboat, MD-multiday headboat, PR-private boat, SH-shore).

Year	CM	CP	HB	MD	PR	Total
1984			2			2
1985			2			2
1986		12	29			41
1987		2	23		2	27
1988			11			11
1989			1			1
1990		36	4			40
1991		111	1	1		113
1992		60	1		3	64
1993		39	1		6	46
1994		64	1		3	68
1995		64	4		1	69
1996		33	1	1		35
1997		32	8			40
1998		13	2	4		19
1999		17	2	1		20
2000		8	1			9
2001		8	4			12
2002		34	1	2		37
2003		18	1		1	20
2004		18	4			22
2005		9	4	2	1	16
2006		13				13
2007		15				15
2008		10	1	1	1	13
2009		10	2			12
2010		20	1			21
2011		26	1	3	1	31
2012		79	1	9	1	90
2013		59	1	3	1	64
2014		25			3	28
2015		43	2			45

Fig 1. Length frequency distributions (LFDs) for almaco jacks collected from commercial fisheries from 1990 to 2015.

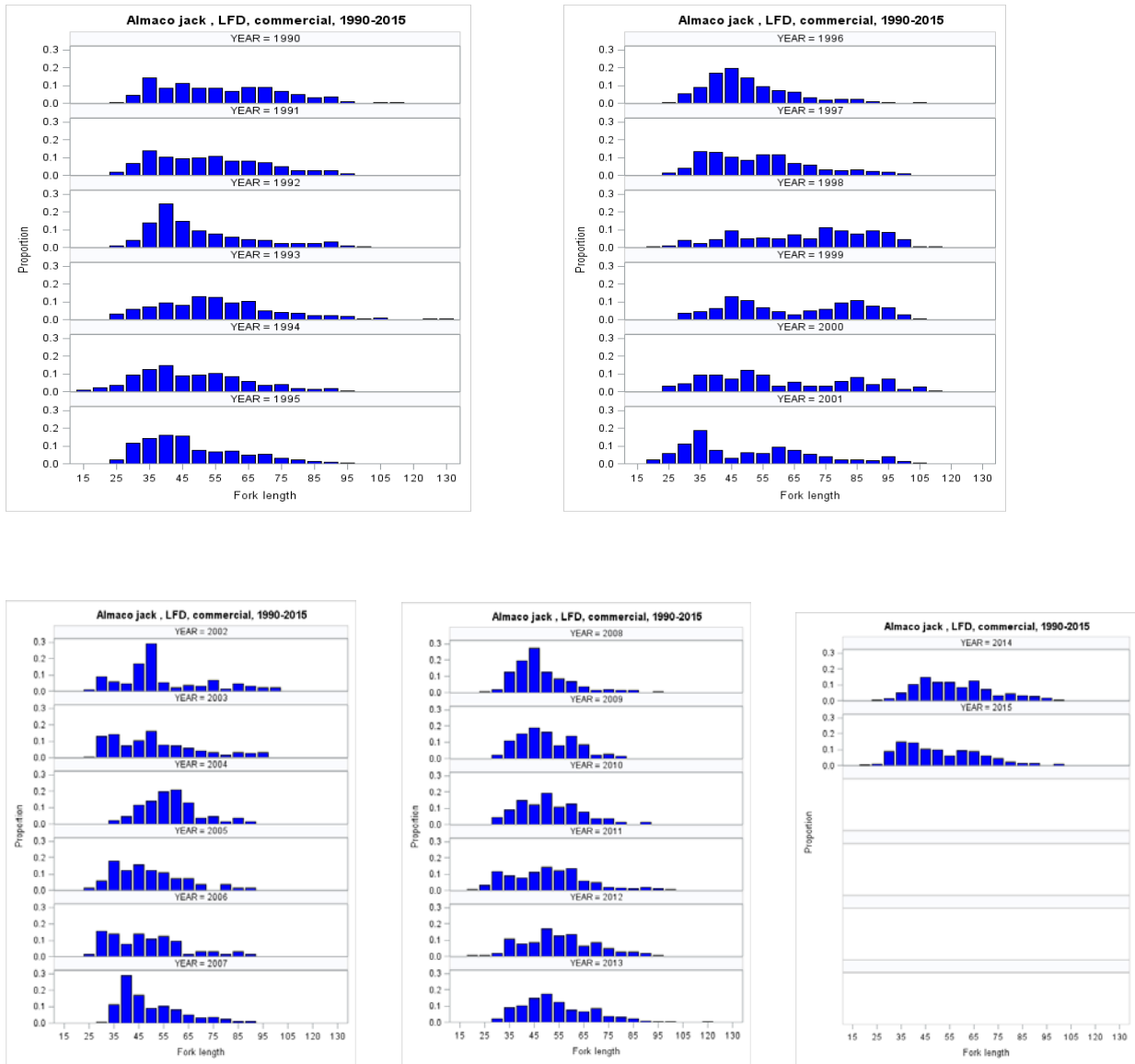


Fig 2. Length frequency distributions (LFDs) for almaco jack collected from recreational fisheries (charter boat, headboat and private boat) from 2000 to 2015.

