Updated catches of Gulf of Mexico blacktip sharks

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UPDATED CATCHES OF GULF OF MEXICO BLACKTIP SHARKS

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ABSTRACT

This document presents updated commercial landings, recreational catches, and dead discard estimates of Gulf of Mexico blacktip sharks up to 2010. Estimated catches of blacktip sharks in neighboring Mexican states are also included. Information on the geographical distribution of both commercial landings 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 presented.

KEYWORDS

Catch, Landings, Discards, Commercial fishing, Long lining, Pelagic fisheries, Shark fisheries, By catch, Logbooks, Observer programs, Mexican shark catches, Blacktip shark

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1. Background

The Catch Statistics Working Group (WG) of SEDAR 11 provided summary reports and tables of Gulf of Mexico blacktip shark catches. The purpose of the present document is to build upon that information to update the baseline scenario catch tables for this species to facilitate input into the SEDAR 29 stock assessment. 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 Blacktip shark

2.1.1 Commercial landings

U.S. commercial landings of blacktip sharks in 1996-2010 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 blacktip sharks in the southeast general canvass and the SEFSC quota monitoring was taken as the value of blacktip 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. Commercial landings of blacktip sharks in the Gulf of Mexico (GOM) for 1996-2010 were obtained by multiplying the total U.S. landings by the proportion of blacktip shark landings corresponding to the Gulf of Mexico region as obtained from general canvass data. U.S. landings for 1987-1995 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 the 1996 SEW report [NMFS 1996]). Landings for 1981-1986 were estimated 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. Annual landings for the Gulf of Mexico for 1981-1986 were estimated by multiplying the total landings (GOM+ATL) by the average proportion corresponding to the GOM in 1987 and 1988 reported in the general canvass program.

Unclassified sharks in 1996-2010 attributed to the LCS grouping were proportionally allocated to blacktip sharks by using the proportion of blacktip 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 blacktip 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 blacktip sharks.

The data are collected in landed or dressed weight. Various conversions were used to convert dressed weight to number of sharks. After revisiting a previous estimate of 20.5 lb for 1986-1993 used in the 2002 assessment that was deemed to be unrealistically low, the SEDAR 11 WG decided to use an average weight of 24.0 lb for the period 1987-1993. This new average weight was a compromise based on discussions among the WG participants and information provided by Mr. Chris Brannon on the average weight of blacktip sharks encountered in his fishing operations during that period. From 1994 onward, the average weight was determined from data provided directly by the bottom longline shark fishery observer program for the Gulf of Mexico region. 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 (Carlson and Baremore, unpublished data).

2.1.2 Recreational catches

Recreational catches of blacktip 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 1981-2010 are thus those incorporating the "new' methodology described in SEDAR 11 and detailed in SEDAR7-AW-03.

Additionally, the MRFSS is now effectively being replaced by the MRIP (Marine Recreational Information Program), and new estimates for a suite of fish species, including blacktip shark, have just been produced (as of 1/25/2012) for the period 2004-2011. We compared MRFSS estimates to MRIP estimates for A+B1 catches of blacktip sharks in the GOM using the available online comparison tool and found the differences were rather small, ca. 10% on average for the 2004-2010 period compared (Appendix 1).

Total, annual recreational catch estimates of blacktip sharks in the Gulf of Mexico were computed as 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 66% (1.0x0.66) of the total landings in the Gulf of Mexico consisted of blacktip sharks. For 1988 and 1999, 33% (0.5x0.66) of the total landings in the Gulf of Mexico consisted of blacktip 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. We kept the catches derived in SEDAR 11 for 1981-2000 (which were used in the 2002 SEW and thereafter and come from Table 10 in document SB-02-3). The values for 2001-2004 used in SEDAR 11 were assumed to be equal to the 2000 value. We thus updated the values for 2001-2004 and estimated values for 2005-2010 by consulting official, annual fisheries statistics from Conapesca, Mexico. Catches therein are available as small sharks ("cazón", <1.5m) and large sharks (tiburón, >1.5 m) (http://www.conapesca.sagarpa.gob.mx/wb/cona/cona_anuario_estadistico_de_pesca). Bonfil and Babcock (2002) used these data to estimate the (whole) weight of blacktip sharks caught in the Mexican fishery by assuming that blacktip sharks made up 57.4% and 59% of the "small shark" category in the states of Tamaulipas and Veracruz, respectively. They further assumed an average weight of 8.75 kg in Tamaulipas and 10.77 kg Veracruz to convert catch in whole weight to catch in numbers. The time series was updated through 2010 using the same methodology.

2.1.5 Illegal Mexican catches in US

The SEDAR 11 WG recommended inclusion of illegal catches of blacktip sharks by Mexican nationals confiscated in US waters by the US Coast Guard. The assumptions used to produce estimates of illegal catches were: 1) use of an average 25 sharks per boat ("lancha") with a mean dressed weight of 10 lb, 2) 50% of the estimated 1900 incursions were fishery-related, 3) 80% of those incursions used gillnets and would catch coastal sharks, 4) the data series began in 2000, 5) 33% of sharks caught were blacktips, based on findings from Castillo et al. (1998), and 6) only sharks confiscated by the US Coast Guard were included (the series was not expanded back to earlier years because those catches may have already been reported in Mexican official catch statistics). Since only estimates for 2000-2004 were produced for

SEDAR 11, we extended the series to 2010 by assuming the same catch of 700 sharks caught in 2004.

2.1.6 Gulf menhaden fishery bycatch

In SEDAR-11, effort-adjusted estimates of dead discards in the GOM menhaden purse seine fishery were calculated. De Silva et al. (2001) reported that blacktip sharks represented 45.3% 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 12,200 (36,000*0.453*0.75) and 11,200 (33,000*0.453*0.75) dead blacktip 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 blacktip sharks discarded dead (11,700), 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. We further obtained the number of vessels operating in the Gulf menhaden fleet for the period 2005-2010 (J. Smith, NOAA Beaufort Laboratory, pers. comm.) to populate the rest of the series.

Table 1 summarizes the updated catch history for blacktip 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.

2.4 Landings by state

2.4.1 Commercial landings by state

Commercial landing information by state was extracted from the quota monitoring system (covering southeast states only), the general canvass, and the coastal fishery logbook. Quota monitoring data for the GOM blacktip shark stock indicate they are landed mostly in Louisiana. General canvass data show a similar trend and coastal fishery logbook data show an increased importance of Florida's west coast and of Alabama in 2003-2006 (Fig. 2).

2.4.2 Recreational landings by state

Combined data from the MRFSS, HBOAT, and TXPWD surveys indicated that about 3 out of each 4 blacktip sharks (75%) were caught in the GOM region during 1981-2010, with the remaining (25%) being caught in the SA region (Fig. 3). Data from MRFSS reveal that most blacktips were caught on the west coast of Florida. Data from the HBOAT survey showed Texas and Louisiana alternated as the most important states where blacktips were caught by headboats (Fig. 3).

2.5 Commercial landings by region and gear

Commercial landing information by region and gear was extracted from the general canvass (southeast and northeast) data. Averaged over the period 1987-2010, about 2/3 of blacktip sharks were landed in the GOM, 1/4 in the South Atlantic, with also some contribution from the mid-Atlantic (MA) region (7%; Table 2). Longlines (43%) and lines (25%) accounted for the majority of landings in the GOM, with "other gear" (a category that includes the designation "combined gears" from the general canvass data) dominating in 1994-1999 (Table 3, Fig. 4).

2.6 Average size (length and weight) and length frequencies

The predicted average weight and observed fork length of blacktip shark in the GOM from the BLLOP showed a generally increasing trend from 1994 to 2010 (Fig. 5). The MRFSS series for GOM blacktip shark (n=1,040) showed no trends (Fig. 6). There were very few observations from the HBOAT survey to discern a trend (n=586) and only 15 individuals were measured in the past decade (none in 2007-2010) (Fig. 7). The TXPWD survey showed a somewhat increasing trend in size overall (n=1,943), consisting of a decreasing trend from 1983 to 1991, followed by an increasing tendency from 1991 to 2010 (Fig. 8). Sample size was too low in the Pelagic Longline Observer Program (PLLOP; n=158) to examine trends.

