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UPDATED CATCHES OF SANDBAR, DUSKY AND BLACKNOSE SHARKS

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ABSTRACT

This document presents updated commercial and recreational landings and discard estimates of sandbar, dusky and blacknose sharks up to 2009. Information on the geographical distribution of both commercial and recreational catches is presented along with gear-specific information of commercial landings. Length-frequency information and trends in average size of the catches from several commercial and recreational sources are also included.

KEYWORDS

Catch, Landings, Discards, Commercial fishing, Long lining, Pelagic fisheries, Shark fisheries, By catch, Logbooks, Observer programs, Sandbar shark, Dusky shark, Blacknose shark

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1. Background

The Catch Statistics Working Groups of SEDAR 11 and SEDAR 13 provided summary reports and tables of sandbar and blacknose shark catches, respectively. The purpose of the present document is to build upon that information to update the baseline scenario catch tables for these two species as well as the catch history for dusky shark presented in Cortés et al. (2006) to facilitate input into the SEDAR 21 stock assessments. Information on geographical distribution of commercial landings and recreational catches as well as gear-specific information of commercial landings from several sources is updated. Size (length frequencies and trends in average length and weight) information from several commercial and recreational sources is also updated.

2. Catch histories

2.1 Sandbar shark

2.1.1 Commercial landings

U.S. commercial landings of sandbar sharks in 1996-2009 were compiled based on Northeast regional general canvass landings data and Southeast regional general canvass landings data (now known as Accumulated Landings System, ALS), and the SEFSC Quota Monitoring System (QMS) data based on southeastern region permitted shark dealer reports (now known as Pelagic Dealer Compliance, PDC). The larger of the two values reported for sandbar sharks in the southeast general canvass and the SEFSC quota monitoring was taken as the value of sandbar shark landings for the southeast. The landings from the northeast general canvass data were then added to the southeast landings to produce total U.S. estimates. Total U.S. landings from 1987 to 1995 were from the general canvass data only and were obtained based on the proportional allocation of commercial landings of unclassified sharks by gear type and region defined in the 1996 Large Coastal Shark Evaluation Workshop (SEW; see Appendix 3 of 1996 SEW report [NMFS 1996]). Landings for 1981-1986 were determined during the 1996 SEW and we continue to include them here as recommended in the last Large Coastal Shark assessment (SEDAR 11 [NMFS 2006]) because they represent the early years of the fishery.

Unclassified sharks in 1996-2009 attributed to the LCS grouping were proportionally allocated to sandbar sharks by using the proportion of sandbar sharks in the large coastal shark (LCS) complex (in the total U.S. landings estimates) and multiplying the unclassified sharks by that value to estimate the weight of sandbar sharks likely listed as unclassified. The value was then added to the value reported from the total U.S. estimates to determine the final total landings for sandbar sharks.

The data are collected in landed or dressed weight. Various conversions were used to convert dressed weight to number of sharks. From 1981 to 1985, an average weight of 35.9 was used (SEDAR 11). From 1986 to 1993, an average weight of 34.5, the average of the average weights from 1994 to 1996 from the bottom longline shark fishery observer program

(BLLOP), was used. From 1994 onward, the average weight was determined from data provided directly by the bottom longline shark fishery observer program. All weights were predicted from fork length measurements taken by observers in the directed shark bottom longline fishery. Predicted weights (obtained by back-transforming from fork lengths) are preferred over directly measured weights because the latter are hard to take during observer operations and are thus very rare. Average weights were calculated by applying a published length-weight regression (Kohler et al. 1995).

2.1.2 Recreational catches

Recreational catches of sandbar sharks correspond to estimates from three data collection programs: the Marine Recreational Fishery Statistics Survey (MRFSS), the NMFS Headboat Survey (HBOAT) operated by the SEFSC Beaufort Laboratory, and the Texas Parks and Wildlife Department Recreational Fishing Survey (TXPWD). As explained in the SEDAR 11 Data Workshop report, during 1998-1999, the MRFSS tested a new methodology for the estimation of charterboat effort, the For Hire Survey (FHS), which was deemed to provide better estimates of charterboat fishing effort and was officially adopted in 2000. The MRFSS catches we report for the period 1981-2009 are thus those incorporating the "new' methodology described in SEDAR 11 and detailed in SEDAR7-AW-03. Total, annual recreational catch estimates of sandbar sharks are the sum of the MRFSS (A+B1=fished landed or killed), HBOAT (fish landed), and TXPWD (fish landed) survey estimates.

2.1.3 Unreported catches

Unreported LCS landings were provided by Mr. Chris Brannon to the National Marine Fisheries Service (NMFS) during the 1996 SEW. These landings have been part of the LCS database since then.

These landings correspond to the Gulf of Mexico during 1986, 1987, 1990 and 1991, while half of the landings correspond to the Gulf of Mexico and the other half to the mid Atlantic during 1988 and 1989. For the Gulf of Mexico, Brannon estimated that landings were approximately 2/3 blacktip sharks, with the remaining third being a combination of sandbar sharks and other LCS species. For the Atlantic, Brannon reported that landings were approximately 80% sandbar sharks, with the remaining being a combination of blacktip sharks and other LCS species. The SEDAR 11 Catch Working Group (WG) did not have any way of determining what amount, if any, of these catches were included in landing reports. Given the general belief that landings before the current reporting systems were underreported, the WG made the assumption that none of the catches were included and kept these data separate, listing them as unreported.

Following the information provided by Mr. Brannon, for the years 1986, 1987, 1990, and 1991, it was assumed that 11% (0.33x0.33) of the total landings in the Gulf of Mexico consisted of sandbar sharks. For 1988 and 1999, 40% (0.5x0.8) of the total landings in the Atlantic consisted of sandbar sharks. We thus kept the catch history derived in SEDAR 11 for 1986-1991.

2.1.4 Mexican catches

In SEDAR-11 document LCS05/06-DW-06 (originally SB-02-3), it was assumed that Mexican catches of blacktip shark corresponded to 50% of the sum of small fish caught in the states of Tamaulipas and Veracruz. This percentage was used to take account of the potential mixing of U.S. and Mexican stocks in Mexican fishing grounds. These two states were selected, as in previous assessments, because they are thought to include catches of blacktip sharks that cross into Mexican waters. For sandbar sharks, however, the total sum of catches for sandbar shark was used because there is no scientific evidence of nursery areas in Mexican waters (thus all sandbar sharks would have come from the U.S.). We thus kept the catch history derived in SEDAR 11 for 1981-2004 (the original estimates for 1981-2000 used for the 2002 SEW and thereafter come from Table 10 in document SB-02-3; the values for 2001-2004 were assumed to be equal to the 2000 value) and used the same estimate as for the last year of data (7,100 fish) to populate the rest of the series (2005-2009).

2.1.5 Gulf menhaden fishery bycatch

In SEDAR-11, effort-adjusted estimates of dead discards were calculated. De Silva et al. (2001) reported that sandbar sharks represented 1.8% of the total observed shark bycatch in 1994-1995. Considering the reported 75% mortality rate among all sharks, this resulted in an estimated bycatch of 486 (36,000*0.018*0.75) and 445 (33,000*0.018*0.75) dead sandbar sharks in 1994 and 1995, respectively. The number of vessels operating in the fishery each year (1981-2004) was divided by 53.5 vessels, the average number of vessels operating for the years in which bycatch estimates were available (1994 and 1995). The year-specific multipliers were then multiplied by the average number of sandbar sharks discarded dead (465), as determined previously. This provided for year-specific bycatch estimates adjusted for the annual number of vessels in the fleet for the period 1981-2004. Since we did not have immediate access to more recent effort estimates for the menhaden fleet we used the same estimate as for the last year of data (374 fish) to populate the rest of the series (2005-2009).

Table 1 summarizes the updated catch history for sandbar sharks showing each of the sources described above. Figure 1 shows the three catch streams ("fleets") that were used for stock assessment purposes in SEDAR 11.

2.2 Dusky shark

2.2.1 Commercial landings

U.S. commercial landings of dusky sharks were compiled from multiple data sources. Southeast general canvass landings data were available for 1985-2009 and SEFSC QMS data for 1992-2009. Two additional data sources were available for the southeast region: pelagic dealer weigh-out reports of dealers holding swordfish and tuna permits (1982-2009) and logbook information from the Coastal Fishery Logbook program (1991-2009; see SEDAR21-DW-07 for a description of all these data sources). The largest annual value reported in these four sources was taken as the annual value of dusky shark landings for the southeast. Landings from the northeast general canvass data (1993-2009) were then added to the southeast landings to produce total U.S. commercial estimates. Since the last assessment was

conducted in weight, not in numbers as for other shark species, we report all landings and catches in landed (dressed) weight.

2.2.2 Recreational catches

Recreational catches of dusky sharks were compiled from the three data collection programs described earlier (MRFSS, HBOAT, and TXPWD. The MRFSS estimates correspond to those incorporating the "new' methodology as described above. Total, annual recreational catch estimates of dusky sharks are the sum of the MRFSS (A+B1; 1981-2009), HBOAT (1986-2009), and TXPWD (1983-2009) survey estimates. Average weights were obtained through a published length-weight regression (Kohler et al. 1995) from length measurements taken by samplers in these surveys, and used to transform catch estimates in numbers to weight (lb dw). Due to the limited number of length observations available, a constant weighted (by sample size) average weight for the whole period was used for each survey (MRFSS: 14.2 lb dw, n=157, 1981-2009; HBOAT: 9.5 lb dw, n=88, 1986-2009; TXPWD: 7.5 lb dw, n=38, 1983-2009).

2.2.3 Pelagic longline discards

Dead discards of some pelagic shark species are estimated based on mandatory logbooks from pelagic longline and other fishing vessels that land swordfish and pelagic longline observer reports when sufficient sample sizes are available (Cramer 2000). Dead discard estimates were available for dusky sharks since 1992 (the year of inception of the pelagic longline observer program). Estimates are produced in both numbers and mt whole weight (ww); the latter were transformed into lb dw using a whole to dressed weight conversion ratio of 1.96.

2.2.4 Shark bottom longline discards

Dead discards of dusky sharks in the directed shark bottom longline fishery for 1994-2009 were estimated by using the annual discard rates observed in the BLLOP and multiplying that proportion by the annual commercial landings described in section 2.2.1. Dead discard rates were low during 1994-1999 (between 0% and 8%), prior to the species being placed on the prohibited list, and fluctuated between 0% and 100% thereafter.

Tables 2 to 4 and Figure 2 show the updated commercial landings, recreational catches, and commercial discards, respectively, and Table 5 and Figure 3 summarize the catch history for dusky sharks.

2.3 Blacknose shark

2.3.1 Commercial landings

U.S. commercial landings of blacknose sharks were compiled from southeast general canvass landings data and SEFSC QMS data, which were available for the period 1995-2009. The largest annual value reported in these two sources was taken as the annual value of blacknose

shark landings for the southeast. Since there were no reported landings of blacknose sharks from the northeast general canvass data, the southeast landings represent the total U.S. commercial estimates. Landings (lb dw) were transformed into numbers by using annual average weights from the BLLOP. As explained above, these weights are derived from observed animals, whole lengths are measured, and by applying a published length-weight relationship. Following SEDAR 13 (NMFS 2007), these commercial landings were further decomposed into three gears: longlines (bottom longlines), nets (gillnets and drift gillnets), and lines, which account for 96-100% of the landings in the time series. This was done by taking the sum of the product of the annual landing estimates by the proportional gear composition in each of two areas (South Atlantic [SA] and Gulf of Mexico [GOM]).

2.3.2 Recreational catches

Recreational catches of blacknose sharks were compiled from the three data collection programs described earlier (MRFSS, HBOAT, and TXPWD). The MRFSS estimates correspond to those incorporating the "new' methodology as described above. Total, annual recreational catch estimates of dusky sharks are the sum of the MRFSS (A+B1; 1981-2009), HBOAT (1986-2009), and TXPWD (1983-2009) survey estimates.

2.3.3 Shark bottom longline discards

Dead discards of blacknose sharks in the directed shark bottom longline fishery were estimated by using the annual discard rates observed in the BLLOP and multiplying that proportion by the annual commercial landings of blacknose sharks caught on longlines as described in section 2.3.1.

2.3.4 Shrimp trawl bycatch

Dead discards of blacknose sharks in the shrimp trawl fishery for 1972-2005 were as reported in SEDAR 13, estimates for 2006 were obtained from Andrews (pers. comm.), and estimates for 2007-2009 were not yet available at the time of this writing and are thus not included. Estimates for the GOM were obtained as described in SEDAR13-DW-32, and those for the SA by scaling the GOM estimates by the ratio of the observed days in the SA (2.2 days on average) to the observed days in the GOM (17.5 days on average). Based on observations from 1992-2003, the ratio was 12.57%.

Table 6 and Figure 4 summarize the updated catch history for blacknose sharks showing each of the sources described above.

2.4 Landings by state

2.4.1 Commercial landings by state

Commercial landing information by state for the three species was extracted from quota monitoring system (covering southeast states only), the general canvass, and the coastal fishery logbook.

2.4.1.1 Sandbar shark

Quota monitoring data for the southeast region indicate that sandbar sharks are mostly landed on Florida's west and east coasts and North Carolina. General canvass and coastal fishery logbook data show similar trends (Fig. 5).

2.4.1.2 Dusky shark

Florida's west and east coasts, and North Carolina to a lesser extent, also account for the majority of dusky sharks landings according to the quota monitoring data. General canvass data show a similar trend, although in some years Virginia and New Jersey have an important contribution. A similar trend is also observed in coastal fishery logbook data (Fig. 6).

2.4.1.3 Blacknose shark

Blacknose sharks are predominantly landed on Florida's east coast, followed by Florida's west coast according to the three data sources. Alabama starts having a substantial contribution to total landings of blacknose sharks in 2005 (Fig. 7).

2.4.2 Recreational landings by state

2.4.2.1 Sandbar shark

Combined data from the MRFSS, HBOAT, and TXPWD surveys indicated that about half (48%) of sandbar sharks were caught in the SA region during 1981-2009 and 36% in the SA region, respectively, with the GOM contributing only 15% (Fig. 8). Data from MRFSS reveal that several states, such as Florida, North Carolina, and South Carolina (with an especially high estimate in 1983) in the SA and Delaware and Virginia in the MA, had substantial contributions to the total catches. Data from the HBOAT survey showed Texas had substantial contributions especially in the early years, with South and North Carolina and Florida contributing more towards the middle and end of the time series, respectively (Fig. 8).

2.4.1.2 Dusky shark

During 1981-2009, the majority of dusky sharks were caught in the MA (47%), followed by the GOM (28%) and SA (25%) (Fig. 9). MRFSS data show that the MA states of New Jersey, Maryland, and Virginia, and Florida and North Carolina in the SA had substantial contributions to the total catches. Data from the Headboat survey indicate that Texas had substantial contributions especially in the early years, with South and North Carolina, Louisiana and the west coast of Florida also contributing since the early 1990s (Fig. 9).

2.4.1.3 Blacknose shark

The majority of blacknose sharks (85%) were caught in the GOM during 1983-2009 with the remainder being caught mainly in the SA (14%; Fig. 10). MRFSS data show that the vast majority of the catches corresponded to the west and east coasts of Florida, respectively. Data from the Headboat survey show that the catches were dominated alternatively through the years by the west and east coasts of Florida and Texas (Fig. 10).

2.5 Commercial landings by region and gear

Commercial landing information by region and gear for the three species was extracted from the general canvass (southeast and northeast) data.

2.5.1 Sandbar shark

Averaged over the period 1987-2009, sandbar sharks were landed mostly in the GOM (53%) and South Atlantic (31%), with also some contribution from the mid-Atlantic (MA) region (16%; Table 7). Longlines (67%) and "other" (a category that includes the designation "combined gears" from the general canvass data) gear (32%) accounted for almost all landings in the GOM, with other gear dominating in 1991-96 and longlines thereafter (Fig. 11). Longlines (47%) and gillnets (39%) contributed similar proportions in the MA, and longlines (79%) and other gear (17%; again from 1991 to 1996) also accounted for the vast majority of landings in the SA (Table 8, Fig. 11).

