Deepwater Horizon Open Ocean Trustee Implementation Group

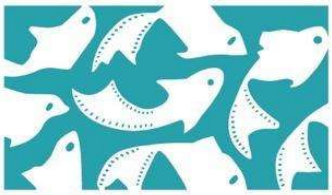
Developing Methods to Observe Sea Turtle Interactions in the Gulf of Mexico Menhaden Purse Seine Fishery

Pilot Phase Year 1 & 2 Summary Report

February 2024

The Menhaden Purse Seine Fishery Monitoring Pilot was conducted by the *Deepwater Horizon* project, Developing Methods to Observe Sea Turtle Interactions in the Gulf of Mexico Menhaden Purse Seine Fishery. NOAA is leading implementation of this project for the Open Ocean Trustee Implementation Group to restore resources injured in the Gulf of Mexico by the 2010 *Deepwater Horizon* oil spill.

The following report was reviewed and edited by Saltwater, Inc., the NOAA project team and the project steering committee inclusive of industry representatives. This report includes detailed information on the results from the first and second pilot year (2022 and 2023 fishing season). A future Executive Summary will highlight the findings and provide next steps and recommendations.



Menhaden Purse Seine Fishery Monitoring

PILOT PROJECT YEARS 1 & 2 END REPORT

2022-2023

February 12, 2024

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1. Introduction:

NOAA contracted Saltwater Inc. in 2021 to provide technical services and support to determine the most effective and efficient way to monitor the Gulf of Mexico (GoM) menhaden purse seine fishery. The contract was designed to evaluate both electronic monitoring (EM) and human observer data to determine their effectiveness in documenting any sea turtle and bottlenose dolphin interactions during fishing activities while detailing the nature of the interactions. An initial Proof of Concept test (POC) was successfully implemented on one volunteer vessel during the 2021 fishing season. Saltwater Inc. installed an EM system on the participating vessel and the industry provided an alternate platform for an observer to view operations. Based on the findings from that POC, a Pilot Project was conducted during the 2022 season involving eight volunteer vessels carrying EM systems and one alternate platform carrying observers. The project continued in the 2023 season for a second year involving eight volunteer vessels carrying EM systems and no observers. This report summarizes the findings from the project during the Pilot Year 1 (2022) and Pilot Year 2 (2023) fishing seasons.

2. Data Collected:

2.1 Pilot Year 1

2.1.1 Human Observers

Observers were deployed on an alternate platform in the GoM for a total of 126 days during Pilot Year 1 with 56 days (40.9%) where no sets were observed. Of these 56 days where sets could not be observed, 29 days (21.2%) were due to weather, 26 days (19.0%) were due to vessels being inaccessible or not fishing, and 1 day (0.7%) was due to logistical issues with launching the alternate platform. An additional 11 days (8%) were scheduled when the observer was unable to leave the dock (Figure 1). During the 70 days (51.1%) where observers successfully monitored fishing activity, a total of 360 sets made by 28 unique vessels were observed with an average of 5.14 ± 3.28 sets observed per day (Figures 2 and 3). Unlike during the POC, observers did not board steamer vessels, so all observations were made from the alternate platform. The fewest total sets monitored by observers occurred during September (n=32) and the most total sets monitored occurred in April (n=68; Table 1, Figure 2). The higher number of observed sets earlier in the fishing season was likely due to a change in the duration of observation of each set. Initially, the observed period was shorter and was extended in late July. The reasons for this change are discussed in section 3.1.7 in this report.

Based on the average of five sets monitored per day, an estimated 55 sets were missed due to the observer being unable to make a trip out on the water, and approximately 280 sets were missed on days when the observer left the dock but could not reach the fishing vessels due to logistics and/or weather.

During the 360 sets that were observed, there were many sightings of dolphins, but only one interaction was observed where a bottlenose dolphin was identified in the net (Table 10). The dolphin's release was not seen by the observer, so the outcome could not be verified. No sea turtle interactions were seen by observers during Pilot Year 1.

Table 1: Total monitored sets listed by monitoring type for Pilot Year 1.

Total Sets Monitored for Pilot Year 1		
Month	EM	Observer
April	135	68
May	270	50
June	254	66
July	332	48
August	205	49
September	284	32
October	268	47

2.1.2. Electronic Monitoring (EM)

Saltwater Inc. EM technicians installed EM systems on eight GoM menhaden purse seine vessels between April 12-June 5, 2022, in three ports: Abbeville, LA; Empire, LA; and Moss Point, MS (Table 2). The EM systems were used to collect video, GPS data, and hydraulic pressure sensor data (as applicable) during Pilot Year 1, April 15-November 1, 2022, for a total of 201 sea days. Over this period, a total of 1,748 sets made by eight unique vessels were reviewed (Table 1 and Figure 4). The fewest total sets monitored via EM occurred in April (n=135) and the greatest total sets monitored occurred in July (n=332; Table 1 and Figure 2).

System issues including power loss to the EM unit (incalculable), instances of video loss (n=143), and image quality (n=93) along with fewer hard drives retrieved from some vessels, caused fewer sets to be reviewed overall (Table 3). This decreased the total sets monitored via EM compared to the total sets made by fishing vessels carrying EM systems during the season.

Total EM coverage of fishing sets during Pilot Year 1 was approximately 9.8% based on the 2022 total fishery set effort. Ideally, at least 10% of the fishing sets would be observed by EM, but to accomplish that, additional EM systems would need to be installed, or a higher percentage of data retrieval would need to be achieved (Table 4).

Table 2: Install and uninstall dates for EM systems in Pilot Year 1, and date of camera resolution upgrade per vessel.

Vessel	EM System Install Date	Date of Image Resolution Upgrade	EM System Uninstall Date
Vessel A	6/4/2022	8/5/2022	11/17/2022
Vessel B	6/5/2022	8/27/2022	11/17/2022
Vessel C	4/14/2022	8/6/2022	NA
Vessel D	6/3/2022	8/5/2022	11/17/2022
Vessel E	4/13/2022	8/26/2022	11/16/2022
Vessel F	4/15/2022	8/6/2022	NA
Vessel G	4/12/2022	8/6/2022	11/16/2022
Vessel H	5/14/2022	8/6/2022	11/16/2022

Table 3: Hard drives (HDDs) received per vessel and associated unsampleable sets for Pilot Year 1. Blank HDDs indicate they had not been loaded into the system. Corrupted HDDs indicate that the hard drive was damaged upon arrival for processing and review. Unsampleable sets are defined as sets that could be identified in the dataset (HDDs with data) using hydraulic pressure alone or video, but which did not have sufficient video or adequate image quality to monitor pumping activity effectively.

Vessel	Total HDDs Sent In	HDDs with Data	Blank HDDS	Corrupt HDDS	Unsampleable Sets from HDDs with Data
Vessel A	6	1	4	1	0
Vessel B	7	5	2	0	0
Vessel C	8	5	2	1	1
Vessel D	5	5	0	0	131
Vessel E	9	5	4	0	2
Vessel F	6	5	1	0	2
Vessel G	9	5	4	0	7
Vessel H	8	4	3	1	93

Table 4: Options showing how to achieve 10% EM coverage of total fishing sets for Pilot Year 1 and 2.

Category	Sets Observed	Total Sets Made by Industry per Year	% Set Coverage
Based on actual data reviewed in Pilot Year 1	1,748	17,857	9.8%
Sets needed to achieve 10% coverage of fishery through EM for Pilot Year 1	1,786	17,857	10%
Based on actual data reviewed in Pilot Year 2	3,160	14,720	21.5%
Sets needed to achieve 10% coverage of fishery through EM for Pilot Year 2	1,472	14,720	10%

2.1.3. Sea Turtle and Dolphin Interactions

Throughout sets that were monitored by human observers and EM in Pilot Year 1, approximately 2,344 dolphins were sighted across 697 sets outside of the net compass and pumping operations and no sea turtle sightings occurred. There were 14 separate sets observed by observers (n=1) and EM (n=13) with either sea turtles or bottlenose dolphins inside the net and during pumping activities. The geographic distribution of sea turtle and dolphin interactions can be seen in Figure 5. Sea turtle interactions occurred during May and June while dolphin interactions occurred from July through October 2022 (Table 10; Figures 6-8).

For this report, data will focus on the 13 confirmed sets recorded by EM that occurred within the net during pumping. Six sets involved a single sea turtle caught in the net, including four Kemp's ridley turtles (*Lepidochelys kempii*) and two loggerhead turtles (*Caretta caretta*; Table 10). All turtles were released alive at the end of pumping. The other seven sets involved bottlenose dolphins (*Tursiops truncatus*) observed in the net (Table 10). Five of these sets involved one bottlenose dolphin in the net, one set involved three bottlenose dolphins in the net, and one set involved five bottlenose dolphins in the net. The release condition of the bottlenose dolphins varied, with some conditions unable to be determined, but included at least two confirmed mortalities. Release conditions were assessed based on the dolphin's behavior and movements as seen in the video which resulted in some unknown conditions.

All interactions identified from both Pilot Year 1 and 2 are mapped in figure 15.

2.1.4. Vessels

A total of 31 unique vessels had sets observed during Pilot Year 1 by human observers (n=23) and by electronic monitoring (n=8; Figures 3 and 4). The number of sets observed in Pilot Year 1 from any one vessel ranged from a single set to 528 sets.

2.2 Pilot Year 2

2.2.1 Human Observers

Human observers were not utilized for Pilot Year 2.

Table 5: Install and uninstall dates for EM systems by vessel for Pilot Year 2.

Vessel	EM System Install Date	EM System Uninstall Date
Vessel A	4/3/2023	11/7/2023
Vessel B	4/4/2023	11/7/2023
Vessel E	3/13/2023	11/6/2023
Vessel K	4/5/2023	11/7/2023
Vessel G	3/14/2023	11/7/2023
Vessel H	3/15/2023	11/6/2023
Vessel L	4/6/2023	11/6/2023
Vessel J	4/3/2023	11/6/2023

Table 6: Total monitored sets listed by monitoring type during Pilot Year 2.

Total Sets Monitored for Pilot Year 2		
Month	EM	Observer
April	232	0
May	712	0
June	506	0
July	575	0
August	426	0
September	445	0
October	264	0

2.2.2. Electronic Monitoring (EM)

Saltwater Inc. EM technicians installed EM systems on eight GoM menhaden purse seine vessels between March 13 - April 6, 2023 (Table 5), in three ports: Abbeville, LA; Empire, LA; and Moss Point, MS. The EM systems were used to collect video, GPS data, and hydraulic pressure sensor data (as applicable) during Pilot Year 2, April 15-November 1, 2023, for a total of 201 sea days. Over this period, a total of 3,160 sets made by eight unique vessels over 415 trips were reviewed (Tables 4, 6 and 7; Figure 10). There were 81 additional tender-only trips made by the fleet which

were not reviewed and contained no sets to review. The fewest total sets monitored via EM in Pilot Year 2 occurred in April (n=232) and the greatest total sets monitored occurred in May (n=712; Table 6 and Figure 11).

System issues including power loss to the EM unit (incalculable), video loss (n=142), and image quality (n=21) decreased the total number of sets monitored via EM (n=3,160), compared to the total verified sets made by EM fishing vessels (n=3,196) during Pilot Year 2. Any sets that could be at least partially reviewed were considered reviewed for the project. A fair number of sets from Vessel H were unsampleable due to missing video because of failing hard drives (Table 8). In addition, two corrupt hard drives were retrieved from Vessel E which caused a data loss of four weeks from Vessel E (Table 8).

Total EM coverage of fishing sets during Pilot Year 2 was approximately 21.5% based on the 2023 total fishery set effort. This exceeded the goal set by NOAA of 10% of the fishing sets being observed by EM for Pilot Year 2 (Table 4).

Table 7: Total sets listed by set type per vessel for Pilot Year 2.

Total Sets Listed by Set Type for Pilot Year 2		
Vessel	Seine	Tender Deliveries
Vessel A	365	74
Vessel B	410	54
Vessel E	401	0
Vessel K	394	37
Vessel G	588	0
Vessel H	579	0
Vessel L	203	24
Vessel J	256	34
Total Sets/Deliveries	3,196	223
Total Sets Reviewed	3,160	0

Table 8: Hard drives (HDDs) received per vessel with associated unsampleable sets for Pilot Year 2. Blank HDDs indicate they had not been loaded into the system. Corrupted HDDs indicate that the hard drive was damaged upon arrival for processing and review. Unsampleable sets are defined as sets that could be identified in the dataset (HDDs with data) using hydraulic pressure alone or video, but which did not have sufficient video or adequate image quality to monitor pumping activity effectively.

Vessel	Total HDDs Sent In	HDDs with Data	Blank HDDS	Corrupt HDDS	Unsampleable Sets from HDDs with Data
Vessel A	15	15	0	0	0
Vessel B	15	15	0	0	0
Vessel E	16	11	3	2	0
Vessel K	15	15	0	0	0
Vessel G	16	15	1	0	8
Vessel H	15	14	1	0	23
Vessel L	16	11	4	0	0
Vessel J	17	15	2	0	0

2.2.3. Sea Turtle and Dolphin Interactions

Throughout sets that were monitored by EM in Pilot Year 2, approximately 3,242 dolphins and zero sea turtles were sighted across 3,160 sets outside of the net compass and pumping operations. There were 42 separate sets observed through EM between sea turtles (n=22) and bottlenose dolphins (n=20) *inside* the net during pumping activities. The geographic distribution of sea turtle and dolphin interactions can be seen in Figure 12. Sea turtle and dolphin interactions occurred during each month from May through October 2023 (Table 11; Figures 12-15).

