PROTECTED SPECIES MITIGATION AND MONITORING REPORT

Marine Geophysical 2D Seismic Survey, Northwest Atlantic Ocean (Cruise ID No. MGL2309 and MGL2310)

Blake Plateau Survey, RV *Marcus G Langseth* (Callsign: WDC6698)
16 July 2023 to 19 August 2023 and 23 August to 14 September 2023

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FINAL
December 5, 2023

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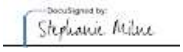
Signature	
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For Submission to:

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Acronyms and Abbreviations

ADCP – Acoustic Doppler Current Profiler
BiOp – Biological Opinion
BOEM – Bureau of Ocean Energy Management
BSS – Beaufort Sea State
BZ – Buffer Zones
DAQ – Data acquisition
dB - decibels
DSLR – Digital Single Lens Reflex
EA – Environmental Assessment
EPU – Electronic Processing Unit
ESA – Endangered Species Act
EEZ – Exclusive Economic Zone
EZ – Exclusion Zone
GPS – Global Positioning System
HF – High Frequency
HZ – Hertz
IHA – Incidental Harassment Authorization
ITS – Incidental Take Statement
LDEO – Lamont-Doherty Earth Observatory
LF – Low Frequency
MBES – Multibeam Echosounder
MCS – Multi-Channel Seismic
MGL – RV Marcus G. Langseth
MMPA – Marine Mammal Protection Act
NMFS – National Marine Fisheries Service
NRP – Navigation Reference Point
NSF – National Science Foundation
PI – Principal Investigator
PTS – Permanent threshold shift
PSO – Protected Species Observer
RME – PAM sound card manufacturer company name (not an acronym)
RMS – Root mean square
RPS – PSO Provider company name (not an acronym)
RV – Research vessel
SBP – Sub-bottom Profiler
TOAD – Time of Arrival Distance
TTS – Temporary Threshold Shift
TVG – Transverse Gradiometer

US – United States
UTC – Coordinated Universal Time
VHF – Very High Frequency
VSA – Vessel Strike Avoidance
WHOI – Woods Hole Oceanographic Institution

1 EXECUTIVE SUMMARY

The research vessel (R/V) *Marcus G. Langseth* (MGL), which is owned and operated by Columbia University's Lamont-Doherty Earth Observatory (L-DEO), conducted a high-energy 2D seismic survey in the Northwest Atlantic Ocean off the coasts of Florida, Georgia, and South Carolina. The survey was conducted in two parts, with the first part occurring from 16 July to 19 August 2023 and the second part occurring from 23 August to 14 September 2023 (referred to herein as "survey"). The operational activities were conducted in support of research proposed by Principal Investigators (PIs) Drs. H. Van Avendonk (University of Texas Institute of Geophysics – UTIG), Dr. N. Bangs (UTIG) and Dr. A. Becel (L-DEO) and funded by the National Science Foundation (NSF).

The purpose of the survey was to collect data to examine the structure and evolution of the rifted margins of the southwestern U.S., including the rift dynamics during the formation of the Blake Plateau.

This report was prepared to meet the reporting requirements for the survey required under the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). On 18 November 2022, NSF applied to the United States (US) National Marine Fisheries Service (NMFS) for an Incidental Harassment Authorization (IHA) that would allow for the potential harassment of small numbers of protected marine mammals incidental during the seismic survey. NSF issued the final Environmental Analysis (EA) on 20 June 2023 and the Finding of No Significant Impact (FONSI) on 11 July 2023, and on 10 July 2023, NMFS issued the signed Biological Opinion (BiOp) and IHA for the survey.

Mitigation measures were implemented to minimize potential impacts to marine mammals and protected species. These measures included, but were not limited to, the use of NMFS approved Protected Species Observers (PSOs) for visual and acoustic monitoring, the designation and implementation of buffer zones (BZ) and exclusion zones (EZ) (where the presence of a protected species would require a mitigation action), and the implementation of ramp-up procedures, mitigation actions (including delayed operations and shutdowns), and vessel strike avoidance (VSA) maneuvers. Continuous protected species observation coverage during the survey was provided by RPS, the PSO provider contracted for the survey. PSOs monitored and reported on the presence and behavior of protected species and directed the implementation of the mitigation measures, as described in the regulatory documents issued for the survey.

A team of five PSOs, one of which was designated as the Lead, were present onboard the *MGL* throughout both parts of the survey to conduct visual and acoustic monitoring. Throughout the entire survey program, PSOs conducted visual monitoring for a total of 804 hours 10 minutes and acoustic monitoring for a total of 851 hours 40 minutes. Visual and acoustic monitoring were conducted simultaneously for a total of 524 hours 54 minutes. The seismic source was active for a total of 776 hours 23 minutes, which occurred during 454 hours 10 minutes of visual monitoring and 776 hours 23 minutes of acoustic monitoring.

There were a total of 23 visual detections of protected species during the survey program, including 13 detections of marine mammals and 10 detections of sea turtles. Visual detections of marine mammals included eight sightings of common bottlenose dolphins (*Tursiops truncatus*), two sightings of pantropical spotted dolphins (*Stenella attenuata*), and three sightings of unidentifiable dolphins. Visual detections of sea turtles included three sightings of green sea turtles (*Chelonia mydas*), one sighting of leatherback sea turtles (*Dermochelys coriacea*), two sightings of loggerhead sea turtles (*Caretta caretta*), and four sightings of unidentifiable shelled sea turtles.

There were two acoustic detections of protected species during the survey program, including one detection of common bottlenose dolphins and one detection of unidentifiable dolphins, both of which were correlated with visual detections of the same individuals.

Protected species detections resulted in the implementation of one mitigation action during the survey program consisting of a shutdown for a loggerhead sea turtle. There were 10 VSA maneuvers implemented for detections of protected species.

NMFS issued an IHA authorizing 12,583 Level B takes for 23 species and two species groups of marine mammals, including five species listed as endangered. There were 53 Level A takes authorized for two species and one species group of marine mammals. For this report, the definition of Level A and Level B takes are the same as found in the MMPA and the NMFS issued BiOp regarding what constitutes a take.

There were 360 Level B takes issued for four ESA-listed sea turtle species, and no specific number of takes issued for ESA-listed seabird species for this survey.

During the survey program, three unidentifiable dolphins were observed within the predicted 160-decibel radius as well as one green sea turtle, two loggerhead sea turtles, and one unidentifiable shelled sea turtle were observed within the 175-decibel radius (where there is a potential for a behavioral response and temporary threshold shift (TTS)) while the acoustic source was active, constituting potential Level B takes. There were no protected species observed within the predicted radius at which there is a potential for auditory injury (based upon each species hearing range and how that overlaps with the frequencies produced by the sound source), constituting potential Level A takes.

There was one potential compliance issue during the survey program. On 01 August 2023, source activity was resumed without a ramp-up at night after a technical issue with the airgun controller software.(The National Marine Fisheries Service Endangered Species Act Section 7 Biological Opinion (3.3.3) states: For any shutdown at night or in periods of poor visibility (e.g., Beaufort sea state 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation was maintained, pre-start clearance watch of 30 minutes is not required.

2 INTRODUCTION

The following report details protected species monitoring and mitigation as well as seismic survey operations undertaken as part of the high-energy 2D marine geophysical survey on board the R/V *MGL* in the Northwest Atlantic Ocean, off the coasts of Florida, Georgia, and South Carolina from 16 July 2023 to 19 August 2023 and from 23 August to 14 September 2023.

This document serves to meet the reporting requirements dictated in the IHA issued to NSF by NMFS on 10 July 2023. The IHA authorized takes of specific protected species incidental to the survey. NMFS has stated that seismic source received sound levels equal to or greater than 160 decibels (dB) re 1 (micropascal) µPa root mean square (rms) (160 dB) could potentially disturb marine mammals, temporarily disrupting behavior, such that they could be considered non-lethal 'takes' (Level B harassment). In July 2016, NMFS released new technical guidance for assessing the effects of anthropogenic sound on marine mammal hearing, which established new thresholds for permanent threshold shift (PTS) onset, Level A harassment (auditory injury), for marine mammal species. Predicted distances to Level A harassment vary based on species specific hearing groups – low frequency cetaceans, mid frequency cetaceans, high frequency (HF) cetaceans, phocid pinnipeds, otariid pinnipeds, sea otters, and sea turtles – and how each group's hearing range overlaps with the frequencies produced by the sound source. For sea turtles, per the ESA, NMFS has stated that received sound levels equal to or greater than 175 dB represents the current best understanding of the threshold at which they exhibit behavioral responses.

NMFS requires that measures such as buffer zones (BZs), exclusion zones (EZs), delayed operations, ramp-ups, and shutdowns be implemented to mitigate for potentially adverse effects of the acoustic source sounds on protected species. The BZs and EZs were established from any element on the acoustic source array as areas, where the presence of a protected species would require the implementation of a mitigation action (see Section 6). For all protected species, the occurrence of an individual detected approaching, entering, or within their designated EZ would require the implementation of a shutdown of the seismic source. NMFS specified a 500 meter EZ for most marine mammals as it encompasses all zones within which auditory injury (Level A harassment) could occur on the basis of instantaneous exposure, provides additional protection from the potential for more severe behavioral reactions for marine mammals at relatively close range to the acoustic source, provides a consistent area for PSOs to conduct effective observational effort, and is a distance within which detection probabilities are reasonably high for most species under typical conditions.

In accordance with the IHA, the PSO team conducted onboard environmental management briefings with the vessel personnel prior to the start of source operations for each part of the survey. The lead PSOs covered the mitigation and monitoring protocols, communication procedures, roles and responsibilities of the monitoring team and any additional operational procedures for this survey.

The IHA is attached as Appendix A.

2.1 Project Overview and Location

The research activities involved a 2D high-energy seismic survey located in in the Northwest Atlantic ocean, off the coasts of Florida, Georgia, and South Carolina between approximately 27.5 to 33.5 degrees North and 74 to 80 degrees West within the Exclusive Economic Zone (EEZ) of the U.S. and in international waters (Figure 1). The closest distance from the survey area to the U.S. coast was approximately 90 kilometers (48.6 nautical miles) to Georgia, approximately 98 kilometers (52.9 nautical miles) to Florida, and approximately 107 kilometers (57.8 nautical miles) to South Carolina. Water depths in the survey area were between 100 and 5,200 meters (328 to 17,060 feet).

The primary goal of the survey was to investigate the structure and evolution of the rifted margins of the southeastern U.S., including the rift dynamics during the formation of the Blake Plateau. The imaging of the sediments and crystalline crust of the margins will give a better understanding of the interaction between tectonic and magmatic processes that led to the continental breakup and the onset of seafloor spreading in the central Atlantic Ocean.

All operations for the survey were conducted solely by *MGL*. The vessel is 72 meters (236.2 feet) in length and has a beam of 17 meters (55.8 feet) and a maximum draft of 5.9 meters (19.4 feet). The

vessel's cruising speed was approximately 10 knots, during transits and varied between three and five knots during seismic survey acquisition operations.

Seismic source operations for the survey were conducted in two parts: between 18 July and 18 August 2023 for the multi-channel seismic (MCS) part of the survey, and between 26 August and 14 September 2023 for the ocean bottom seismometer (OBS) part of the survey. For the MCS part of the survey, seismic source operations totaled 31 days, with 4,436 kilometers acquired over 19 survey lines and six test lines totaling 34 sequences. For the OBS part of the survey, seismic source operations totaled eight days, with 1,030 kilometers acquired over three survey lines and two test/transit lines totaling eight sequences. In the map in Figure 1, the red lines indicate where seismic source operations were conducted for the MCS part of the survey, with the three lines with numbers indicating the lines also acquired during the OBS operations.

