VACAPES Outer Continental Shelf Cetacean Study, Virginia Beach, Virginia: 2018 Annual Progress Report

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Sowerby's beaked whale (*Mesoplodon bidens*) off the coast of Virginia. Photographed by Todd Pusser. Photograph taken under National Marine Fisheries Service Scientific Research Permit No. 16239, issued to Dan Engelhaupt / HDR.

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Acronyms and Abbreviations

AMAPPS	Atlantic Marine Assessment Program for Protected Species
ARS	Area Restricted Search
BSS	Beaufort sea state
GPS	Global Positioning System
hr	hour(s)
km	kilometer(s)
LIMPET	Low-Impact Minimally Percutaneous Electronic Transmitter
m	meter(s)
min	minute(s)
MMO	marine mammal observer
NAVFAC LANT	Naval Facilities Engineering Command Atlantic
NM	nautical mile(s)
NSN	Naval Station Norfolk
OPAREA	Operating Area
PAM	passive acoustic monitoring
photo-ID	photo-identification
sec	second(s)
SPOT	Smart Position and Temperature
U.S.	United States
UD	Utilization Distribution
VACAPES	Virginia Capes

1. Introduction and Background

The United States (U.S.) Navy routinely conducts training and testing activities in the Virginia Capes (VACAPES) Operating Area (OPAREA) off the mid-Atlantic. Since 2012, HDR has worked with the U.S. Navy to carry out vessel-based line transect visual surveys, photo-identification (photo-ID) surveys, and focal-follow surveys, with the goal of determining common bottlenose dolphin (*Tursiops truncatus*) densities and site fidelity (see Engelhaupt et al. 2014, 2015, 2016, 2017), as well as humpback whale (*Megaptera novaeangliae*) habitat use (see Aschettino et al. 2015, 2016, 2017, 2018) within waters adjacent to Naval Station Norfolk (NSN), Joint Expeditionary Base Little Creek-Fort Story, Naval Air Station Oceana Dam Neck Annex, and within and near the W-50 Mine Neutralization Exercise area.

The region encompassing the deeper waters of the continental shelf, shelf break, and continental slope has been recognized as an important habitat for multiple species of cetaceans. Kenney and Winn (1986) showed that the shelf edge from Cape Hatteras to Georges Bank was the second most intensively used cetacean habitat off the northeastern United States based on 3 years of surveys conducted by the Cetacean and Turtle Assessment Program (CETAP 1982). More recent, still on-going, broad-scale surveys by the National Marine Fisheries Service, including the Atlantic Marine Assessment Program for Protected Species (AMAPPS) and marine mammal stock-assessment reports (Waring et al. 2016) show the same pattern. Cetacean species known to be common in some seasons in outer shelf and slope waters include both baleen whales and odontocetes, such as fin whales (*Balaenoptera physalus*), sei whales (*Balaenoptera borealis*), minke whales (*Balaenoptera acutorostrata*), humpback whales, sperm whales (*Physeter macrocephalus*), beaked whales (*Ziphius cavirostris*, *Mesoplodo*n spp.), long-finned and short-finned pilot whales (*Globicephala melas* and *Globicephala macrorhynchus*, respectively), Risso's dolphins (*Grampus griseus*), common bottlenose dolphins, common dolphins (*Delphinus delphis*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), Atlantic spotted dolphins (*Stenella frontalis*), and striped dolphins (*Stenella coeruleoalba*) (CETAP 1982; Hain et al. 1985, 1992; Kenney and Winn 1986, 1987; Selzer and Payne 1988; Kenney 1990; Payne and Heinemann 1993; Waring et al. 1993, 2001, 2016; Northridge et al. 1997; Palka et al. 1997; Mead 2009; NEFSC and SEFSC 2012, 2013; Jefferson et al. 2014). Fin, sei, and sperm whales are all listed as endangered under the U.S. Endangered Species Act. Recent aerial and vessel surveys and passive acoustic monitoring (PAM) studies for the U.S. Navy Marine Species Monitoring Program (Foley et al. 2019; Salisbury et al. 2018; Mallette et al. 2017, 2018; Aschettino et al. 2018) have provided data confirming the overall patterns, and suggesting that the outer shelf area off Virginia in the VACAPES OPAREA would be an ideal location for more focused research.

Offshore surveys were first conducted in association with the Mid-Atlantic Humpback Whale Monitoring project from April 2015 through June 2016 (Aschettino et al. 2016). A separate study focusing on outer continental shelf cetaceans was initiated in July 2016 (Engelhaupt et al. 2017, 2018. This progress report includes all offshore activities conducted in 2018. The goals of this effort focus on addressing fundamental information gaps related to marine mammal occurrence, exposure, and response as identified the U.S. Navy's Integrated Comprehensive Monitoring Program (DoN 2010) and the follow-up Scientific Advisory Group review (DoN 2011). In order to

address these gaps for offshore waters in the VACAPES OPAREA, a combination of techniques are being used, including: (1) photo-ID and behavioral data collection to provide baseline assessments of animal movement patterns, site fidelity, habitat use, life history, and behavior; (2) biopsy sampling for incorporation into existing genetic studies (where opportunities exist) to identify individuals, determine foraging patterns, and assist in delineating stock structure; and (3) satellite-linked tagging techniques to provide information on residency patterns and habitat use across intermediate time scales (weeks to months).

Residency and movement patterns are of particular interest given the potential for repeated exposure to U.S. Navy training and testing activities known to occur within the area. Findings from work conducted off the coast of Southeast Virginia and Cape Hatteras, North Carolina, suggests a year-round presence of several species of cetaceans, including Cuvier's beaked whales and short-finned pilot whales, near the continental shelf break (McAlarney et al. 2018a, 2018b). Tagging efforts for this project will provide opportunities to assess movement patterns of additional species and may identify the extent of overlap with these animals and offshore training and testing activities conducted within the VACAPES OPAREA. Given the duration of the tag attachments and experience from previous tagging studies in waters off Cape Hatteras, North Carolina (Baird et al. 2018), there is potential to track tagged animals to OPAREAS outside of VACAPES, including the Cherry Point OPAREA to the south and the Atlantic City OPAREA to the north.

Taking into consideration the multiple intermediate scientific objectives in the U.S. Navy's Strategic Planning Process (DoN 2013), the goals of this study are to assist the U.S. Navy and regulatory agencies with environmental planning and compliance by addressing the following questions:

- Which cetacean species occur over the outer continental shelf to the east of NSN, and how does occurrence fluctuate seasonally?
- What are the baseline behaviors and ecological relationships of offshore cetaceans within the study area?
- Do individual cetaceans exhibit site fidelity within specific regions of the study area over periods of weeks, months, or years?
- What is the seasonal extent of cetacean movements within and around U.S. Navy VACAPES training range boxes?
- Do cetaceans spend significant time within or primarily move through areas of U.S. Navy live-fire or Anti-Submarine Warfare training events?

2. Methods

The primary survey area includes the offshore waters (approximately 90 km (50 nautical miles [NM]) to 160 km (85 NM) off Virginia (**Figure 1**). The offshore study area includes the outer part of the continental shelf, the shelf break, and slope waters, along with Norfolk and Washington Canyons. Depths within the study area range from < 100 meters (m) to 3,000 m.

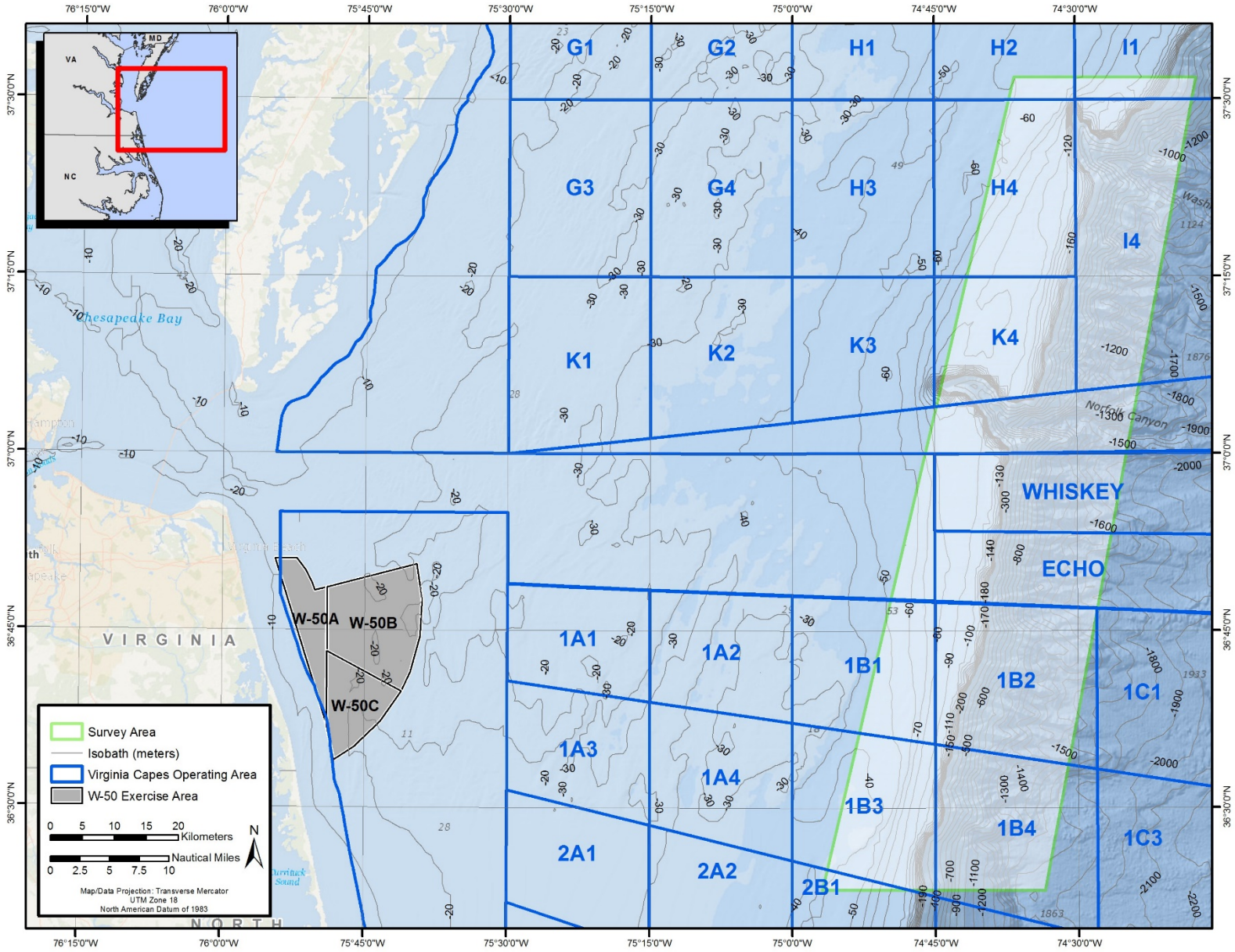


Figure 1. Map of the offshore study area off southeastern Virginia and the VACAPES training range surface grid in the region.

2.1 Survey Operations

Survey departure times were adjusted to maximize weather and clearance windows, and to take into account the long transit time to reach the survey area (approximately 3 hours [hr] each way when transiting at 20+ knots). Survey days were planned to utilize survey time within the area of interest during optimal weather conditions, including good visibility and a Beaufort sea state (BSS) of 3 or lower when possible, as well as access to the VACAPES OPAREA range boxes within the study area (K3, K4, 1B1, 1B2, 1B3, and 1B4; **Figure 1**) so that the research vessels had clearance to operate when training was not being conducted. However, because of frequent range closures and limited weather windows, it was not always possible to conduct surveys within the desired VACAPES OPAREA boxes.

Two offshore charter sport-fishing vessels, the 17.4 m *Capt. Cheryl* and 16.2 m *Top Notch* (**Figure 2)** were the primary vessels used in 2018 to support surveys. Each is equipped with a Global Positioning System (GPS) receiver, marine radio, emergency beacon, life raft, depth sounder, and emergency equipment. All captains are familiar with the Virginia Beach waterways and the unique characteristics of the region and hold U.S. Coast Guard-approved 100-ton master's licenses.

Figure 2. One of two sport-fishing vessels chartered for use during offshore surveys, the 16.2 m *Top Notch*.

Surveys departed from Rudee Inlet in Virginia Beach, Virginia. Efforts were coordinated with the VACAPES range so that the vessel would have clearance in the primary study area as often as possible. The K3 and K4 range boxes, which encompass Norfolk Canyon, require clearance to be obtained on the day of surveys, and therefore there were times that area was unavailable. Coordination with the HDR aerial survey team (see Cotter et al. 2019) was also attempted, whenever possible, in order to maximize sightings potential.

The scientific crew consisted of a minimum of four marine mammal observers (MMOs), but no more than six, including (at least) one photographer, one data recorder, one tagging specialist, and one biopsy specialist. Roles were generally interchangeable throughout surveys.

