Protected Species Observer Technical Report Scripps Institution of Oceanography's Marine Geophysical Surveys in the Northwest Atlantic Ocean, June–July 2018

Prepared for:

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Low-Energy Marine Geophysical Surveys
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1 Introduction

1.1 Background

This report fulfills requirements described in an incidental harassment authorization (IHA) (NMFS 2018a) granted to the Scripps Institution of Oceanography (SIO) to take marine mammals incidental to a low-energy marine geophysical survey in the Northwest Atlantic Ocean that occurred during June-July 2018. The IHA and its accompanying conditions and requirements are described in a Federal Register notice (83 FR 27954; NMFS 2018b), dated 15 June 2018, issuing the IHA. This report is in accordance with regulations implementing the Marine Mammal Protection Act (Sections 101(a)(5)(A) and (D) (and 16 U.S.C. 1361 et seq.)). The IHA authorized the taking of small numbers of up to 31 marine mammal species (Section 3.5, "Estimates of Marine Mammal Exposures"). Mitigation and monitoring for sea turtles was also conducted in accordance with the Programmatic Environmental Impact Statement/Overseas Environmental Impact Statement for Marine Seismic Research Funded by the National Science Foundation or Conducted by the U.S. Geological Survey (NSF USGS 2011).

The purpose of this project was support of a potential future International Ocean Discovery Program (IODP) focused on examining regional seismic stratigraphy and providing seismic images to characterize changing sediment distributions from deepwater production changes. It proposed using low-energy, high-resolution multi-channel seismic (MCS) profiles for this purpose. The surveys occurred in an area that is of interest to the IODP that includes previous Deep Sea Drilling Project sites.

SIO conducted low-energy marine seismic surveys from the R/V *Atlantis* during the period 14 June - 17 July 2018 (dates inclusive, and include transit times) in international waters, between 33.5° and 53.5° N Latitude and 37° and 49° W Longitude (Figure 1). Water depths ranged from 1,800 to over 5,000 m. The survey was conducted using a towed pair of 45 cubic inch (in^3) GI airguns and a receiving system consisting of one hydrophone streamer.

Smultea Environmental Sciences, LLC. (Smultea Sciences) entered into a contract with SIO to conduct monitoring and mitigation operations for protected species including marine mammals and sea turtles as described in the NMFS-issued IHA for the activities (NMFS 2018a&b). Herein, we provide comprehensive information on all activities conducted, summaries of dates and locations of survey operations, methods used for monitoring for protected species, dates and locations of all sightings that resulted, and related information as required in the IHA provisions. The full data base of all sightings, observation effort, and survey tracklines and associated metadata in Excel csv and shapefiles are provided to NMFS under separate cover as required per they IHA.

1.2 Summary of Geophysical Survey Activities

The R/V *Atlantis* was at sea from 14 June - 17 July 2018 (inclusive) to conduct the survey in the area depicted in Figure 1. The study consisted of two types of surveys involving two different types of airgun array configurations.

1. The first survey was a reconnaissance survey to inform the second survey. The associated reconnaissance grid was designed to identify the optimum orientation and length of seismic lines. In the initial work, digital bathymetric, echosounding and MCS surveys were conducted at six locations to enable the selection and analysis of potential future IODP drill sites;
2. The second survey consisted of a second, higher-data quality survey designed to more precisely locate the most suitable potential future drill site suggested by results of the reconnaissance survey. Digital bathymetric, echosounding and MCS reflection profiles were obtained during this second survey.

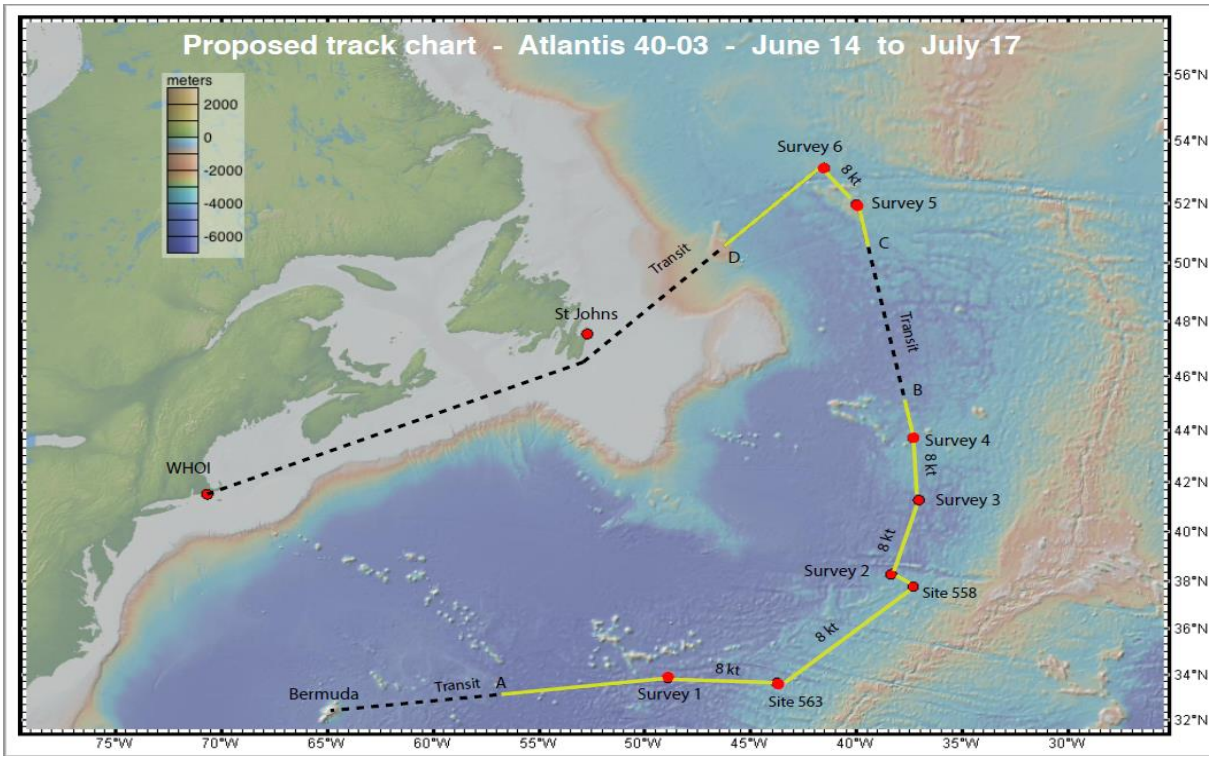

Figure 1. Locations of originally proposed geophysical seismic survey tracks and sampling station sites for the R/V *Atlantis* in the Northwest Atlantic Ocean, 14 June - 17 July 2018.

A pair of 45 in^3 GI airguns were towed at 5-8 knots at a depth of 2–4 m with a total discharge volume of approximately 90 in^3 along predetermined survey lines. A towed receiving system consisted of one hydrophone streamer, either 200 or 600 m in length. Airgun dominant frequency components were 0 – 188 Hz, employed at shot intervals of 9.72 seconds (2-m airgun separation survey) and 12.15 seconds (8-m airgun separation survey) (

Table 1). Additional detail regarding survey methods used in this project can be found in a Federal Register notice proposing to provide an IHA and request for comments (83 FR 18664; 27 April 2018), and notice of the issuance of an IHA for the project (NMFS 2018b).

Table 1. SIO R/V *Atlantis* geophysical survey equipment details

Number of airguns	2
Airgun positions used	Two in-line airguns 2- or 8-m apart
Tow depth of energy source	2–4 m
Dominant frequency components	0–188 Hz
Air discharge volume	Approximately 90 in^3
Shot interval	9.72 seconds (2-m airgun separation survey) and 12.15 seconds (8-m airgun separation survey)

2 Monitoring and Mitigation Program

Protected species monitoring and mitigation procedures were developed to address protocols identified in SIO's application for an IHA (SIO 2018) and as prescribed in the NMFS-issued IHA (NMFS 2018a&b). These prescribed procedures, developed in advance of the cruise, were strictly followed during the survey and cruise.

To reduce the potential for disturbance from acoustic stimuli regulated by NMFS associated with these surveys, the NMFS-issued mitigation requirements had six components as follows. These same mitigation measures were also implemented for sea turtles per NSF USGS (2011).

(1) vessel-based visual mitigation monitoring;

(2) establishment of a 100-m exclusion zone (EZ);

(3) establishment of a 100 -500-m buffer zone;

(4) shutdown procedures;

(5) ramp-up procedures; and

(6) vessel strike avoidance measures.

2.1 Protected Species Observers

Smultea Sciences (http://www.smulteasciences.com/) provided three qualified and NMFS-approved Protected Species Visual Observers (PSVOs). Two of these had previous experience conducting protected species mitigation and monitoring procedures; one also had previous experience associated with offshore seismic activities in U.S. Atlantic Ocean waters. SIO provided all PSVO observation equipment (in accordance with equipment specifications) as identified in the IHA (NMFS 2018a). This equipment included but was not limited to, Baker Marine 7x50 reticle binoculars and night-vision devices (ITT Night Vision Goggles, Gen 3 AN/PVS-7D [F5001 Series]).

In addition, mitigation measures identified in the IHA (NMFS 2018a) were implemented by the captain and crew of the survey vessel for the duration of the study as appropriate/needed. Vessel operators and crew were appraised by the Lead PSVO of their duties to maintain a vigilant watch, when possible, for cetaceans, pinnipeds, and sea turtles and to inform the lead PSVO of such information as soon as possible. A visual observer monitored a vessel strike avoidance zone around the vessel, and the vessel operator and crew were prepared to slow or stop the vessel or alter course, as appropriate, to avoid striking any marine mammal or sea turtle. In addition, in accordance with the IHA (NMFS 2018a), Smultea Sciences PSVOs worked with the survey vessel's captain and crew to develop and implement a plan for shutting down seismic activities during periods of low visibility.

2.2 Visual Observation Procedures

Visual monitoring protocol implemented during the project was designed per IHA provisions (NMFS 2018a&b). Protected species observations were consistent with standard U.S. agency-approved PSVO data collection requirements and incorporated all data variables and definitions identified in the IHA. Observers adhered to IHA-designated rotation limitations (i.e., <4 hrs per watch rotation, a minimum 2-hr break between 4-hr watches, and no more than 12 hrs/day on watch for each 24-hr period).

Visual monitoring was conducted during all daylight hours and continued for periods 30 min before and after sunrise/sunset. At least one, sometimes two, PSVO(s) visually monitored for marine mammals and sea turtles, and recorded all sightings, throughout the entire cruise during daylight periods when airguns were in operation (seismic period) and when they were not in operation (non-seismic periods) except during inclement weather. Two PSVOs were on watch for all pre-clearance and ramp-up periods. Observations also occurred during daytime periods when the R/V *Atlantis* was underway without seismic operations, i.e., during transits to/from port and between survey sites. Observations were conducted primarily from the vessel's bridge at a height of approximately 12.8 m above sea level.

While underway (when the vessel was moving between survey locations, or in transit to/from port) observations focused forward and to the sides of the vessel in an arc of ~180° from the bridge. PSVOs also regularly scanned in a sweeping pattern for the presence of protected species astern of the vessel while the vessel was underway. When the vessel was on station during geophysical operations, observers monitored an area 360° in scope around the vessel. Crew aboard the vessel also watched for protected species, including during transits between stations (insofar as practical) and alerted the PSVOs in the event of a sighting.

Data were systematically entered into *Mysticetus*™ software using a project-specific, custom-designed template matching the data components required to be collected per the IHA, using a laptop PC. Use of *Mysticetus* increased efficiency and accuracy of observations by instantly displaying positions and distances to protected species sightings when PSVOs entered a binocular reticle or estimated visual distance and bearing to sighting values. In addition, *Mysticetus* displayed vessel and sighting locations in real time relative to the exclusion and disturbance zone distances relative to the seismic source location. Bathymetry was also displayed in real time using *Mysticetus*.

All data parameters required in the IHA were recorded, along with any supplemental data, into a *Mysticetus* data form as follows.

