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Original Paper

Stingray and Shark Tagging Analysis in Promotion of Population and Ecosystem Conservation: Alabama, Florida 2015-2018 Project Report

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Abstract

Stingrays and sharks are linchpin species that help maintain the function and stabilization of local bay systems. A three-year tagging project was designed and implemented in an effort to gather migration and habitat data of target species. Seventy-two specimens were tagged using labeled, plastic anchor tags placed in the medial pectoral radials for rays and adjacent the dorsal fin for sharks. To date, tagged stingrays have a 0% return, sharks have a 12.5% return. Continued research is needed for a more complete understanding of their population dynamics in the promotion of on-going conservation efforts.

Keywords

stingrays, sharks, tagging, T-bar anchor, dart tag, D. sabina, tag return, trawling

1. Introduction

Little is known about the movement and distribution of stingrays and sharks along the Alabama and Florida coastline systems. This project entailed tagging species of stingrays and sharks from voluntary fishing abandonments, and trawl by-catch. Tagging was in effort to acquire baseline data on population dynamics mainly along the Gulf of Mexico coastline. Due to the availability of recreational shrimp trawls, stingrays were the emphasis of the project. While there are many species of stingray and shark along the Alabama, Florida coastline, some species were readily acquired over others, and species not listed on permits were avoided for tagging. The data acquired and detailed in this report is pursuant to the Florida Special Activities License, SAL-15-1752B-SR. It also exposes acquisition difficulties, tag successes, and shortfalls, as well as the continued need for more data.

1.1 Stingrays and Sharks-Alabama and Florida

This project concentrated on tagging stingrays in Alabama/Florida waters, with sharks tagged during recreational fishing. Species of rays and sharks present in Alabama waters can also be found in Florida. Florida has a wider variety of rays and sharks than Alabama due to its vast coastline and geographical position.

1.1.1 Common Stingrays of Alabama and Florida

The most common stingray identified during tagging events in bay waters of Alabama and Florida was the Atlantic stingray (*Dasyatis sabina*). Cownose rays (*Rhinoptera bonasus*) were the next common ray identified, but they were identified offshore. Smooth butterfly rays (*Gymnura micrura*) and the Lesser electric ray (*Narcine bancroftii*) were, to a much less extent, caught and tagged in bay water during the project. The Southern stingray (*Dasyatis americanus*) is also a common ray of both states, but was only tagged in Florida waters.

1.1.2 Common Sharks of Alabama and Florida

The most common shark identified during tagging events in waters of Florida was the Spinner shark (*Carcharhinus brevipinna*), and Blacktip shark (*Carcharhinus limbatus*). The Sandbar shark (*Carcharhinus plumbeus*) and Tiger shark (*Galeocerdo cuvier*) were tagged on a single tagging event in Alabama waters. A single Atlantic sharpnose shark (*Rhizoprionodon terraenovae*) was tagged in the Florida waters around Pensacola Pass.

2. Method

Prior to any tagging events, permits to collect scientific data in state waters were applied for and granted. Chartered recreational shrimp trawls were the main source used to acquire stingrays. Sharks were tagged as abandonment from recreational anglers. T-bar tag and dart tags were specially made and printed with a unique identifier code and the Stingraytagging.com website address. The stingray website was created specifically for return tag locations to be uploaded and tracked. The tagged specimens are logged and tracked via Google Earth.

2.1 Tagging Permits

A scientific collection permit was not required in Alabama, because target species are unregulated nor are they considered threatened or endangered. Tagging stingrays and sharks in Florida waters require a Special Activities License (SAL) permit granted by the Florida Fish and Wildlife Conservation Commission (FWC). A Florida SAL permit (SAL-15-1752B-SR) was applied for and granted on December 18, 2015 (expiration date: December 18, 2018). Addendums to the original permit were filed when additional taggers were needed. Mike Kitchell was added to the permit on June 29, 2016, and David Miller was added on August 30, 2018. In Alabama, the tagging project outline was shared with Colonel Scott Bannon, the Director of the Marine Resources Division of the Alabama Department of Conservation and Natural Resources (ADCNR). An open line of communication was established in an effort to maintain project transparency while operating in Alabama state waters regardless of the

unregulated status of any target species.