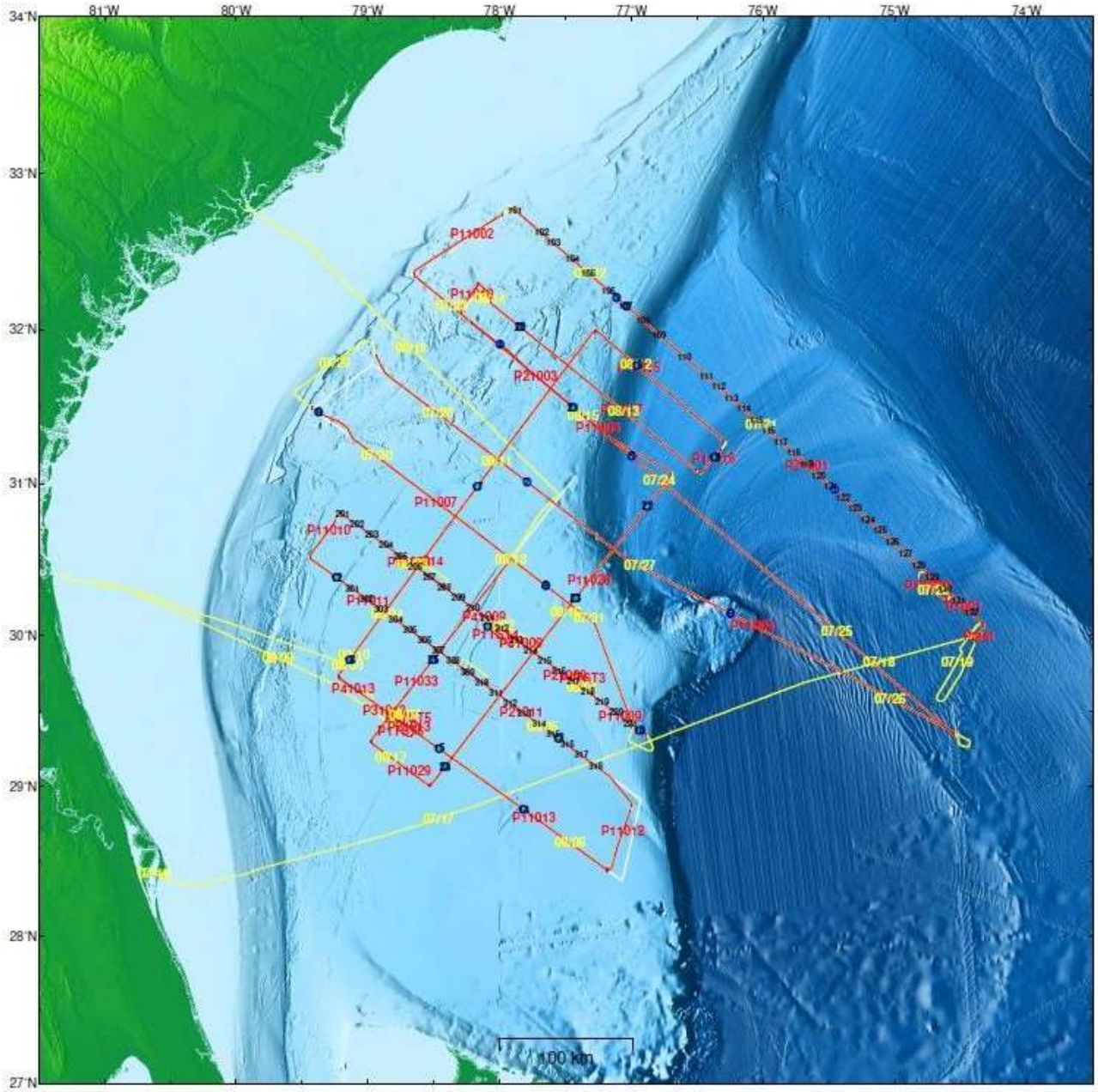

Figure 1: Location and survey points of the 2D seismic survey.

2.1.1 Energy Source and Receiving Systems

The energy source utilized during the surveys consisted of four towed acoustic source sub-arrays, each with nine source elements (for a total of 36 source elements), deployed just aft of the vessel. The source array utilized Bolt 1500LL and Bolt 1900LLX elements ranging in size from 40 to 360 cubic inches (in^3), with an operating pressure of 1,950 pounds per square inch. The dominant frequency components ranged from two to 188 hertz (Hz) and nominal source levels ranged from 258 dB re: 1 µPa (zero to peak) to 264 dB re: 1 µPa (peak-to-peak). The source elements were towed at a depth of 12 meters for both MCS and OBS parts of the survey. For the first seven sequence lines of the MCS survey, the center of the source was situated 236 meters from the navigation reference point (NRP), which was located on the PSO observation tower. This positioned the first elements on the arrays 199 meters from the stern of the vessel. For the remainder of the MCS survey sequence lines and for the OBS survey sequence lines, the center of the source was 276.6 meters from the NRP placing the first elements 247.6 meters from the stern of the vessel.

The maximum source volume utilized during the seismic survey was 6,600 in^3 with all 36 source elements active; however, when there were issues with the elements and during times when source sub-arrays were brought onboard for maintenance, the total source volume was reduced to varying lower volumes depending on how many of the elements/sub-arrays were disabled. The shot point interval was 50 meters the MCS survey lines and 150 meters for the OBS survey lines.

The receiving system for the MCS part of the survey consisted of one towed hydrophone streamer totaling 12 kilometers in length. As the acoustic source array was towed along the track lines, the towed hydrophone streamer received the returning acoustic signal and transferred the data to the on-board processing system. The long streamer length allows for more accurate measurements of seismic velocities and provides a large amount of data redundancy for enhancing seismic images during data processing. The receiving system for the OBS part of the survey consisted of 39 short-period OBSs from Woods Hole Oceanographic Institution WHOI and Scripps. The OBSs are deployed to the seafloor along the survey lines and the vessel shoots over them. The received returning acoustic signals are stored internally on the OBSs for later analysis after the devices are retrieved from the seafloor back to the vessel.

Additional sound sources used in support of research efforts included a Kongsberg EM 122 multi-beam echosounder (MBES), Knudsen Chirp 3260 sub-bottom profiler (SBP), and a Teledyne RDI 75 kHz Ocean Surveyor acoustic doppler current profiler (ADCP). The hull mounted MBES operated at frequencies between 10.5 and 13 (usually 12) kilohertz. Each ping consisted of eight (in water depths greater than 1000 meters) or four (in water depths less than 1000 meters) successive fan-shaped transmissions. The transmitting beam width was one or two degrees fore-aft and 150 degrees perpendicular to the ship's line of travel. The maximum source level was 242 dB re: 1 µPa (root mean square [rms]). The hull-mounted SBP beam was transmitted as a 27-degree cone, which was directed downward by a 3.5 kilohertz transducer. The nominal power output was 10 kilowatts; however, the actual maximum radiated power was three kilowatts or 222 dB re: 1 µPa m (rms). The ping duration was 64 seconds, and the interval was one second. The hull-mounted ADCP operated at a frequency of 75 kilohertz and a maximum source level of 224 dB re: 1 µPa m (rms) over a conically shaped 30-degree beam. The MBES and SBP operated simultaneously to provide information about near seafloor sedimentary features and to map the topography of the ocean floor. The ADCP was used to measure water current velocities.

3 MITIGATION AND MONITORING METHODS

The PSO monitoring program on the *MGL* was established to meet the standards set forth in the IHA and BiOp requirements. Survey mitigation measures were designed to minimize potential impacts of the *MGL*'s seismic activities on marine mammals and other protected species of interest. The following monitoring protocols were implemented to meet these objectives.

- Visual observations were conducted to provide real-time sighting data, allowing for the implementation of mitigation procedures, as necessary.
- A passive acoustic monitoring (PAM) system was operated 24 hours a day during seismic source operations to augment visual observations and provide additional marine mammal detection data.
- Effects of marine species exposed to sound levels constituting a defined take were observed and documented. The nature of the probable consequences was discussed when possible.

In addition to the mitigation objectives outlined in the project permit documents, PSOs collected and analyzed necessary data mandated by the IHA.

3.1 Mitigation Methodology

Mitigation actions were implemented for visual and acoustic detections of protected species, including marine mammals, sea turtles, and ESA-listed seabirds, as outlined in the IHA, BiOp, and EA. These actions included the establishment of buffer zones (BZs) and exclusion zones (EZs) as the areas in which the presence of a protected species would trigger a mitigation action, and the implementation of delayed operations and shutdowns (where the seismic source was fully silenced) for protected species detected approaching, entering, or within their designated BZ and EZ (Table 1). Throughout the detections, PSOs and PAM operators would keep in frequent contact with each other and the seismic team, relaying information on the location and movement of the protected species, and the implementation of any needed mitigation actions and clearances to begin/resume operation of the seismic source.

Before the seismic source could be activated from silence, two PSOs and one PAM (Passive Acoustic Monitor) operator conducted a 30-minute clearance search period of the BZs and EZs during both daylight and night-time hours. In the event of a detection of protected species within their designated zones (Table 2) or as outlined in Table 1, a delay of source activation operations would be implemented. Source operations would not be cleared to begin until the protected species were observed exiting their designated zones, or if they were not observed exiting their zone, then 15 or 30 minutes (species dependent, see Table 2) following the final detection of the individual(s) within their zone.

Once the seismic source was active, the BZs from any element on the source array were established as areas in which the presence of a protected species would initiate an alert to the seismic operators that the animal was detected, and that the implementation of a mitigation action may soon be required. The EZs from any active source element were established as areas in which the detection of a protected species would require a shutdown of the seismic source. For marine mammals and sea turtles, the detection of one approaching, entering, or within their designated zone would require a shutdown (excluding the specified shut-down exemption delphinid species per the IHA and BiOp). For ESA-listed sea birds, the detection of one foraging or diving within their designated zone would require a shutdown.

Upon the implementation of a shutdown for a detection of marine mammals, a ramp-up was required to resume source activity once the protected species were confirmed to have exited their designated EZs. For sea turtles and ESA-listed seabirds, source activity could resume to the previous operative volume without a ramp-up once the protected species were confirmed to have exited their designated EZs. If the protected species could not be confirmed to have exited their designated EZ (i.e., if they dove/submerged within the zone and were not re-sighted), then clearance for source activity to resume would not be given until 15 or 30 minutes (species dependent, see Table 2) following the final detection of the individual(s) within their zone.

The IHA also outlined additional mitigation actions for specific protected species while the acoustic source was active as outlined in Table 1.

Table 1: Specific detections of protected species and their required mitigation actions.

Detection of:	Mitigation Action Required
A North Atlantic right whale detected at any distance from the seismic source.	Delayed operation of inactive seismic source or shutdown of active seismic source.
A large whale with a calf detected 1,500 meters from the seismic source.	Delayed operation of inactive source or shutdown of active source.
An aggregation of six or more large whales detected 1,500 meters from the seismic source.	Delayed operation of inactive source or shutdown of active source.
Any beaked whale or pygmy or dwarf sperm whale detected at 1,500 meters from the seismic source.	Delayed operation of inactive source or shutdown of active source.
Any marine mammal species not authorized for take observed approaching, entering, or within the 160-decibel radius.	Delayed operation of inactive source or shutdown of active source.
Any marine mammal species for which the total authorized takes has been met observed approaching, entering, or within the 160-decibel radius.	Delayed operation of inactive source or shutdown of active source.
Any other marine mammals detected approaching, entering, or within their designated buffer and exclusion zones.	Delayed operation of inactive source (buffer zone) or shutdown of active source (exclusion zone).
Any sea turtle species detected approaching, entering, or within their designated exclusion zones.	Delayed operation of inactive source or shutdown of active source.
Any ESA-listed sea bird species detected diving and/or foraging within their designated exclusion zones.	Delayed operation of inactive source or shutdown of active source.
Any dolphin species with a shut-down exemption detected approaching, entering, or within their designated exclusion zones.	None.

Table 2: Separation distances, buffer and exclusion zones sizes for each species / species group expected to occur in the survey area.

