

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

Executive Summary Report

February 2024

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Project Highlights and Outcomes

“*Developing Methods to Observe Sea Turtle Interactions in the Gulf of Mexico Menhaden Purse Seine Fishery*” (“the Menhaden Project”) was one of 18 projects included in the *Deepwater Horizon* Open Ocean Trustee Implementation Group Restoration Plan 2/Environmental Assessment, released in December 2019. This project was awarded \$3M for implementation, with a goal of testing methods to observe the Gulf of Mexico Menhaden Fishery and collecting data on the nature and extent of interactions with sea turtles. A secondary goal was to identify opportunities for effective voluntary practices to reduce injury and mortality, if it is found to occur. The project team successfully completed all components, and the major findings are listed below.

- A steering committee comprised of NOAA, Saltwater, Inc. and industry representatives provided real time feedback to guide this project
- Sea turtles were the primary taxa group focused on for this restoration project.
- The project successfully identified and tested protocols for observing the Gulf of Mexico Menhaden fishery. The most cost effective and efficient method tested was electronic monitoring via video cameras with human video review.
- A total of 4,908 sets (approximately 10-20% of overall yearly effort) were observed over two years (2022 and 2023). Of the 4,908 sets recorded, a total of 75 interactions with protected species were observed (31 sea turtles and 44 dolphins).
- Based on visual assessment of the video, 28 sea turtle interactions resulted in the animals being released alive, while 3 were released in undetermined condition upon completion of the pumping.
- Potential next steps have been identified to reduce potential injury/harm to sea turtles, however due to the nature of observed interactions, a follow-up restoration project is not being proposed.

Introduction

On or about April 20, 2010, the mobile offshore drilling unit *Deepwater Horizon*, which was being used to drill a well for BP Exploration and Production, Inc. (BP) in the Macondo prospect (Mississippi Canyon 252 – MC252), exploded, leading to a fire and its subsequent sinking in the Gulf of Mexico (GoM). This incident resulted in discharges of oil and other substances into the GoM from the rig and the submerged wellhead, and resulting response actions, affecting multiple natural resources, which provide a number of important ecological and human use services.

In the *Deepwater Horizon (DWH) Oil Spill Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (PDARP/PEIS; DWH NRDA Trustees, 2016a)*, the Trustees selected a comprehensive, integrated ecosystem approach to restoration in the Gulf of Mexico. The restoration portfolio allocates up to \$8.8

billion (including funds already spent for Early Restoration) paid out over fifteen years for natural resources restoration across the five Gulf States and the open ocean. The “*Developing Methods to Observe Sea Turtle Interactions in the Gulf of Mexico Menhaden Purse Seine Fishery*” (“the Menhaden Project”) is one of eighteen projects included in the *Deepwater Horizon Open Ocean Trustee Implementation Group Restoration Plan 2/Environmental Assessment*, released in December 2019, to restore for injuries to fish, sea turtles, marine mammals, and mesophotic and deep benthic communities.

The Gulf of Mexico menhaden purse seine fishery occurs in state waters, primarily off Louisiana, Mississippi, and Alabama. Fishery operations include a mother vessel (or steamer) with two boats (purse boats) that run around a portion of a school of menhaden with the purse seine, and then cinch the bottom of the seine closed while reducing the volume inside the seine to concentrate the menhaden catch. The purse seine is typically one thousand two hundred (1,200) feet long, resulting in a diameter of over three hundred and eighty (380) feet before the seine is cinched together and reduced in size to concentrate the catch prior to tying it up with the steamer. The purse boats then bring the net alongside the steamer (the steamers are 140-200 feet long vessels), where the crew on the steamer uses a large hose with an exclusion grate on the end, to pump the menhaden out of the net and up into the ship’s hold. Following the pumping operation, the crew at the net then performs a “roll over” where the cork line of the net is submerged and all larger fish, or animals if present, that were excluded by the hose grate are released from the net.

It is important to be able to effectively observe all primary aspects of the operation to determine if sea turtle interactions occurred, and to detail the nature of the interactions. In order to develop an effective observer methodology for this fishery, this project conducted a one (1) week proof-of-concept (POC) phase to determine approaches (fixed electronic monitoring devices, human observers, drones/UAS) and observation vantage points that are deemed feasible for further, in-depth testing in a subsequent two (2) year pilot observer program. To execute the human observer and electronic monitoring portion for both Pilot years, NOAA worked with contractor Saltwater Inc. This project cost approximately \$2.5M and was executed from July 2020 - March 2024. This report summarizes the findings from the Pilot Years 1 and 2 during the 2022-2023 fishing seasons.

Contents of this Report

The following report provides a summary of field efforts over multiple years. The discussion below provides a summary of field work conducted during 2021, 2022 and 2023 and a summary discussion of the protected species interactions observed. For more detailed yearly data reports and project information visit this project’s page on the Gulf Spill Restoration website:

<https://www.gulfspillrestoration.noaa.gov/project?id=220>. Here you will find reports detailing:

- [Proof of Concept Field Work \(2021\)](#)
- [Year 1 Data Collection Report from 2022 Menhaden Fishing Season](#)
- [Year 1 and 2 Data Collection Report from 2022-2023 Menhaden Fishing Season](#)

Steering Committee

In order to coordinate across all project elements, a steering committee was formed to guide project elements, problem solve field issues and review written materials. The steering committee met regularly through the fishing season to discuss the data in near real time and met outside the fishing season to prepare for year two and to review data sheets and written reports. The steering committee consisted of representatives from NOAA, Saltwater Inc., and industry representatives from Daybrook, Westbank, Omega, and Ocean Harvesters.

Methods of Observation

Proof of Concept

An initial 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. Additionally, drones were operated from the alternate platform to test the ability to view operations from above. Drones were not used beyond the POC effort due to challenges discussed below.

Based on the findings from that POC, Pilot Year 1 was conducted during the 2022 season involving eight volunteer vessels carrying EM systems and one alternate platform carrying observers. Pilot Year 2 continued in the 2023 season involving eight volunteer vessels carrying EM systems and no observers.

Human Observers

Observers were deployed on an alternate platform in the GoM for a total of 126 days during the 2022 fishing season. During this period, no sets were observed for 40.9% of their field days. The lack of observations was due to a variety of reasons including weather, vessels being inaccessible or not fishing, logistical issues with the alternate platform itself, or lack of ability to leave the dock.

During the 360 sets that were observed through this method in 2022, there were many sightings of dolphins around the outside of the net, but only one interaction was observed where a bottlenose dolphin was identified as being encircled by the net. This dolphin was only sighted once early in the net set and the dolphin's release was not seen by the observer; therefore, the outcome could not be verified. This interaction is not included in the table and total numbers in the following sections. No sea turtle interactions were seen by observers during Pilot Year 1. Due to the lack of efficiency in this method to observe the fishery and interactions with sea turtles/marine mammals, the use of human observers from an alternate platform was not moved forward into Pilot Year 2.