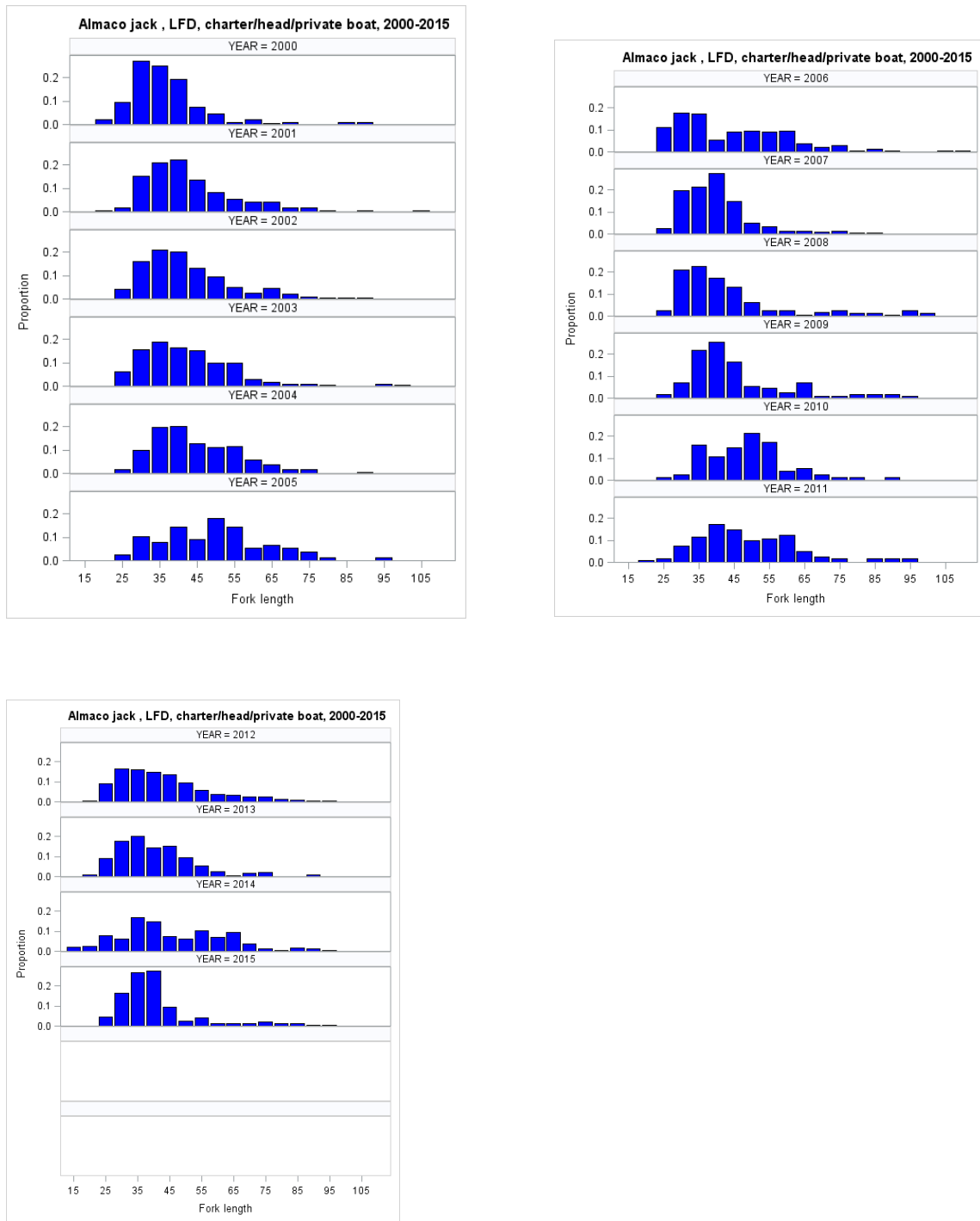


Fig 3. Length frequency distributions (LFDs) for lane snappers collected from commercial fisheries from 1990 to 2015.

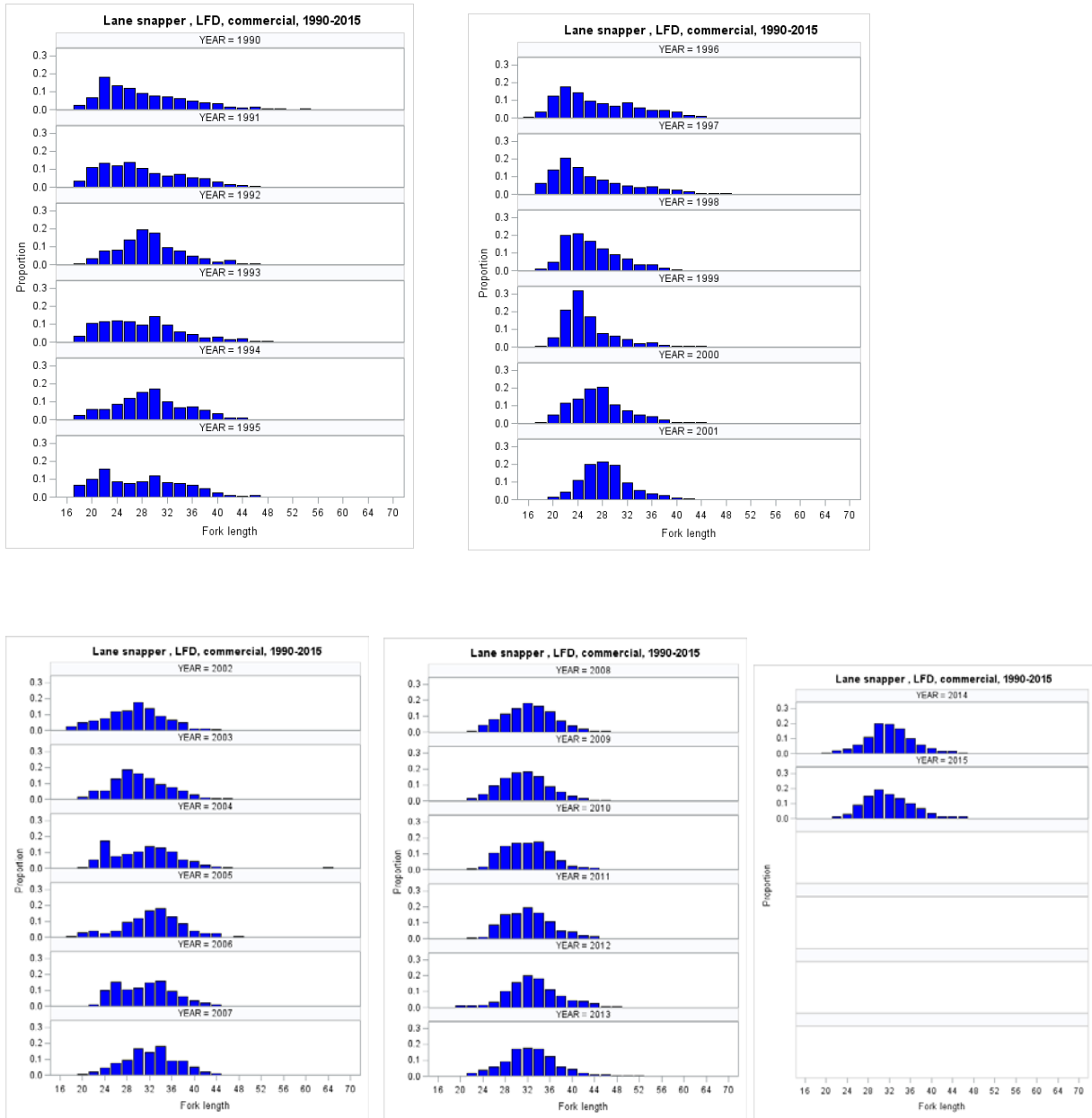


Fig 4. Length frequency distributions (LFDs) for lane snappers collected from recreational fisheries (charter boat, headboat and private boat) from 1990 to 2015.