Length-frequency distributions of GOM blacktip sharks observed in the BLLOP show that all sizes are caught, although the majority of animals are mature (ca. $\geq$ 103-117 cm FL for males and females combined; Fig. 9). The recreational fisheries sampled by MRFSS and especially the TXPWD survey catch mostly immature individuals (ca. $\leq$ 103-117 cm FL or ca. $\leq$ 116-135 cm TL for males and females combined; Figs. 10 and 12), whereas a larger proportion of mature individuals is caught by headboats (Fig. 11).

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Table 1. Catch history for Gulf of Mexico blacktip sharks (thousands of fish).

Year	Commercial Landings	Recreational catches	Unreported catches	Mexican catches	Menhaden fishery Bycatch	Illegal Mexican catches in US	Total
1981	7.3	52.2		109.918	17.495		186.9
1982	7.3	58.6		70.098	17.933		153.8
1983	7.8	22.6		74.318	17.714		122.5
1984	10.7	23.4		108.987	17.714		160.8
1985	10.0	53.7		79.846	15.964		159.4
1986	55.0	145.9	16.43	72.474	15.746		305.5
1987	23.4	69.7	46.40	73.205	16.402		229.1
1988	102.9	116.7	37.39	80.157	15.964		353.1
1989	113.0	91.2	31.78	97.226	16.839		350.1
1990	42.5	79.8	34.39	111.494	16.402		284.6
1991	73.6	105.2	7.46	86.641	12.684		285.6
1992	93.2	62.9		93.638	11.153		260.9
1993	63.1	49.2		110.751	11.372		234.4
1994	56.6	42.5		100.339	12.200		211.6
1995	75.1	42.9		86.112	11.200		215.3
1996	53.2	57.6		95.335	11.153		217.3
1997	41.9	54.4		74.693	11.372		182.4
1998	58.6	60.2		66.935	10.935		196.7
1999	47.7	25.2		49.089	12.028		134.0
2000	45.3	65.2		45.010	10.279	0.330	166.1
2001	35.7	34.2		49.801	9.622	0.485	129.8
2002	27.1	34.1		53.988	9.404	0.459	125.0
2003	64.3	26.6		44.636	9.185	0.432	145.1
2004	40.2	26.0		53.156	9.404	0.700	129.5
2005	29.0	27.4		55.726	9.404	0.700	122.2
2006	43.7	27.3		31.227	8.966	0.700	111.9
2007	45.8	16.3		30.355	8.966	0.700	102.1
2008	14.1	9.7		30.728	8.966	0.700	64.1
2009	14.5	10.1		36.985	8.966	0.700	71.3
2010	21.0	21.6		50.811	8.966	0.700	103.0

Table 2. Percentage of blacktip shark commercial landings by region and year for all gear combined (from general canvass).

	Region		
Year	Gulf of Mexico	Mid Atlantic	South Atlantic
1987	85.9	14.1	0.0
1988	100.0	0.0	0.0
1989	99.6	0.4	0.0
1990	94.3	5.7	0.0
1991	34.1	38.8	27.1
1992	35.4	28.6	36.0
1993	44.4	16.0	39.6
1994	55.2	3.0	41.9
1995	47.0	8.5	44.5
1996	49.6	2.9	47.4
1997	48.2	1.0	50.8
1998	58.4	4.7	36.9
1999	86.9	2.1	10.9
2000	82.0	2.7	15.3
2001	77.3	0.2	22.6
2002	58.4	1.6	40.0
2003	70.3	0.4	29.3
2004	70.2	5.5	24.3
2005	77.1	2.0	20.9
2006	69.1	5.3	25.7
2007	90.7	4.5	4.8
2008	55.8	11.1	33.0
2009	61.9	0.2	37.8
2010	71.4	3.6	25.0

Table 3. Percentage of blacktip shark commercial landings by gear in the Gulf of Mexico for years 1987-2010 combined (from general canvass).

Gear	Gulf of Mexico (1987 - 2010)
Diving	0.00
Gillnets	4.34
Lines	24.67
Longlines	43.30
Other	19.87
Other nets	0.05
Other trawl	0.00
Otter trawl	0.29
Pots & traps	0.02
Purse seine	0.02
Unknown	7.43