2.5.2 Dusky shark

Averaged over the period 1988-2009, dusky sharks were landed mostly in the MA (49%) and South Atlantic (28%) and GOM (23%) in similar proportions (Table 9). In the MA, longlines (41%) and gillnets (35%) contributed similar proportions to the landings, but longlines were the dominant gear in both the GOM and SA (88% and 72%, respectively; Table 10, Fig. 12).

2.5.3 Blacknose shark

The vast majority of blacknose sharks were landed in the SA (79%) vs. the GOM (21%) region during 1995-2009 (Table 11). The dominant gear in all years since 1996 were drift nets (Fig. 13), which accounted for 73% of all landings over the whole time period (1995-2009), followed by longlines (26%; Table 12).

2.6 Average size (length and weight) and length frequencies

2.6.1 Sandbar shark

The predicted average weight and observed fork length of sandbar shark from the BLLOP showed a declining trend in 1993-1998, but followed an increasing trend since then (Fig. 14). Although there were only 422 observations for sandbar shark from MRFSS, trends in size

were stable during most of the time series and started to climb in the 2000s, a period with the lowest sample sizes (Fig. 15). There were too few observations for the entire time period from both the HBOAT (n=97) and TXPWD (n=41) surveys to examine any trends in size. Sample size was also low in the PLLOP (n=248), which showed no trend (Fig. 16). Data from the dealer weighout (for animals weighed individually) revealed a fairly stable trend for the period with a large number of observations (1992-2006; Fig. 17).

Length-frequency distributions of sandbar sharks observed in the BLLOP show that both immature and mature animals (ca. > 152-155 cm FL) are caught in the directed shark fishery (Fig. 18). Although based on few observations, a similar trend is seen in the PLLOP (Fig. 18). In contrast, the vast majority of animals caught in the recreational fishery are immature (Fig. 18; only MRFSS shown).

2.6.2 Dusky shark

The predicted average weight and observed fork length of dusky shark from the BLLOP also showed a declining trend initially in 1994-1998, followed by a generally increasing trend thereafter (Fig. 19). There were few observations for dusky shark from the three recreational surveys (MRFSS n=157 [Fig. 20]; HBOAT n=88, TXPWD n=38). With the exception of a very high peak in 2002 (n=1 for 2002 and 2003); there was no trend in size from the PLLOP (n=534; Fig. 21). Data from the dealer weighout (for animals weighed individually) also revealed a fairly stable trend for the period with more observations (1994-2000; Fig. 22).

Length-frequency distributions of dusky sharks in the BLLOP show that more mature individuals (ca. > 231-235 cm FL) were observed at the beginning of the program, and that there has been a progressive decline in mature individuals observed (Fig. 23). In contrast, immature animals have always been predominantly observed in the PLLOP (Fig. 23). The vast majority of animals caught in the recreational fishery are also immature (Fig. 23; only MRFSS shown).

2.6.3 Blacknose shark

With the exception of information from the BLLOP there were few size observations for blacknose sharks from other programs. The BLLOP data (n=4043) showed no trend (Fig. 24). There were very few observations from the three recreational surveys (MRFSS n=230; Headboat n=32, TXPWD n=20), with MRFSS showing no trend (Fig. 25).

Length-frequency distributions of blacknose sharks in the BLLOP show that more mature individuals (ca. > 72-77 cm FL) are caught in the bottom longline fishery, although immature animals are also caught (Fig. 26). Both mature and immature individuals are caught in the recreational fishery (Fig. 26; only MRFSS shown).

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Table 1. Catch history for sandbar sharks (thousands of fish).

BASELINE SCENARIO
CATCHES OF SANDBAR SHARKS (in thousands)

Year	Commercial Landings	Recreational catches	Unreported catches	Menhaden fish. Bycatch	Mexican catches	Total
1981	6.6	128.9		0.7	10.1	146.3
1982	6.6	33.6		0.7	11.8	52.8
1983	7.2	415.9		0.7	11.1	434.9
1984	9.8	56.4		0.7	11.7	78.6
1985	9.1	67.7		0.6	7.9	85.3
1986	23.1	124.8	2.739	0.6	9.4	160.6
1987	66.3	30.5	7.733	0.7	7.0	112.1
1988	79.4	63.6	45.32	0.6	9.1	198.1
1989	122.2	26.2	38.52	0.7	8.3	195.9
1990	116.7	57.7	5.731	0.7	10.7	191.6
1991	95.4	35.4	1.243	0.5	9.1	141.6
1992	100.6	33.8		0.4	9.7	144.5
1993	72.0	23.8		0.5	9.1	105.4
1994	126.3	14.6		0.5	8.8	150.2
1995	84.4	25.3		0.4	9.9	120.0
1996	65.5	36.1		0.4	10.7	112.8
1997	41.5	41.0		0.5	8.4	91.2
1998	62.7	34.6		0.4	7.2	104.9
1999	53.3	19.4		0.5	8.0	81.1
2000	37.3	10.8		0.4	7.1	55.5
2001	48.2	35.7		0.4	7.1	91.3
2002	56.4	8.0		0.4	7.1	71.8
2003	45.2	4.9		0.4	7.1	57.6
2004	39.1	3.2		0.4	7.1	49.7
2005	33.4	1.7		0.4	7.1	42.5
2006	42.1	0.4		0.4	7.1	50.0
2007	16.9	6.6		0.4	7.1	30.9
2008	2.2	4.8		0.4	7.1	14.3
2009	4.0	4.5		0.4	7.1	15.9

Table 2. Dusky shark commercial landings (pounds dressed weight) from five data collection programs: Canvass southeast, Quota monitoring system, Coastal logbook program, southeast dealer weighout, and Canvass northeast.

Year	Canvass southeast	QMS	Coastal Log	SE dealer weighout	Canvass northeast	Total
1982				40		40
1983				11		11
1984				0		0
1985	4,963			0		4,963
1986	0			0		0
1987	83			11		83
1988	1,691			135		1,691
1989	994			529		994
1990	39,951			922		39,951
1991	33,138		300	709		33,138
1992	141,730	2,318	56,574	1,114		141,730
1993	60,526	2,752	12,687	3,540	37,747	98,273
1994	86,074	31,348	5,889	28,178	36,330	122,404
1995	99,039	327,560	3,664	57,454	30,360	357,920
1996	94,189	270,626	174,334	44,612	20,194	290,820
1997	35,600	73,250	54,970	25,238	7,680	80,930
1998	37,037	79,206	52,295	21,214	1,918	81,124
1999	65,523	62,102	92,231	15,324	45,419	137,650
2000	24,830	78,456	22,797	24,007	127,290	205,746
2001	145	145	2,724	562	1,739	4,463
2002	4,174	1,139	12,300	202	4,605	16,905
2003	8,108	282	12,727	146	15,180	27,907
2004	986	0	2,958	0	39	2,997
2005	638	0	408	0	236	874
2006	4,000	0	84	0	209	4,209
2007	1,700	0	0	0	364	2,064
2008	0	0	0	0	0	0
2009	486	0	0	0	0	486

Table 3. Dusky shark recreational landings (numbers and pounds dressed weight) from three data collection programs: MRFSS, Headboat, and TXPWD surveys.

	MRFSS		Headboat		TXPWD		Total	
Year	numbers	weight	numbers	weight	numbers	weight	numbers	weight
1981	36,417	518,858					36,417	518,858
1982	9,024	128,571					9,024	128,571
1983	21,325	303,832			1,310	9,830	22,635	313,662
1984	30,505	434,626			0	0	30,505	434,626
1985	15,194	216,479			372	2,791	15,566	219,271
1986	20,348	289,912	149	1,420	743	5,575	21,240	296,907
1987	25,379	361,592	123	1,172	0	0	25,502	362,765
1988	15,390	219,272	105	1,001	0	0	15,495	220,273
1989	12,117	172,639	155	1,477	0	0	12,272	174,117
1990	11,405	162,495	38	362	0	0	11,443	162,857
1991	15,059	214,556	89	848	0	0	15,148	215,404
1992	28,220	402,070	392	3,736	0	0	28,612	405,806
1993	3,307	47,117	457	4,356	0	0	3,764	51,473
1994	9,285	132,290	191	1,820	0	0	9,476	134,110
1995	7,804	111,189	223	2,125	31	233	8,058	113,547
1996	14,865	211,792	355	3,384	32	240	15,252	215,416
1997	13,558	193,170	250	2,383	50	375	13,858	195,928
1998	4,336	61,778	163	1,554	0	0	4,499	63,332
1999	5,065	72,165	384	3,660	0	0	5,449	75,825
2000	2,720	38,754	200	1,906	35	263	2,955	40,923
2001	5,959	84,902	34	324	0	0	5,993	85,226
2002	962	13,706	85	810	0	0	1,047	14,516
2003	2,647	37,714	51	486	79	593	2,777	38,793
2004	0	0	36	343	0	0	36	343
2005	2,998	42,715	17	162	25	188	3,040	43,064
2006	58	826	22	210	114	855	194	1,891
2007	0	0	19	181	93	698	112	879
2008	2,324	33,112	67	639	0	0	2,391	33,750
2009	388	5,528	59	562	0	0	447	6,090

Landings in weight were obtained by multiplying numbers by average weight for all years combined (due to very small sample sizes in some individual years) for each of the three surveys.

Table 4. Dusky shark commercial discards (pounds dressed weight) from two data sources: pelagic longline fishery (i.e., dead discards estimated from the pelagic longline logbook and observer reports from that fishery) and bottom longline observers (BLLOP).

Year	pelagic longline fishery	Bottom longline Observers	Total
1992	66,338	0	66,338
1993	148,807	0	148,807
1994	62,542	10,196	72,738
1995	31,501	7,230	38,731
1996	16,047	0	16,047
1997	29,650	0	29,650
1998	39,651	5,134	44,786
1999	12,139	3,243	15,382
2000	29,751	0	29,751
2001	10,812	1,169	11,980
2002	10,671	10,018	20,689
2003	42,958	10,593	53,552
2004	52,155	1,285	53,439
2005	14,972	362	15,334
2006	14,780	1,347	16,127
2007	21,603	1,514	23,116
2008	2,039	0	2,039
2009	14,172	248	0

Discard estimates from the bottom longline fishery obtained by multiplying the annual commercial landing estimate (see Table 2.1) by the annual discard rate observed.

Table 5. Dusky shark total catches (pounds dressed weight).

Year	Commercial	Recreational	Discards	Total
1981		518,858		518,858
1982	40	128,571		128,612
1983	11	313,662		313,673
1984	0	434,626		434,626
1985	4,963	219,271		224,234
1986	0	296,907		296,907
1987	83	362,765		362,848
1988	1,691	220,273		221,964
1989	994	174,117		175,111
1990	39,951	162,857		202,808
1991	33,138	215,404		248,542
1992	141,730	405,806	66,338	613,874
1993	98,273	51,473	148,807	298,553
1994	122,404	134,110	72,738	329,253
1995	357,920	113,547	38,731	510,198
1996	290,820	215,416	16,047	522,283
1997	80,930	195,928	29,650	306,508
1998	81,124	63,332	44,786	189,241
1999	137,650	75,825	15,382	228,856
2000	205,746	40,923	29,751	276,419
2001	4,463	85,226	11,980	101,669
2002	16,905	14,516	20,689	52,110
2003	27,907	38,793	53,552	120,251
2004	2,997	343	53,439	56,779
2005	874	43,064	15,334	59,272
2006	4,209	1,891	16,127	22,227
2007	2,064	879	23,116	26,059
2008	0	33,750	2,039	35,789
2009	486	6,090	0	6,576

Table 6. Catch history for the blacknose shark by sector (numbers of fish).

BASELINE SCENARIO

CATCHES OF BLACKNOSE SHARKS (in numbers)

Year	Commercial				Recreational catches	Bottom longline discards	Shrimp bycatch (GOM)	Shrimp bycatch (SA)	EFP	Total
	Total	Longline	Nets	Lines						
1972							14,921	1,876		16,796
1973							15,177	1,908		17,084
1974							7,743	973		8,716
1975							20,404	2,565		22,969
1976							13,287	1,670		14,957
1977							100,259	12,603		112,861
1978							21,472	2,699		24,171
1979							13,168	1,655		14,823
1980							8,669	1,090		9,759
1981							10,194	1,281		11,475
1982							7,963	1,001		8,963
1983					13,956		9,533	1,198		24,687
1984					844		7,285	916		9,044
1985					1,918		9,794	1,231		12,943
1986					2,068		20,222	2,542		24,832
1987					14,545		12,131	1,525		28,201
1988					13,573		10,900	1,370		25,843
1989					1,793		26,649	3,350		31,792
1990					4,275		20,081	2,524		26,880
1991					8		37,291	4,687		41,987
1992					4,934		38,197	4,801		47,932
1993					4,547		15,514	1,950		22,011
1994					14,475		27,351	3,438		45,264
1995	15,672	15,652	0	20	2,814	3,975	40,316	5,068		67,845
1996	23,981	8,641	14,573	768	12,414	916	35,295	4,437		77,043
1997	43,792	17,628	26,004	88	11,079	6,011	58,309	7,329		126,448
1998	23,345	7,689	15,613	43	10,547	1,161	34,082	4,284		73,418
1999	29,057	5,968	21,812	539	6,027	5,007	27,461	3,452		70,266
2000	46,603	13,493	32,154	956	10,240	8,136	31,556	3,967	0	100,501
2001	35,568	5,732	28,549	29	14,885	5,520	45,593	5,731		106,039
2002	28,681	6,877	21,280	522	11,345	3,397	25,400	3,193		72,015
2003	22,995	10,387	12,498	90	6,615	3,501	54,258	6,820	2	94,169
2004	13,945	5,889	7,942	114	15,101	4,011	65,546	8,239	68	106,842
2005	22,426	9,833	12,311	280	7,101	3,048	20,568	2,585	77	55,727
2006	31,592	19,091	12,435	32	9,914	7,484	21,280	2,586	77	72,822
2007	17,581	4,959	12,349	125	9,177	858			77	27,468
2008	25,384	6,129	19,106	170	3,718	933			77	30,056
2009	33,261	13,722	19,361	178	5,845	1,933			77	41,039

Table 7. Percentage of sandbar shark commercial landings by region and year for all gear combined (from general canvass).

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1987	100.0	0.0	0.0
1988	94.0	0.0	6.0
1989	5.8	94.2	0.0
1990	0.0	100.0	0.0
1991	91.8	6.6	1.5
1992	69.1	11.1	19.8
1993	62.8	7.5	29.7
1994	68.4	3.6	28.0
1995	58.1	3.8	38.1
1996	49.0	4.1	46.9
1997	51.1	3.4	45.5
1998	51.5	2.6	45.9
1999	33.9	3.9	62.1
2000	45.0	5.0	50.0
2001	54.3	3.3	42.3
2002	48.9	2.7	48.4
2003	52.3	0.0	47.7
2004	47.2	4.6	48.2
2005	42.3	8.0	49.7
2006	52.5	9.0	38.5
2007	35.9	39.9	24.2
2008	31.0	54.0	15.0
2009	67.9	0.3	31.9

Table 8. Percentage of sandbar shark commercial landings by region and gear for all years combined (from general canvass). Years listed under each region indicate those used in the summary calculation.

	Region		
Gear	**Gulf of Mexico** (1991 - 2009)	**Mid Atlantic** (1989 - 2009)	**South Atlantic** (1991 - 2009)
Diving	0.00	0.00	0.00
Gillnets	0.07	39.44	2.40
Lines	0.80	1.38	1.09
Longlines	67.53	46.94	78.87
Other	31.59	0.24	17.51
Other nets	0.01	0.39	0.02
Other trawl	0.00	0.00	0.00
Otter trawl	0.00	8.58	0.12
Pots & traps	0.00	0.00	0.00
Purse seine	0.00	0.00	0.00
Unknown	0.00	3.03	0.00

Table 9. Percentage of dusky shark commercial landings by region and year for all gear combined (from general canvass).