Species/Species Groups	Separation Distance (meters)	Buffer Zones (meters)	Exclusion Zones (meters)	Delay Duration (minutes)
North Atlantic right whale	500	Any distance	Any distance	30
Beaked whales	100	1,500	1,500	30
Pygmy and dwarf sperm whales	100	1,500	1,500	30
Large whale with a calf	100	1,500	1,500	30
Groups of 6 or more large whales	100	1,500	1,500	30
Sperm whales	100	1,000	500	30
Mysticetes	100	1,000	500	30
Killer whale, Risso's dolphin, pilot whale	50	1,000	500	30
Other delphinids[1] and porpoises	50	1,000	500	15
Pinnipeds (1 element) >1,000 m water depth	50	431	431	15
Pinnipeds (1 element) 100-1,000 m water depth	50	647	647	15
Pinnipeds (36 element) >1,000 m water depth	50	6,733	6,733	15
Pinnipeds (36 element) 100-1,000 m water depth	50	10,100	10,000	15
Sea turtles	45	150	150	15
ESA-listed sea birds	none	150	150	15

1 Except exempt species of the genera Delphinus, Lagenodelphis, Stenella, Steno, and Tursiops per the NMFS IHA

Specific acoustic source operation procedures outlined in the IHA that were relevant to this specific survey included:

1. Ramp-ups could not be less than 20 minutes and were required to begin with the smallest volume element and continue in stages by doubling the number of active elements, with each stage approximately the same duration. The time between ramp-up completion and start of data acquisition had to be minimized.
2. Testing of individual elements or strings required a 30-minute clearance search period but no ramp-up. Testing of more than one element or string required both a 30-minute clearance search period and a ramp-up to the maximum volume being tested.
3. Brief periods (less than 30 minutes) of operational silence for reasons other than a protected species shut-down did not require a ramp-up to resume full volume source operations provided that: (1) PSOs maintained constant acoustic and/or visual observation, and (2) no detections of protected species occurred within the applicable exclusion zone during that silent period. For any brief period of silence at night or in periods of poor visibility (e.g., Beaufort Sea State (BSS) of four or greater), a ramp-up was required, but if constant observation was maintained, a pre-start clearance watch was not required. For any longer shutdown, both a 30-minute pre-start clearance search by two PSOs and a PAM operator and a ramp-up were required.

Table 3 outlines the predicted 160 decibel (dB) radius (Level B harassment zone for marine mammals) and the predicted 175 dB radius (Level B harassment zone for sea turtles) for both a single 40 in^3 element and the full source volume of 6,600 in^3, which varied depending on the water depth. Table 4 outlines the predicted Level A harassment zones for each hearing group, which differed for the MCS and OBS parts of the survey, including low frequency cetaceans (all mysticete species), mid-frequency cetaceans (sperm whales, beaked whales, and all delphinid species), high frequency cetaceans (Kogia and porpoise species), and sea turtles.

Table 3: Predicted 160 and 175 decibel Level B harassment zones implemented during the survey.

Source	Volume (in^3)	Water Depth (meters)	160 dB radius (meters) – Level B harassment zone for marine mammals	175 dB radius (meters) – Level B harassment zone for sea turtles
1 element	40	>1,000	431	77
		100-1,000	647	116
36 elements	6,600	>1,000	6,733	1,864
		100-1,000	10,100	2,796
Distances are from any single elements on the array.				

Table 4: Predicted Level A harassment zones implemented during the survey.

Source	Volume (in3)	Low frequency cetaceans	Mid-frequency cetaceans	High frequency cetaceans	Sea turtles
MCS Survey					
36 elements	6,600	320.2	13.6	268.3	15.4
OBS Survey					
36 elements	6,600	80	13.6	268.3	10.6
Distances are from any single elements on the array.					

3.2 Visual Monitoring Survey Methodology

There were five experienced PSOs on board the *MGL* during both parts of the seismic survey to conduct monitoring for protected species, record and report detections, and request mitigation actions in accordance with the IHA and BiOp. The PSOs onboard were NMFS approved and held certifications from a recognized Bureau of Ocean Energy Management (BOEM) PSO course and are listed in Appendix B. Visual monitoring was primarily carried out from an observation tower (Figure 2) located 18.9 meters above the surface of the water, which allowed a 360-degree viewpoint around the vessel and seismic source.

Figure 2: Protected Species Observer stern view of observation tower with mounted big-eye binoculars.

The PSO tower was equipped with Fujinon 7x50 and Steiner Marine 7x50 binoculars, as well as two mounted 25x150 Big-eye binoculars for visual monitoring. A D-300-2MS Night Optics USA, Inc. monocular and two Butler Creek PVS-7-night vision devices were also available for visual monitoring during reduced/restricted lighting conditions if needed. Two Canon 80D cameras with 300-millimeter lenses were also provided to document protected species detections and other wildlife. Inside the tarpaulin tent the PSOs were provided a laptop for data entry; a telephone and two hand-held Very High Frequency (VHF) radios for communication with the PAM operator, seismic operators, and the bridge; and a monitor that displayed pertinent information about the vessel (position, speed, heading, water depth), source activity (line number, number of active elements, operating volume), and environmental conditions (wind speed and direction, air and sea temperatures). Environmental conditions along with vessel and acoustic source activity were recorded at least once an hour, and every time there was a change in one or more of the above variables. Most visual monitoring was held from the tower; however, during severe weather or when the ships exhaust was blowing on the tower, monitoring would be conducted from the bridge (approximately 12.8 meters above sea level) or the catwalk (approximately 12.3 meters above sea level).

Visual monitoring methods were implemented in accordance with the survey requirements outlined in the IHA. A minimum of two PSOs were required to be on duty conducting monitoring during all daylight hours (30 minutes before sunrise to 30 minutes after sunset) while the vessel was at sea. Visual monitoring during the transits between ports and survey area were conducted to implement any needed vessel strike avoidance maneuvers and to gather baseline data on the presence and abundance of protected species in the areas during periods of acoustic source silence. Scheduled watches were a maximum of four hours followed by at least one hour of scheduled break time.

Visual observations were conducted around the entire area of the vessel and acoustic source, divided between the two PSOs on watch. The smaller monitoring area for each observer increased the probability of protected species being sighted. PSOs searched for blows, fins, splashes or disturbances of the sea surface, large flocks of feeding sea birds, and other sighting cues indicating the possible presence of a protected species. Upon the visual detection of a protected species, PSOs would identify the animals'

range to the vessel and acoustic source. Range estimations were made using reticle binoculars, the naked eye, and by relating the animal(s) to an object at a known distance, such as the acoustic source arrays and streamer head float. PSOs would also identify to species, if possible, upon initial detection to ensure that the proper mitigation measures were implemented, should any be required.

As required by the IHA (section 5(d)(iii)), PSOs recorded the following information for each protected species detection:

I. Date, time of first and last sighting, observers on duty during the detection, location of the observers, vessel information (e.g., position, speed, heading), water depth, and acoustic source activity (e.g., volume and number of active elements).

II. Species, detection cue, group size (including number of adults, juveniles, and calves), visual description (e.g., overall size, shape of the head, position and shape of the dorsal fin, shape of the flukes, height, and direction of the blow), observed behaviors (e.g., porpoising, logging, diving, etc.), and the initial and final pace, heading, bearing, and direction of travel in relation to both the vessel and the source (e.g., towards, away, parallel, perpendicular, etc.).

III. Initial, closest, and final distance to the vessel and the source, time when entering and exiting the exclusion zones, type of mitigation action implemented, total time of the mitigation action, description of other vessels in the area, and any avoidance maneuvers conducted.

During or immediately after each sighting event, the PSOs recorded the detection details per the requirements of the IHA in a detection datasheet. Each sighting event was linked to an entry on an effort datasheet where specific environmental conditions (e.g., Beaufort Sea state, wind force, swell height, visibility, and glare) and vessel activity were logged.

Species identifications were made whenever the distance from the observer, length of the sighting, and visual observation conditions allowed. Marine mammal identification manuals (*Whales, Dolphins, and Other Marine Mammal of the World; Guide to Marine Mammals of the world; Readers Digest Whales, Dolphins, and Porpoises*) were consulted, and photos were examined to confirm identifications were consulted, and photos were examined to confirm identifications.

3.3 Passive Acoustic Monitoring Methodology

Passive Acoustic Monitoring (PAM) was used to augment visual monitoring efforts in the detection, identification, and locating of marine mammals, especially during periods of time when visual monitoring was not effective (periods of darkness or low visibility). Acoustic monitoring was conducted continuously during all seismic operations and to the maximum extent possible during periods of acoustic source silence. When the acoustic source was activated from any extended period of silence, acoustic monitoring was conducted for at least 30 minutes prior to the activation of the source for the pre-clearance search along with the two visual PSOs. PAM shifts were a maximum of four hours in duration followed by at least one hour of scheduled break time.

In accordance with the NMFS issued IHA and ITS, in the event of an issue with PAM equipment, acoustic source activity could continue for 30 minutes without acoustic monitoring while the PAM operator diagnosed the issue. If the diagnosis indicated that the PAM system needed maintenance, operations could continue for an additional 10 hours without acoustic monitoring, during daylight hours only, provided that: (1) the sea state was less than or equal to a BSS 4; (2) with the exception of delphinids, no marine mammals were acoustically detected in the applicable exclusion zones in the previous two hours; (3) active acoustic source operations without acoustic monitoring did not exceed a cumulative total of 10 hours within any 24 hour period; and (4) NMFS was notified via email as soon as practicable of the time and location in which operations occurred without an active PAM system.

The PAM system was located in the main science lab which allowed ample space, quick communication with the PSOs and seismic technicians, and access to the vessel's instrumentation screens. Information about the vessel (e.g., position, heading, and speed), water depth, source activity (e.g., line number, total source volume, number of active elements), and the PAM system (e.g., cable deployments/retrievals, changes to the system, background noise score, hydrophone depth) were recorded at least once an hour, and whenever any of the parameters changed.

Acoustic monitoring for marine mammals was conducted aurally, utilizing Sennheiser headphones, and visually with the PAMGuard software program. Low frequency (LF) to mid-frequency delphinid whistles, clicks, and burst pulses, as well as sperm whale clicks and baleen whale vocalizations, could be visualized in PAMGuard's spectrogram modules. Sperm whale, beaked whale, Kogia species, and delphinid clicks could also be visualized in LF and HF click detector modules. Settings adjustments to amplitude range, amplitude triggers, and spectral content filters, among others, could be made in PAMGuard's spectrogram and click detector modules to maximize the distinction between cetacean vocalizations and ambient signal. The map module within PAMGuard could be utilized to attempt localizing the position and range of vocalizing marine mammals. Sound recordings could be made using the HF and LF sound recording modules when potential marine mammal vocalizations were detected, or when the operator noted unknown or unusual sound sources.

As required by the IHA (section 5(d)(iv)), PAM operators recorded the following information during acoustic detections of protected species:

I. Detection number, date, time of first and last detection, operator on duty, any associated visual detection number, vessel information (position, speed, heading), water depth, and acoustic source activity.
II. Species (if determinable), number of individuals, methods/modules on which vocalizations were detected, and vocalization characteristics (e.g., signal type, frequency and amplitude range, patterns, etc.).
III. Determinable bearings and ranges to the vessel, hydrophones, and seismic source, type and duration of any implemented mitigation actions.

3.3.1 Passive Acoustic Monitoring Parameters

A PAM system designed to detect most species of marine mammals was installed on board the *MGL*. The system was developed by Seiche Measurements Limited and consisted of the following main components: a 255 meter hydrophone cable (configured as a separate 230 meter steel-reinforced tow cable and detachable 25 meter hydrophone array); a 100 meter deck cable; a rack-mounted electronic processing unit (EPU) that incorporated a buffer unit, RME Fireface 800 unit and computer; two desktop monitors; a keyboard and mouse; acoustic analysis software package; and headphones for aural monitoring. A complete spare system of all components was also present on board in the event that any of the main system components became damaged or inoperable. The diagram in Figure 3 is a simplified depiction of the PAM system installed on the *MGL*.

