

## Annual Summary Report

Reporting Period: February 1, 2024, to December 31, 2024

**Project Title:** Marine Distribution of Gulf of Mexico Sturgeon; Improved Understanding of NAVSEA Testing Through a Multi-Phase Passive Acoustic Biotelemetry Approach

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### **Background:**

Gulf Sturgeon (*Acipenser desotoi*) were listed as threatened under the Endangered Species Act (ESA) in 1991. From spring to fall adults undergo a prolonged period of fasting in rivers before transiting to estuarine and marine foraging areas to overwinter. Although much management focus has been on riverine habitats including spawning sites, it is these overwintering areas that are linked to reproductive success and key to the recovery of this species. Improving the limited understanding of overwintering habitat requirements is emphasized in the Gulf Sturgeon Recovery Plan (USFWS and GSMFC 1995), which highlights the need for multi-year tracking studies; further knowledge could assist the US Navy during ESA Section 7 consultations with regulators. The US Naval Surface Warfare Center Panama City Division Testing Range overlaps with Gulf Sturgeon critical habitat and adjacent areas where Gulf Sturgeon are believed to occur and information on the spatial and temporal patterns of habitat use is needed.

### **Previous work:**

In October of 2021, 30 long-lived acoustic transmitters (VEMCO Ltd. V-16-6H) were surgically implanted into adult Gulf Sturgeon following previously developed protocols (Fox et al. 2000). This effort was supplemented by 25 transmitters deployed in adult Gulf Sturgeon in the Choctawhatchee River on October 7 and 8, 2023. To monitor for these transmitters as well as transmitters deployed for other projects (in Gulf Sturgeon and other species) we deployed an acoustic receiver array in the NSWC Panama City Testing Range (**Figure 1**) in the fall of 2021. This array consisted of 30 Innovasea (VR2AR) Acoustic Release and 46 Innovasea (VRTX) Transmitting Receivers and was maintained until mid-May 2022. In October 2022, a modified acoustic receiver array was deployed based on the findings from the first sampling season and

included 37 Innovasea (VR2AR) Acoustic Release and 43 Innovasea (VRTX) Transmitting Receivers. These modifications included moving the furthest offshore receivers (40 km offshore) to the nearshore environment (<10 km offshore) and concentrating receivers in the northeast portion of the study where most Gulf Sturgeon were detected (**Figure 2**). In the third field season of this project, our array was reconfigured into a finer scale array to facilitate identifying important habitats, key use areas and seasonal patterns for Gulf Sturgeon during their winter foraging season in the NSWC Panama City Test Range (**Figure 3**). This array was redeployed in early October 2023 and was active throughout this reporting period.

In an attempt to image and locate Gulf Sturgeon with and without transmitters in the Test Range, 20 REMUS 100 Autonomous Underwater Vehicle (AUV) missions (equipped with a Innovasea (VEMCO) Ltd. receiver and a Marine Sonics ArcScout side scan sonar) were conducted in search of Gulf Sturgeon within the NSWC Panama City Test Range (Figures 4 and 5) plus two range test missions to determine maximum acoustic transmitter detection.

A total of 73 Gulf Sturgeon were detected in the Gulf of Mexico during the 2022/2023 field season representing telemetered individuals from several river systems including the Choctawhatchee, Apalachicola, Suwanee, Yellow and Pascagoula Rivers. The majority of Gulf Sturgeon detections remained close to shore with no confirmed detections beyond seven kilometers offshore (**Figure 2**).

In the first three years of the acoustic array, transmitters in many other fish species including Black Drum, Bull Shark, Cobia, Crevalle Jack, Great Hammerhead, Lesser Devil Ray, Mutton Snapper, Spotted Eagle Ray, Southern Flounder, Tarpon, Triple Tail, Tiger Shark, and White Sharks were detected in our array. In addition to these fishes, we also detected increasing numbers of ESA listed Green, Kemp's Ridley, and Loggerhead Turtles. These data have been shared with the tag owners and we have received permission to include them in our final analyses. Note, there are still dozens of transmitters with unidentified species so this list will likely expand after final consultation with iTag when tag owners upload their information. We have been in touch with Dr. Sue Lowerre-Barbieri who runs iTag at the University of Florida and she informed us that they have secured funding to get the system fully operational and are planning a meeting for the spring of 2025 at which time we hope to be put in contact with the tag owners for unknown transmitters.