	Region		
Year	**Gulf of Mexico**	**Mid Atlantic**	**South Atlantic**
1988	0.00	100.00	0.00
1989	0.00	97.65	2.35
1990	0.00	100.00	0.00
1991	3.22	94.46	2.32
1992	1.61	78.00	20.39
1993	1.70	61.04	37.25
1994	6.90	41.18	51.92
1995	17.93	23.70	58.37
1996	31.72	17.67	50.61
1997	27.62	18.74	53.65
1998	22.50	5.00	72.50
1999	9.15	43.53	47.32
2000	1.14	85.00	13.86
2001	0.00	84.90	15.10
2002	0.90	58.92	40.19
2003	0.00	72.90	27.10
2004	94.72	5.28	0.00
2005	78.47	21.53	0.00
2006	95.03	4.97	0.00
2007	82.36	17.64	0.00
2008			
2009	0.00	0.00	100.00

Table 10. Percentage of dusky shark commercial landings by region and gear for all years combined (from general canvass). Years listed under each region indicate those used in the summary calculation.

Gear	Region		
	Gulf of Mexico (1991 - 2009)	**Mid Atlantic** (1988 - 2009)	**South Atlantic** (1991 - 2009)
Diving	0.00	0.00	0.00
Gillnets	0.02	35.46	12.63
Lines	6.43	0.44	1.49
Longlines	88.10	41.36	71.80
Other	5.44	0.02	6.57
Other nets	0.00	2.11	6.69
Other trawl	0.00	0.00	0.00
Otter trawl	0.00	4.24	0.62
Pots & traps	0.00	3.23	0.00
Purse seine	0.00	0.02	0.00
Unknown	0.00	13.13	0.20

Table 11. Percentage of blacknose shark commercial landings by region and year for all gear combined (from general canvass).

	Region	
Year	**South Atlantic**	**Gulf of Mexico**
1995	34.7	65.3
1996	89.5	10.5
1997	91.8	8.2
1998	86.0	14.0
1999	90.1	9.9
2000	91.0	9.0
2001	92.0	8.0
2002	75.1	24.9
2003	86.6	13.4
2004	85.6	14.4
2005	58.3	41.7
2006	45.1	54.9
2007	72.9	27.1
2008	91.3	8.7
2009	87.9	12.1

Table 12. Percentage of blacknose shark commercial landings in the SA region by gear for all years combined (from general canvass). Years listed indicate those used in the summary calculation.

Gear	Region South Atlantic (1995 - 2009)
Gillnets	0.6
Drift nets	73.0
Lines	0.6
Longlines	25.8

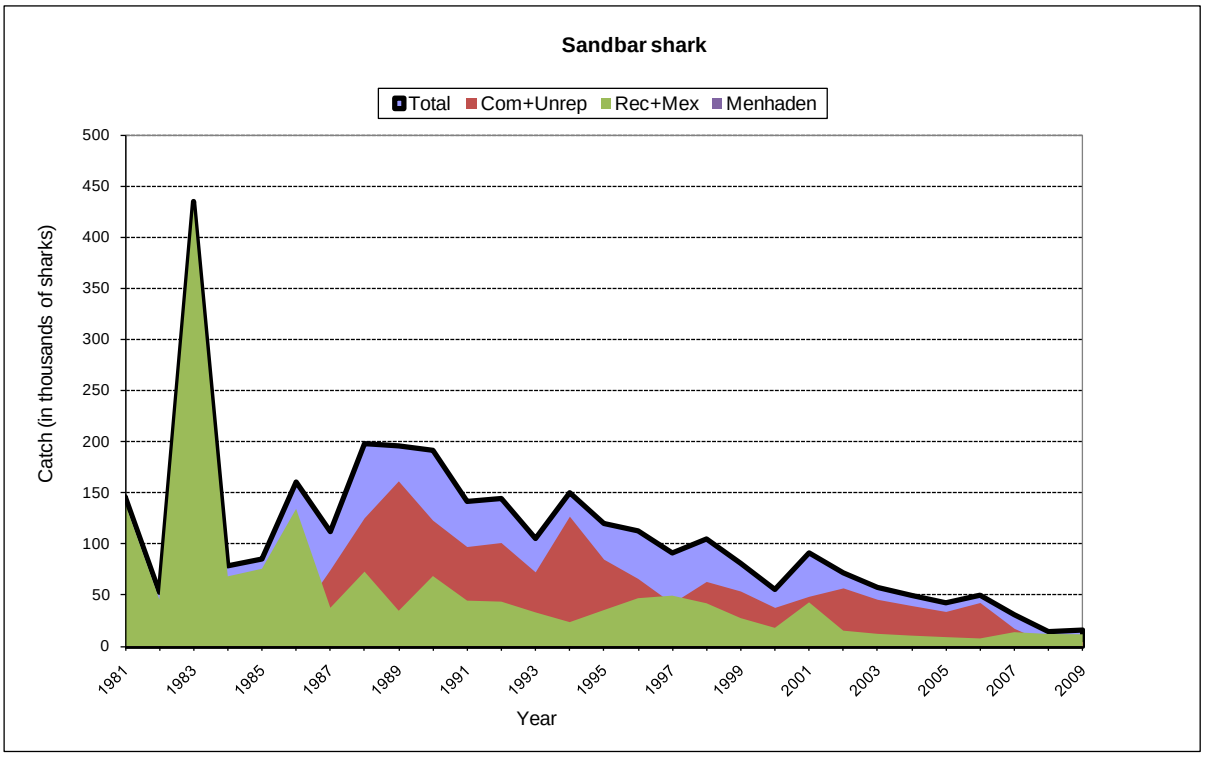

Figure 1. Total catches of sandbar sharks by sector.

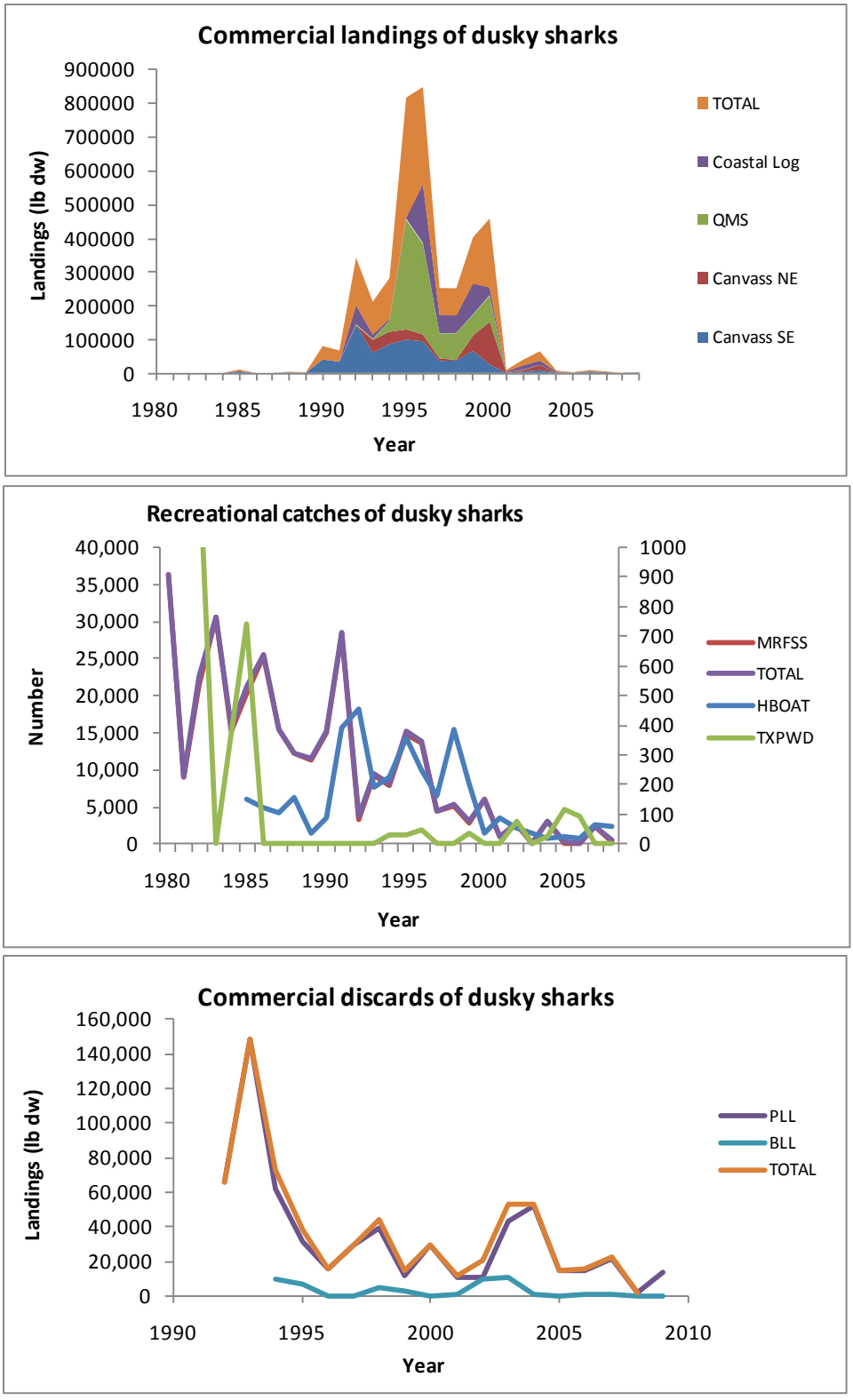

Figure 2. Commercial landings, recreational catches, and commercial discards of dusky sharks as reported in sources available. In the middle panel, the HBOAT and TXPWD series use the Y-axis on the right side of the plot.

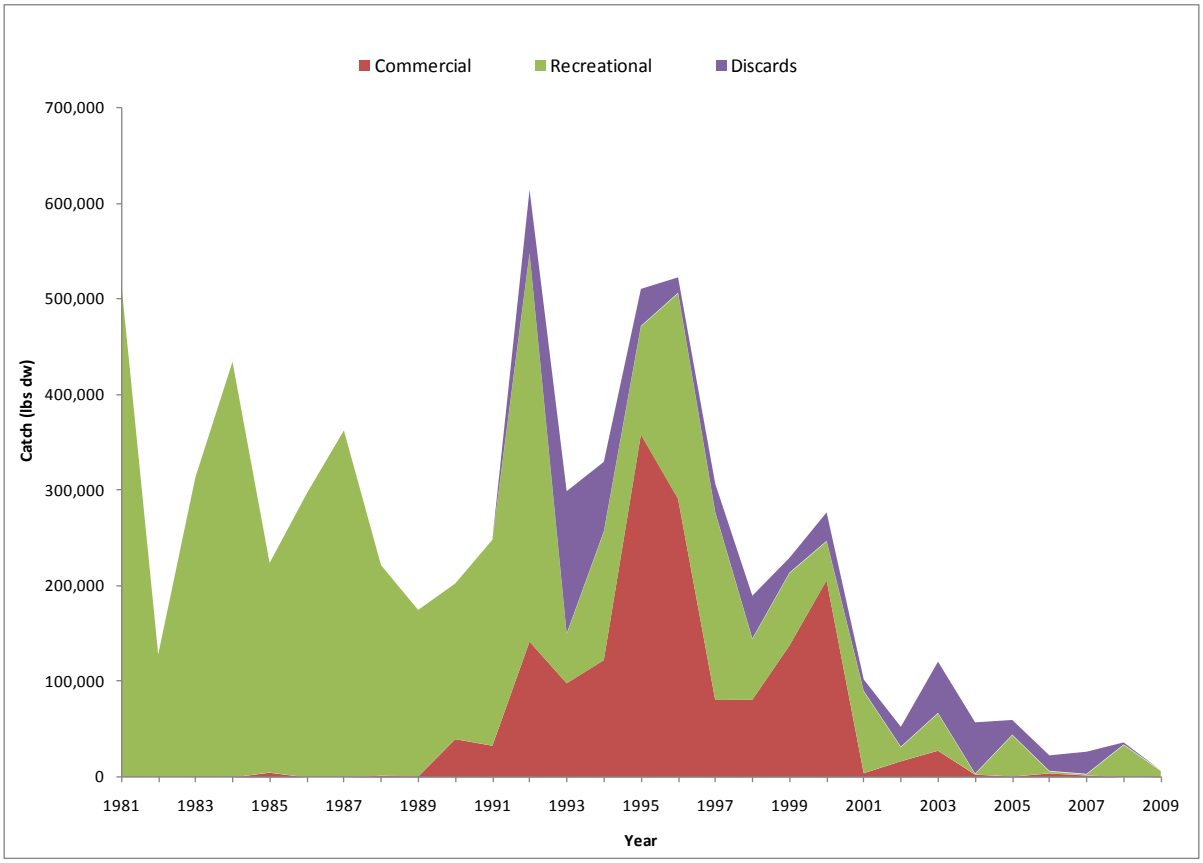

Figure 3. Total catches of dusky sharks by sector.

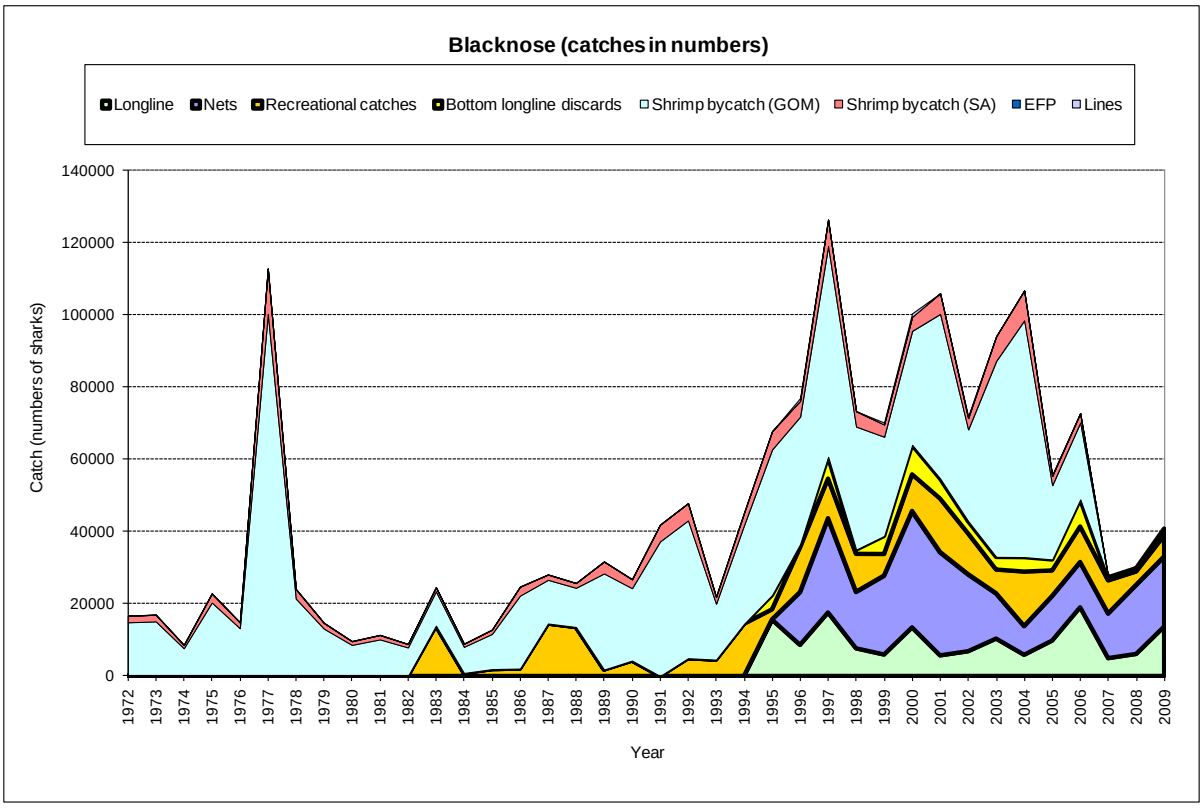

Figure 4. Total catches of blacknose sharks by sector.