Electronic Monitoring

Saltwater Inc. EM technicians installed EM systems on eight GoM menhaden purse seine vessels between April 12-June 5, 2022, and March 13-April 6, 2023. All vessels were located across 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 the entire

menhaden season. Pilot Year 1 recorded a total of 1,748 sets (9.7% of total fishing effort); however, many challenges were encountered. Issues included both EM system problems (power loss, video loss, image quality issues), and logistical problems (few hard drives being retrieved from the vessels).

The steering committee worked together to identify ways to limit and minimize issues and problems before starting Pilot Year 2. All challenges/problems that were encountered in Pilot Year 1 were well documented, which allowed for identification of areas of improvement. Discussions on areas to improve included more efficient install of units, vessel selection for EM install, EM testing on selected vessels prior to the start of season and a revised method of hard-drive retrieval. While Pilot Year 2 still encountered some power loss, video loss, and image quality issues, the total number of sets reviewed increased almost 2-fold to 3,160 sets (21.5% of preliminary reported total fishing effort in 2023). The efficiency of Pilot Year 2 was largely due to: (1) increased/better communication between Saltwater Inc., NOAA, and the Menhaden Industry reps; (2) testing the EM systems on selected vessels prior to install to determine suitability; (3) timely review of EM footage to address any issues as quickly as possible; and (4) the switch from vessel captains mailing in hard-drives to having Saltwater Inc. technicians travel to retrieve the hard-drives themselves on a bi-weekly schedule.

Conclusions

Effective Observation Methods

The primary goal of the Menhaden Project was to test methods, including initial data collection, and determine if any were effective and feasible for observing sea turtle and marine mammal interactions in the fishery. After conducting a Proof of Concept, it was determined that drones were not an effective method to observe interactions. While drones provided a great aerial view of the fishing operation as a whole, the minimum safe height for operating the drone did not allow for an ideal vantage point to observe interactions. Additionally, the personnel needed to operate the drone, and limited battery life limit the effectiveness of this method.

Human observers were determined to be a semi-effective method to observe the first part of the menhaden operation – when the net is formed into a circle (called the compass) to initially encircle a group of menhaden. A human observer aboard an alternate platform is able to circle around the net and monitor for marine mammals free swimming inside the net. Glare, viewing angle, and distance from the net did, however, create difficulties in obtaining a full view. Human observers aboard an alternate platform were unable to effectively observe sea turtles in the net as it was closed and brought to the steamer vessel. Additionally, due to safety concerns and placement of the purse boats alongside the steamer, the alternate platform could not get close enough, or provide a high enough vantage point, to allow for the human observer to see any sea turtle or marine mammal interactions during pumping or rollover procedures.

Electronic monitoring was found to be an effective and feasible method of observing marine mammal and sea turtle interactions during the pumping and rollover procedures. The pumping and rollover procedures were the primary points of observation to understand the disposition of the animal post interaction. While issues still occurred with electronic monitoring such as camera

triggering failures or delays, glare, salt spray, etc., this method was by far the most effective for observations. Sea turtle and marine mammal interactions were identified easily, and able to be identified down to species in all interactions observed. Additionally, the disposition of the animal as alive or dead was apparent in 73% of interactions. It is unknown if EM can provide the ability to see small sea turtles in the pumping net. All sea turtles identified in the net during the project were considered to be subadult to adult size. Additionally, EM data were collected and reviewed of the sorting chute - where menhaden are sorted to go into the hull while bycatch are discarded off the side of the boat. No sea turtles or marine mammals were observed in this footage. It is unknown if EM can provide the ability to see small turtles in the sorting chute.

Protected Species Interactions

For the purpose of this project, all instances where a sea turtle or marine mammal ended up inside the purse seine were considered an “interaction.” The intent was to determine if there was a method of observation to detect protected species that was feasible and effective within the menhaden fishery. The data collected were not used to extrapolate any numbers across the fishery. The data collected within this project only represent the interactions seen through the various methods of observation tested. A summary of all interactions, including total number of animals as well as disposition of the animal at net rollover is found in Table 1. A comprehensive table showing all interactions including the date, species, disposition at rollover, vessel, and latitude/longitude can be found in Table 2.

Across both Pilot Year 1 and Pilot Year 2, a total of 75 interactions were observed, within 55 sets (Table 1). All marine mammals involved (n=44) were bottlenose dolphins, *Tursiops truncatus*. Sea turtle interactions were identified for Kemp’s ridleys (*Lepidochelys kempii*) (n=23) and loggerheads (*Caretta caretta*) (n=8). Only two sets involved more than one turtle interaction in the set. Ten sets involved multiple marine mammal interactions in the set, ranging from two to five dolphins. All animals, both sea turtles and marine mammals, were considered to be free swimming in the net during the pumping operation. One sea turtle was temporarily entrapped and suspended in the net during the rollover process prior to being released alive. There were no animals entangled in the net itself. All animals were assessed at the time of release for an alive, dead, or unknown disposition (Figure 1). Of the total number of animals observed, 46 (MM=18, ST =28) were released at rollover alive, 8 (MM=8, ST=0) were released at rollover dead, and 21 (MM=18, ST = 3) were released at rollover with an unknown disposition.