For this report, data will focus on the 42 confirmed sets recorded through EM that occurred within the net during pumping. Nineteen sets involved a single sea turtle caught in the net, including 14 Kemp's Ridley turtles (*Lepidochelys kempii*) and five loggerhead turtles (*Caretta caretta*; Table 11). Three sets involved two sea turtles caught in the net, including five Kemp's Ridley turtles and one loggerhead turtle. Of the 25 total sea turtles seen, 22 were released alive at the end of pumping, while three had unknown dispositions due to animal behavior. The other 20 sets involved a total of 31 bottlenose dolphins (*Tursiops truncatus*) observed in the net (Table 11). Twelve of these sets involved one bottlenose dolphin in the net, five sets involved two bottlenose dolphins in the net, and three sets involved three bottlenose dolphins in the net. The release condition of the bottlenose dolphins varied, with some conditions unable to be determined, but included at least six confirmed mortalities. Release conditions were assessed based on the dolphin's behavior and movements as seen in the video which resulted in some unknown conditions.

All interactions identified from both Pilot Year 1 and 2 are mapped in figure 15.

2.2.4. Vessels

A total of 8 unique vessels had sets observed during Pilot Year 2 by electronic monitoring (n=8; Figure 11). Of these vessels, three were new to the project for Pilot Year 2: Vessel K, Vessel L, and Vessel J. All other vessels previously participated in Pilot Year 1. The number of sets observed from any one vessel ranged from 203 to 580 sets (Figure 10).

3. Observer Lessons Learned:

3.1 Pilot Year 1

3.1.1. Alternative Platform Successes

Saltwater Inc. contracted two experienced Protected Species observers who rotated on a schedule throughout the season. Both were highly professional and collected quality data. There were no issues with their schedules or performances.

Saltwater Inc. contracted Salty Marsh Charters to provide a 27-foot vessel to serve as an alternate platform for the observers. The vessel was supplied with a Saltwater Inc. Research flag (Figure 9) which was displayed from the vessel during observer operations. The alternate platform operator was safety conscious, dependable, and did an excellent job of ferrying the observers to the fishing grounds and doing his best to get them appropriate and effective vantage points for viewing.

3.1.2. Alternative Platform Challenges

It was difficult for the observers aboard the alternate platform to collect the desired data for a variety of reasons. Overall, it is estimated that observers missed 50% of the fishing operations. These data losses and challenges are broken down into seven key issues: (1) weather, (2) fleet inaccessibility, (3) vantage point, (4) interference/intimidation, (5) observation period identification, (6) data forms, and (7) lodging.

3.1.3. Weather

Due to the small size of the contracted alternate platform vessel, going out in rough seas was often not a safe option. Throughout the season, observers were unable to leave the dock on 11 days (8.0%) of the scheduled observation days due to weather conditions. In addition, observers were able to make a trip, but no sets were observed for an additional 29 days (21.2%) due to weather preventing the alternate platform from safely making it to the fishing grounds. A larger vessel may have made more trips possible, but the costs of leasing anything larger would have cost more than the available budget.

3.1.4. Fleet Inaccessibility

Another challenge presented by having a smaller alternate platform was difficulty in locating vessels due to the distance the fleet sometimes traveled to fish. While some vessels fished close to their ports, (e.g., Abbeville vessels sometimes fished within a 10-mile radius of the canal) many vessels traveled over an hour to fishing grounds. During Pilot Year 1, the observers made a trip, but were unable to reach the fishing vessels or the vessels were not fishing when reached on 26

days (19.0%) which resulted in no sets observed on these days. Initially, observers attempted to locate the vessels by following the scouting planes. When planes were not visible, the observers and alternate platform vessel operator determined that the vessels were fishing too far away for them to locate and follow safely. The lack of communication between the fishing vessels and the alternate platform vessel operator about their fishing plans contributed to difficulties in locating the fishing vessels. Industry contacts at the plants often had no information about the vessels' fishing plans in terms of both location and duration. The alternate platform vessel operator did acquire an app mid-season that provided vessel locations, but it only worked when he was in cell range, so benefits were limited.

3.1.5. Vantage Point

Overall, observing from the alternate platform was used to mainly view the net setting process, and did not allow for an unobstructed view of pumping activities, which was consistent with findings during the POC. While the observers reported that the alternate platform vessel operator did an excellent job getting as close as possible, they still had a difficult time seeing operations due to lighting conditions. Glare on the water, vessels fishing close together, and large numbers of pelicans in and around the net obstructed observation of the net-setting process and the ability to see small dolphins and sea turtles near the fishing operations.

3.1.6. Interference/Intimidation

There appeared to be some lack of understanding about the project with some of the fishing vessel skippers on the water and spotter plane pilots that led to two instances of interference. Both instances occurred while the alternate platform was displaying the Saltwater Inc. Research flag and led to the observers aboard the alternate platform feeling intimidated. On July 12, a spotter plane "buzzed" the alternate platform while they were observing by coming within 150-200 meters of the vessel. Saltwater Inc.'s Project Manager (PM) reported the incident immediately to Steve Williamson at Omega Seafoods and there were no further incidents. On September 19, a steamer vessel approached the alternate platform within ten feet which blocked the alternate platform vessel from approaching the net set closer than 30 meters. This specific incident was not reported to the industry due to the delay in the notification from the observer and communications with the observer not occurring until October.

3.1.7. Observation Period Identification

The initial lack of clarity about the duration of the observation period confused the observers. During a July 2022 meeting, NOAA noted that the "set time" and "pump time" on the observer forms seemed short. Based on the POC, Saltwater Inc.'s PM at the start of the season instructed the observers to document each set from the time the two net-setting boats pulled apart to set the net compass to when they finished setting the net compass, which was about ten minutes. The observers followed this protocol for about a month until they reported to the PM that the observation period was short and that they were missing the pursing and pumping operations. Based on their feedback, the observation period was extended to include the entire period that the net was being cinched, right up until pumping started, which typically lasted 20-30 minutes.

3.1.8. Data Forms

In mid-July 2022, NOAA noted that the observer data sheets had a lot of written notes. For consistency, NOAA revised the data sheets to allow more structured data entry, standardizing

fields that were showing up frequently. The revised sheets were shared with Saltwater Inc.'s PM for initial feedback and to ensure that all parties understood the definitions of each component. The data sheets were then provided to the observers for use in the field. During a subsequent meeting in early August, the observers provided additional feedback to NOAA on these new data sheets and the group discussed additional changes to improve consistency and clarity. This included adding a chart with fields to describe the location and comments about any sets with sea turtles and dolphins, as well as clarifying guidance on the Beaufort scale. NOAA updated the data sheets after the call, and the revised forms were used for the remainder of Pilot Year 1.

3.1.9. Lodging

At the start of Pilot Year 1, Saltwater Inc. had issues securing lodging for the observers in the western GoM that was close to a suitable launching location for the alternate platform vessel. For observation of the Moss Point, MS and Empire, LA boats, the observers were based in Venice, LA and the alternate platform vessel launched from the Cyprus Cove Marina. This boat launch was reportedly accessible and allowed for flexibility in reaching the fishing vessels and quickly get protection from the weather. It was more difficult to find adequate lodging in Abbeville, LA which was in the vicinity of a boat launch. In July, lodging that was within 18-25 miles of the harbor was secured. Despite some early challenges, lodging for the observers and alternate platform vessel operator during their scheduled work period was secured without any interruptions. Saltwater Inc. used five different sites, and all accommodations were comfortable and within the projected budget.

3.2 Pilot Year 2

Human observers were not utilized for Pilot Year 2.

4. EM Challenges

4.1. Pilot Year 1

Overall, the EM systems performed well, and review of the available video and sensor files resulted in the collection of valuable data about the menhaden fishery. However, during the period of performance, there were some areas for improvement of the EM process that were identified by NOAA and Saltwater Inc. Some changes were implemented in-season, and there were also additional challenges identified that would need to be addressed for Pilot Year 2. The following is a description of the various issues encountered and steps taken or planned to resolve them. Issues centered around (1) installation/mechanical and (2) data processing/review.

4.1.1. Install/Mechanical

4.1.1a. Pressure Sensors

Global chain supply issues exacerbated the tight install schedule that was agreed upon before the start of Pilot Year 1. The main challenge faced was getting the PSI sensors needed for this project. PSI sensors are installed to trigger cameras to record during fishing activity because of changes in hydraulic line pressure. The sensors needed for this project were significantly more sensitive (300 PSI) than the sensors that are typically used by Saltwater Inc., which are 1500 or 3000 PSI. Some gaps in recording may have been due to issues with the sensor threshold setting that resulted in the cameras not being triggered to record. This is something that would be remedied in Pilot Year 2 with the knowledge gained on these sensors.

Another issue that impacted the use of the PSI sensors was that some vessels used a different system for pumping fish from the net which could not support hydraulic sensors. Three of the eight vessels (Vessel A, Vessel B, and Vessel H) did not have hydraulic lines that technicians could install sensors on to trigger the cameras, so those systems had to be set to record 24/7. This did not cause any problems with data storage but having sensor data is useful for identifying fishing activity during data review. It is also preferable not to record 24/7 when data needs do not require it in deference to the privacy concerns of crew members. Now that this limitation is known, Saltwater Inc. would look for other means to trigger recording on these vessels for Pilot Year 2 if they participate.

4.1.1b. Install Location Issues

All the central processing units of the EM system (EMUs) were initially installed in the pump room of each participating vessel. The decision to install them there was based on the experience from the POC phase, preference from industry, proximity to power, and where the cameras were to be installed. During Pilot Year 1, however, it was determined that this is not an ideal location. There is a great deal of vibration in the pump rooms, which was so severe that in one instance, it reportedly shook an HDD out of the system which had never occurred previously. It also caused some interruptions in power and, consequently, data collection. The EMUs received more exposure to the elements by being placed in the pumphouse. On October 7-8, 2022, Saltwater Inc. technicians were able to move the EMUs on Vessel C and Vessel F to the vessels' wheelhouses, but due to the ending of the fishing season, no additional data were received after this change. Saltwater Inc. recommends installing EMUs in the wheelhouse for all vessels for future EM data collection. Placing all the EMUs in the wheelhouses will require having space made available in the wheelhouse for the equipment, access to a power source, and installing longer wire runs to the cameras, all of which would require collaboration with the industry.

4.1.1c. Upgraded Image Quality

During a July 2022 project meeting, NOAA noted that some of the video footage appeared grainy and requested that the EM video resolution be increased from 720/15 to 1080/15 to allow for better identification of sea turtles and marine mammals in the net during pumping operations. One of Saltwater Inc.'s EM technicians was able to complete six of the eight upgrades in the first weeks of August and the final two vessels were upgraded in late August (Table 2).

Reviewers did find that the improved imagery made sea turtle identification to species easier. The increase in resolution did not contribute significantly to the volume of data collected, which would have been the primary reason to record at a lower level. Saltwater Inc. plans to maintain the higher resolution setting on all vessels in the future.

4.1.2. Data Processing & Review

The EM data that were collected during Pilot Year 1 were effective in documenting sea turtle and dolphin interactions in the menhaden fishery. That said, challenges caused some initial confusion and delays in the process such as retrieving data from the vessels, mailing time to Anchorage, and large datasets that could not be broken up to review in time for reporting deadlines. These issues are detailed below.

4.1.2a. Definitions

At the start of Pilot Year 1, there was some lack of clarity about data points—the main one being the definition of a trip. During the POC Saltwater Inc. used a week of fishing as the definition of a trip but that created some inconsistencies. In consultation with NOAA, the definition was clarified where the start and end of a trip was "dock-to-dock", from the dock of departure to the dock of return which mirrored the observer's definition. Once that was clarified, there was no additional confusion on this point.

4.1.2b. Processing Delays

There were significant delays in data processing at the start of Pilot Year 1 that contributed to a delay in the EM review and reporting of the data. One factor was the time required to ship HDDs to Saltwater Inc.'s main office in Anchorage, Alaska for processing and archiving. Once completed, the data team had to then copy the data and send it out to reviewers working in various locations in other states. This process added seven to ten days between when the data were shipped from the vessel and when the data review began. Saltwater Inc.'s team discussed options and agreed that the best option would be to establish a new processing and storage hub closer to the project site. In September, Saltwater Inc. switched over to having all data sent to a location in Virginia where a member of the review team could process and copy data for distribution, and then immediately start reviewing the data themselves.

Once the data were received by the review team, there were no significant delays in the review. Saltwater Inc. had an adequate number of reviewers available to review the quantity of data received and reviewers were able to complete the video review of a trip (defined as "dock to dock" and typically ranging from 2-3.5 days) in 98.03 ± 68.57 minutes on average. This average is based on video review time only and does not include time for processing, data cleaning, or reporting.

4.1.2c. Monthly Summary Uploads to NOAA

Monthly summary data reports were prepared in Google Sheets and uploaded to Google Drive along with pictures and videos of interactions. This arrangement worked well for the delivery of data summaries, but the timeline and format were less than ideal with the data retrieval and processing delays. Since most of the data were not received by the beginning of the following month, they could not be reviewed quickly enough to add to the monthly reports by the mid-month deadlines. This created delays in reporting data on monthly reports and resulted in a scenario where partial reports were delivered. Numerous updates then had to be made throughout the season as data were received. A longer turnaround time in the future, along with regular data retrievals from the vessels, could help alleviate this. In addition, a spreadsheet layout with all data for the season added with a dashboard to filter by month, vessel, etc., may be a better option in the future instead of individual monthly spreadsheets.