In order to maximize achievement of the project's core objectives, departures from the marina were scheduled at approximately sunrise or earlier and up to 12 hr were allocated for each survey day. Once departing the marina, transit time was approximately 3 hr to reach the study area. MMOs were on-effort during the outbound and inbound transit as long as there was sufficient daylight and a BSS of 4 of lower. Due to the distance from shore and overall effort required to complete each survey day, effort in the primary study area continued until the end of the survey day even if sea states turned unfavorable (BSS 4 to 6), unless conditions were deemed to be unsafe. Every effort was made to avoid such circumstances by following weather forecasts closely before commencing a survey day.

The survey area for each day was chosen depending on weather conditions, clearance, and reports of high-priority species (e.g., information from recent aerial or vessel surveys). Areas of high U.S. Navy training use, such as the Norfolk Canyon area (**Figure 1**) were a priority. The survey vessel often followed pre-determined tracks that covered high-priority regions; however, because these surveys were intended to maximize the potential for making observations, surveys did not follow line-transect distance-sampling protocols. The vessel maintained a survey speed of approximately 18 to 22 km/hr (10 to 12 knots) during search efforts that often followed a zig-zag pattern to waypoints chosen on the day of survey that would optimize coverage across the depth gradient in the areas that could be accessed that day.

The on-effort MMOs used both 10 × 30 hand-held image-stabilized binoculars and unaided eyes. MMOs covered a 270-degree swath of observation area in front of and to the sides of the survey vessel. Once in deep water (>400 m) a directional hydrophone was frequently used to listen for sperm whales. If clicks were heard, every effort was made to localize the detections and maneuver the boat to where the whales were heard. If no clicks were heard, the vessel would continue transiting before stopping approximately 20-30 minutes later to listen in a different area.

Once a sighting was made, one MMO focused on data entry using COMPASS (Richlen et al. 2019), the data-recording application running on an Apple iPad tablet (see **Appendix A**) while others focused on visually tracking and obtaining photo-ID images of the individual or group. In addition to photo-ID, some species were targeted for biopsy, satellite tagging, and/or digital video-recording. Baleen whales, sperm whales, and beaked whales were given highest priority in terms of time and effort spent collecting information and attempting to deploy tags and collect samples. Species not frequently seen in the area, such as killer whales (*Orcinus orca*), false killer whales (*Pseudorca crassidens*), melon-headed whales (*Peponocephala electra*), and pygmy killer whales (*Feresa attenuata*) were also defined as high-priority if encountered. Pilot whales and Risso's dolphins were considered medium-priority species and were worked in the event that higher-priority species were not encountered, although because of the high number of sightings of pilot whales, groups were not always approached for identification to species and photo-ID. Other delphinid species were the lowest priority and effort spent collecting data and

photographs was limited to confirming species identification, estimating group size, and determining initial behavior.

During a high priority marine mammal sighting, the research vessel would attempt to approach the animal(s) for the purpose of photographs, biopsy sampling, focal-follow data collection, and/or tagging. The approach was done in a manner to minimize disturbance to the animals and to maximize the crew's abilities to confirm species, obtain group size estimates, and collect photo-IDs and video. The decision on when to end data collection efforts on a priority species or to switch to a different sighting was made by the Chief Scientist.

2.2 Photography and Data Logging

Once a sighting was made, one observer focused on data entry, while the others focused on obtaining photo-ID images of the individual(s) using a digital SLR camera (Canon 7D, 7D Mark II, or 1DX Mark II) with a zoom lens (Canon 100- to 400-millimeter). Every effort was made to obtain good quality identification photos of the flukes and/or dorsal fins of high-priority species encountered. Following each survey day, photos were cropped and compiled in a format suitable for data sharing with other catalogs. HDR shares their images with known regional and local catalogs, including the North Atlantic Right Whale Catalog curated by the New England Aquarium, the North Atlantic Fin Whale Catalog curated by the Center for Coastal Studies, the North Atlantic and Mediterranean Sperm Whale catalog curated by Whale Watch Azores, the Mid-Atlantic Humpback Whale Catalog currently being developed by the Virginia Aquarium (Mallette et al. 2018, 2019), the Gotham Whale Humpback Whale Catalog, and multiple other cetacean catalogs maintained by Duke University.

During surveys, the data recorder maintained a log of observers, environmental conditions, and sighting information in COMPASS running on an iPad (**Appendix A**). Environmental data were updated whenever sighting conditions changed. When a sighting was made, information regarding the distance and bearing to the sighting, species identification, speed and direction of the animal(s), group size, photographs, and videos was logged when available.

Sighting distances were estimated visually. Location data and vessel speed were obtained from a GPS unit feeding directly into the iPad and logging a location every 30 seconds.

2.3 Biopsy Sample Collection

Biopsy samples were collected from priority species after the survey team finished collecting identification photographs. Biopsy samples were collected with a sampling dart fired from a Paxarms MK24c projector (Paxarms New Zealand Ltd., Cheviot, New Zealand) or Barnett Recurve crossbow (Barnett Outdoors, LLC, Tarpon Springs, FL). Skin samples were placed in a Whirl-Pak® bag after collection and stored in an ice cooler on the vessel. Samples were subsequently cross-sectioned, placed in the appropriate Cryovial® storage tube, and stored in a freezer until ready for shipment. Samples for fin whale genetic analysis studies were collected for the University of Groningen, and samples for sperm whale genetic analyses were collected for Oregon State University. Analysis of these samples will take place once the budgeted number of samples has been collected.

2.4 Satellite Tagging

A combination of Wildlife Computers (Redmond, Washington) Argos-linked location-only Smart Position and Temperature (SPOT-240), Argos-linked time-depth archival (SPLASH10-292 tags), and Argos-linked time-depth archival with Fastloc® GPS technology (SPLASH10-333-F), all in the Low-Impact Minimally Percutaneous External-electronics Transmitter (LIMPET) configuration (Andrews et al. 2008), were deployed on priority species. Tags were deployed remotely with a DAN-INJECT J.M.SP.25 CO_2 projector (DAN-INJECT ApS, Børkop, Denmark; www.dan-inject.com). Two surgical-grade titanium darts measuring 6.8 centimeters in length containing six backwards-facing petals were used to attach tags to the dorsal fin or just below the dorsal fin. Tags were programmed to maximize the number of transmissions and locations received during attachment rather than to extend battery life based on expected attachment durations of LIMPET tags on baleen and sperm whales of less than 60 days. Locations of tagged individuals were approximated by the Argos system using the Kalman filtering location algorithm (Argos User's Manual © 2007-2015 Collective Location Services). Using tools provided within Movebank (www.movebank.org), unrealistic locations (e.g., those on land) were manually removed prior to a further final Douglas Argos Filtering step. For the purpose of this report, for tags where both Argos and Fastloc® GPS locations were collected, only Argos locations were plotted. All dives were manually inspected, and unrealistic dive durations were removed from the data that could not be verified by both the time series and behavior file output. Additional dive data results were processed further using the statistical software R (R Core Team 2018).

2.5 State-Space Modeling

Filtered ARGOS locations from 2017 and some 2018 tag data were used to create state-space models and explore the feasibility of home range analyses. A two-state model, nominally traveling and area restricted search (ARS), was chosen as it was expected to be the best first approach to inferring animal behavior from Argos data (Jonsen et al. 2005). This method estimates movement parameters for all animals jointly, as well as an individual effects parameter for each tag. This can allow shorter deployments that could not have been modeled individually to give realistic results. The model assumes that animal movement patterns are broadly similar, but we suggest that this is reasonable if a model is created for each species, each representing a single stock and all animal tagged in the same region. As with other state-space approaches, the track s smoothed into equal time intervals, with the estimated locations taking Argos location error into account. Argos locations are uncertain, with the magnitude of uncertainty based on the quality of the satellite fix (CLS 2016). The SSM model takes these location errors into account. Model diagnostics were examined to ensure that Monte Carlo Markov chains (MCMC) were mixing and that all movement and individual effect parameters were converging as expected.

A suite of models was fit in R package bsam (Jonsen 2016) for both fin and sperm whales at 3, 6, and 12-hour time intervals. Model diagnostics were examined to ensure models were converging and outputs were examined visually for a qualitative assessment of model performance. Estimated locations were classified into behaviors based on the mean predicted behavioral state from the model runs. Values less than 1.25 were classified as traveling. Values

greater than 1.75 were classified as ARS. Values in between were classified as indeterminant behavior.

A gridded approach to calculating utilization distributions (UDs) was selected for generating home ranges to leverage the ease with which individual home ranges can be combined and interpreted (Maxwell et al. 2011). A grid of hexagons with a diameter of 15 kilometers was used to aggregate locations that were identified as ARS and subsequently were used to generate UDs for each tag. Home range metrics for the gridded utilization distributions (UDs) are reported in numbers of cells, a hexagon with a diameter of 15 kilometers has an area of roughly 150 square kilometers. Because the locations occur in even time intervals, the UD isopleths correspond directly to residency time (in this case, time spent performing ARS). For example, the 50% UD contains 50% of locations identified as ARS and 50% of time spent engaged in ARS behavior for the tag duration.

3. Results

We conducted 14 offshore vessel surveys in 2018 covering 4,570 km of trackline during more than 170 hr of effort (**Table 1, Figure 3**). Surveys were conducted at least once per month in all months except January, March, July, and November, during which weather conditions prevented survey effort.

Surveys resulted in 187 marine mammal sightings and 36 sea turtle sightings (**Figures 4 through 7; Appendix B and C**). Fifteen cetacean taxa were identified (in order of decreasing frequency): unidentified pilot whale (*Globicephala* sp.) (*n*=35), fin whale (*n*=34), common bottlenose dolphin (*n*=29), common dolphin (*n*=28), Risso's dolphin (*n*=11), humpback whale (*n*=8), sperm whale (*n*=8), Atlantic spotted dolphin (*n*=7), short-finned pilot whale (*n*=6), minke whale (*n*=2), North Atlantic right whale (*n*=2), pygmy sperm whale (*n*=2), Sowerby's beaked whale (*n*=2), striped dolphin (*n*=1), blue whale (*n*=1), and dwarf sperm whale (*n*=1). In addition, there were 10 sightings of unconfirmed species: unidentified dolphin (*n*=5), unidentified large whale (*n*=2), unidentified cetacean (*n*=1), unidentified medium whale (*n*=1), and unidentified beaked whale (*n*=1). Two sea turtle taxa were identified: loggerhead turtle (*n*=22) and leatherback turtle (*n*=12), and there were also 2 unconfirmed sightings: unidentified hardshell turtle (*n*=1) and unidentified turtle (*n*=1). Given the study's focus on priority species that do not include pilot whales, combined with the challenge of identifying the genus *Globicephala* down to species from a distance, most pilot whale groups were classed as unidentified pilot whales.

3.1 Photo-ID

Due to priorities and limited windows of opportunity, photo-ID images were collected from only 120 of the 187 marine mammal sightings. All photos of baleen and sperm whales were added to HDR's existing catalogs (**Appendix D**). The HDR fin whale catalog now contains 69 unique individuals, the minke whale catalog contains 10 individuals, and the sei whale catalog contains 2 individuals. Of the 69 identified fin whales, 13 (19%) have been re-sighted; 9 (13%) of them during different years ranging 247 to 355 between first and last sightings. Locations of all re-sighted fin whales were in water over the continental shelf, less than 200 m depth for all encounters. Humpback whale images were incorporated into the existing nearshore catalog (see Aschettino et al. 2018, 2019), adding 9 new whales and a re-sighting for a known

individual, HDRVAMn049, sighted during nearshore surveys since December 2015. A new catalog was also created for right whales, which consists of two individuals from vessel surveys, but a total of 6 whales including aerial sightings (Cotter et al. 2019).

Table 1. Summary of 2018 offshore survey effort in the VAPACES outer continental shelf study area.