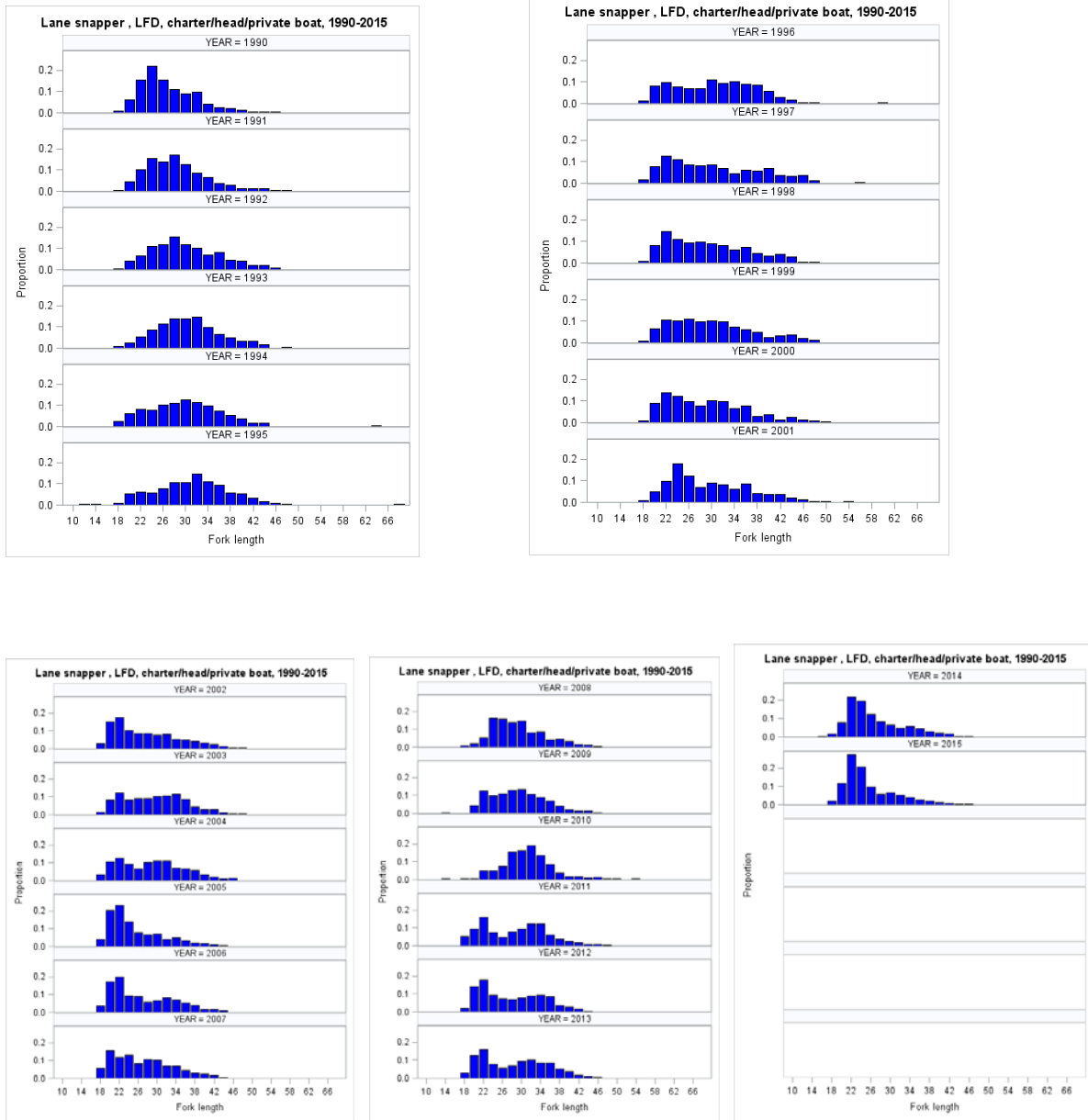


Fig 5. Length frequency distributions (LFDs) for red drums collected from recreational fisheries (charter boat, headboat and private boat) from 1990 to 2015.