**Work Performed:**

The year three acoustic receiver array was serviced in February, May and October of 2024 (beginning of the 4th season). This over summer deployment of the acoustic array was the first for these efforts and done so to determine additional species utilizing the northern end of the NSWC Panama City Test Range outside the times of year traditionally associated with Gulf Sturgeon's winter range. Of the 80 receivers deployed during year two of the project, one went missing between March and May until being returned by a private citizen who found it washed ashore in Mexico Beach. Initial results from that deployment again showed that Gulf Sturgeon were almost exclusively detected in the nearshore environment. Twenty-five of the 80 receivers detected sturgeon and 21 of those 25 were within 5km of shore (**Figures 2 and 5**) which corresponds very closely to designated Gulf Sturgeon critical habitat. The complete second season of this finer scale array will allow us to strengthen our understanding of key use areas and seasonal patterns during Gulf Sturgeon winter foraging season in the NSWC Panama City Test Range (**Figure 3**). This array will be serviced again in February and retrieved in the spring or summer of 2024.

One final REMUS 100 mission was conducted in February 2024 to image and locate Gulf Sturgeon. Unfortunately, due to heavy seas and high swells in shallow waters, this mission was moved to deeper water and could not safely be conducted in the very nearshore environment where the highest concentrations of Gulf Sturgeon were observed during previous efforts.

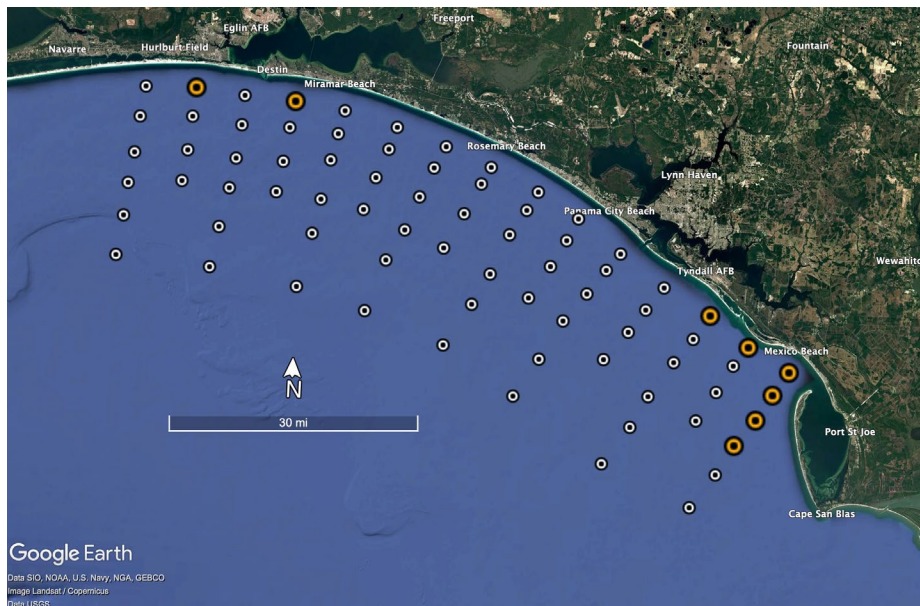
**Anticipated work for the next period and beyond:**

Upon retrieval and full download of the array in the late spring or early summer of 2025, all telemetry data will be coordinated with I-Tag and the Gulf Sturgeon telemetry databases to confirm species and metadata associated with acoustic detections. We will analyze these detection data with habitat parameters such as temperature, time of year, location, and depth to determine the primary use areas and habitat characteristics for Gulf Sturgeon during winter foraging in the Gulf of Mexico. Additionally, data collected from the REMUS 100 missions will be evaluated in hopes of identifying fine scale Gulf Sturgeon congregations particularly in the northeastern portions of the Test Range.

