Movement and post-release mortality data for great hammerheads, *Sphyrna mokarran*, tagged during research bottom longline surveys in the northern Gulf of Mexico from 2012-2014

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Movement and post-release mortality data for great hammerheads, *Sphyrna mokarran*, tagged during research bottom longline surveys in the northern Gulf of Mexico from 2012-2014

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Great hammerheads, Sphyrna mokarran, were targeted using 1.8 km bottom longline with 100 3m gangions baited with Atlantic mackerel, scomber scomber set in northern Gulf of Mexico waters from 9 – 366m. The bottom longlines were soaked for one hour and retrieved, and sharks were identified, measured, weighed and then tagged and released. Nine great hammerheads (male n=1: 155 cm FL; female n=8: 85.5-214 cm FL) were fitted with smart position and temperature transmitting (SPOT) tags. Four SPOT tags (range 19 to 101 days, mean: 53.3 ± 20.0 days) reported data with five of the tags not transmitting data to the satellite after the tags were deployed, suggesting those sharks succumbed to the capture stress. All four great hammerheads remained in relatively coastal, nearshore waters with only two locations occurring in waters deeper than 50m. Two of the sharks remained in the general localized area where they were tagged, whereas the other two sharks moved across the Mississippi River Delta from MS to LA and vice versa. The post-release mortality rate was estimated to be 55.5% with a 95% binomial confidence interval of 21.2 to 86.3%.

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INTRODUCTION

The National Marine Fisheries Service Southeast Fisheries Science Center's bottom longline survey has been conducted annually in the Gulf of Mexico waters from 9 to 366m since 1995. The gear consists of 1.8 km bottom longline with 100 3m gangions baited with Atlantic mackerel, scomber scomber and set for one hour and retrieved. Great hammerheads, *Sphyrna mokarran* are caught on this survey relatively rarely, however, due to the paucity of information on movements, were targeted for tagging.

METHODOLOGY

The bottom longlines were soaked for one hour and retrieved, and sharks were identified, measured, weighed and then tagged and released. All great hammerheads in fair to good condition were tagged with Wildlife Computers Smart Position and Temperature transmitting (SPOT) tags and their release condition was recorded. Tag locations with location quality (0, 1, 2, 3, and B) were plotted in QGIS to visual the movements of the great hammerhead sharks.

For this study, we assumed that sharks that did not report any data to the satellite, succumbed to the stress associated with the bottom longline capture and application of the SPOT tags. Post-release mortality estimates were calculated by dividing the number of sharks that did not report any data by the total number of sharks that were tagged. To estimate error associated with the post-release mortality rate, a 95% binomial confidence interval was calculated using the Clopper-Pearson exact method (Weltersbach et al. 2018).

Summary information provided in this document includes tagging date, location, recapture date and location, time at liberty, and distance traveled. The time at liberty is the number of days between the initial tagging and recapture event. The distance traveled is calculated as the straight-line distance over water between the tagging location and the recapture location, and was measured in kilometers (km).

RESULTS

Nine great hammerheads (male n=1: 155 cm FL; female n=8: 85.5-214 cm FL) were fitted with smart position and temperature transmitting (SPOT) tags. Four SPOT tags (range 19 to 101 days, mean: 53.3 ± 20.0 days) reported data with five of the tags not transmitting data to the satellite after the tags were deployed, suggesting those sharks succumbed to the capture stress. All four great hammerheads remained in relatively coastal, nearshore waters with only two locations occurring in waters deeper than 50m. Two of the sharks remained in the general localized area where they were tagged, whereas the other two sharks moved across the Mississippi River Delta from MS to LA and vice versa. The post-release mortality rate was 55.5% with a 95% binomial confidence interval of 21.2 to 86.3%.

REFERENCES

Weltersbach MS, Strehlow HV, Ferter K, Klefoth T, Graaf M De, Dorow M (2018) Estimating and mitigating post-release mortality of European eel by combining citizen science with catch-and-release angling experiment. Fish Res 201:98–108.

Table 1. Tagging summary data from 9 Smart Position and Temperature (SPOT) tags deployed on great hammerheads in the northern Gulf of Mexico from 2012 – 2014.