> **Effort and Vessel Activity Data**: Date, time, airgun activity (i.e., whether seismic equipment was/was not active), array volume, Beaufort sea state, visibility, glare, and cloud cover, as well as the location, speed, and activity of the vessel. These data were recorded at least every 30 min, when a sighting occurred, or when conditions changed significantly.
>
> **Seismic Period,** i.e., any time airguns were operating (i.e., on), included notations regarding ramp-up and mitigation activities.
>
> **Non-seismic Period**, when no airguns were operational (i.e., off), data were recorded that included transit locations and times when magnetometer or sonar

equipment (multibeam echosounder, sidescan sonar, sub-bottom profiler) were operational.

Protected Species Sighting Data: When marine mammals or sea turtles were sighted, data were recorded regarding: date, time, species, total number of individuals, number of calves (<1/3 the length of the closely accompanying adult)/juveniles, bearing of the sighting relative to the heading of the R/V *Atlantis*, direction of movement relative to the vessel, initial distance from the vessel, closest observed point of approach to the airgun array location, behavior state when sighted, secondary behavior, pace (i.e., animal's swim speed), vessel position, water depth, number and location of other vessels within a 5-km radius, and the time that mitigation measures were requested and implemented (if necessary).

2.3 Seismic Survey Mitigation Measures

To minimize the potential impacts to, and Level B incidental taking of, protected species during the surveys described herein, mitigation measures were implemented when protected marine species were seen approaching, entering, or within safety zones defined in the IHA (NMFS 2018a, described below). All mitigation and monitoring measures and protocols specified in the IHA were implemented during the cruise.

Per IHA conditions, PSVOs established and at all times visually monitored for the occurrence of protected marine species within a previously defined (SIO 2018) EZ (<100 m) and a buffer zone (100-500 m) based on radial distances around active airguns. On-duty PSVOs continuously observed the area within the EZ during all applicable project operations in all daylight periods and, as relevant, requested night periods. Target scanning in a focused area was conducted when marine mammal or sea turtle presence occurred.

Observations were made using the naked eye and reticle binoculars paying particular attention to the EZ surrounding the towed acoustic equipment. PSVOs also monitored areas outside 500 m, as conditions allowed. The occurrence and location of protected species approaching or within these specified areas were recorded. Airgun power-down or shutdown procedures were implemented when a marine mammal or sea turtle was sighted within or approaching applicable zones.

Standard and accepted seismic survey-related mitigation measures were used for marine mammal and sea turtle observations during airgun operations (NMFS 2018a&b). These were:

Pre-clearance Procedures (Clearing Exclusion Zones). Two PSVOs continuously observed for at least 30 min prior to activation of seismic equipment per the IHA and used the decision-making protocol and flow chart identified in Figure 2. Use of airgun equipment did not commence until applicable EZs were clear of protected species for at least 30 min. If protected species appeared in an EZ during the 30-min clearance period and did not vacate the EZ, additional monitoring was conducted to ensure no subsequent observations occurred for at least 15 min for small odontocetes and 30 min for all other species.

Ramp-up. Use of seismic equipment was initiated and ramped-up at the start of survey activities beginning with the lowest acoustic output (starting with one seismic array followed by a second >5 min after the first). Prior to initiating all ramp-up

activities, two PSVOs were on watch to "clear" the EZ >30 min prior to the start of the ramp-up period as noted above. A third PSVO was used on a rotational basis, as needed, during Lead PSVO and Lead Surveyor pre-approved night-time ramp-up operations.

Operation. At least one PSVO continuously monitored the EZ, buffer zone, and surrounding areas while airguns were in use.

Shut-down. If protected species were observed inside or transiting toward an EZ, an immediate shutdown of the equipment was requested and implemented (Figure 2). Subsequent restart of the survey equipment employed ramp-up procedures described above only after the EZ was free of all protected species for at least 30 min.

When the seismic survey equipment was shut down for over 30 min for reasons other than the presence of a protected species, PSVOs took steps to ensure that the EZ was free of protected species prior to initiation of the ramp-up procedure described above. If the shutdown was less than 30 min, PSVOs advised the operations team that the equipment may be restarted as soon as practicable at its operational level if visual surveys were continuous throughout the operational break and the EZ remained free of protected species. Observations were also conducted for 30 min after airgun operations ceased in cases in which operations were suspended for any reason.

Survey equipment was not operated when any part of any EZ was obscured. When a clear view of the full EZ was not possible during expected or planned seismic operations or during required 'clearance' periods, seismic equipment operations were suspended. As needed, PSVOs assured that vessel operators adhered to the IHA-specified procedures regarding EZ pre-clearance and power-down situations.

Data were checked by PSVOs at the start and end of each watch shift. This provided multiple data reviews, as PSVOs looked at both their own and their watch partner's entries. The Lead PSVO also reviewed the data the following day and ensured any QA/QC issues were resolved. Data were also QAQC'd by a data management expert from Smultea Sciences as soon as data could be uploaded to the internet cloud for sharing and/or when received at the end of the survey.

In addition, PSVOs ensured vessel operator(s) adhered at all times to Vessel Strike Avoidance Procedures in accordance with provisions of the IHA.

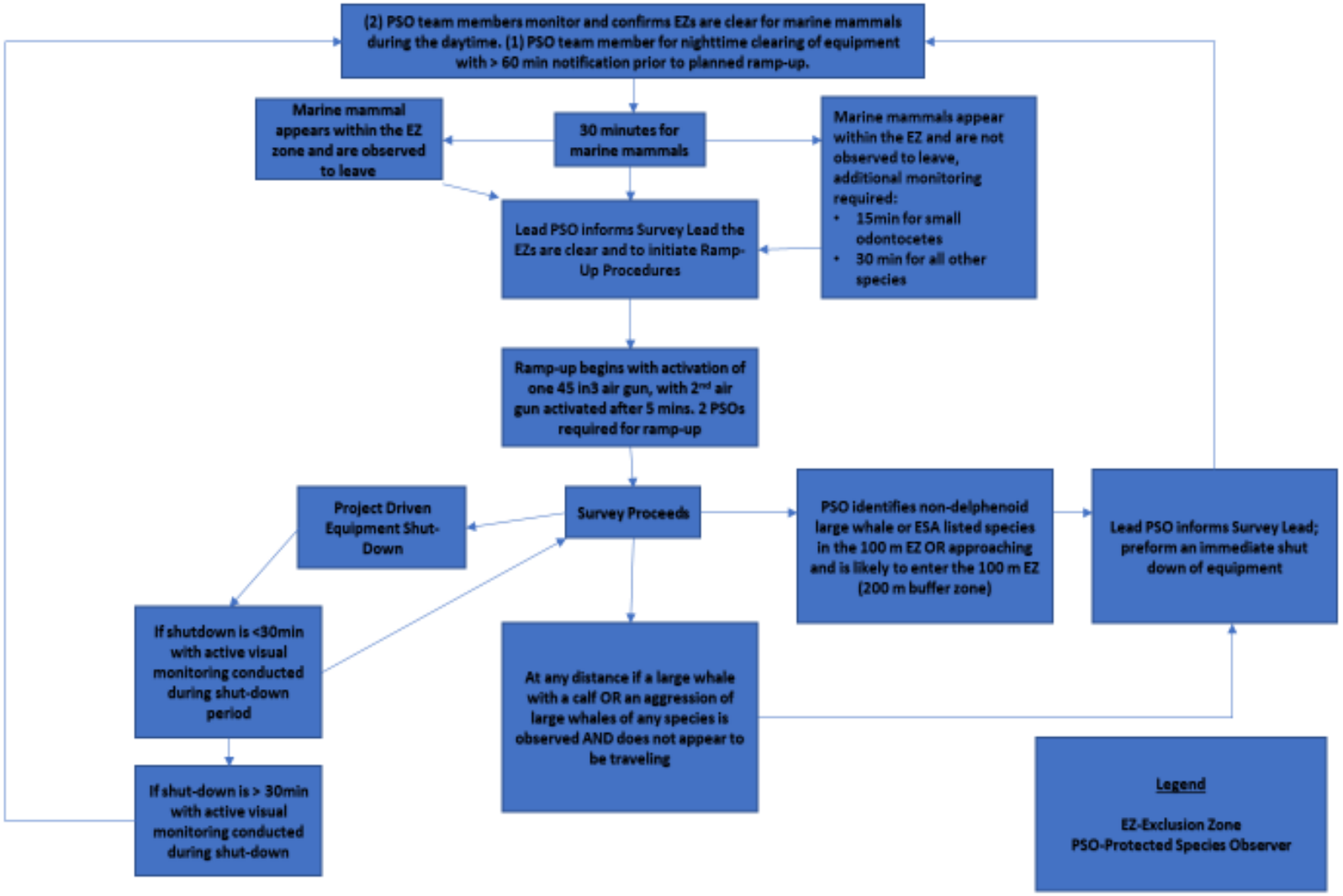

Figure 2. SIO R/V *Atlantis* PSVO mitigation and monitoring communications flow diagram.

3 Results

3.1 Observer Effort

The R/V *Atlantis* was at sea for the Scripps Bermuda survey for a total of 33 days from 14 June 2018—17 July 2018 until the vessel demobilized at Wood's Hole, Massachusetts on 17 July. PSVOs conducted observations from 14 June until darkness on 16 July for a total of 32 days. The survey tracks covered a total of 10,657 kilometers (km) (Table 2). The total kilometers during periods when PSVOs were on watch versus when they were not on watch relative to periods when airguns were operating and not operating is summarized in Table 2. PSVOs were on watch during all daylight periods (including periods with and without seismic operations) except during inclement weather periods when operations were suspended (e.g., Beaufort sea state >6). PSVOs were also on watch during all IHA-required 30-min clearance and ramp-up periods. However, per the IHA, PSVOs were not on watch during darkness after they had cleared the area for protected species before and during ramp-up of airguns, unless otherwise required per IHA stipulations. Approximately 46% of the total survey tracks were made with active seismic equipment on (
Table 2). PSVO observation effort by vessel activity is depicted in Table 3. Note that all data required in the IHA is addressed in this report and/or will be provided in an Excel database of all original QAQC'd data, including both sightings and effort as well as shapefiles as requested in the IHA issued by NMFS for this project.

Table 2. SIO R/V *Atlantis* survey trackline distance with seismic equipment on and off during periods with and without observation effort by Protected Species Visual Observers (PSVOs).

	PSVOs on Watch	PSVOs Not on Watch[1]	Total
Total Days	32	33	33
Total Trackline Length (km)	6,949	3,708	10,657
Airguns On Length[2/]	3,289	1,595	4,884
Airguns Off Length	3,660	2,113	5,773

[1/] Periods when PSVOs were not on watch during darkness after they had cleared the area for protected species before and during ramp-up of the airguns per the project IHA.
[2/] Includes 27 km with airgun(s) on during ramp up.

Table 3. PSVO observation effort totals by vessel activity.

Description	Hours	Kilometers
Operations - Airguns On	258	3,262
Ramp Up - Airguns On	3	27
Underway/ Transit/ Other (Airguns Off)	242	3,660
Total	**503**	**6,949**

Survey tracklines are shown in Figure 3. Details of survey sites and tracklines are also provided (Figure 4, Figure 5, Figure 6). Note that the originally planned survey tracks shown in Figure 1 were curtailed in the northern portion of the survey region at the end of the survey period to avoid the path of an oncoming hurricane.

Figure 3. Overview of R/V *Atlantis* tracklines while the seismic acoustic source was active shown above. Survey grids are centered around Sites 1 through 6, with Site number increasing to the North. Landsat / Copernicus images taken from Google Earth.