When uploading videos of sets with interactions in October, NOAA indicated that the sets were broken up into multiple short clips which made reviewing the video outside of the review software difficult. Clips were merged into one video which improved the ability of NOAA to confirm the interaction and share the video with their team. Going forward, all clips were merged for individual events to make viewing more efficient.

4.1.2d. Data Retrieval Issues

One of the biggest challenges during Pilot Year 1 was the delay in getting the HDDs with data from the vessels to the review team. There were a range of factors that contributed to the delays, some of which were addressed in-season, but this is an area that will need improvement going forward.

The foundation of the data retrieval issue was the lack of clarity about who was responsible on the vessel for retrieving the HDDs, and a lack of training by Saltwater Inc.'s team because of that. Saltwater Inc. asked that vessels had a designated representative available who can receive training from EM technicians during the system install on system upkeep, and HDD retrieval and replacement. The menhaden fishing fleet did assign a person to be on each vessel during install, however, this person was not associated with that specific vessel. The EM technicians trained the designated person on how to retrieve and replace HDDs, but it is likely that this information did not get passed on to others who would have regular access to the vessel. This likely contributed to delays in getting HDDs off the vessels and receiving some HDDs with no data (the absence of data typically means someone pulled the wrong HDD).

Another cause of processing delays was the long timeframe that was initially set for data retrieval. The original instructions to the fleet were to send in HDDs at the end of each month, creating a long time between the first trips of the season and any data review. Receiving an HDD with multiple trips also slows data turnaround because reviewers cannot create separate data sheets for each trip; if there are trips from previous months on one hard drive, they cannot be reviewed and reported separately. Saltwater Inc. and NOAA agreed to change the requirement to bi-monthly rather than monthly to correct the issue. Saltwater Inc. and NOAA communicated this change to the industry in early August, but it wasn't clear that the message made it to the people responsible for pulling the HDDs. While there was some improvement over the season, there is plenty of room for more progress in this area.

Saltwater Inc. fell behind in late September in providing replacement HDDs to keep up with the new retrieval and return protocol. It was reported by some vessels that they weren't returning HDDs because they didn't have spare HDDs. Two batches of new HDDs were immediately sent to the three ports on September 30 after receiving this complaint. Saltwater Inc. will revisit the protocol in the future to ensure an adequate supply of replacement HDDs at the start of the season are supplied and are consistently replenishing the vessels with new HDDs as they come in.

4.1.2e. Communication

During Pilot Year 1, each vessel carrying an EM system did not have an official designated contact that was responsible for communicating with Saltwater Inc. There was a contact in each port instead, but they did not always have up-to-date information on each vessel's operations and schedule. There were also changes in personnel at Saltwater Inc. during Pilot Year 1 that may have exacerbated these communication issues.

Ideally, each vessel would have a designated crew member who maintains contact with Saltwater Inc.'s EM technicians throughout the fishing season. This would allow for communication between the crew and Saltwater Inc. for assistance with maintenance checks, system problems, lens cleaning, etc. Additionally, this would help with data retrieval as Saltwater Inc. would be able

to communicate reminders to the crew to retrieve and replace the HDDs on schedule. Going into Pilot Year 2, this communication system should be established with each EM-outfitted vessel to streamline the communications and data management processes.

4.2. Pilot Year 2

With the lessons learned from Pilot Year 1, Saltwater Inc. and NOAA implemented strategic changes to improve EM system performance, data collection and processing, data reporting, and communications with the fleet for Pilot Year 2. All these changes resulted in a streamlined EM project and efficient data collection throughout Pilot Year 2. There were also some new challenges identified in Pilot Year 2 that would need to be addressed for future EM projects with the fleet. The following is a description of various changes implemented, new issues encountered, and the steps taken or planned to resolve them. Issues are organized around (1) installation/mechanical and (2) data processing/review, and (3) outreach and communication to the fleet.

4.2.1. Install/Mechanical

4.2.1a. Pressure Sensors

With the knowledge gained in Pilot Year 1, Saltwater Inc. technicians initially installed various PSI pressure sensors on all Pilot Year 2 participating vessels using Pilot Year 1's information and the information gained during Pilot Year 2's vessel assessments (Table 9). With the first rounds of data retrieved, reviewers identified occurrences where the sensor would experience issues which triggered 24/7 recording on some vessels. Saltwater Inc. technicians continually worked on these vessels during each bi-weekly service to identify and fix the issue. It was determined that a 300 PSI sensor may have been too low for some of these vessels. Technicians were able to replace these sensors with higher PSI sensors to accommodate individual operations. By the end of Pilot Year 2, only one vessel's EM system still had a 300 PSI sensor while all seven other vessels had sensors with 1,000 PSI or higher.

Testing all equipment prior to the fishing season starting is critical. Unfortunately, one vessel (Vessel L) was in dry dock and Saltwater Inc. technicians were unable to test the hydraulic pressure sensor that was installed on the vessel prior to them fishing. After the first several data retrievals, reviewers indicated that no data were being collected on the vessel. Saltwater Inc. technicians then visited the vessel to determine the issue which was found to be a threshold setting being set too high for the vessel. The hydraulic pressure being used for pumping was not high enough to trigger recording from the EM system. Saltwater Inc. technicians addressed the issue by lowering the threshold and recording was triggered after that.

In Pilot Year 1, three participating vessels used a different system for pumping fish from the net which could not support sensors used to trigger camera recording, which meant that 24/7 recording was used. Industry indicated that was unacceptable to move forward into Pilot Year 2. Saltwater Inc. technicians performed pre-season assessments of eight potential vessels to ensure that the vessel's pumping operations would work well with a pressure sensor to limit recording. During these assessments, Saltwater Inc. technicians worked with vessel engineers to identify alternate triggers for the pressure sensors which was successful and allowed all three participating vessels

that initially had 24/7 recording (Vessel A, Vessel B, and Vessel H) to participate in Pilot Year 2 without the same issues.

In general, there can be significant variations among vessels within the same fleet, necessitating adjustments to tailor the EM system to each vessel's unique setup. Although Saltwater Inc. technicians can leverage past experience to install the appropriate components, it remains essential to conduct comprehensive testing for all EM systems before starting data collection during the fishing season.

Table 9: Pressure sensor installation details and amendments per vessel for Pilot Year 2.

Vessel	Initial Installed Pressure Sensor PSI	Final Installed Pressure Sensor PSI
Vessel A	1000	1000
Vessel B	1000	1000
Vessel E	300	1000
Vessel K	300	300
Vessel G	300	1500
Vessel H	300	1500
Vessel L	3000	3000
Vessel J	1000	1000

4.2.1b. Install Location

All the central processing units of the EM system (EMUs) were installed in the wheelhouse for Pilot Year 2. The fleet made space available to Saltwater Inc. to install these systems in the wheelhouse which allowed for better protection and operation of the EM system. While this brought the EM system into a more central location that was better monitored by vessel crew, it did introduce an additional issue of the monitor lighting causing issues during night operations. The monitor lighting can be turned off, however, one vessel's crew did not know this and ended up turning the entire EM system off multiple times throughout the season. While it was later clarified that the crew turned the EM system off after fishing operations were complete, this may not always be the case. Once this issue was identified, Saltwater Inc. technicians worked with the fleet to turn the monitor off, while allowing the EM system to operate as normal to ensure no loss of data.

4.2.1c. Upgraded Image Quality

All video footage was set at 1080/15 at the start of the season to better identify sea turtle and marine mammal interactions based on knowledge gained during Pilot Year 1. This improved quality allowed for clearer images during review. Due to data being retrieved every two weeks,

there were no issues with hard drive space, which was the initial concern about recording at the higher resolution.

4.2.1d. Recording Duration

During Pilot Year 1, there were several vessels that could not accommodate a hydraulic pressure sensor in the traditional way that Saltwater Inc. utilized them to trigger camera recordings. Due to this set-up, those vessel's systems had been set to record 24/7 once the EM system was turned on. During Pilot Year 1, it was made clear that this was not in line with the industry's needs for privacy and that this would need to be remedied for Pilot Year 2.

Prior to the start of the Pilot Year 2 fishing season, Saltwater Inc. technicians conducted assessment trips to multiple vessels to determine which would be suitable to the hydraulic pressure sensor's arrangements. During this time, Saltwater Inc. technicians with the help of vessel engineers carried out additional research on the vessels participating in Pilot Year 2 to determine alternate triggers for the hydraulic pressure sensors. In the end, selected vessels that had previously been unable to accommodate a pressure sensor were able to work with Saltwater Inc. technicians to identify alternate triggers (See section 4.1.2a.). All parties agreed on having a recording cutoff of 10 minutes post-pumping to ensure excessive footage was not recorded but still allowed for the entire set duration through net rollover to be viewed.

While all vessels initially started off recording only during sets, there were some additional issues encountered with the hydraulic pressure sensors installed on some vessels which resulted in some non-fishing footage being captured (See section 4.1.1a.). These occurrences were fixed as soon as the issue was realized during video analysis

4.2.1e. Time Syncing between EM Cameras

Each EM camera is equipped with a timestamp (UTC) intended to synchronize across all cameras and the central EM computer. During installation, Saltwater Inc. technicians synchronized all cameras to ensure accurate timing. However, following the initial data retrieval, reviewers noticed timestamp inconsistencies on some vessels. Although this did not impact data accuracy due to additional time logs used during review, it affected the video display sent to NOAA. Upon investigation, Saltwater Inc. technicians discovered that syncing camera time with the central EM computer could lead to discrepancies between cameras. To address this, it was decided to sync the cameras to the Network Time Protocol (NTP) to prevent time variations. Throughout the season, technicians conducted bi-weekly checks, ensuring camera times were synced to NTP for consistent timestamp accuracy.

4.2.1f. Hard Drive Failure

Data collected from the EM systems rely on hard drives enclosed in protected caddies, installed on the vessel during fishing, and subsequently sent to Saltwater Inc. for processing and review. Despite the safeguarding measures, hard drives are susceptible to failures, be it from natural wear and tear or issues like mechanical or electrical malfunctions such as power surges. Although Saltwater Inc. technicians conducted thorough tests upon retrieval - eliminating corrupt hard drives from the rotation, instances of data loss due to corrupt hard drives still occurred during the season

(Table 8). While complete mitigation of all factors contributing to hard drive failure may not be feasible, implementing additional checks before installation on each vessel could prove beneficial in preventing potential data loss in the future. For example, adding in a second HDD check prior to installing the HDD back on a vessel could be implemented which would help alleviate any shipping-related damage that occurred when sending the HDD from the processing hub back to the technicians to install on the vessels. Saltwater Inc. is also moving to replace spinning hard drives with solid state hard drives to help avoid HDD failures.

4.2.2. Data Processing & Review

During Pilot Year 2 of the project, several changes were made to data processing and review including in-person data collection by Saltwater Inc. technicians every two weeks, data processing in Virginia, and more frequent reports throughout the season. These changes streamlined the entire data flow from data collection at the vessel through to review and then on to reporting. These changes also increased buy-in from the fleet and made for an efficient and productive Pilot Year 2.

4.2.2a. Definitions

Before the start of the Pilot Year 2 fishing season, Saltwater Inc.'s data manager worked with NOAA to streamline the review protocol and all definitions used during review. Changes included removing options to label injuries for marine mammals and indicating when to label a sea turtle as injured. These changes pre-season allowed for a smooth start to the season with no review changes mid-season resulting in consistent EM data throughout the year.

4.2.2b. Processing

During Pilot Year 2, the more frequent and in-person data retrievals made by Saltwater Inc. technicians allowed for quick turnaround of the data. All data retrieved from the vessels were sent to Virginia for processing which reduced mailing time over Pilot Year 1 when HDDs were mailed to Alaska for processing.

Once the data were received by the review team, there were no delays in the review and all data were reviewed and reported within one month. Saltwater Inc. maintained the same number of reviewers as Pilot Year 1 and the reviewers were able to complete the video review of a trip (defined as "dock to dock" and typically ranging from 1-6 days) in 49.45 ± 40.0 minutes on average. This review time was approximately half of the time needed per trip in Pilot Year 1. This average is based on video review time only and does not include time for processing, data cleaning, or reporting. In addition, Pilot Year 2 data include tender deliveries in both tender-only trips and mixed trips (purse seine and tender deliveries in one trip) which took significantly less time to mark since no review was completed for any tender deliveries. If tender-only trips are removed from this calculation, review time increased slightly to 58.53 ± 37.47 minutes per trip.

4.2.2c. Monthly and Biweekly Summary Uploads to NOAA

During Pilot Year 1, monthly summary reports were submitted to NOAA, however, these reports were typically incomplete due to the erratic data retrieval schedule and lengthy fishing periods on an individual drive. During Pilot Year 2, the reporting schedule was changed to have complete

monthly reports delivered one month after the data retrieval (Table 12). This allowed for timely updates on reviewed fishing activity for both NOAA and the industry. All monthly reports were delivered in a Google Sheets format designed prior to the start of the season by Saltwater Inc. and NOAA staff. In addition to these monthly reports, two additional report types were utilized: 1) a biweekly PDF report that covered each hard drive retrieval visit and, 2) daily interaction emails which outlined any interactions seen during review on that day. In addition, for each interaction seen, video clips were uploaded to Drive for NOAA to review. All video clips of each interaction were merged into a single video before being provided to NOAA in-season to ensure that only one video was provided for each interaction. Overall, this arrangement worked extremely well for the delivery of the data and allowed for timely feedback from NOAA regarding any species ID updates and allowed for monthly review and feedback by the industry.