Date	Survey Time (min)	Distance surveyed (km)	# Sightings	# Individuals	Baleen Whales # Sightings/ # Individuals	Deep Diving Whales # Sightings/ # Individuals	Dolphins # Sightings/ # Individuals	Sea Turtles # Sightings/ # Individuals
09-Feb-18	694	296.7	10	123	4/5	1/18	5/100	0/0
11-Apr-18	709	275.9	13	19	12/15	0/0	1/4	0/0
22-Apr-18	746	298.8	8	207	3/18	1/7	4/182	0/0
28-Apr-18	829	317.7	19	199	12/24	1/6	6/169	0/0
01-May-18	804	320.8	14	161	9/16	2/6	3/139	0/0
25-May-18	733	322.6	17	280	0/0	3/15	7/252	7/13
08-Jun-18	732	360.8	14	319	1/2	3/49	9/267	1/1
06-Aug-18	766	374.6	35	581	3/5	8/83	12/480	12/13
03-Sep-18	679	336.9	17	284	0/0	5/60	5/215	7/9
07-Sep-18	730	363.3	19	342	0/0	10/173	7/166	2/3
14-Oct-18	722	349.0	24	487	0/0	14/224	5/258	5/5
19-Oct-18	704	341.9	13	250	0/0	4/36	7/212	2/2
13-Dec-18	724	303.1	10	182	5/12	2/58	3/112	0/0
19-Dec-18	703	307.8	10	584	0/0	1/7	9/577	0/0
Total	**10,275**	**4,569.9**	**223**	**4,018**	**49/97**	**55/742**	**83/3,133**	**36/46**

Key: min = minute(s); km = kilometer(s)

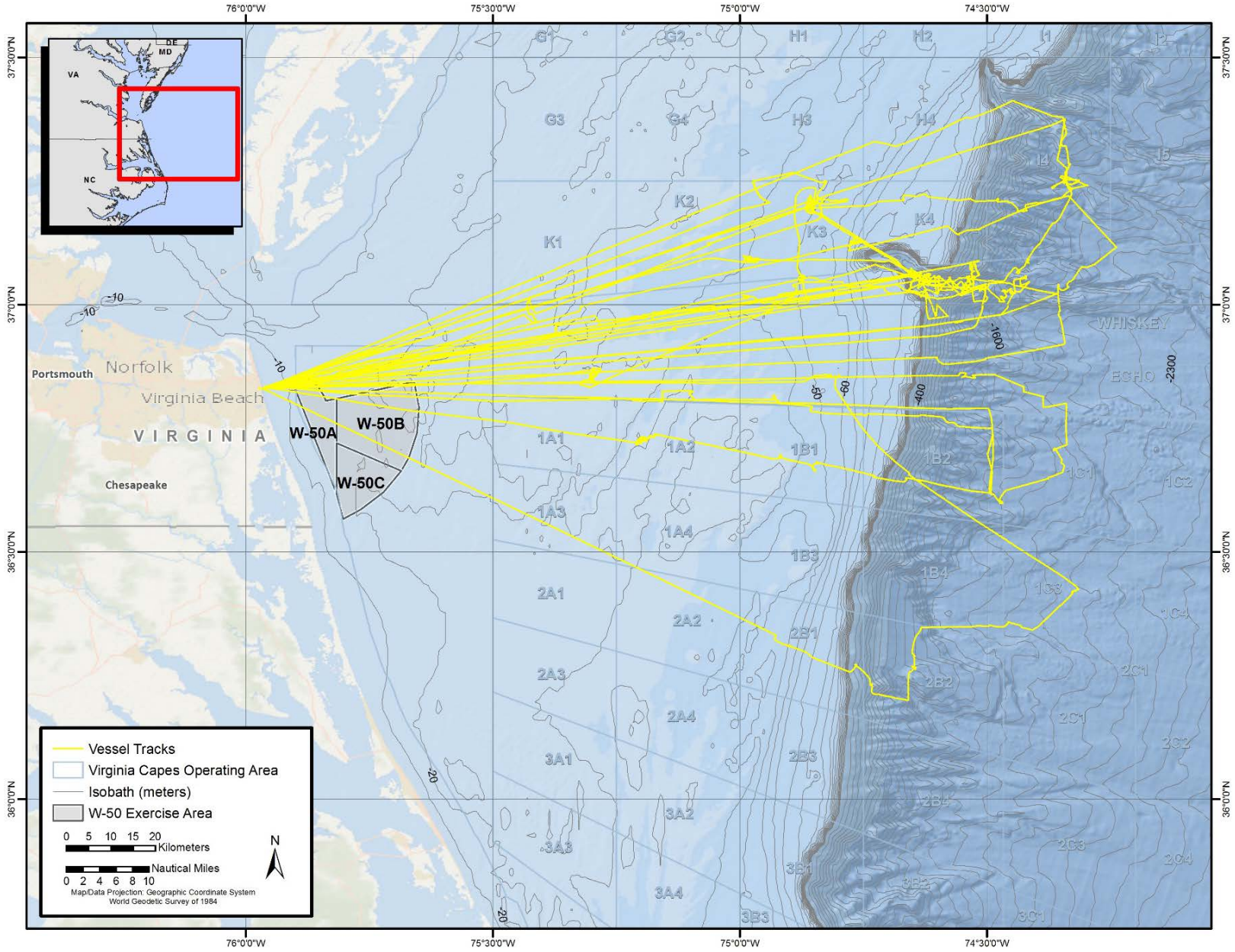


Figure 3. Offshore survey tracks for all surveys conducted in 2018.

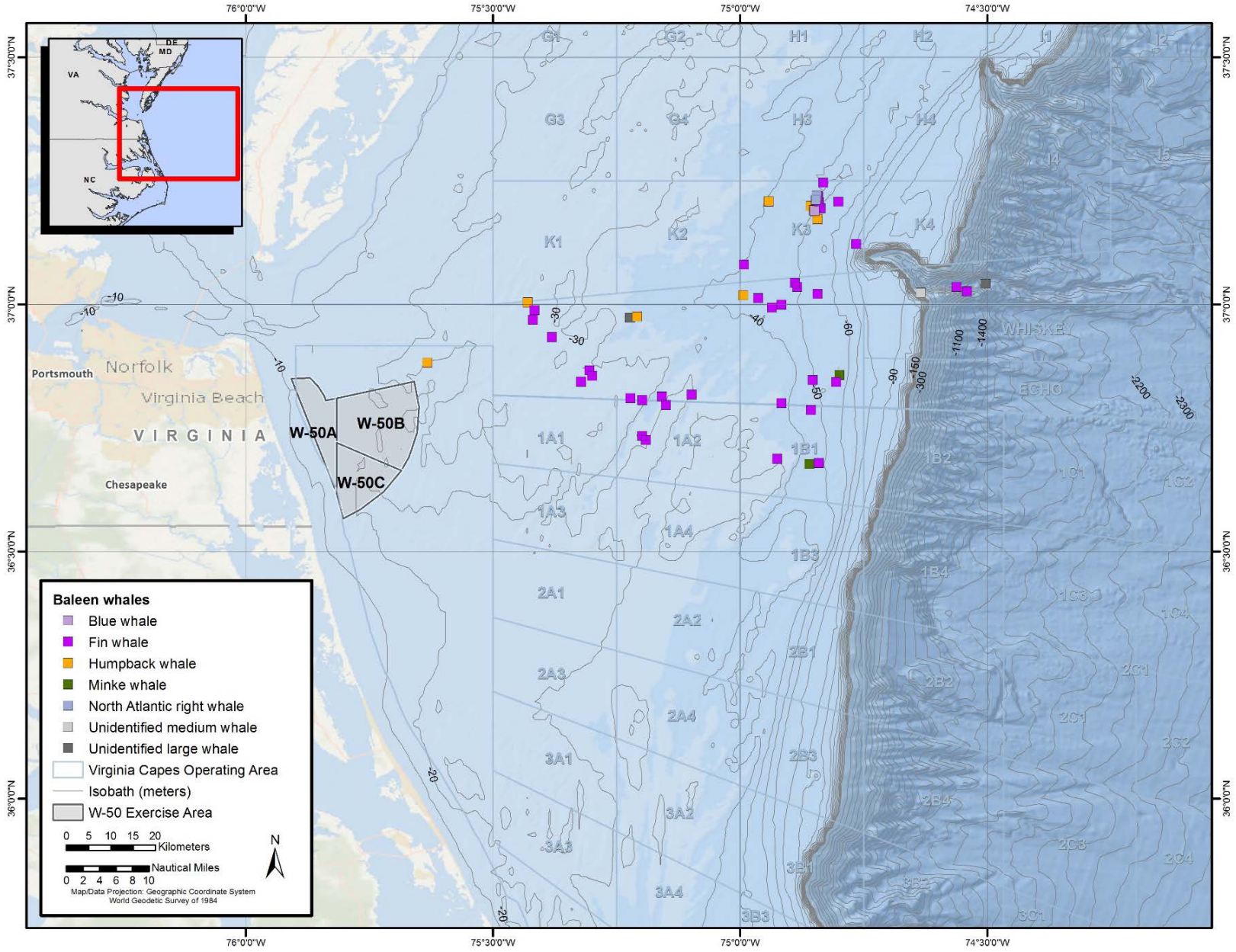


Figure 4. Locations of all baleen whale sightings (*n*=49) in 2018.

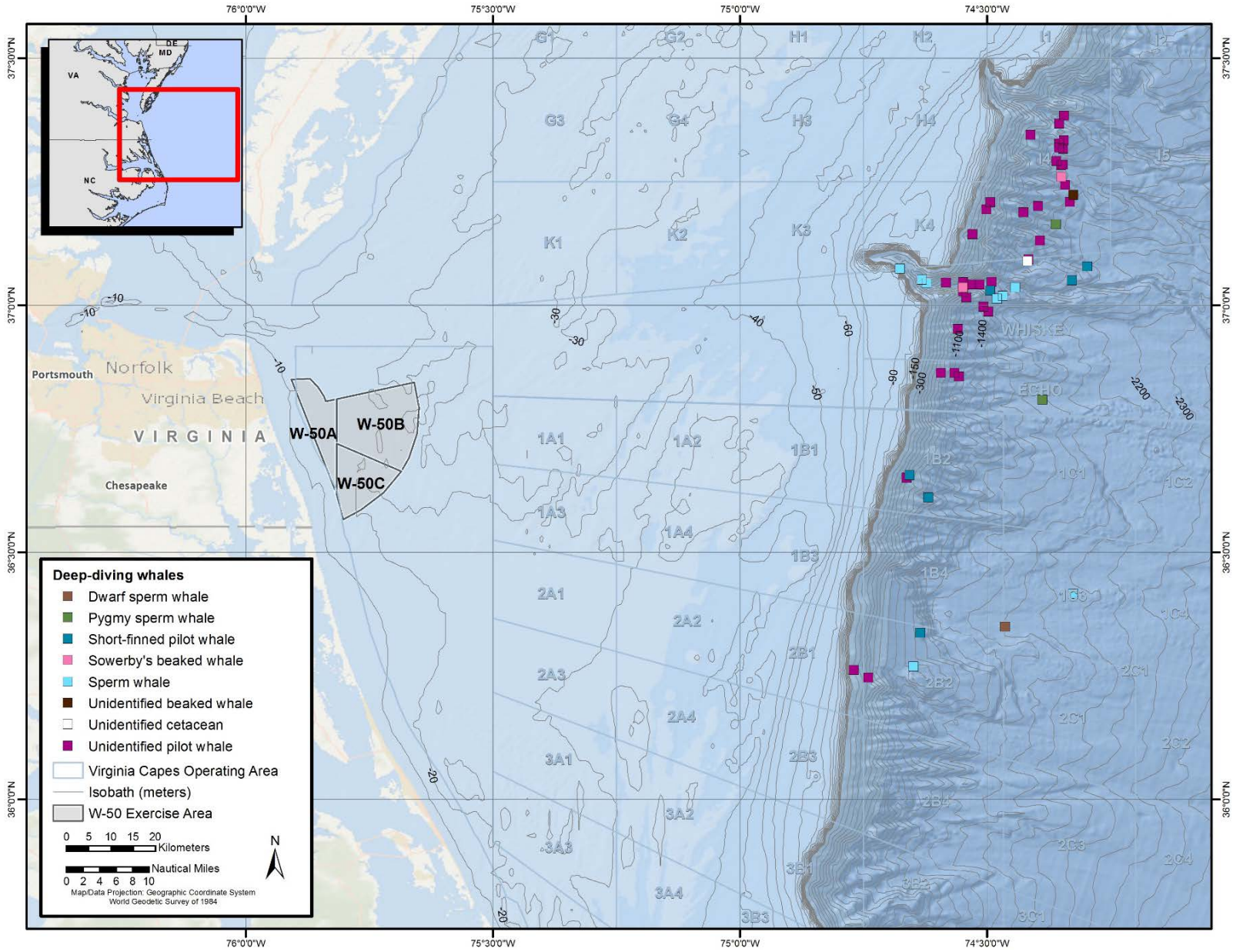


Figure 5. Locations of all deep diving whale sightings (*n*=55) in 2018.