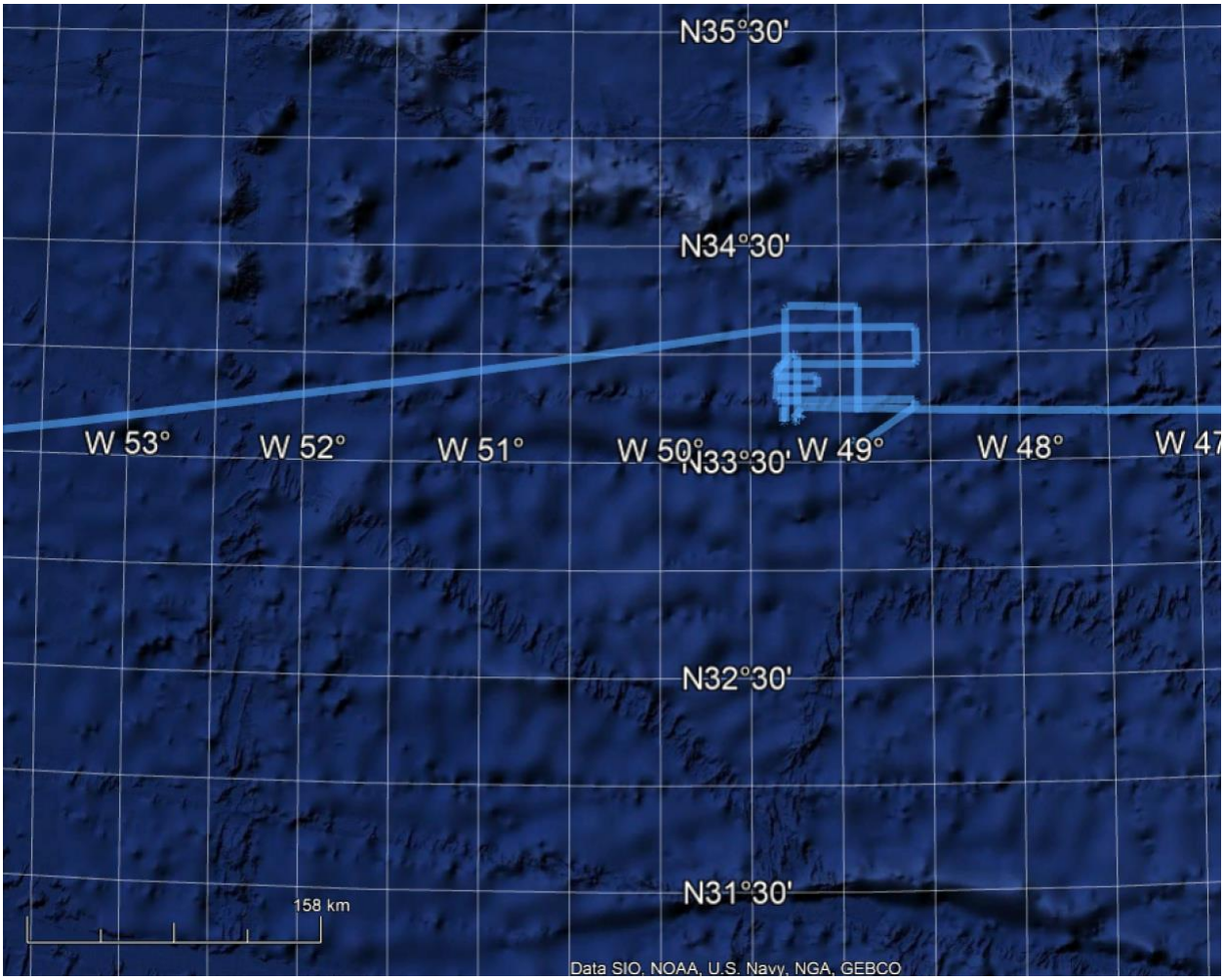

Figure 4. SIO R/V *Atlantis* survey closeup on Site 1

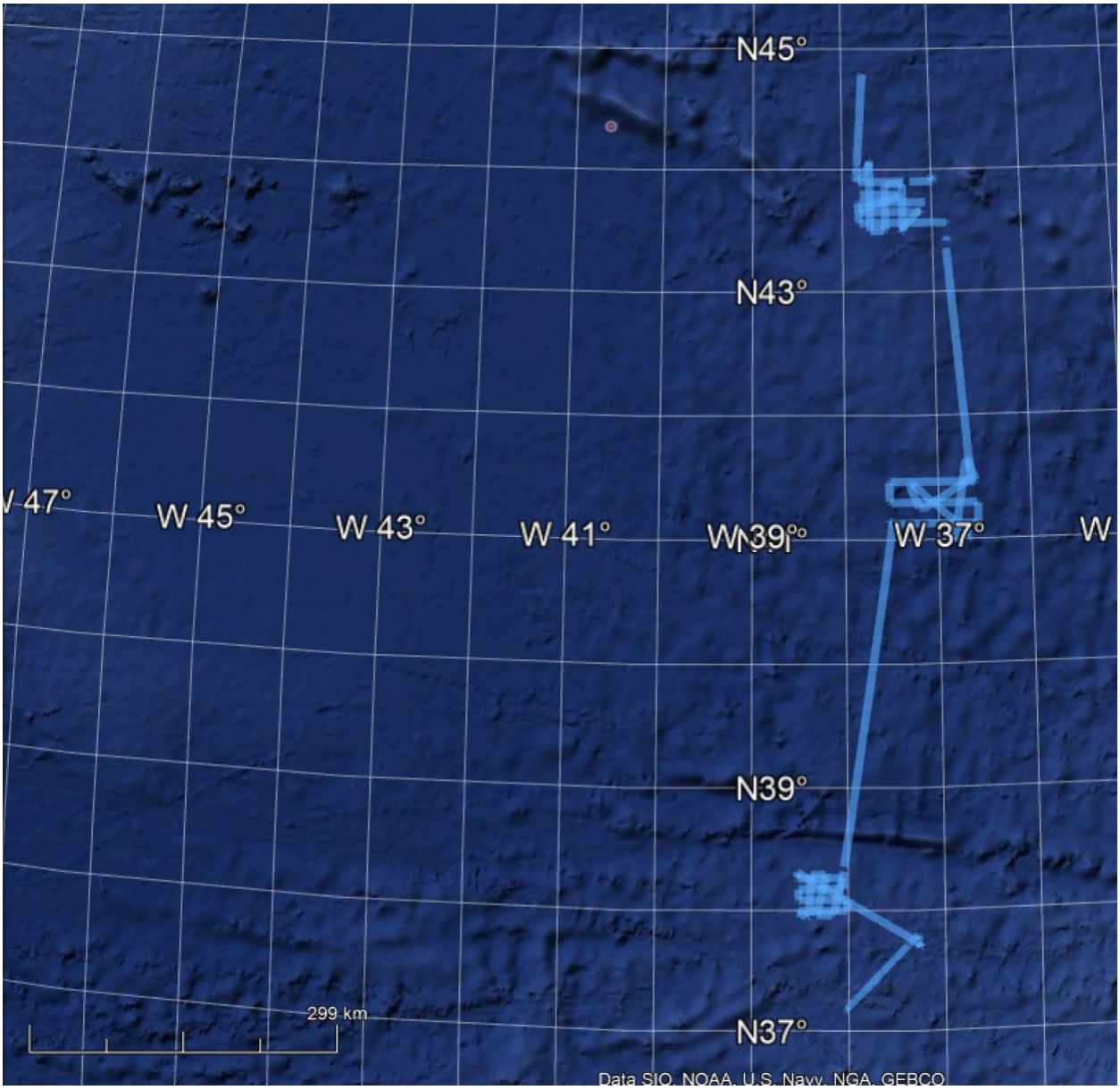

Figure 5. SIO R/V *Atlantis* survey closeup on Sites 2, 3, and 4.

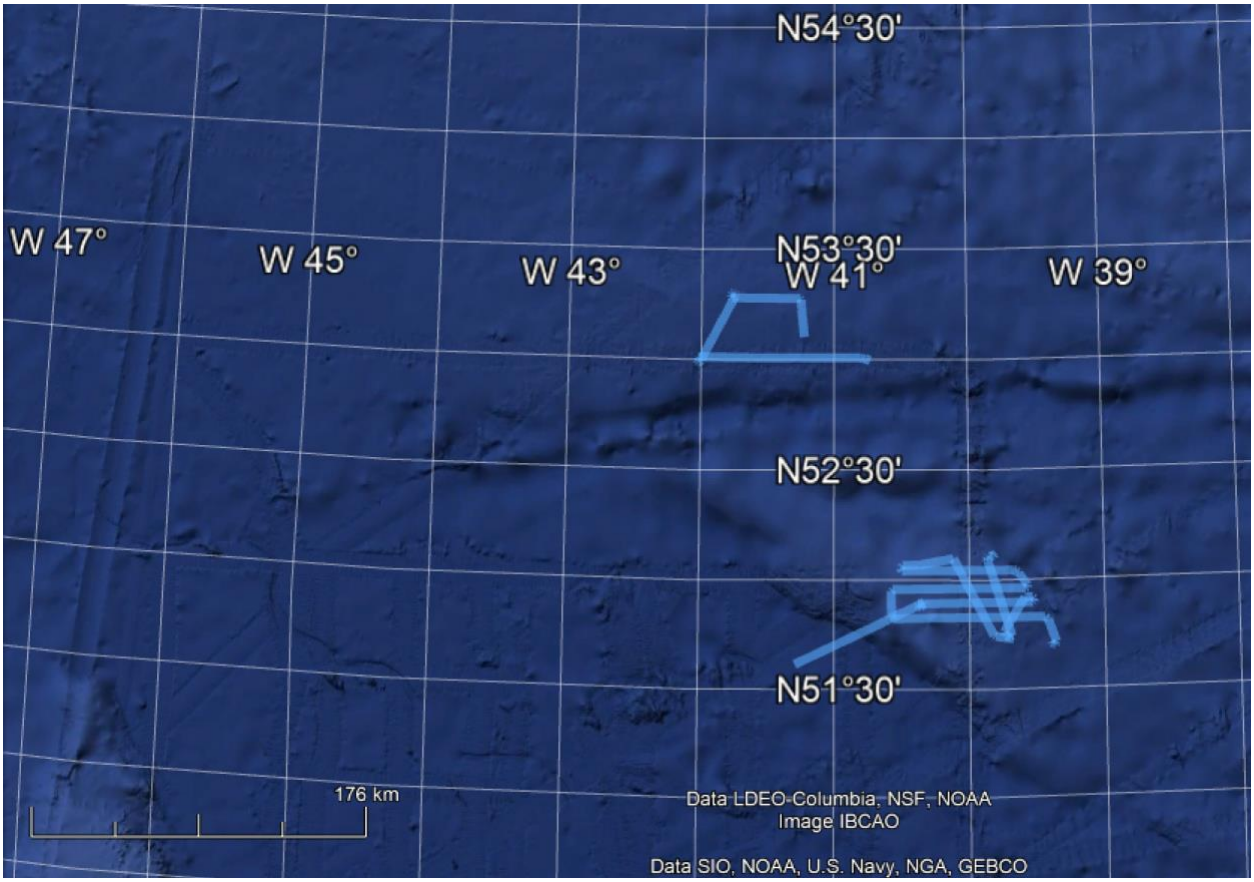

Figure 6. SIO R/V *Atlantis* survey closeup on Site 5 and 6.

3.2 Protected Species Sighting Information

A description of the expected occurrence, distribution, density and natural history of marine mammal and sea turtles potentially encountered in the survey area can be found in SIO's IHA application (SIO 2018), in the Federal Register notices of the proposed IHA (83 FR 18664; 27 April 2018) and issuance of the IHA (NMFS 2018a).

A total of 121 sighting events (i.e. number of groups seen) occurred during this survey comprised of an estimated total of 944 individual marine mammals and sea turtles. Of these 121 sighting events, 32% (n=303) of all individuals were seen when seismic equipment was off (e.g., underway/in transit or deploying equipment prior to turning on the equipment); the remaining 68% (n=641) of individuals were observed when seismic equipment was being operated (Table 4). Of all recorded sightings, 98% (n=928) were marine mammals, and 2% were sea turtles. A single basking shark (*Cetorhinus maximus*) was also sighted.

Table 4. Number of marine mammal and sea turtle groups and individuals recorded during periods while seismic airguns were on and while airguns were off during the SIO survey on R/V *Atlantis* from 14 June - 16 July 2018.