2.1.1 Permitted Alabama Species

Species that were not allowed to be tagged in Alabama waters were species that are listed by the United State Fish and Wildlife Service (USFWS) as Threatened or Endangered (T&E). No species that were targeted for tagging are listed by the USFWS. Alabama does not list any stingray or shark as being a T&E species at the state level. All stingray or shark species caught in Alabama waters were eligible for tagging.

2.1.2 Permitted Florida Species

Only specific stingrays and sharks were permitted for tagging in Florida waters, regardless of the federal status. The permitted species are listed on the SAL permit and are depicted in Table 1.

Tagging was only permitted in the following Florida counties: Bay, Broward, Duval, Escambia Hillsborough, Nassau, Palm Beach, Pinellas and Walton counties. A 24-hour notice was required to be given to the FWC Division of Law Enforcement prior to any tagging.

Table 1. The List of the Stingray and Shark Species Permitted to be Tagged in Florida Waters per the December 18, 2015 SAL-15-1752B-SR. Reprinted from SAL-15-1752B-SR, 2018

Permitted Specimens	Common or Scientific Name
Family: Dasyatis	Stingray, whiptail
Family: Gymnuridae	Stingray, butterfly
Family: Rajidae	Skates
Shark, Atlantic sharpnose	*Rhizoprionodon terraenovae*
Shark, blacknose	*Carcharhinus acronotus*
Shark, blue	*Prionace glauca*
Shark, bonnethead	*Sphyrna tiburo*
Shark, brown smooth-hound	*Mustelus henlei*
Shark, bull	*Carcharhinus leucas*
Shark, finetooth	*Carcharis isodon*
Shark, narrowfin smooth-hound	*Mustelus norrisi*
Shark, nurse	*Ginglymostoma cirratum*
Shark, oceanic whitetip	*Carcharhinus longimanus*
Shark, shortfin mako	*Isurus oxrinchus*
Shark, smooth dogfish	*Mustelus canis*
Shark, spinner	*Carcharis brevipinna*
Shark, thresher	*Alopias vulpinus*

2.2 Stingray and Shark Acquisition

Acquisitions of the target species were through the combination of recreational shrimp trawling, as well as, hook and line recreational angler abandonment.

2.2.1 Recreational Shrimp Trawling

Two recreational shrimp charter services were employed during the research timeframe. A-Pair-Of-Dice Charters (APODC) and Alabama Coastal Charters, LLC (ACC) are both licensed in the State of Alabama to perform recreational shrimping in inshore waters. APODC, docked at The Wharf Marina (Orange Beach), operates in the Arnica Bay, Bayou La Launch, and Wolf Bay areas, which are approximately 3.0 miles from the beachfront of Orange Beach, AL. ACC, docked out of the SanRoc Cay Marina (Orange Beach), operates in Cotton Bayou, Bayou St. John, and Terry Cove, which is approximately 0.5-1.0 miles from the beachfront of Orange Beach, AL.

Trawling for stingrays usually took place in the months of March, October, November, and December. The trawl nets used on both vessels were 12 foot (ft) balloons with doors. Nets pulls for stingrays lasted approximately 10 minutes (or less) in effort to decrease stress and injury. Water depths for trawling ranged from 8ft. to 10ft. All locations where trawling was performed and any by-catch released, complied with 2018 ADCNR recreational shrimping regulations.

2.2.2 Recreational Sport Fishing

Two permitted anglers in Florida tagged sharks and stingrays. While stingrays are unregulated in Florida, any rays outside the default bag limit of two specimens or 100 pounds, would be considered abandoned (FWC, n.d.). Abandoned rays were tagged and returned to the water. Shark fishing is regulated in Florida. “The daily bag limit is one shark per person per day and there is an overlapping vessel limit of two sharks” (FWC, 2013, Para. 5). The water depths of specimens caught ranged from 15ft. to 50ft. Hook and line rigging as highly variable, but anglers were licensed per state. All rays and sharks tagged in Florida waters were from angler abandonment, no trawling was performed.