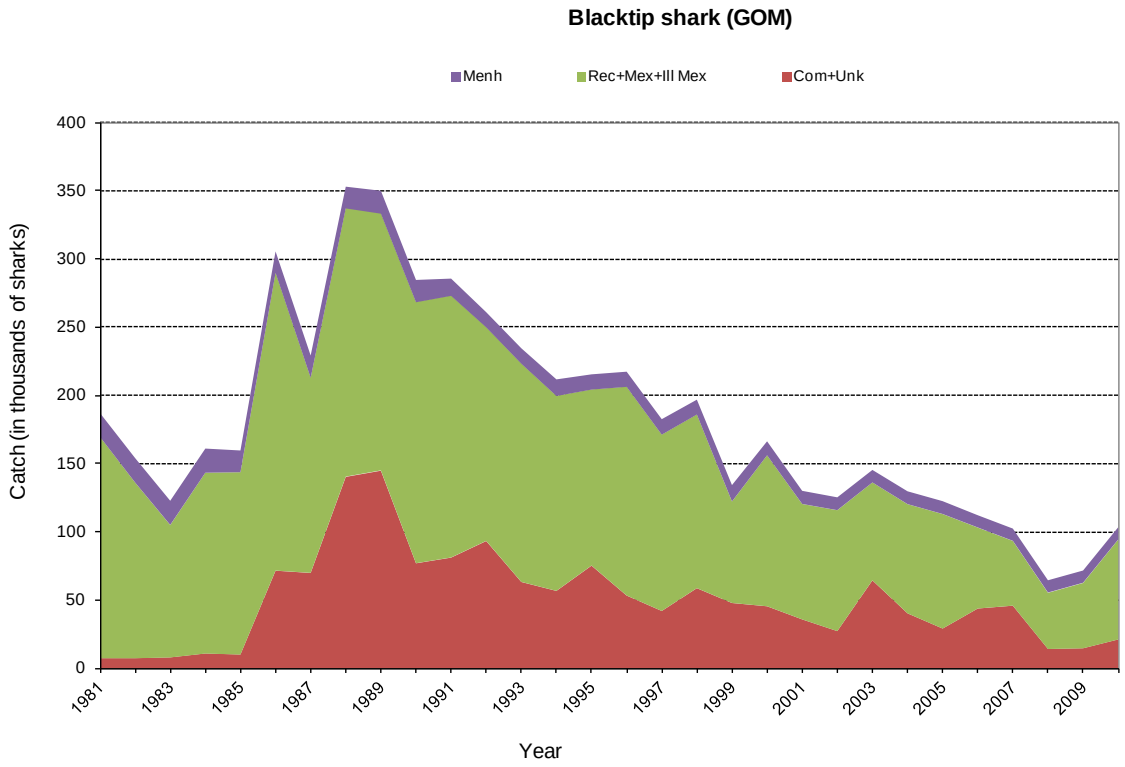
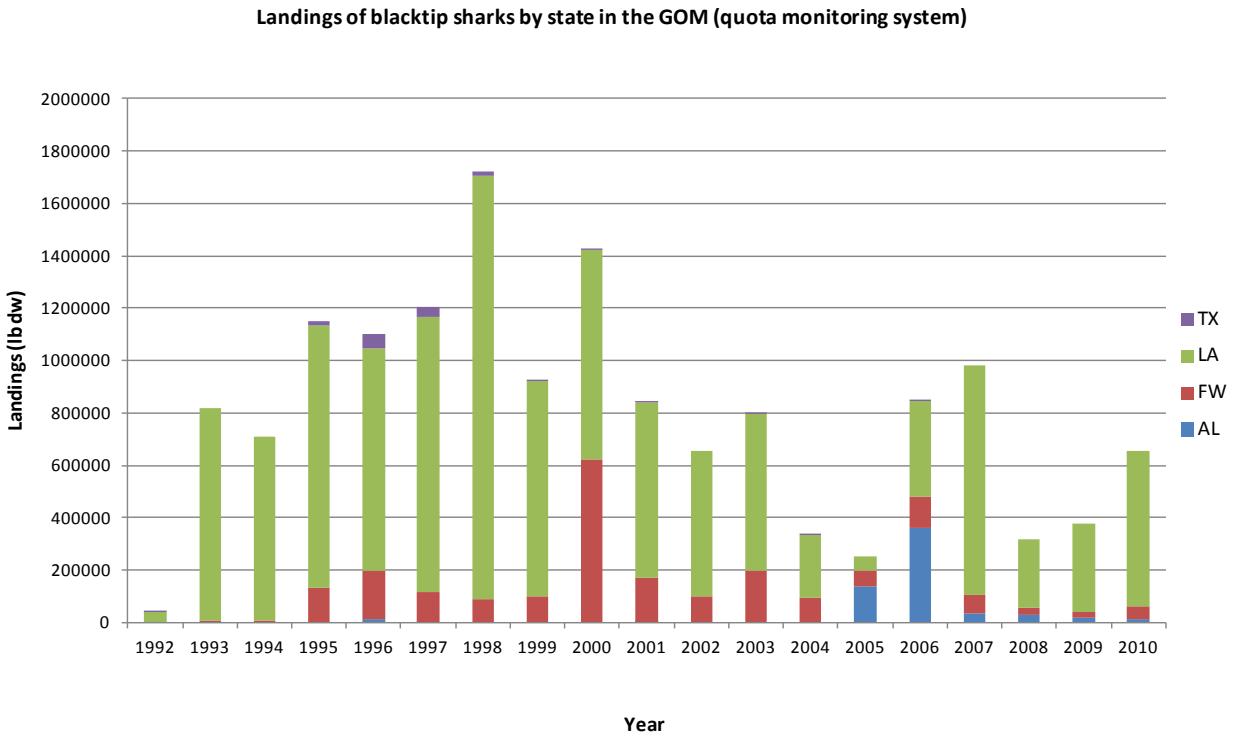
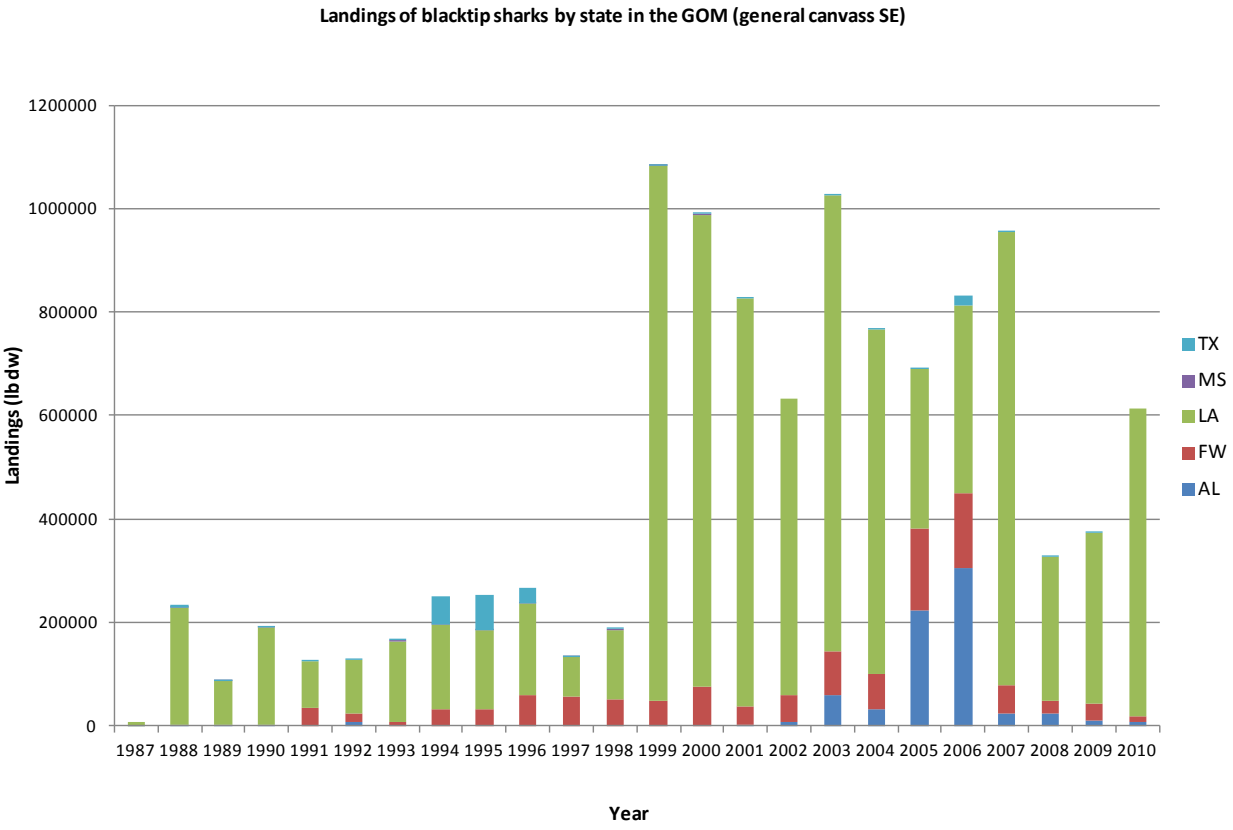


Figure 1. Total catches of blacktip sharks in the Gulf of Mexico by sector.


Landings of blacktip sharks by state in the GOM (quota monitoring system)
Landings (lb dw)
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Year
TX
LA
FW
AL


Landings of blacktip sharks by state in the GOM (general canvass SE)
Landings (lb dw)
1200000
1000000
800000
600000
400000
200000
0
1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
Year
TX
MS
LA
FW
AL