	Seismic Airguns Operating (On)	Seismic Airguns Off	Total
No. of Groups	81	40	**121**
No. Individuals	641	303	**944**

The Atlantic white-sided dolphin (*Lagenorhynchus acutus*) was the most commonly seen species during the survey, comprising 36% of all individuals sighted (total 340 individuals, with 218 observed when seismic equipment was in operation) (Table 5). The second-most commonly sighted species (30%) was the short-beaked common dolphin (*Delphinus delphis*) (286 individuals sighted, with 200 seen when seismic equipment was in operation). This was followed by long-finned pilot whales (*Globicephala melas)* (95 individuals sighted, with 67 sighted when seismic equipment was in operation) (

Table 5; delphinid maps Figure 7, Figure 8; whale maps Figure 9, Figure 10).

Table 5. Estimated number of individual marine mammals sighted by species during periods with airguns on and airguns off from 14 June - 16 July 2018. Species listed in descending order of sighting frequency

Species	No. Individuals Seen While Airguns On	No. Individuals Seen While Airguns Off	Total
Atlantic white-sided dolphin	218	122	340
Short-beaked common dolphin	200	86	286
Long-finned pilot whale	67	28	95
Atlantic spotted dolphin	54	11	65
Unidentified dolphin or porpoise	25	23	48
Sperm whale	31	8	39
Unidentified whale	25	2	27
Risso's dolphin	9	0	9
White-beaked dolphin	0	5	5
True's beaked whale	0	4	4
Unidentified marine mammal	2	2	4
Blue whale	3	0	3
Fin whale	0	1	1
Minke whale	0	1	1
Sei whale	1	0	1
Total	**635**	**293**	**928**

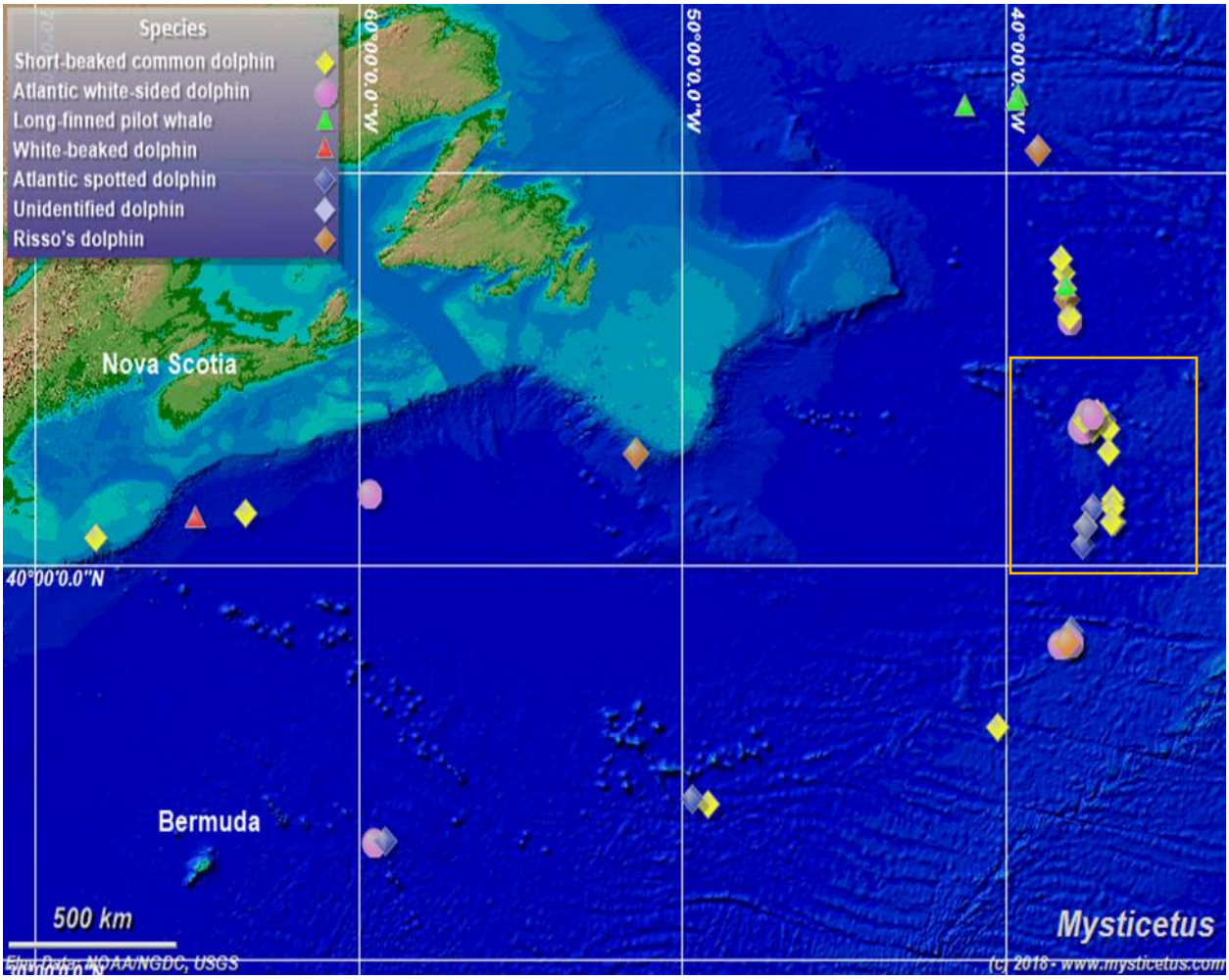

Figure 7. The SIO R/V *Atlantis* survey delphinid sighting locations, 14 June - 16 July 2018. Orange box enlarged in map below.

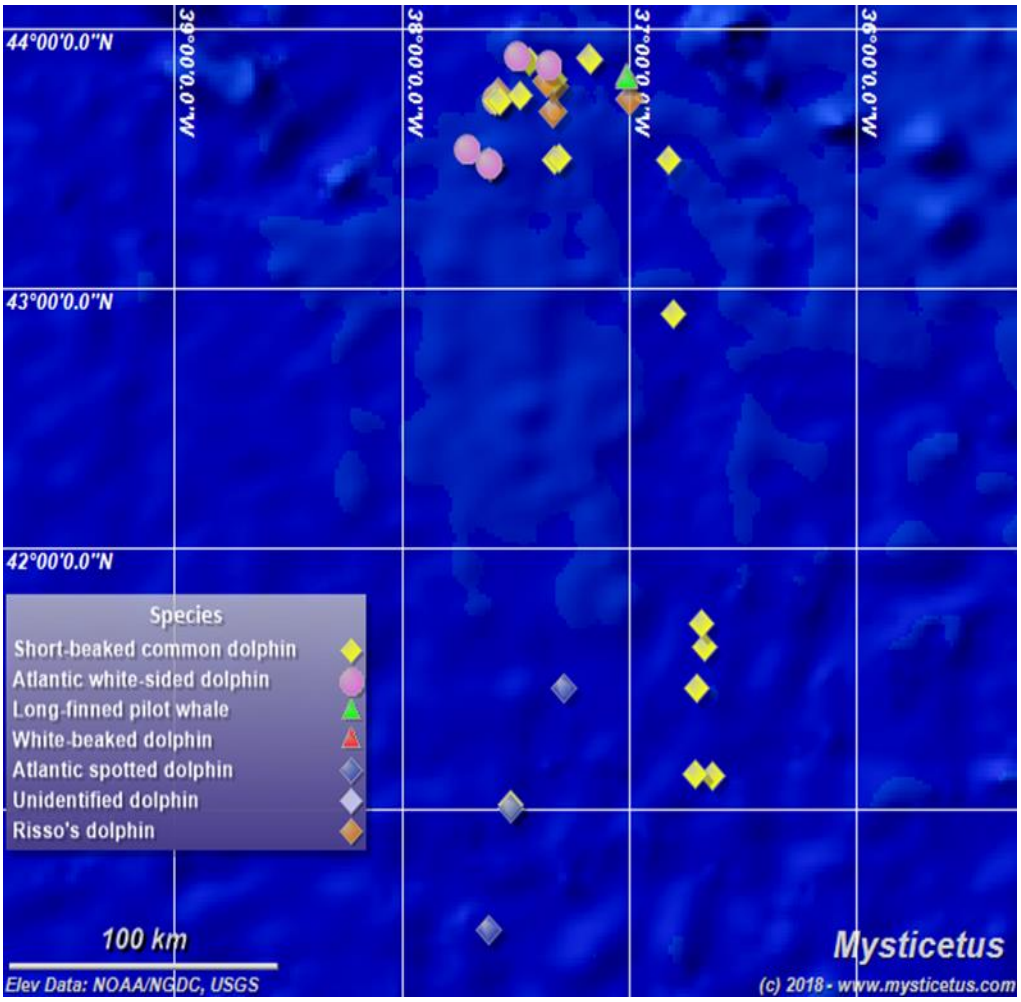

Figure 8. The SIO R/V *Atlantis* survey delphinid sightings, expanded view of cluster of sightings identified in orange box on map above, 14 June - 16 July 2018.

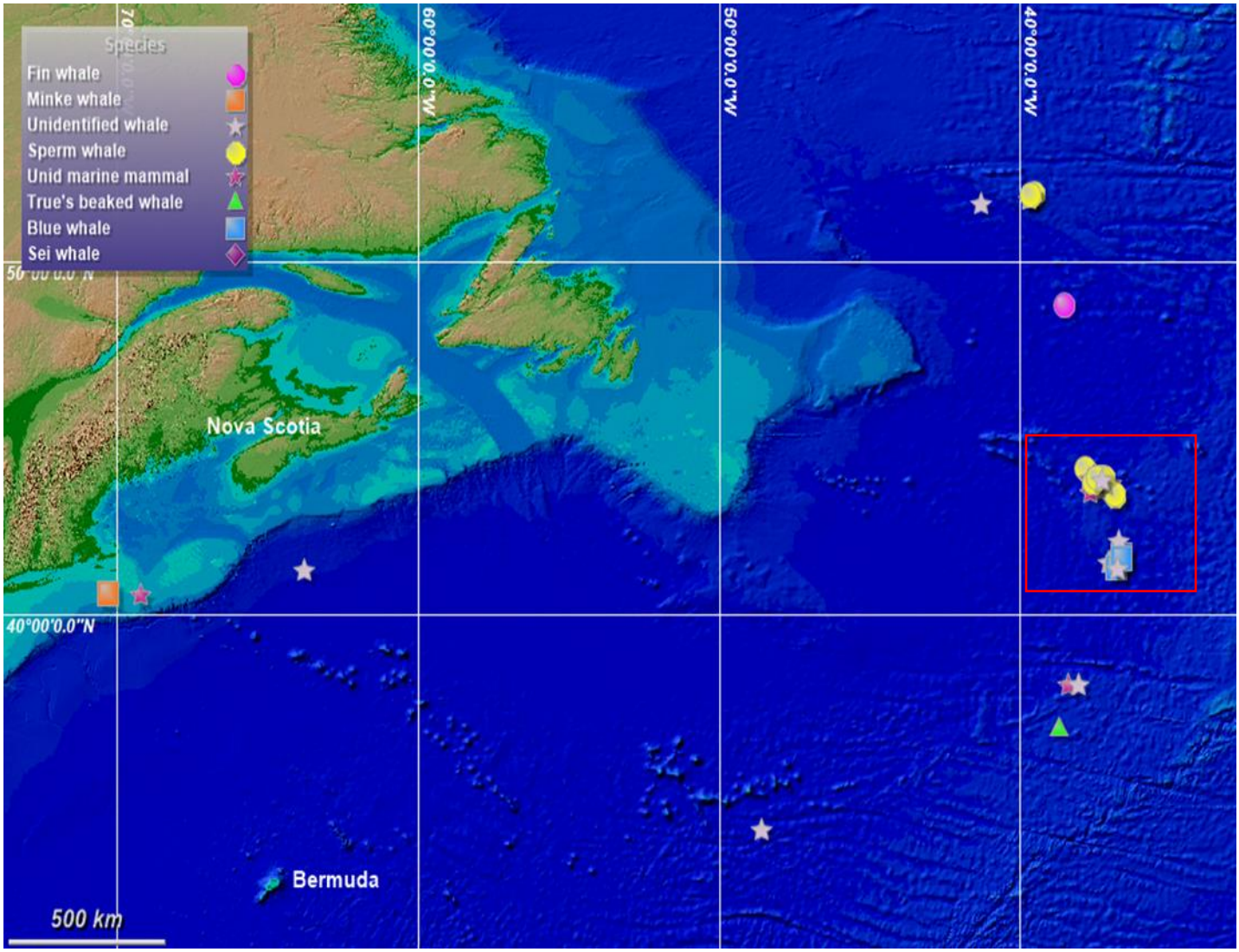

Figure 9. The SIO R/V *Atlantis* survey whale sighting locations 14 June - 16 July 2018. Red box enlarged in map below.

