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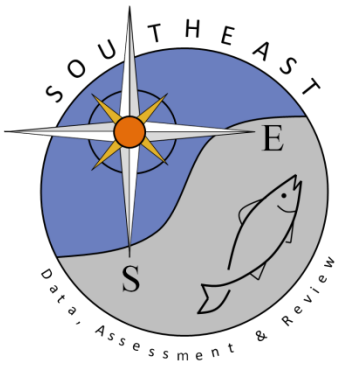

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Tag and recapture data for Great Hammerhead, *Sphyrna mokarran*, and Scalloped Hammerhead, *Sphyrna lewini*, sharks caught in the western Gulf of Mexico from 2014-2021

Kesley G. Banks[1], and Gregory W. Stunz[1]

In partnership with the Center for Sportfish Science and Conservation, anglers participating in the Texas Shark Rodeo target sharks from shore using large reels and baits. The anglers practice catch-photo-release with an "emphasis on tagging and collecting data for the conservation of sharks". From 2014 - June 2021, >7,500 sharks have been sampled as part of TSR with >6,000 of those tagged and >5,000 fin clipped. Of these sharks, 100 were Great Hammerhead and 97 were Scalloped Hammerhead. Of the 100 Great Hammerhead sharks caught, 46 were tagged with 3 reported recaptured, one of which was recaptured twice within a month. Of the 97 Scalloped Hammerhead sharks caught, 39 were tagged with 1 reported recaptured. Of note, a Scalloped Hammerhead tagged (dart and satellite) as part of a movement study in June 2015 was recaptured and landed in Carbajal, Mexico in July 2017. No other Scalloped Hammerhead or Great Hammerhead sharks were reported recaptured outside of United States waters.

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INTRODUCTION

The Center for Sportfish Science and Conservation (CSSC) enjoys many partnerships with area residents including recreational anglers who are engaged in multiple activities to collect data on fisheries. One of which is the Texas Shark Rodeo (TSR), an annual 9-month long land-based shark fishing tournament that advocates for catch-photo-release with an "emphasis on tagging and collecting data for the conservation of sharks" (texassharkrodeo.com). Anglers participating in the TSR tag and submit a photograph of their catch for it to be counted. At the end of the tournament, the participant or team with the most points wins, depending on the division (e.g., top three teams, top three anglers, top three junior anglers, and largest of each species). Points are awarded based on the length of sharks landed with the potential to earn bonus points for collecting scientific data, landing an "uncommon" species, or recapturing a previously tagged shark. The photos submitted allowed for validation of species. Gibson et al. (2019) reported that anglers correctly identified shark species 97.2% of the time. For iconic species such as hammerheads, correct identification was reported at 98% of the time. The misidentifications that were reported were generally Great Hammerheads mistaken for Scalloped Hammerheads. The purpose of this tagging effort is to provide long-term monitoring and seasonal data of the shark population in the western Gulf of Mexico. The partnership between the TSR and CSSC allows for invaluable data to be collected of a magnitude that would be impossible under traditional scientific study constraints both logistically and financially.

METHODS

Anglers participating in the TSR target sharks from shore (e.g., beach, jetty, channel), excluding piers or vessels of any type. For a detailed description of fishing method used by TSR participants, see Ajemian et al. (2016). Generally, anglers use large reels spooled with up to 1,000 m of 50-lb to 100-lb test line (monofilament or braid) with approximately 100 m of monofilament top shot with high strength. Connected to this top shot is a wire leader (sometimes coated) consisting of a weight and circle or J-hook (some entries date back before recently passed circle hook requirement regulations in Texas; TPWD 2019) ranging in size from 13/0 to 24/0. Hooks are typically baited with large portions of stingray (*Rhinoptera* spp. or *Dayatis* spp.) or Crevalle Jack (*Caranx hippos*), which are then either surf casted or kayaked out up to 400 m offshore.

As per tournament rules, landed sharks were identified, measured, photographed, fin clipped, tagged with a Floy© stainless steel-tipped conventional dart tag, and released. Tags had phone number, website, unique identification number, and "REWARD" printed on the tag for reporting recaptures. Date of capture, location, length (stretch total length: STL; measured from the tip of the snout to the tip of the stretched upper caudal lobe, fork length; FL; measure from the tip of the snout to the tip of fork of the caudal fin), sex, species, and tag number, along with photographs were then submitted via online form (Gibson et al. 2019). While this effort is still continuing, these data were available for all sharks captured during the TSR between 2014 (first year of the tournament) and June 2021.