4.2.2d. Data Retrieval and Servicing

To prevent the same data retrieval issues encountered during Pilot Year 1, Saltwater Inc., NOAA, and industry agreed that data retrievals by Saltwater Inc. technicians throughout the season would be the best approach. Saltwater Inc. technicians conducted bi-weekly data retrievals during Pilot Year 2, starting at the end of April and continuing through November (Table 12). The technicians visited all three main ports during each visit and were able to adjust these visits as needed depending on where the vessels were currently located. The biggest problem encountered in Pilot Year 1 were delays in retrieving hard drives and getting those data to the review team. These issues were completely resolved in Pilot Year 2 with the in-person, bi-weekly data retrievals.

Furthermore, having a Saltwater Inc. technician visit each vessel every two weeks allowed for them to identify issues and perform any services needed. This prevented minor EM system performance issues from turning into larger issues that may have impacted data. While this was beneficial, it was also time intensive to drive to each port every two weeks. This setup worked well for Pilot Year 2, however, for future projects, less intensive options should be investigated to save both time and reduce costs.

4.2.3. Communication

Prior to the start of the Pilot Year 2 season, NOAA, Saltwater Inc. staff, and industry worked to identify one contact for each vessel that Saltwater Inc. technicians could communicate with regarding data retrievals, vessel servicing, and any other issues that may have been encountered. This officially designated contact improved communications immensely and allowed the technicians to conduct all vessel-related services much more efficiently. One concern that the technicians ran into was the inability to speak directly to the captain or crew of each vessel, which may have caused some corrections of crew-related issues to be delayed. For example, any issues that crew had with the EM systems were not identified until review and then communications were routed through NOAA and the steering committee. Had a Saltwater Inc. technician had direct contact with vessel operators, communications could have been made directly to them to address issues in a timelier manner.

Overall, the industry contacts in Pilot Year 2 were communicative and extremely helpful, which was invaluable to the project. Ideally, however, future projects would have both types of contacts

in place to allow for direct contact with the vessel's operator when needed, in addition to the shoreside vessel contact.

5. Final Conclusions

The two-year menhaden pilot project encountered several challenges in Pilot Year 1, prompting the need for innovative solutions. However, the insights gained from these challenges were instrumental in transforming the project into a highly successful endeavor in Pilot Year 2. In Pilot Year 1, the total sets monitored fell just short of the 10% target set by NOAA. Based on the knowledge gained from Pilot Year 1 and adjustments made, the project surpassed expectations in Pilot Year 2, achieving EM data collection and review of 21.5% of sets based on the fleet's 2023 count of approximately 14,720 sets. The implementation of enhanced communication channels and streamlined data flow facilitated a rapid data turnaround, with data being processed and reported on within a month of retrieval. This efficiency allowed NOAA to promptly provide feedback on species identifications and address any ongoing concerns with the industry. Overall, the experiences and adaptations from Pilot Year 1 paved the way for a significantly more successful Pilot Year 2 and can be used to inform future EM ventures within the menhaden fleet.

6. Additional Tables and Figures:

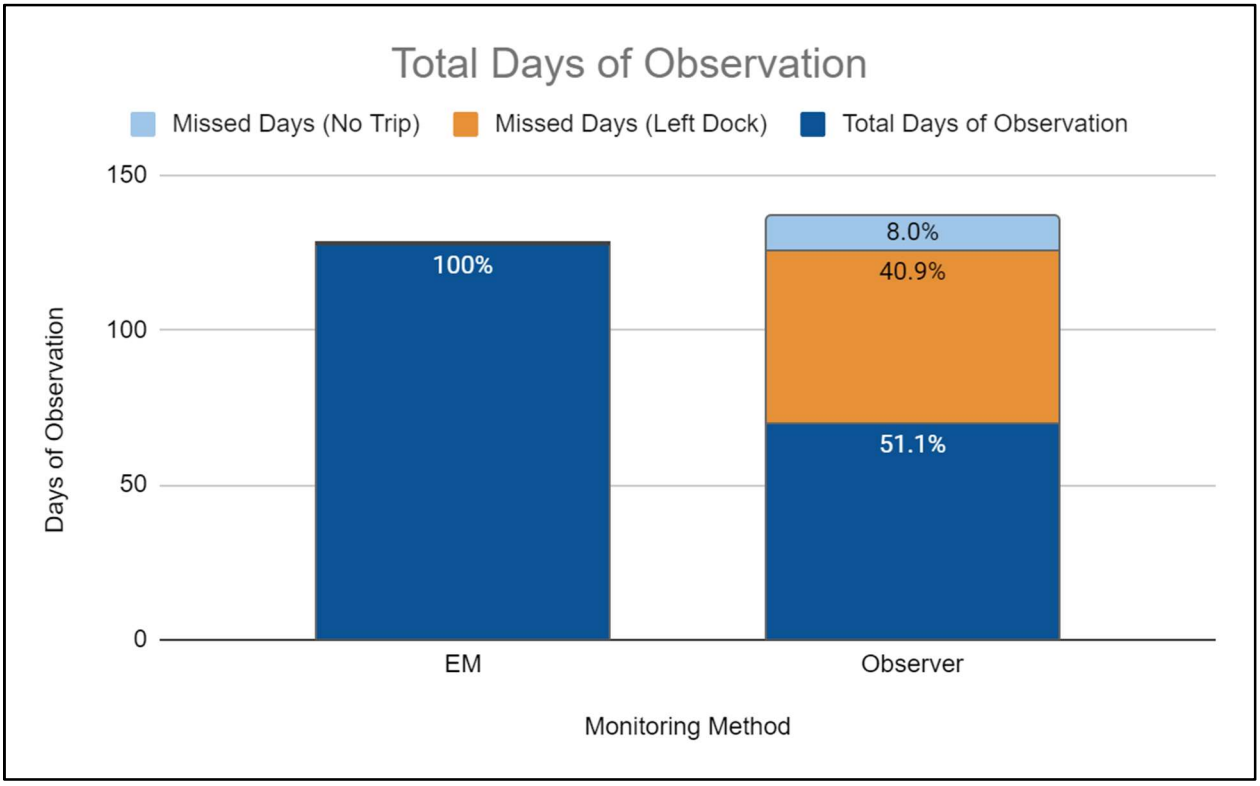

Figure 1: Total days of observation by monitoring method for Pilot Year 1.

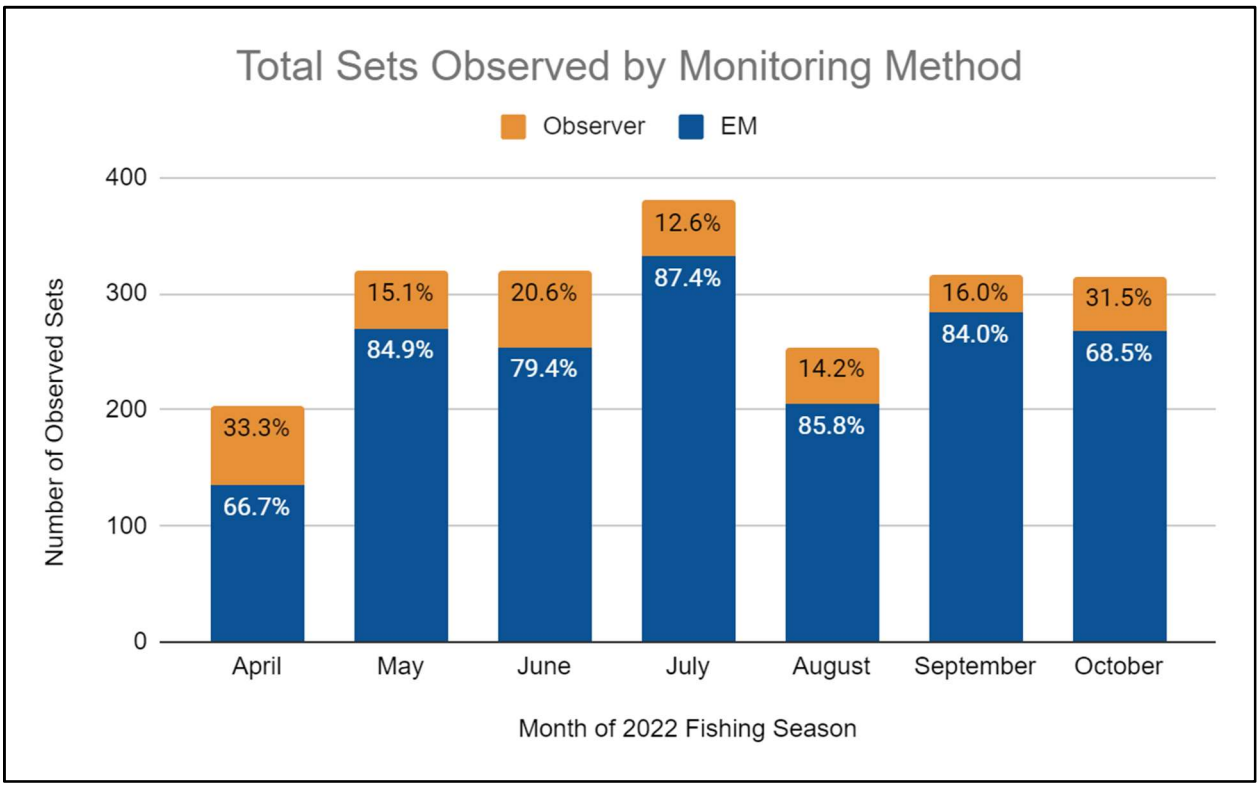

Figure 2: Total sets observed by monitoring method and month for Pilot Year 1.

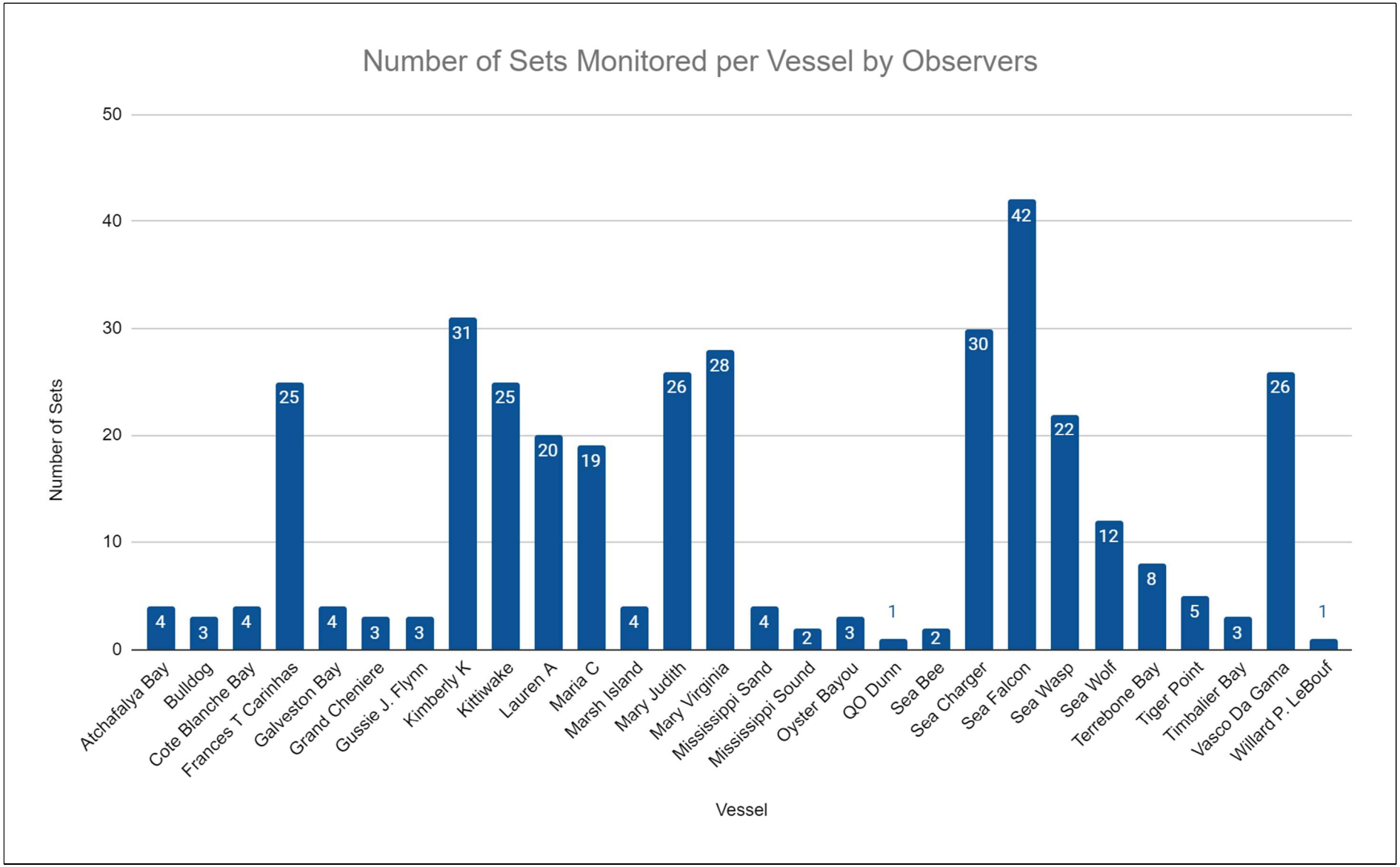

Figure 3: Total sets monitored by observers per vessel for Pilot Year 1.