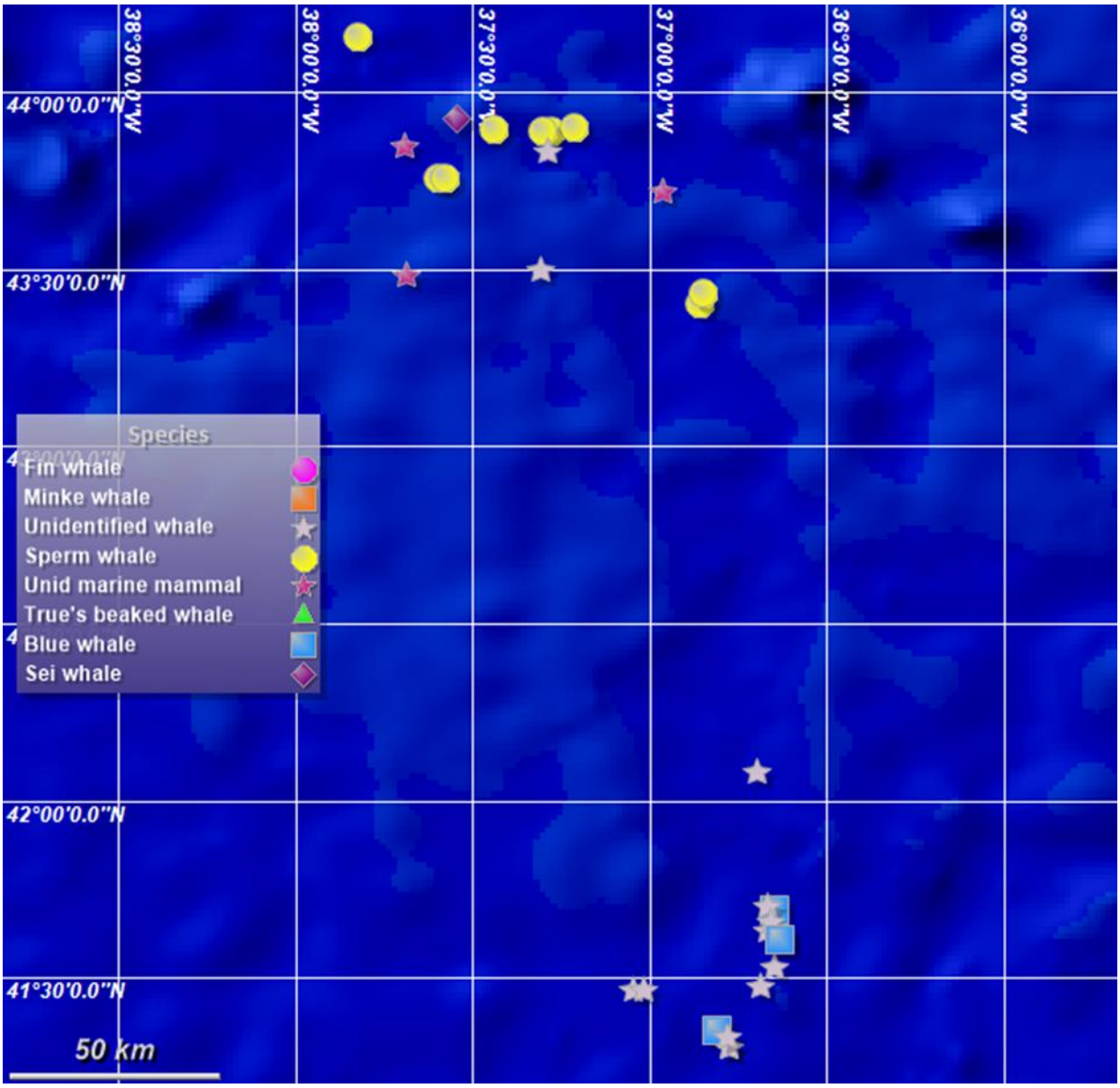

Figure 10. The SIO R/V *Atlantis* survey whale sightings, expanded view of cluster of sightings identified in red box on map above, 14 June - 16 July 2018.

3.3 Sea Turtle Sighting Information

A total of 15 individual sea turtles were observed (Figure 11): 6 were seen while seismic airguns were operating, with 9 individuals seen when seismic equipment was not in operation (i.e., during equipment Deployment and Vessel Transit) (Table 6).

Table 6. The SIO R/V *Atlantis* survey estimated number of individual sea turtles sighted by species during periods with airguns on and airguns off from 14 June - 16 July 2018.

Species	No. Seen While Airguns On	No Seen While Airguns Off	Total
Green turtle	2	0	**2**
Leatherback turtle	0	2	**2**
Loggerhead turtle	3	3	**6**
Unidentified turtle	1	4	**5**
Total	**6**	**9**	**15**

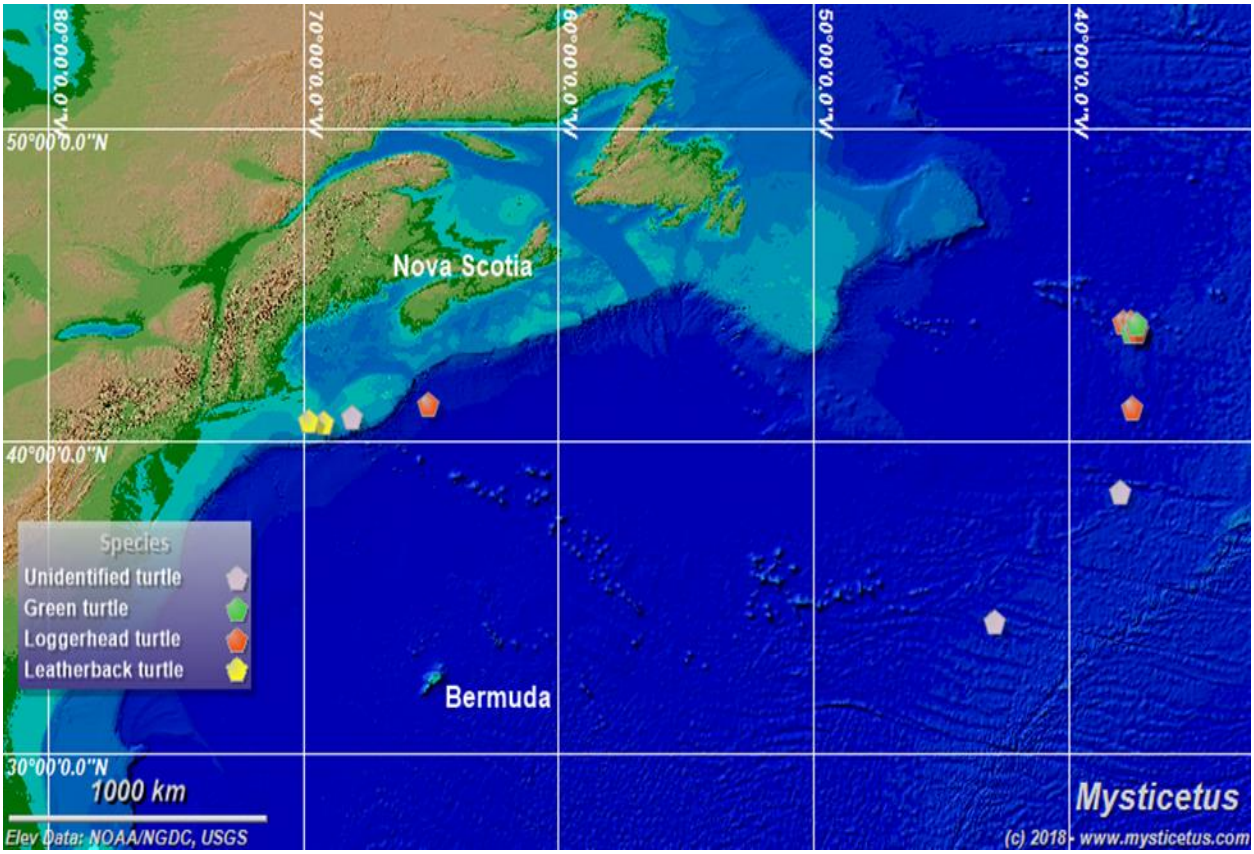

Figure 11. The SIO R/V *Atlantis* survey sea turtle sighting locations, 14 June - 16 July 2018

3.4 Injured or Dead Protected Species

One green turtle was sighted forward of the vessel at 150 m on 01 July 2018. It initially was thought to possibly be dead and a mitigation request was thus made to change course. With additional observation it was determined that the animal was making some slight movements and a shutdown was ordered until the turtle was outside the 100 m EZ.

No injuries or deaths of protected species were observed to occur as a result of the IHA-specified activities.

3.5 Estimates of Marine Mammal Exposures

Using the criteria described in SIO's IHA application and in the IHA issued by NMFS (NMFS 2018b), SIO applied for and NMFS provided authorization for the taking of a small number of up to 31 species of marine mammals by Levels A & B harassment. Of these, the NMFS-issued IHA only authorized Level A take for the harbor porpoise, none of which were seen during the survey.

Visual observations alone cannot always account for the true number of marine mammals and sea turtles present in a given area due to normal surfacing and dive behavior, which can limit the likelihood of visual detection. Marine mammals and sea turtles spend a significant portion of their time below the water's surface. Further, visual detection of deep-diving cetaceans is limited, even in the best of sighting conditions, due to short surface periods relative to time submerged. The probability of detecting certain species of marine mammals and sea turtles also varies relative to an animal's size, distance from the vessel, regional abundance, and sea and weather conditions. Estimating the number of individuals potentially present, but having gone unobserved, and therefore may have been exposed to loud sounds is not readily calculated.

For the purposes of this report, we have used the number of individuals observed within the estimated Level A and Level B sound exposure isopleths modeled in the project IHA application to NMFS (SIO 2018) as the minimum number of exposures. These numbers are then compared to the authorized numbers of such takes per the project NMFS-issued IHA (NMFS 2018a) which were based on estimated densities of each species in the project region based on the best available data. The estimated radial distance to the Level B harassment threshold isopleth for source levels generated by the airguns used during the survey is relatively small at approximately 500 m. The estimated radial distance to the Level A threshold isopleth per the project IHA application modeling (SIO 2018) is very small. The percentage of individual marine mammals sighted within the 500-m buffer zone estimated to represent the Level B harassment threshold represents less than 5% of the authorized NMFS takes, with the exception of the Atlantic spotted dolphin (9% of authorized Level B take). Thus, even accounting for periods when the airguns were operating when PSVOs were not on watch (e.g., during darkness) and accounting for individuals that may have been missed within this relatively small radius, it is considered highly unlikely that the authorized level of take would have been exceeded (see further historical logic and discussion in the SIO IHA application (SIO 2018).

Table 7 summarizes the mitigation measures implemented during the survey. These measures included shutdowns for marine mammals and sea turtles initially sighted within or near the 100-m EZ and/or the 100-500 m buffer zone, as well as delays in the ramping

up/starting of the airguns due to sightings in these mitigation zones. Table 7 also provides a summary of mitigation measures implemented for strike avoidance.

Table 8 summarizes all sightings made while the airguns were operating, regardless of distance of the sighting from the airgun sound source. Thus, this table includes a number of sightings for which no mitigation measures were required or implemented because the sightings were outside the IHA-identified mitigation distances.