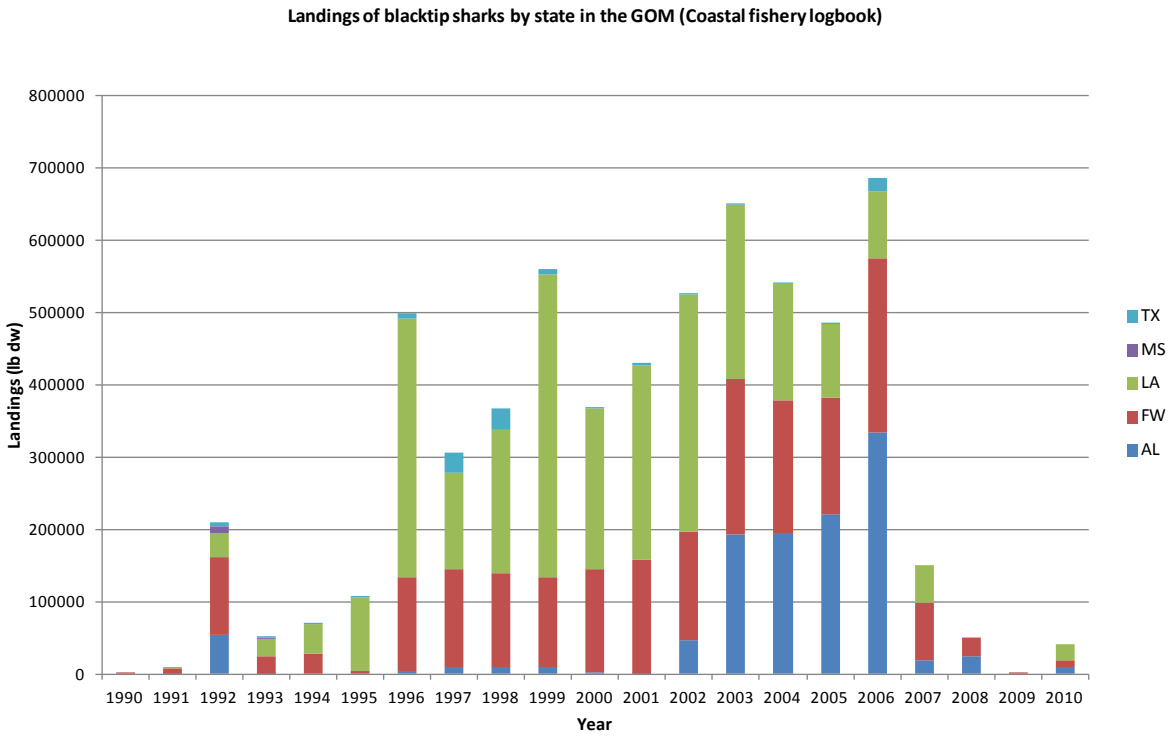


Figure 2. Commercial landings of blacktip sharks in the Gulf of Mexico by state from three data sources.

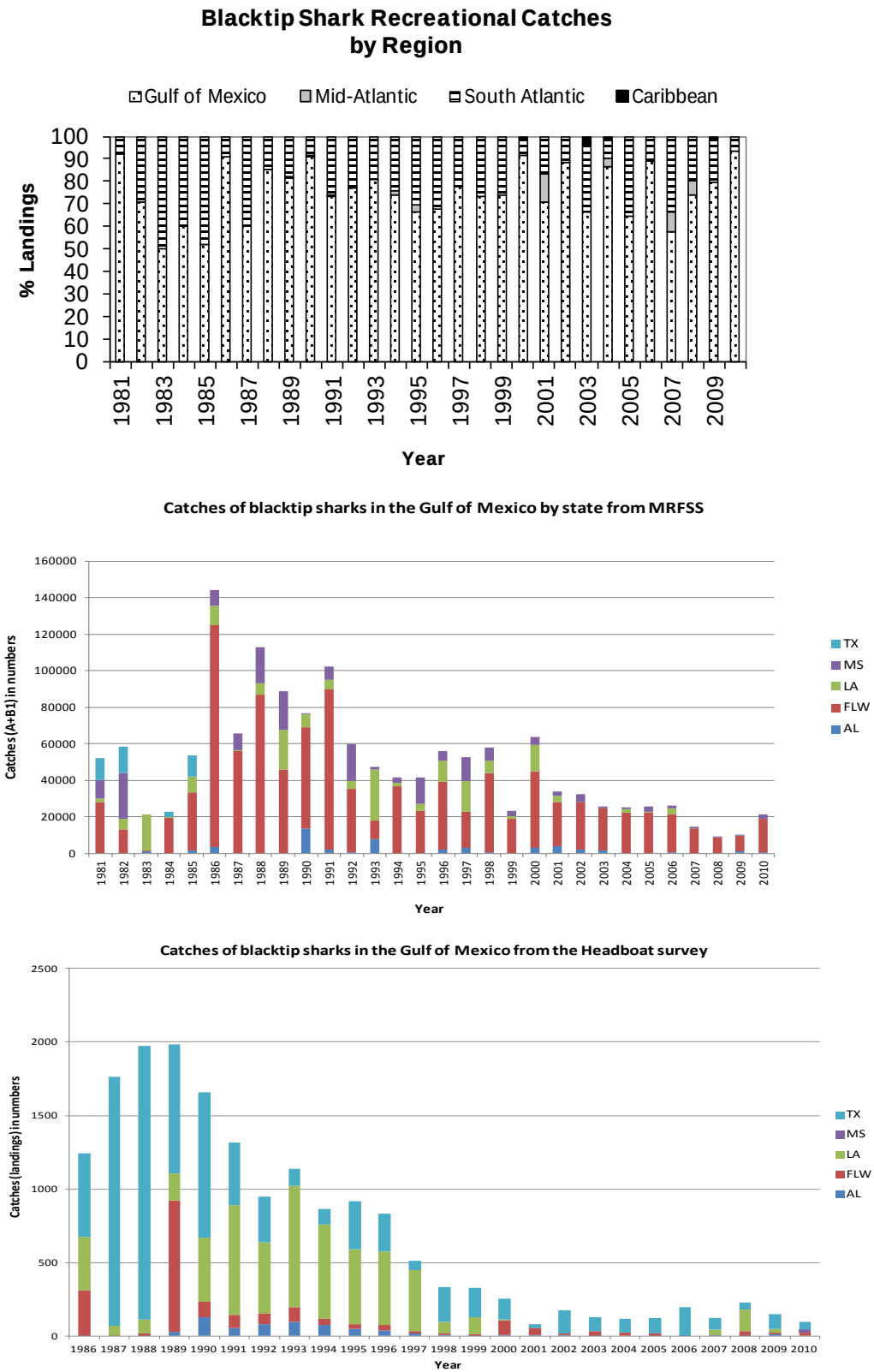


Figure 3. Recreational catches of blacktip sharks by region from MRFSS, HBOAT and TXPWD survey data combined (top), by GOM state from MRFSS (middle), and by GOM state from the HBOAT survey (bottom).

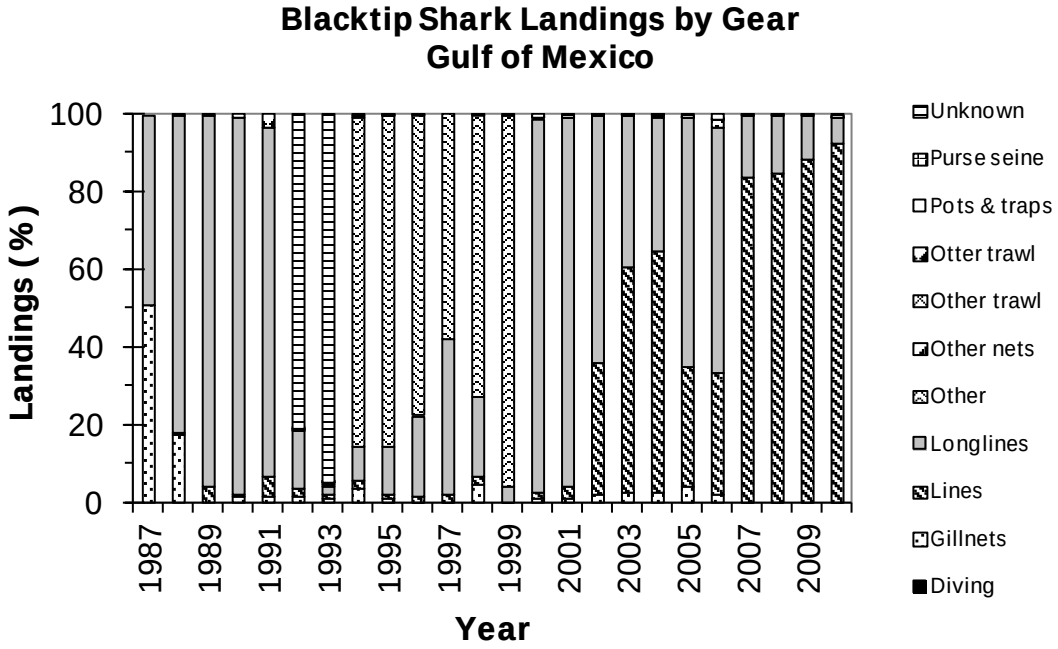


Figure 4. Commercial landings of blacktip shark by gear type in the Gulf of Mexico. Data are from the southeast general canvass.

