Relative abundance of blacknose sharks, *Carcharhinus acronotus*, from coastal shark surveys in the eastern Gulf of Mexico, 2001–2006.

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SEDAR 13 (Small Coastal Sharks) Data Workshop

Summary

Coastal shark surveys conducted by the Center for Shark Research using drumlines and longlines off the eastern Gulf of Mexico captured 76 blacknose sharks, *Carcharhinus acronotus*, from 2001-06. The catch comprised mostly mature sharks with a relatively equal ratio of male to females. Preliminary analysis of the catch per unit effort data from these fishery-independent efforts revealed that there was no significant difference in catch rate from year to year in either gear type.

Introduction

Beginning in June of 2001, Mote Marine Laboratory's Center for Shark Research began surveys primarily 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 2006 (and are ongoing). The primary objectives of these surveys are to: a) assess the relative abundance of large and small coastal shark species; b) determine the movement patterns of individual sharks in the eastern Gulf of Mexico; c) document the overall migratory patterns of the various 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. Although large coastal sharks are the primary target of these fishing efforts, small coastal species have been a regular component of the catch. The purpose of this document is to provide preliminary catch per unit effort data for the blacknose shark (*Carcharhinus acronotus*) which may be relevant to the 2007 stock assessment workshop for small coastal sharks.

Materials and Methods

Field Methods

A total of 1,635 single-hook drumlines were set during large shark surveys in Gulf coastal waters off Tampa Bay, Sarasota, and Charlotte Harbor from 2001 to 2006 (Figure 1). This gear type consisted of a cement block anchor attached to 20-40 m of line (depending on water depth) that connected with 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, Rhizoprionodon terraenovae* or *Sphyrna 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 facilitate high survivorship as they permit the hooked shark to swim in circles around the anchor. Although this gear selects for relatively large sharks, it also catches some small coastal species.

Bottom longlines were similarly used to target adult and large juvenile sharks, primarily off Tampa Bay and Sarasota, since 2002. The gear comprised 57-121 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 (*E. alletteratus*) and the typical soak time was 4 hours. Sets made during 2002 and 2003

used stainless steel leader material; this was changed to monofilament in early 2004. A total of 63 longline sets of this type were conducted in 2002-06 (Figure 1).

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

Analysis for this paper was separated by gear type (drumlines vs. longlines). The number of sharks caught with each gear type was converted to catch per unit effort (CPUE). CPUE for the drumline was calculated by dividing the number of animals caught by the soak time of the drumline, and the CPUE for the longlines was calculated by dividing the number of animals caught by the hook-hours (number of hooks used multiplied by the total soak time). CPUE data were standardized using the natural logarithm of the CPUE + 1 before being analyzed. Regression analyses of the mean annual catch rates for both gear types were used to assess if there has been an increase or decrease in the annual catch rates. A General Linear Model (GLM) was also used for both gear types to investigate if there were different patterns of catch rates between months and years.

Results and Discussion

A total of 624 sharks comprising 11 species were captured during these surveys. Blacknose sharks were the fourth most abundant species by number with 76 total captures (12.2%) (Table 1). Of the specimens of known sex, 37 were male and 31 were

female. At least 58 of the captured blacknose sharks were sexually mature (average FL = 89.8 cm). Longline gear captured 64 specimens (84.2 %) while drumlines accounted for 12 sharks (15.8 %). This species was captured in all seasons by both drumline and longline gear (Figure 2). The highest catch rates of *C. acronotus* for longline gear was observed in the summer months. For drumlines, winter catch rates were highest but this observation is likely reflective of the relatively low overall catch rates of this gear type.

Longline analysis:

There was a significant difference in catch rates for the month factor but not for the year (Table 2). Regression analysis of the mean annual catch rates indicated that the slope of the catch series was not significantly different from zero (slope = 0.0003, R^2 = 0.2279) (Figure 3a).

Drumline analysis:

There was not a significant difference in catch rates for any of the factors (Table 2). Regression analysis of the mean annual catch rates indicated that the slope of the catch series was not significantly different from zero (slope = 0.0005, R^2 = 0.5402) (Figure 3b).