Table 9 presents and compares the NMFS IHA-authorized number of Level A and B takes to the actual number of marine mammals observed during the survey. This table also includes the estimated species densities in the study area as presented in the IHA application (SIO 2018). For the purposes of estimating exposures to the NMFS Level B threshold, an area ca. 500 m from the operating seismic vessel, with airguns actively employed, is considered a reasonable proxy for Level B marine mammal harassment thresholds (Figure 8 in SIO 2018). Table 9 provides the minimum number of exposures observed by species during the survey and indicates these numbers, by species, as a percentage of the total authorized takes in the NMFS IHA issued for the project. These numbers demonstrate that far fewer individuals were observed to be exposed to the estimated Level B exposure isopleths than authorized for exposure. No marine mammal sightings were observed to be exposed to Level A exposure thresholds based on estimated distances to Level A thresholds calculated and presented in the project IHA application (SIO 2018).

Table 7 Mitigation measures implemented for marine mammal and sea turtle sightings by species and airgun source status during the SIO R/V *Atlantis* survey from 14 June - 16 July 2018. Table also includes mitigation measures implemented for vessel strike avoidance.

Date and Time (UTC)	Species	Best Group Size Count	CPA (Closest Observed Point of Approach) Distance to Sound Source (m)	Type of Behavior Change	Airgun Sound Source Status when First Sighted	Mitigation Request	Mitigation Response	Notes	GPS Position
2018-06-27 16:08:40	Loggerhead turtle	1	5	None	On	Shutdown	Shutdown		41 03 7.9 N 37 31 0.2 W
2018-06-29 08:59:43	Short-beaked common dolphin	35	100	Behavior state	On	Shutdown	Shutdown	Seen feeding on fish with seabirds near vessel	41 42 37.4 N 36 40 51.6 W
2018-06-29 21:14:49	Sperm whale	8	100	Dive	On	Speed Reduction then Shutdown	Speed Reduction then Shutdown	Juvenile sperm whales. Initially seen 400 m away implemented speed reduction then shutdown	43 20 38.2 N 36 51 25.6 W
2018-06-29 21:59:37	Sperm whale	2 (including 1 calf)	300	Dive	On	Shutdown	Shutdown	Shutdown due to presence of calf	43 26 13.5 N 36 50 43.2 W
2018-06-29 22:25:20	Short-beaked common dolphin	15	25	Direction of travel	Off	Delay	Delay	Initially seen bowriding vessel while airguns off during clearance period prior to ramp up of airguns resulted in delay of clearing period	43 29 35.3 N 36 49 41.5 W
2018-06-30 17:57:39.2	Sperm whale	7 (including 1 calf)	2500	Dive	On	Shutdown	Shutdown	Sighting outside mitigation zone but shutdown due to presence of calf	43 53 17.7 N 37 15 0.5 W

Date and Time (UTC)	Species	Best Group Size Count	CPA (Closest Observed Point of Approach) Distance to Sound Source (m)	Type of Behavior Change	Airgun Sound Source Status when First Sighted	Mitigation Request	Mitigation Response	Notes	GPS Position
2018-07-01 08:12:46	Unidentified marine mammal	1	800	None	On	Course Change	Course Change	Sighting outside mitigation zone but changed course to avoid crossing its path	43 29 33.6 N 37 41 13.2 W
2018-07-01 09:04:50	Green turtle	1	150	None	On	Change Course then Shutdown	Change Course then Shutdown		43 29 22.7 N 37 35 17.3 W
2018-07-01 13:19:42	Loggerhead turtle	1	75	None	On	Shutdown	Shutdown		43 49 9.9 N 37 31 40.4 W
2018-07-01 17:18:13	Green turtle	1	15	Direction of travel	On	Shutdown	Shutdown		43 43 32.2 N 37 19 58.6 W
2018-07-10 12:17:39	Long-finned pilot whale	19	100	Direction of Travel	On	Shutdown	Shutdown		51 38 1.6 N 41 16 23.1 W

Table 8. Summary of estimated density, NMFS IHA-authorized Level B Takes, and number of individual marine mammals by species observed within the estimated Level B isopleth during the SIO R/V *Atlantis* survey 14 June – 16 July 2018.[1/]

Species	Estimated Density (#/1000 km^2)[2/]	Authorized Level B Takes per IHA	No. Individual Observed <100 m within EZ while Airguns Operating	No. Indiv. Observed within Estimated Level B Isopleth while Airguns On (100-500 m from Airgun Array)[3/]	Percent of IHA-Authorized Level B Take Observed within Estim. Level B Isopleth while Airguns On
North Atlantic right whale	*0*	*1*	-	-	
Bowhead whale	*0*	*3*	-	-	
Humpback whale	10	113	-	-	
Minke whale	4	46	-	-	
Bryde's whale	0.1	1	-	-	
Sei whale	*10*	*113*	-	-	
Fin whale	*8*	*91*	-	-	
Blue whale	*0*	*1*	-	-	
Sperm whale	*40*	*451*	*8*	*6*	*3%*
Cuvier's beaked whale	60	136[8]	-	-	
Northern bottlenose whale	0.8	9	-	-	
True's beaked whale	60	136[8]	-	-	
Gervais beaked whale	60	136[8]	-	-	
Sowerby's beaked whale	60	136[8]	-	-	
Blainville's beaked whale	60	136[8]	-	-	
Rough-toothed dolphin	3	34	-	-	
Common bottlenose dolphin	60	677	-	-	
Pantropical spotted dolphin	10	113			
Atlantic spotted dolphin	40	451	20	22-	9%
Striped dolphin	80	902	-	-	
Atlantic white-sided dolphin	60	677	-	2	0.3%
White-beaked dolphin	1	12			
Short-beaked common dolphin	800	9017	95	11	1.2%
Risso's dolphin	20	226	-	9	4%
Pygmy killer whale	1.5	17	-	-	
False killer whale	2	23	-	-	
Killer whale	0.2	**5**	**-**	**-**	
Long-finned pilot whale	200	2255	19	6	1.1%
Short-finned pilot whale	200	2255	-	-	
Pygmy/dwarf sperm whale	0.6	7	-	-	
Harbor porpoise	60	677	-	-	
Ringed seal	0	1	**-**	**-**	
Hooded seal	0	1	**-**	**-**	
Harp seal	0	1	**-**	**-**	
Unidentified whale	na	na	**-**	3	
Unidentified dolphin/porpoise	na	na	-	9	

[1/] No Level A takes were permitted under the NMFS-issued IHA except for the harbor porpoise which was not observed during the survey. Species in italics are listed as endangered or threatened under the U.S. Endangered Species Act. Species rows shaded in light gray are those observed during the survey <500 m from operating airguns. Actual distances by each individual sighting to the operating airguns is presented in Table 9.

[2/] Density taken from Scripps Bermuda IHA application to NMFS based on the highest density category nearest or overlapping the project area as described in the project IHA application to NMFS (SIO 2018).

[3/] An area ca. 500 m from the operating seismic vessel, with airguns actively employed, is a reasonable proxy for Level B marine mammal harassment thresholds (Figure 8 in SIO 2018).

Table 9. Estimated number of individual marine mammals and sea turtles sighted within 500 m by species during periods while airgun(s) operated from 14 June 2018 through 16 July 2018. Mitigation actions indicated in bold font.

Species	Sighting Distance (m)	Behavior Change	Beaufort Sea State	Best Count	Mitigation Request	Mitigation Response
Atlantic white-sided dolphin	5	Other	4	2	None	
Atlantic spotted dolphin	20	None	5	3	None	
Atlantic spotted dolphin	150	Direction of travel	3	22	None	NA
Unidentified turtle	75	Dive	3	1	None	NA
Short-beaked common dolphin	50	Dive	3	15	None	NA
True's beaked whale	120	Dive	4	4	None	NA
Unidentified dolphin	200	Dive	1	1	None	NA
Atlantic white-sided dolphin	450	Dive	2	2	None	NA
Atlantic spotted dolphin	50	None	3	8	Other	Other
Unidentified turtle	15	Direction of travel	3	1	None	NA
Atlantic spotted dolphin	10	None	2	6	None	NA
Atlantic spotted dolphin	80	None	3	9	None	NA
Short-beaked common dolphin	1	None	3	1	None	NA
Loggerhead turtle	5	None	3	1	**Shutdown**	**Shutdown**
Short-beaked common dolphin	1	Direction of travel	3	25	None	NA
Atlantic spotted dolphin	10	None	3	5	None	NA
Unidentified whale	400	Dive	3	1	None	NA
Short-beaked common dolphin	1	Dive	3	15	None	NA
Unidentified whale	200	Dive	4	1	None	NA
Short-beaked common dolphin	20	Direction of travel	4	4	None	NA
Short-beaked common dolphin	100	Surface-Active Mill	4	35	**Shutdown**	**Shutdown**
Short-beaked common dolphin	10	Dive	3	4	None	NA
Sperm whale	150	Dive	3	8	None	NA
Sperm whale	300	Dive	3	2	**Shutdown**	**Shutdown**
Sperm whale	100	Dive		8	**Shutdown**	**Shutdown**
Short-beaked common dolphin	100	Dive	1	3	None	NA
Short-beaked common dolphin	350	Dive	1	2	None	NA
Unidentified dolphin	400	Dive	2	10	None	NA

Species	Sighting Distance (m)	Behavior Change	Beaufort Sea State	Best Count	Mitigation Request	Mitigation Response
Long-finned pilot whale	300	Direction of travel	2	12	None	NA
Long-finned pilot whale	400	Direction of travel	2	12	None	NA
Short-beaked common dolphin	200	Dive	2	7	None	NA
Sperm whale	500	Dive	2	1	None	NA
Green turtle	120	None	0	1	**Shutdown**	**Shutdown**
Loggerhead turtle	75	None	1	1	**Shutdown**	**Shutdown**
Short-beaked common dolphin	50	None	1	20	None	NA
Short-beaked common dolphin	80	Direction of travel	1	5	None	NA
Risso's dolphin	250	Dive	1	9	None	NA
Green turtle	15	Direction of travel	1	1	**Shutdown**	**Shutdown**
Unidentified dolphin	400	Dive	1	8	None	NA
Loggerhead turtle	20	None	1	1	None	NA
Unidentified turtle	500	None	1	1	None	NA
Loggerhead turtle	500	None	1	1	None	NA
Short-beaked common dolphin	100	None	1	3	None	NA
Unidentified turtle	400	Direction of travel	1	1	None	NA
Short-beaked common dolphin	150	Dive	3	2	None	NA
Loggerhead turtle	50	None	3	1	None	NA
Sperm whale	200	Dive	4	1	None	NA
Atlantic white-sided dolphin	300	None	4	45	None	NA
Short-beaked common dolphin	80	Dive	4	2	None	NA
Unidentified dolphin	20	None	4	2	None	NA
Long-finned pilot whale	100	None	4	4	None	NA
Short-beaked common dolphin	75	None	4	3	None	NA
Short-beaked common dolphin	10	Dive	2	4	None	NA
Short-beaked common dolphin	15	Dive	3	9	None	NA
Unidentified dolphin or porpoise	80	Direction of travel	3	10	None	NA
Sperm whale	500	None	3	3	None	NA
Long-finned pilot whale	300	None	3	6	None	NA

Species	Sighting Distance (m)	Behavior Change	Beaufort Sea State	Best Count	Mitigation Request	Mitigation Response
Long-finned pilot whale	100	Direction of travel	6	19	**Shutdown**	**Shutdown**
Unidentified whale	150	Dive	6	1	None	NA
Unidentified dolphin or porpoise	20	Dive	2	1	None	NA
Short-beaked common dolphin	10	Dive	2	8	None	NA
White-beaked dolphin	100	Dive	2	5	None	NA
Loggerhead turtle	1	None	2	1	None	NA
Unidentified turtle	1	None	1	1	None	NA
Short-beaked common dolphin	10	Dive	1	10	None	NA
Leatherback turtle	15	Dive	1	1	None	NA
Leatherback turtle	5	Dive	1	1	None	NA
Minke whale	15	Dive	1	1	None	NA
Total				**432**		

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Appendix A Certification Regarding the Accuracy of this Report

I hereby certify the data and information contained in this report has been verified and the content of the report is accurate.