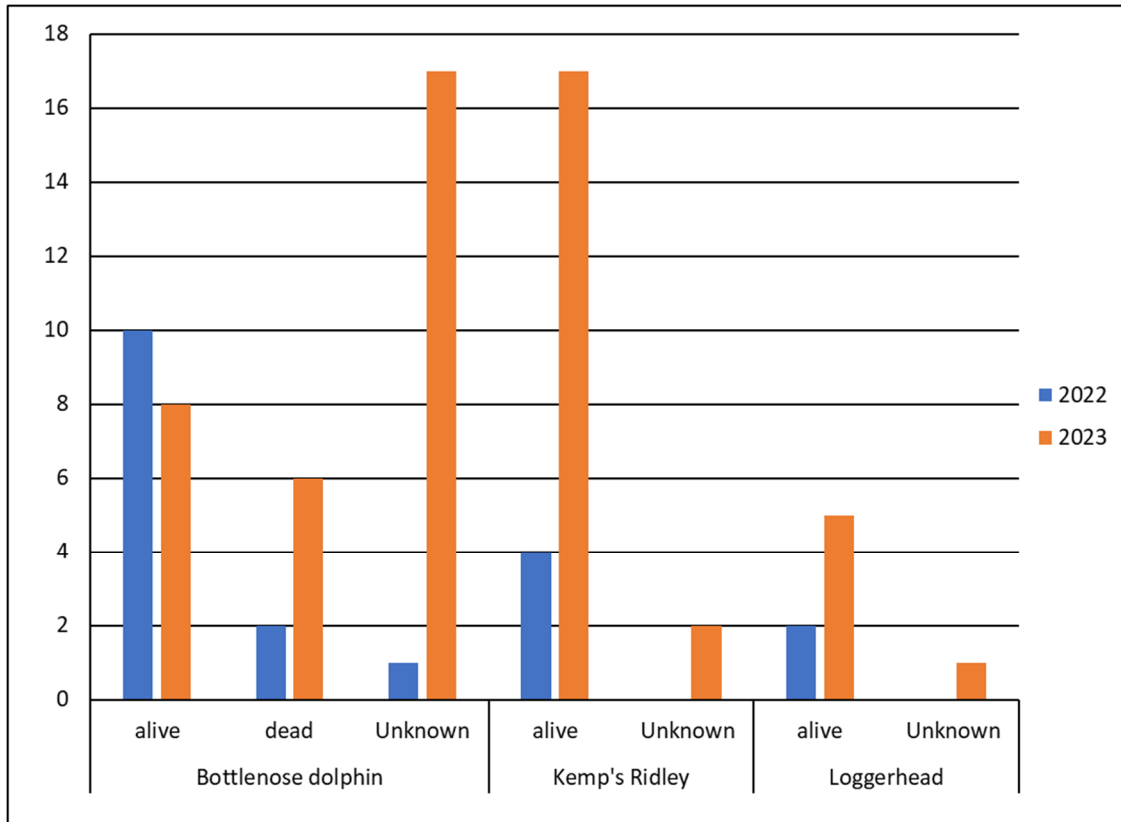


Figure 1. All interactions across all years, by species and disposition.

“Unknown” disposition was used conservatively. Unknown disposition was defined as either when image quality or an obstruction in the footage prevented the reviewer from seeing the rolover, or when animals moving on their own could not be distinguished from the rolling of the net moving the animal. Thirteen animals (MM=13, ST=0) were considered an unknown disposition at rolover due to image quality or view obstruction, while 8 animals (MM=5, ST=3) were considered an unknown disposition at rolover due to animal movement.

Across both Pilot Years, there were a total of 11 different vessels that were outfitted with EM, for either one or both years. At least one interaction was observed from each of these vessels. All interactions were mapped and are reflected in Figures 2-8.

Recommendations

Following the implementation of the Project, and after reviewing all data that were collected, NOAA was successful in observing fishery operations and protected species in the net. The observed interactions for sea turtles and marine mammals were not examined for injury within this project; they were only reviewed for released disposition to be determined as alive, dead, or unknown. Over the course of the project, 4,908 total sets were observed. Thirty-one turtles were recorded, all being released alive except for three that were released with an unknown

disposition. Forty-four marine mammals were recorded with release dispositions of 18 alive, eight dead, and 18 unknown. Based on these data, NOAA recommends the menhaden fishery take the following actions:

- Continue collaboration with NOAA species experts to identify, if possible, safe and feasible ways to remove protected species sooner than rollover in the pumping process, to reduce the frequency and severity of interactions
- Continue discussions regarding ESA and MMPA with NOAA
 - Options for authorizing sea turtle interactions under the ESA
 - Reporting marine mammals interactions to the [Marine Mammal Authorization Program](#)
- Continue industry collaboration should other partners desire to monitor the fishery for protected species

Tables

Table 1. Summary of major findings for both Pilot Year 1 and Pilot Year 2. Major findings include number of sets, number of interactions, and disposition of the animals at rollover.

	Pilot Year 1 - 2022		Pilot Year 2 - 2023		Disposition at Rollover			
	Sets	Total animals (interactions)	Sets	Total animals (interactions)	Alive	Dead	Unk. (image quality and/or obstruction)	Unk. (animal behavior)
Marine Mammals	7	13	20	31	18	8	13	5
Sea Turtles	6	6	22	25	28	0	0	3
Totals	13	19	42	56	46	8	13	8

Table 2. Comprehensive table showing all interactions from Pilot Year 1 and 2, including the date, species, disposition at rollover, vessel, and latitude/longitude.

Date	Species	Disposition at Rollover	Vessel	Lat	Long
Pilot Year 1					
5/5/2022	Loggerhead	alive	Vessel G	30.06	-89.12
5/9/2022	Kemp's ridley	alive	Vessel G	29.84	-89.18
5/11/2022	Kemp's ridley	alive	Vessel G	29.26	-89.65
5/11/2022	Kemp's ridley	alive	Vessel G	29.27	-89.67
5/17/2022	Kemp's ridley	alive	Vessel G	29.24	-89.6
6/28/2022	Loggerhead	alive	Vessel D	29.87	-89.06
7/25/2022	Bottlenose dolphin	unknown	Vessel B	29.63	-89.35
8/1/2022	Bottlenose dolphin	dead	Vessel D	29.84	-89.13
9/6/2022	Bottlenose dolphin	alive	Vessel C	29.63	-93.85
9/8/2022	Bottlenose dolphin	alive	Vessel D	29.2	-91.32
	Bottlenose dolphin	alive	Vessel D	29.2	-91.32

Date	Species	Disposition at Rollover	Vessel	Lat	Long
	Bottlenose dolphin	alive	Vessel D	29.2	-91.32
10/4/2022	Bottlenose dolphin	alive	Vessel F	29.48	-92.25
10/4/2022	Bottlenose dolphin	alive	Vessel F	29.57	-92.56
	Bottlenose dolphin	alive	Vessel F	29.57	-92.56
	Bottlenose dolphin	alive	Vessel F	29.57	-92.56
	Bottlenose dolphin	alive	Vessel F	29.57	-92.56
	Bottlenose dolphin	alive	Vessel F	29.57	-92.56
10/20/2022	Bottlenose dolphin	dead	Vessel B	30.34	-88.77
Pilot Year 2					
4/19/2023	Bottlenose dolphin	alive	Vessel B	28.955	-89.415
	Bottlenose dolphin	alive	Vessel B	28.955	-89.415
	Bottlenose dolphin	unknown	Vessel B	28.955	-89.415
4/20/2023	Kemp's ridley	alive	Vessel E	29.117	-89.506
4/27/2023	Kemp's ridley	alive	Vessel E	29.219	-89.546
5/4/2023	Bottlenose dolphin	alive	Vessel E	29.2765	-89.8615
5/9/2023	Bottlenose dolphin	dead	Vessel K	29.0084	-90.6839
5/10/2023	Loggerhead	alive	Vessel H	29.77	-89.152
5/11/2023	Kemp's ridley	alive	Vessel G	29.851	-89.122
5/15/2023	Kemp's ridley	unknown	Vessel B	29.8305	-89.1854
5/17/2023	Bottlenose dolphin	unknown	Vessel G	29.2575	-89.8703
	Bottlenose dolphin	unknown	Vessel G	29.2575	-89.8703
5/19/2023	Kemp's ridley	alive	Vessel H	29.6186	-89.6814