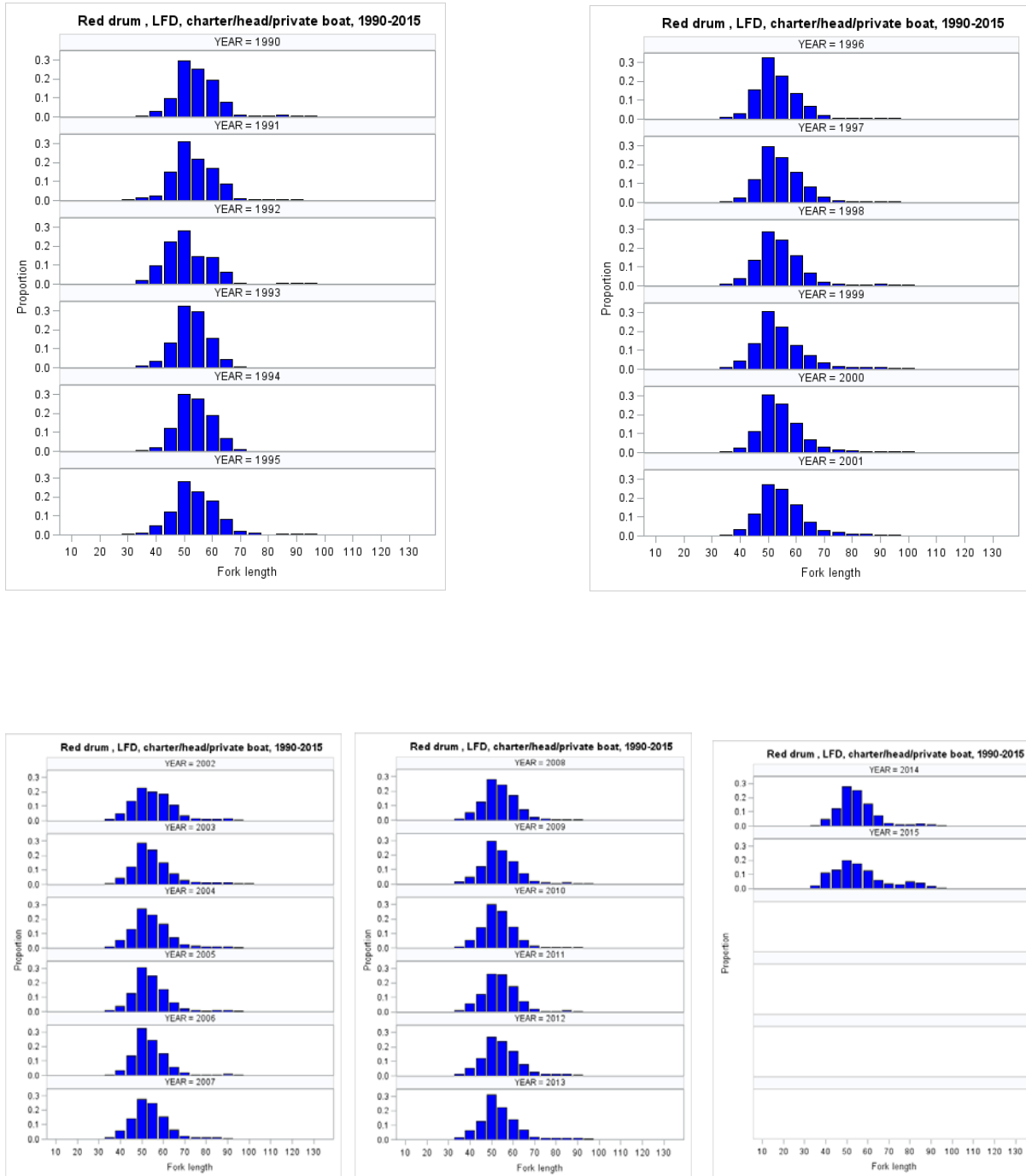


Fig 6. Length frequency distributions (LFDs) for snowy groupers collected from commercial hand line (HL) fisheries from 1990 to 2015.