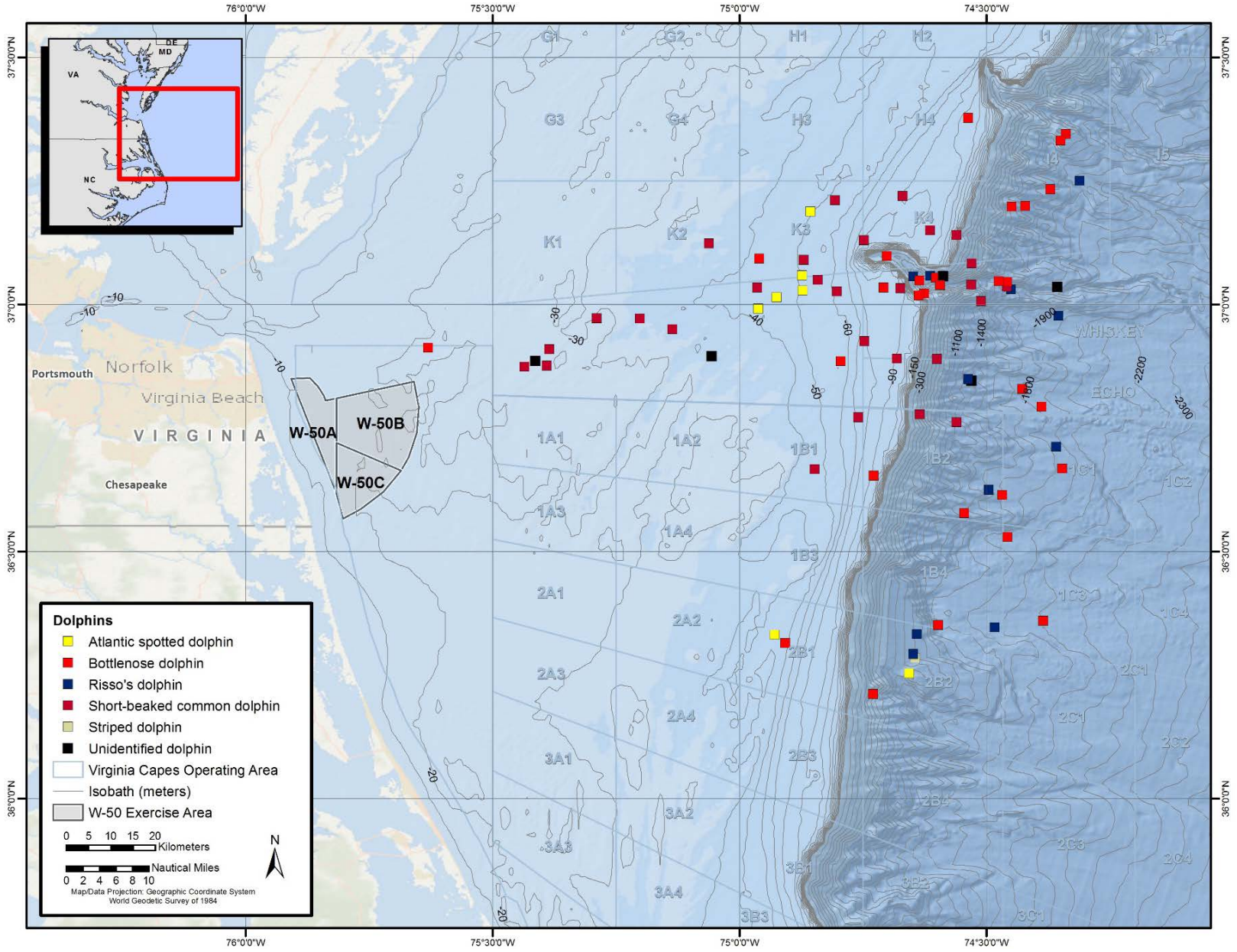


Figure 6. Locations of all dolphin sightings (*n*=83) in 2018.

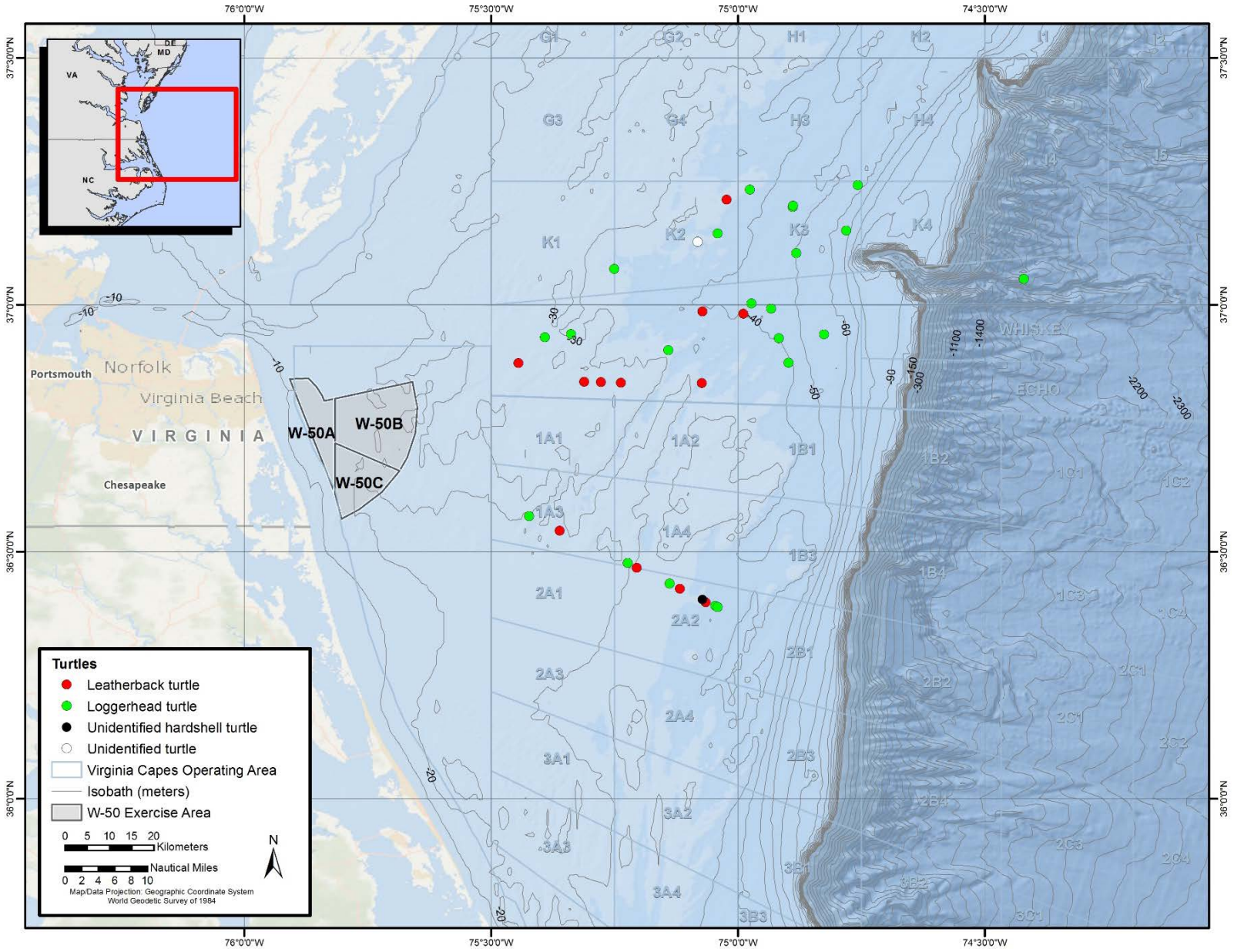


Figure 7. Locations of all sea turtle sightings (*n*=36) in 2018.

The HDR sperm whale catalog now contains 59 individuals. Seven (12%) were sighted on more than one day, ranging from nine to 428 days between sightings. Photos of sperm whales have also been provided by Duke University for comparison against individuals sighted in the Cape Hatteras study area (Foley et al. 2016) for which 18 sperm whales have been identified, although there have been no matches between the two catalogs to date. A new catalog was also created for Sowerby's beaked whales, which now contains 6 individuals. Images of pilot whales through the 2016 field season were shared with Duke University for matching to their existing catalog from Cape Hatteras, North Carolina, yielding 24 matches between individual pilot whales sighted off Virginia and Cape Hatteras. Images of other odontocete species have been archived for future processing.

3.2 Biopsy Sample Collection

Three biopsies were collected from fin whales and seven biopsies were collected from sperm whales in 2018 (**Appendix D**). A biopsy was also collected from a humpback whale and one sloughed skin sample was collected from a sperm whale. The humpback whale sample was added to the nearshore humpback effort (Aschettino et al. 2019) and the fin and sperm whale samples are currently being processed. Gender results from sperm whale samples collected in 2017 and 2018 showed 3 were females and 10 were males, but no other results are available at the time of this report.

3.3 Satellite Tagging

A total of seventeen satellite tags were successfully deployed in 2018, nine on sperm whales, five on fin whales, two on humpback whales, and one on a Sowerby's beaked whale (**Tables 2 through 7**). The humpback tag data will be included in the nearshore humpback project report (Aschettino et al. 2019) and therefore has been excluded from this summary. Six of the nine sperm whale tags and three of the five fin whale tags were SPLASH10 tags, which collected location and dive depth/duration information (**Tables 8 through 10**).

Sperm whale tag duration ranged from 11.9 to 33.2 days (mean=21.4). Movements of tagged individuals were varied, with some showing little movement from the tag deployment location and others moving greater distances to the north or south along the continental shelf slope (**Figures 8 through 16**). Tagged sperm whales traveled up to 609 km away from initial tag deployment location and had 29-100% of locations within the VACAPES OPAREA depending on individual (**Table 5**). Sperm whale maximum dive depth ranged from 1,151 to 2,127 m and maximum dive duration ranged from 51 to 70 minutes (**Table 8**).

Fin whale tag duration ranged from 9.0 to 41.0 days (mean=25.9). Movements for the 2018 tagged whales show most individuals spent more time on the continental shelf, and only brief periods spent past the continental break for a few individuals (**Figures 17 through 21**). Distance traveled by fin whales away from initial tag location ranged from 63 to 371 km, and the number of locations within the VACAPES OPAREA was between 60 and 91% depending on individual (**Table 6**). Fin whale maximum dive depth ranged from 39 to 76 m and maximum dive duration ranged from 9 to 13 minutes (**Table 9**).

The Sowerby's beaked whale tag duration was 14.5 days, and it traveled 135.6 km from the tag location during that time (**Tables 7 and 10**). 91 percent of locations were within the VACAPES range (**Table 7**). **Figure 22** shows the movements of the individual in mostly deep water to the north of the tagging location. Maximum dive depth was 871 m and maximum dive duration was 39 minutes (**Table 10**).

Table 2. Summary of tag deployment details for all sperm whale tags deployed in 2018.

Animal ID	Tag Type	Argos ID	Deployment (GMT)	Deployment Latitude (°N)	Deployment Longitude (°W)	Depth at Tagging Location (m)	Last Transmission (GMT)	Tag Duration (days)
HDRVAPm032	SPLASH10	171883	2018-Apr-22 17:05	37.0696	74.6505	549	2018-May-15 02:16	22.2
HDRVAPm033	SPOT6	173177	2018-Apr-22 17:25	37.0639	74.6461	567	2018-May-26 01:46	33.2
HDRVAPm034	SPLASH10	163793	2018-Apr-22 17:51	37.0586	74.6441	631	2018-May-15 02:21	22.2
HDRVAPm035	SPLASH10	171882	2018-May-01 20:21	37.0619	74.6433	604	2018-May-24 01:53	22.2
HDRVAPm012	SPLASH10	171844	2018-May-25 14:45	37.0248	74.4642	1553	2018-Jun-14 11:08	19.8
HDRVAPm010	SPLASH10-F	173233	2018-May-25 14:57	37.0108	74.5028	1157	2018-Jun-06 13:15	11.9
HDRVAPm036	SPOT6	173174	2018-May-25 15:20	37.0182	74.4610	1321	2018-Jun-24 14:07	29.9
HDRVAPm039	SPOT6	173175	2018-May-25 16:36	37.0507	74.4424	1227	2018-Jun-10 15:35	15.9
HDRVAPm041	SPLASH10	173229	2018-Aug-06 14:14	36.2660	74.6445	1259	2018-Aug-21 14:03	15.0

Table 3. Summary of tag deployment details for all fin whale tags deployed in 2018.

Animal ID	Tag Type	Argos ID	Deployment (GMT)	Deployment Latitude (°N)	Deployment Longitude (°W)	Depth at Tagging Location (m)	Last Transmission (GMT)	Tag Duration (days)
HDRVABp046	SPLASH10-F	172530	2018-Apr-22 12:54	37.0883	74.9728	43	2018-May-16 12:35	24.4
HDRVABp047	SPOT6	173176	2018-Apr-22 15:07	37.0968	74.9846	41	2018-May-22 09:09	29.7
HDRVABp048	SPLASH10-F	172531	2018-Apr-22 15:22	37.0938	74.9805	41	2018-Jun-02 15:06	41.0
HDRVABp060	SPLASH10-F	172532	2018-May-01 14:16	36.8507	75.3004	30	2018-May-11 00:15	9.0
HDRVABp050	SPOT6	173172	2018-May-01 17:21	37.0562	74.8731	52	2018-May-11 23:43	10.1

Table 4. Summary of tag deployment details for the Sowerby's beaked whale tag deployed in 2018.

Animal ID	Tag Type	Argos ID	Deployment (GMT)	Deployment Latitude (°N)	Deployment Longitude (°W)	Depth at Tagging Location (m)	Last Transmission (GMT)	Tag Duration (days)
HDRVAMb001	SPLASH10	173230	2018-Sep-07 15:28	37.2550	74.3467	1385	2018-Sep-22 10:51	14.5

Table 5. Summary of results from satellite tag data for all sperm whale tags deployed in 2018.

Animal ID	Argos ID	No. of Locations Post Filtering	% Within VACAPES OPAREA	Max Distance from Initial Location (km)	Mean Distance from Initial Location (km)
HDRVAPm032	171883	274	83.2	481.5	69.1
HDRVAPm033	173177	650	99.4	69.1	5.8
HDRVAPm034	163793	236	97.5	184.4	136.1
HDRVAPm035	171882	251	98.4	63.7	30.2
HDRVAPm012	171844	229	66.4	422.7	230.0
HDRVAPm010	173233	112	100	61.1	23.5
HDRVAPm036	173174	340	49.1	609.7	218.0
HDRVAPm039	173175	268	92.9	195.7	46.1
HDRVAPm041	173229	102	29.4	404.4	213.7

Table 6. Summary of results from satellite tag data for all fin whale tags deployed in 2018.