Date	Species	Disposition at Rollover	Vessel	Lat	Long
5/22/2023	Bottlenose dolphin	alive	Vessel K	29.7492	-89.1655
	Bottlenose dolphin	alive	Vessel K	29.7492	-89.1655
5/22/2023	Loggerhead	alive	Vessel K	29.7807	-89.2307
5/29/2023	Bottlenose dolphin	unknown	Vessel L	29.48898	-92.4624
5/29/2023	Kemp's ridley	alive	Vessel B	29.6746	-89.2972
	Kemp's ridley	alive	Vessel B	29.6746	-89.2972
5/29/2023	Kemp's ridley	alive	Vessel B	29.6704	-89.2717
	Kemp's ridley	alive	Vessel B	29.6704	-89.2717
6/1/2023	Kemp's ridley	alive	Vessel H	29.2262	-89.5297
6/1/2023	Kemp's ridley	alive	Vessel H	29.2353	-89.5858
6/6/2023	Bottlenose dolphin	unknown	Vessel K	29.4892	-92.328
	Bottlenose dolphin	unknown	Vessel K	29.4892	-92.328
6/20/2023	Kemp's ridley	alive	Vessel G	29.8024	-89.2644
6/26/2023	Kemp's ridley	alive	Vessel H	29.7104	-89.2679
6/27/2023	Bottlenose dolphin	alive	Vessel K	29.9084	-89.143
6/28/2023	Kemp's ridley	unknown	Vessel E	29.28	-89.6704
6/28/2023	Loggerhead	unknown	Vessel E	29.2111	-89.527
7/5/2023	Bottlenose dolphin	unknown	Vessel E	29.2012	-89.5239
	Bottlenose dolphin	unknown	Vessel E	29.2012	-89.5239
	Bottlenose dolphin	unknown	Vessel E	29.2012	-89.5239
7/5/2023	Bottlenose dolphin	dead	Vessel B	29.8849	-89.1231
7/6/2023	Kemp's ridley	alive	Vessel H	29.0493	-89.4246
7/6/2023	Bottlenose dolphin	unknown	Vessel B	29.6119	-89.4032
7/10/2023	Bottlenose dolphin	dead	Vessel A	29.6269	-89.383

Date	Species	Disposition at Rollover	Vessel	Lat	Long
7/10/2023	Bottlenose dolphin	unknown	Vessel K	29.7181	-89.2287
7/10/2023	Bottlenose dolphin	alive	Vessel K	29.6287	-89.3712
	Bottlenose dolphin	dead	Vessel K	29.6287	-89.3712
7/14/2023	Bottlenose dolphin	dead	Vessel E	29.0803	-90.2349
7/19/2023	Bottlenose dolphin	unknown	Vessel K	29.6984	-89.3333
	Bottlenose dolphin	unknown	Vessel K	29.6984	-89.3333
8/3/2023	Bottlenose dolphin	unknown	Vessel L	29.4804	-92.4356
8/9/2023	Kemp's ridley	alive	Vessel K	29.9996	-89.0799
8/16/2023	Kemp's ridley	alive	Vessel G	29.357	-89.2198
8/29/2023	Loggerhead	alive	Vessel J	29.1028	-91.1538
9/4/2023	Bottlenose dolphin	dead	Vessel K	29.3976	-89.3968
9/5/2023	Kemp's ridley	alive	Vessel A	28.9475	-91.1756
	Loggerhead	alive	Vessel A	28.9475	-91.1756
9/6/2023	Kemp's ridley	alive	Vessel B	29.0254	-91.0912
9/11/2023	Bottlenose dolphin	alive	Vessel K	29.1745	-91.2462
10/9/2023	Bottlenose dolphin	unknown	Vessel H	29.1468	-91.2006
	Bottlenose dolphin	unknown	Vessel H	29.1468	-91.2006
	Bottlenose dolphin	unknown	Vessel H	29.1468	-91.2006
10/10/2023	Loggerhead	alive	Vessel G	29.0355	-90.9311