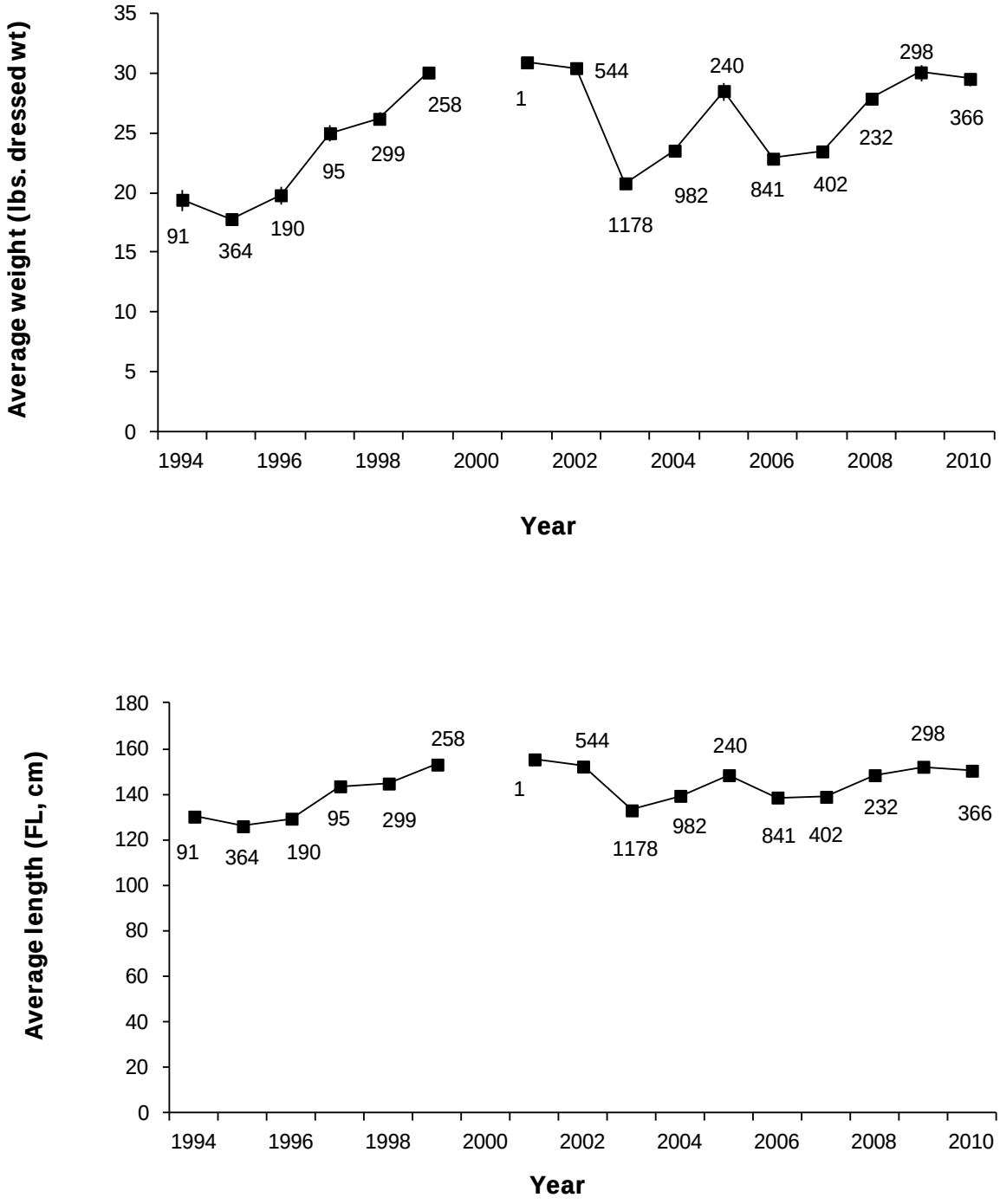


Figure 5. Average weight (top) and length (bottom) of blacktip sharks in the Gulf of Mexico observed in the BLLOP. Error bars represent +/- one standard error; sample sizes are indicated. Note that lengths are fork lengths.

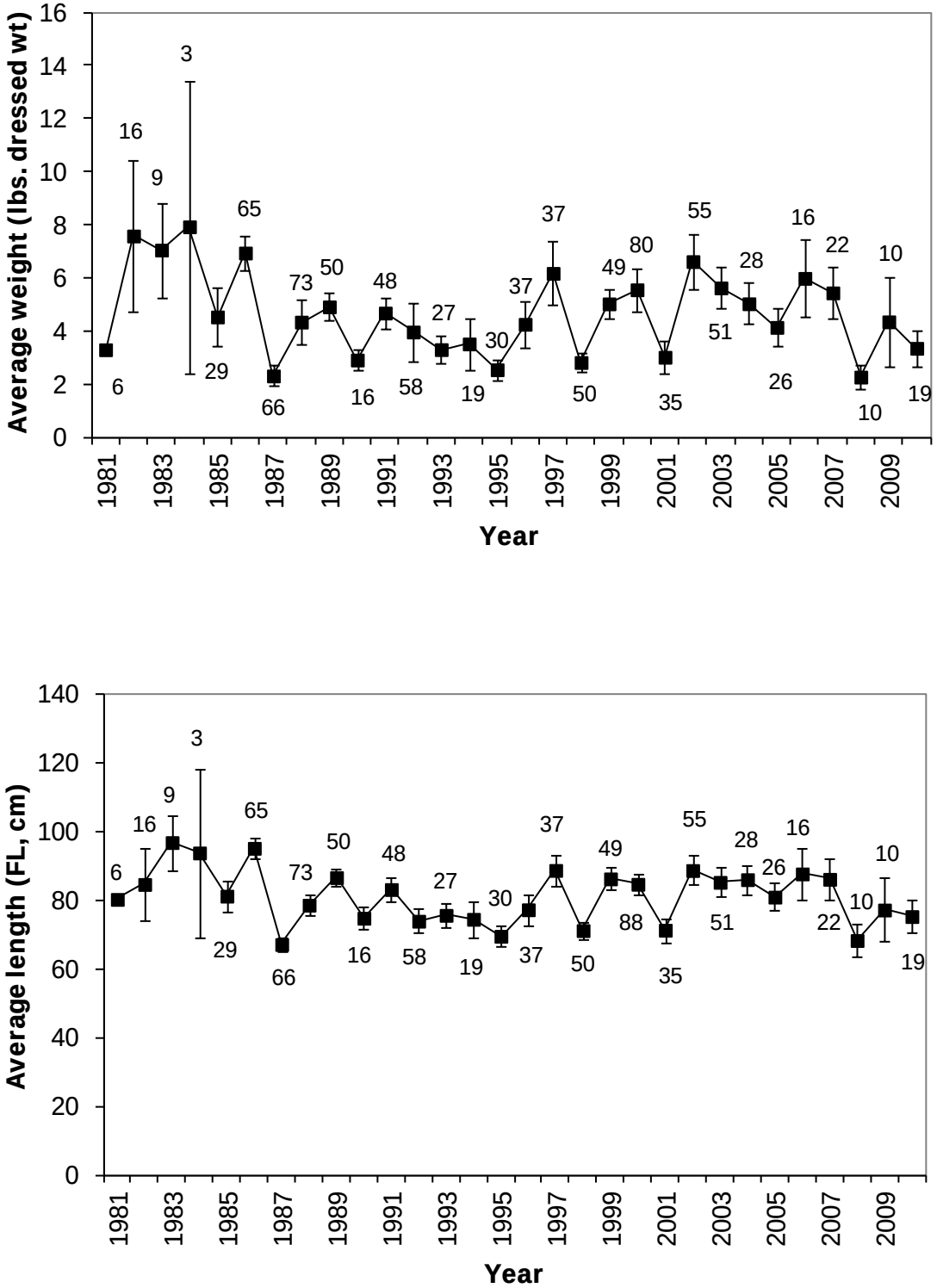
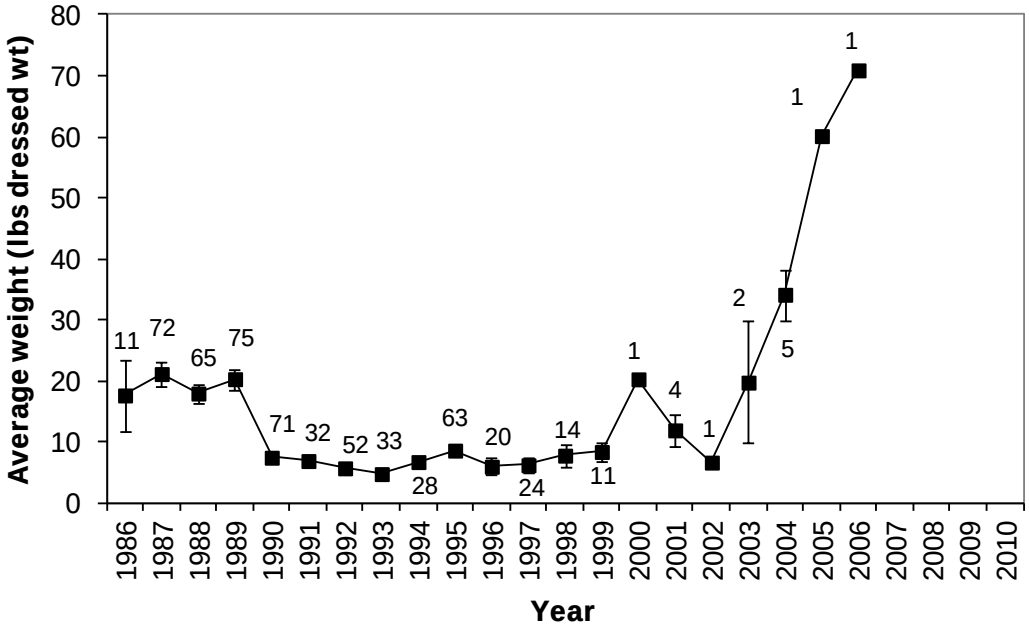