If a shark was recaptured, date, location, sex, species, and lengths were requested as well as the condition of the shark (e.g., released or harvested). The recapture information was then compared to the initial tagging information to discern movement and growth changes for each shark. Summary recapture information provided in this document includes tagging date, location, size at tagging, recapture date, recapture location, days at liberty, size at recapture, and distance traveled.

RESULTS

From 2014 to June 2021, >7,500 sharks have been sampled as part of TSR. To date, >6,000 sharks have been tagged and >5,000 fin clipped as part of the tournament. Not all sharks caught are tagged for various reasons, including decreasing handling time after long fight times, size limit based on tournament rules (sharks <32 in [82 cm] are not to be tagged), or the angler was out of tags. Some sharks that were below the minimum tournament approved tagging size were tagged anyway by anglers and submitted. Of the 7,500 sharks reported, 100 were Great Hammerhead and 97 were Scalloped Hammerhead. For Great Hammerhead sharks, 13 (13%) were male and 87 (87%) were females. Sixty-six of the 100 sharks were adults, 33 were juveniles, and 1 was classified as young of the year (YOY). For Scalloped Hammerhead sharks, 61 (62.8%) were males and 36 (37.2%) were females. Forty-five of the 97 Scalloped Hammerhead sharks were classified as adults, 9 as juveniles, and 43 as YOY.

Since the tagging began, 139 recaptures have been reported for all species, yielding an overall recapture rate of 1.83%. While most recaptures were reported by experienced recreational anglers (usually tournament participants), some sharks were reported by inexperienced anglers or beachgoers, thus not all data is available for each recapture. Of the 97 caught Scalloped Hammerhead sharks, 39 were tagged with 1 reported recaptured resulting in a recapture rate of 2.56% (Figure 1; Table 1). The recapture was reported by a recreational angler and was released.

Of note, a dart and satellite tagged Scalloped Hammerhead was recaptured (denoted by the * in Table 1). This shark was tagged as part of a movement study (Wells et al. 2018) in June 2015 and landed in Carbajal, Mexico in July 2017 (Figure 1). This shark had been at liberty 777 days and was landed 401 km from the initial tagging location. For detailed satellite movements, see Wells et al. (2018).

Of the 100 caught Great Hammerhead sharks, 46 were tagged with 3 reported recaptured, resulting in an 8.70% reported recapture rate (Figure 2; Table 1). One of the recaptures was reported recaptured a second time within a month of the first recapture. The shark was released after both recaptures. For the other 2 recaptures, the shark was found washed up same day or following day after the initial tagging event. For Great Hammerhead sharks, time at liberty ranged from 0 for 42 days while the distance traveled ranged from 0 to 84 km. For the one recaptured Scalloped Hammerhead shark, time at liberty was 14 days with distance traveled was 71 km.

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Table 1. Data for recaptured Great Hammerhead (GHH), *Sphyrna mokarran*, and Scalloped Hammerhead (SCHH), *Sphyrna lewini*, sharks in the Gulf of Mexico as documented by the Center for Sportfish Science and Conservation Citizen Science Tagging Program in partnership with the Texas Shark Rodeo from 2014 – June 2021. Numbers in parentheses for Time at liberty represents time at liberty between reported recaptures. * denotes a shark not tagged as part of the Citizen Science Tagging Program, but was recaptured.

Species	ID	Tag Type	Sex	Date Tagged	Latitude	Longitude	TL (cm)	Date Recaptured	Recapture Latitude	Recapture Longitude	Time at Liberty (days)	Distance Traveled (km)	Recapture Fate
GHH	10185	Dart	Male	5/14/2016	27.000	-97.379	224	6/4/2016	27.138	-97.370	21	15	Released
								6/25/2016	27.838	-97.040	42 (21)	84	Released
GHH	36082	Dart	Female	6/11/2021	27.777	-97.098	244	6/11/2021	27.784	-97.092	0	1	Deceased
GHH	36128	Dart	Female	6/15/2021	27.693	-97.157	203	6/16/2021	27.693	-97.157	1	0	Deceased
SCHH	35253	Dart	Male	8/8/2020	28.614	-95.932	62	8/22/2020	28.934	-95.299	14	71	Released
SCHH*	12889	Dart/ Satellite	Male	6/2/2015	27.900	-96.424	225	7/18/2017	24.502	-97.741	777	401	Harvested

Figure 1. Recapture data for Scalloped Hammerhead sharks tagged in the western Gulf of Mexico. Blue circles represent initial tagging locations. The * denotes the Scalloped Hammerhead tagged as part of the satellite movement study (Wells et la. 2018) but was recaptured in Mexico. Yellow triangles represent recapture locations. Port Aransas, Texas, is represented by the white star, and the United States Exclusive Economic Zone is represented by the white line.