Animal ID	Argos ID	No. of Locations Post Filtering	% Within VACAPES OPAREA	Max Distance from Initial Location (km)	Mean Distance from Initial Location (km)
HDRVABp046	172530	110	70.9	190.6	79.6
HDRVABp047	173176	776	91.5	190.7	96.9
HDRVABp048	172531	695	84.9	371.7	106.7
HDRVABp060	172532	70	60.0	63.2	23.3
HDRVABp050	173172	113	91.2	64.2	34.1

Table 7. Summary of results from satellite tag data for the Sowerby's beaked whale tag deployed in 2018.

Animal ID	Argos ID	No. of Locations Post Filtering	% Within VACAPES OPAREA	Max Distance from Initial Location (km)	Mean Distance from Initial Location (km)
HDRVAMb001	173230	135	91.1	135.6	88.6

Table 8. Summary of dive data for all sperm whale SPLASH10 tags deployed in 2018.

Animal ID	Argos ID	No. Dives Logged	Max Dive Depth (m)	Max Dive Duration (mm:ss)
HDRVAPm032	171883	538	1279	54:13
HDRVAPm034	163793	327	2127	62:21
HDRVAPm035	171882	526	1151	52:01
HDRVAPm012	171844	417	1951	51:13
HDRVAPm010	173233	184	1887	64:15
HDRVAPm041	173229	160	1375	70:43
HDRVAPm032	171883	538	1279	54:13

Table 9. Summary of dive data for all fin whale SPLASH10 tags deployed in 2018.

Animal ID	Argos ID	No. Dives Logged	Max Dive Depth (m)	Max Dive Duration (mm:ss)
HDRVABp046	172530	230	64	10:15
HDRVABp048	172531	2230	76	13:45
HDRVABp060	172532	45	39	9:01

Table 10. Summary of dive data for the Sowerby's beaked whale SPLASH10 tag deployed in 2018.

Animal ID	Argos ID	No. Dives Logged	Max Dive Depth (m)	Max Dive Duration (mm:ss)
HDRVAMb001	173230	74	871	39:13

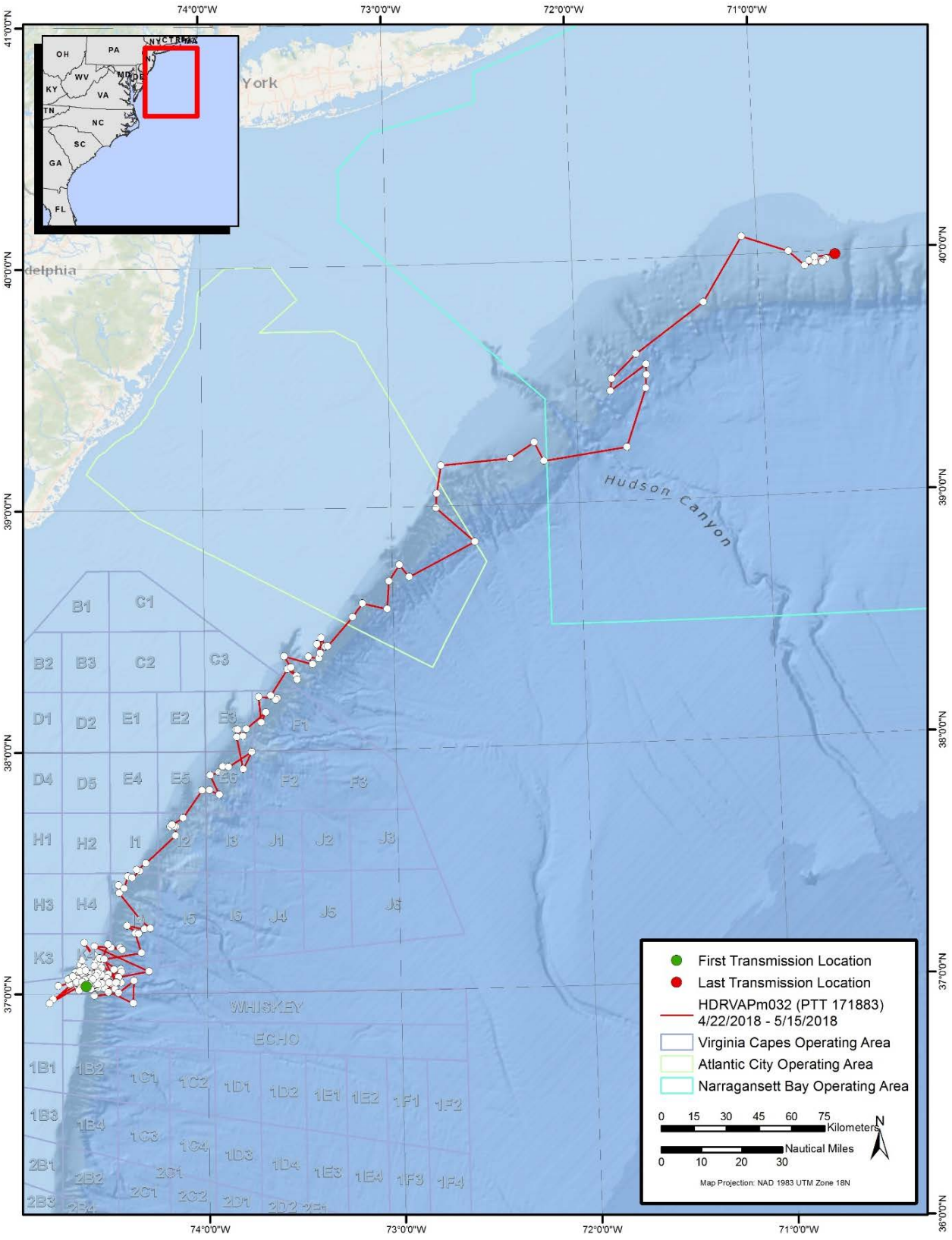


Figure 8. Filtered locations (white dots) and track of sperm whale HDRVAPm032 over 22.2 days.

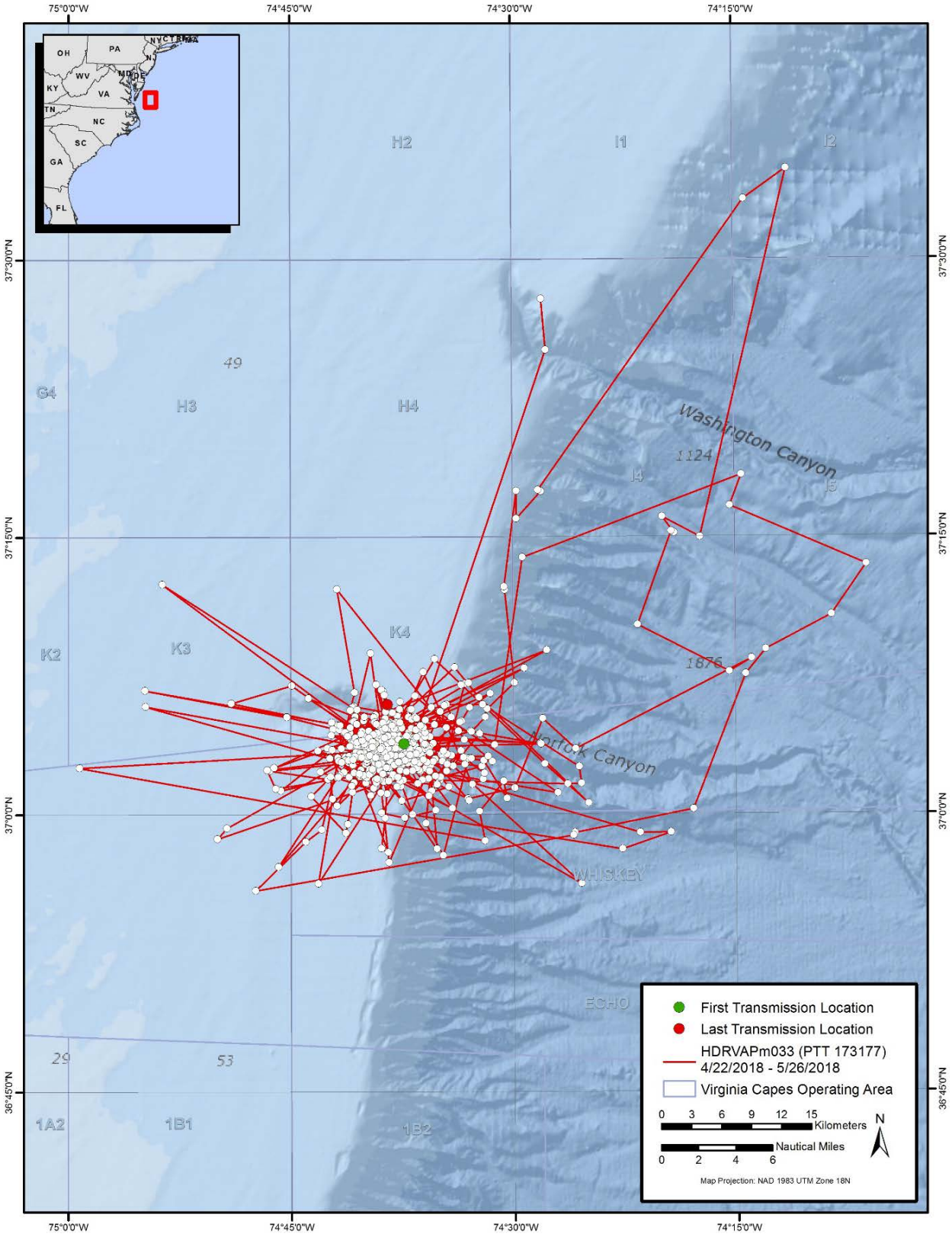


Figure 9. Filtered locations (white dots) and track of sperm whale HDRVAPm033 over 33.2 days.

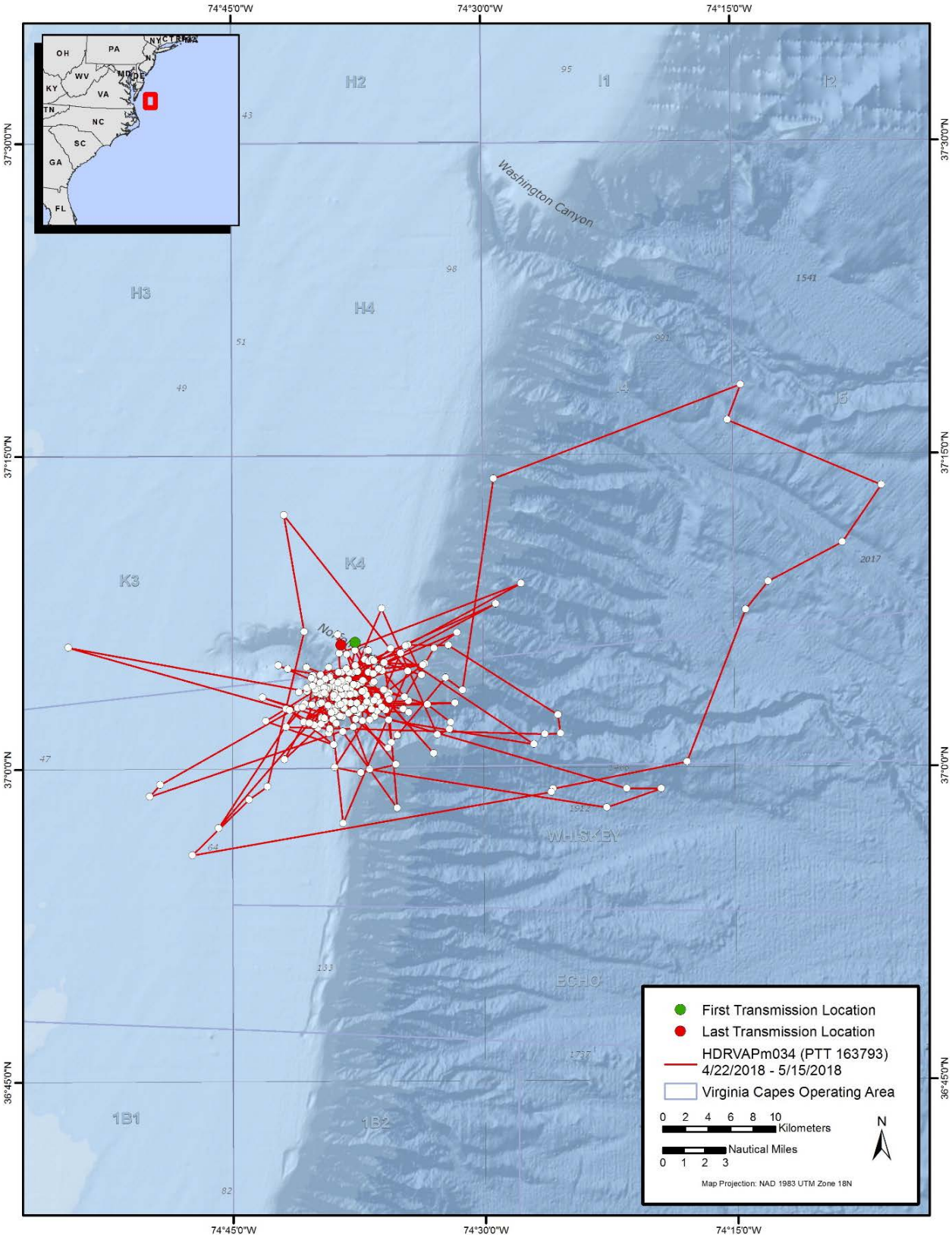


Figure 10. Filtered locations (white dots) and track of sperm whale HDRVAPm034 over 22.2 days.

