Large coastal shark surveys in eastern Gulf of Mexico, 2001 – 2004.

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Introduction

Beginning in June of 2001, Mote Marine Laboratory's Center for Shark Research began surveys targeting adult and older juvenile large coastal sharks by means of drumlines and longlines. These field efforts became regular quarterly surveys beginning in 2002 and continued through 2004 (and are ongoing). The primary objectives of these surveys are to: a) assess the relative abundance of large coastal shark species; b) determine the movement patterns of individual sharks of large coastal species in the eastern Gulf of Mexico; c) document the overall migratory patterns of blacktip sharks and other large coastal shark stocks in the Gulf; d) investigate the depth and temperature preferences of these species and how these change between seasons; and e) examine post-release mortality of large and small coastal sharks. The purpose of this document is to provide preliminary catch per unit effort data from this survey.

Materials and Methods

Field Methods

A total of 1,081 single-hook drumlines were set during large shark surveys in Gulf coastal waters off Tampa Bay, Sarasota, and Charlotte Harbor from 2001 to 2004. This gear type consisted of a cement block anchor attached to 20-40 m of line (depending on water depth) that runs to a surface float, and a 30 m heavy monofilament gangion (800 lb test) secured to the bottom anchor by a swivel and terminating with a baited circle hook (16/0 or 18/0). Bait used in these surveys consisted of equal proportions of shark (*C. limbatus, C. acronotus, R. terraenovae* or *S. tiburo*), ray (*Rhinoptera bonasus* or *Dasyatis* spp.) and teleost fish (*Euthynnus alletteratus*, *Sphyraena barracuda* or *Scomberomorus maculatus*). Individual drumlines (10-20) were set approximately 1 km apart and allowed to soak for 2 to 4 hours before being checked for sharks and/or re-baited. Drumlines were ideal for catching relatively large sharks, minimizing bycatch, and providing higher survivorship as they permit the hooked shark to swim in circles around the anchor.

Bottom longlines were similarly used to target adult and large juvenile sharks, primarily off Tampa Bay and Sarasota, since 2002. The gear comprised 80-120 hooks (9/0 J or 18/0 circle), 3 m gangions with a 1 m leader (stainless steel or monofilament) and a 1.6 km mainline. The primary bait for these surveys was mullet (*Mugil* sp.) and little tunny (*Euthynnus alletteratus*) and the typical soak time was 4 hours. Sets made during 2002 and 2003 used stainless steel leader material, with the change made to monofilament in early 2004. A total of 34 longline sets of this type were conducted in 2002-04.

Surveys occurred four times each year, once in each season (typically March, June, September and December), with five days of surveys in each season. Each day normally consisted of a single longline set and two sets of 10-20 drumlines. Sharks captured were identified, measured, sexed, tagged and released.

Data analysis

Since this was a preliminary examination of catch per unit effort (CPUE) of large coastal shark species no standardization of data to produce catch rates was attempted. Effort (hook hours) was calculated for each set of either drumlines or longline, and the effort summed for all sets in a single season. Catches of each species by gear type were also summed for each season, and divided by the effort to provide a seasonal catch per unit effort. Annual total CPUE was calculated by dividing the total annual catch by the total effort in seasons in which each species occurred (e.g. for sandbars catches over the four year period only occurred in fall, winter and spring and so only effort in these seasons was used to calculate total annual CPUE). No statistical analysis of CPUE data were undertaken due to the short time over which data were collected to date. The raw seasonal and annual CPUE values are provided in Appendix A.

Results and Discussion

Catch per unit effort for five large coastal shark species (blacktip, bull, lemon, sandbar and spinner) were calculated for drumlines and longlines. Seasonal catches across all years (Figures 1, 2) indicated that blacktip and bull sharks occurred in the eastern Gulf of Mexico year-round. Blacktips sharks were most common in spring and summer, while bulls were most common in summer and fall. Sandbar sharks occurred in all seasons except summer, with the peak in abundance in winter. Spinner sharks occurred in all seasons except summer, with greatest abundance in winter. Lemon sharks occurred in all seasons except winter, with greatest abundances in spring and fall.

Figure 1. Seasonal drumline catch per unit effort of five species of large coastal shark, 2001- 2004.