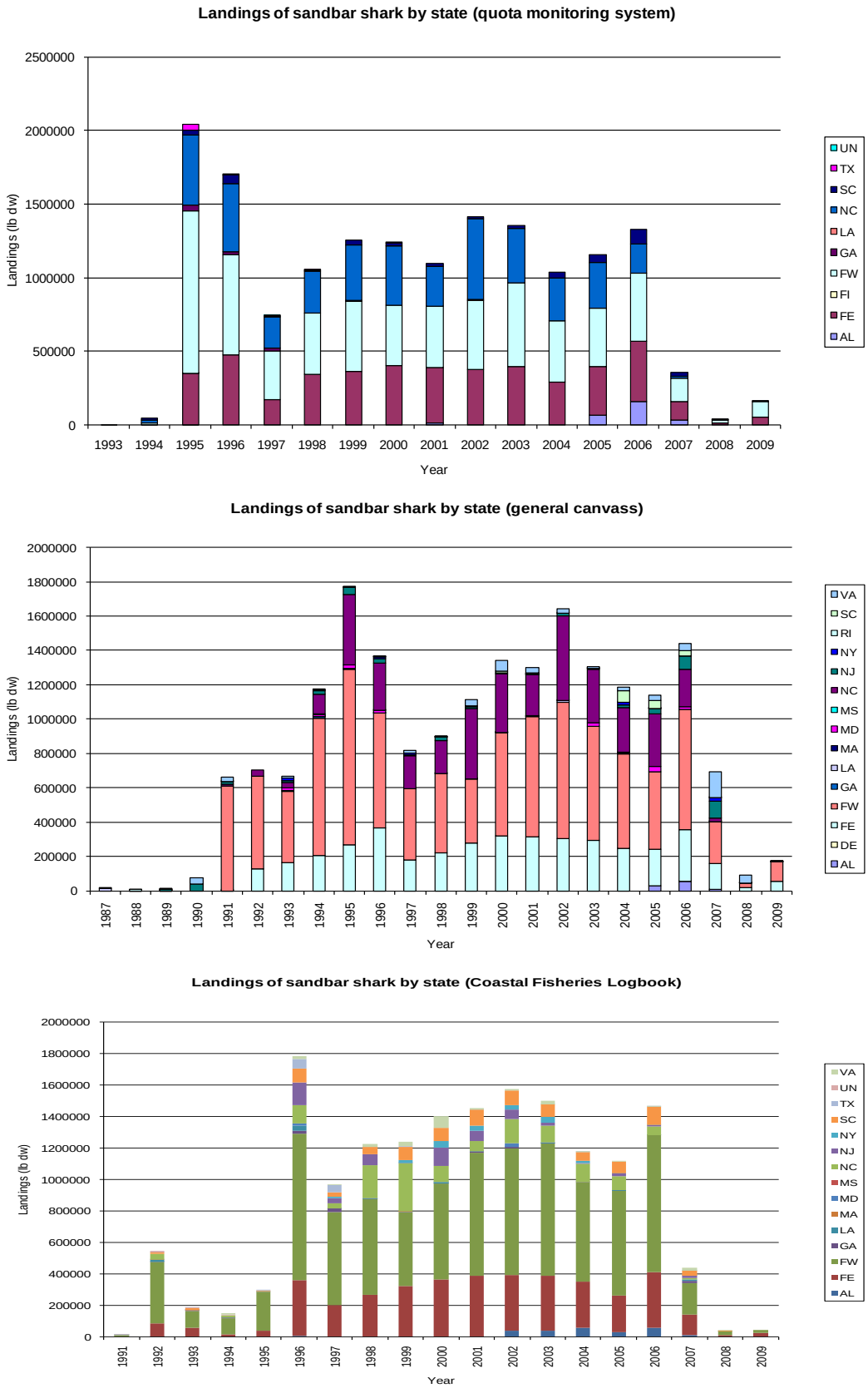

Figure 5. Commercial landings of sandbar sharks by state from three data sources.

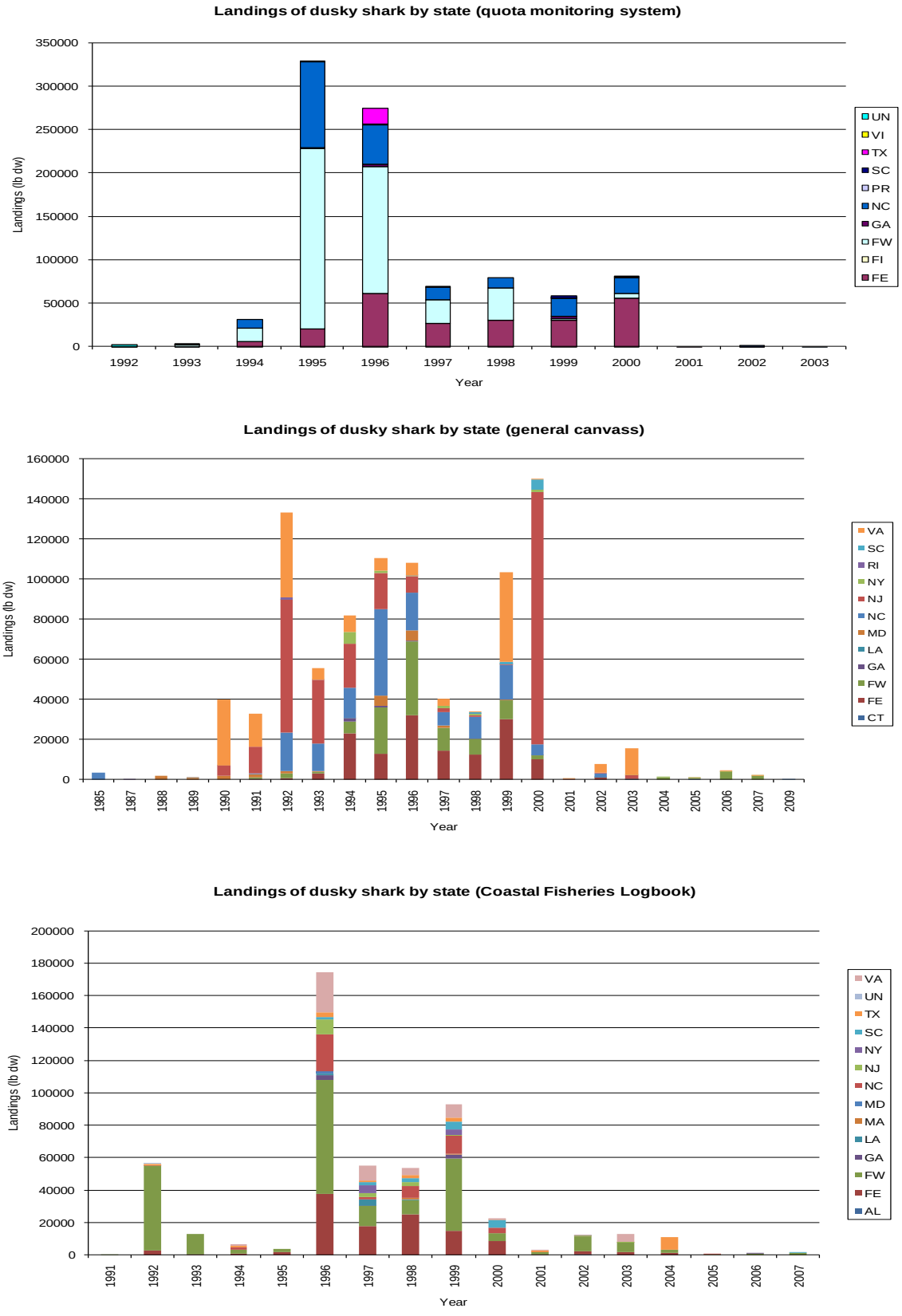

Figure 6. Commercial landings of dusky sharks by state from three data sources.

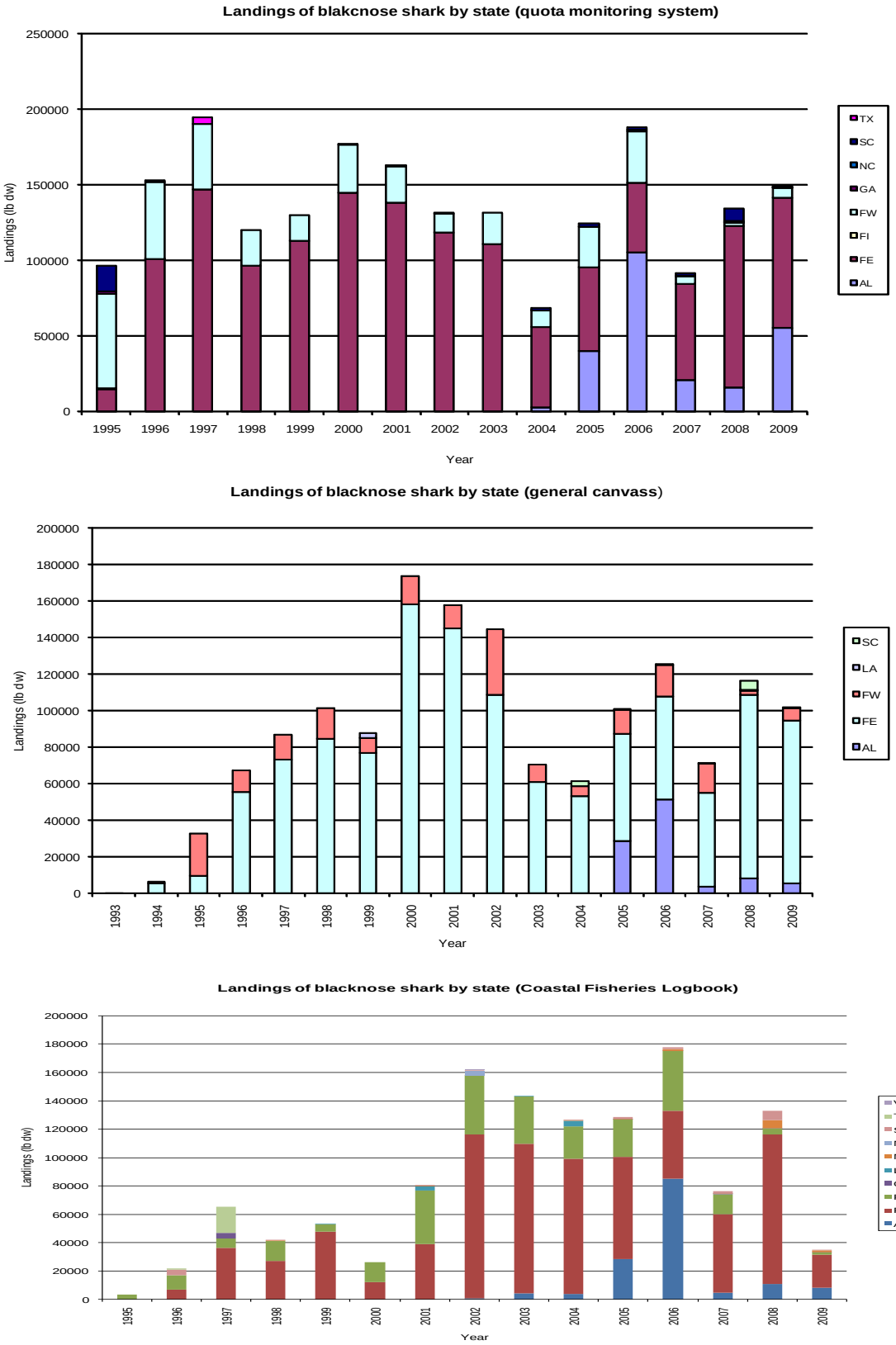

Figure 7. Commercial landings of blacknose sharks by state from three data sources.

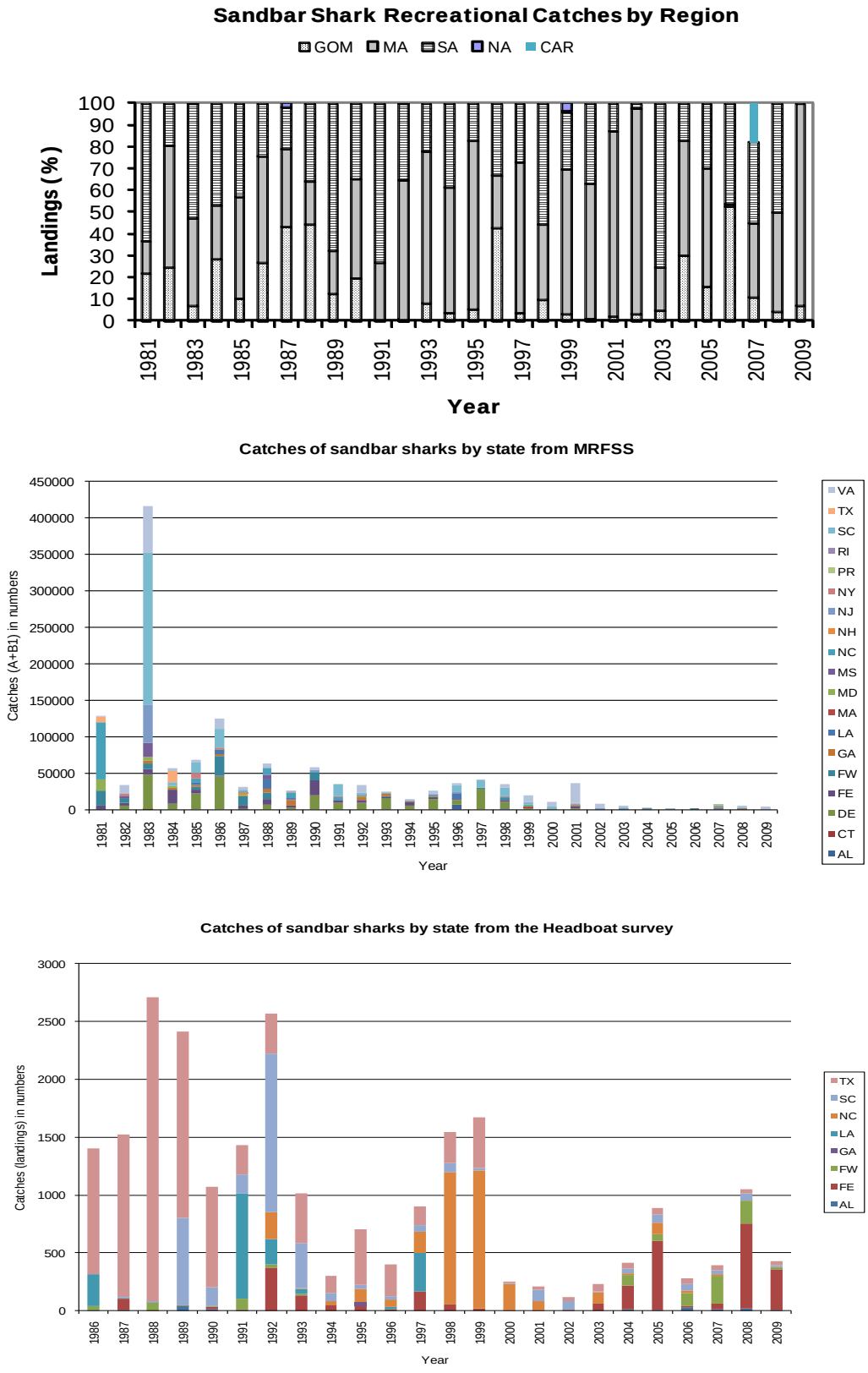

Figure 8. Recreational catches of sandbar sharks by region from MRFSS, HBOAT and TXPWD survey data combined (top), by state from MRFSS (middle), and from the HBOAT survey (bottom).