Signed _____ Date ____10/9/2018_____

Joshua Domenico

Lead PSVO

Scripps Institution of Oceanography's Northwest Atlantic Ocean Marine Geophysical Survey, R/V *Atlantis*, June–July 2018

Appendix B Statement Concerning Implementation and Effectiveness of Required Mitigation and Monitoring Activities

We conclude monitoring and mitigation protocols and their implementation were fitting and appropriate for this seismic survey. We found these activities were effective in minimizing adverse impacts to protected species for the duration of this cruise.

Pro-active and dynamic coordination and communication between the ship's crew, principal investigators, and PSVOs fostered a clear understanding of respective roles and responsibilities and resulted in a commitment by all involved to implementation of all IHA requirements. This was perhaps the most vital portion of our successful implementation of the cruise's mitigation requirements. Principal investigators Dr. Gregory Mountain and Dr. Mitch Lyle deserve particular recognition for ensuring these requirements were adhered to and ensuring PSVOs had ample time and space to do their jobs. Use of qualified and experienced observers and directly involving an interested and willing ship's crew in mitigation activities also contributed to effective protocol implementation. This cruise involved a relatively large number of protected species sightings; use of Mysticetus software for real-time logging of sighting and ancillary geospatial information facilitated our recording of these biological data. Collection of both seismic and biological data were also aided by generally favorable sea states and observation conditions.

The following are observations on specific aspects of the program and protocols used.

Pre-cruise meetings: We found briefing and coordinating sessions prior to the cruise particularly helpful. The vessel's Captain, First and Second Mates attended these meetings as did principals of the Scripps scientific/technical team and PSVOs. Requirements of the IHA for the project, including distribution of written material detailing chain of command for the expedition and a diagram illustrating the vessel's EZ zones relative to the seismic air gun activities, were discussed. We found having a clear understanding of technical objectives, roles and responsibilities, and IHA protocols at the outset very much aided in smooth operation of the various aspects of the cruise when underway.

During Day Two of the cruise (while in transit to the survey area), further discussions were held among observers and the ship's crew. Among other things, this included a Powerpoint presentation by the Lead PSVO; additional discussion regarding thresholds for Levels A & B harassment; the importance of, and chains of command for, mitigation work and ramp-up procedures; and an overview of hardware/software used in collecting seismic data. Again, we believe this level and extent of ongoing communication between principal investigators, ship's crew, and PSVOs were vital to smooth functioning of all aspects of the cruise and requirements regarding operation of equipment.

Observer Scheduling. We note that three observers sufficed for this project but, given the need to adhere to PSVO time off/time on schedules while also ensuring complete coverage of operations became a challenge at times. Ideally, a fourth observer might have alleviated this situation. Observations from the ship's bridge did not always provide a complete 360° field of view around the vessel at all times, due to the inherent structure of the bridge (we note this is the case for most seismic vessels in which monitoring/mitigation work is required.) Nonetheless, and to compensate, 30-min periods of intense focus in areas immediately around the vessel were utilized to ensure all EZs were clear before ramp-ups.

The situation was also facilitated by having a clear understanding of when airguns were to be activated well in advance of their actual operation, so observer schedules could be arranged accordingly.

PSVO Communications with Seismic Operators. Direct, intra-ship communications (i.e., PSVOs to technical/seismic team) when an immediate shut-down may be required can, at times, be a challenge during operations of this nature. Dual, back-up communications systems between the bridge and equipment operators ensured rapid communications between observers and technical teams. We employed both hand-held radios and direct telephone communications for this purpose.

Observer Equipment. A digital single-lens reflex camera was not provided for this cruise. These devices are useful in enabling species identification during subsequent analysis. Therefore, routinely including this equipment should be considered.

Joshua Domenico, Smultea Environmental Sciences

Lead PSVO
Scripps Institution of Oceanography's Northwest Atlantic Ocean Marine Geophysical Survey, R/V *Atlantis*, June–July 2018