Table 1. Catch composition from CSR shark surveys using drumlines and longlines, 2001-2006

Species	DL	LL	Total
Carcharhinus limbatus	76	55	131
Ginglymostoma cirratum	43	70	113
Carcharhinus brevipinna	25	71	96
Carcharhinus acronotus	**12**	**64**	**76**
Carcharhinus plumbeus	32	35	67
Carcharhinus leucas	57	7	64
Negaprion brevirostris	41	5	46
Sphyrna mokarran	8	5	13
Rhizoprionodon terraenovae	1	10	11
Galeocerdo cuvier	4	1	5
Sphyrna lewini	2	0	2
Total	301	323	**624**

Table 2. Results of the GLM for both type of gear

	Deg. of	Drumlines		Longlines	
Effect	**Freedom**	**F**	**P**	**F**	**P**
Month	7	1.429561	0.189061	4.25703*	0.001828*
Year	5	1.929224	0.086545	1.93453	0.121513

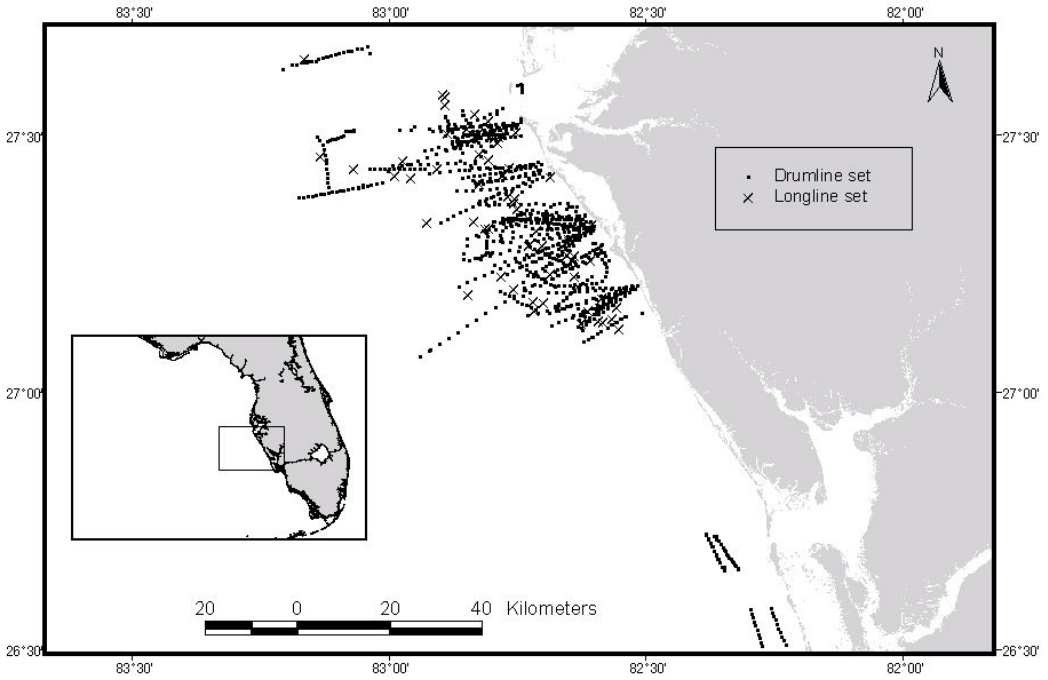

Figure 1. Sampling areas for CSR coastal shark surveys, 2001-06.

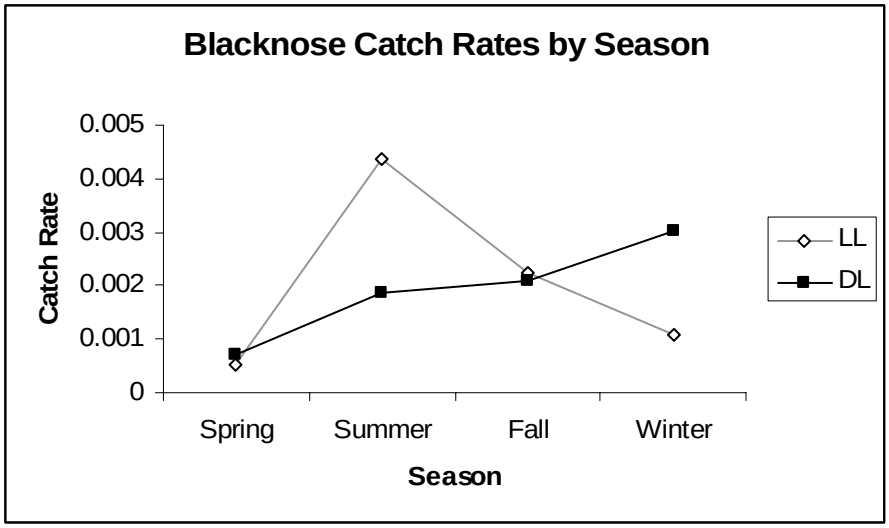

Figure 2. Catch rates of blacknose sharks by season, 2001-2006.