Figure 6. Average weight (top) and length (bottom) of GOM blacktip sharks observed in the MRFSS. Error bars represent +/- one standard error; sample sizes are indicated. Note that lengths are fork lengths.



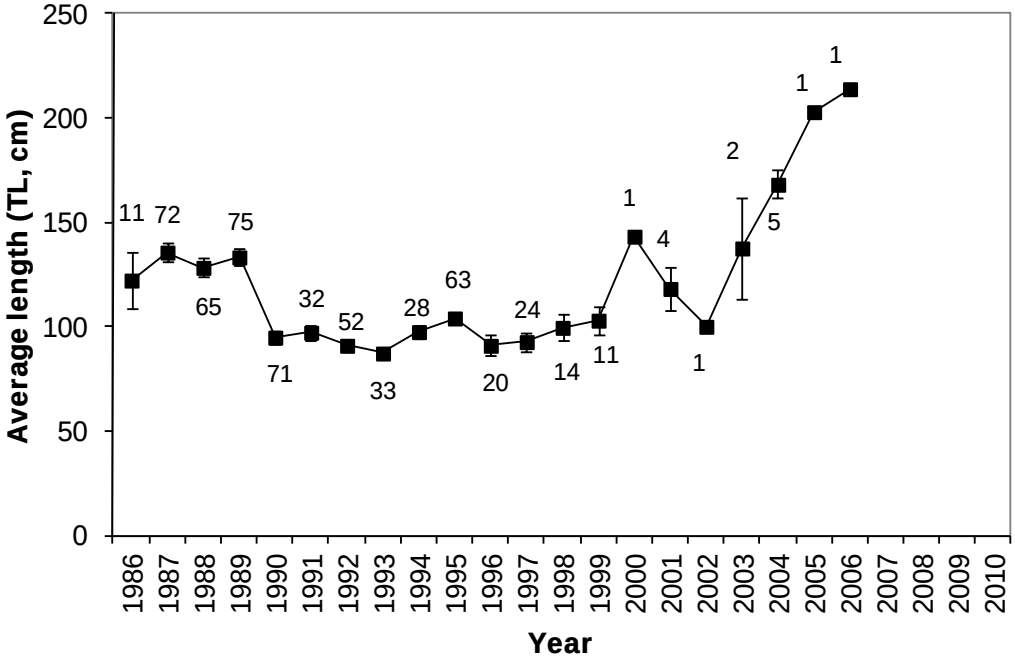


Figure 7. Average weight (top) and length (bottom) of GOM blacktip sharks observed in the Headboat survey. Error bars represent +/- one standard error; sample sizes are indicated. Note that lengths are total lengths.

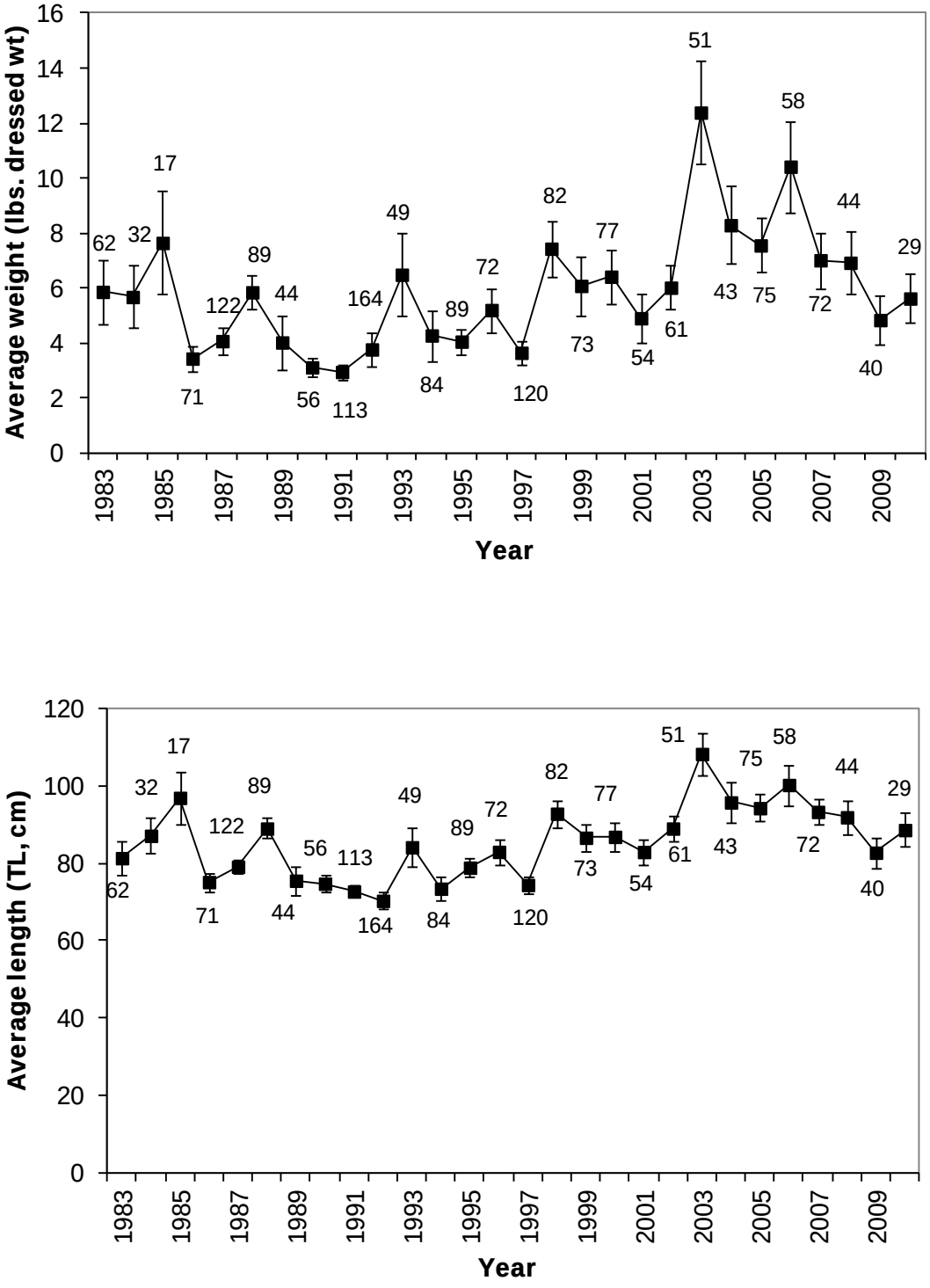


Figure 8. Average weight of GOM blacktip sharks from the TXPWD survey. Error bars represent +/- one standard error; sample sizes are indicated. Note that lengths are total lengths.

