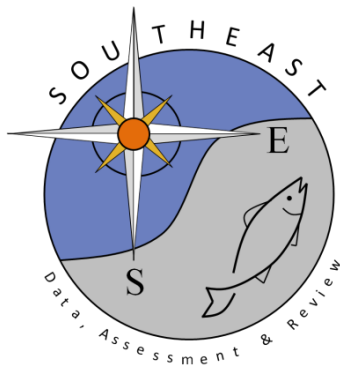


Discards of sandbar shark, *Carcharhinus plumbeus*, from the
menhaden purse seine fishery

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Discards of sandbar shark, *Carcharhinus plumbeus*, from the menhaden purse seine fishery

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Introduction

The Gulf menhaden purse seine fishery incidentally captures sharks, thereby contributing to fishing mortality of sandbar shark. Shark bycatch from the menhaden fishery was first estimated during the SEDAR11 assessment of the Large Coastal Sharks Complex, Blacktip Shark, and Sandbar Shark (Neer and Cortés 2005; SEDAR11 2006). Shark bycatch in the menhaden fishery is not collected to species level and bycatch mortality is not collected. Therefore, Neer and Cortés (2005) developed a methodology to allocate total shark bycatch to the complex or species level using data from 1994-95 (de Silva et al. 2001). Of the shark species assessed in SEDAR11 (2006), sandbar shark represented the lowest proportion of shark bycatch in the menhaden fishery (the Large Coastal Complex comprised 97%; Blacktip were 45.3% and Sandbar were only 1.8%). A precedent was set in this assessment to include sandbar shark dead discards from the menhaden fishery. Menhaden fishery dead discards were included in all subsequent sandbar shark SEDARs as a separate fleet in the assessment model, despite being such a low percentage of shark species caught by this fishery and representing <1% of removals over the past 50 years (SEDAR21 2011; SEDAR54 2017). This methodology was updated here for continuity, but it is recommended to reconsider how to include this source of mortality in this and future sandbar shark stock assessments.

Methods

Methodology summarized here follows that presented in Cortés and Baremore (2010) (updated from Neer and Cortés (2005)) to provide effort-adjusted estimates of dead sandbar shark discards from the menhaden fishery in the U.S. Gulf. de Silva et al. (2001) conducted a study

estimating species composition of shark discards from the menhaden purse seine fleet in 1994-95, where there was a total estimated 35,989 and 33,069 sharks caught, respectively. They reported that sandbar shark represented 1.8% of total observed shark bycatch during this time. This was calculated from Table 1 in de Silva et al. (2001) by dividing the 13 identified sandbar sharks by 726 total observed sharks (identified and unidentified) from 492 sets. At the time of release, 75% of sharks in the bycatch were estimated dead. This resulted in an estimated dead bycatch of 485.85 sharks ($35,989 \times 0.018 \times 0.75$) in 1994 and 446.43 sharks ($33,069 \times 0.018 \times 0.75$) in 1995. These values match what was reported in the previous SEDAR reports accounting for rounding errors (Cortés and Baremore 2010).

Using the menhaden fishery's total shark bycatch and species compositions reported by de Silva et al. (2001), sandbar shark dead discard estimates were standardized to the average number of registered vessels operating in the fishery over the same interval as reported by the Southeast Fisheries Science Center (average 53.5 vessels, 55 vessels in 1994 and 52 vessels in 1995). This allowed for the calculation of a 1994-95 average dead discard rate per vessel, which was applied to the time series of menhaden vessels operating per year. Neer and Cortés (2005) applied this methodology back to 1964, and Cortés and Baremore (2010) reported values back to 1981, where SEDAR54 (2017) copied menhaden fleet discard estimates from 1980 to 1960 for incorporation in the stock assessment. These menhaden discards from SEDAR54 (2017) represented 12-30% of total removals from 1960-62. Since 1978, menhaden fleet discards comprised <1% of total removals.

While the modern Gulf menhaden fishery began post-WWII and data collection began around the early 1960s, the survey was not considered standardized and consistent until 1965. Prior to that, a precise rendering of participating vessels is not possible. Therefore, information on menhaden discards is only provided back to 1965 for consideration in this assessment.

Results and Discussion

Dead discarded sandbar shark estimates ranged from 235.25 in 2017, 2024, 2025 to 801.59 in 1966 (Table 1). Over the duration of the menhaden fishery, the number of participating vessels has decreased. At the same time, the abundance of sandbar shark has reportedly been increasing. Given the changing abundance and composition of sharks in the Gulf, compounded with changes in the menhaden and other Gulf fisheries, it would be reasonable to assume that the proportion of sandbar shark bycatch in the menhaden purse seine fishery has not remained constant at 1994-1995 levels. Nevertheless, these allocation proportions may serve as a potential lower bound of estimated sandbar shark discard estimates from the menhaden fishery. For example, if the sandbar shark population has been increasing at a faster rate compared to other shark species, we might expect the species composition to have increased beyond the estimated 1.8% in 1994-95, resulting in a larger estimate of dead sandbar sharks.

Ultimately, the overall number of dead discards from this fishery (<1% of total removals) is low and there is high uncertainty in sandbar shark landings. Consequently, we expect the

dead sandbar shark removals from the menhaden fleet to be negligible for the purposes of a sandbar shark stock assessment. It is recommended to integrate these values into the general uncertainty around removals and not explicitly model them as a separate discard fleet as done in previous SEDAR assessments.

Table 1: Menhaden fleet discards of dead sandbar shark in numbers. These estimates were produced based on a study in 1994-95 and scaled by the number of vessels operating in these years to generate a time series of dead discards in numbers, assuming sandbar bycatch per vessel from 1994-95 is constant over this interval.

Year	Menhaden Vessels	Dead Discards (number)
1965	80	697.03
1966	92	801.59
1967	85	740.60
1968	80	697.03
1969	75	653.47
1970	76	662.18
1971	85	740.60
1972	75	653.47
1973	66	575.05
1974	71	618.62
1975	78	679.61
1976	82	714.46
1977	80	697.03
1978	80	697.03
1979	78	679.61
1980	79	688.32
1981	80	697.03
1982	82	714.46
1983	82	714.46
1984	82	714.46
1985	73	636.04

Year	Menhaden Vessels	Dead Discards (number)
1986	71	618.62
1987	72	627.33
1988	70	609.90
1989	77	670.90
1990	75	653.47
1991	59	514.06
1992	51	444.36
1993	52	453.07
1994	55	479.21
1995	52	453.07
1996	51	444.36
1997	52	453.07
1998	50	435.65
1999	53	461.79
2000	43	374.66
2001	44	383.37
2002	41	357.23
2003	40	348.52
2004	41	357.23
2005	41	357.23
2006	39	339.80
2007	41	357.23
2008	39	339.80
2009	39	339.80
2010	39	339.80
2011	37	322.38
2012	36	313.67

Year	Menhaden Vessels	Dead Discards (number)
2013	37	322.38
2014	32	278.81
2015	32	278.81
2016	31	270.10
2017	27	235.25
2018	31	270.10
2019	32	278.81
2020	42	365.94
2021	31	270.10
2022	28	243.96
2023	29	252.67
2024	27	235.25
2025	27	235.25

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