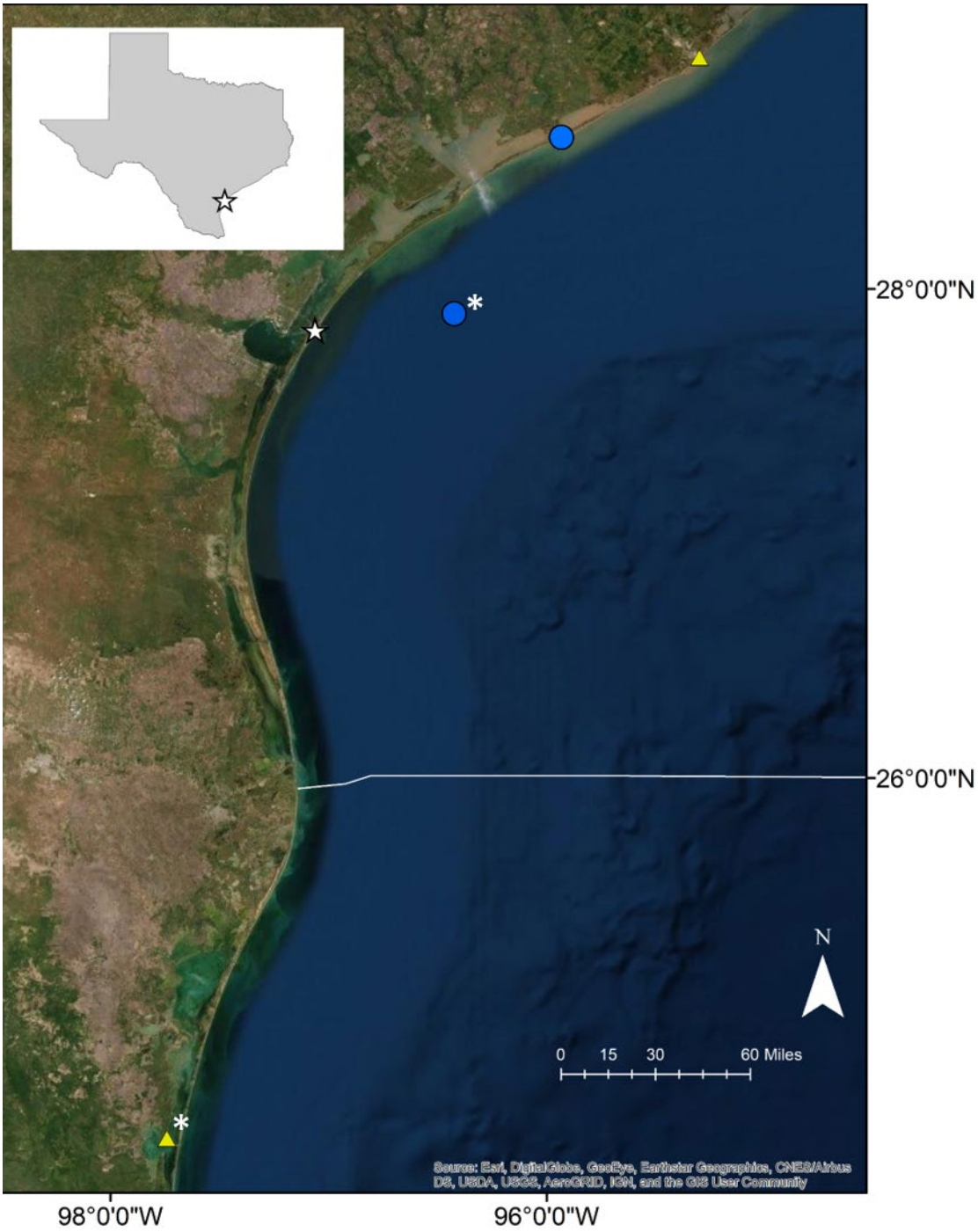

Figure 2. Recapture data for Great Hammerhead sharks tagged in the western Gulf of Mexico. Blue circles represent initial tagging locations. Yellow triangles represent recapture locations. Port Aransas, Texas, is represented by the white star.