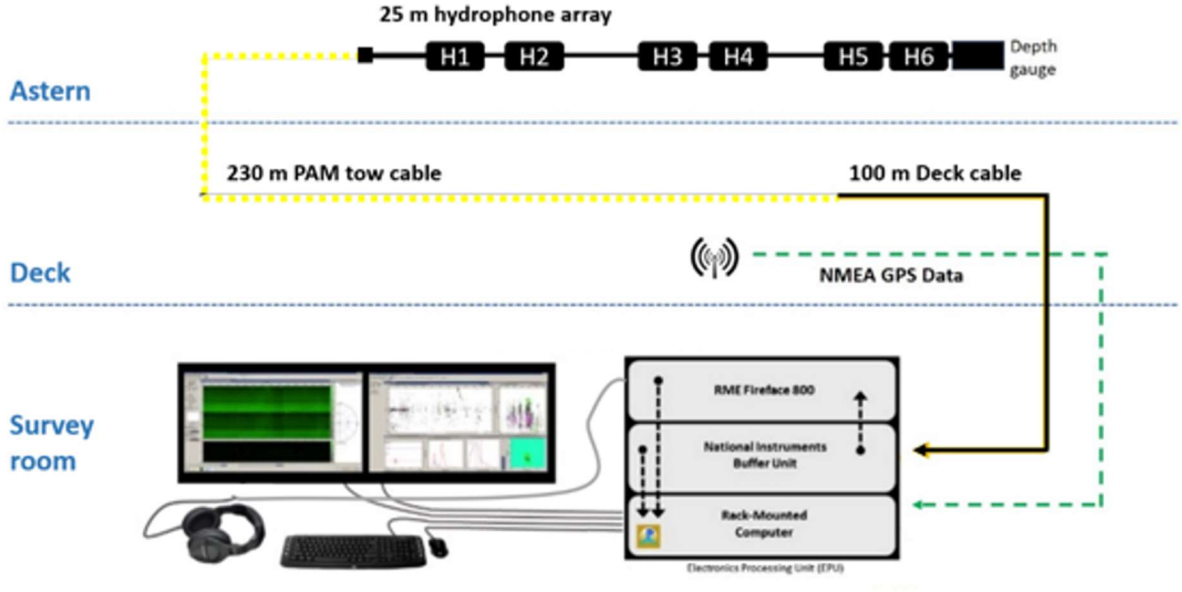

Figure 3: Simplified pathway of data through the PAM system onboard the *MGL*.

The hydrophone cable contained six hydrophone elements and a depth gauge molded into a 25-meter section of the cable. The six-element linear hydrophone array allowed the system to sample a large range of marine mammal vocalization frequencies. The hydrophone pair closest to the end by the depth gauge were used for low frequencies between 10 hertz and 24 hertz, the middle hydrophone pair was used for mid frequencies between 200 hertz and 200 kilohertz, and the forward hydrophone pair closest to the connector to the tow cable was used for high frequencies between two kilohertz and 200 kilohertz.

The deck cable interfaced between the hydrophone cable deployed astern of the vessel and the electronics processing unit (EPU) located in the main science lab. The rack-mounted EPU was set up with the two pre-installed, wall-mounted monitors supplied by the *MGL*, a keyboard, a mouse, and headphones. The EPU contained a buffer unit with Universal Serial Base (USB) output, an RME Fireface 800 ADC unit with firewire output, and a rack-mounted computer. A Global Positioning System (GPS) feed of GNGGA strings was supplied from the ship's Seapath navigation system and routed to the computer, reading data every five seconds. Data from the hydrophone cable's depth transducer was routed through the buffer unit to the computer, via USB connection. PAMGuard *Beta* version 1.15.17 was the software version utilized for the survey program.

Raw feed from the two high frequency hydrophone elements was digitized in the buffer unit using an analogue-digital National Instruments data acquisition (DAQ) soundcard at a sampling rate of 500 kilohertz. The output was filtered for HF content and visualized using the PAMGuard software, which used the difference between the time that a signal arrived at each of the two hydrophones to calculate and display the bearing to the source of the signal. A scrolling bearing/time module displayed the filtered data in real time, allowing for the detection and directional mapping of click trains. Additional components of the HF click detector system in PAMGuard included: an amplitude/time display that registered click intensity data in real time, as well as click waveform, click spectrum, and Wigner plot displays, providing the PAM operator immediate review of individual click characteristics in the identification process.

Raw feed from the two low frequency and two mid frequency hydrophone elements was routed from the buffer unit to the RME Fireface 800 unit, where it was digitized at a sampling rate of 48 kilohertz. The relatively low frequency (LF) output was further processed within PAMGuard by applying Engine Noise Fast Fourier Transform (FFT) filters, including click suppression and spectral noise removal filters (e.g., median filter, average subtraction, Gaussian kernel smoothing and thresholding). Filtered LF content was visualized in two spectrograms, one displaying a channel feed at frequency ranges of zero to 24 kilohertz, and another displaying a channel feed at a frequency range of zero to three kilohertz. LF click detector modules allowed for review of individual click characteristics as well as the detection and tracking of click trains.

A map module on the LF system interfaced with GPS data provided by the vessel to display the vessel location and could be used to determine range and bearing estimates based on clicks tracked in the click detector module. PAMGuard contained a function for calculating the range to vocalizing marine mammals based upon the least squares fit test. This method is most effective with animals that are relatively stationary in comparison to the moving vessel, such as sperm whales. The mathematical function estimated the range to vocalizing marine mammals by calculating the most likely crossing of a series of bearing lines generated from tracked clicks or whistles and plotted on a map display. The bearings of detected whistles and moans were calculated using a Time-of-Arrival-Distance (TOAD) method (where the signal time delay between the arrival of a signal on each hydrophone was compared), and presented on a radar display, along with amplitude information for the detected signal as a proxy for range.

Additional modules displayed on the LF monitor included a LF sound recorder and clip generator. The clip generator module within PAMGuard could be used to generate short sound clips in response to either an automatic detection or the operator manually selecting a portion of the spectrogram display. This module was useful in the event that the whistle-and-moan detector falsely triggered and identified a non-biological sound (i.e., echosounder) or if it missed detecting tonal signatures that the operator determined to be vocalizations.

3.3.2 Hydrophone Deployment

The hydrophone cable was deployed from a hydraulic winch on the port stern of the vessel's aft deck where the acoustic source arrays were deployed. Two deck cables, a main and a spare, were installed along the deck-head running from the winch to the main science lab. A Chinese finger attached to the tow cable approximately 125 meters ahead of the connector to the hydrophone array was secured to the port side boom via lifting rope. This reduced the tension on the cable remaining on the winch and served as a method to pull the cable further to port and away from the source arrays. This deployment method placed the trailing end of the hydrophone cable approximately 125 meters from the port stern of the vessel (Figure 4 and 74 meters ahead of the first elements on the arrays for the initial deployment configuration of the source and 122.6 meters ahead of the first elements for the final deployment configuration. One piece of chain of seven kilograms was attached and secured to the tow cable to increase tow depth and to decrease the chance of entanglement with the source arrays' umbilicals. The tow depth of the hydrophones varied between nine and 26 meters and averaged 16 meters throughout the seismic survey.

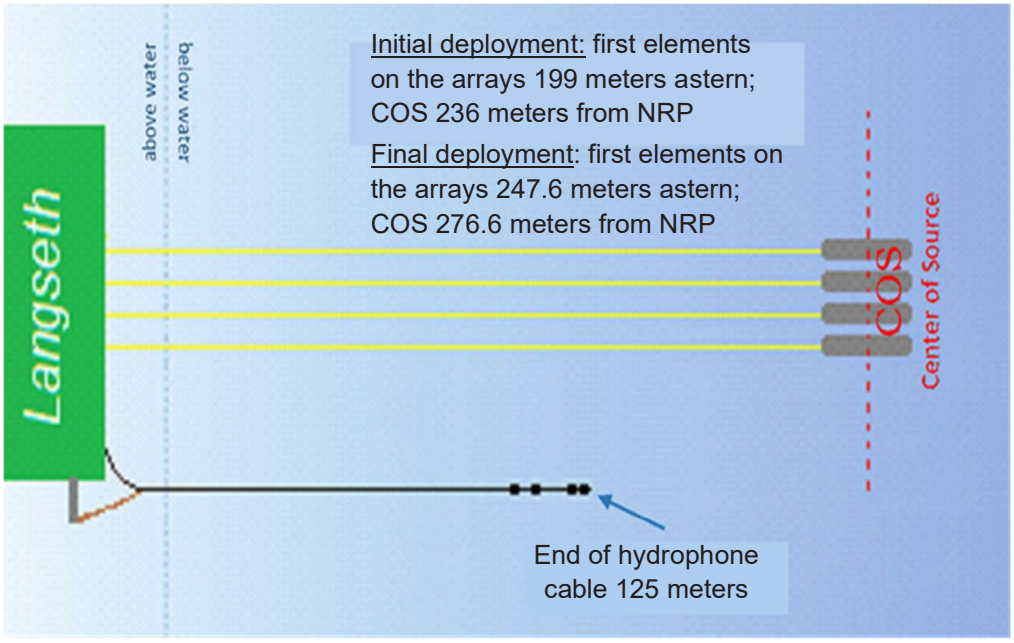

Figure 4. Location of the PAM cable in relation to the seismic gear during the survey.

4 MONITORING EFFORT SUMMARY

4.1 Survey Operations Summary

4.1.1 General Survey Parameters

The Blake Plateau seismic survey was conducted in two parts, with the MCS part of the survey occurring between 16 July and 19 August 2023, and the second OBS part of the survey occurring between 23 August and 14 September 2023. The vessel mobilized for the MCS part of the survey in Port Canaveral, Florida, with all other port calls for mobilizing and de-mobilizing occurring in Charleston, South Carolina (Table 5). During survey operations, data was acquired continuously according to the survey plan, with source operations only suspended when operationally necessary as outlined in Table 6.

Table 5: Survey parameters.

Survey Parameter	Date	Time (UTC)	Location
MCS part of survey			
Mobilization – depart port	16 July 2023	12:11	Port Canaveral, FL
Start of equipment deployment	17 July 2023	13:36	survey area
First seismic source activity	18 July 2023	10:48	survey area
Start of acquisition	19 July 2023	13:40	survey area
End of acquisition	17 August 2023	23:57	survey area
End of survey – all gear onboard	18 August 2023	10:19	survey area
De-mobilization – arrive at port	19 August 2023	13:20	Charleston, SC
OBS part of survey			
Mobilization – depart port	23 August 2023	19:15	Charleston, SC
Start of OBS deployment	24 August 2023	11:27	survey area
First seismic source activity	26 August 2023	11:36	survey area
Start of acquisition	26 August 2023	12:06	survey area
End of acquisition	10 September 2023	21:23	survey area
End of survey – all gear onboard	13 September 2023	14:44	survey area
De-mobilization – arrive at port	14 September 2023	12:00	Charleston, SC

Table 6: Suspension of source operations during the survey.