2.3 Tags and Tag Placement

All tags deployed were T-bar anchor tags, except for two dart tags. The tags are made by Floy Tag and Manufacturing, Inc. The most deployed tags was a 3” monofilament (FD-94) with a hot pink polyolefin Shrink-Lock™ tube covering; printed with the www.Stingray-Tagging.com website address and a consecutive identifier number. The tags are administered with an Avery Mark lll tagging gun (Figure 1). A larger, 4” neon green T-bar tag (FD-94) was used on sharks #103 - #105, and a smaller, 1” blue T-bar tag (FF-94) was used on small rays (< 9” in wing width). The FF-94 tags were administered with a Mark lll fine fabric gun. Both of these tag types were also imprinted with the website and identifier number. The two dart tags (FT-1-94) were a 4” neon green filament imprinted with the website and identifier number.

Figure 1. A Depiction of the Pink FD-94 T-bar Anchor Tags Printed with the Stingray-Tagging.com Website and Identifier Code. Additionally Portrayed Is the Avery Mark lll Application Gun Used to Insert the Tags into Targeted Specimens

2.3.1 Tagging Stingrays

A strict tagging protocol was followed in an effort to decrease harm to specimens. Once the rays were removed from the trawl net, they were immediately put into a plastic container of bay water to await tagging. Upon selection for tagging, the ray was moved to a tagging container that allowed for data collection, such as wing measurements, health assessment, and sexing (Figure 2). Data pertinent to water salinity and the weather were also recorded on each specimen's field tagging data sheet. The weight of each ray was not recorded in the field. In effort to avoid injury to the ray and the tagger when trying to weigh a specimen, the Length/Weight Conversions for Marine Fishes of Texas website (http://txmarspecies.tamug.edu/length-weight.cfm) was used during entry of field data into the Excel database.

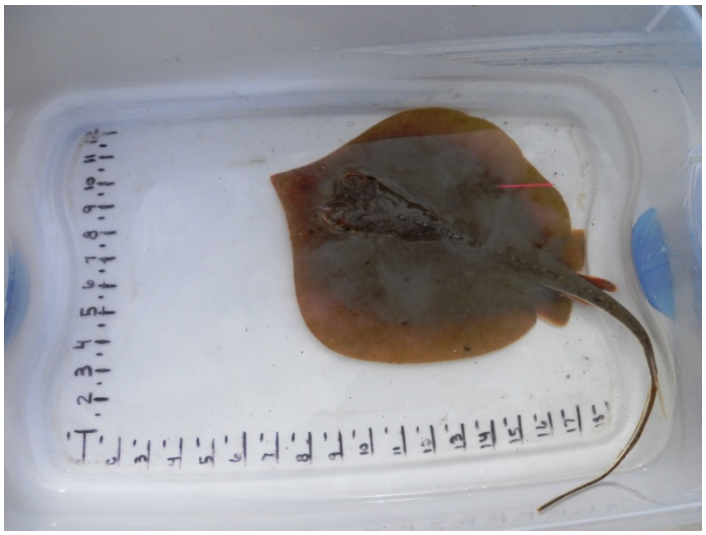

Figure 2. A Tagged Male Atlantic Stingray *(Dasyatis Sabina)* in the Data Collection Container. Note the FD-94 Tag Placement in the Medial Radials of the Pectoral Fin

Each ray was visually assessed for the best tag insertion location. "Determining the proper placement of the T-bar anchor tag in the pectoral fin of the Atlantic Stingray is important to ensure the longevity of the tag" (Lahn, 2017). The best section of the fin for tag insertion is the mid-line medial radials. Placing the tag a quarter of the total length to the anterior or posterior the mid-line would also be acceptable due to the radial calcification and their ability to resist pull through. Placement in this area of the wing allows full locomotion, which promotes ray longevity (Lahn, 2017). Tags were placed in either the left or the right pectoral fin. Tags were not placed in injured fins.