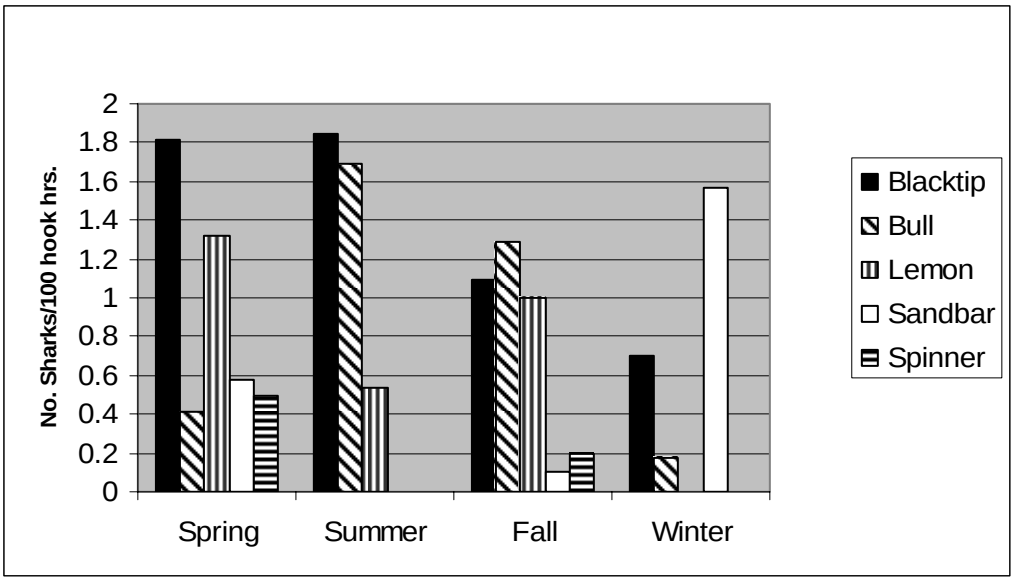
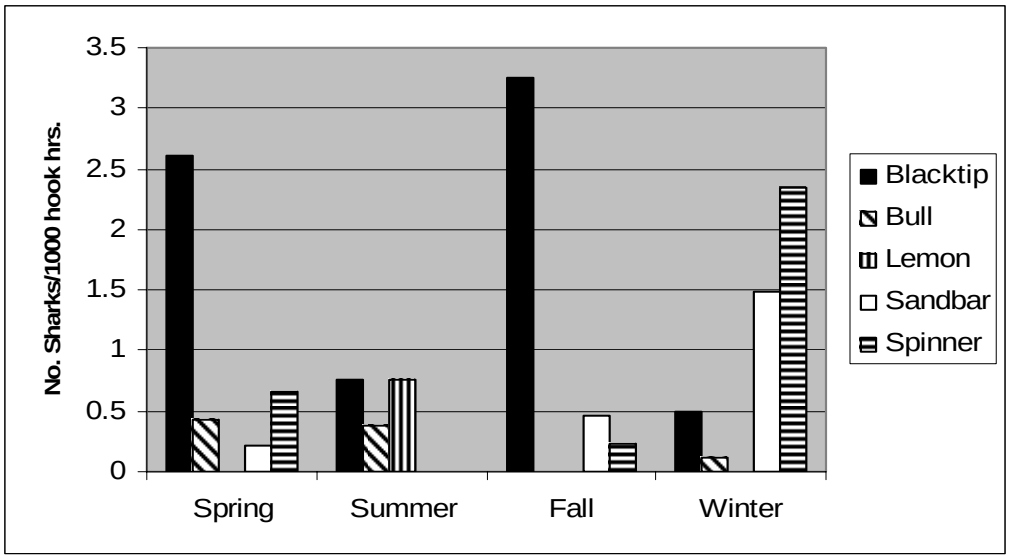


Figure 2. Seasonal longline catch per unit effort of five species of large coastal shark, 2002-2004.