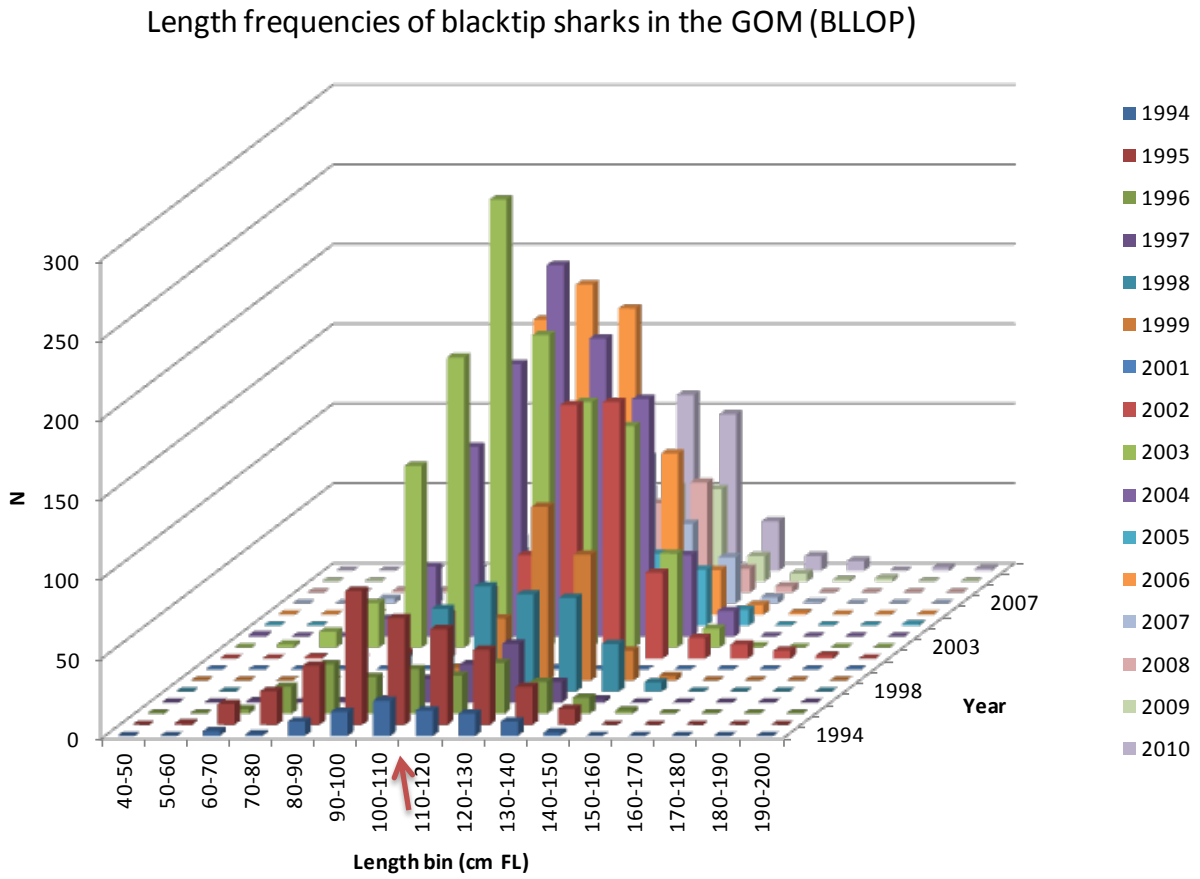


Figure 9. Length-frequency distribution of GOM blacktip sharks from the BLLOP. The arrow indicates the approximate midpoint of length at maturity for sexes combined. Note that lengths are fork lengths.

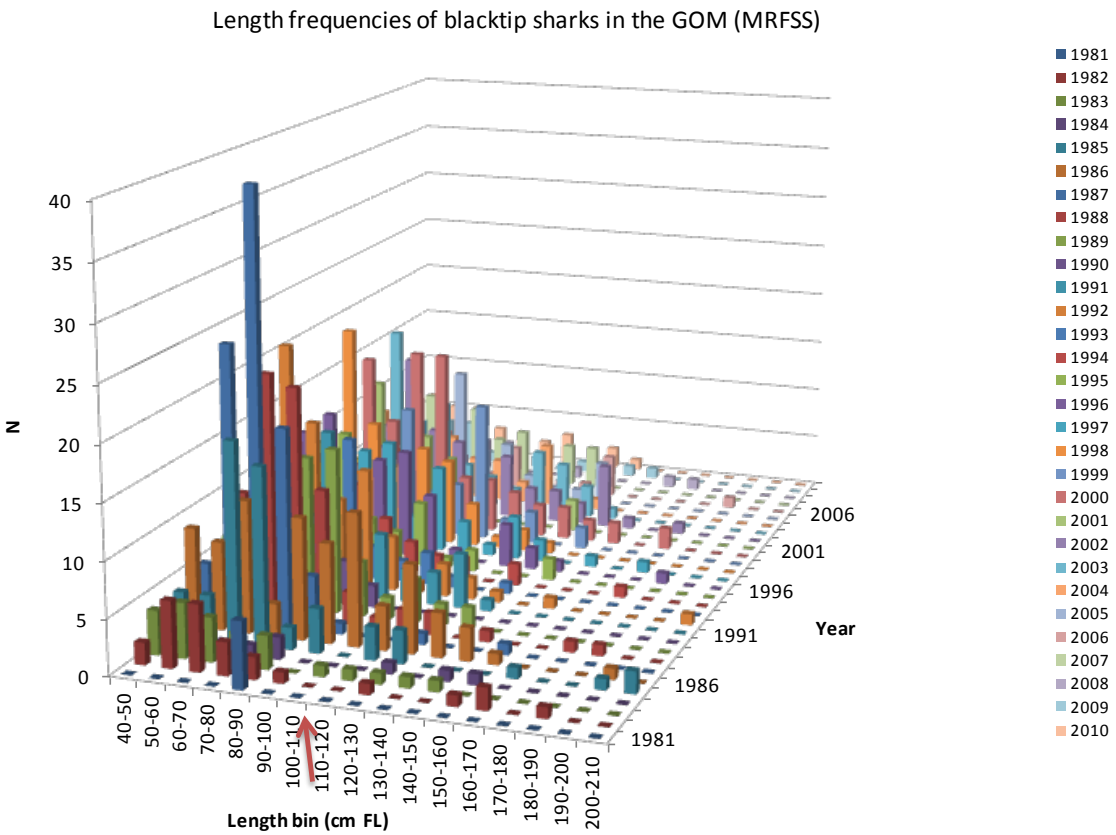


Figure 10. Length-frequency distribution of GOM blacktip sharks from the MRFSS. The arrow indicates the approximate midpoint of length at maturity for sexes combined. Note that lengths are fork lengths.