2.3.2 Tagging Sharks

The National Marine Fisheries Service (NMFS) shark tagging protocol and data collection was followed when tagging of any specimen of permitted shark. According to the NMFS tagging regime, "the ideal location on large sharks is in the muscle at the very base of the first dorsal fin" (NMFS, 2018).

While sharks were not the focus of the research project, any permitted sharks that were considered angler abandonment were tagged. After landing a shark, it would be identified (genus and species) and checked against the FWC SAL list if caught in Florida waters. Field data such as length, width, sex, and health assessment were recorded on the field data log.

All sharks, but two, were tagged at the base of the dorsal fin with T-bar anchor tags (Figure 3). Two sharks were tagged with dart tags at the base of the dorsal fin. Unhealthy or injured sharks were not tagged.

Figure 3. A Female Tiger Shark *(Galeocerdo Cuvier)* Displaying a Newly Inserted Pink FD-94 T-Bar Tag. Note the Tag Placement at the Base of the Dorsal Fin

3. Result

The total of 11 tagging expeditions were completed during the permitted timeframe, for an average of 3.66 per permit year. Each expedition lasted at least three hours. Terry Cove, AL was the predominant bay with 47-tagged rays. The next common water body was Perdido Pass with 11 tags and Wolf's Bay with 10 tags. The most prolific month for tagging was November with 38-tagged specimens followed by December with 11 individuals. It is not believed that these tagging numbers are a reflection of monthly populace as there are researcher constraints on tagging during summer months. A full log of tagging bays and dates can be reviewed in Table 2.

The most tagged stingray was the Atlantic stingray. A total of 51 *D.sabina* were tagged, with all specimens being caught and returned to waters of Alabama. The next abundant ray tagged was the Cownose ray, with eight individuals tagged followed by two tagged Southern stingray. The Smooth Butterfly ray and the Lesser Electric ray were each tagged once for a total of 64 rays being tagged. The average number of rays tagged per trip was 5.81. Two Sandbar sharks and one Tiger shark were tagged in Alabama waters. One Atlantic Sharpnose shark, two Blacktip sharks, and two Spinner sharks were tagged in Florida waters. Total specimens tagged in all waters are 72. GPS locations of each specimen tagged are available in Table 2.

3.1 Return Tags

Only one tagged individual from the 2015-2018 Alabama, Florida tagging project was a viable return. Tiger shark #35, tagged on December 8, 2016, in the Alabama waters of Perdido Pass, was logged as a return on August 17, 2018. The shark was re-caught on Pensacola Beach from recreational shark fishing. It should be noted that the tag was corroded and fell off the shark during data recovery. The 3", pink T-bar tag lasted one year, eight months and nine days, on this particular shark. Shark #35 also

Table 2. The Tag Log Data Collected From each Deployed Tag. The Identifier Code Reflects Only Those Tagged Specimens in Alabama, Florida Waters and May Not Be Sequential

Identifier Code	Tag Date	Species Tagged	Tag Location	GPS Location	Permit	24 Hr Notice	Tagger / Comments
006	29-OCT-15	Lesser Electric Ray (*Narcine bancroftii*)	Mobile Bay, AL	N 30. 235630° W-88.005530°	N/A	N/A	Tagger - Lahn
007	29-OCT-15	Atlantic Stingray (*Dasyatis sabina*)	Mobile Bay, AL	N 30. 327285° W-87.989525°	N/A	N/A	Tagger - Lahn
008	29-OCT-15	Smooth Butterfly Ray (*Gymnura micrura*)	Mobile Bay, AL	N 30. 327285° W-87.989525°	N/A	N/A	Tagger - Lahn
009	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.288728° W-87.552520°	N/A	N/A	Tagger - Lahn
010	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 279501° W-87.561410°	N/A	N/A	Tagger - Lahn
011	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 279501° W-87.561411°	N/A	N/A	Tagger - Lahn
012	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 279501° W-87.561412°	N/A	N/A	Tagger - Lahn
013	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 279501° W-87.561413°	N/A	N/A	Tagger - Lahn
014	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 279501° W-87.561413°	N/A	N/A	Tagger - Lahn
015	11-NOV-15	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 279501° W-87.561413°	N/A	N/A	Tagger - Lahn
016	03-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.290384° W-87.556161°	N/A	N/A	Tagger - Lahn
017	03-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.290384° W-87.556161°	N/A	N/A	Tagger - Lahn
018	03-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.290384° W-87.556161°	N/A	N/A	Tagger - Lahn
019	03-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.290384° W-87.556161°	N/A	N/A	Tagger - Lahn
020	03-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.290384° W-87.556161°	N/A	N/A	Tagger - Lahn