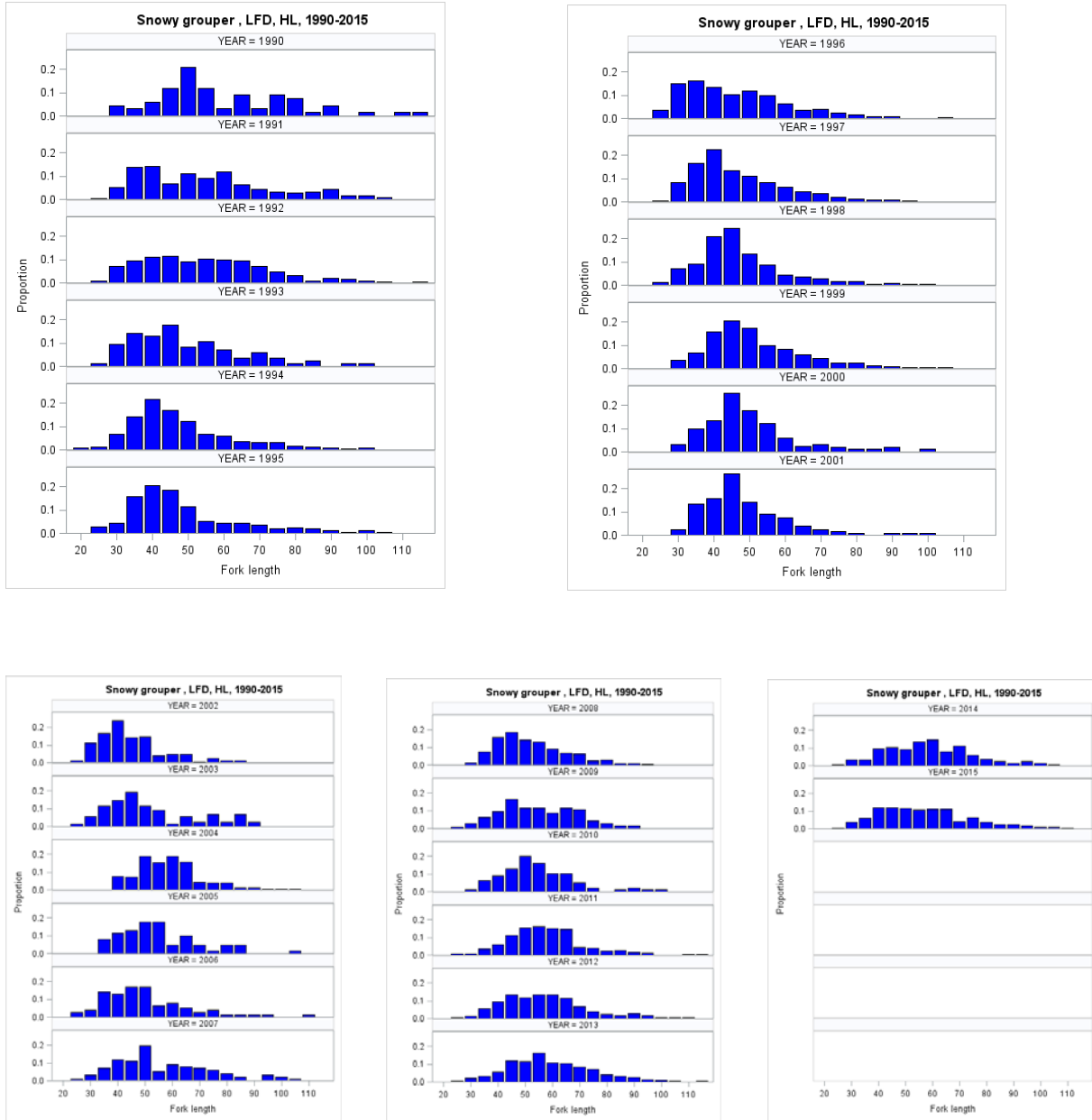




Fig 7. Length frequency distributions (LFDs) for snowy groupers collected from commercial long line (LL) fisheries from 1990 to 2015.