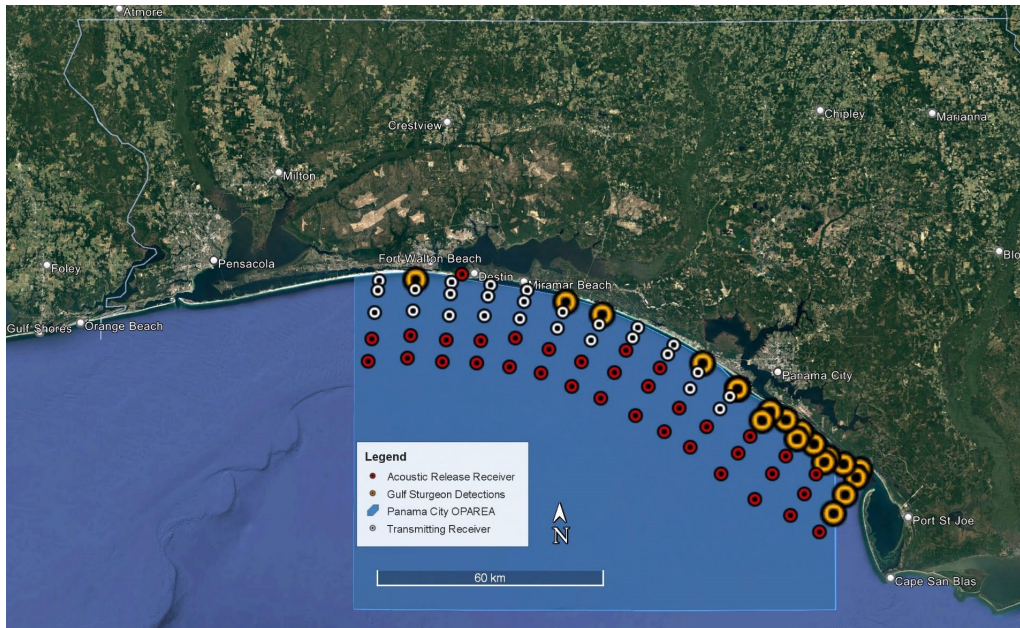
## Project Status and Lessons Learned:

This project is ongoing and actively collecting data on Gulf Sturgeon and other telemetered species including ESA listed turtles in the NSWC Panama City Test Range. As designed, iterations of the receiver array configuration have allowed for finer resolution of spatial and temporal habitat uses. The REMUS 100 was used to collect data from the acoustic receiver and sidescan sonar on Gulf Sturgeon. The work done to date has emphasized the seasonal nature of Gulf Sturgeon migrations in the Gulf of Mexico and cursory data analysis reveals concentrations in the near shore environment from late November to April with few sturgeons occurring beyond 5km from shore.

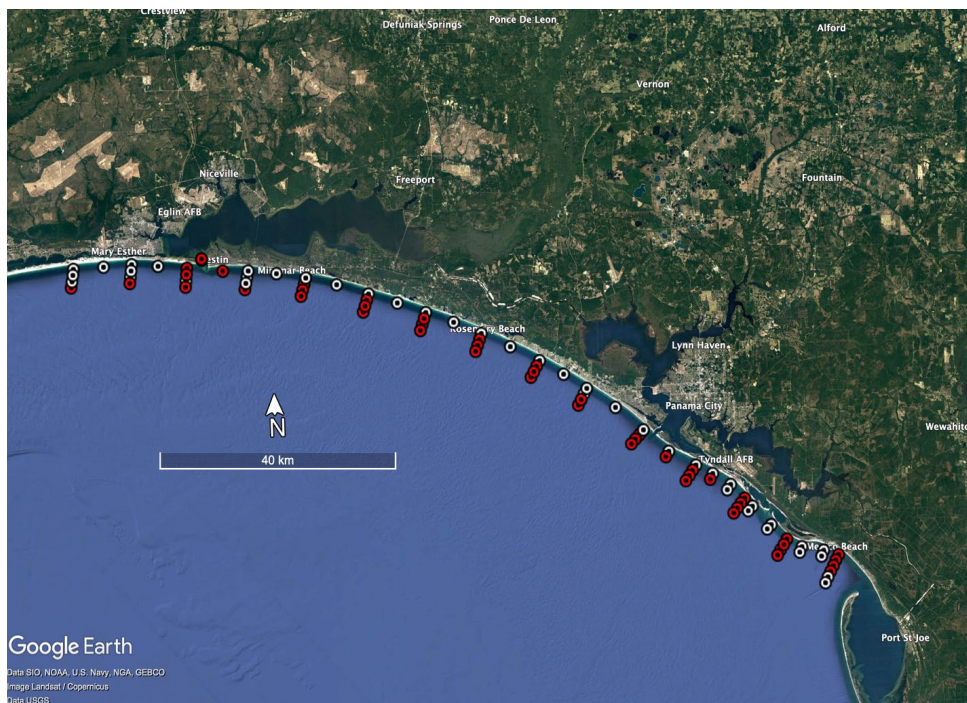
One major lesson learned during this project was the unexpected difficulty of conducting REMUS 100 missions in the areas where Gulf Sturgeon appear to be concentrating during the winter. This shallow environment (<7 meters) is heavily impacted by increased winds and swells limiting weather windows and causing distortions in the sidescan data. To overcome these limitations, attempts were made to maximize data collection during optimal weather conditions. Collaborations with NOAA Panama City Laboratory and USFWS Panama City Field Office were formed and strengthened in the beginning stages of this project and will be vital assets going forward.