021	3-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 235630° W-88.005530°	N/A	N/A	Tagger Lahn	-
022	3-MAR-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30. 327285° W-87.989525°	N/A	N/A	Tagger Lahn	-
023	7-MAY-16	Atlantic Stingray (*Dasyatis sabina*)	Bayou St. John, AL	N 30. 327285° W-87.989525°	N/A	N/A	Tagger Lahn	-
024	7-MAY-16	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.288728° W-87.552520°	N/A	N/A	Tagger Lahn	-
025	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
026	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
027	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
028	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
029	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
030	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
031	7-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256999° W-87.562056°	N/A	N/A	Tagger Lahn	-
032	25-DEC-16	Sandbar Shark (*Carcharhinus plumbeus*)	Perdido Pass, AL	N 30.254935° W-87.557893°	N/A	N/A	Tagger Lahn	-
034	25-DEC-16	Atlantic Stingray (*Dasyatis sabina*)	Perdido Pass, AL	N 30.256867° W-87.556973°	N/A	N/A	Tagger Lahn	-
035	25-DEC-16	Atlantic Stingray (*Dasyatis sabina*)	Perdido Pass, AL	N 30.257630° W-87.558236°	N/A	N/A	Tagger Lahn	-

036	25-DEC-16	Cownose Ray (*Rhinoptera bonasus*)	Perdido Pass, AL	N 30.256341° W-87.552835°	N/A	N/A	Tagger Lahn	-
040	2-NOV-16	Atlantic Stingray (*Dasyatis sabina*)	Perdido Bay, AL	N 30. 332600° W-87.492200°	SAL-15-1752-SR	Yes	Tagger Lahn	-
041	2-NOV-16	Atlantic Stingray (*Dasyatis sabina*)	Arnica Bay, AL	N 30. 332600° W-87.492200°	SAL-15-1752-SR	Yes	Tagger Lahn	-
042	2-NOV-16	Atlantic Stingray (*Dasyatis sabina*)	Arnica Bay, AL	N 30. 332600° W-87.492200°	SAL-15-1752-SR	Yes	Tagger Lahn	-
043	26-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.301200° W-87.602000°	N/A	N/A	Tagger Lahn	-
044	26-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.300700° W-87.584500°	N/A	N/A	Tagger Lahn	-
045	26-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.305400° W-87.534800°	N/A	N/A	Tagger Lahn	-
046	26-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Arnica Bay, AL	N 30.305400° W-87.534800°	N/A	N/A	Tagger Lahn	-
051	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger Lahn	-
052	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger Lahn	-
053	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger Lahn	-
054	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger Lahn	-
055	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger Lahn	-
056	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger Lahn	-
057	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.286700° W-87.559000°	N/A	N/A	Tagger Lahn	-
058	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.286700° W-87.559000°	N/A	N/A	Tagger Lahn	-
059	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Perdido Bay, AL	N 30.286700° W-87.559000°	SAL-15-1752-SR	Yes	Tagger Lahn	-
060	8-NOV-18	Atlantic Stingray	Arnica Bay,	N 30.286700°	SAL-15-1752-SR	Yes	Tagger	-