Date	Time Source Silenced	Date	Time Source Re-activated	Reason for Interruption to Acquisition
18 July 2023	11:18	19 July 2023	11:42	source and streamer maintenance
22 July 2023	15:57	22 July 2023	16:08	mechanical/technical silence to adjust streamer
25 July 2023	13:27	25 July 2023	17:30	line change out of permit area
28 July 2023	16:45	29 July 2023	07:12	line change out of permit area
29 July 2023	13:36	29 July 2023	13:43	mechanical/technical silence for compressor issue
31 July 2023	09:48	31 July 2023	15:37	silent for normal line change and source maintenance
01 August 2023	04:07	01 August 2023	04:12	mechanical/technical silence - gunlink froze - potential compliance issue, resumed source activity at night without a ramp-up
01 August 2023	15:55	01 August 2023	20:03	line aborted, vessel circling for source maintenance

Date	Time Source Silenced	Date	Time Source Re-activated	Reason for Interruption to Acquisition
02 August 2023	03:40	02 August 2023	05:55	line aborted, vessel circling for source maintenance - guns accidentally disabled at end of test line during the night
02 August 2023	15:25	02 August 2023	20:44	line aborted, vessel circling for source maintenance
04 August 2023	10:36	04 August 2023	15:26	line aborted, vessel circling for source maintenance
06 August 2023	21:38	06 August 2023	23:46	line aborted, vessel circling for source maintenance
07 August 2023	17:21	09 August 2023	17:43	all gear retrieved for transit to Jacksonville, FL for crew transfer
16 August 2023	01:23	16 August 2023	01:32	mechanical/technical silence for compressor issue
26 August 2023	12:01	26 August 2023	12:06	ramp-up aborted and re-started
27 August 2023	15:14	27 August 2023	19:45	line aborted, vessel circling for source maintenance
27 August 2023	19:49	27 August 2023	19:53	ramp-up aborted and re-started
28 August 2023	14:54	28 August 2023	15:02	mechanical/technical silence
29 August 2023	04:00	07 September 2023	13:50	OBS retrieval and re-deployment
08 September 2023	21:04	08 September 2023	21:15	mechanical/technical silence
10 September 2023	02:01	10 September 2023	02:46	line aborted, vessel circling for source maintenance
10 September 2023	08:52	10 September 2023	13:25	line aborted, vessel circling for source maintenance

4.1.2 MBES, SBP, and ADCP Operations

Throughout the survey program, the MBES was active for a total of 1,042 hours 11 minutes, SBP was active for a total of 1,091 hours 27 minutes, and the ADCP was active for a total of 1,277 hours 52 minutes. The MBES, SBP, and ADCP were activated for the first time at 15:10 UTC on 16 July 2023 for the MCS part of the survey and were disabled for at 05:53 UTC on 19 August 2023 when the vessel was completing the transit into port for crew change and mobilizing the next part of the survey. For the OBS part of the survey, the MBES, SPB and ADCP were enabled at 01:38 UTC on 24 August 2023 and then disabled at 12:00 UTC on 14 September 2023 when the vessel was heading into port at the end of the project. During both parts of the survey, the MBES, SPB and ADCP were de-activated and re-activated several times. mainly for issues with the equipment and proximity to the Bahamas EEZ (where operations were prohibited).

4.1.3 Seismic Source Operations

The seismic source was active throughout the survey for a total of 776 hours 23 minutes. This total included: seven hours and 14 minutes of ramp-up, 724 hours and nine minutes of operations on a survey line (291 hours 57 minutes at a full volume of 6,600 in^3 and 360 hours 57 minutes at reduced volumes), 44 hours 10 minutes of operations not on a survey line (31 hours 39 minutes at a full volume of 6,600 in^3 and 12 hours 31 minutes at reduced volumes), and 50 minutes of testing.

Table 1 summarizes the seismic source operations over the course of the survey program.

The seismic source was ramped-up 22 times during the survey, including 18 times during daylight hours and four times during hours of darkness. Twenty-one of the ramp-ups were cleared by both visual and

acoustic monitoring, with one ramp-up being cleared by acoustic monitoring only after a brief mechanical/technical silence at night (less than 30 minutes). The duration of the completed ramp-ups ranged between 21 and 24 minutes, with any ramp-ups of less duration being aborted before completion due to issues with the source.

There were three occasions of source testing including one single source test (single 40 in^3 element) and two multi-source tests that were both preceded by a ramp-up.

There were six instances where source activity was resumed without a ramp-up after a brief period of mechanical/technical silence (less than 30 minutes) and one instance where source activity was resumed without a ramp-up after a mitigation shut-down for a sea turtle.

There was one compliance issue on 01 August 2023 at 04:07 UTC. During full source operations being conducted at night, the source controller malfunctioned, which caused the source to stop firing for a period of approximately four minutes. When the source controllers' functionality returned, the source automatically activated at a volume of 4950 in^3, at 04:12 UTC. The source was active again at full volume at 04:14 UTC. (The National Marine Fisheries Service Endangered Species Act Section 7 Biological Opinion (3.3.3) states: For any shutdown at night or in periods of poor visibility (e.g., Beaufort sea state 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation was maintained, pre-start clearance watch of 30 minutes is not required).

The geospatial data for source operations are provided as a shapefile attachment to this report.

The monitoring effort, source operations and protected species detections for this survey are provided as an excel dataset in Appendix C and the basic data summary form found in Appendix D.

Table 7: Total acoustic source operations during the survey.

Acoustic Source Operation	Number	Duration (hh:mm)
Source Tests	3	00:50
Ramp-up	22	07:14
Day-time ramp-ups	18	05:47
Night-time ramp-ups	4	01:27
Full (6600 in^3)/Reduced Volume on a Survey Line		724:09
Full (6600 in^3)/Reduced Volume not on a Survey Line		44:10
Total Time Acoustic Source Was Active		**783:37**

4.1.4 Interactions with Other Vessels

In addition to visually monitoring for protected species, PSOs also observed and documented interactions with other marine vessel traffic. Such interactions included but were not limited to another vessel or another vessels' towed gear/equipment interacting with the *MGL's* towed gear/equipment, and the *MGL* having to deviate from planned survey operations (i.e., diverge from the survey line, increase/decrease speed) because of another vessel.

There was one instance during the MCS part of the survey on 05 August 2023 where the *MGL* had to deviate approximately 15 degrees offline and then turn onto the next line early to avoid fishing gear deployed from a nearby fishing vessel.

4.2 Visual Monitoring Survey Summary

Visual monitoring was conducted by two PSOs during all daylight hours, beginning 30 minutes before sunrise and ending 30 minutes after sunset each day, initiating when the vessel left dock at the beginning of the program and terminating upon the vessels return to dock at the end of the program (Table 8). During transit and other periods with no source operations, observations were undertaken by two PSOs for VSA and to collect baseline data about protected species abundance in the survey areas. Visual

monitoring was also conducted at night on four occasions for night-time pre-clearance searches and ramp-ups.

Table 8: Initiation and termination of visual monitoring during the survey.

Visual Monitoring	Date	Time (UTC)
Initiation for the MSC part of the survey	16 July 2023	12:11
Termination for the MSC part of the survey	19 August 2023	13:20
Initiation for the OBS part of the survey	23 August 2023	19:15
Termination for the OBS part of the survey	14 September 2023	14:14

Visual monitoring on the *MGL* was conducted over a period of 58 days for a total of 804 hours 10 minutes. Of the overall total visual monitoring effort, 56% (454 hours 10 minutes) was undertaken while the acoustic source was active, and 44% (350 hours) was undertaken while the acoustic source was silent. Visual monitoring while the acoustic source was silent was mainly conducted during the transits and equipment deployment and retrieval. Table 9 details visual monitoring with acoustic source operations on the *MGL* throughout the seismic survey.

Table 9: Total visual monitoring effort during the survey.

Visual Monitoring Effort	Duration (hh:mm)	% of Overall Effort
Total monitoring while acoustic source active	454:10	56
Total monitoring while acoustic source silent	350:00	44
Total monitoring effort	**804:10**	**-**

Visual observations on the *MGL* were preferentially conducted from the PSO tower, which provided a 360-degree view of the water around the vessel and the acoustic source. Visual watches were conducted from other locations, including the catwalk and bridge if monitoring conditions could not be undertaken from the tower, such as during rough weather and sea conditions which made the tower unsafe, or when the vessel was heading directly into the wind, blowing the engine exhaust onto the tower. PSOs conducted visual monitoring from the tower (63%) more often than any other location (Table 10) during the survey. Monitoring was conducted simultaneously from the bridge and catwalk when the ships exhaust was blowing on the tower but monitoring conditions were otherwise favorable. Monitoring was conducted simultaneously from the tower and catwalk when the ships exhaust was only blowing on part of the tower.

Table 10: Total visual monitoring effort from observation locations during the survey.

Observation Location During Visual Effort	Duration (hh:mm)	% of Overall Effort
Tower	507:57	63
Bridge	206:17	26
Catwalk	89:56	11

4.3 Acoustic Monitoring Survey Summary

Acoustic monitoring was conducted continuously throughout acoustic source operations and to the maximum extent possible while the acoustic source was silent (Table 11). Periods without source activity or acoustic monitoring occurred when the PAM hydrophone cable was secured on board the vessel during transits, during deployment and recovery of the seismic gear, and during times when operations were suspended due to rough weather and sea conditions or gear maintenance.

Table 11: Initiation and termination of acoustic monitoring watches during survey.

Acoustic Monitoring	Date	Time (UTC)
Initiation for the MSC part of the survey	18 July 2023	07:11
Termination for the MSC part of the survey	18 August 2023	02:35

Initiation for the OBS part of the survey	25 August 2023	19:13
Termination for the OBS part of the survey	10 September 2023	23:15

Acoustic monitoring was conducted over 40 days for a total of 851 hours 40 minutes. Of the overall total acoustic monitoring effort, 88% (752 hours 23 minutes) was undertaken while the acoustic source was active, and 12% (99 hours 17 minutes) was undertaken while the acoustic source was silent. Acoustic monitoring while the acoustic source was silent was mainly conducted during the brief periods of time between recovery/deployment of the seismic gear and recovery/deployment of the PAM cable. Table 12 details acoustic monitoring with acoustic source operations.

Table 12: Total Passive Acoustic Monitoring (PAM) effort during the survey.

Acoustic Monitoring Effort	Duration (hh:mm)	% of Overall Effort
Total monitoring while the acoustic source was active	752:23	88
Total monitoring while the acoustic source was silent	99:17	12
Total acoustic monitoring	**851:40**	**-**

Acoustic monitoring was suspended four times throughout the survey program between the initial deployment of the hydrophone cable at the start of each part of the survey, during deployment and retrieval of OBS instruments, and the final retrieval of the hydrophone cable at the end of each part of the survey. Acoustic monitoring downtime totaled 451 hours 44 minutes, all of which occurred while the acoustic source was silent. Table 13 outlines the dates, times, and reasons for each instance of acoustic monitoring downtime.

Table 13: Acoustic monitoring downtime during the survey.

Acoustic Monitoring Stopped		Acoustic Monitoring Resumed		Total Downtime	Downtime with Source Active	Downtime with Source Silent	Reason for Downtime
Date	Time	Date	Time				
18 July 2023	19:23	19 July 2023	08:00	12:37	00:00	12:37	Source and streamer maintenance.
07 August 2023	19:57	09 August 2023	13:09	41:12	00:00	41:12	Transit to Jacksonville, FL to drop off crew member.
18 August 2023	10:08	25 August 2023	19:13	177:05	00:00	177:05	Source retrieval for crew change and end of MSC portion.
29 August 2023	07:40	07 September 2023	12:30	220:50	00:00	220:50	All gear retrieved for OBS retrieval and deployment.
Total acoustic monitoring downtime				**451:44**	**00:00**	**451:44**	

4.4 Simultaneous Visual and Acoustic Monitoring Summary

Simultaneous visual and acoustic monitoring was conducted to the maximum extent possible for a total of 524 hours 54 minutes. Of the overall simultaneous monitoring effort, 87% (454 hours 10 minutes) was conducted while the acoustic source was active (Table 14). Additional visual monitoring conducted during transit periods and while OBS instruments were deployed/retrieved and was not accompanied by acoustic monitoring as the varied vessel speed would causes the hydrophone cable to migrate to the water surface, out of the ideal tow position, where increased background noise would impair acoustic detection capabilities.

Table 14: Simultaneous visual and acoustic monitoring effort during the survey.

Simultaneous Visual and Acoustic Monitoring	Duration (hh:mm)	% of Overall Downtime
Source Active	454:10	87
Source Silent	70:44	13
Overall Total	**524:54**	**-**

4.5 Environmental Conditions

Environmental conditions can have an impact on the probability of detecting protected species. The environmental conditions present during visual observations undertaken during the survey program were generally considered to be 'very good'.

Visibility was classified as 'excellent' if it extended greater than 10 kilometers and 'very good' if it was between seven and 10 kilometers. 64% and 17% of monitoring effort on the *MGL* was undertaken at 'excellent' and 'very good' visibility levels, respectively (Table 15). The entire predicted harassment zone radii, BZs, and EZs were not visible on multiple occasions, mainly due to precipitation and reduced lighting before sunrise and after sunset and during night-time visual monitoring. During these times, it is possible that protected species were not detected within these zones.