**Figure 1. Fall 2021 Deployment locations of the passive acoustic receivers to monitor Gulf Sturgeon in the US Naval Surface Warfare Center Panama City Division Testing Range. Red = receivers with detections of Gulf Sturgeon during the fall 2021 to spring 2022 field season.**



**Figure 2. October 2022 Deployment locations with detections of the passive acoustic receivers to monitor for Gulf Sturgeon in the US Naval Surface Warfare Center Panama City Division Testing Range in the fall 2022 to spring 2023 field season. White = TX receivers, Red = AR, Orange = Detection of Gulf Sturgeon.**

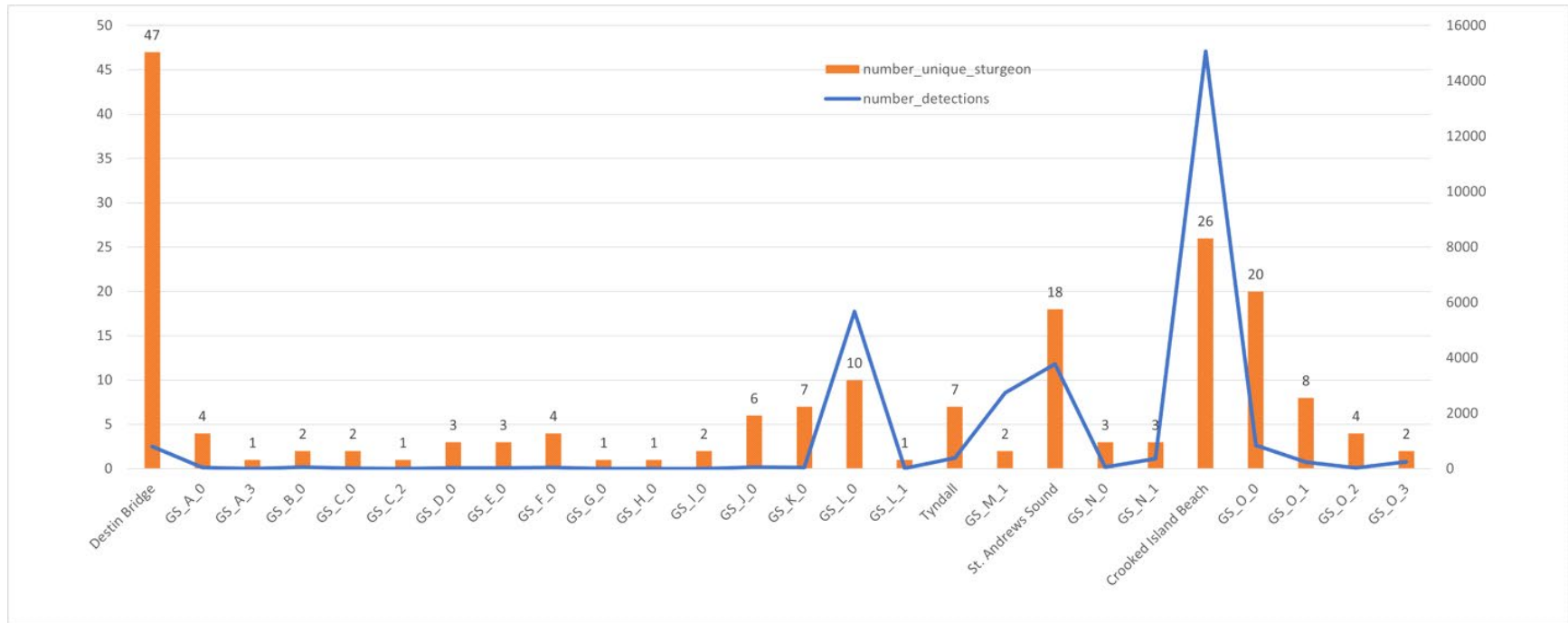


**Figure 3. October 2023 Deployment locations with detections of the passive acoustic receivers to monitor for Gulf Sturgeon in the US Naval Surface Warfare Center Panama City Division Testing Range in the 2023-2024 field season. White = TX receivers, Red = AR receivers.**