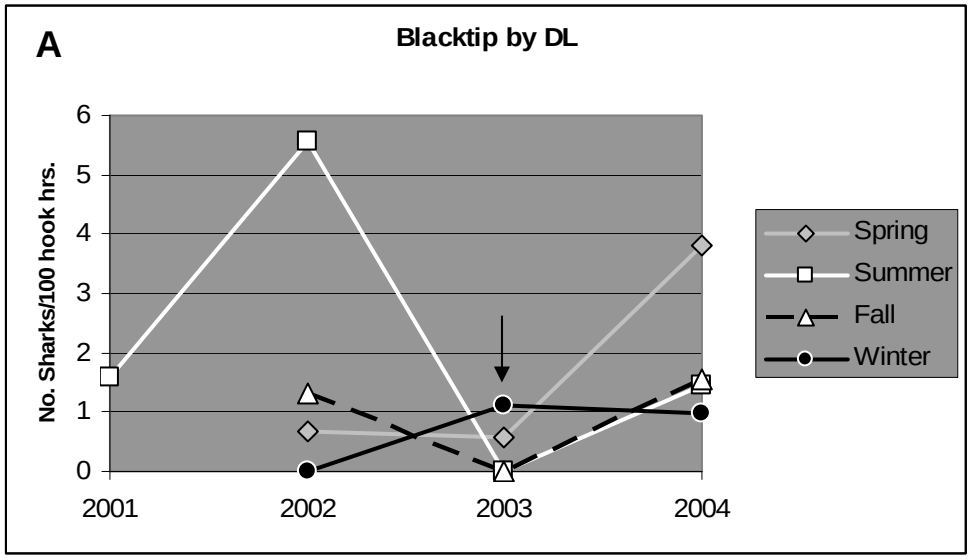
Blacktip sharks

Annual seasonal drumline CPUE of blacktip sharks was variable (Figure 3a), with no consistent pattern apparent in the data. The short time over which longlines have been used, and the change in leader material makes interpretation of the annual longline data difficult (Figure 4). However, the switch from metal to monofilament leader appears to have significantly increase CPUE of blacktip sharks. Annual drumline CPUE values were mostly between 1 shark/100 drumline hr and 2 sharks/100 drumline hr. The lowest value was recorded in 2003 when red tide probably reduced the number of sharks in the survey area.

Sandbar sharks

Annual seasonal drumline (Figure 5) and longline (Figure 6) CPUE for sandbar sharks showed increases from 2002 to 2004. However, the short time periods mean that these increases are not significant and should be interpreted with extreme caution. Total annual drumline CPUE also increased from 2002 to 2004, but again do not cover a sufficient time period to provide a meaningful result. Unlike blacktip sharks, the sandbar shark annual CPUE values declined after the transition to monofilament gear. Again, these data are very preliminary and this result should be interpreted with caution.

Figure 3. Annual drumline catch per unit effort of blacktip sharks (a) by season, and (b) for all seasons combined, 2001-2004. Arrow indicates year when catch per unit effort was likely to have been significantly reduced by the presence of red tide in the eastern Gulf of Mexico.