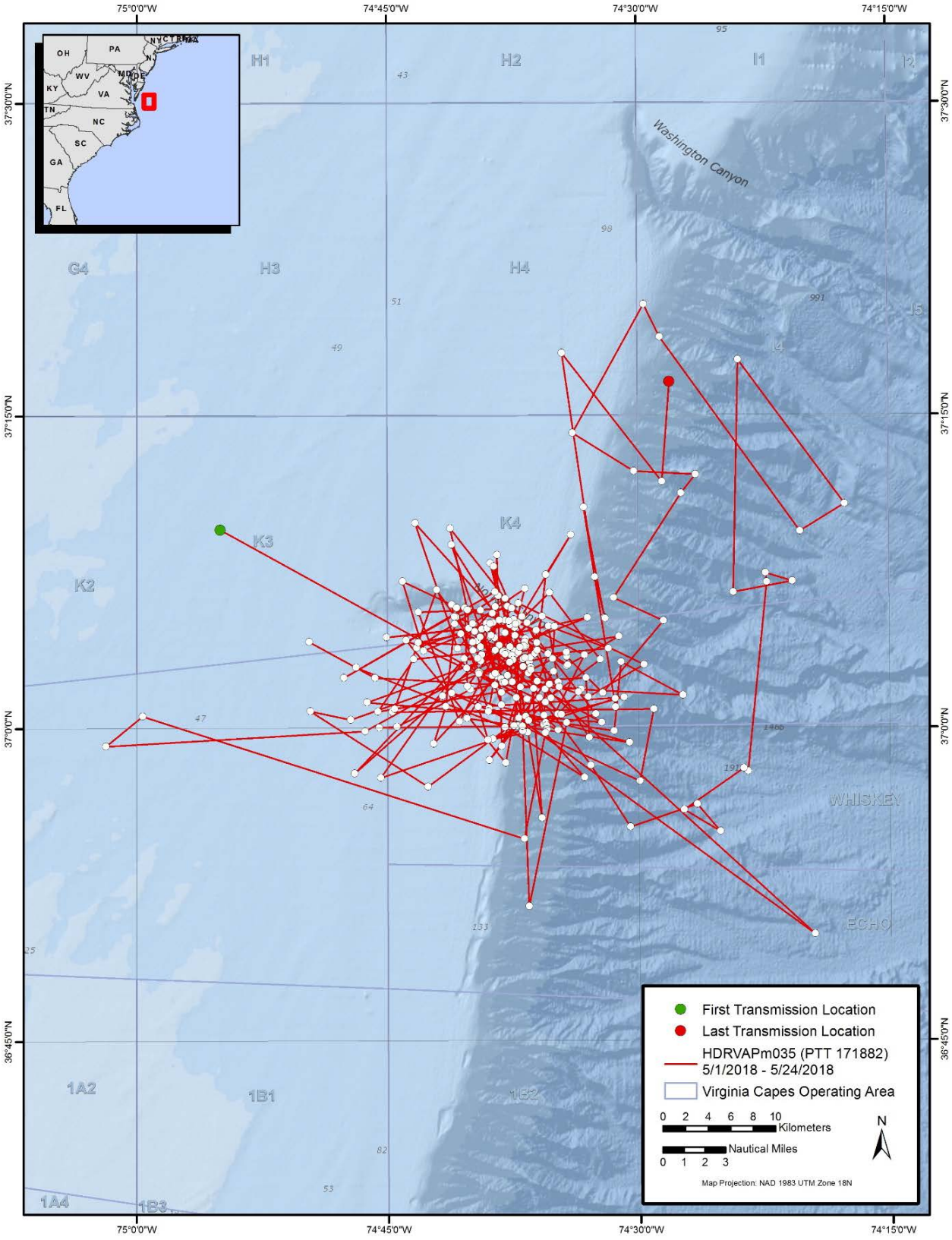


Figure 11. Filtered locations (white dots) and track of sperm whale HDRVAPm035 over 22.2 days.

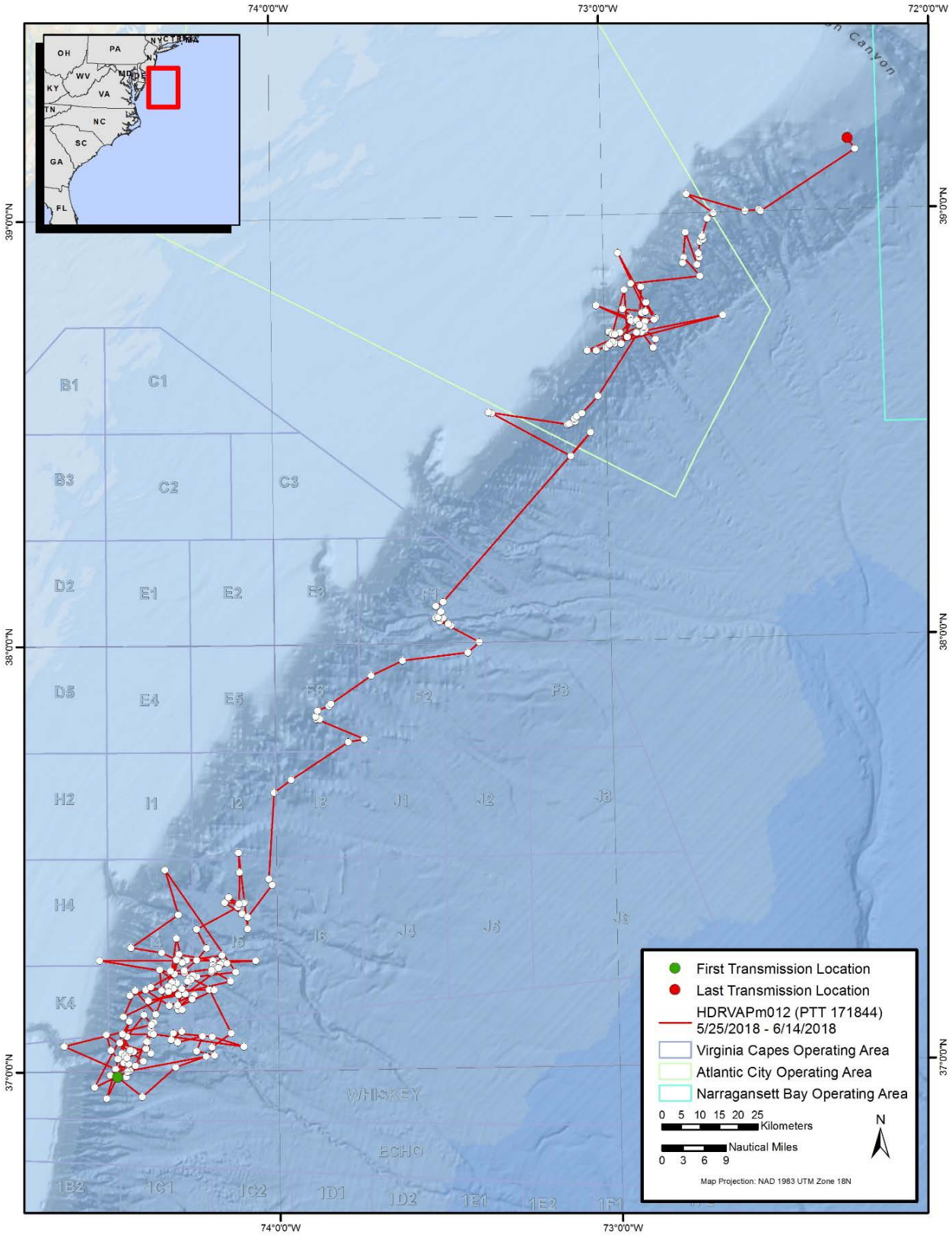


Figure 12. Filtered locations (white dots) and track of sperm whale HDRVAPm012 over 19.8 days.

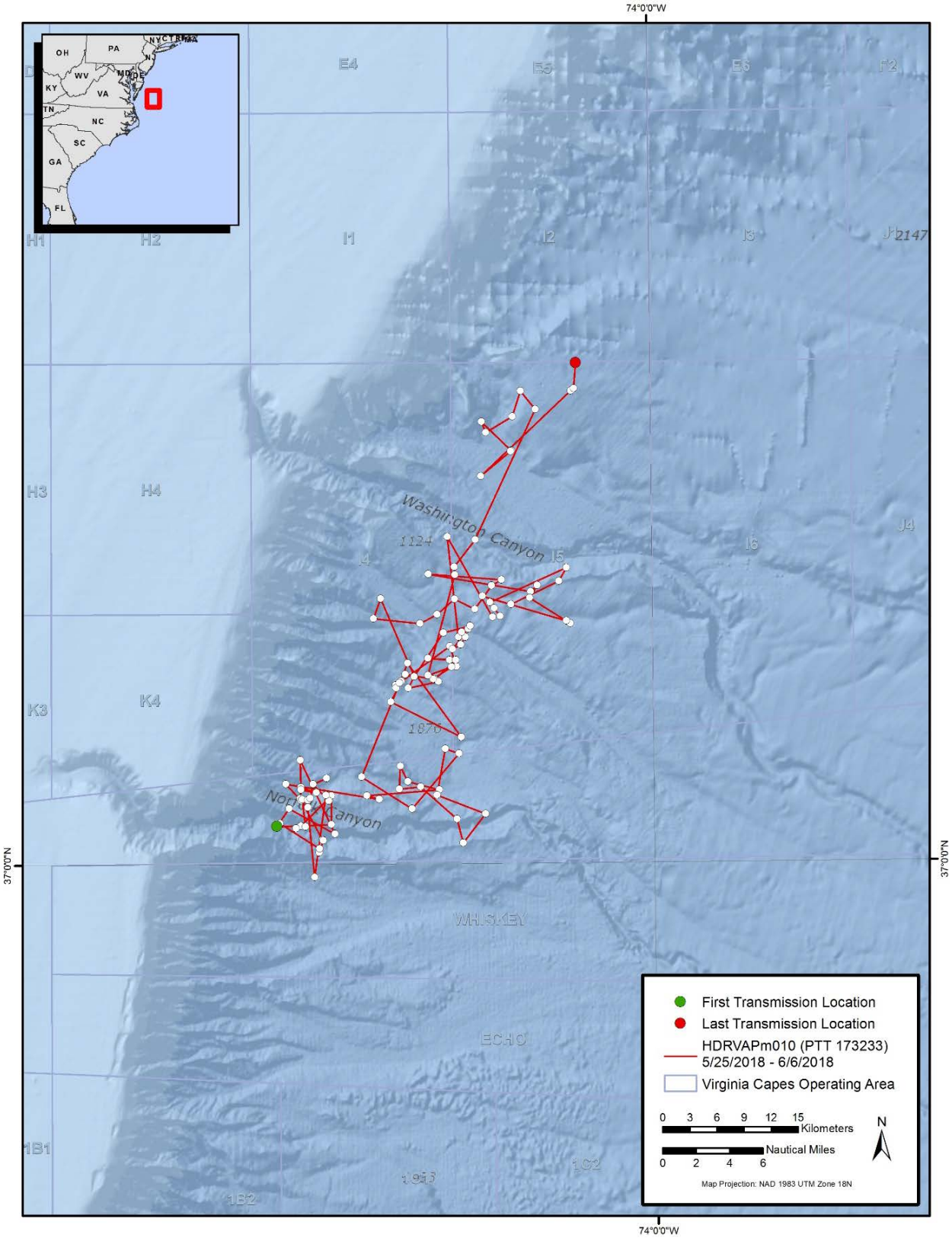


Figure 13. Filtered locations (white dots) and track of sperm whale HDRVAPm010 over 11.9 days.