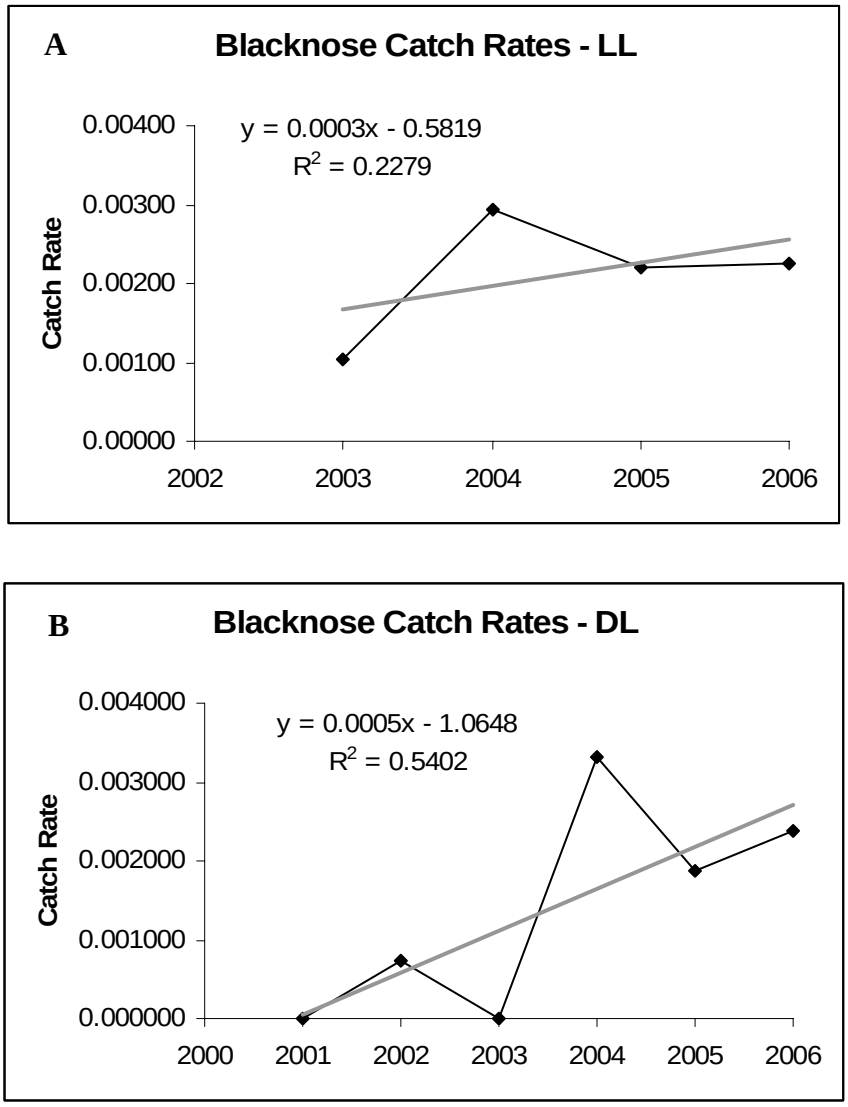

Figure 3. Annual catch rates for blacknose sharks for longline (A) and drumline (B) gear types.

ADDENDUM

SCS07/13-DW-37

Relative abundance of blacknose sharks, *Carchahinus acronotus*, from coastal shark surveys in the eastern Gulf of Mexico, 2001-2006

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After reviewing the document submitted to the SEDAR indices group, it was recommended that we:

- Standardized the catch rate data from both gear types (drumline and longline) using the delta log method
- Use the transformed data to run the GLM model for both gear types

Results after recommendations were applied:

Drumline data – After the data was standardized using a zero-inflated delta log transformation, the model was not able to run due to the relatively low catch rate with respect to the relatively high fishing effort.

Longline data – The catch rate data covered the years from 2002 to 2006; however, the 2002 data was not used for this analysis since there were only two data points for this year. CPUE was calculated by number of sharks per 1,000 hook hours. Due to the nature of the data, the GLM model was not applicable. Instead, a Negative Binomial Regression Analysis was used to obtain the indices of abundance, and only Year was included as a factor in this model.

Year	Index	LCL	UCL	CV
2003	0.624309	0.59661	0.651993	0.473
2004	1.610186	1.6985	1.523225	0.42367
2005	1.085021	1.036587	1.133292	0.47308
2006	0.680484	0.668303	0.69149	0.45934