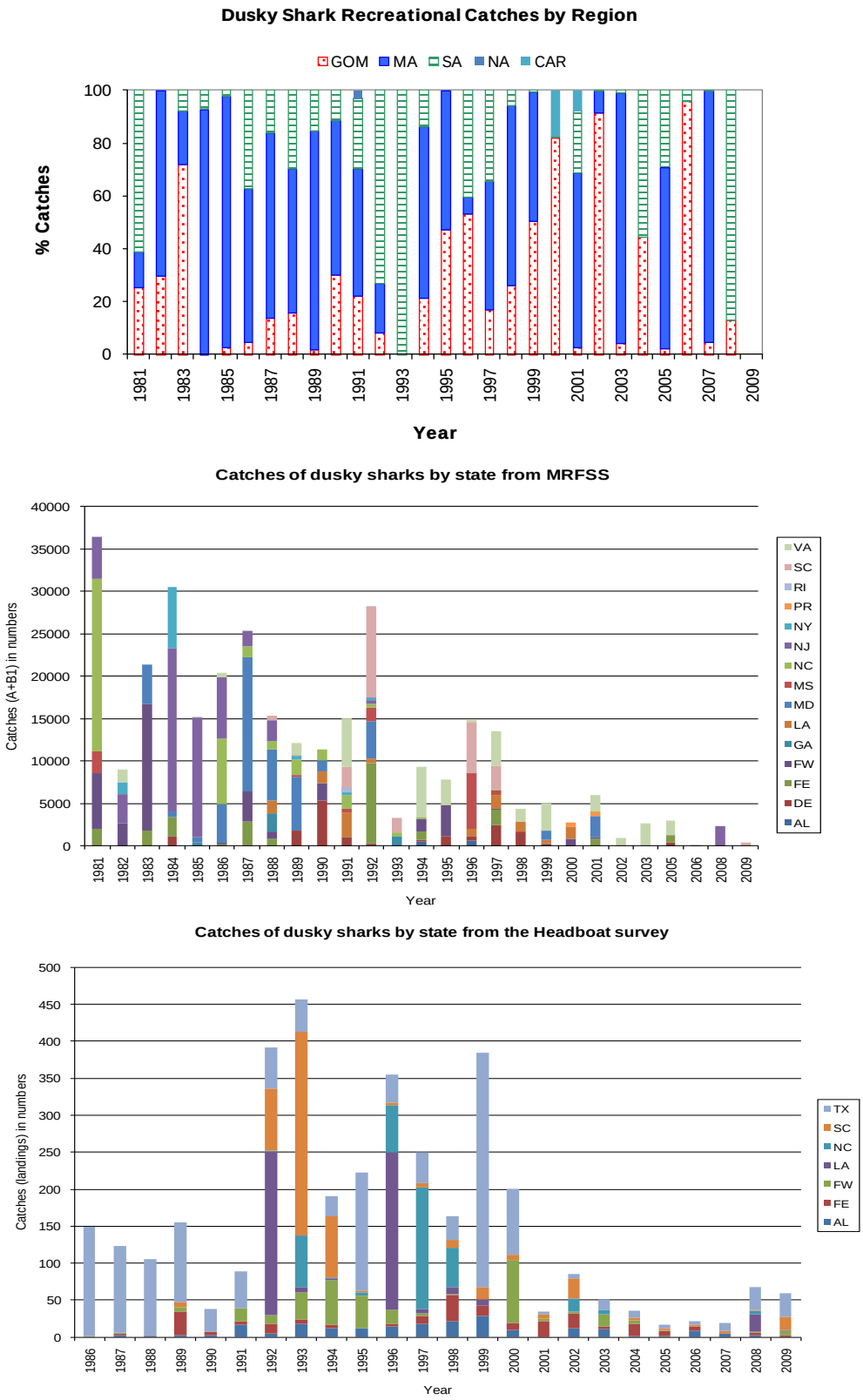

Figure 9. Recreational catches of dusky sharks by region from MRFSS, HBOAT and TXPWD survey data combined (top), by state from MRFSS (middle), and from the Headboat survey (bottom).

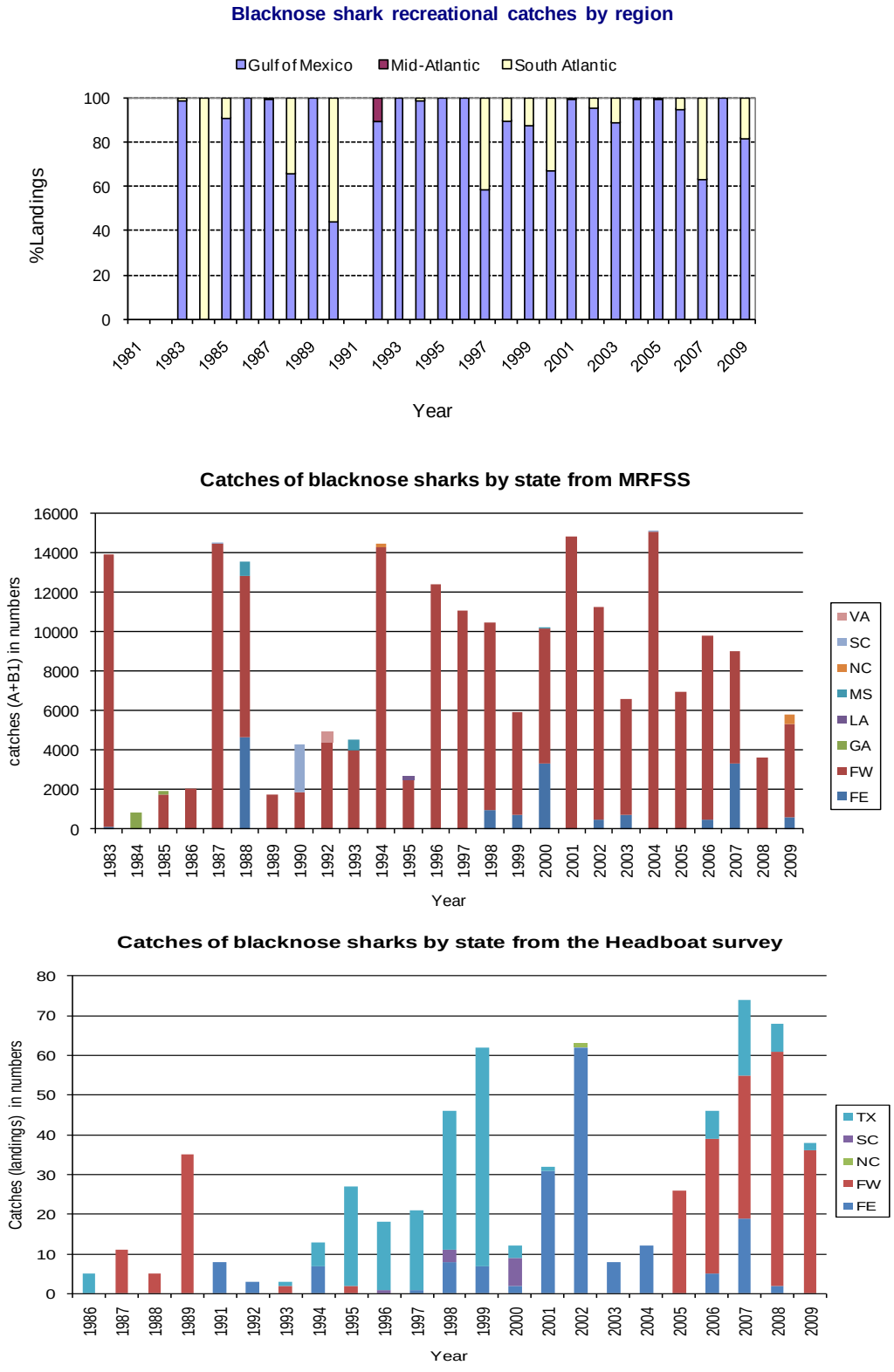

Figure 10. Recreational catches of blacknose sharks by region from MRFSS, HBOAT and TXPWD survey data combined (top), by state from MRFSS (middle), and from the Headboat survey (bottom).

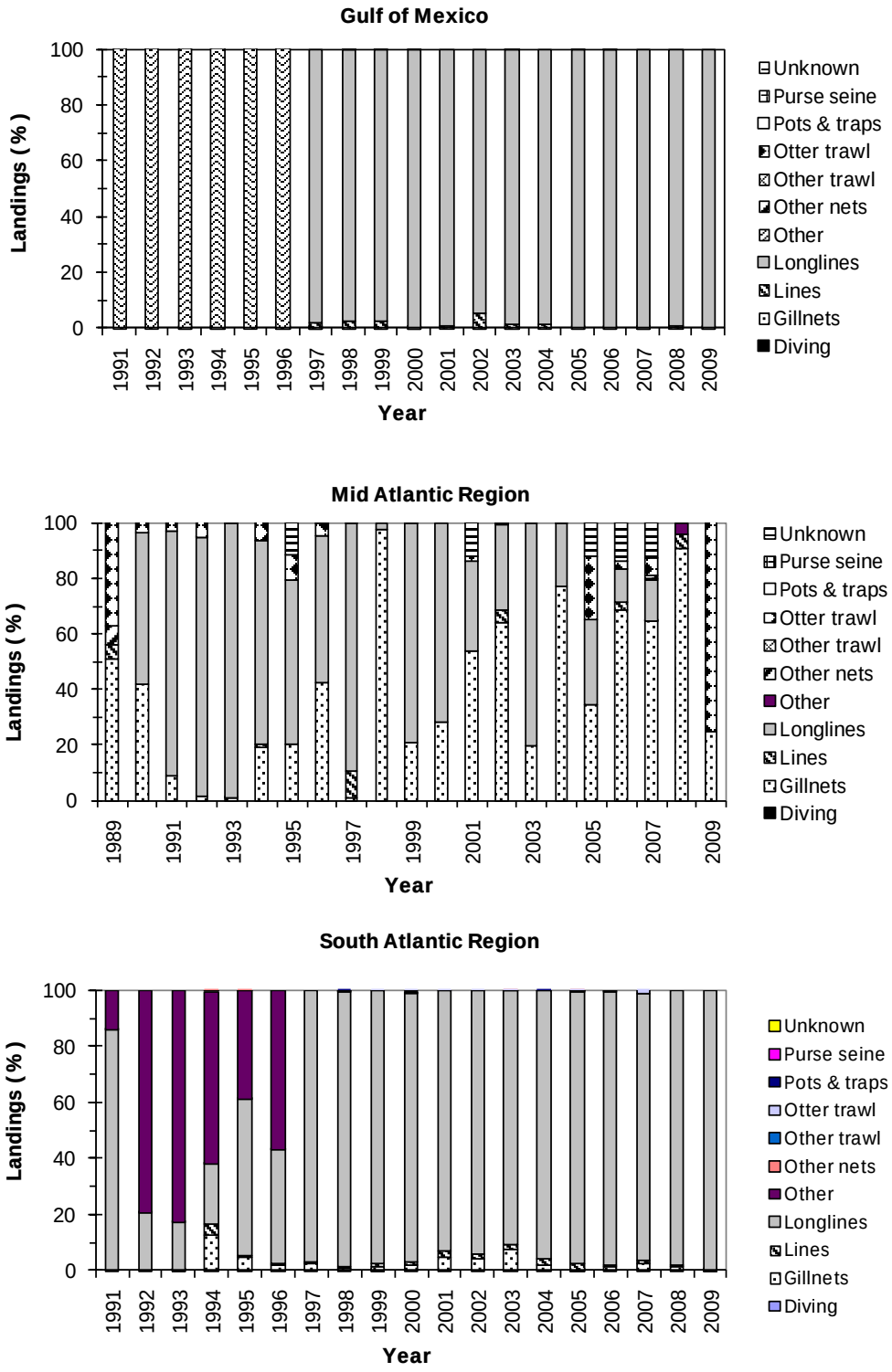

Figure 11. Commercial landings for the sandbar shark by region and gear type. Data are from the northeast and southeast general canvass.

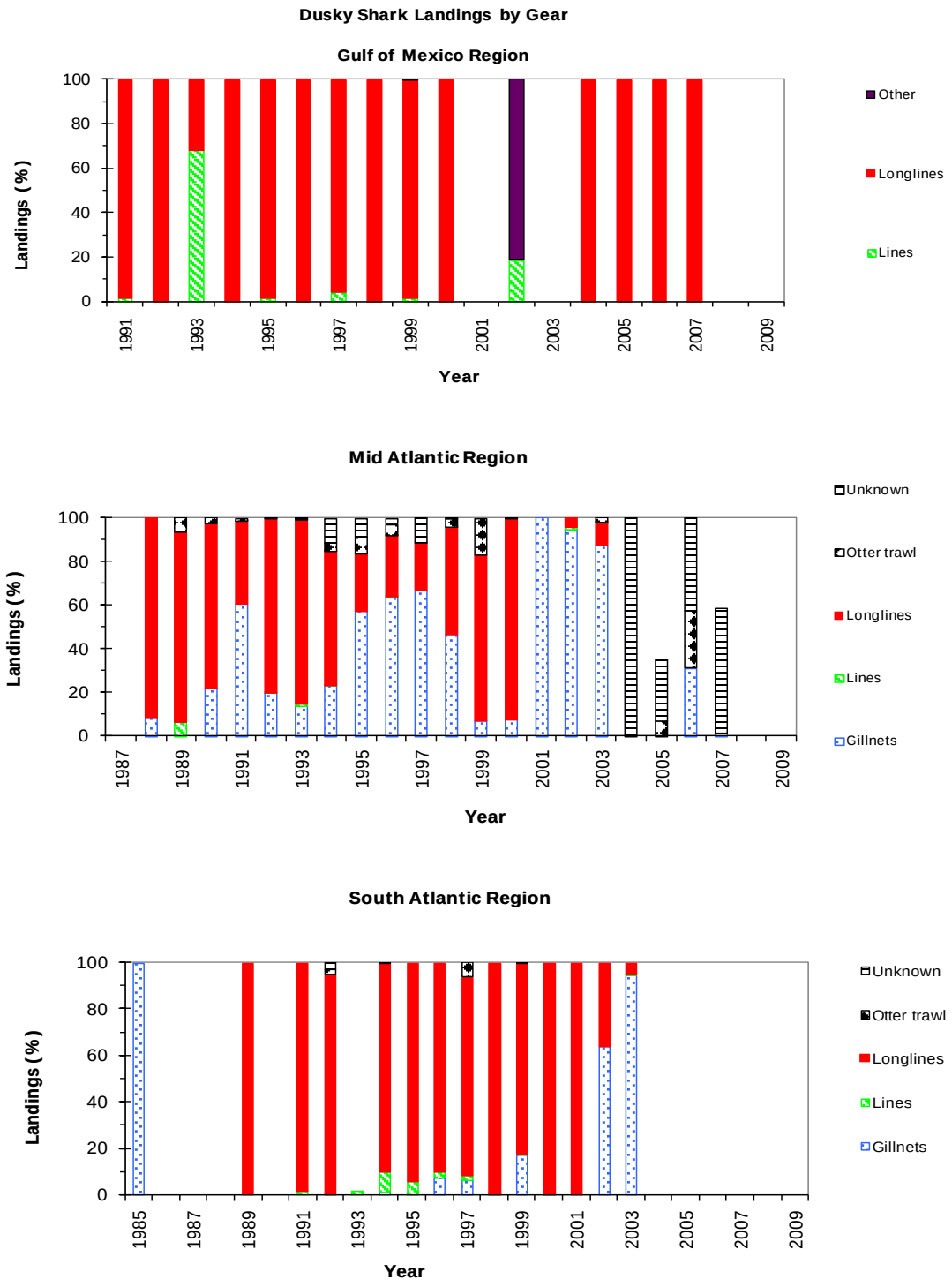

Figure 12. Commercial landings for the dusky shark by region and gear type. Data are from the northeast and southeast general canvass.