		(*Dasyatis sabina*)	AL	W-87.559000°			Lahn
061	8-NOV-18	Atlantic Stingray	Arnica Bay,	N 30.286700°	SAL-15-1752-SR	Yes	Tagger -
		(*Dasyatis sabina*)	AL	W-87.559000°			Lahn
062	8-NOV-18	Atlantic Stingray	Wolfs Bay,	N 30.286700°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.559000°			Lahn
063	8-NOV-18	Atlantic Stingray	Wolfs Bay,	N 30.286700°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.559000°			Lahn
064	8-NOV-18	Atlantic Stingray	Wolfs Bay,	N 30.286700°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.559000°			Lahn
066	8-NOV-18	Atlantic Stingray	Terry Cove,	N 30.287100°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.555400°			Lahn
067	8-NOV-18	Atlantic Stingray	Terry Cove,	N 30.287100°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.555400°			Lahn
068	8-NOV-18	Atlantic Stingray	Terry Cove,	N 30.287100°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.555400°			Lahn
069	8-NOV-18	Atlantic Stingray	Terry Cove,	N 30.287100°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.555400°			Lahn
070	8-NOV-18	Atlantic Stingray	Terry Cove,	N 30.287100°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.555400°			Lahn
077	3-MAR-18	Atlantic Stingray	Terry Cove,	N 30.287100°	N/A	N/A	Tagger -
		(*Dasyatis sabina*)	AL	W-87.555400°			Lahn
101	8-JUL-16	Southern Stingray	Atlantic -	N 30.687010°	SAL-15-1752-SR	Yes	Tagger -
		(*Dasyatis*	Nassau Co.,	W-81.428097°			Kitchell
		americana)	FL				
102	8-JUL-16	Southern Stingray	Atlantic -	N 30.709789°	SAL-15-1752-SR	Yes	Tagger -
		(*Dasyatis*	Nassau Co.,	W-81.388672°			Kitchell
		americana)	FL				
103	8-JUL-16	Spinner Shark,	Atlantic -	N 30.709789°	SAL-15-1752-SR	Yes	Tagger -
		(*Carcharhinus*	Nassau Co.,	W-81.388672°			Kitchell
		brevipinna)	FL				
104	8-JUL-16	Spinner Shark,	Atlantic -	N 30.709789°	SAL-15-1752-SR	Yes	Tagger -
		(*Carcharhinus*	Nassau Co.,	W-81.388672°			Kitchell
		brevipinna)	FL				
105	8-JUL-16	Blacktip Shark	Atlantic -	N 30.709789°	SAL-15-1752-SR	Yes	Tagger -
		(*Carcharhinus*	Nassau Co.,	W-81.388672°			Kitchell
		limbatus)	FL				

106	21-NOV-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.300467° W-87.598100°	N/A	N/A	Tagger - Godwin
107	21-NOV-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.300467° W-87.598100°	N/A	N/A	Tagger - Godwin
108	21-NOV-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.300467° W-87.598100°	N/A	N/A	Tagger - Godwin
109	21-NOV-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.300467° W-87.598100°	N/A	N/A	Tagger - Godwin
110	6-DEC-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.300467° W-87.598100°	N/A	N/A	Tagger - Godwin
117	6-DEC-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.309103° W -87.596594°	N/A	N/A	Tagger - Godwin
118	6-DEC-17	Atlantic Stingray (*Dasyatis sabina*)	Wolfs Bay, AL	N 30.309103° W -87.596594°	N/A	N/A	Tagger - Godwin
J001	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.287100° W-87.555400°	N/A	N/A	Tagger - Lahn
J002	8-NOV-18	Atlantic Stingray (*Dasyatis sabina*)	Terry Cove, AL	N 30.286700° W-87.559000°	N/A	N/A	Tagger - Lahn
K060	7-SEP-18	Atlantic Stingray (*Dasyatis sabina*)	Perdido Key Beach, FL	N 30.296047° W-87.427064°	SAL-15-1752-SR	Yes	Tagger - Miller
K061	7-SEP-18	Southern Stingray (*Dasyatis americana*)	Pensacola Pass., FL	N 30.247068 W-87.285717°	SAL-15-1752-SR	Yes	Tagger - Miller

traveled 24.72 miles from the original tag location of the Perdido Pass area to the tag return location of Pensacola Beach (Figure 4). The original Total Length (TL) was 86”, the TL at re-capture was 89”, for a growth of 3” in one year, four months and nine days. Of the eight sharks tagged, the return rate, to date, is 12.5%. Of the 64 stingrays tagged, the return rate, to date, is 0%.