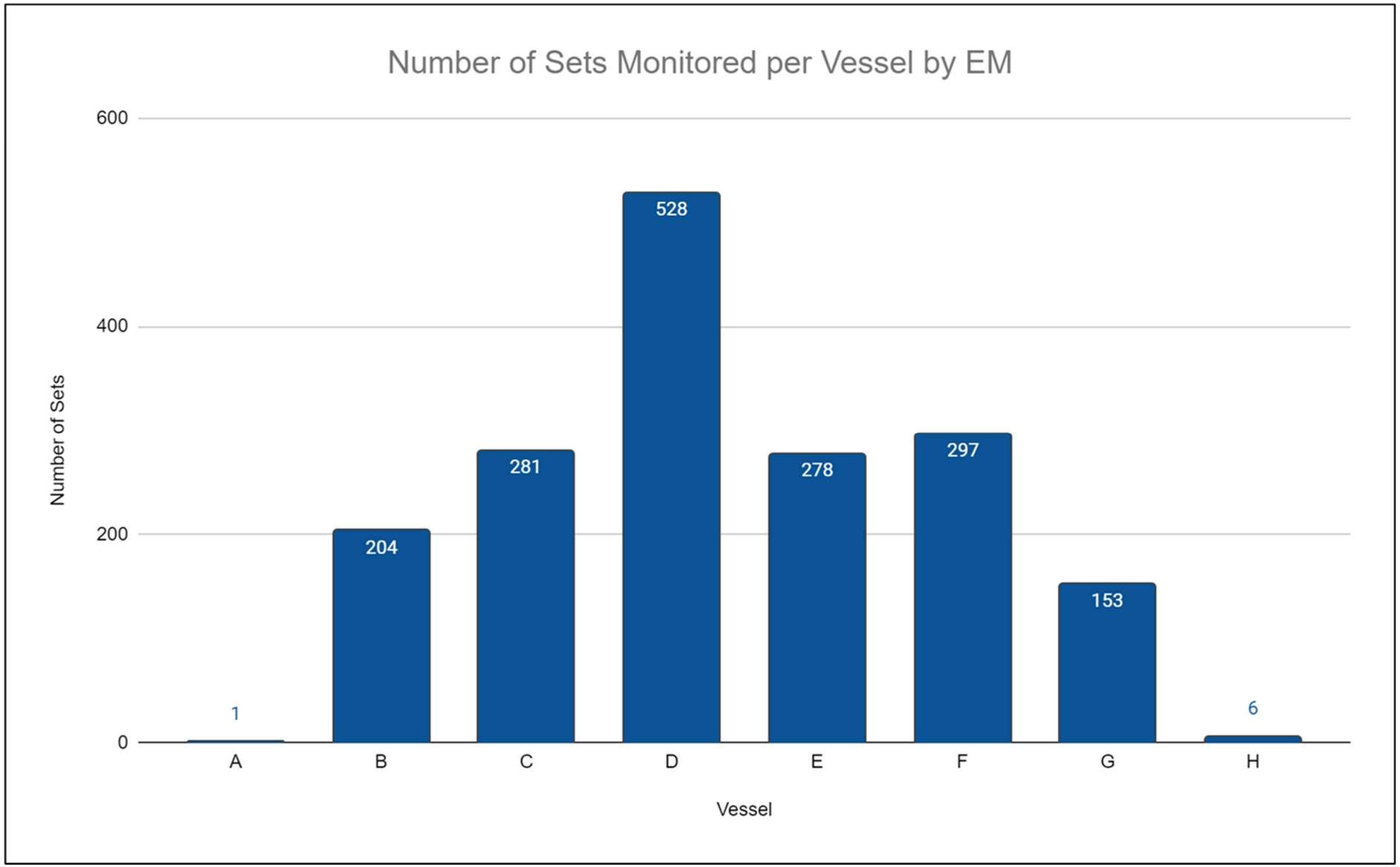

Figure 4: Total sets observed by EM per vessel for Pilot Year 1.

Table 10: List of all sea turtle and dolphin interactions inside the net by date, monitoring method, and vessel for Pilot Year 1.

Date	Species	Count	Monitoring Method	Vessel	Latitude	Longitude	Release Timing	Release Condition	Reason for Unknown
5/5/2022	Loggerhead Turtle	1	EM	Vessel G	30.06	-89.12	Released at the finish of pumping	Alive	-
5/9/2022	Kemp's Ridley Turtle	1	EM	Vessel G	29.84	-89.18	Released at the finish of pumping	Alive	-
5/11/2022	Kemp's Ridley Turtle	1	EM	Vessel G	29.26	-89.65	Released at the finish of pumping	Alive	-
5/11/2022	Kemp's Ridley Turtle	1	EM	Vessel G	29.27	-89.67	Released at the finish of pumping	Alive	-
5/17/2022	Kemp's Ridley Turtle	1	EM	Vessel G	29.24	-89.60	Released at the finish of pumping	Alive	-
6/28/2022	Loggerhead Turtle	1	EM	Vessel D	29.87	-89.06	Released at the finish of pumping	Alive	-
7/25/2022	Bottlenose Dolphin	1	EM	Vessel B	29.63	-89.35	Released at the finish of pumping	Unknown	Animal Behavior
8/1/2022	Bottlenose Dolphin	1	EM	Vessel D	29.84	-89.13	Released at the finish of pumping	Dead	-
8/22/2022	Bottlenose Dolphin	1	Observer	Vessel I	29.29	-89.68	Unknown	Unknown	Image quality/ Obstruction
9/6/2022	Bottlenose Dolphin	1	EM	Vessel C	29.63	-93.85	Released at the finish of pumping	Alive	-
9/8/2022	Bottlenose Dolphin	3	EM	Vessel D	29.20	-91.32	Released at the finish of pumping	Alive	-
10/4/2022	Bottlenose Dolphin	1	EM	Vessel F	29.48	-92.25	Released at the finish of pumping	Alive	-
10/4/2022	Bottlenose Dolphin	5	EM	Vessel F	29.57	-92.56	Released at the finish of pumping	Alive	-
10/20/2022	Bottlenose Dolphin	1	EM	Vessel B	30.34	-88.77	Released at the finish of pumping	Dead	-

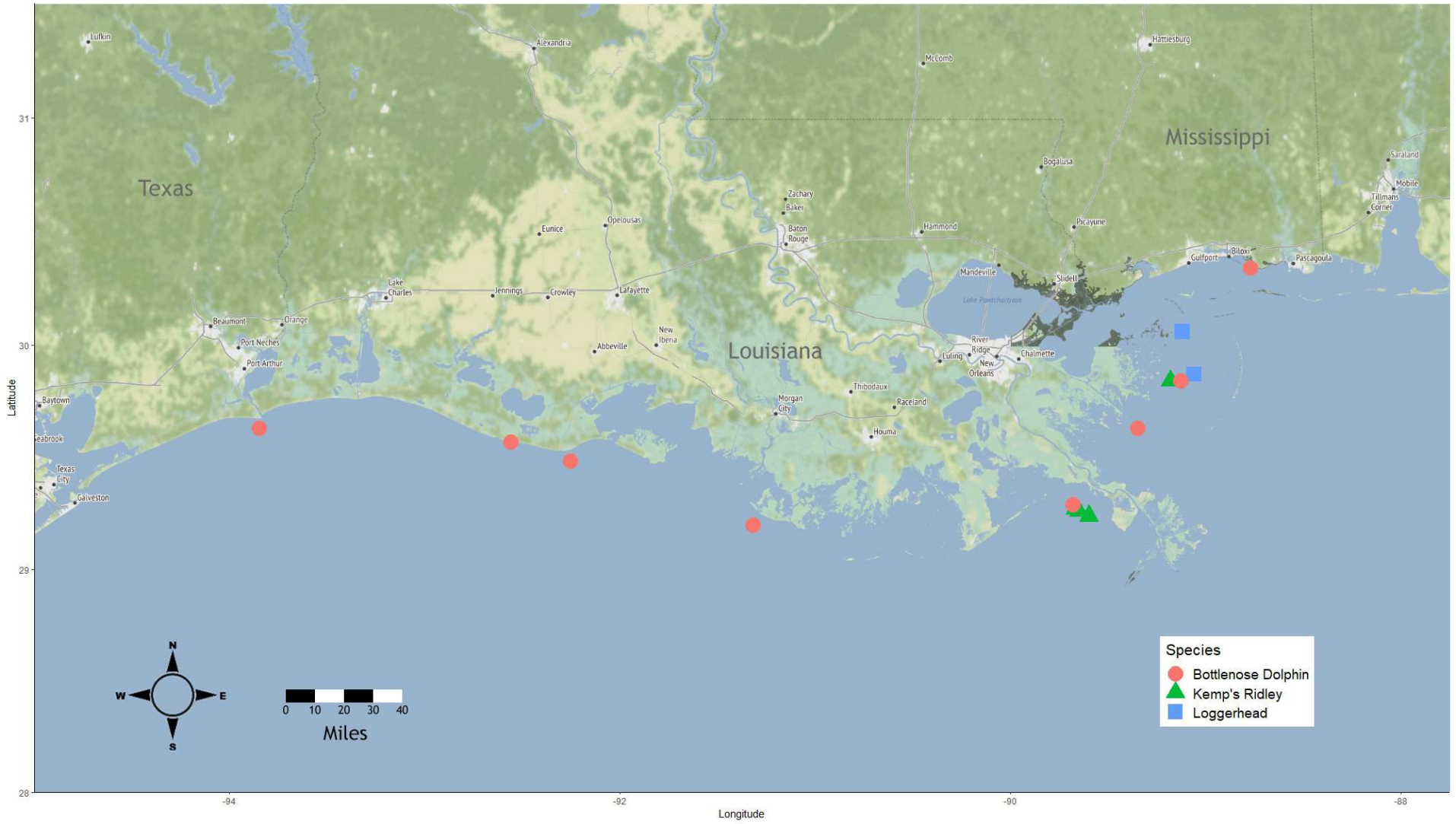

Figure 5: Map showing all interactions inside the net with sea turtles and dolphins during Pilot Year 1.

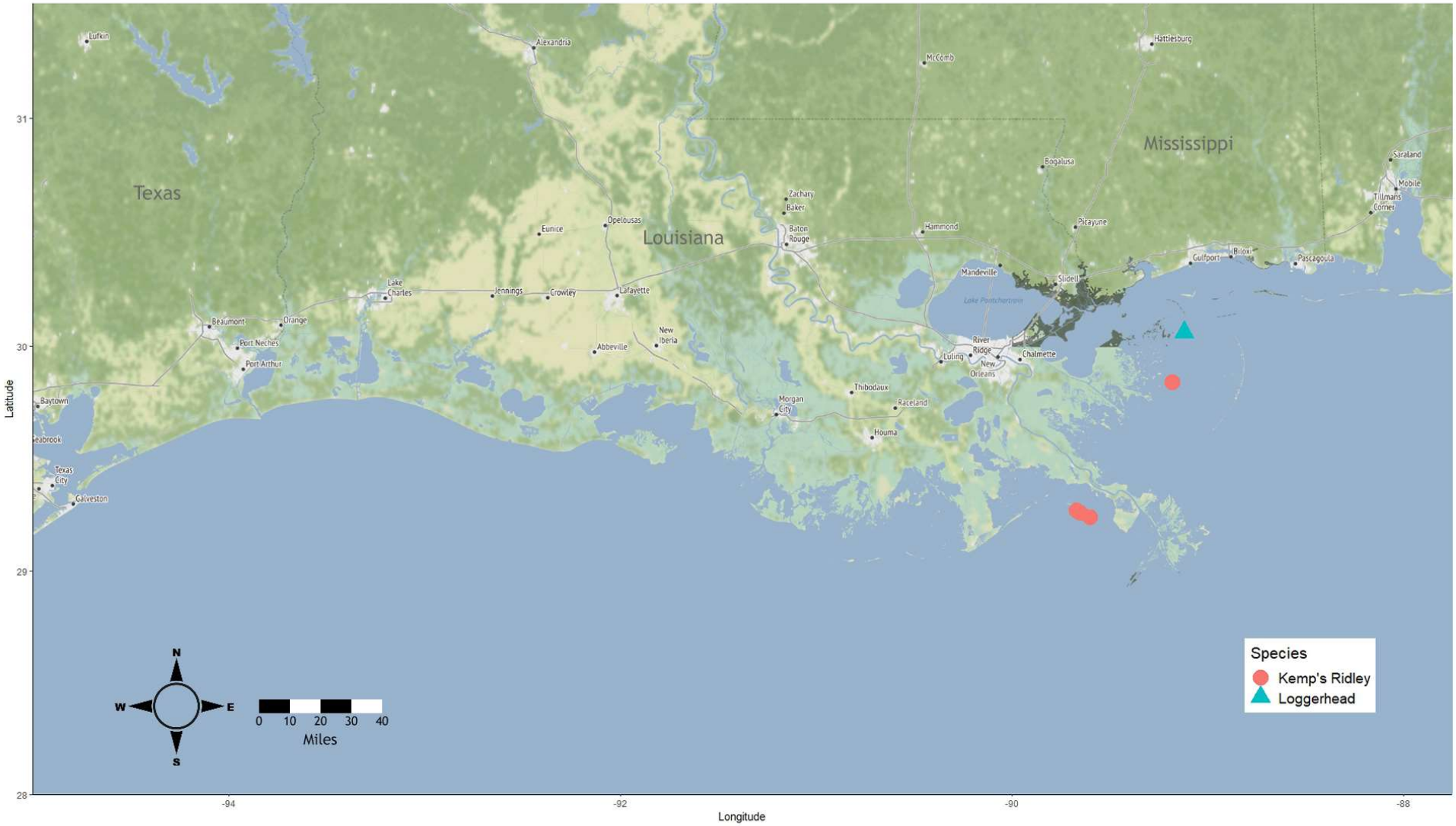

Figure 6: Map showing all interactions inside the net with sea turtles in May during Pilot Year 1.

