The Distribution, Diversity and Abundance of Elasmobranches in the Mangrove Creeks of South Eleuthera, Bahamas

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INTRODUCTION

Over the past several decades, shark populations have been declining at an increasing rate (Myers et al. 2007). All elasmobranches have 8-9 selected life histories meaning that they have a long lifespan and take many years to sexually mature. Elasmobranches also have a low fecundity, thus it is very difficult for their populations to recover from any unnatural decline in their populations. Ball (Carcharhinus leucas) and Sandbar (Carcharhinus planci) shark populations have decreased over the past 38 years by rates of 87% and 98% respectively. Declining elasmobranch populations have strong top-down effects on the food chain affecting other species populations (Myers et al. 2007).

Longline fishing, the predominant capture method for commercial shark fisheries, has been banned in the Bahamas since 1993. However other anthropogenic threats such as coastal development can be very detrimental to local species. For example in Bimini there was a 25.3% decrease in fisher recovery rates of juvenile lemon sharks due to the destruction of their nursery grounds (Jennings et al. 2006). Juvenile lemon sharks demonstrate particularly high site fidelity towards their nursery grounds (Chapman et al. 2009), so the destruction of their natural habitat has particularly damaging effects. South Eleuthera is home to many shallow creeks used by an array of juvenile elasmobranchs, development destroys the creeks, which provide an ideal habitat for juvenile lemon sharks. Recent developments on Cape Eleuthera and in Cactus Bay have contributed to the loss of many mangrove habitats along the coast. Currently 69% of the Bahamas’ GDP is generated by tourism (Buchan 2001), so this development is likely to continue all over the Bahamas.

There is currently little to no data on the elasmobranchs in South Eleuthera, so the purpose of this empirical study was to establish a baseline data set comprised of abundance, diversity and distribution of the elasmobranchs that reside in mangrove creeks. This study seeks to demonstrate the degree to which the stage, sex and CPUE of elasmobranchs in South Eleuthera, The Bahamas vary with, and are dependent upon creek location.

METHODS

The research was conducted in Broad Creek, Page Creek, Plum Creek, Kemps Creek, and Deep Creek in South Eleuthera, Bahamas between March and June (FIG. 1). The 10-meter survey line has ten, 1-meter long gangions with a float above each one to keep the line on the surface. Size 11/0 circle hooks are attached on the end of the leaders. Ever diver used a seine (FIG. 2). Seining was conducted from 5:00 am to 7:00 pm from February 9th to November 14th in 2009. Fifty-one young-of-the-year (YOY) lemon sharks were also caught, accounting for 10.5% of our total catch. Three statistical tests: ANOVA, Kruskal Wallis, and Spearman Rank Correlation are used to analyze and compare different variables such as CPUE, or the sex of sharks, and help us generate our P-Values.

RESULTS

The study period lasted from February 9th through May 9th. Fifty-one young-of-the-year (YOY) lemon sharks were caught over the course of this study, with fork lengths ranging from 32 to 96 centimeters. Two nurse sharks and three southern stingrays were also caught, accounting for 10.5% of our total catch. Thirteen previously tagged lemons were recaptured, twelve in the same location they were originally caught in, and only one in a different but nearby creek, denoting 92.3% site fidelity among recaptured lemons. The mean fork length of sharks caught in each creek ranged from 58.75cm to 84.93cm with an overall mean of 65.82cm. (FIG. 4) The mean CPUE in the sampled creeks ranged from 0.0096 to 0.0563, with an overall mean of 0.02818 (FIG. 5), and a P value of 0.052 when comparing all five creeks using a Kruskal Wallis test, indicating a significant difference in the relative abundance of sharks between the five creeks. Significant differences were found using a Mann-Whitney test between Broad Creek and Deep Creek (P=0.023) and Broad Creek and Plum Creek (P=0.017), as well as between the Rock Sound (North) side of Cape Eleuthera, including Kemps Creek, Page Creek and Broad Creek, and the Emma sound (South) side of Cape Eleuthera, including Deep Creek and Plum Creek (P=0.010) (FIG. 6). There is a direct relationship between the CPUE’s of mojarras and lemon sharks. Using a spearman rank correlation test there was a 0.8 correlation between the mean CPUE’s of mojarras and lemon sharks. The P-value of the relationship was 0.0157 showing that there was no statistical significance (FIG. 7). The ratio of male to female sharks and number of sharks caught varied between creeks. There was also a large gender divide between the Rock sound and Emma sound sides of the creek. (FIG. 8).

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LITERATURE CITED