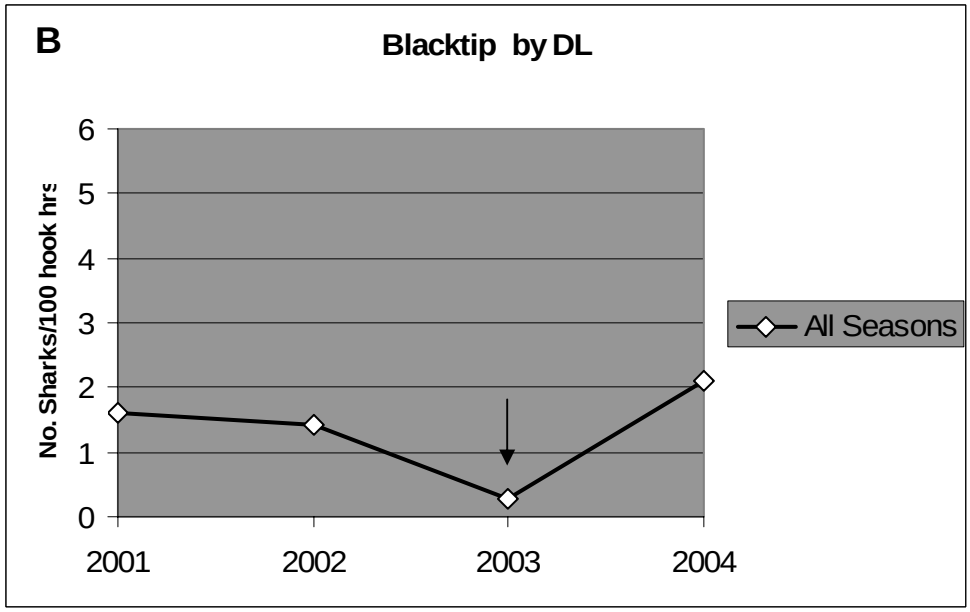
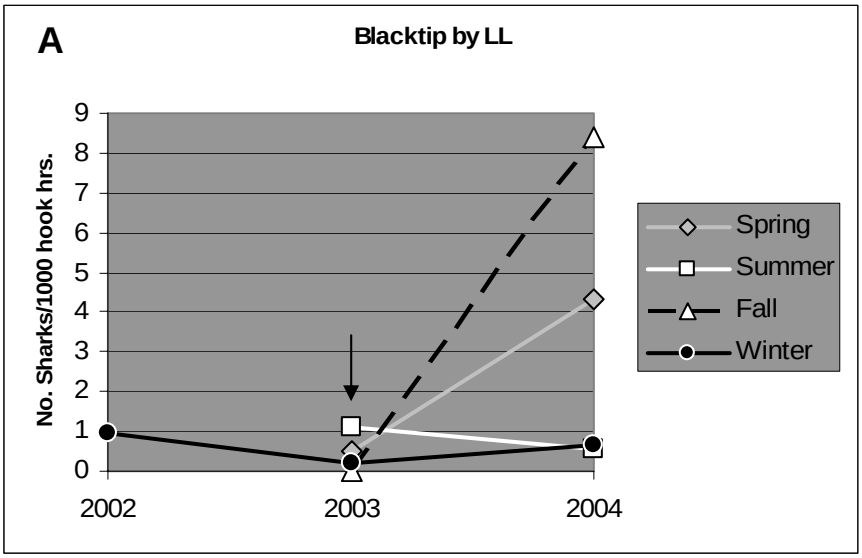


Figure 4. Annual longline catch per unit effort of blacktip sharks (a) by season, and (b) for all seasons combined, 2002-2004. Arrow indicates year when catch per unit effort was likely to have been significantly reduced by the presence of red tide in the eastern Gulf of Mexico.



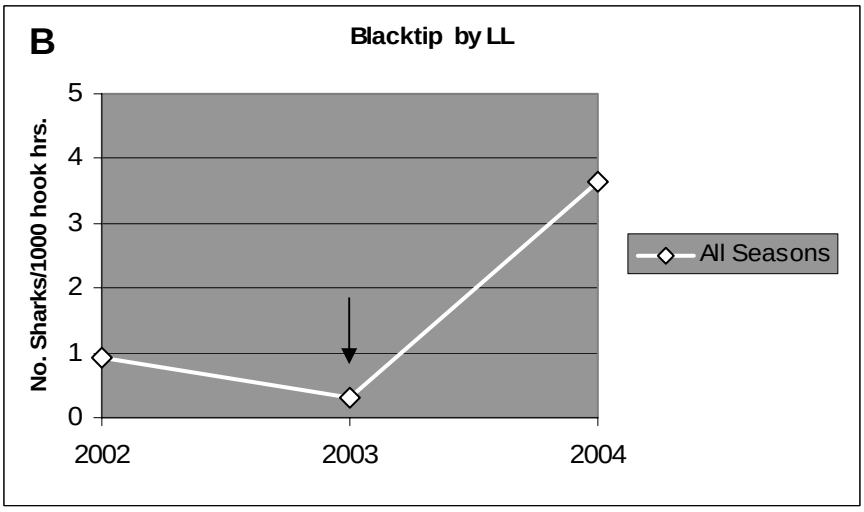
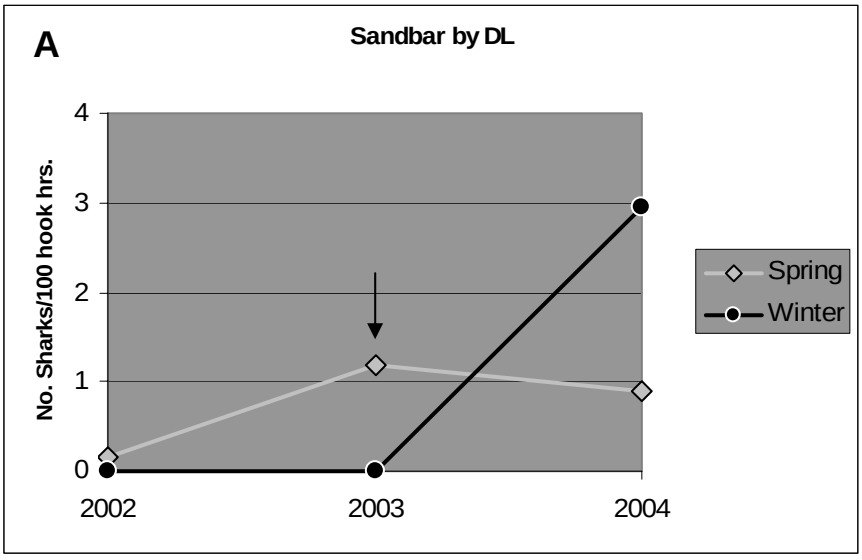