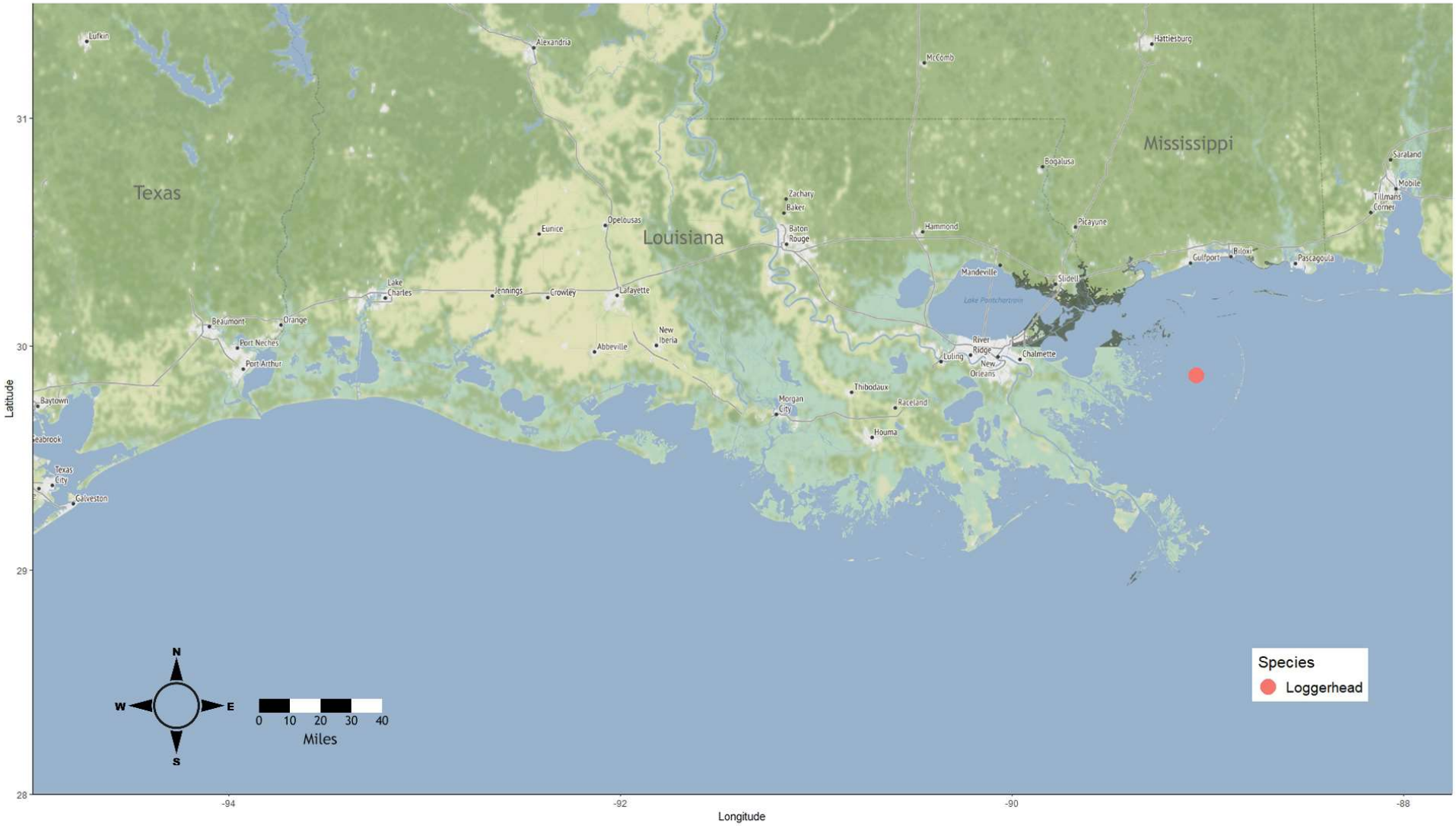

Figure 7: Map showing all interactions inside the net with sea turtles in June during Pilot Year 1.

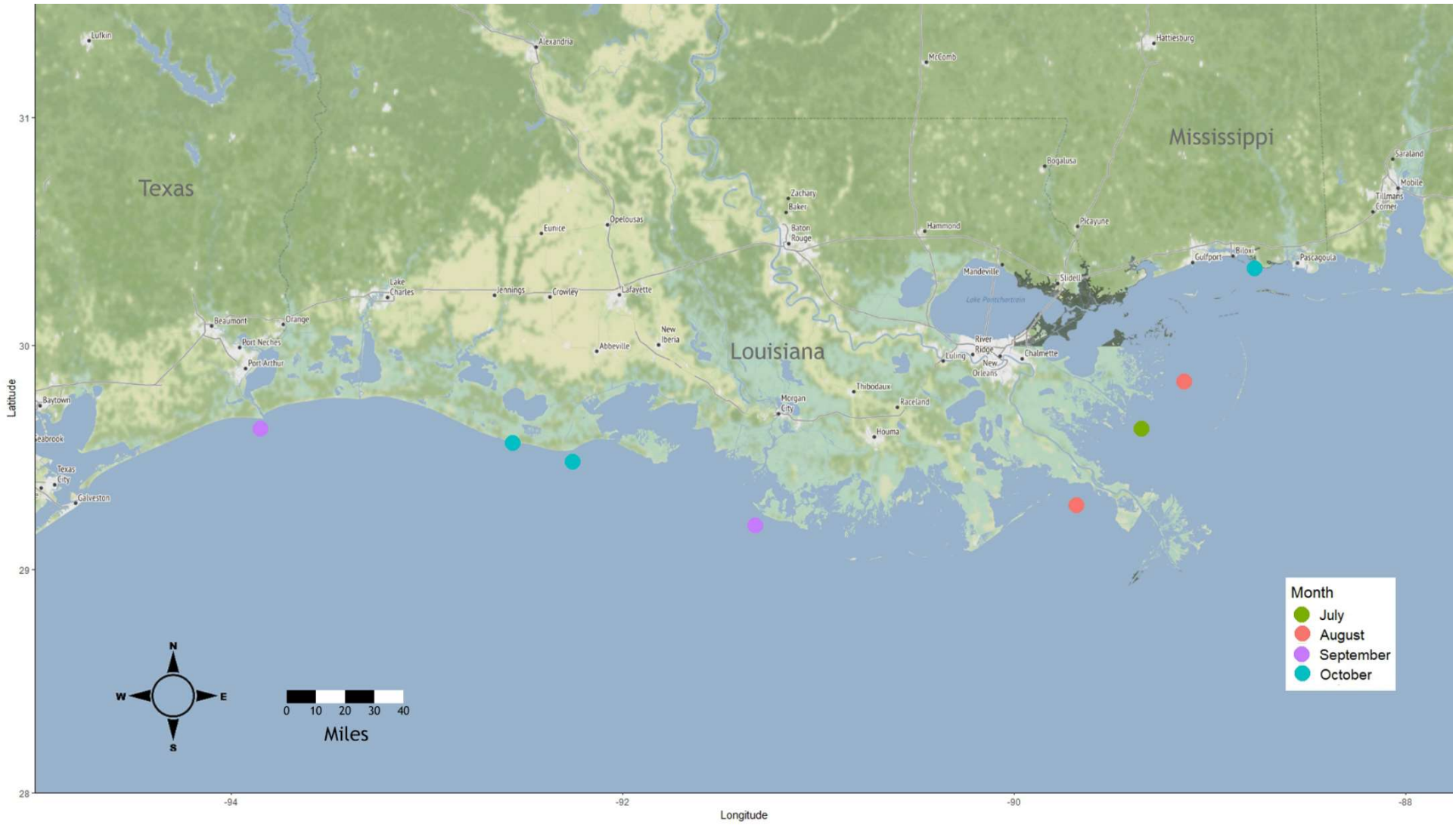

Figure 8: Map showing all interactions inside the net with bottlenose dolphins in July through October of Pilot Year 1.

Figure 9: Saltwater Inc. Research flag that was displayed by the alternate platform during observer operations in Pilot Year 1. Photo credit: Mark Seramur, Saltwater Inc.

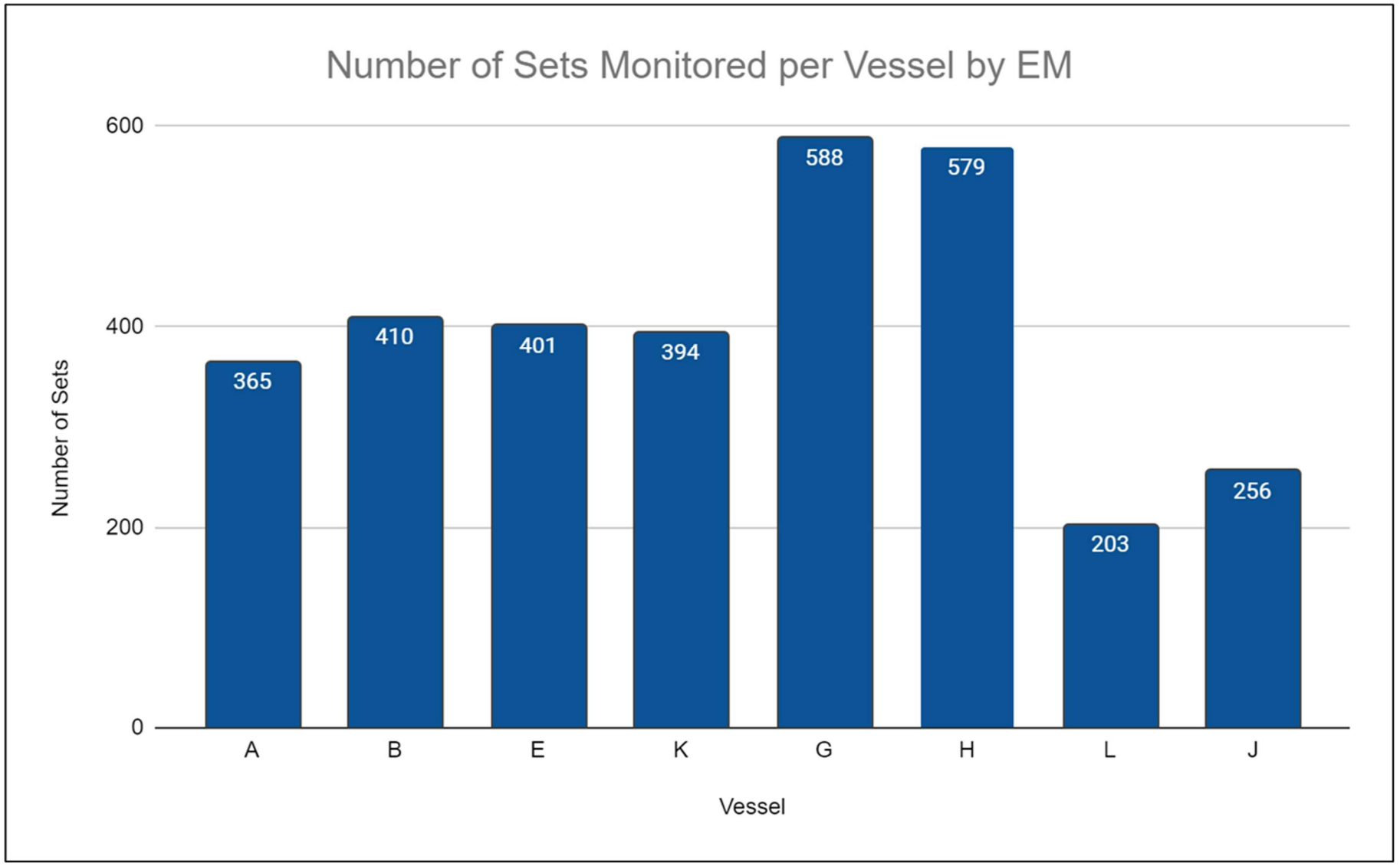

Figure 10: Total sets observed by EM per vessel for Pilot Year 2.