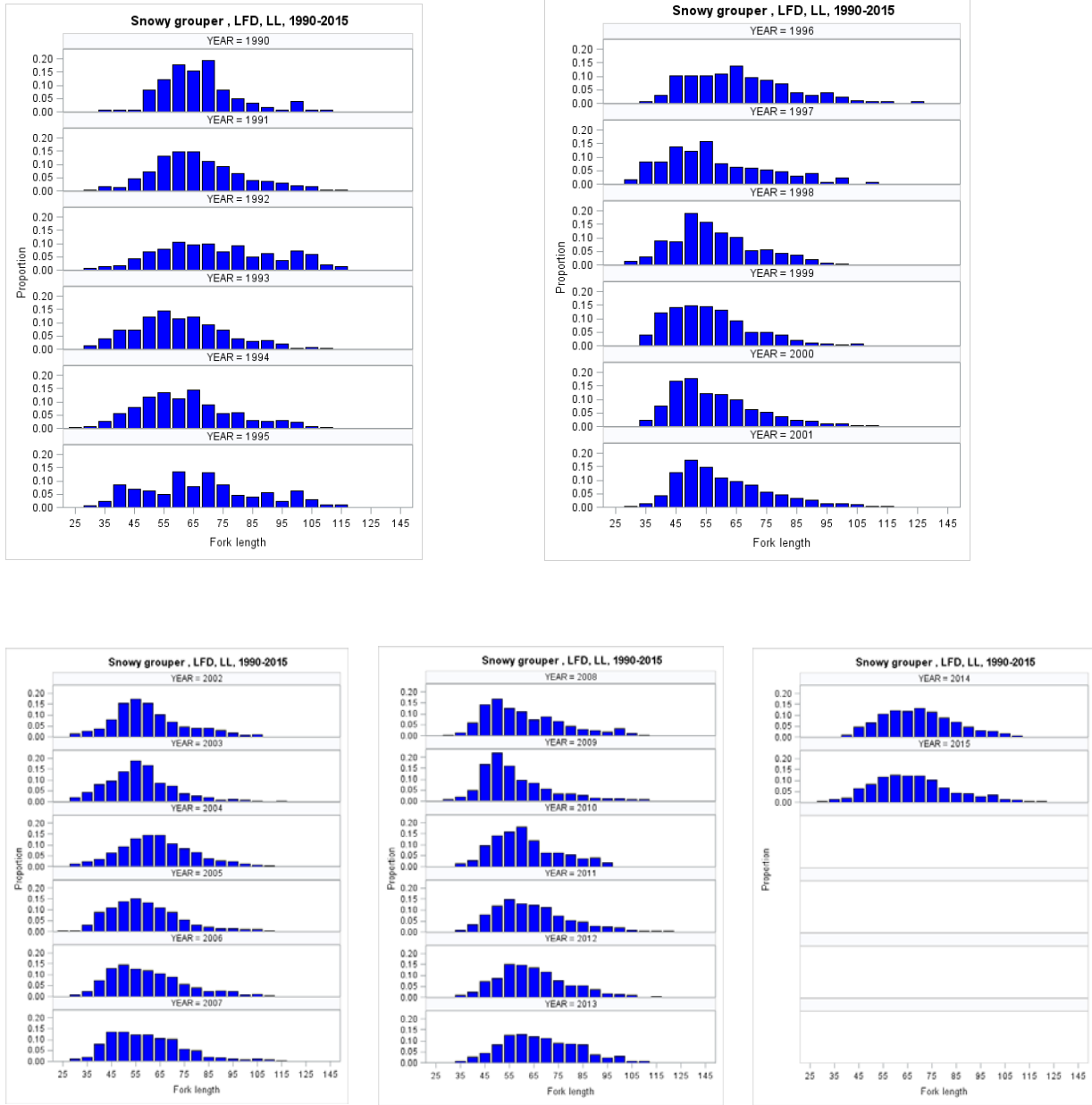


Fig 8. Length frequency distributions (LFDs) for speckled hinds collected from commercial long line (LL) fisheries from 1990 to 2015.