Appendix C List of All Sighting Events and Details

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-06-15T12:17:11.9	Atlantic white-sided dolphin	5	Bow Riding	Other	2	None		Underway	32 59 39.6 N 59 32 46.4 W
2018-06-15T13:59:33.5	Atlantic spotted dolphin	20	Bow Riding	None	3	None		Underway	33 01 36.9 N 59 08 47.6 W
2018-06-18T09:41:59.6	Atlantic spotted dolphin	150	Surface-Active Travel	Direction of travel	22	None		Operations	34 04 28.0 N 49 40 43.8 W
2018-06-18T17:32:24.6	Unid whale	4941	Unknown		1	None		Operations	33 56 24.1 N 48 35 3.6 W
2018-06-18T21:37:52.7	Short-beaked common dolphin	1904	Surface-Active Travel	Dive	3	None		Operations	33 57 58.6 N 49 12 1.6 W
2018-06-22T18:22:57.1	Unid turtle	75	Rest	Dive	1	None		Underway	34 13 27.9 N 42 52 41.0 W
2018-06-23T08:35:34.9	Short-beaked common dolphin	50	Bow Riding	Dive	15	None		Underway	35 55 19.8 N 40 15 47.6 W
2018-06-23T16:29:54.0	True's beaked whale	120	Surface-Active Travel	Dive	4	None		Underway	36 47 5.2 N 38 41 47.0 W
2018-06-25T17:23:34.9	Atlantic spotted dolphin	4000	Surface-Active Travel	None	12	None		Operations	38 05 9.6 N 37 59 37.8 W
2018-06-25T18:14:35.3	Unid whale	2000	Travel	Dive	1	None		Operations	38 02 13.5 N 38 03 49.8 W
2018-06-25T18:06:13.1	Atlantic white-sided dolphin	8000	Surface-Active Travel	None	6	None		Operations	38 04 8.3 N 37 59 1.0 W
2018-06-25T17:59:49.6	Atlantic white-sided dolphin	4000	Surface-Active Travel	None	3	None		Operations	38 05 50.4 N 38 00 25.8 W
2018-06-25T18:01:51.0	Unid dolphin	200	Travel	Dive	1	None		Operations	38 01 13.9 N 38 02 26.0 W
2018-06-25T18:37:02.2	Unid dolphin	4000	Surface-Active Travel	None	3	None		Operations	38 03 12.0 N 38 05 27.8 W
2018-06-25T20:43:21.3	Atlantic white-sided dolphin	450	Surface-Active Travel	Dive	2	None		Operations	38 00 54.2 N 38 19 58.2 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-06-25T21:11:13.8	Unid marine mammal	700	Unknown	None	1	None		Operations	38 00 50.5 N 38 23 21.3 W
2018-06-26T16:24:17.6	Atlantic spotted dolphin	50	Travel	None	8	Other	Other	Deployment	38 22 15.8 N 37 58 37.8 W
2018-06-26T17:47:31.5	Unid turtle	15	Travel	Direction of travel	1	None		Deployment	38 22 42.5 N 37 59 8.1 W
2018-06-27T11:53:22.3	Atlantic spotted dolphin	10	Travel	None	6	None		Operations	40 32 14.8 N 37 37 1.5 W
2018-06-27T15:45:59.9	Atlantic spotted dolphin	80	Surface-Active Travel	None	9	None		Operations	41 00 25.0 N 37 31 34.1 W
2018-06-27T15:51:57.3	Short-beaked common dolphin	1	Surface-Active Travel	None	1	None		Operations	41 01 5.9 N 37 31 25.6 W
2018-06-27T16:08:40.1	Loggerhead turtle	5	Surface-Active Mill	None	1	Shutdown	Other	Operations	41 03 8.0 N 37 31 0.4 W
2018-06-27T21:55:42.0	Short-beaked common dolphin	1000	Surface-Active Travel	None	11	None		Operations	41 08 21.9 N 36 42 53.1 W
2018-06-27T22:25:53.2	Short-beaked common dolphin	1	Bow Riding	Direction of travel	25	None		Operations	41 07 53.4 N 36 38 7.0 W
2018-06-28T07:46:09.6	Atlantic spotted dolphin	10	Travel	None	5	None		Operations	41 27 52.4 N 37 17 22.1 W
2018-06-28T08:52:08.7	Unid whale	5000	Surface-Active Travel	None	1	None		Operations	41 27 59.8 N 37 02 34.6 W
2018-06-28T09:21:18.6	Unid whale	400	Travel	Dive	1	None		Operations	41 27 57.6 N 37 00 54.4 W
2018-06-28T11:20:09.2	Short-beaked common dolphin	1	Bow Riding	Dive	15	None		Operations	41 27 55.2 N 36 42 27.5 W
2018-06-28T15:49:33.8	Blue whale	4000	Travel	None	1	None		Operations	41 21 17.0 N 36 48 32.5 W
2018-06-28T16:06:33.4	Unid whale	700	Travel	Dive	3	None		Operations	41 20 3.5 N 36 46 42.9 W
2018-06-28T16:18:38.4	Unid whale	200	Travel	Dive	1	None		Operations	41 18 6.3 N 36 46 34.6 W
2018-06-28T16:20:49.7	Unid whale	700	Travel	Dive	1	None		Operations	41 18 12.3 N 36 46 23.2 W
2018-06-29T07:00:35.1	Unid whale	700	Travel	Dive	1	None		Operations	41 28 33.3 N 36 41 15.3 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-06-29T07:34:58.8	Unid whale	1000	Unknown	Dive	1	None		Operations	41 31 54.1 N 36 38 42.1 W
2018-06-29T08:08:37.5	Blue whale	3000	Unknown	Dive	1	None		Operations	41 36 35.3 N 36 37 58.0 W
2018-06-29T08:15:43.8	Sperm whale	2500	Unknown	Dive	7	None		Operations	41 36 55.0 N 36 38 23.0 W
2018-06-29T08:21:32.3	Short-beaked common dolphin	20	Bow Riding	Direction of travel	4	None		Operations	41 37 32.4 N 36 40 18.9 W
2018-06-29T08:22:39.8	Unid whale	700	Travel	Dive	1	None		Operations	41 37 54.5 N 36 39 55.5 W
2018-06-29T08:25:49.8	Blue whale	7000	Unknown	None	1	None		Operations	41 41 38.4 N 36 38 40.4 W
2018-06-29T08:34:16.8	Unid whale	1750	Travel	Other	2	None		Operations	41 39 28.6 N 36 39 19.6 W
2018-06-29T08:52:57.8	Unid whale	1400	Travel	Dive	1	None		Operations	41 42 8.2 N 36 39 55.6 W
2018-06-29T08:58:43.9	Short-beaked common dolphin	100	Surface-Active Mill	Behavior state	35	Shutdown	Shutdown	Operations	41 42 32.6 N 36 40 51.4 W
2018-06-29T11:36:03.3	Unid whale	3000	Travel	Dive	1	None		Operations	42 04 44.8 N 36 41 45.9 W
2018-06-29T17:58:32.0	Short-beaked common dolphin	10	Surface-Active Travel	Dive	4	None		Operations	42 54 9.2 N 36 48 36.2 W
2018-06-29T21:45:17.8	Sperm whale	150	Surface-Active Travel	Dive	8	None		Operations	43 24 20.9 N 36 51 33.4 W
2018-06-29T21:59:37.3	Sperm whale	300	Surface-Active Travel	Dive	2	Shutdown	Shutdown	Operations	43 26 12.8 N 36 50 56.5 W
2018-06-29T22:25:20.7	Short-beaked common dolphin	25	Bow Riding	Direction of travel	15	Delay	Delay	Operations	43 29 34.8 N 36 49 40.7 W
2018-06-30T07:59:33.9	Short-beaked common dolphin	100	Surface-Active Travel	Dive	3	None		Operations	43 43 19.0 N 37 35 30.7 W
2018-06-30T08:07:37.1	Short-beaked common dolphin	350	Surface-Active Travel	Dive	2	None		Operations	43 43 5.9 N 37 34 21.7 W
2018-06-30T11:43:56.8	Unid dolphin	400	Travel	Dive	10	None		Deployment	43 43 35.3 N 37 00 59.7 W
2018-06-30T12:12:20.9	Unid marine mammal	5000	Unknown	None	1	None		Deployment	43 43 14.2 N 36 57 39.1 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-06-30T13:00:25.8	Long-finned pilot whale	300	Surface-Active Travel	Direction of travel	12	None		Deployment	43 47 59.0 N 37 00 46.5 W
2018-06-30T13:10:18.5	Long-finned pilot whale	400	Surface-Active Travel	Direction of travel	12	None		Deployment	43 48 47.7 N 37 00 40.0 W
2018-06-30T17:18:03.1	Short-beaked common dolphin	550	Surface-Active Travel	None	10	None		Operations	43 52 58.7 N 37 10 14.8 W
2018-06-30T17:23:23.3	Short-beaked common dolphin	200	Surface-Active Travel	Dive	7	None		Operations	43 53 23.0 N 37 10 55.9 W
2018-06-30T17:32:45.1	Sperm whale	2000	Surface-Active Travel	Dive	1	None		Operations	43 54 13.9 N 37 12 46.8 W
2018-06-30T17:58:41.5	Sperm whale	2000	Surface-Active Travel	Dive	7	Other	Other	Other	43 53 44.4 N 37 16 29.9 W
2018-06-30T18:22:26.3	Sperm whale	500	Rest	Dive	1	None		Other	43 53 33.8 N 37 18 5.3 W
2018-06-30T19:49:51.8	Sperm whale	2500	Surface-Active Travel	Dive	5	None		Operations	43 53 48.7 N 37 26 13.1 W
2018-06-30T20:25:13.3	Sei whale	4750	Travel	Dive	1	None		Operations	43 55 49.0 N 37 32 31.6 W
2018-07-01T07:43:15.7	Atlantic white-sided dolphin	1500	Surface-Active Travel	Behavior state	8	None		Operations	43 32 17.0 N 37 42 55.2 W
2018-07-01T08:16:55.0	Unid marine mammal	600	Unknown	None	1	None		Operations	43 28 59.2 N 37 41 7.5 W
2018-07-01T08:43:01.6	Short-beaked common dolphin	1000	Surface-Active Travel	Other	40	None		Operations	43 29 5.2 N 37 37 9.6 W
2018-07-01T08:46:36.6	Atlantic white-sided dolphin	1000	Surface-Active Travel	Behavior state	51	None		Operations	43 28 50.2 N 37 37 12.1 W
2018-07-01T09:02:04.7	Unid dolphin	2500	Surface-Active Travel	Dive	3	None		Operations	43 28 24.1 N 37 36 53.8 W
2018-07-01T09:27:59.0	Green turtle	120	Rest	None	1	Shutdown	Shutdown	Operations	43 29 21.4 N 37 32 33.5 W
2018-07-01T13:19:42.1	Loggerhead turtle	75	Rest	None	1	Shutdown	Shutdown	Operations	43 49 12.2 N 37 31 41.5 W
2018-07-01T13:58:23.9	Atlantic white-sided dolphin	3000	Surface-Active Mill	None	15	None		Operations	43 53 28.1 N 37 29 36.8 W
2018-07-01T14:38:42.7	Short-beaked common dolphin	50	Surface-Active Travel	None	20	None		Deployment	43 52 17.0 N 37 26 24.1 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-07-01T15:16:51.5	Atlantic white-sided dolphin	1500	Surface-Active Travel	None	8	None		Operations	43 51 29.6 N 37 21 35.3 W
2018-07-01T15:55:46.6	Unid dolphin or porpoise	5000	Surface-Active Travel	None	3	None		Operations	43 48 0.8 N 37 21 50.6 W
2018-07-01T16:22:50.4	Short-beaked common dolphin	80	Bow Riding	Direction of travel	5	None		Operations	43 48 4.5 N 37 19 57.9 W
2018-07-01T16:39:27.2	Unid whale	7000	Surface-Active Travel	Dive	1	None		Operations	43 49 56.2 N 37 17 11.6 W
2018-07-01T16:44:00.0	Risso's dolphin	250	Surface-Active Travel	Dive	9	None		Operations	43 46 24.9 N 37 19 48.1 W
2018-07-01T17:18:13.5	Green turtle	15	Rest	Direction of travel	1	Shutdown	Shutdown	Operations	43 43 32.7 N 37 19 59.0 W
2018-07-01T17:54:35.3	Unid dolphin	400	Surface-Active Travel	Dive	8	None		Operations	43 40 48.5 N 37 20 6.9 W
2018-07-01T18:50:34.9	Loggerhead turtle	20	Mill	None	1	None		Operations	43 35 54.1 N 37 19 58.7 W
2018-07-01T18:58:11.2	Unid turtle	500	Mill	None	1	None		Operations	43 35 30.5 N 37 20 10.5 W
2018-07-01T19:33:37.0	Loggerhead turtle	500	Mill	None	1	None		Operations	43 32 14.4 N 37 19 36.4 W
2018-07-01T19:58:01.7	Short-beaked common dolphin	2000	Surface-Active Travel	None	30	None		Operations	43 30 3.7 N 37 18 30.2 W
2018-07-01T19:58:32.6	Unid whale	2000	Travel	None	1	None		Operations	43 30 1.0 N 37 18 30.2 W
2018-07-01T20:05:26.8	Short-beaked common dolphin	100	Travel	None	3	None		Operations	43 29 30.2 N 37 19 55.0 W
2018-07-01T21:37:15.8	Unid turtle	400	Travel	Direction of travel	1	None		Operations	43 34 10.6 N 37 15 41.5 W
2018-07-02T08:19:30.7	Sperm whale	7000	Surface-Active Travel	Dive	1	None		Operations	43 45 43.2 N 37 34 37.7 W
2018-07-02T07:42:53.9	Unid dolphin or porpoise	2800	Surface-Active Mill	Dive	7	None		Operations	43 44 44.7 N 37 34 42.3 W
2018-07-02T08:14:34.5	Sperm whale	8000	Surface-Active Travel	Dive	1	None		Operations	43 45 47.3 N 37 35 52.9 W
2018-07-02T08:13:53.7	Atlantic white-sided dolphin	7000	Surface-Active Travel	Dive	125	None		Operations	43 43 37.8 N 37 35 35.5 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-07-02T08:29:24.8	Short-beaked common dolphin	150	Surface-Active Travel	Dive	2	None		Operations	43 44 30.4 N 37 28 41.4 W
2018-07-02T13:41:42.3	Loggerhead turtle	50	Surface-Active Mill	None	1	None		Deployment	43 48 37.8 N 37 49 27.4 W
2018-07-02T18:39:17.2	Sperm whale	200	Travel	Dive	1	None		Operations	44 09 27.3 N 37 49 28.0 W
2018-07-03T08:27:35.1	Atlantic white-sided dolphin	800	Surface-Active Travel	None	45	None		Underway	46 15 52.5 N 38 00 33.5 W
2018-07-03T08:49:52.0	Short-beaked common dolphin	80	Surface-Active Travel	Dive	2	None		Underway	46 20 24.8 N 38 01 34.4 W
2018-07-03T11:13:47.1	Unid dolphin	20	Surface-Active Travel	None	2	None		Underway	46 46 16.6 N 38 06 43.9 W
2018-07-03T12:53:17.5	Long-finned pilot whale	100	Surface-Active Mill	None	4	None		Underway	47 03 20.6 N 38 10 18.7 W
2018-07-03T12:56:06.7	Short-beaked common dolphin	75	Surface-Active Travel	None	3	None		Underway	47 03 49.9 N 38 10 28.9 W
2018-07-03T15:15:02.6	Short-beaked common dolphin	10	Surface-Active Travel	Dive	4	None		Underway	47 27 42.6 N 38 11 56.8 W
2018-07-03T17:07:30.9	Short-beaked common dolphin	15	Surface-Active Travel	Dive	9	None		Underway	47 47 17.4 N 38 16 54.1 W
2018-07-03T22:29:14.7	Fin whale	1200	Surface-Active Travel with Visible Blows	None	1	None		Underway	48 46 53.6 N 38 31 25.2 W
2018-07-04T07:58:18.6	Unid dolphin or porpoise	80	Surface-Active Travel	Direction of travel	10	None		Underway	50 35 5.9 N 38 59 57.2 W
2018-07-09T18:00:15.7	Long-finned pilot whale	600	Surface-Active Travel with Visible Blows	Direction of travel	42	None		Operations	51 45 11.7 N 39 42 42.1 W
2018-07-09T18:16:02.3	Unid whale	2500	Surface-Active Travel with Visible Blows	Dive	2	None		Operations	51 45 35.2 N 39 42 34.6 W
2018-07-09T18:21:58.7	Unid whale	4000	Surface-Active Travel with Visible Blows	Dive	4	None		Operations	51 45 27.0 N 39 41 46.4 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-07-09T19:58:28.4	Sperm whale	600	Surface-Active Travel with Visible Blows	None	1	None		Operations	51 53 5.7 N 39 39 1.7 W
2018-07-09T20:05:28.4	Sperm whale	700	Surface-Active Travel with Visible Blows	Dive	3	None		Operations	51 53 40.2 N 39 38 26.0 W
2018-07-09T21:07:00.2	Sperm whale	600	Surface-Active Travel with Visible Blows	Dive	1	None		Operations	51 55 32.9 N 39 31 37.7 W
2018-07-09T21:57:47.1	Long-finned pilot whale	300	Surface-Active Travel	None	6	None		Operations	51 54 18.9 N 39 37 25.8 W
2018-07-10T12:17:39.9	Long-finned pilot whale	100	Surface-Active Travel	Direction of travel	19	Shutdown	Shutdown	Deployment	51 37 53.8 N 41 16 57.6 W
2018-07-10T12:12:27.7	Unid whale	150	Travel	Dive	1	None		Operations	51 37 59.3 N 41 16 30.0 W
2018-07-13T09:01:10.0	Unid dolphin or porpoise	20	Surface-Active Travel	Dive	1	None		Underway	42 53 6.8 N 51 24 25.7 W
2018-07-14T20:27:22.6	Atlantic white-sided dolphin	3500	Surface-Active Travel	None	75	None		Underway	41 51 27.0 N 59 38 24.5 W
2018-07-15T11:40:15.4	Short-beaked common dolphin	10	Bow Riding	Dive	8	None		Underway	41 19 49.1 N 63 28 28.5 W
2018-07-15T12:49:10.2	Unid whale	6000	Surface-Active Travel with Visible Blows	Dive	2	None		Underway	41 15 36.2 N 63 47 8.3 W
2018-07-15T19:14:25.6	White-beaked dolphin	100	Surface-Active Travel	Dive	5	None		Underway	41 10 54.1 N 65 03 56.0 W
2018-07-15T19:26:29.3	Loggerhead turtle	1	Rest	None	1	None		Underway	41 10 36.7 N 65 06 15.0 W
2018-07-16T10:58:53.8	Unid turtle	1	Rest	None	1	None		Underway	40 45 0.3 N 68 05 8.2 W
2018-07-16T11:07:35.4	Short-beaked common dolphin	10	Surface-Active Travel	Dive	10	None		Underway	40 44 45.4 N 68 06 56.2 W
2018-07-16T16:26:11.7	Basking shark	50	Surface-Active Travel	Behavior state	1	None		Underway	40 35 41.4 N 69 06 33.0 W
2018-07-16T16:53:41.0	Leatherback turtle	15	Mill	Dive	1	None		Underway	40 35 3.5 N 69 11 54.4 W

Time (UTC)	Species	Sgt Dist (m)	Behavior State	Behavior Change	Best Count	Mitigation Request	Mitigation Response	Vessel Activity	Sgt Pos
2018-07-16T16:54:56.0	Unid marine mammal	1000	Surface-Active Travel	None	1	None		Underway	40 34 58.0 N 69 12 50.7 W
2018-07-16T19:54:53.4	Leatherback turtle	5	Surface-Active Travel	Dive	1	None		Underway	40 37 49.9 N 69 47 22.5 W
2018-07-16T22:40:07.6	Minke whale	15	Travel	Dive	1	None		Underway	40 37 41.6 N 70 18 7.3 W