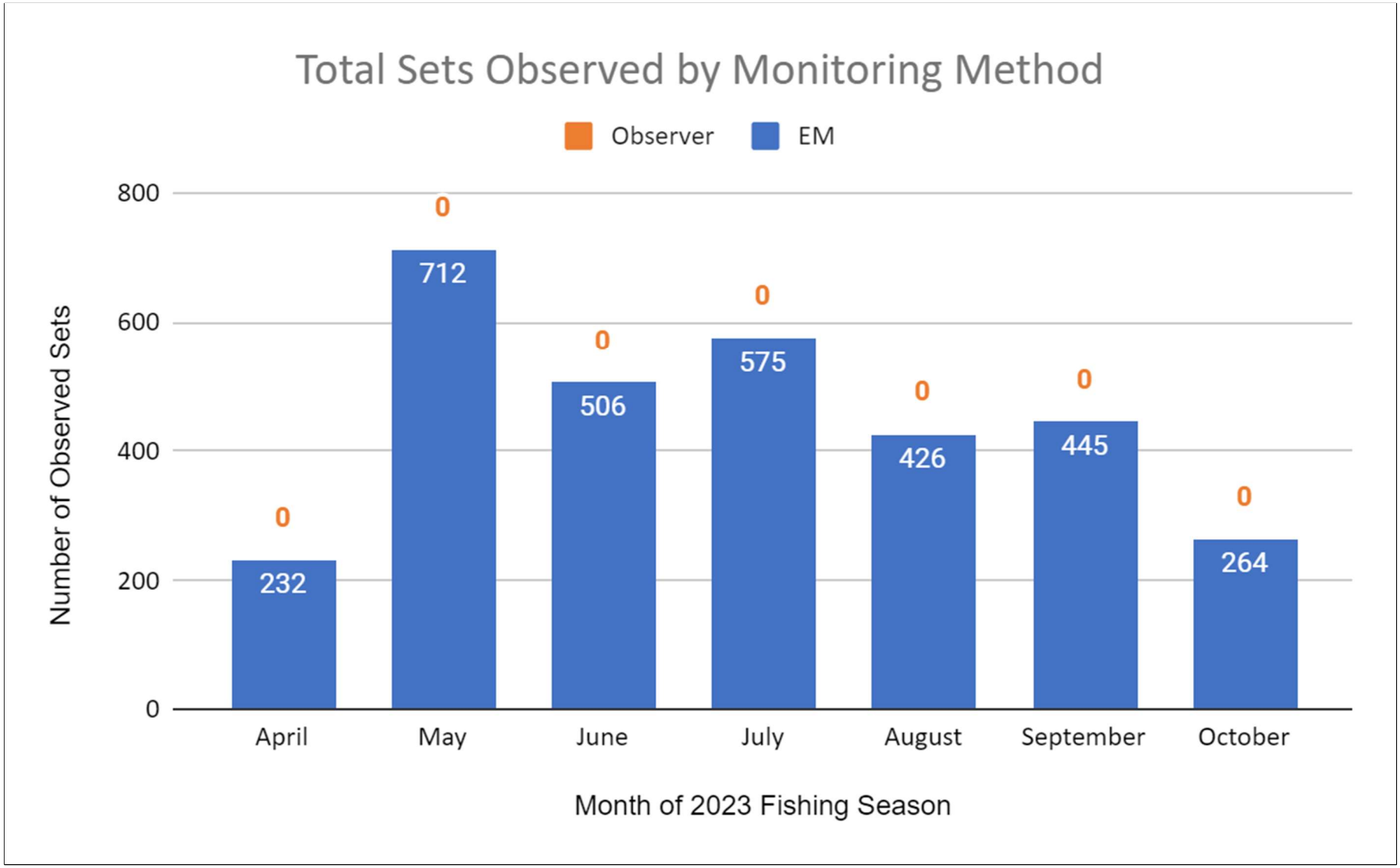

Figure 11: Total sets observed by monitoring method and month for Pilot Year 2.

Table 11: List of all sea turtle and dolphin interactions inside the net by date, monitoring method, and vessel for Pilot Year 2.

Date	Species	Count	Monitoring Method	Vessel	Latitude	Longitude	Release Timing	Release Condition	Reason for Unknown
4/19/2023	Bottlenose Dolphin^	2	EM	Vessel B	28.95	-89.41	Released at the finish of pumping	Alive	-
4/19/2023	Bottlenose Dolphin^	1	EM	Vessel B	28.95	-89.41	Released at the finish of pumping	Unknown	Image quality/ Obstruction
4/20/2023	Kemp's Ridley	1	EM	Vessel E	29.11	-89.50	Released at the finish of pumping	Alive	-
4/27/2023	Kemp's Ridley	1	EM	Vessel E	29.21	-89.54	Released at the finish of pumping	Alive	-
5/4/2023	Bottlenose Dolphin	1	EM	Vessel E	29.27	-89.86	Released at the finish of pumping	Alive	-
5/9/2023	Bottlenose Dolphin	1	EM	Vessel K	29.00	-90.68	Released at the finish of pumping	Dead	-
5/10/2023	Loggerhead	1	EM	Vessel H	29.76	-89.15	Released at the finish of pumping	Alive	-
5/11/2023	Kemp's Ridley	1	EM	Vessel G	29.85	-89.12	Released at the finish of pumping	Alive	-
5/15/2023	Kemp's Ridley	1	EM	Vessel B	29.83	-89.18	Released at the finish of pumping	Unknown	Animal Behavior
5/17/2023	Bottlenose Dolphin	2	EM	Vessel G	29.25	-89.87	Other	Unknown	Image quality/ Obstruction
5/19/2023	Kemp's Ridley	1	EM	Vessel H	29.68	-89.26	Released at the finish of pumping	Alive	-
5/22/2023	Loggerhead	1	EM	Vessel K	29.78	-89.23	Released at the finish of pumping	Alive	-
5/22/2023	Bottlenose Dolphin	2	EM	Vessel K	29.74	-89.16	Released at the finish of pumping	Alive	-
5/29/2023	Kemp's Ridley	2	EM	Vessel B	29.67	-89.29	Released at the finish of pumping	Alive	-
5/29/2023	Kemp's Ridley	2	EM	Vessel B	29.67	-89.27	Released at the finish of pumping	Alive	-

Table 11 continued (2 of 3): List of all sea turtle and dolphin interactions inside the net during Pilot Year 2.

Date	Species	Count	Monitoring Method	Vessel	Latitude	Longitude	Release Timing	Release Condition	Reason for Unknown
5/29/2023	Bottlenose Dolphin	1	EM	Vessel L	29.48	-92.46	Released at the finish of pumping	Unknown	Animal Behavior
6/1/2023	Kemp's Ridley	1	EM	Vessel H	29.23	-89.53	Released at the finish of pumping	Alive	-
6/1/2023	Kemp's Ridley	1	EM	Vessel H	29.24	-89.59	Released at the finish of pumping	Alive	-
6/6/2023	Bottlenose Dolphin	2	EM	Vessel K	29.49	-92.33	Released at the finish of pumping	Unknown	Animal Behavior
6/20/2023	Kemp's Ridley	1	EM	Vessel G	29.80	-89.26	Released at the finish of pumping	Alive	-
6/26/2023	Kemp's Ridley	1	EM	Vessel H	29.71	-89.27	Released at the finish of pumping	Alive	-
6/27/2023	Bottlenose Dolphin	1	EM	Vessel K	29.91	-89.14	Released at the finish of pumping	Alive	-
6/28/2023	Loggerhead	1	EM	Vessel E	29.21	-89.53	Released at the finish of pumping	Unknown	Animal Behavior
6/28/2023	Kemp's Ridley	1	EM	Vessel E	29.28	-89.67	Released at the finish of pumping	Unknown	Animal Behavior
7/5/2023	Bottlenose Dolphin	1	EM	Vessel B	29.88	-89.12	Released at the finish of pumping	Dead	-
7/5/2023	Bottlenose Dolphin	3	EM	Vessel E	29.20	-89.52	Other	Unknown	Image quality/ Obstruction
7/6/2023	Kemp's Ridley	1	EM	Vessel H	29.05	-89.42	Released at the finish of pumping	Alive	-
7/6/2023	Bottlenose Dolphin	1	EM	Vessel B	29.61	-89.40	Released at the finish of pumping	Unknown	Image quality/ Obstruction
7/10/2023	Bottlenose Dolphin	1	EM	Vessel A	29.63	-89.38	Released at the finish of pumping	Dead	-
7/10/2023	Bottlenose Dolphin^	1	EM	Vessel K	29.63	-89.37	Released at the finish of pumping	Alive	-

Table 11 continued (3 of 3): List of all sea turtle and dolphin interactions inside the net during Pilot Year 2.

Date	Species	Count	Monitoring Method	Vessel	Latitude	Longitude	Release Timing	Release Condition	Reason for Unknown
7/10/2023	Bottlenose Dolphin^	1	EM	Vessel K	29.63	-89.37	Released at the finish of pumping	Dead	-
7/10/2023	Bottlenose Dolphin	1	EM	Vessel K	29.72	-89.23	Released at the finish of pumping	Unknown	Image quality/ Obstruction
7/14/2023	Bottlenose Dolphin	1	EM	Vessel E	29.08	-90.23	Released at the finish of pumping	Dead	-
7/19/2023	Bottlenose Dolphin	2	EM	Vessel K	29.70	-89.33	Released at the finish of pumping	Unknown	Image quality/ Obstruction
8/3/2023	Bottlenose Dolphin	1	EM	Vessel L	29.48	-92.44	Released at the finish of pumping	Unknown	Animal Behavior
8/9/2023	Kemp's Ridley	1	EM	Vessel K	30.00	-89.08	Released at the finish of pumping	Alive	-
8/16/2023	Kemp's Ridley	1	EM	Vessel G	29.36	-89.22	Released at the finish of pumping	Alive	-
8/29/2023	Loggerhead	1	EM	Vessel J	29.10	-91.15	Released at the finish of pumping	Alive	-
9/4/2023	Bottlenose Dolphin	1	EM	Vessel K	29.40	-89.40	Released at the finish of pumping	Dead	-
9/5/2023	Loggerhead^	1	EM	Vessel A	28.95	-91.18	Released at the finish of pumping	Alive	-
9/5/2023	Kemp's Ridley^	1	EM	Vessel A	28.95	-91.18	Released at the finish of pumping	Alive	-
9/6/2023	Kemp's Ridley	1	EM	Vessel B	29.03	-91.09	Released at the finish of pumping	Alive	-
9/11/2023	Bottlenose Dolphin	1	EM	Vessel K	29.17	-91.25	Released at the finish of pumping	Alive	-
10/9/2023	Bottlenose Dolphin	3	EM	Vessel H	29.15	-91.2	Released at the finish of pumping	Unknown	Image quality/ Obstruction
10/10/2023	Loggerhead	1	EM	Vessel G	29.04	-90.93	Released at the finish of pumping	Alive	-

1^ Indicates that the species are from the same interaction

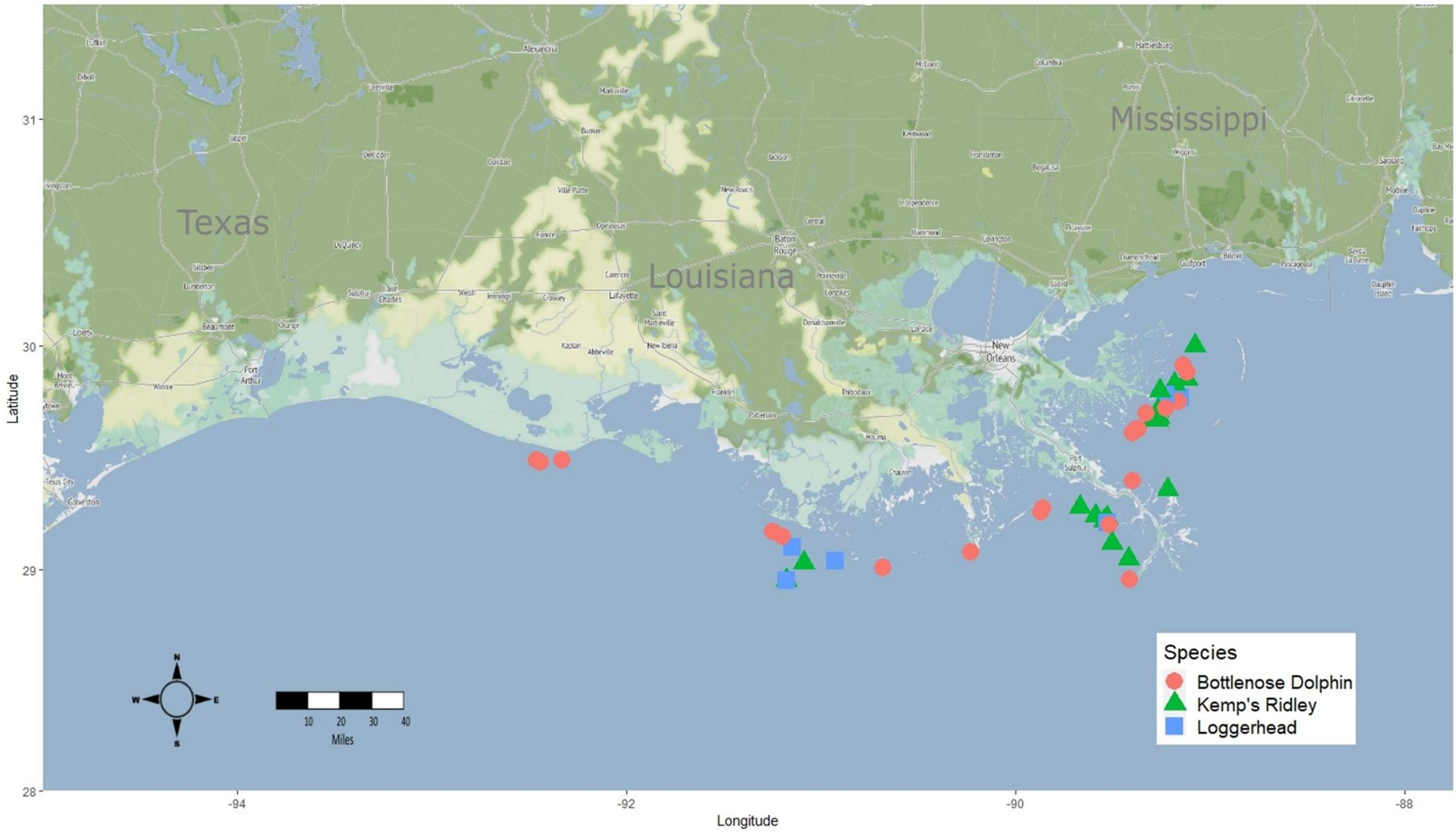

Figure 12: Map showing all interactions inside the net with sea turtles and dolphins during Pilot Year 2.