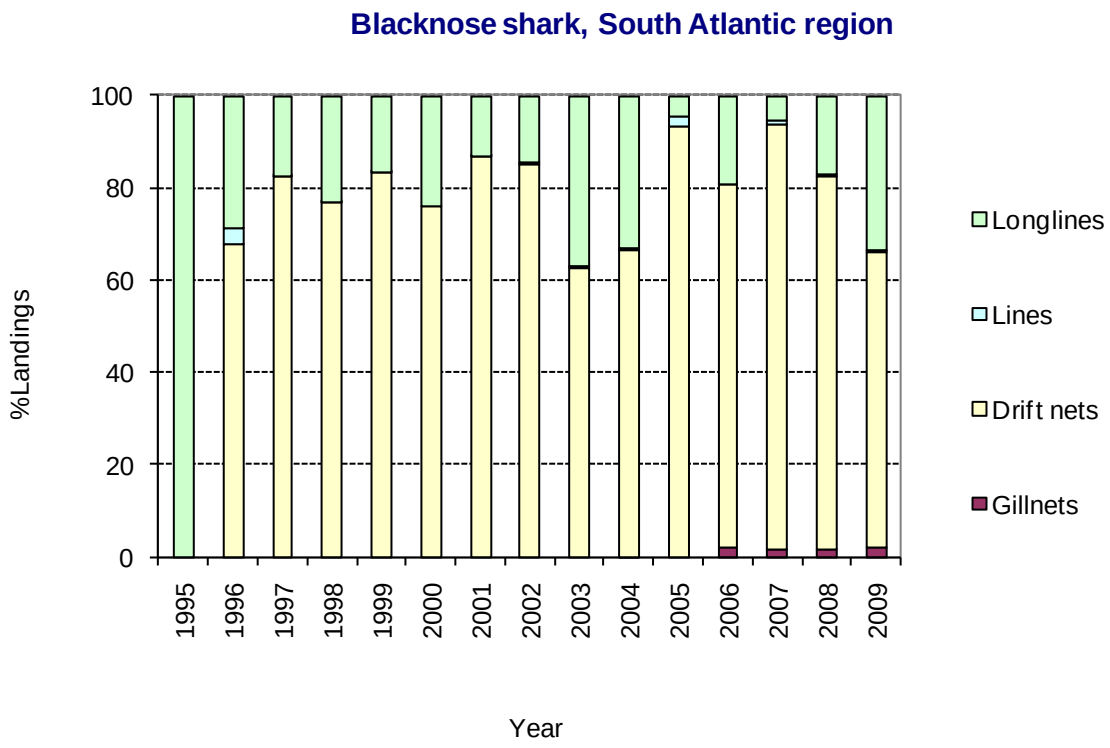

Figure 13. Commercial landings for the blacknose shark in the South Atlantic (SA) region. Data are from the northeast and southeast general canvass.

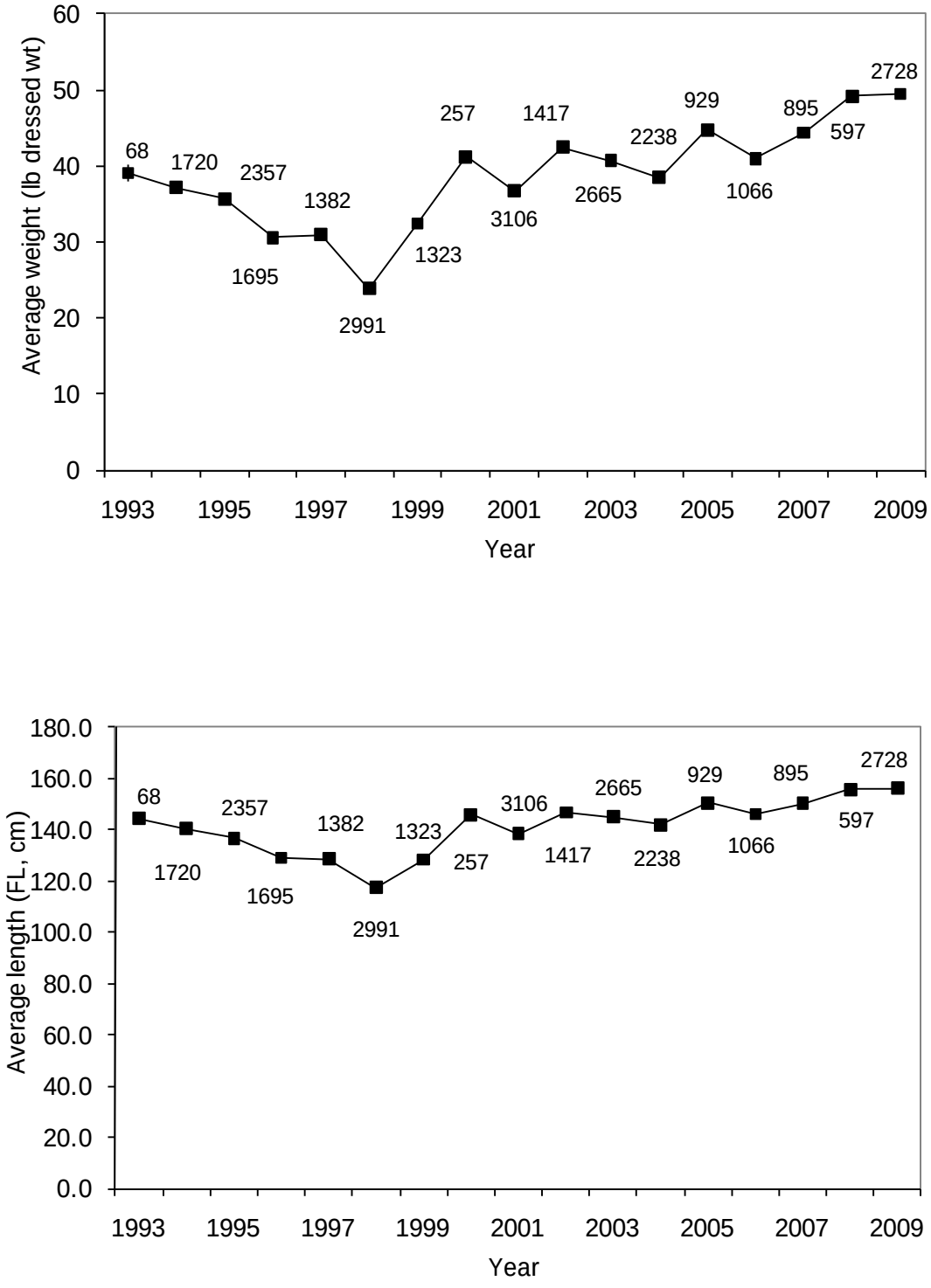

Figure 14. Average weight (top) and length (bottom) of sandbar sharks observed in the Shark Bottom Longline Observer Program. Error bars represent +/- one standard error; sample sizes are indicated.

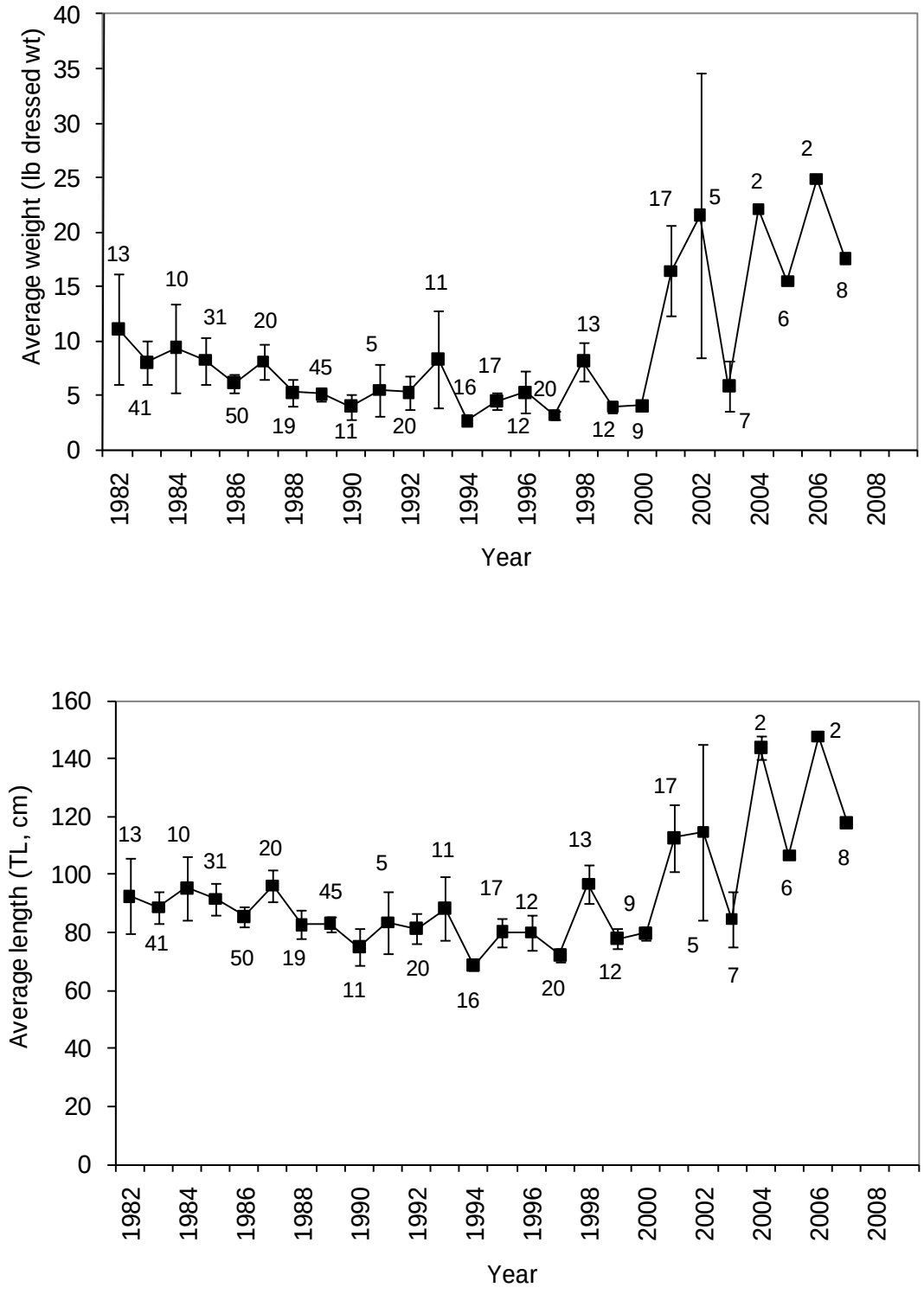

Figure 15. Average weight (top) and length (bottom) of sandbar sharks observed in the Marine Recreational Fishery Statistics Survey. Error bars represent +/- one standard error; sample sizes are indicated.

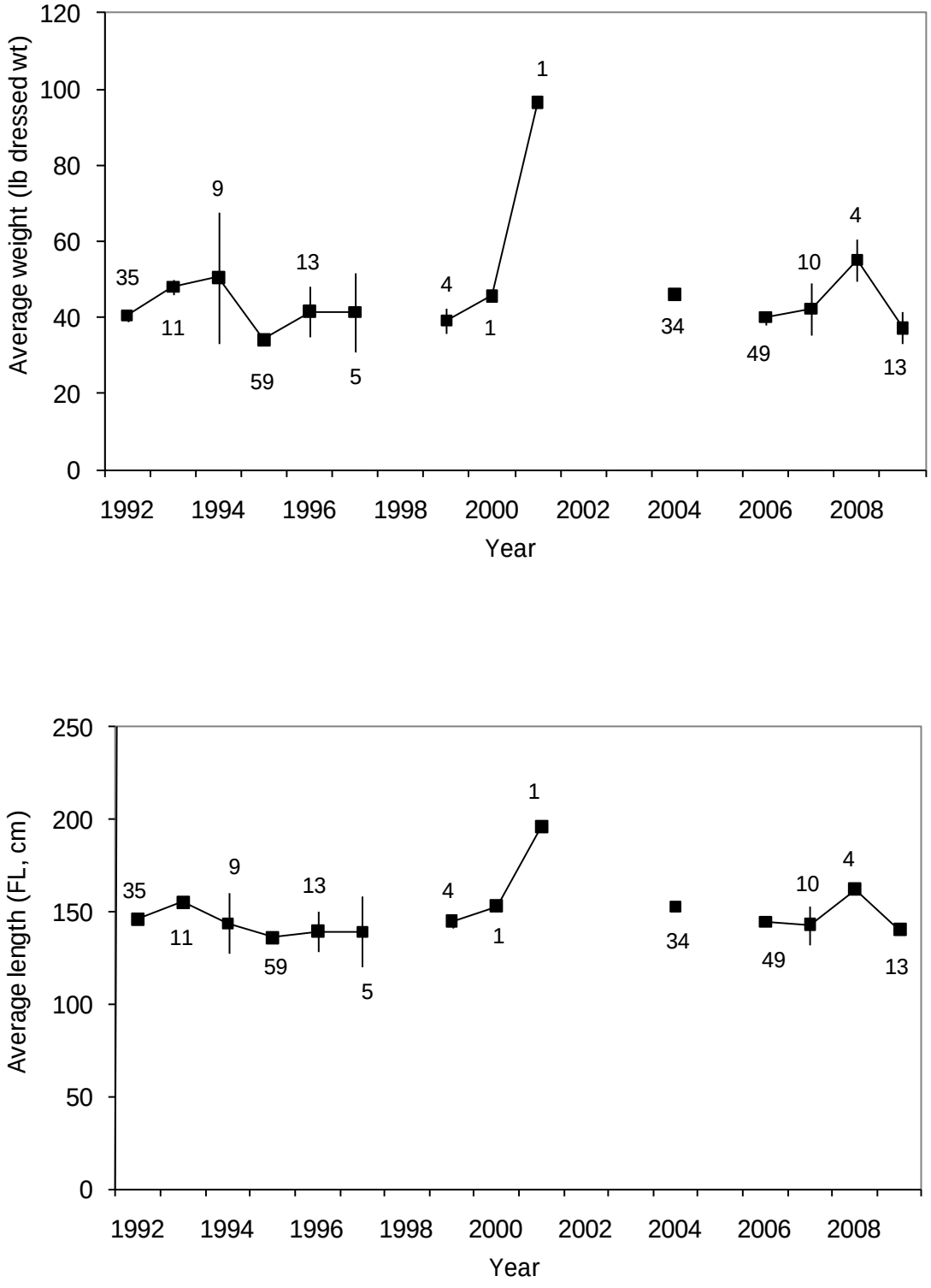

Figure 16. Average weight (top) and length (bottom) of sandbar sharks observed in the Pelagic Longline Observer Program. Error bars represent +/- one standard error; sample sizes are indicated.

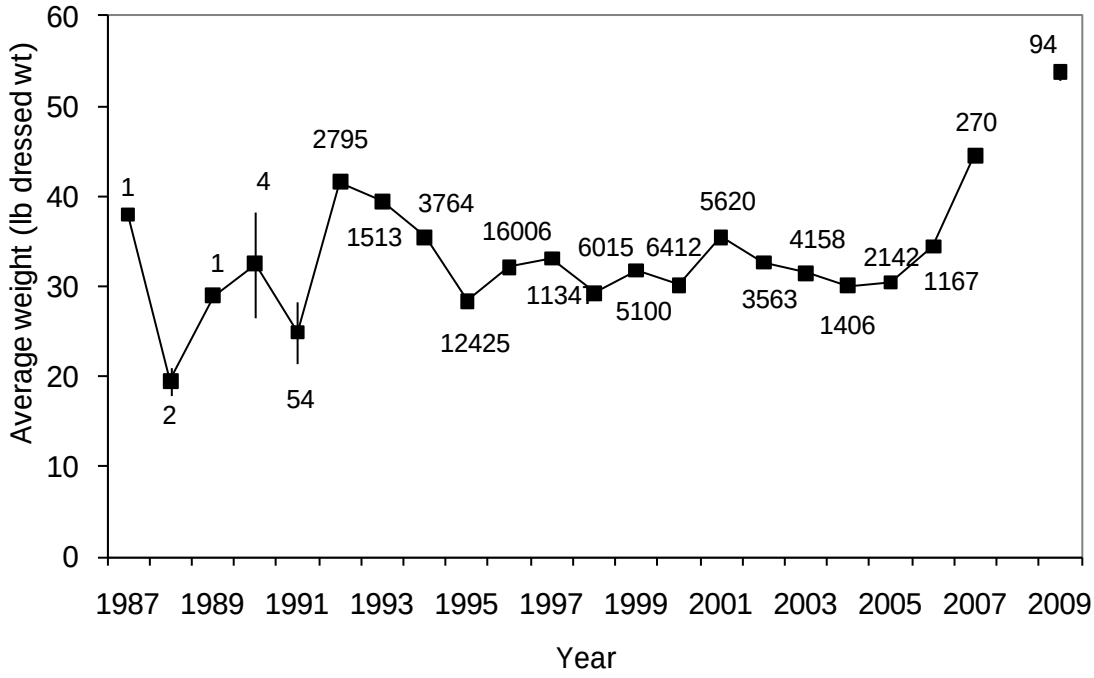

Figure 17. Average weight of sandbar sharks from dealer weigh-outs. Error bars represent +/- one standard error; sample sizes are indicated.

