Estimation of large coastal shark complex, blacktip, and sandbar shark bycatch in the Gulf of Mexico menhaden fishery

Julie A. Neer and Enric Cortés

NOAA Fisheries
Southeast Fisheries Science Center
Panama City Laboratory
3500 Delwood Beach Road
Panama City, Florida 32407, USA

October 2005

Summary

Bycatch numbers from the Gulf of Mexico menhaden fishery were estimated for the large coastal shark complex (LCS) as well as for blacktip and sandbar shark individually. Estimates were based on observer data collected in 1994-1995 by de Silva et al. (2001). Two discard rate series are provided for each complex/species, one based on average of observed bycatch (used in the 2002 Large Coastal Shark assessment) and one adjusted for the number of boats in the fishery each year. This document describes how those estimates were obtained, and extends the series through 2004.

Introduction

In an attempt to account for as many sources of mortality as possible in the catch histories for the LCS, blacktip, and sandbar sharks, the participants of the 2002 Shark Evaluation Workshop developed estimates of dead discards from the Gulf of Mexico menhaden fishery operating primarily off Louisiana. This document describes how those estimates were obtained, and extends the series through 2004.

Methods and Results

Large Coastal Shark Complex Estimates:

De Silva et al. (2001) reported on bycatch of sharks in the Gulf of Mexico menhaden fishery for the years 1994 and 1995. Based on observer data, the authors indicated that 75% of the sharks encountered in the fishery died: 97% were large coastal and 3% were small coastal sharks. The total number of sharks caught by this fishery was estimated to be about 36,000 in 1994 and 33,000 in 1995, or about 26,200 (36,000*0.75*0.97) and 24,000 large coastal sharks discarded dead in 1994 and 1995, respectively. For the first bycatch series, the average number of large coastal sharks caught during 1994-1995 (25,100 fish) was used as the estimate for all years for which we do not have observer data (Table 1).

An alternative bycatch series was estimated which incorporated changes in the number of vessels operating in the fishery over time. For each year of the series, the number of vessels operating in the fishery was divided by the average number of vessels operating for the years in which bycatch estimates were available (55 boats in 1994 and 52 boats in 1995; average = 53.5 vessels). This year-specific multiplier was then multiplied by 25,000, the average number of large coastal sharks discarded dead as determined above. This provides for year-specific bycatch estimates adjusted for the annual number of vessels in the fleet (Table 2). The number of vessels operating the Gulf of Mexico menhaden fleet from 1964 – 1997 was obtained from Vaughan et al. (2000; 1964-1997) and Joseph W. Smith, NOAA Fisheries Service (personal communication; 1998 – 2004).

Species-Specific Discard Estimates:

Bycatch estimates were also developed for blacktip and sandbar sharks using the data reported in de Silva et al. (2001) as the basis. The authors reported that blacktip sharks represented 45.3% of the total observed bycatch in 1994 – 1995, while sandbar sharks accounted for 1.8%. Considering the reported 75% mortality rate among all sharks, this results in an estimated bycatch of 12,200 (36,000*0.453*0.75) and 11,200 dead blacktip sharks, and 486 and 445 sandbar sharks, in 1994 and 1995, respectively. For the first bycatch series, the average number of blacktip and sandbar sharks caught during 1994-1995 (11,700 fish for blacktip sharks; 465 fish for sandbar sharks)) was used as the estimate for all years for which we do not have observer data (Table 3).

An alternative bycatch series was also estimated for blacktip and sandbar sharks. Following the rationale above, the number of vessels operating in the fishery was divided by the 53.5 vessels, the average number of vessels operating for the years in which bycatch estimates were available. The year-specific multipliers were then multiplied by the average number of blacktip (11,700) and sandbar (465.5) sharks discarded dead, as determined previously. This provides for year-specific bycatch estimates adjusted for the annual number of vessels in the fleet (Table 4). The number of vessels operating the Gulf of Mexico menhaden fleet from 1964 – 1997 was obtained from Vaughan et al. (2000; 1964-1997) and Joseph W. Smith, NOAA Fisheries Service (personal communication; 1998 – 2004).

Discussion

The bycatch estimates provided above are based on only two years of observation but provide the only estimates available for the Gulf of Mexico menhaden fishery. The 2002 Stock assessment utilized the bycatch estimates presented in Tables 1 and 3, applying the average value of observed dead discards for all years other than 1994 and 1995. The alternative estimates presented here provide a way to incorporate how changes in fishing effort (as expressed by number of vessels in the fishery) may have affected bycatch rates over time.

References

de Silva, J.A., R.E. Condrey, and B.A. Thompson. 2001. Profile of shark bycatch in the U.S. Gulf of Mexico menhaden fishery. North American Journal of Fisheries Management 21:111-124.