Figures

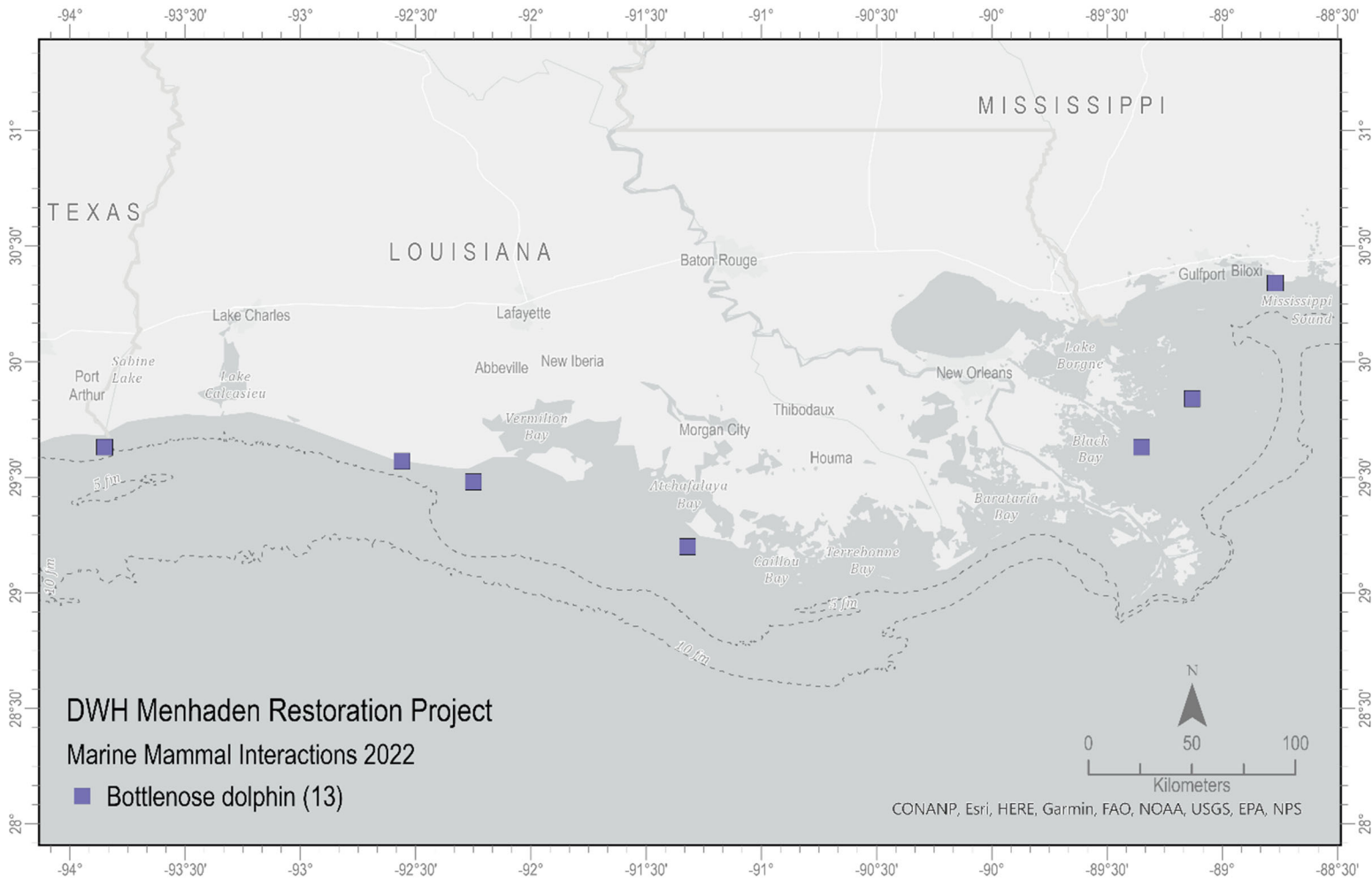


Figure 2. All marine mammal interactions (n=7) in Pilot Year 1 (2022) totaling 13 individual dolphins. Interactions are denoted by the purple square.

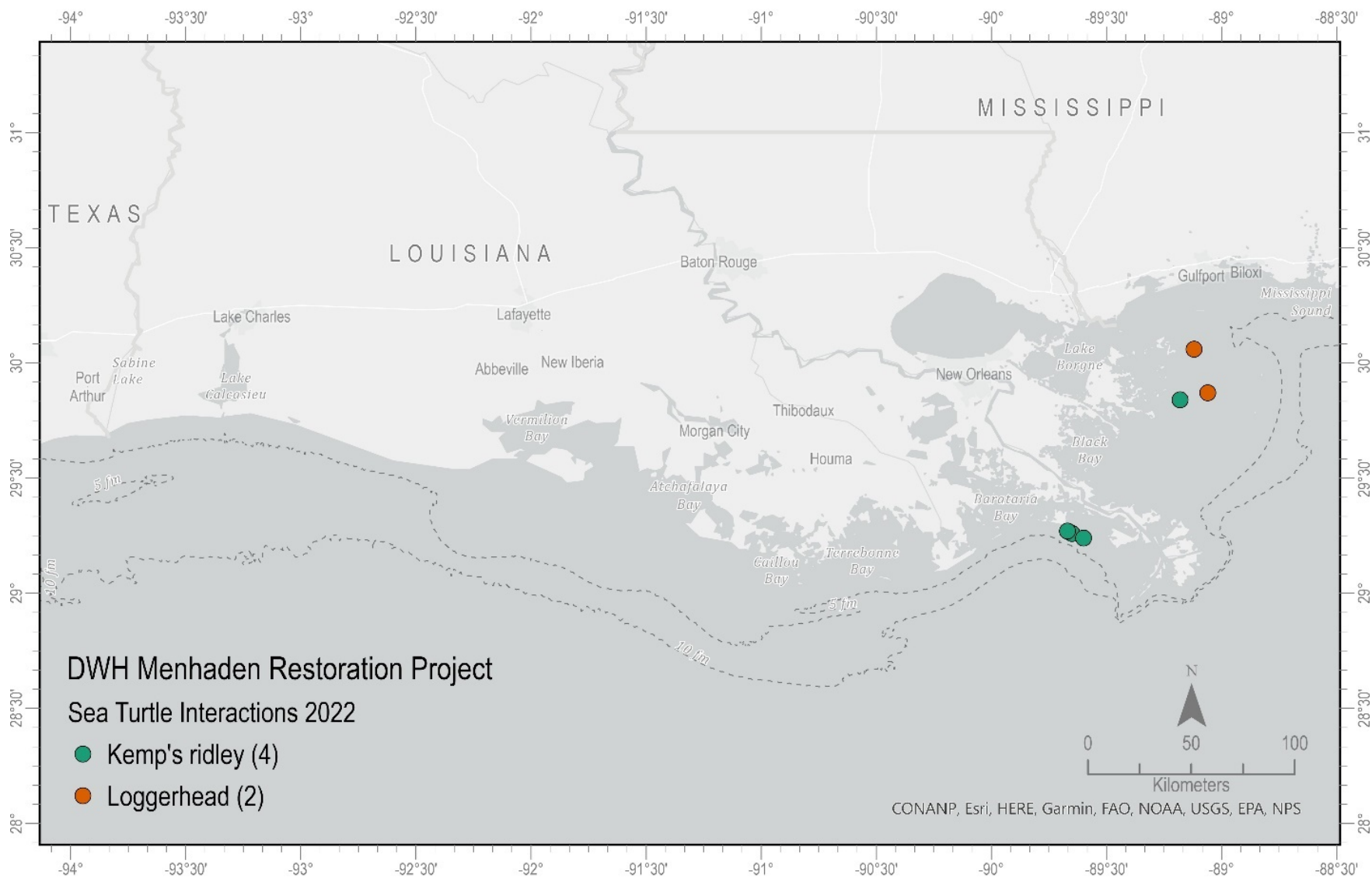


Figure 3. All sea turtle interactions (n=6) in Pilot Year 1 (2022) totaling 6 individual sea turtles. Loggerheads are denoted by the red circle, and Kemp's ridleys are denoted by the green circle.