Figure 4. Tagged Tiger Shark #35 Traveled from the Original Tag Location of Perdido Pass to Pensacola Beach. The Travel Distance Was 24.72 Miles. The Tag Is not Identifiable in the Photo due to Corrosion

3.1.1 Additional Tagging

It should also be noted that two Spinner sharks (*Carcharhinus brevipinna*) (Tag #01, Tag #02), two Bonnethead (*Sphyrna tiburo*) (Tag #03, Tag #05), and one Southern stingray (Tag #04) were tagged in Texas waters on October 15, 2015. Bonnethead #03 was a return tag on October 1, 2016, for a timeframe of 1 year and 15 days. It was caught 50.59 miles east of the original tag location for a return rate of 20%. Full Texas data analysis is not included in this report.

4. Discussion

There were multiple successes, areas of improvement and project adversities that are worth review. Issues with tag longevity and the lack of stingray returns are the top concerns.

4.1 Tag Longevity

To date, the longest a 3" monofilament (FD-94) tag has lasted is one year, four months and nine days. After the condition of tag #35 was reported as highly corroded and fell off the specimen, a thicker tag (FT-1-94) was used for additional shark tagging. The effort output for tagging sharks versus length of viable tag time makes the FD-94 unsuitable for continued shark tagging. It should also be considered that the FD-94 tags are not suitable for long-term tagging of any saltwater species.

4.2 Stingray Returns

There are no stingray returns to date. This can be attributed to several factors. The sheer volume of stingrays present in the tagging bays could mean that the tagged rays have not been recovered amid the large population. The lack of returns may also be due to the FD-94 tags not holding up to the stingrays' natural burrowing instincts and therefore FD-94 tags have a very short lifespan. There is also heavy

bow hunting in Alabama and Florida bays. Bow hunters may not be inclined to submit returned tags of their kills in an effort to avoid scrutiny of their activities, especially if they are moving back and forth between Alabama and Florida waters.

4.3 Tagging Success

Using recreational shrimping charters offered the best way to acquire stingrays, although it is considered high effort (charter cost, physical output, etc…). Netting the rays also decreased potential injury to the ray versus a hook and line catch. Shrimp charters also operate during peak stingray season, which made chartering easy. The on-vessel method of using water-filled containers while gathering data and tagging, also contributed to the decrease in potential ray stress.

4.4 Angler Abandonment

Angler abandonment was successful when anglers had a tagging interest, but that interest waned over time. It does not appear that using permitted angler abandonment would lead to significant data collection. A better approach to angler abandonment tagging would be to seek out anglers in a concentrated area, such as a pier or beach, and offer to tag their abandonment.

5. Conclusions

Stingrays may be a linchpin species between trophic regimes and their persistent populations help maintain the function and stability of our local bay systems. It was hoped that tagged specimens could be tracked and then contribute data for several years, but the tagging data thus far does not support this. It is possible that some tagged rays could be returned and if so, updated return percentages will change. Any tagging in the future will entail using tags with a longer viability range. Angler abandonment should also be approached from a group concentration rather than an individual basis. While tagging specimens for research can be intriguing, dedication to the project from individual anglers fades quickly.

Although there were some limitations on the initial tags used during the project, the overall project contributed to knowledge of the stingray and shark species in the Alabama/Florida coast systems. The human influence of over-fishing and biodiversity loss can affect the stingray and shark populations, as well as their environmental niches. Understanding potential specie regime shifts is an important factor due to it occurring at the regional level with wider geographical implications (Collie et al., 2004). The result of a regime shift, potentially due to overfishing of stingrays and sharks, could lead to a reconfiguration of ecological states (Andersen et al., 2009). Those new regimes may not be as advantageous to human occupancy or commercial endeavors. Any data that expands our awareness of the ecosystem and the interconnected species that rely on it, the better position we will be in to safeguard their populations.

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