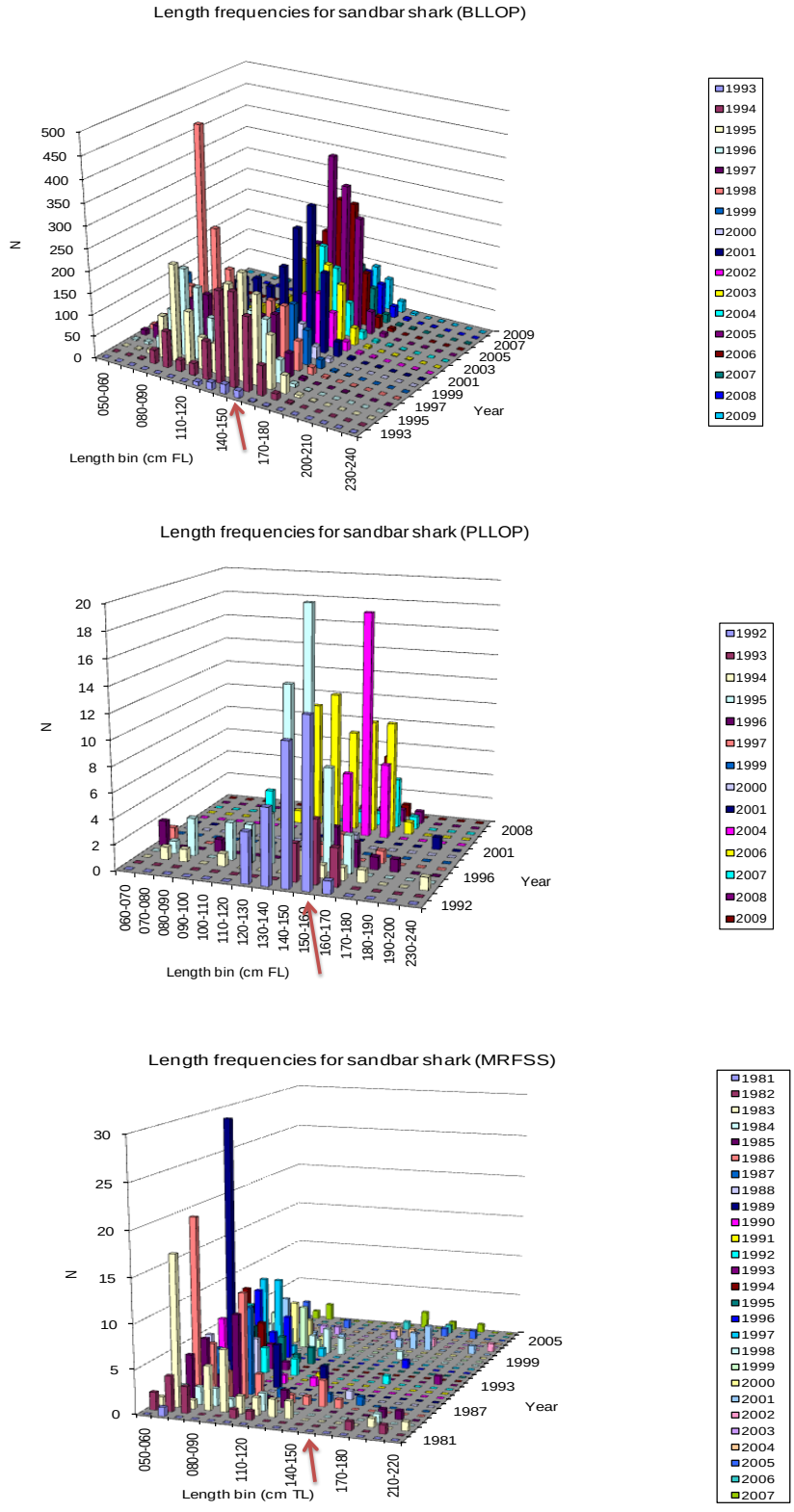

Figure 18. Length-frequency distributions of sandbar sharks from the BLLOP (top), PLLOP (middle) and MRFSS (bottom). The arrows indicate approximate median length at maturity.

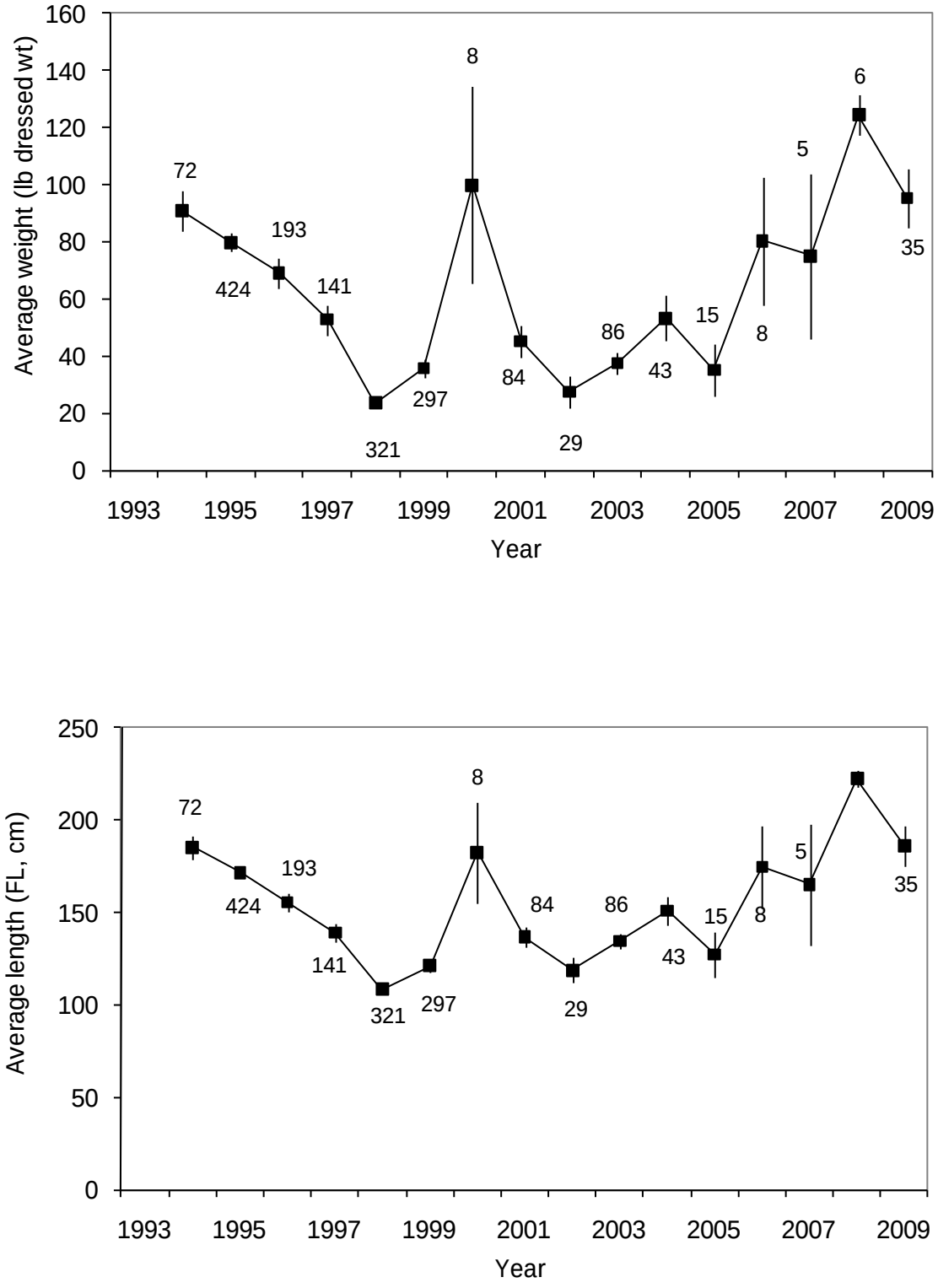

Figure 19. Average weight (top) and length (bottom) of dusky sharks observed in the Shark Bottom Longline Observer Program. Error bars represent +/- one standard error; sample sizes are indicated.

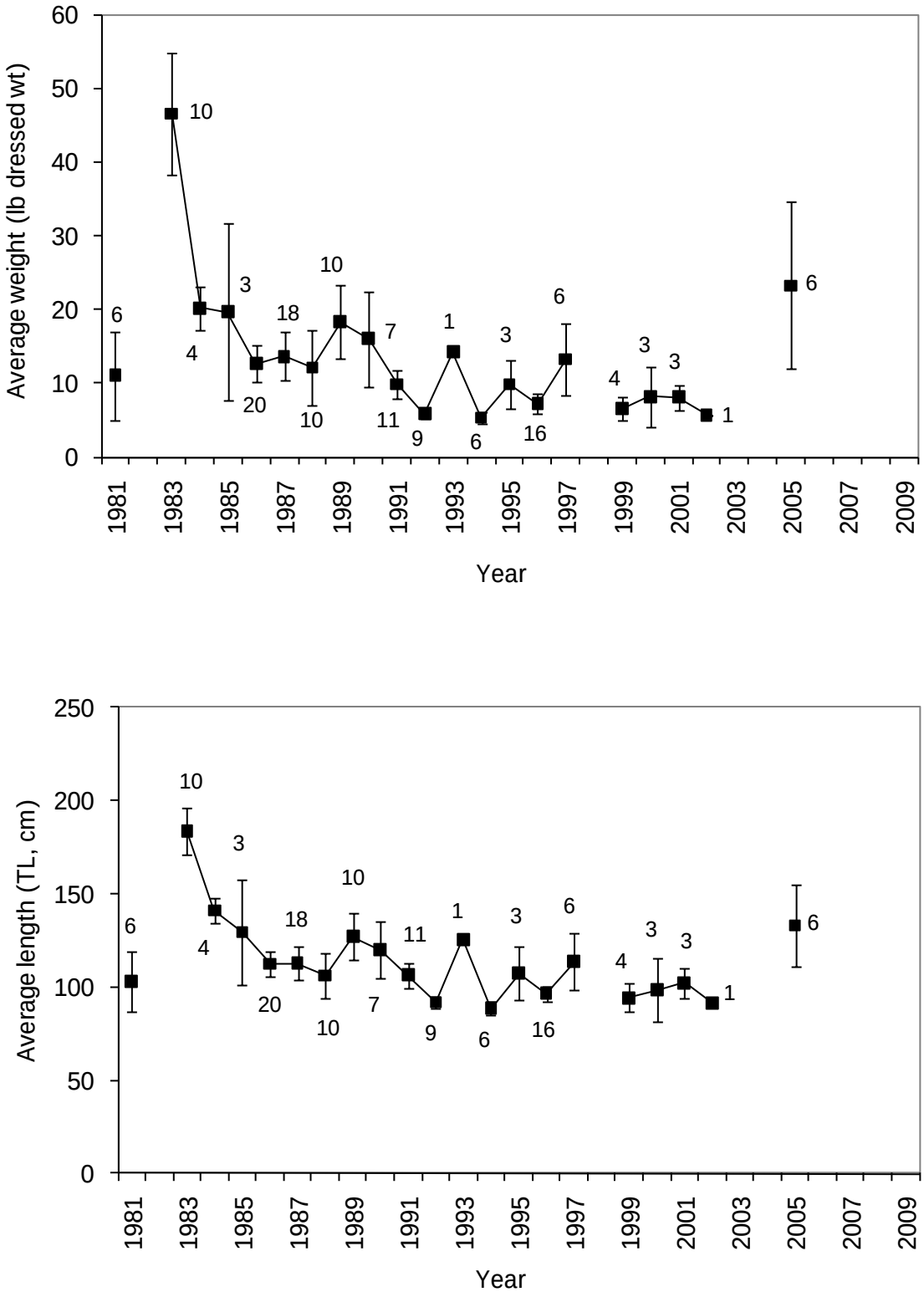

Figure 20. Average weight (top) and length (bottom) of dusky sharks observed in the Marine Recreational Fishery Statistics Survey. Error bars represent +/- one standard error; sample sizes are indicated.

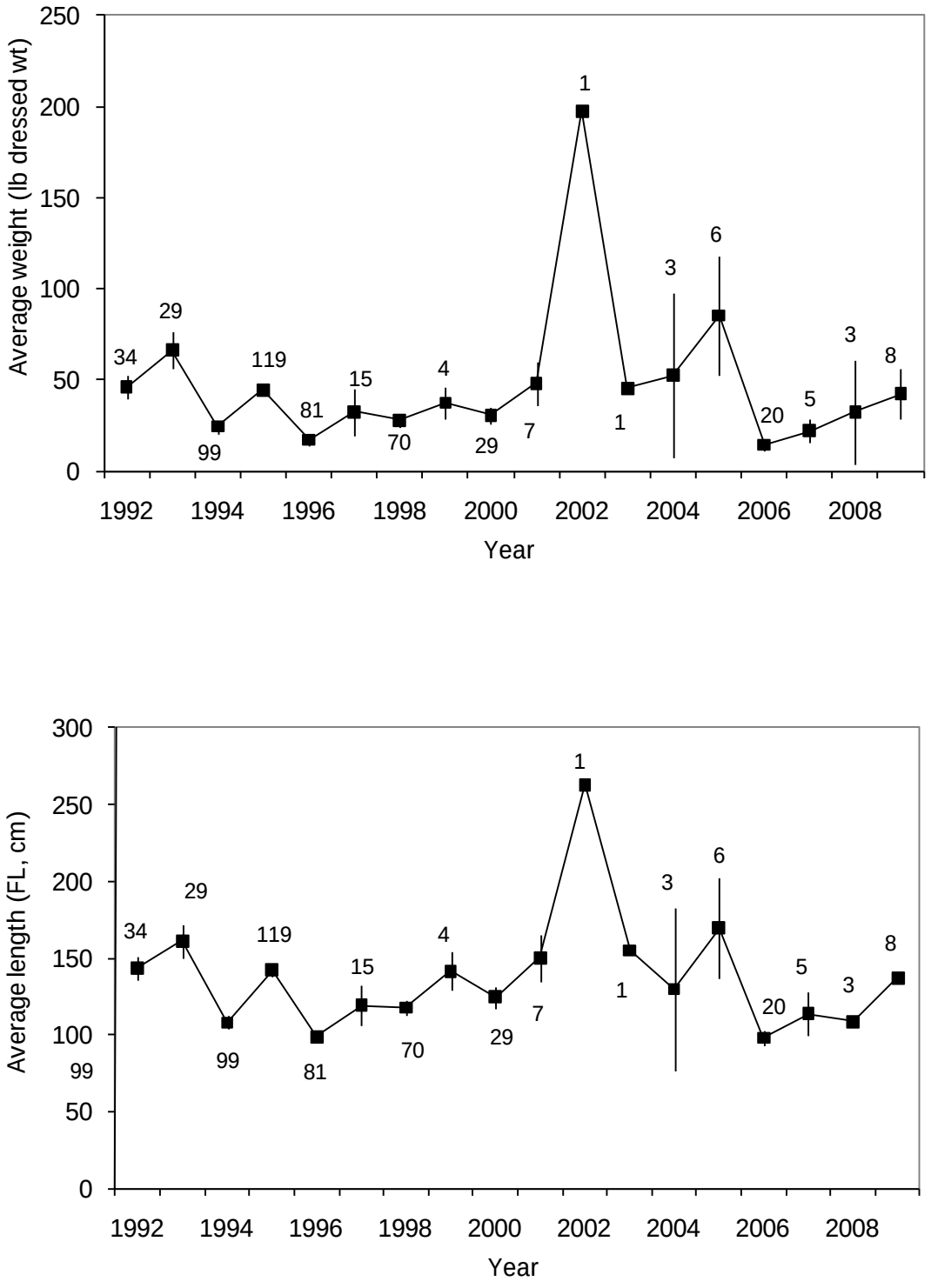

Figure 21. Average weight (top) and length (bottom) of dusky sharks observed in the Pelagic Longline Observer Program. Error bars represent +/- one standard error; sample sizes are indicated.