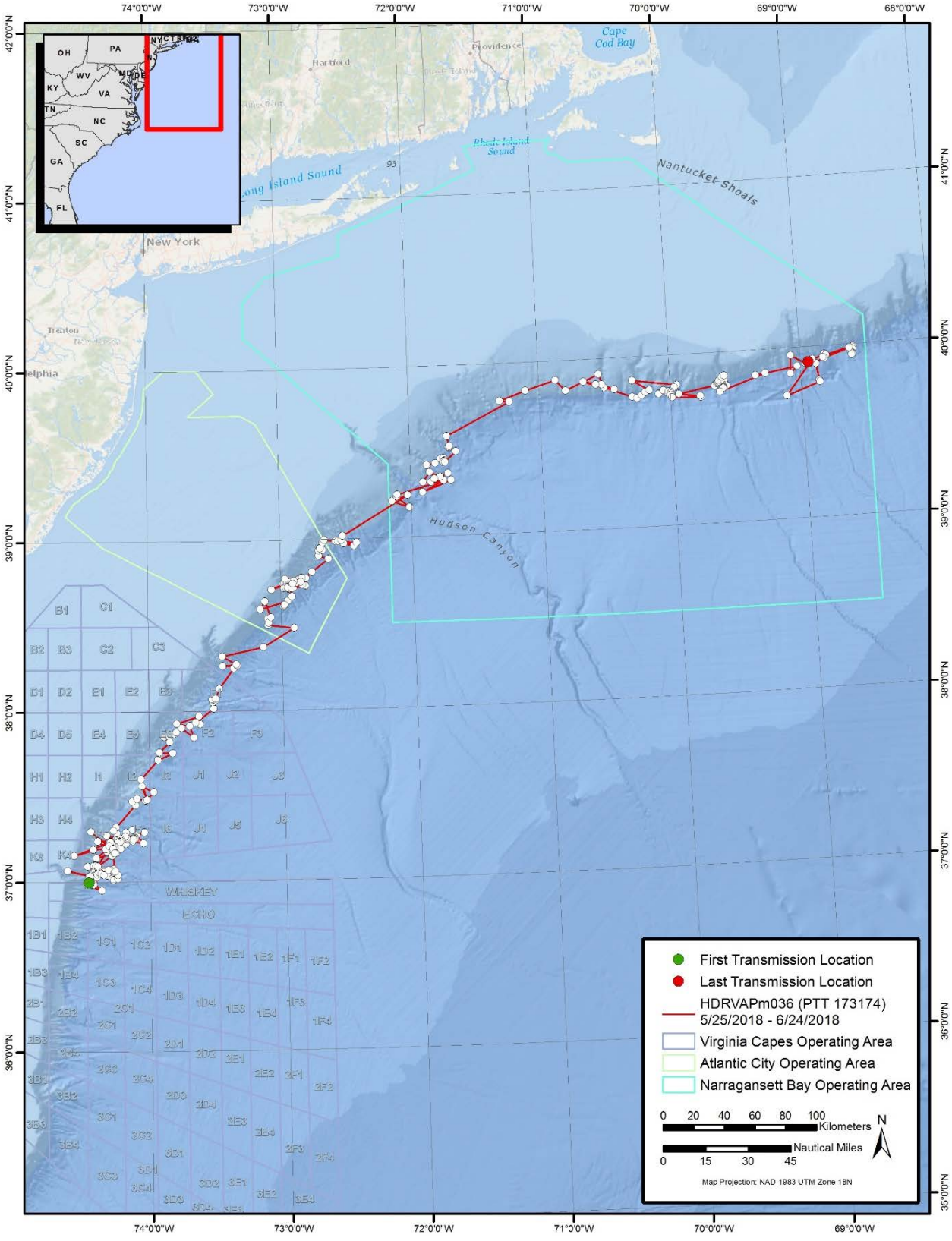


Figure 14. Filtered locations (white dots) and track of sperm whale HDRVAPm036 over 29.9 days.

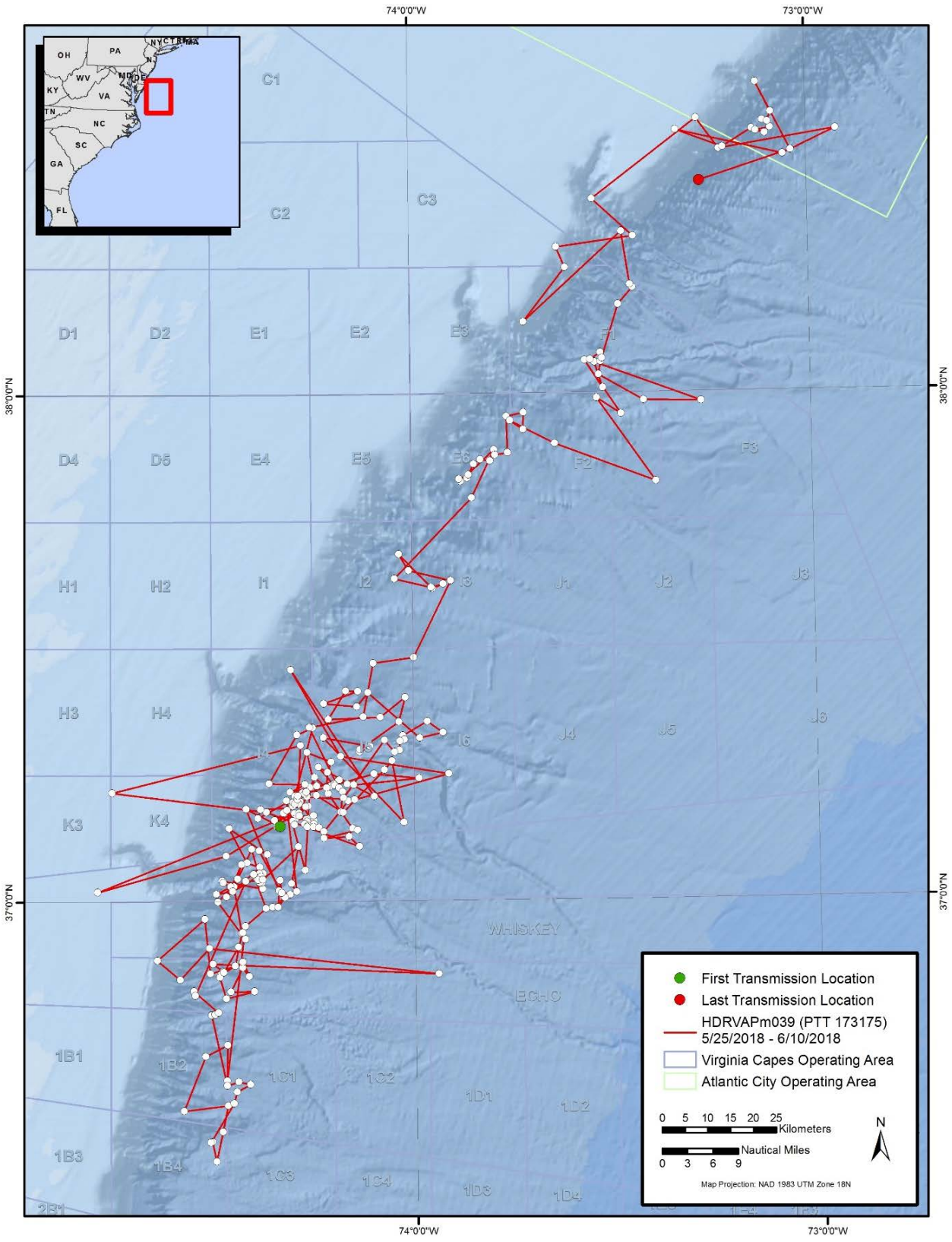


Figure 15. Filtered locations (white dots) and track of sperm whale HDRVAPm039 over 15.9 days.

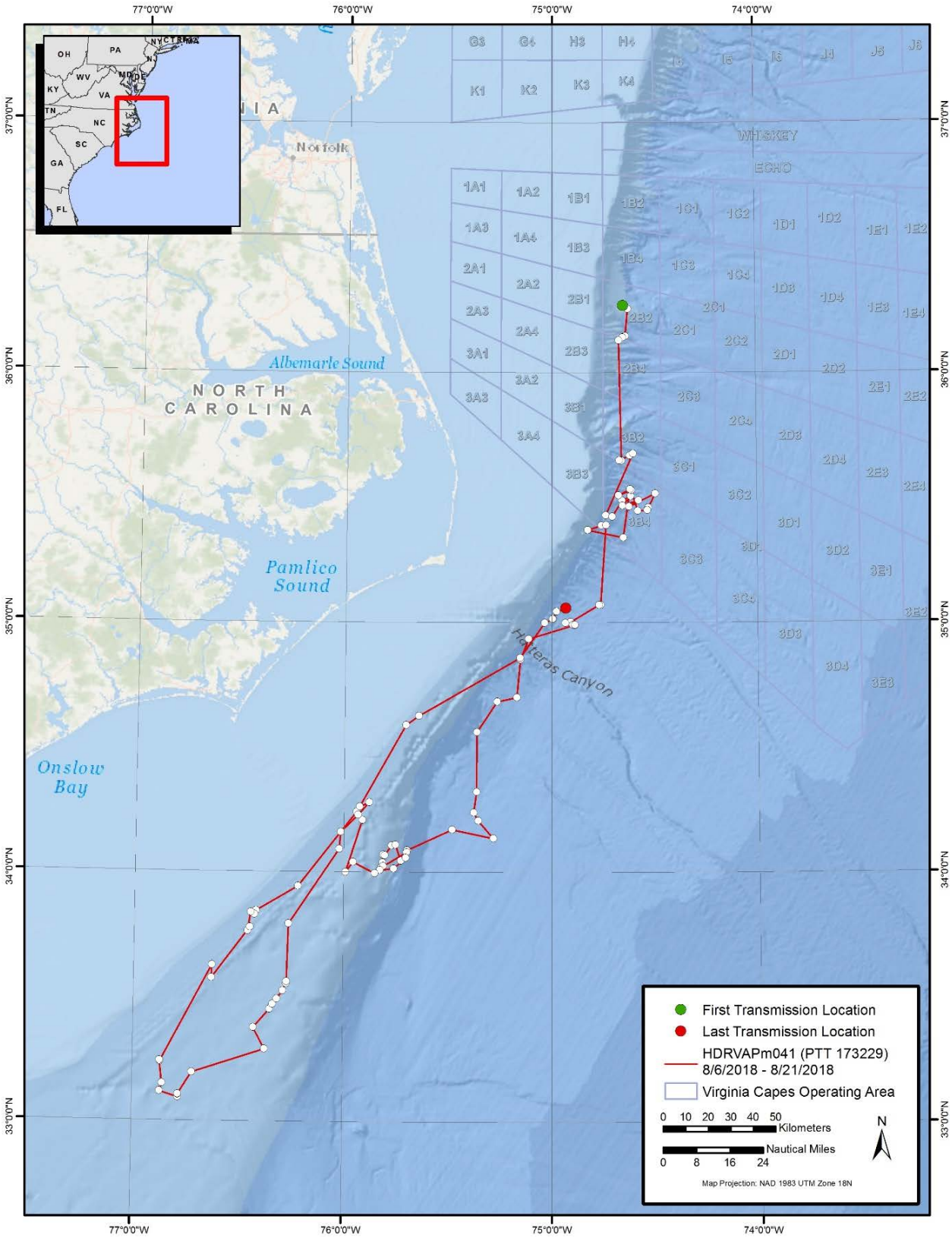


Figure 16. Filtered locations (white dots) and track of sperm whale HDRVAPm041 over 15.0 days.

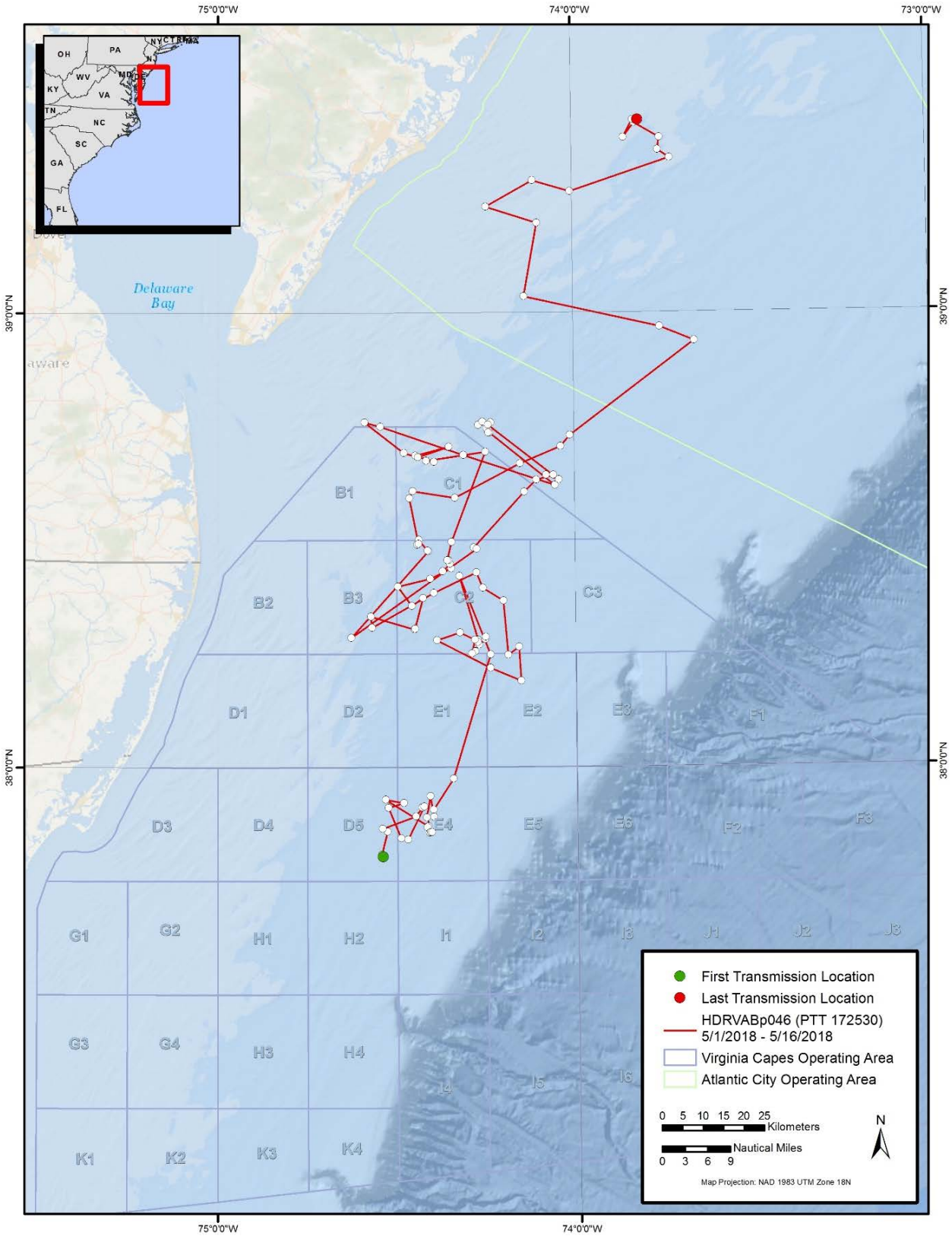


Figure 17. Filtered locations (white dots) and track of fin whale HDRVABp046 over 15.4 days.