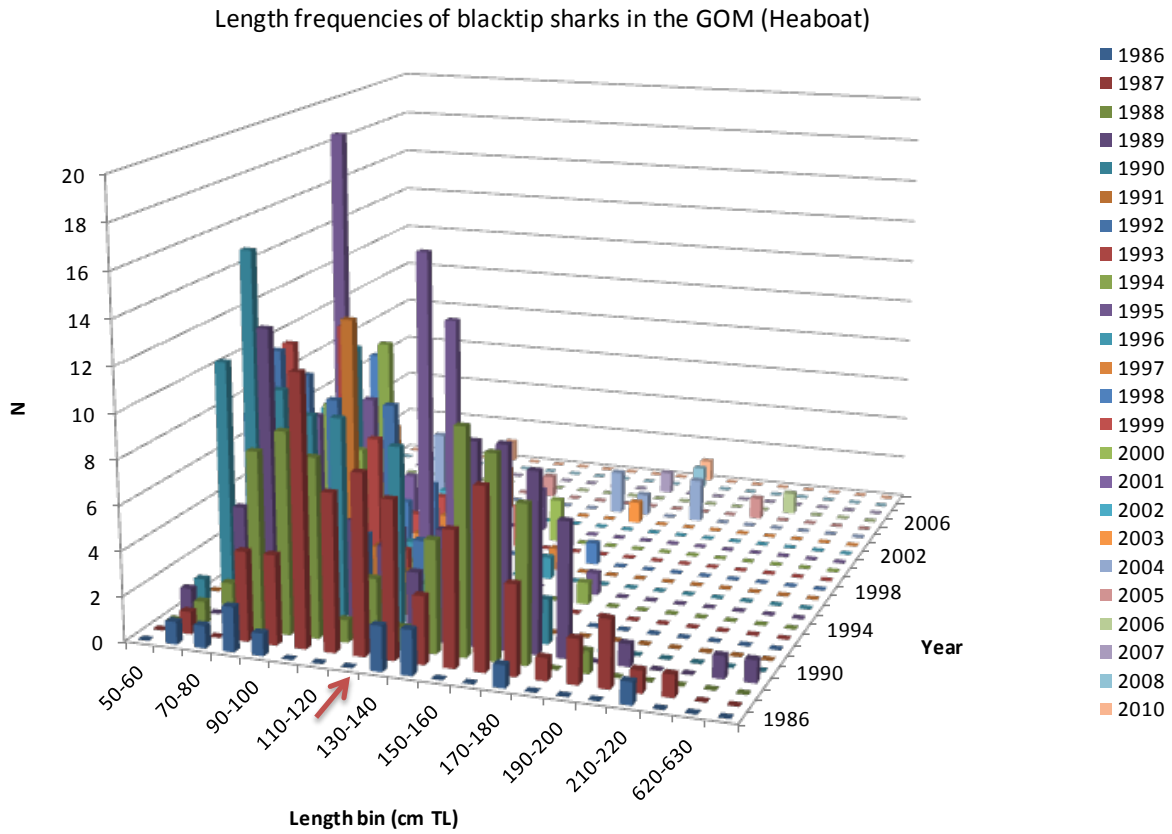


Figure 11. Length-frequency distribution of GOM blacktip sharks from the Headboat survey. The arrow indicates the approximate midpoint of length at maturity for sexes combined. Note that lengths are total lengths.

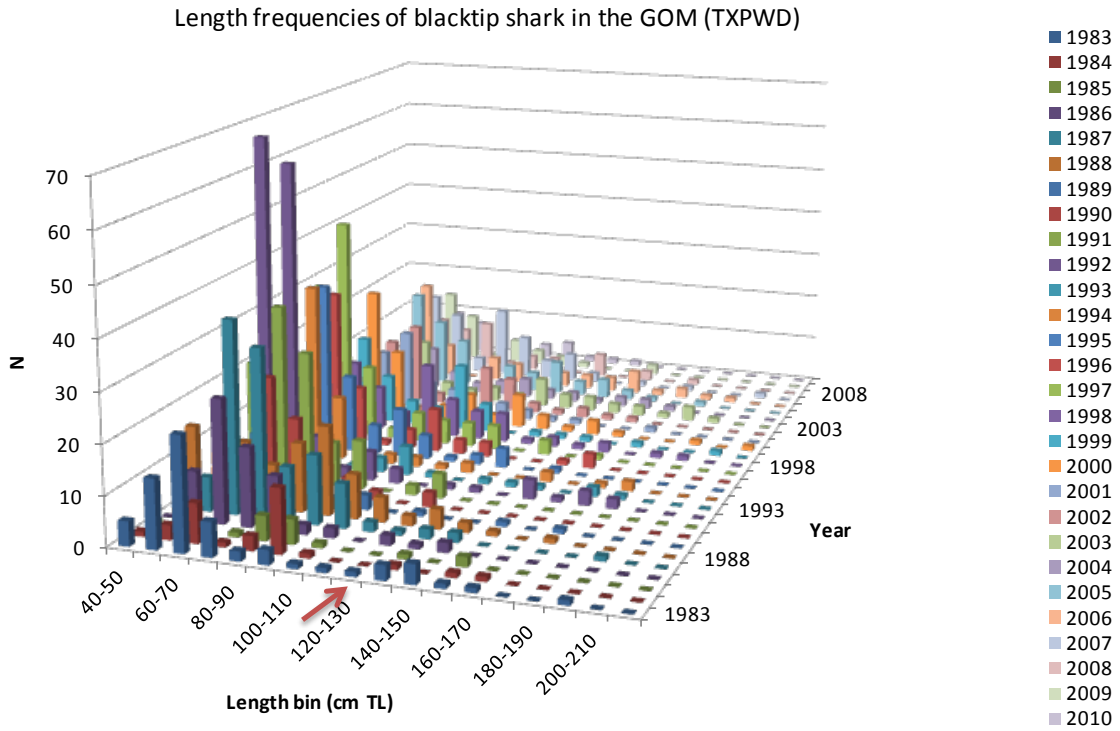
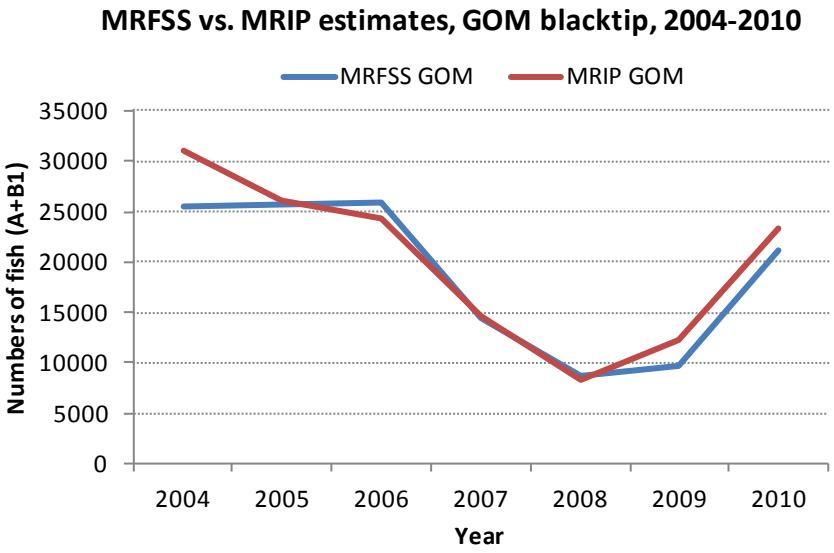


Figure 12. Length-frequency distribution of GOM blacktip sharks from the TXPWD survey. The arrow indicates the approximate midpoint of length at maturity for sexes combined. Note that lengths are total lengths.

Appendix 1. Comparison of MRFSS and MRIP estimates for GOM blacktip shark (A+B1 catches) for 2004-2010.



Year	MRFSS	MRIP	difference	% change from MRFSS
2004	25430	31023	5593	22.0%
2005	25633	26144	511	2.0%
2006	25971	24377	-1594	-6.1%
2007	14398	14691	293	2.0%
2008	8784	8367	-417	-4.7%
2009	9715	12193	2478	25.5%
2010	21161	23385	2224	10.5%