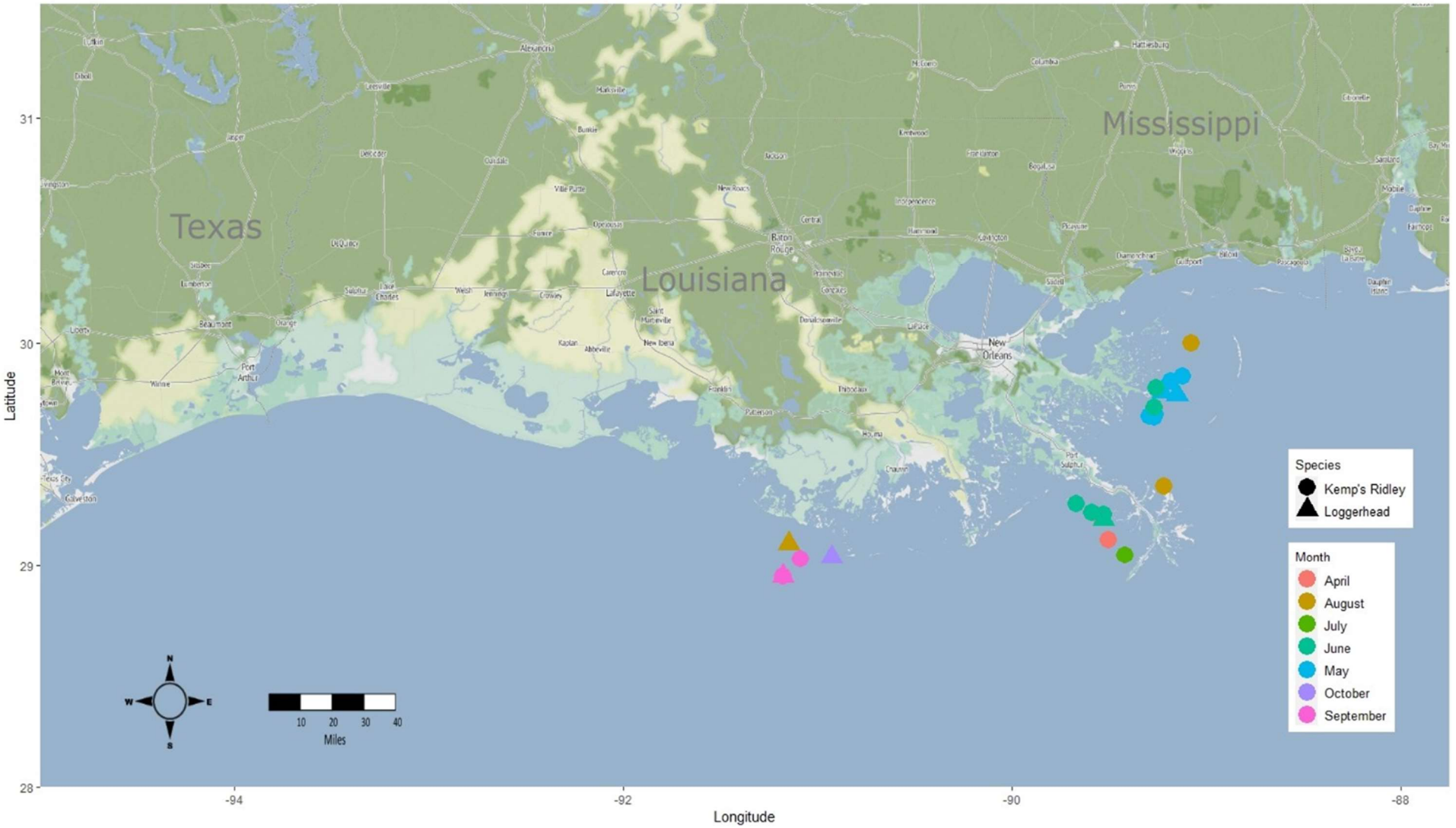

Figure 13: Map showing all interactions inside the net with sea turtles by month during Pilot Year 2.

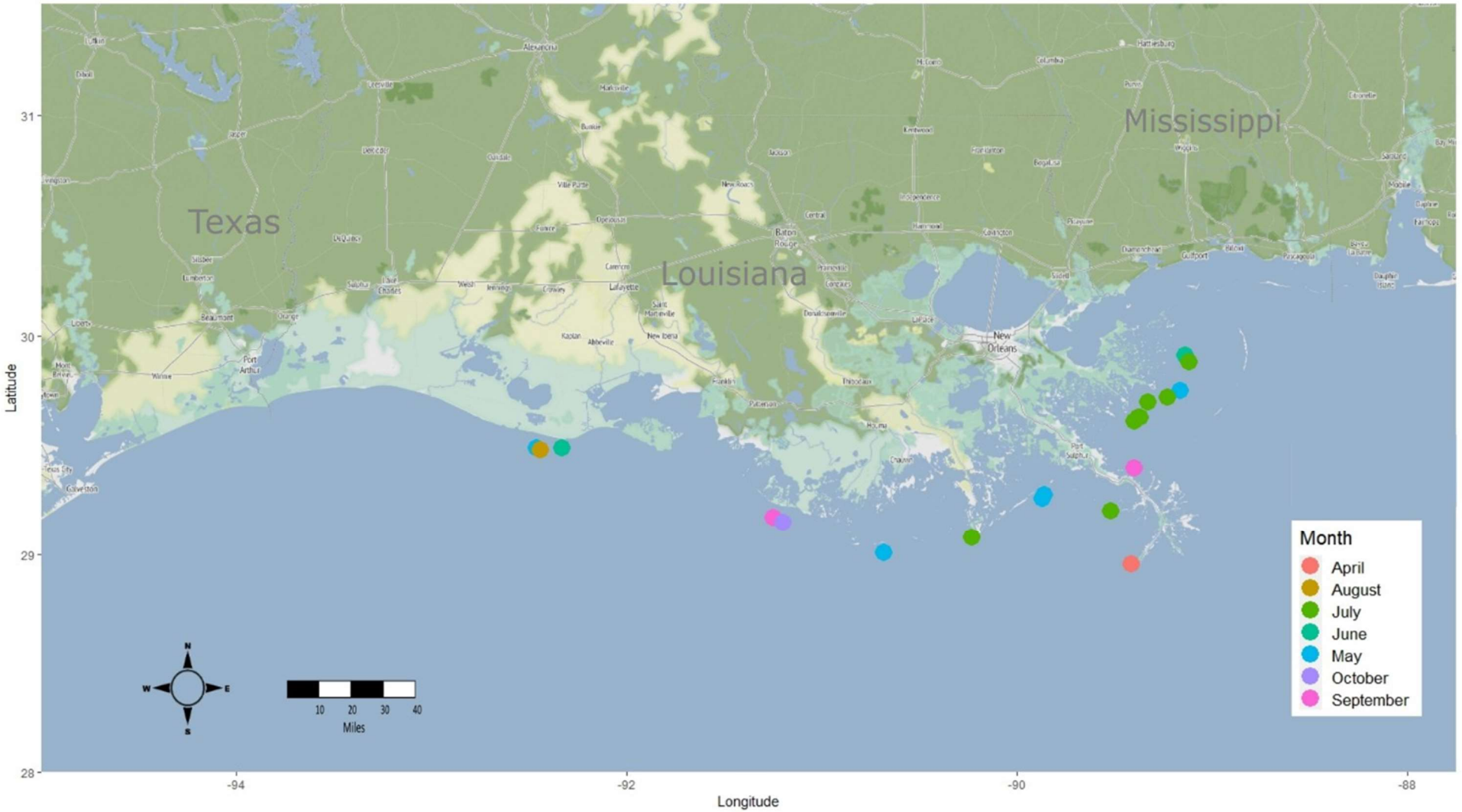

Figure 14: Map showing all interactions inside the net with bottlenose dolphins by month during Pilot Year 2.

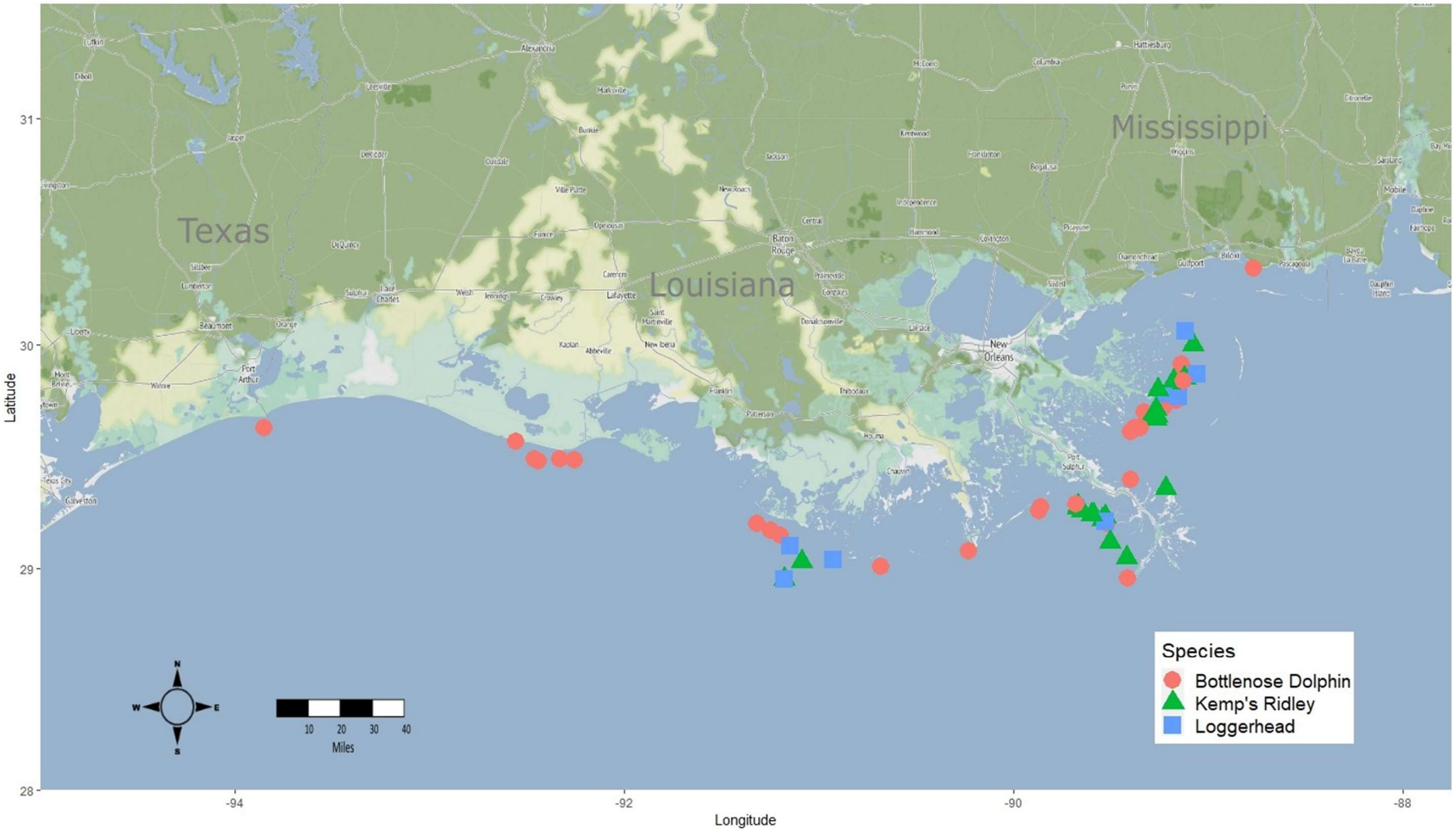

Figure 15: Map showing all interactions inside the net with sea turtles and bottlenose dolphins during both Pilot Year 1 and 2.

Table 12: List of all data retrievals conducted throughout Pilot Year 2 and reporting periods.

Start Date of Visits	End Date of Visits	Ports Visited	Expected Data on HDDs	Expected Days of Data per Hard Drive	Reporting Date	Reports Delivered
4/28/2023	4/30/2023	All	4/15-4/28	13	5/30/2023	HDD Report and April Monthly Report
5/12/2023	5/14/2023	All	4/29-5/12	14	6/13/2023	HDD Report
5/26/2023	5/28/2023	All	5/13-5/26	14	6/27/2023	HDD Report
6/9/2023	6/11/2023	All	5/27-6/9	14	7/11/2023	HDD Report and May Monthly Report
6/23/2023	6/25/2023	All	6/10-6/23	14	7/25/2023	HDD Report
7/7/2023	7/9/2023	All	6/24-7/7	14	8/8/2023	HDD Report and June Monthly Report
7/21/2023	7/23/2023	All	7/8-7/21	14	8/22/2023	HDD Report
8/4/2023	8/6/2023	All	7/22-8/4	14	9/5/2023	HDD Report and July Monthly Report
8/18/2023	8/20/2023	All	8/5-8/18	14	9/19/2023	HDD Report
9/1/2023	9/3/2023	All	8/19-9/1	14	10/3/2023	HDD Report and August Monthly Report
9/15/2023	9/17/2023	All	9/2-9/15	14	10/17/2023	HDD Report
9/29/2023	10/1/2023	All	9/16-9/29	14	10/31/2023	HDD Report
10/13/2023	10/15/2023	All	9/30-10/13	14	11/14/2023	HDD Report and September Monthly Report
11/1/2023	11/3/2023	All	10/14-11/1	19	12/3/2023	HDD Report and October Monthly Report