Tag ID	Tag Date	Deploy Lat (°N)	Deploy Lon (°W)	Sex	FL (cm)	End Date	End Lat (°N)	End Long (°W)	Days at Liberty
120883	8/8/2012	30.1686	-88.6016	F	190	NR	-	-	-
120876	8/21/2012	28.3518	-83.4422	F	211.5	NR	-	-	-
120902	9/6/2012	26.9288	-97.2268	F	165.5	12/16/2012	25.974	-97.005	101
120898	9/20/2012	29.0562	-89.9398	M	155	10/12/2012	29.544	-88.877	22
120905	9/25/2012	30.2330	-86.1968	F	195	10/14/2012	30.272	-87.106	19
120909	8/21/2013	29.2988	-83.5797	F	201.5	NR	-	-	-
132398	8/18/2014	29.3810	-93.6002	F	85.5	NR	-	-	-
120889	9/25/2014	30.1610	-88.5000	F	162.7	12/5/2014	28.591	-90.476	71
132407	9/28/2014	29.7040	-88.1570	F	214	NR	-	-	-

Tag ID is the tag identification number; Tag Date is the date of tag deployment; Deploy Lat/Long are the GPS coordinates where the tag was initial deployed on the shark; sex was assigned (M) for male and (F) for female when determination was possible by visual observation of the presence or absence of claspers; FL is the fork length of the tagged individual; End Date is the last day tag reported a location; End Lat/Lon are the last GPS coordinates of the tag; Days at liberty are the number of days between tag deployment and final transmission. NR indicates the SPOT did not report any data.

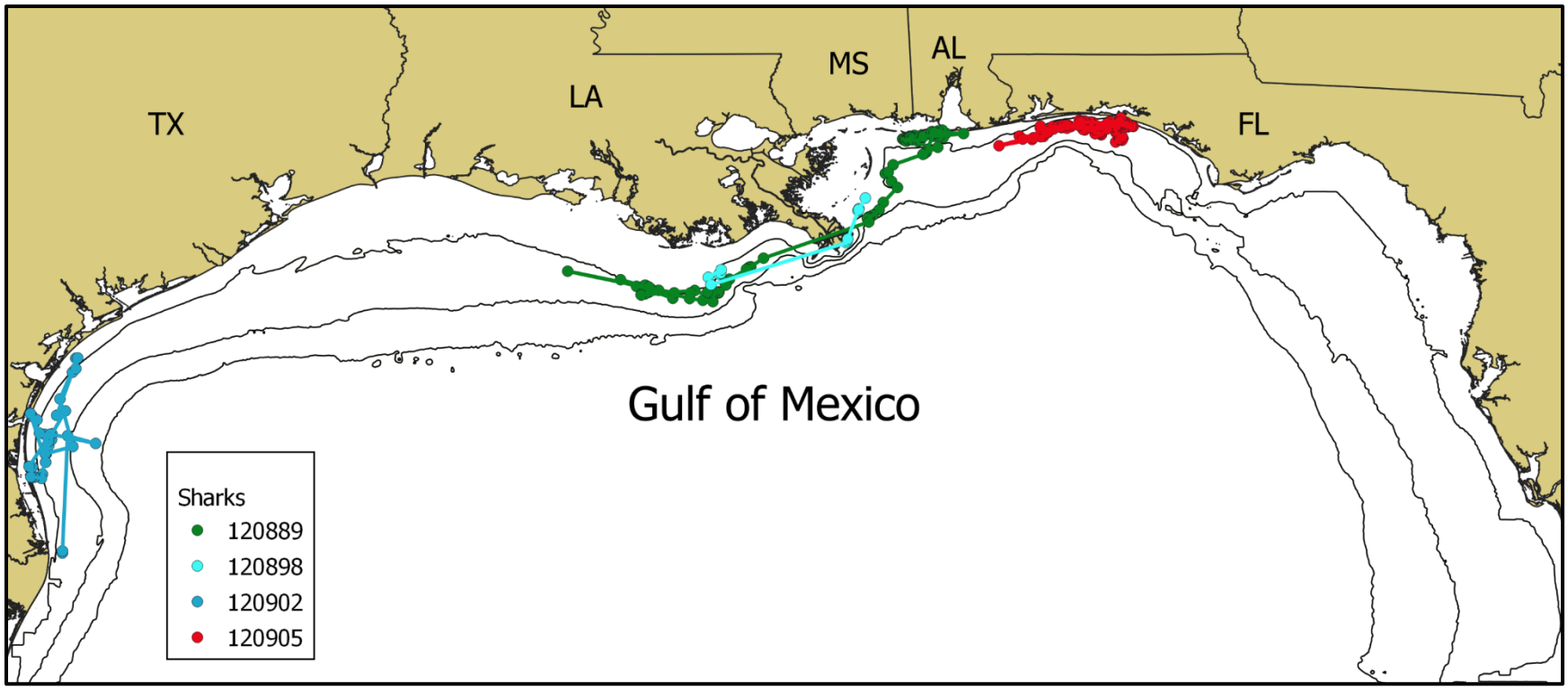

Figure 1. Map depicting movements of great hammerheads, *Sphyrna mokarran*, in the Gulf of Mexico.