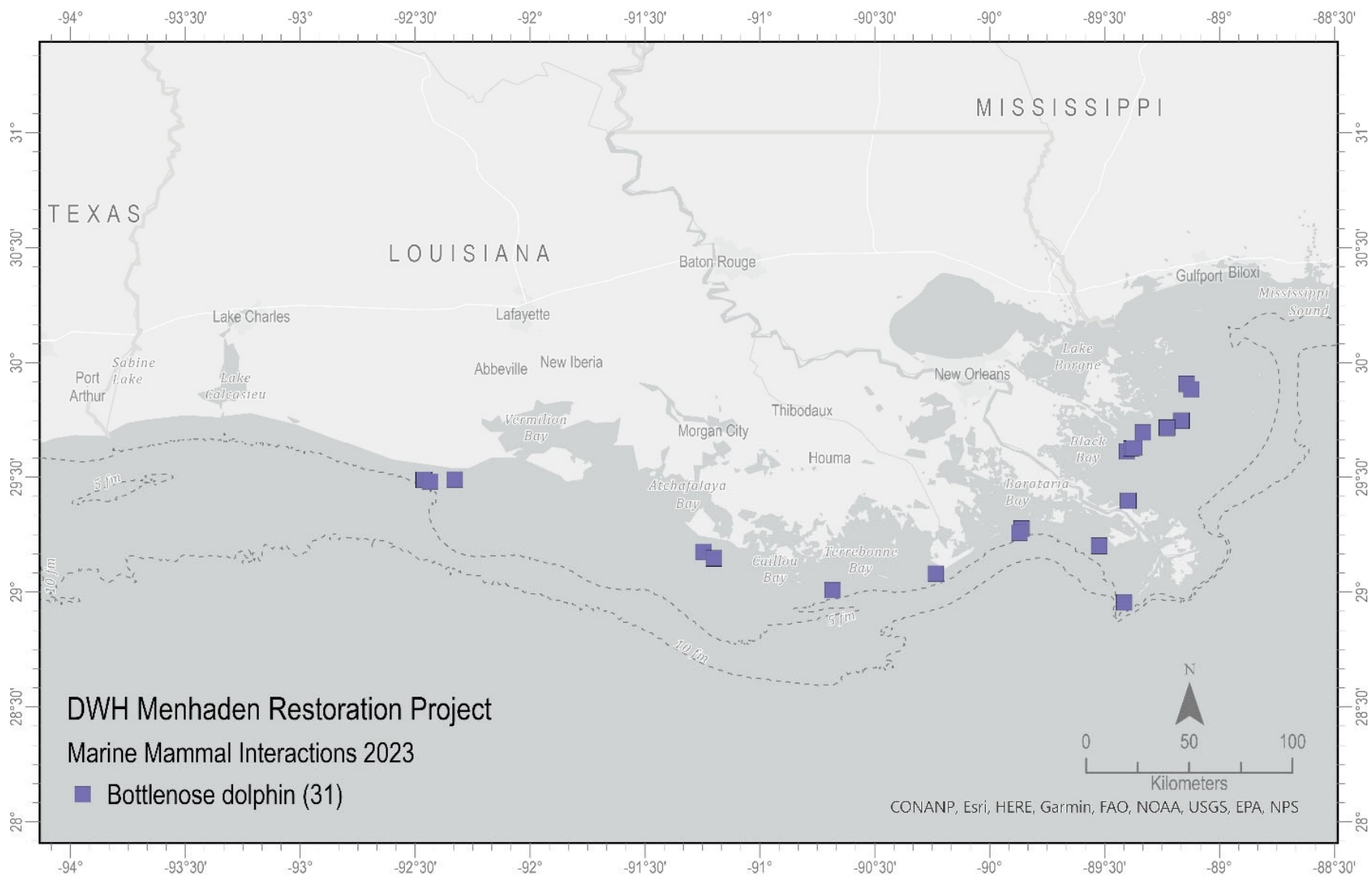


Figure 4. All marine mammal interactions (n=19) in Pilot Year 2 (2023) totaling 31 individual dolphins. Interactions are denoted by the purple square.

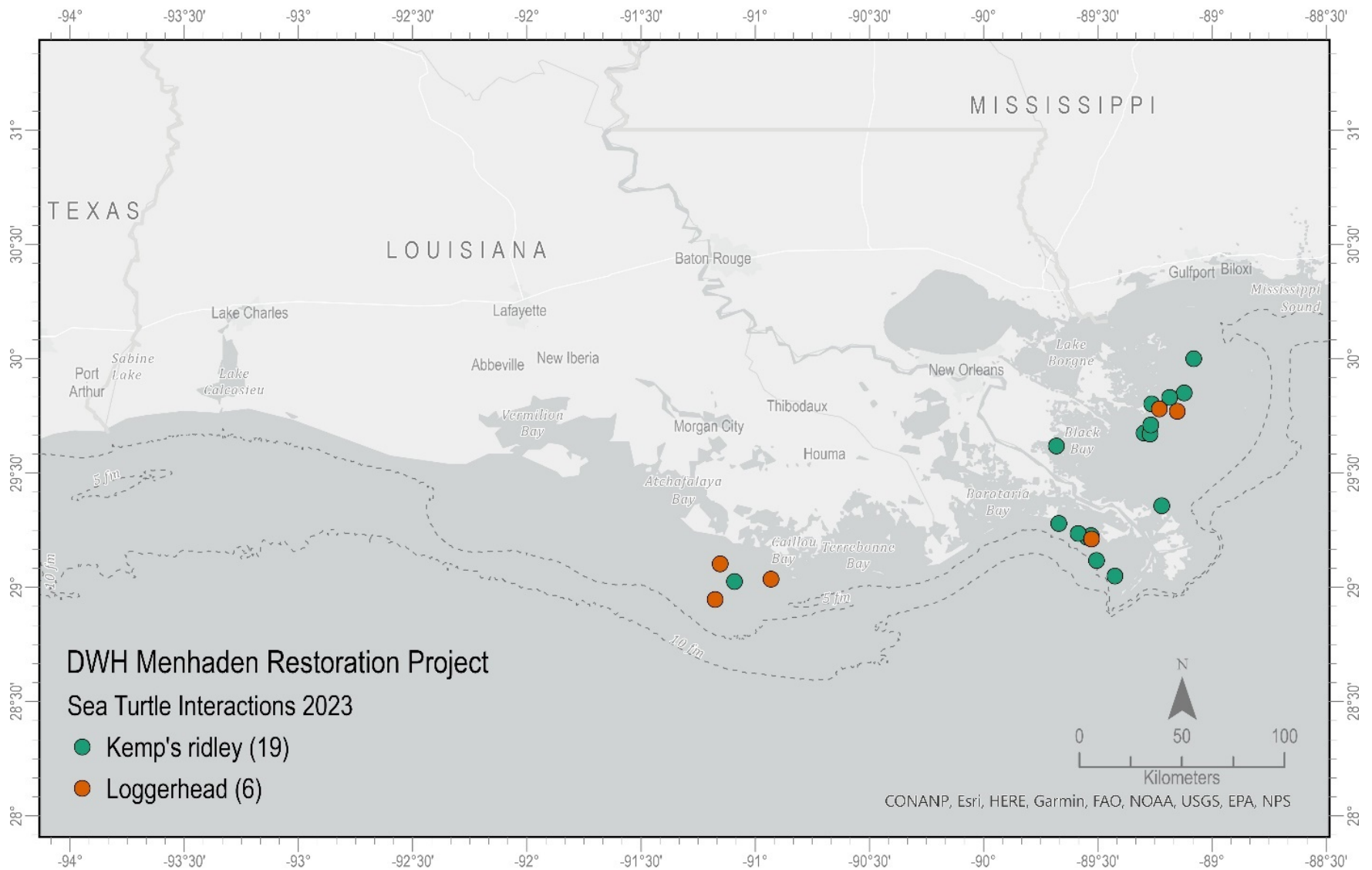


Figure 5. All sea turtle interactions (n=22) in Pilot Year 2 (2023) totaling 25 individual sea turtles. Loggerheads are denoted by the red circle, and Kemp's ridleys are denoted by the green circle.