Figure 5. Annual drumline catch per unit effort of sandbar sharks (a) by season, and (b) for all seasons (when present) present combined, 2001-2004. Arrow indicates year when catch per unit effort was likely to have been significantly reduced by the presence of red tide in the eastern Gulf of Mexico.



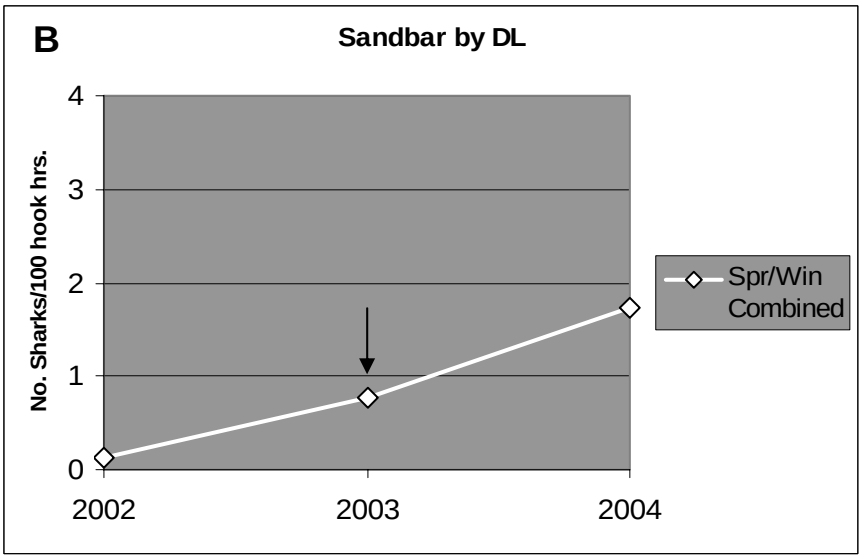
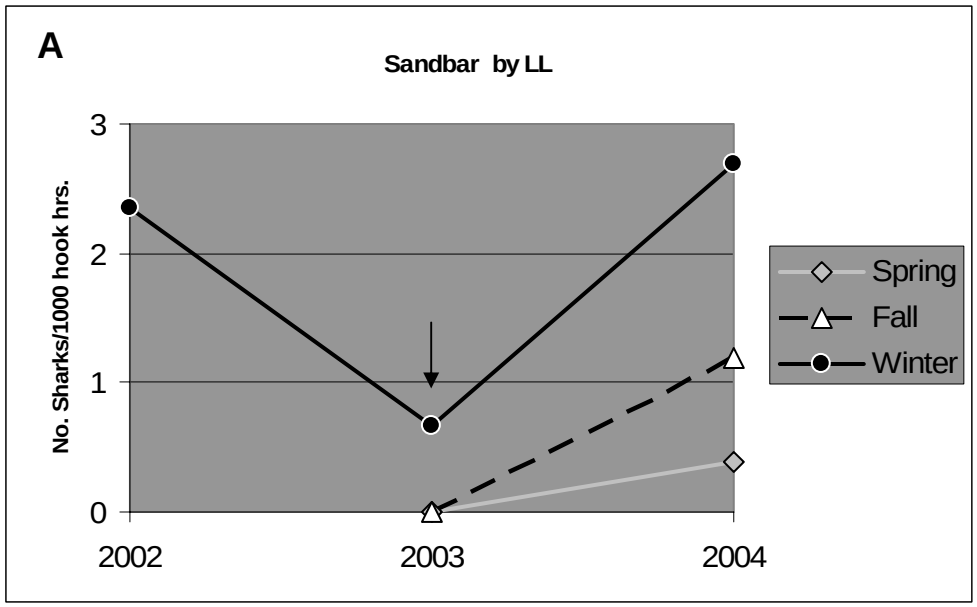
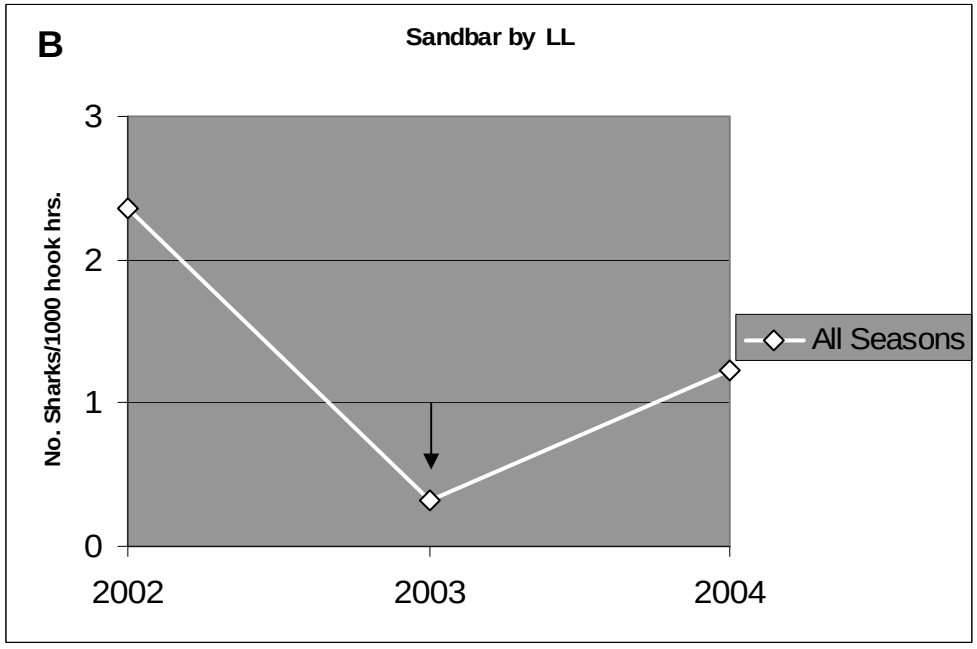