Vaughan, D.S., J.W. Smith, and M.H. Prager. 2000. Population characteristics of Gulf Menhaden, *Brevoortia patronus*. NOAA Technical Report NMFS 149 U.S Department of Commerce**:** 20 pages.

Table 1. Estimated LCS dead discards from the Gulf of Mexico menhaden fishery based on the average bycatch reported in de Silva et al. (2001).

Year	# of fish (thousands)
1981	25.1
1982	25.1
1983	25.1
1984	25.1
1985	25.1
1986	25.1
1987	25.1
1988	25.1
1989	25.1
1990	25.1
1991	25.1
1992	25.1
1993	25.1
1994	26.2
1995	24.0
1996	25.1
1997	25.1
1998	25.1
1999	25.1
2000	25.1
2001	25.1
2002	25.1
2003	25.1
2004	25.1

Table 2. Estimated LCS dead discards from the Gulf of Mexico menhaden fishery based on the average bycatch reported in de Silva et al. (2001), adjusted for the number of vessels operating annually.

Year	# Boats	Multiplier	# of fish (thousands)
1964	78	1.46	36.6
1965	87	1.63	40.8
1966	92	1.72	43.2
1967	85	1.59	39.9
1968	78	1.46	36.6
1969	75	1.40	35.2
1970	76	1.42	35.7
1971	85	1.59	39.9
1972	75	1.40	35.2
1973	66	1.23	31.0
1974	71	1.33	33.3
1975	78	1.46	36.6
1976	82	1.53	38.5
1977	80	1.50	37.5
1978	80	1.50	37.5
1979	78	1.46	36.6
1980	79	1.48	37.1
1981	80	1.50	37.5
1982	82	1.53	38.5
1983	81	1.51	38.0
1984	81	1.51	38.0
1985	73	1.36	34.2
1986	72	1.35	33.8
1987	75	1.40	35.2
1988	73	1.36	34.2
1989	77	1.44	36.1
1990	75	1.40	35.2
1991	58	1.08	27.2
1992	51	0.95	23.9
1993	52	0.97	24.4
1994	55		26.1
1995	52		24.0
1996	51	0.95	23.9
1997	52	0.97	24.4
1998	50	0.93	23.5
1999	55	1.03	25.8
2000	47	0.88	22.1
2001	44	0.82	20.6
2002	43	0.80	20.2
2003	42	0.79	19.7
2004	43	0.80	20.2

Table 3. Estimated blacktip and sandbar shark dead discards from the Gulf of Mexico menhaden fishery based on the average bycatch reported in de Silva et al. (2001).

Year	# of fish	
	Blacktip shark	Sandbar shark
1981	11,700	465
1982	11,700	465
1983	11,700	465
1984	11,700	465
1985	11,700	465
1986	11,700	465
1987	11,700	465
1988	11,700	465
1989	11,700	465
1990	11,700	465
1991	11,700	465
1992	11,700	465
1993	11,700	465
1994	12,200	486
1995	11,200	445
1996	11,700	465
1997	11,700	465
1998	11,700	465
1999	11,700	465
2000	11,700	465
2001	11,700	465
2002	11,700	465
2003	11,700	465
2004	11,700	465

Table 4. Estimated blacktip and sandbar shark dead discards from the Gulf of Mexico menhaden fishery based on the average bycatch reported in de Silva et al. (2001), adjusted for the number of vessels operating annually.

			# of fish	
Year	# Boats	Multiplier	Blacktip	Sandbar
1964	78	1.46	17,058	679
1965	87	1.63	19,026	757
1966	92	1.72	20,120	800
1967	85	1.59	18,589	740
1968	78	1.46	17,058	679
1969	75	1.40	16,402	653
1970	76	1.42	16,621	661
1971	85	1.59	18,589	740
1972	75	1.40	16,402	653
1973	66	1.23	14,434	574
1974	71	1.33	15,527	618
1975	78	1.46	17,058	679
1976	82	1.53	17,933	713
1977	80	1.50	17,495	696
1978	80	1.50	17,495	696
1979	78	1.46	17,058	679
1980	79	1.48	17,277	687
1981	80	1.50	17,495	696
1982	82	1.53	17,933	713
1983	81	1.51	17,714	705
1984	81	1.51	17,714	705
1985	73	1.36	15,964	635
1986	72	1.35	15,746	626
1987	75	1.40	16,402	653
1988	73	1.36	15,964	635
1989	77	1.44	16,839	670
1990	75	1.40	16,402	653
1991	58	1.08	12,684	505
1992	51	0.95	11,153	444
1993	52	0.97	11,372	452
1994	55		12,200	486
1995	52		11,200	445
1996	51	0.95	11,153	444
1997	52	0.97	11,372	452
1998	50	0.93	10,935	435
1999	55	1.03	12,028	479
2000	47	0.88	10,279	409
2001	44	0.82	9,622	383
2002	43	0.80	9,404	374
2003	42	0.79	9,185	365
2004	43	0.80	9,404	374