Reduced visibility was mainly attributed to periods of heavy rain, the brief periods of reduced lighting before sunrise and after sunset, and any time visual monitoring was required for a nighttime ramp-up.

Table 15: Visibility during the survey (in kilometers).

Total	<0.05	0.05-0.1	0.1-0.3	0.3-0.5	0.5-1	1-2	2-5	5-7	7-10	>10
Duration (hh:mm)	01:46	01:47	02:32	18:57	17:33	17:41	38:45	54:31	137:33	513:05

Precipitation was recorded during visual monitoring on the *MGL* for a total of 804 hours 10 minutes. Most of the precipitation recorded was clear (79%) or light rain (10%) (Table 16).

Table 16: Precipitation during the survey.

Total	None	Heavy Rain	Moderate Rain	Light Rain	Heavy Fog	Moderate Fog	Thin Fog	Haze	Sleet	Snow
Duration (hh:mm)	634:22	12:58	11:57	83:57	00:00	00:00	05:45	55:11	00:00	00:00

The Beaufort Sea State recorded during visual monitoring ranged from level one to level eight Most visual observations on the *MGL* were undertaken in conditions where the BSS was level 4 (32%) or level 3 (32%), which were considered 'good' conditions for the detection of protected species (Table 17).

Table 17: Beaufort Sea State during the survey.

Total	B0	B1	B2	B3	B4	B5	B6	B7	B8	B9
Duration (hh:mm)	00:00	37:00	174:55	253:37	256:17	54:53	16:38	04:20	06:30	00:00

Wind speeds recorded visual monitoring ranged between one and 44 knots. Most of the visual monitoring on the *MGL* occurred during recorded wind speeds less than 10 knots (39%) and from 10 to 15 knots (38%) (Table 18).

Table 18: Wind speed during the survey.

Total	<10	10-15	16-20	21-25	26-30	>31
Duration (hh:mm)	312:05	307:40	130:50	36:29	09:24	07:42

Swell heights during visual observations were generally low, with swells of less than two meters recorded for the majority of visual observations (92%) (Table 19).

Table 19: Swell height during the survey.

Total	<2m	2-4m	>4m
Duration (hh:mm)	738:03	56:11	09:56

Visual monitoring was conducted primarily when severe glare (35%) was present (Table 20). During times of moderate to severe glare, it is possible that the detection of protected species was hindered.

Table 20: Glare during the survey.

Total	None	Mild	Moderate	Severe
Duration (hh:mm)	186:03	119:56	213:41	284:30

5 MONITORING AND DETECTION RESULTS

5.1 Visual Detections

Visual monitoring efforts during the survey program resulted in a total of 23 visual detections of protected species totaling 79 individuals (summarized in Appendix E. This total included 13 detections of dolphins and 10 detections of sea turtles.

Table 21 lists the total number of detections and total number of individuals for each protected species observed during the survey program. Photographs taken of visual detections can be found in Appendix F.

Maps of the protected species detections are shown in Figure 5.

Table 21: Number of visual detection records collected for each protected species during the survey.

Species	Total Number of Detection Records	Total Number of Animals
Dolphins		
Common bottlenose dolphin	3	31
Pantropical spotted dolphin	7	31
Unidentifiable dolphin	3	7
Sea turtles		
Green sea turtle	3	3
Loggerhead sea turtle	2	2
Leatherback sea turtle	1	1
Unidentifiable shelled sea turtle	4	4
Total	**23**	**79**

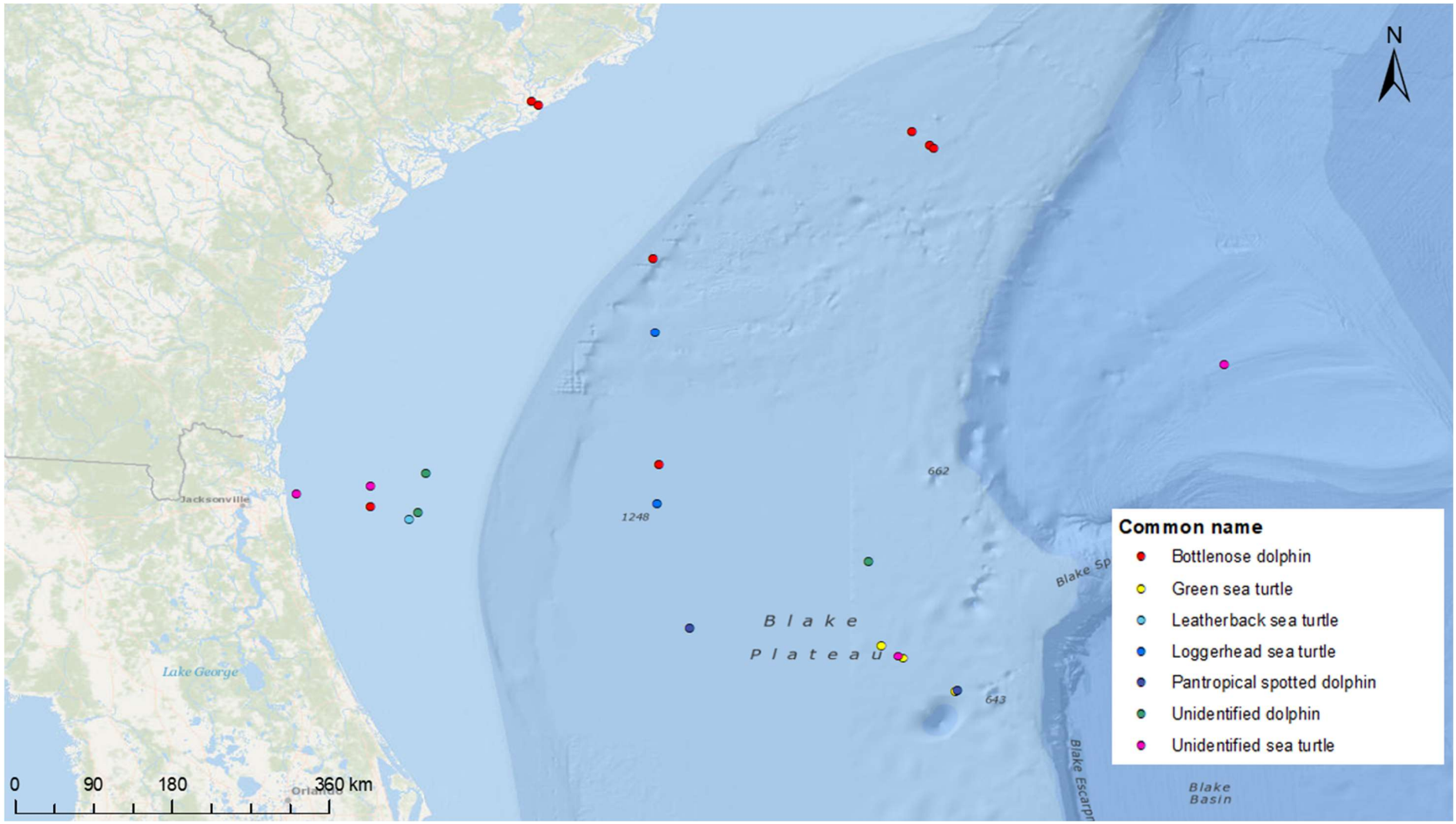

Figure 5: All protected species detections observed by common name during the survey.

Of the 23 visual detections of protected species, five occurred while the acoustic source was deployed and active, two occurred while the acoustic source was deployed and inactive, and 16 occurred while the acoustic source was not deployed. Table 22 lists the number of detections of each protected species while the source was deployed, and the average closest observed approach to the active and inactive seismic source. For detections where the source was not deployed, there are no calculated distances to the source. Detections occurred in water depths between 11 and 1,034 meters.

Table 22: Average closest approach of protected species to the acoustic source during the survey.

Species Detected	Regulated Source Active		Regulated Source Inactive	
	Number of detections	Mean closest observed approach to source (meters)	Number of detections	Mean closest observed approach to source (meters)
Common bottlenose dolphin	-	-	1	280
Pantropical spotted dolphin	-	-	1	280
Unidentified dolphin	1	700	-	-
Green sea turtle	1	258	-	-
Loggerhead sea turtle	2	160	-	-
Unidentified sea turtle	1	217	-	-

In general, dolphins detected during the survey program were mainly observed surfacing and swimming at moderate or vigorous paces, mostly towards and away from the vessel. Sea turtles detected during the survey program were mainly observed swimming at and below the surface of the water at moderate or vigorous paces and diving, mainly in the opposite direction or away from the vessel.

5.1.1 Other Wildlife

Observations of other wildlife included 32 species of birds and one species of fish. A complete list of birds and other marine wildlife observed and identified, in addition to the approximate number of individuals observed and the number of days on which they were observed, can be found in Appendix H. No adverse impacts to any other wildlife species as a result of research activities were observed.

There were no sightings of any ESA-listed seabirds during the survey program.

5.2 Acoustic Detections

There were two acoustic detections of protected species during the survey program, including one detection of common bottlenose dolphins and one detection of unidentifiable dolphins. Both detections occurred during daylight hours and were correlated with visual detections of the same individuals. The detection of common bottlenose dolphins occurred in water depths of 523 meters with the acoustic source deployed but silent while the vessel was conducting a line change outside of the survey area. The detection consisted of six individuals detected via inaudible clicks and audible whistles. The detection of unidentifiable dolphins occurred in water depths of 819 meters while the seismic source was active at full volume while the vessel was acquiring a survey line. The detection consisted of three individuals detected via inaudible clicks. There were no mitigation actions implemented for either detection. Screenshots of the acoustic detections can be found in Appendix G.

6 MITIGATION ACTION SUMMARY

There was one mitigation action implemented during the survey program consisting of a shutdown of the active source totaling 15 minutes for a loggerhead sea turtle detected while the source was active at full volume while the vessel was acquiring a survey line. The turtle was observed resting and swimming sedately at the surface of the water off the starboard side of the vessel heading parallel in the opposite direction as the vessel. When the turtle was near the stern of the vessel, it changed heading slightly towards the vessel, then dove and disappeared. A shutdown mitigation action was requested as the turtle was approaching and entering the 150-meter exclusion zone, and the turtle had a closest and final observed distance of 147 meters to the active source. As the turtle was not observed exiting the designated exclusion zone, a 15-minute delay was implemented before clearance was given for source operations to resume at the previous operational activity (no ramp-up was required as per the project permits).

6.1 Vessel Strike Avoidance (VSA) Maneuvers

There were 10 VSA maneuvers implemented during the survey program, each consisting of the vessel maintaining course and speed while the protected species were sighted within the required separation distance. Five of the VSAs were implemented for sea turtles and five of the VSAs were implemented for dolphins. Additionally, there were three instances of protected species sighted within the required separation distance where no VSA was requested as the vessel was towing equipment and was restricted in maneuverability, including one instance for a sea turtle and two instances for dolphins. However, the vessel was maintaining course and speed during these times due to the vessel activities during the detections (the vessel was going straight at a steady speed while acquiring a line, on an extended straight-line change, and deploying equipment). Finally, there was one instance where a sea turtle entered the required separation distance but was only sighted for a second and the detection was too brief to request a VSA to be requested and implemented; however, during the detection, the vessel was stopped/stationary while awaiting a crew boat near Jacksonville, Florida for a crew transfer.

6.2 Protected Species Known to Have Been Exposed to 160 Decibels or Greater of Received Sound Levels

Numerous protected species are known to occur within the survey area, including nine species listed as endangered or threatened under the ESA. These species included five marine mammals, including humpback whale, blue whale, fin whale, sei whale and sperm whale; and four species of sea turtles, including green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. NSF came to a "no effect" determination for seabirds due to their unlikely presence; however, PSOs monitored for three ESA-listed sea birds including the roseate tern, the Bermuda petrel, and the black-capped petrel, in the unlikely event they were encountered in the survey area.