Figure 6. Annual longline catch per unit effort of sandbar sharks (a) by season, and (b) for all seasons (when present) combined, 2002-2004. Arrow indicates year when catch per unit effort was likely to have been significantly reduced by the presence of red tide in the eastern Gulf of Mexico.





Appendix A. Catch per unit effort (CPUE) data for blacktip and sandbar sharks from Mote Marine Laboratory large coastal shark surveys in the eastern Gulf of Mexico. Combined season CPUE for sandbar sharks was calculated by dividing catches by the effort from fall, winter and spring.

		No. Sharks/100 DL hook hrs.				
Species	**Year**	**Spring**	**Summer**	**Fall**	**Winter**	**Combined Seasons**
C. limbatus	2001	–	1.60	–	–	1.60
	2002	0.67	5.55	1.30	0.00	1.41
	2003	0.59	0.00	0.00	1.10	0.29
	2004	3.82	1.46	1.54	0.99	2.09
C. plumbeus	2001	–	–	0.00	–	
	2002	0.17	0.00	0.00	0.00	0.13
	2003	1.17	0.00	0.00	0.00	0.77
	2004	0.90	0.00	0.00	2.96	1.74

		No. Sharks/1000 LL hook hrs.				
Species	**Year**	**Spring**	**Summer**	**Fall**	**Winter**	**Combined Seasons**
C. limbatus	2002	–	–	–	0.94	0.94
	2003	0.49	1.11	0.00	0.22	0.30
	2004	4.34	0.57	8.37	0.67	3.63
C. plumbeus	2002	–	–	–	2.35	2.35
	2003	0.00	0.00	0.00	0.67	0.33
	2004	0.39	1.20	0.00	2.69	1.23