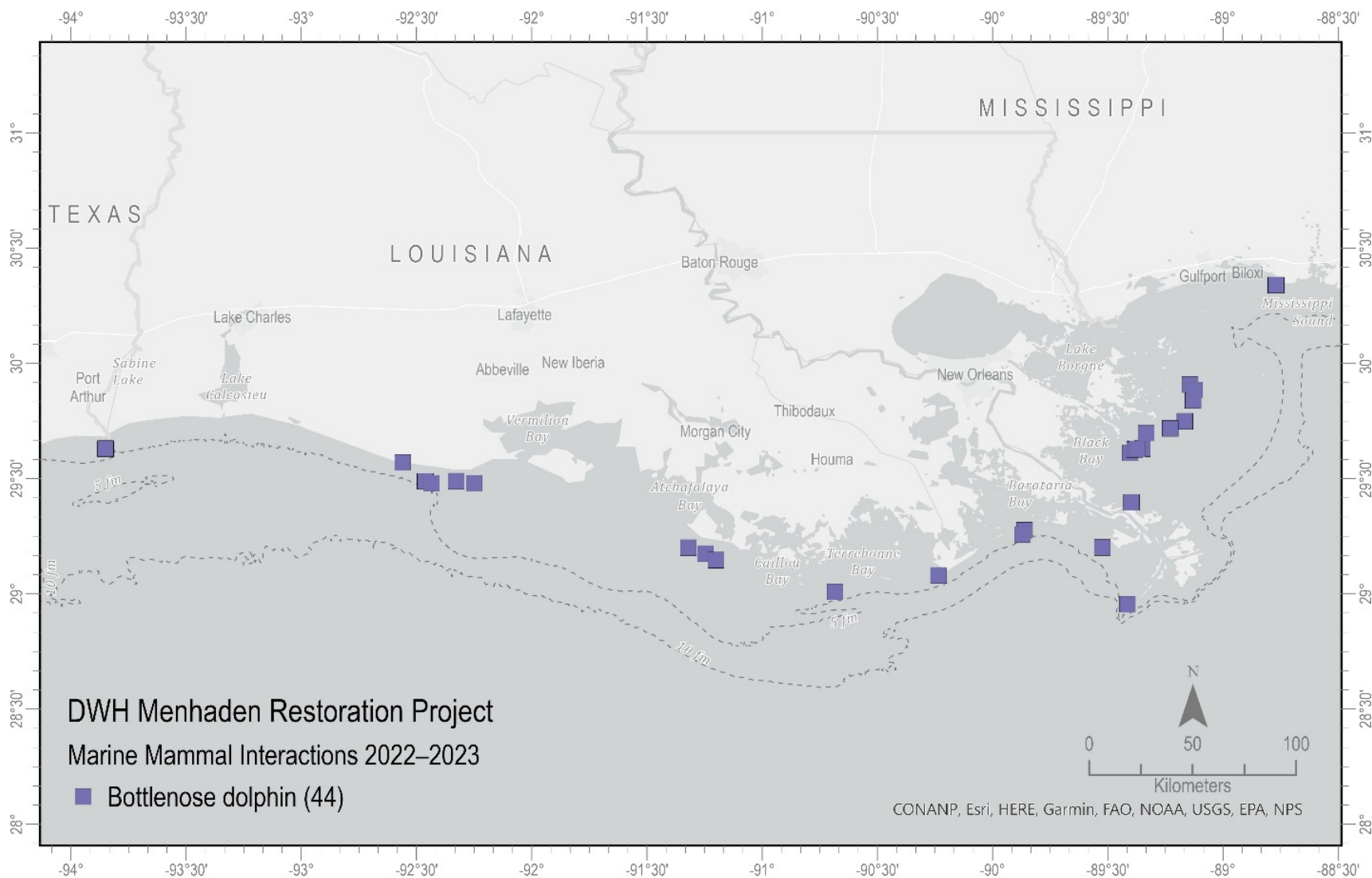


Figure 6. All marine mammal interactions (n=27) across Pilot Year 1 and 2 (2022 and 2023) totaling 44 individual dolphins. Interactions are denoted by the purple square.