**Figure 4. REMUS 100 Autonomous Underwater Vehicle equipped with side scan sonar, acoustic telemetry receiver and environmental sensors utilized to detect Gulf Sturgeon.**



**Figure 5. Total detections and number of unique telemetered Gulf Sturgeon detected in the US Naval Surface Warfare Center Panama City Division Testing Range. Station names ending with 0 are the closest line of receivers to shore followed by 1, 2, and 3. The x axis is labeled from west to east with the first station being located at Destin Pass inside the mouth of the Choctawhatchee Bay.**



**Figure 6. REMUS 100 Autonomous Underwater Vehicle side scan sonar mosaics. Acoustic telemetry and environmental sensors were also incorporated to detect Gulf Sturgeon and quantify their habitat.**



**Table 1- Total number of unique individuals by species detected in Gulf of Mexico array for 2021 calendar year.**

<b>Species</b>	<b>Unique Individuals</b>
<b>2021</b>	
<b>Acipenser desotoi</b>	<b>11</b>
<b>Caranx hippos</b>	<b>1</b>
<b>Carcharhinus leucas</b>	<b>3</b>
<b>Lepidochelys kempii</b>	<b>1</b>
<b>unknown</b>	<b>4</b>

**Table 2- Total number of unique individuals by species detected in Gulf of Mexico array for 2022 calendar year.**

<b>Species</b>	<b>Unique Individuals</b>
<b>2022</b>	
<b>Acipenser desotoi</b>	<b>39</b>
<b>Aetobatus narinari</b>	<b>2</b>
<b>Carcharhinus leucas</b>	<b>13</b>
<b>Carcharodon carcharias</b>	<b>13</b>
<b>Caretta caretta</b>	<b>6</b>
<b>Galeocerdo cuvier</b>	<b>1</b>
<b>Megalops atlanticus</b>	<b>6</b>
<b>Mobula hypostoma</b>	<b>6</b>
<b>Paralichthys lethostigma</b>	<b>1</b>
<b>Pogonias cromis</b>	<b>3</b>
<b>Rachycentron canadum</b>	<b>1</b>
<b>unknown</b>	<b>54</b>

**Table 3- Total number of unique individuals by species detected in Gulf of Mexico array for 2023 calendar year.**

<b>Species</b>	<b>Unique Individuals</b>
<b>2023</b>	
<b>Acipenser desotoi</b>	<b>74</b>
<b>Carcharhinus leucas</b>	<b>11</b>
<b>Carcharodon carcharias</b>	<b>8</b>
<b>Caretta caretta</b>	<b>12</b>
<b>Chelonia mydas</b>	<b>1</b>
<b>Galeocerdo cuvier</b>	<b>5</b>
<b>Lepidochelys kempii</b>	<b>1</b>
<b>Lobotes surinamensis</b>	<b>1</b>
<b>Lutjanus analis</b>	<b>1</b>
<b>Megalops atlanticus</b>	<b>10</b>
<b>Mobula hypostoma</b>	<b>30</b>
<b>Paralichthys lethostigma</b>	<b>1</b>
<b>Pogonias cromis</b>	<b>1</b>
<b>Rachycentron canadum</b>	<b>2</b>
<b>Sphyrna mokarran</b>	<b>1</b>
<b>unknown</b>	<b>76</b>

**Table 4- Total number of unique individuals by species detected in Gulf of Mexico array for 2024 calendar year.**

<b>Species</b>	<b>Unique Individuals</b>
<b>2024</b>	
<b>Acipenser desotoi</b>	<b>99</b>
<b>Carcharhinus leucas</b>	<b>5</b>
<b>Carcharodon carcharias</b>	<b>5</b>
<b>Caretta caretta</b>	<b>8</b>
<b>Chelonia mydas</b>	<b>1</b>
<b>Galeocerdo cuvier</b>	<b>5</b>
<b>Lepidochelys kempii</b>	<b>1</b>
<b>Megalops atlanticus</b>	<b>10</b>
<b>Mobula hypostoma</b>	<b>18</b>
<b>unknown</b>	<b>172</b>