NMFS granted an IHA, which included an ITS, for the marine seismic survey, authorizing Level B harassment (exposure to sound pressure levels equal to or greater than 160 dB re: 1 µPa rms) where there is a potential for behavioral changes) for 12,583 individuals from 25 species or species groups, including five whale species listed as endangered. Two species of whales, minke and sei, and one whale species group (*Kogia*) were authorized for a total of 53 individuals for Level A harassment (exposure to sound pressure levels where there is a potential for auditory injury based upon each species hearing range). Additionally, there was a total of 360 individuals from four endangered sea turtle species authorized for Level B harassment.

During seismic source operations, seven protected species were observed within the predicted 160 and 175 decibel radii (where there is a potential for a behavioral response) while the acoustic source was active, constituting potential Level B takes. This total included three unidentified dolphins, one green sea turtle, two loggerhead sea turtles, and one unidentified sea turtle. There were no protected species observed within the predicted radius at which there is a potential for auditory injury (based upon each

species hearing range and how that overlaps with the frequencies produced by the sound source), constituting potential Level A takes/exposures.

The number of potential takes may be an underestimation and, therefore, may be a minimum estimate of the actual number of protected species potentially exposed to received sound levels within the predicted Level A and Level B harassment zones. It is possible that the estimated numbers of animals recorded were underestimates due to some individuals not being visually sighted or having moved away before they were observed (Table 23).

Table 23: Number of authorized and potential Level A and B harassment takes / exposures during the survey.

Species	IHA Authorized Level A Takes/ Exposures	IHA Authorized Level B Takes/ Exposures	Total Potential Takes/ Exposures During Seismic operations
Humpback whale	-	2	-
Minke whale	1	20	-
Fin whale	-	5	-
Sei whale	2	28	-
Blue whale	-	2	-
Sperm whale	-	709	-
Cuvier's beaked whale	-	366	-
Mesoplodon beaked whales	-	155	-
Risso's dolphin	-	1280	-
Rough-toothed dolphin	-	302	-
Bottlenose dolphin	-	4457	-
Pantropical spotted dolphin	-	420	-
Atlantic spotted dolphin	-	1774	-
Spinner dolphin	-	149	-
Striped dolphin	-	46	-
Clymene dolphin	-	182	-
Fraser's dolphin	-	227	-
Common dolphin	-	182	-
Pilot whale	-	1428	-
Killer whale	-	6	-
False killer whale	-	6	-
Pygmy killer whale	-	20	-
Melon-headed whale	-	213	-
Kogia species	50	601	-
Harbor porpoise	-	3	-
Green sea turtle	-	116	1
Kemp's ridley sea turtle	-	2	-
Leatherback sea turtle	-	8	-
Loggerhead sea turtle	-	234	2
Unidentified whale	-	-	-
Unidentified dolphin	-	-	3
Unidentified porpoise	-	-	-
Unidentified pinniped	-	-	-
Unidentified sea turtle	-	-	1

Table 24 describes the behavior of all animals, including unidentified species, which were visually observed within the predicted Level B harassment zones. There were no highly distinctive behavioral reactions observed in relation to the vessel or acoustic source during the seismic survey.

Table 24: Behavior of species visually observed to be exposed to sound pressure levels of 160 dB or greater during the survey.

Species	Detection No.	No. of Animals	CPA Active Source (meters)	Source Volume (in^3) at CPA	Initial Behavior	Initial Direction in Relation to Vessel	Subsequent and Final Behaviors	Final Direction in Relation to Vessel
Loggerhead sea turtle	2	1	150	6600	swimming below surface	parallel in same direction as vessel	swimming below surface, surfacing, resting at surface / logging, diving	towards vessel
Unidentifiable dolphin	3	3	700	6600	surfacing	away from vessel	surfacing, fast travel	parallel in opposite direction as vessel
Unidentifiable shelled sea turtle	10	1	217	6600	swimming	parallel in opposite direction as vessel	fast travel, diving	away from vessel
Loggerhead sea turtle	17	1	170	6600	surfacing	away from vessel	surfacing, fast travel	away from vessel
Green sea turtle	18	1	258	6540	surfacing	away from vessel	surfacing, fast travel	away from vessel

6.3 Implementation and Effectiveness of the Biological Opinion and IHA

To minimize the potential impacts to marine mammals during the seismic survey, LDEO and PSOs were prepared to implement mitigation measures whenever these protected species were detected approaching, entering, or within their designated exclusion zones as outlined in the IHA and BiOp. There was one mitigation action implemented for protected species consisting of a shut-down of the sound source for a loggerhead sea turtle. The confirmation of the implementation of each term and condition of the project permit documents are described in this report.

If a North Atlantic right whale was observed at any time during at survey program at any distance from the vessel, the sighting was to be reported immediately to the NMFS North Atlantic Right Whale Sighting Advisory System and the U.S. Coast Guard. There were no sightings of North Atlantic right whales during the survey program.

If an injured or dead protected species was discovered, the incident was to be reported to the NMFS Office of Protected Resources (OPR), NMFS, and the NMFS Southeast Regional Stranding Coordinator as soon as possible. The report would include a detailed description of the incident (time, date, location, species identification, description of the animal, condition of the animal/carcass, observed behaviors if the animal was alive, and general circumstances under which the animal was discovered), including pictures when possible. There were no sightings of dead or injured protected species during the survey program.

To prevent the occurrence of the vessel striking a marine mammal during transits, PSOs and vessel crew members maintained a vigilant watch for marine mammals, and the vessel was prepared to slow down, stop, or alter course as appropriate to avoid striking a protected species. The vessel speed had to be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans were observed near the vessel. The vessel had to maintain the minimum separation distances as described in Table 2. If a marine mammal was sighted during transits, the vessel was to act as necessary to avoid violating the relevant separation distances (e.g., attempt to remain parallel to the animal's course, avoid

excessive speed or abrupt changes in direction until the animal left the area). If marine mammals were sighted within the relevant separation distances, the vessel was required to reduce speed, shift the engines to neutral, and not engage the engines until the animals were clear of the area. If a whale entered the separation zone while the vessel was stationary, the vessel would not engage the engines until the whale has exited the zone. These requirements did not apply in any case where compliance would create an imminent and serious threat to a person or vessel, or if the vessel was restricted in maneuverability due to towed equipment. There were 10 instances of vessel strike avoidance maneuvers being implemented for detections of protected species sighted within the required separation distance.

In the event of a ship strike of a marine mammal, the incident was to be reported to NMFS, OPR, and to the Southeast Regional Stranding Coordinator, as soon as feasible. The report would include a detailed description of the incident (date, time, location, species identification, description of the animal(s) involved, vessel speed leading up to the incident, vessel's course/heading and what operations were being conducted, status of all sound sources in use, description of avoidance measures taken if any, environmental conditions, description of the animals behavior preceding and following the strike, and estimated fate of the animal), including pictures when possible. There were no instances of the vessel striking a protected species during the survey.

PSOs likely did not detect all animals present; however, it is highly unlikely that the actual number of animals present during survey operations reached anywhere near the fully authorized levels for all species. The combination of conservative predicted mitigation zones combined with conservative take estimation by NMFS (*i.e.,* the precautionary approach), appears for most species to have resulted in an overestimation of take and of overall impact on marine species from the activity. The monitoring and mitigation measures required by the IHAs appear to have been an effective means to protect the marine species encountered during survey operations.

Appendix A: Incidental Harassment Authorization

Appendix B: RPS Protected Species Observers Onboard the *MGL*

Appendix C: Complete Survey Raw Datasheets (Provided in Attached File in Excel Format)

Appendix D: Basic Data Summary Form

Appendix E: Summary of Visual Detections of Protected Species During the Survey

Appendix F: Photographs of Protected Species Visually Detected During the Survey

Appendix G: Screenshots of Acoustic Detections During the Survey

Appendix H: Birds and Other Wildlife Observed During the Survey

Appendix D: Basic Data Summary Form

BASIC DATA FORM			
LDEO Project Number	MGL2309 and MGL2310		
Seismic Contractor	LDEO		
Area Surveyed During Reporting Period	Northwest Atlantic Ocean: Florida, Georgia, and South Carolina coasts		
Survey Type	2D seismic		
Vessel and/or Rig Name	*Marcus G. Langseth*		
Permit Number	IHA issued and BiOp issued on 10 July 2023		
Location / Distance of Source Deployment	236 meters and then 276.6 meters astern from NRP in PSO tower to COS.		
Water Depth in survey area	Between 100 and 5,200 meters		
Dates of MCS part of survey	16 July 2023	through	19 August 2023
Dates of OBS part of survey	23 August 2023	through	14 September 2023
Total time source operating – all power levels:	776:23		
Time source operating on survey lines:	724:09		
Time source operating not on a survey line:	44:10		
Amount of time single 40 in³ element operations:	00:00		
Amount of time in ramp-up:	07:14		
Number daytime ramp-ups:	18		
Number of nighttime ramp-ups:	4		
Number of ramp-ups from mitigation source:	0		
Amount of time conducted in source testing:	00:50		
Duration of visual observations:	804:10		
Duration of observations while source active:	454:10		
Duration of observation during source silence:	350:00		
Duration of acoustic monitoring:	851:40		
Duration of acoustic monitoring while source active:	752:23		
Duration of acoustic monitoring during source silence:	99:17		
Duration of simultaneous acoustic and visual monitoring:	524:54		
Lead Protected Species Observer:	Amanda Dubuque (MCS) Cassandra Frey (OBS)		
Protected Species Observers on the Langseth:	Avinash Maharajh (MCS), Beatriz Cotrim (MCS), Gloria Ponce (MCS), Pablo Curiel (MCS), Ana Lira (OBS), Claudia Portocarrero (OBS), Laura Danos (OBS), Lorena Figueroa (OBS)		
Number of Marine Mammal Visual Detections:	13		
Number of Marine Mammal Acoustic Detections:	2		
Number of Simultaneous Visual and Acoustic Detections:	2		
Number of Sea Turtle Detections:	10		
Total Number of Protected Species Detections:	23		
List Mitigation Actions	1 shutdown for a loggerhead sea turtle		
Duration of Mitigation Actions:	00:15		

Appendix E: Summary of Visual Detections of Protected Species During the Survey

Movement Codes: **TV**: towards vessel; **AV**: away from vessel; **PV/SD**: parallel vessel, same direction; **PV/OD**: parallel vessel, opposite direction; **PE (AH/BH):** perpendicular (crossing ahead or behind); **MI**: milling; **SA**: stationary; **V:** variable, **UN**: unknown**; OM**: other movement

Behavioral Codes: **NS**: normal swimming; **FT**: fast travel; **ST**: slow travel; **PO**: porpoising; **SS**: swimming below surface; **MI**: milling: **BR**: bow/wake riding; **BA**: resting/basking at surface; **FL:** floating; **SA: surface** active (lob tailing/pectoral slapping, full/partial breaching)**; R:** rolling; **DI**: dive; **DF**: dive with fluke; **FF**: feeding/foraging; **SB**: social behavior; **MT**: mating behavior; **BV**: blow visible (whale); **SV**: only splashes visible (dolphins); **DV**: dorsal fin visible; **OB**: other behavior