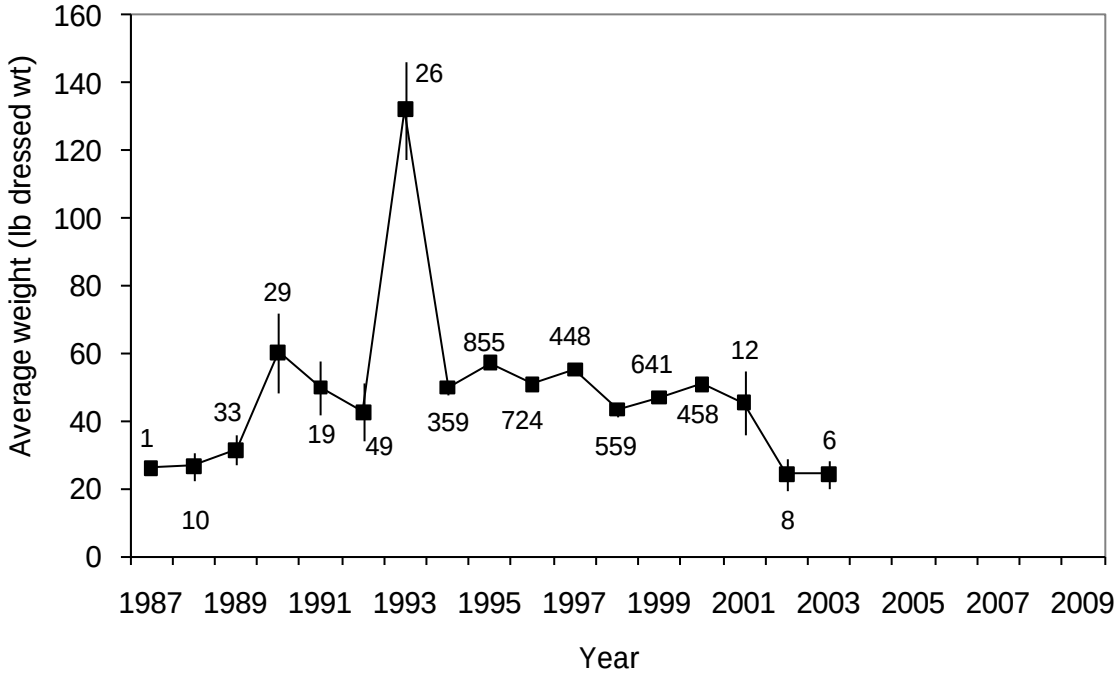

Figure 22. Average weight of dusky sharks from dealer weigh-outs.
Error bars represent +/- one standard error; sample sizes are indicated.

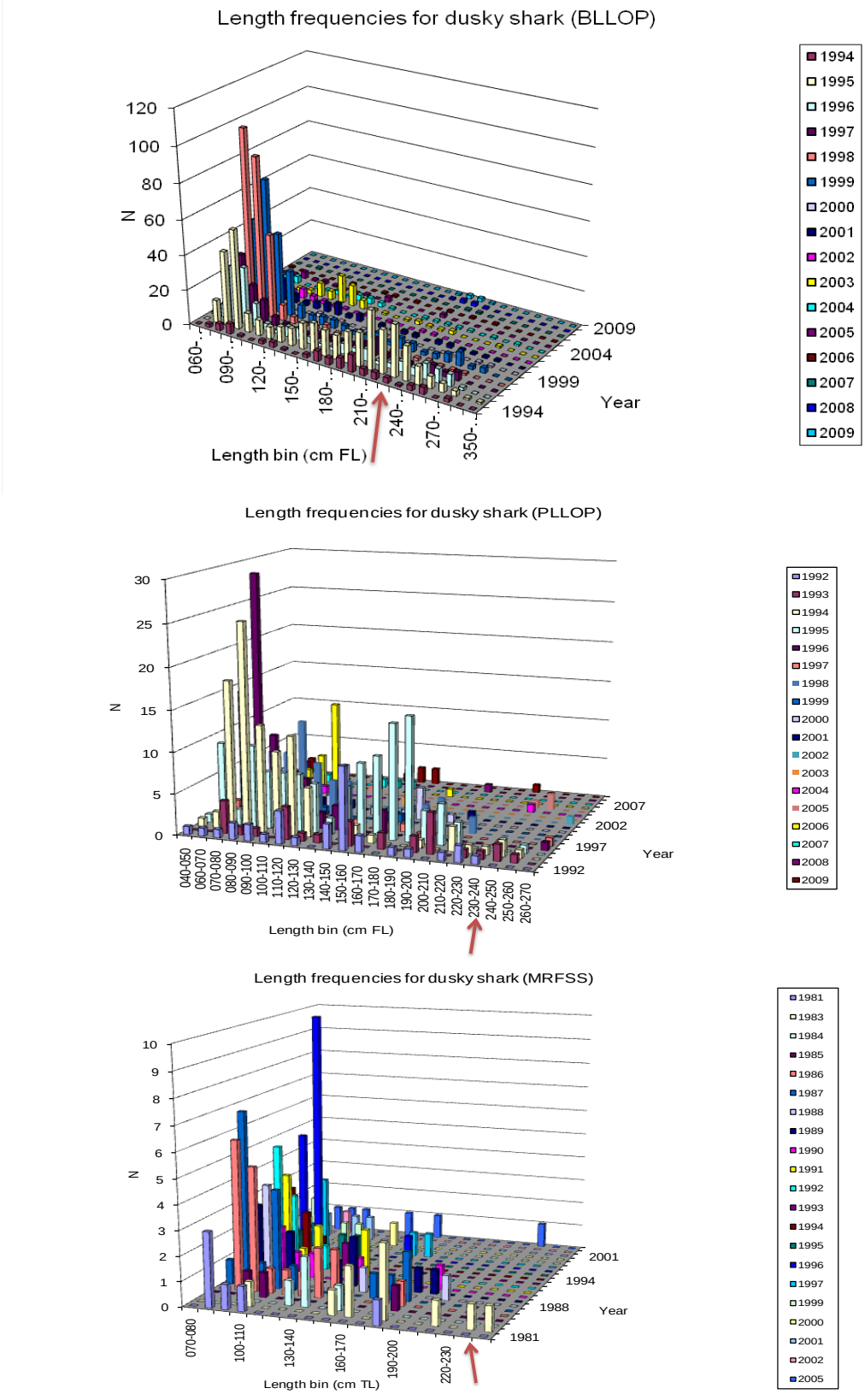

Figure 23. Length-frequency distributions of dusky sharks from the BLLOP (top), PLLOP (middle) and MRFSS (bottom). The arrows indicate approximate median length at maturity.

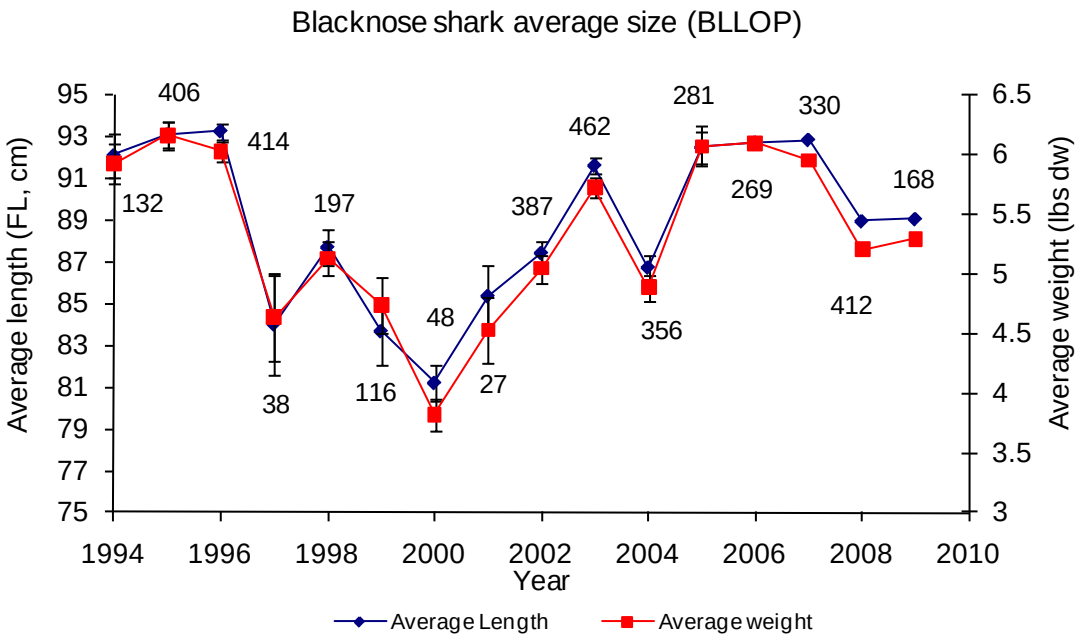

Figure 24. Average weight and length of blacknose sharks observed in the Bottom Longline Observer Program. Error bars represent +/- one standard error; sample sizes are indicated.

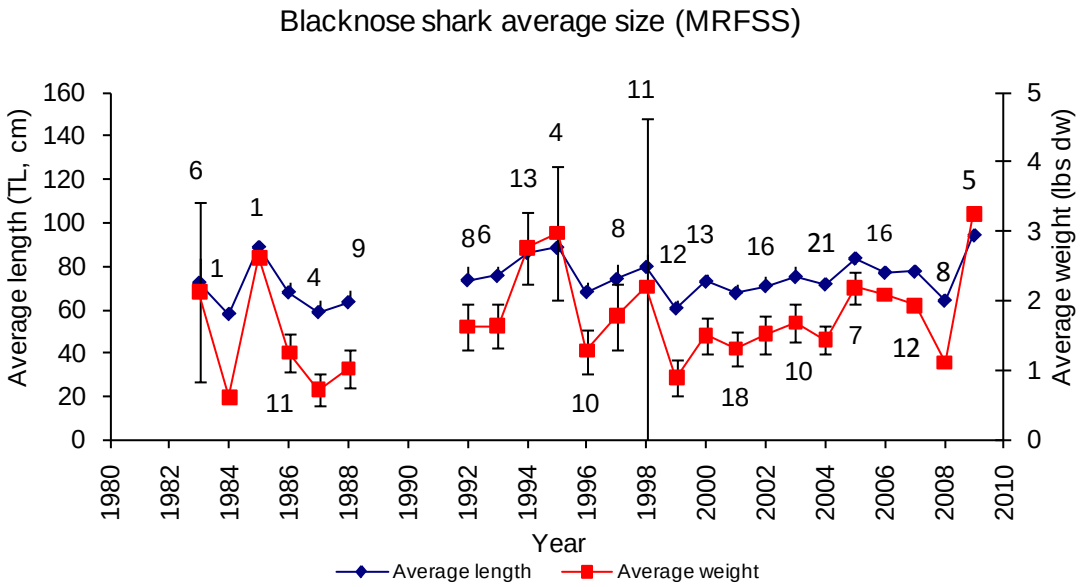

Figure 25. Average weight and length of blacknose sharks observed in the Marine Recreational Fishery Statistics Survey. Error bars represent +/- one standard error; sample sizes are indicated.

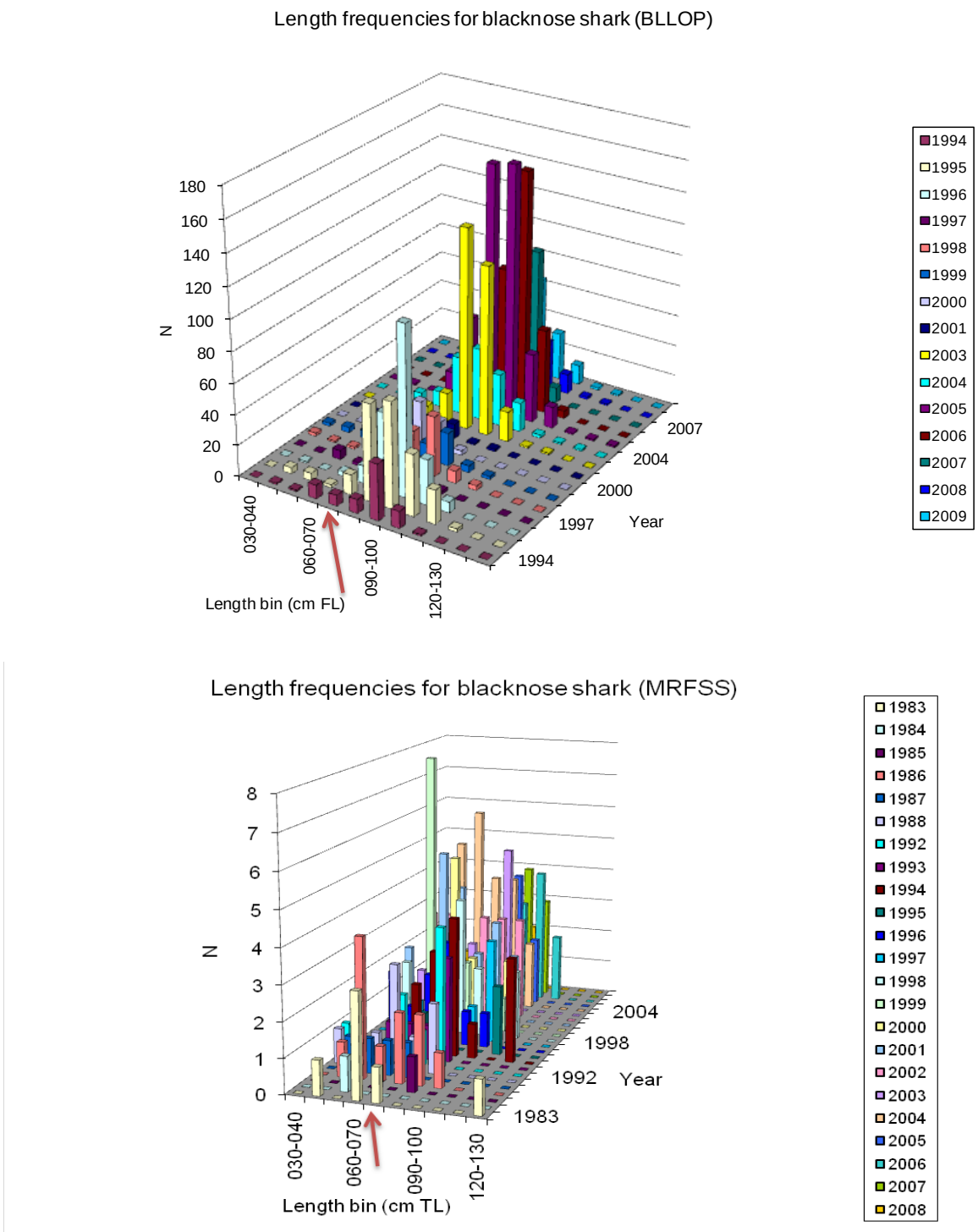

Figure 26. Length-frequency distributions of blacknose sharks from the BLLOP (top) and MRFSS (bottom). The arrows indicate approximate median length at maturity.