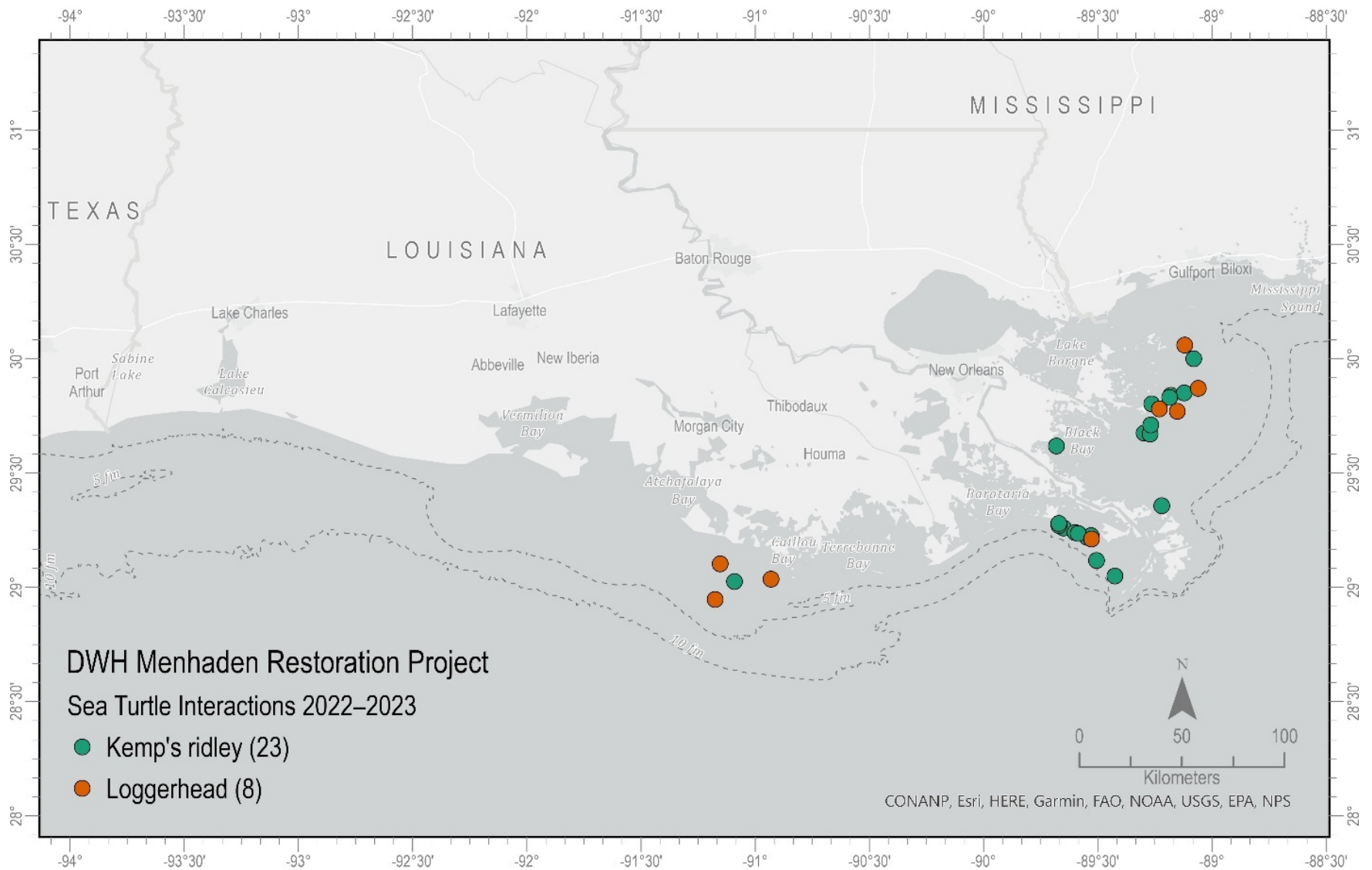


Figure 7. All sea turtle interactions (n=28) across Pilot Year 1 and 2 (2022 and 2023) totaling 31 individual turtles. Loggerheads are denoted by the red circle, and Kemp’s ridleys are denoted by the green circle.

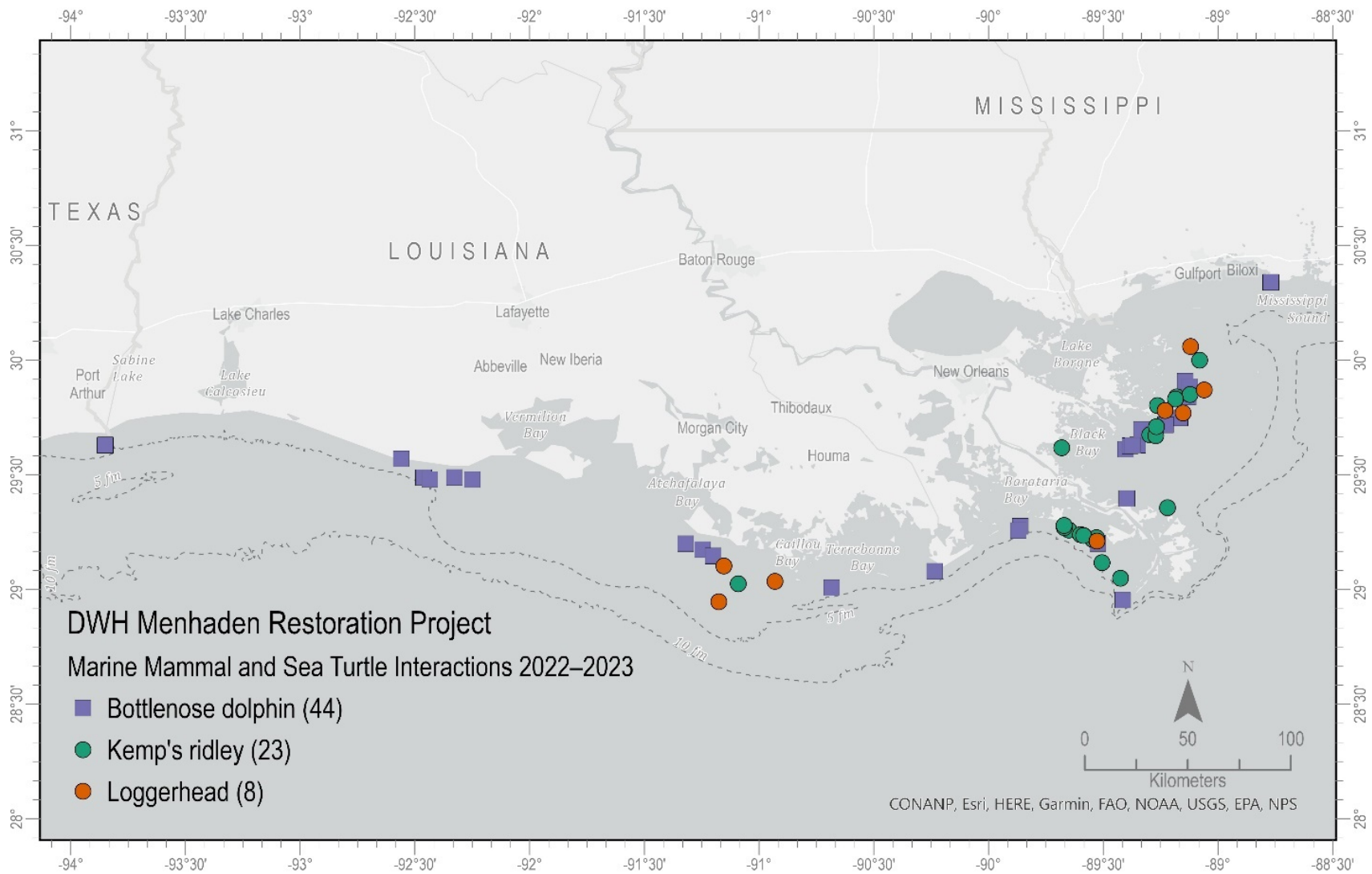


Figure 8. Map of all interactions (n=55), both sea turtle and marine mammal, across both Pilot Year 1 and 2 (2022 and 2023) totaling 75 individual animals. Marine mammals are denoted by a purple square, loggerheads are denoted by a red circle, and Kemp’s ridley are denoted by a green circle. The number in parentheses represents the number of individual animals, not number of sets.