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement	Behavior	CPA Source/ Source Activity	Mitigation Action	Comments
1	2023-07-28	22:36	Common bottlenose dolphin	6	31.83007°N, 079.18877°W	Source silent	PV/SD, AV	SS, SR	280 meters/silent	none	Vessel was conducting a line change outside of the survey area.
2	2023-07-29	18:23	Loggerhead sea turtle	1	31.37669°N, 079.17814°W	Full volume	PV/SD, TV	SS, SR, BA, DI	150 meters/active and 147 meters/silent	shutdown of source	Mitigation duration was 15 minutes. Potential Level B take/exposure.
3	2023-08-01	22:14	Unidentifiable dolphin	3	29.98457°N, 077.89118°W	Full volume	AV, PV/OD	SR, FT	700 meters/active	none	Potential Level B take/exposure.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement	Behavior	CPA Source/ Source Activity	Mitigation Action	Comments
4	2023-08-08	13:49	Unidentifiable Shelled Sea Turtle	1	30.39875°N, 081.33402°W	Source not deployed	PV/OD, PV/OD	DI	N/A	none	Vessel was stopped near Jacksonville, FL awaiting crew transfer.
5	2023-08-08	16:40	Common bottlenose dolphin	5	30.31980°N, 080.89162°W	Source not deployed	TV, V	DI, NS, SS, FT, SR	N/A	none	Vessel was in transit back to the survey area.
6	2023-08-08	18:00	Leatherback sea turtle	1	30.24256°N, 080.65540°W	Source not deployed	PV/SD, PV/SD	SS, DI	N/A	none	Vessel was in transit back to the survey area.
7	2023-08-09	15:10	Pantropical spotted dolphin	5	29.58406°N, 078.96787°W	Source silent	TV, AV	DI, FT, PO	280 meters/silent	none	Vessel was re-deploying survey equipment after returning to the survey area.
8	2023-08-19	12:31	Common bottlenose dolphin	1	32.78715°N, 079.91813°W	Source not deployed	AV, AV	SR	N/A	none	Vessel was in transit into port.
9	2023-08-23	19:40	Common bottlenose dolphin	2	32.76681°N, 079.87936°W	Source not deployed	TV, AV	SR, NS, SS	N/A	none	Vessel was in transit to the survey area from port.
10	2023-08-27	13:27	Unidentifiable shelled sea turtle	1	31.18206°N, 075.75085°W	Full volume	PV/OD, AV	NS, FT, DI	217 meters/active	none	Potential Level B take/exposure.
11	2023-08-29	13:18	Common bottlenose dolphin	2	32.60173°N, 077.62892°W	Source not deployed	PE(AH), TV	SR, FT, SS	N/A	none	Vessel was in transit within the survey area. VSA – maintain course and speed.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement	Behavior	CPA Source/ Source Activity	Mitigation Action	Comments
12	2023-08-29	17:46	Common bottlenose dolphin	7	32.52233°N, 077.52410°W	Source not deployed	PV/SD, PV/SD	SS, SR, FT	N/A	none	Vessel was in transit within the survey area. VSA – maintain course and speed.
13	2023-08-29	18:03	Common bottlenose dolphin	5	32.50034°N, 077.49690°W	Source not deployed	TV, TV	FT, NS, SR, SS, DI	N/A	none	Vessel was in transit within the survey area. VSA – maintain course and speed.
14	2023-09-02	11:34	Unidentifiable dolphin	2	30.28117°N, 080.60250°W	Source not deployed	PV/OD, PV/OD	SR, SS	N/A	none	Vessel was in transit to port.
15	2023-09-02	17:36	Unidentifiable shelled sea turtle	1	30.44635°N, 080.88886°W	Source not deployed	AV, AV	SR, SS	N/A	none	Vessel was in transit back to the survey area.
16	2023-09-02	19:23	Unidentifiable dolphin	2	30.51968°N, 080.55527°W	Source not deployed	TV, AV	SS, FT	N/A	none	Vessel was in transit back to the survey area.
17	2023-09-07	16:37	Loggerhead sea turtle	1	30.33761°N, 079.16405°W	Full volume	AV, AV	SR, FT	170 meters/active	none	Potential Level B take/exposure. VSA – maintain course and speed.
18	2023-09-08	18:14	Green sea turtle	1	29.19799°N, 077.36802°W	Reduced volume	AV, AV	SR, FT	258 meters/active	none	Potential Level B take/exposure. VSA – maintain course and speed.
19	2023-09-12	12:59	Pantropical spotted dolphin	20	29.19883°N 077.35467°W	Source not deployed	AH	FT	N/A	none	Vessel was in OBS retrieval operations. VSA – maintain course and speed.

Record No.	Date	Time (UTC)	Species	Group Size	Vessel Position	Source Activity Initial Detection	Movement	Behavior	CPA Source/ Source Activity	Mitigation Action	Comments
20	2023-09-12	17:47	Green sea turtle	1	29.39770°N 077.68229°W	Source not deployed	AV	NS	N/A	none	Vessel was in OBS retrieval operations. VSA – maintain course and speed.
21	2023-09-12	18:05	Unidentifiable shelled sea turtle	1	29.41207°N 077.70935°W	Source not deployed	PV/OD	SS	N/A	none	Vessel was in OBS retrieval operations. VSA – maintain course and speed.
22	2023-09-12	20:20	Green sea turtle	1	29.47713°N 077.81458°W	Source not deployed	AV	SS	N/A	none	Vessel was in OBS retrieval operations. VSA – maintain course and speed.
23	2023-09-12	16:56	Common bottlenose dolphin	9	30.57249°N 079.15320°W	Source not deployed	AH	NS	N/A	none	Vessel was in transit to dock. VSA – maintain course and speed.

Photographs of Protected Species Visually Detected During the Survey

Figure 1: Common bottlenose dolphins; 28 July 2023 (VD#01, correlated with AD#01).

Figure 2: Loggerhead sea turtle; 29 July 2023 (VD#02).

Figure 3: Unidentifiable dolphins; 28 July 2023 (VD#03, correlated with AD#02).

Figure 4: Common bottlenose dolphin, 08 August 2023 (VD#5).

Figure 5: Pantropical spotted dolphin, 09 August 2023 (VD#7).

Figure 6: Common bottlenose dolphin, 23 August 2023 (VD#09

Figure 7: Common bottlenose dolphin, 23 August 2023 (VD#11).

Figure 8: Common bottlenose dolphin, 29 August 2023 (VD#12).

Figure 9: Common bottlenose dolphin, 23 August 2023 (VD#13).

Figure 10: Loggerhead sea turtle, 07 September 2023 (VD#17).

Figure 11: Green sea turtle, 08 September 2023 (VD#18).

Figure 12: Pantropical dolphin, 12 September 2023 (VD#19).

Figure 13: Green sea turtle, 12 September 2023 (VD#20).

Figure 14: Green sea turtle, 12 September 2023 (VD#22).

Figure 15: Common bottlenose dolphin, 13 September 2023 (VD#23).

Screenshots of Acoustic Detections During the Survey

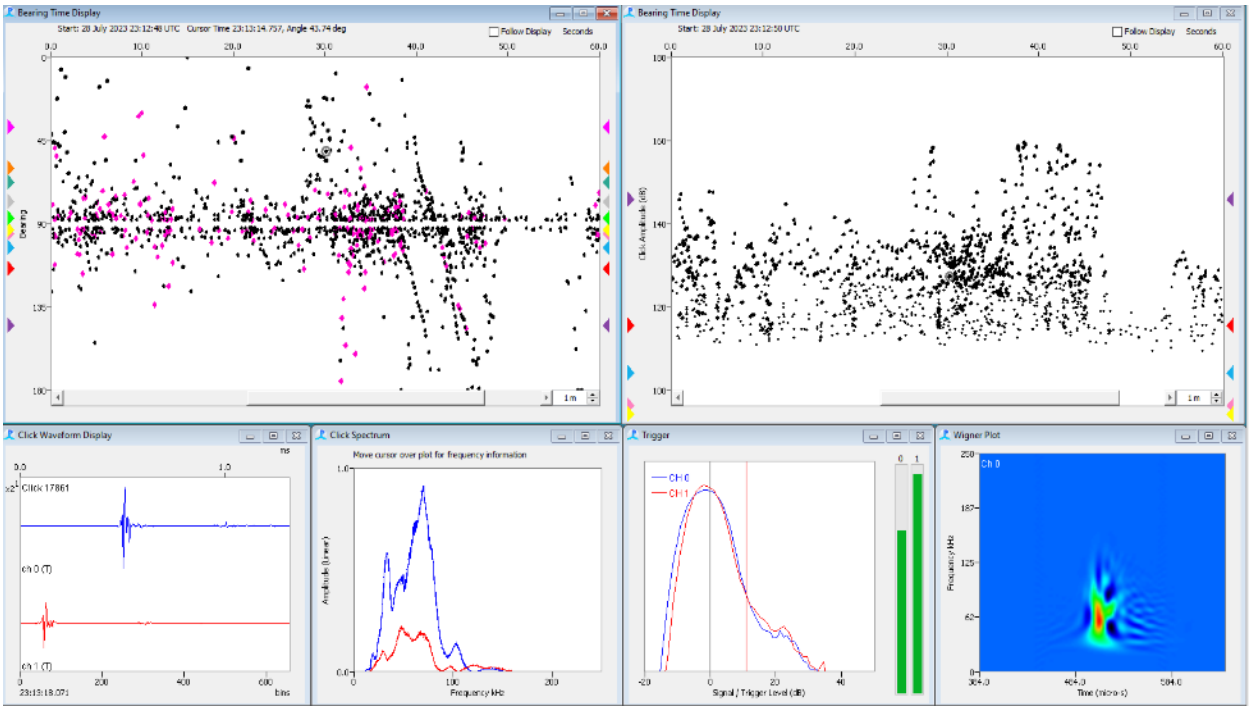

Figure 1: Common bottlenose dolphins; 28 July 2023 (AD#01, correlated with VD#01).

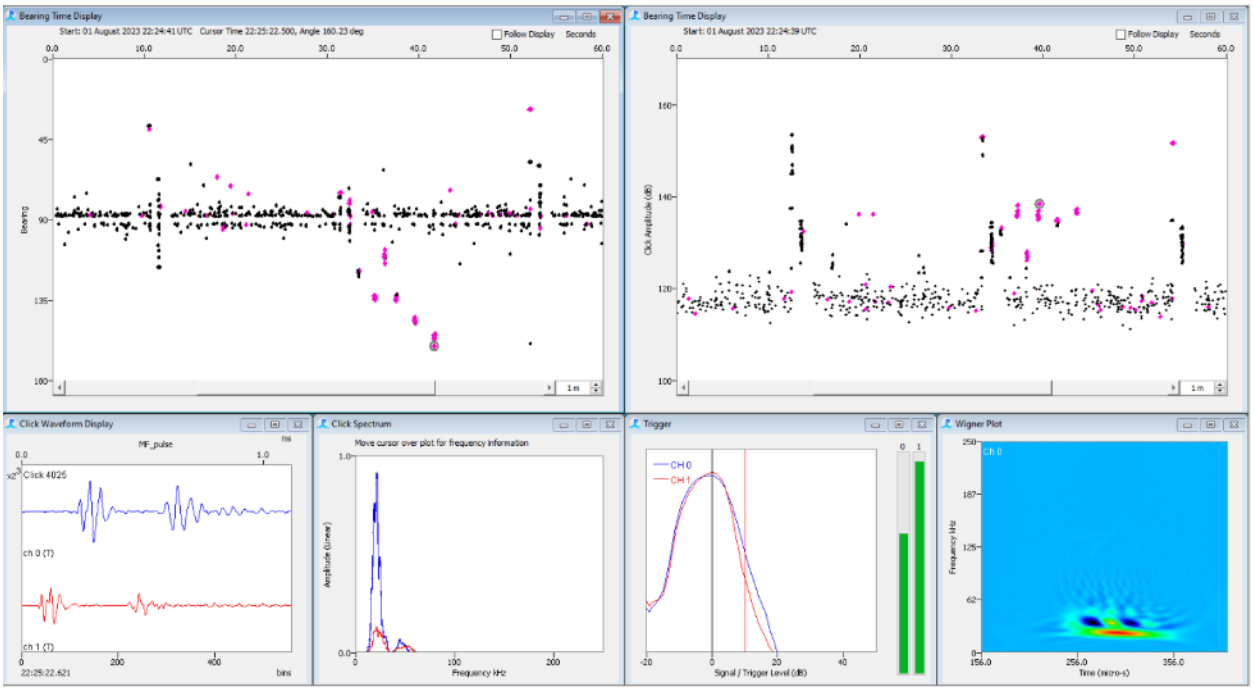

Figure 2: Unidentifiable dolphins; 28 July 2023 (AD#02, correlated with VD#03).