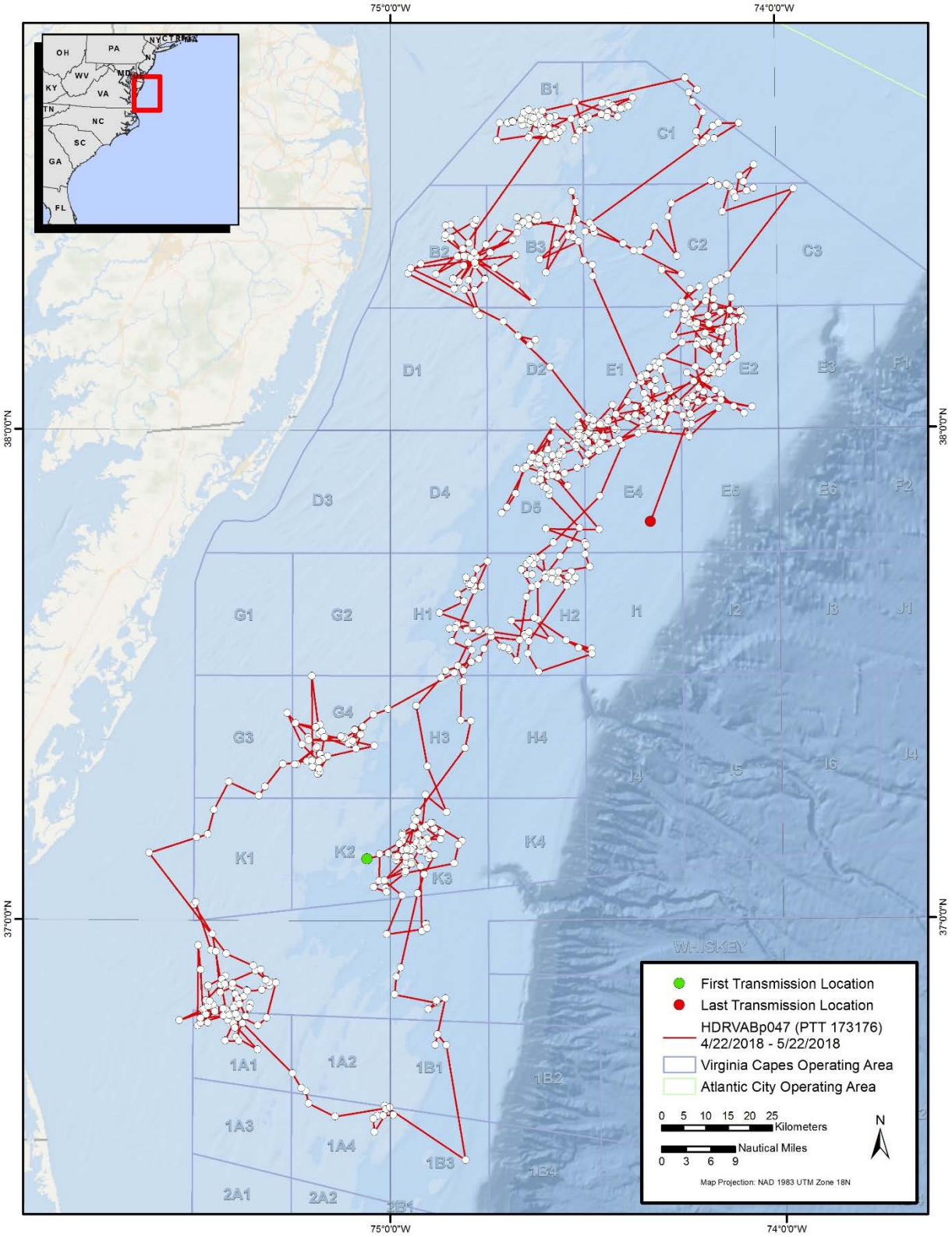


Figure 18. Filtered locations (white dots) and track of fin whale HDRVABp047 over 29.7 days.

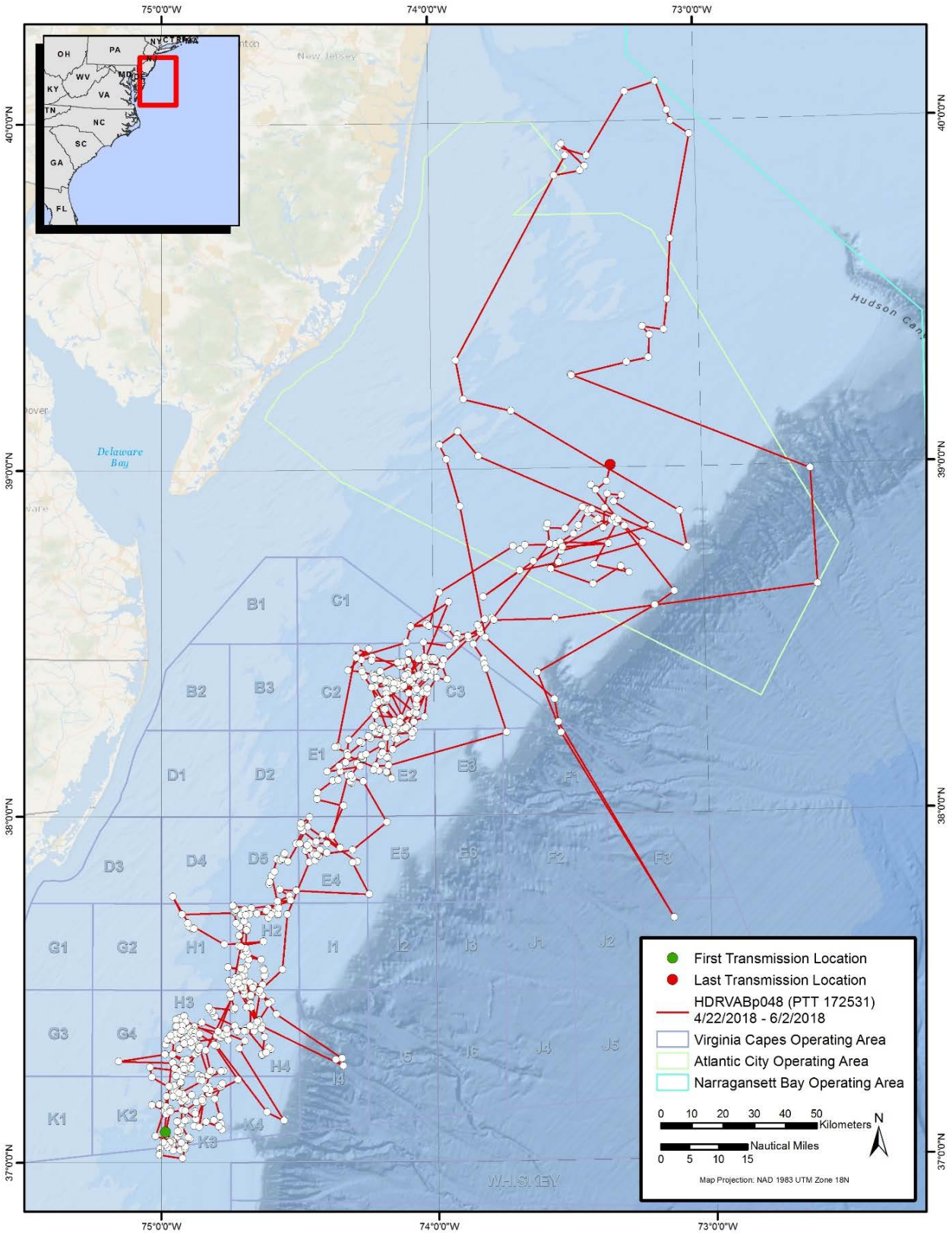


Figure 19. Filtered locations (white dots) and track of fin whale HDRVABp048 over 41.0 days.

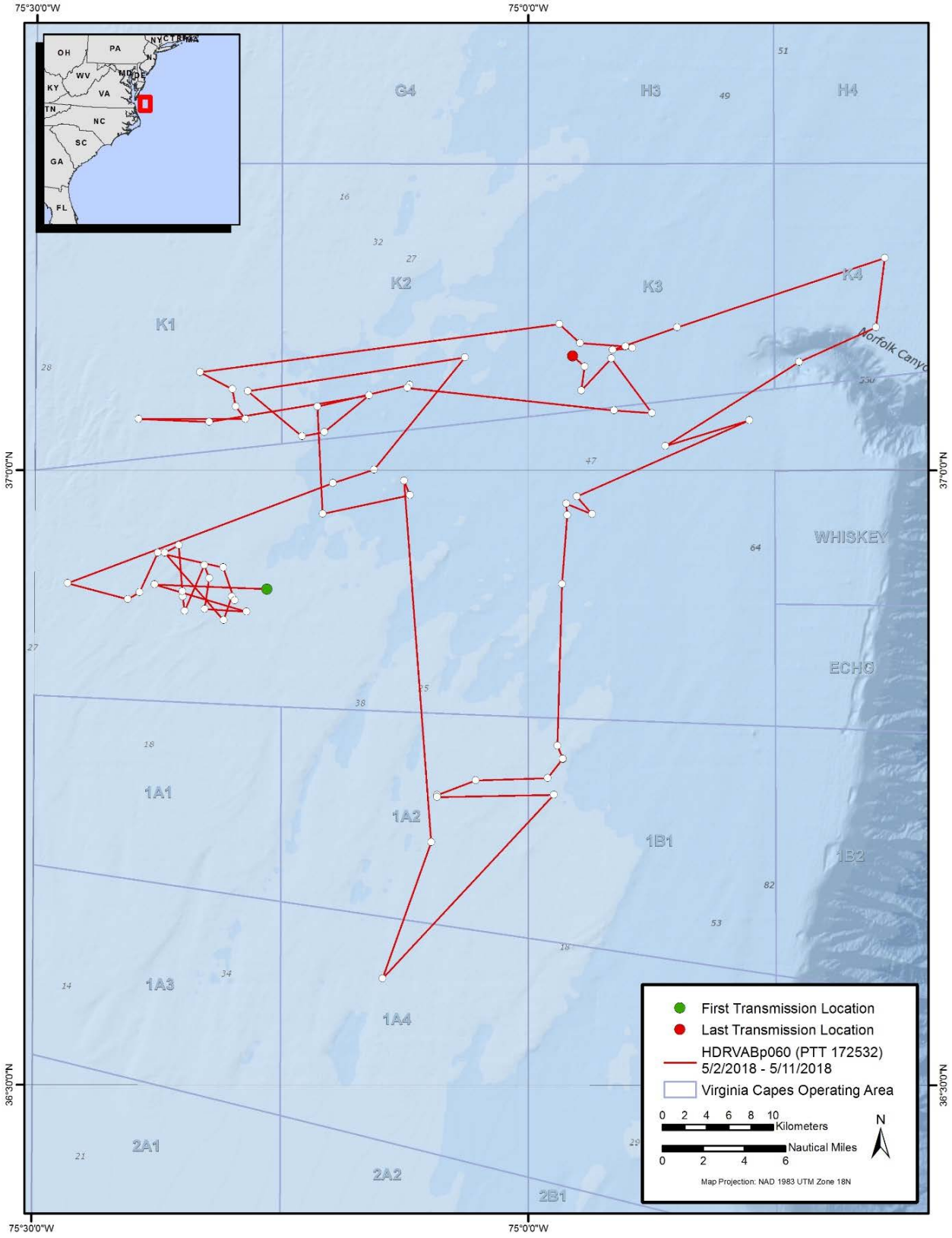


Figure 20. Filtered locations (white dots) and track of fin whale HDRVABp060 over 9.0 days.

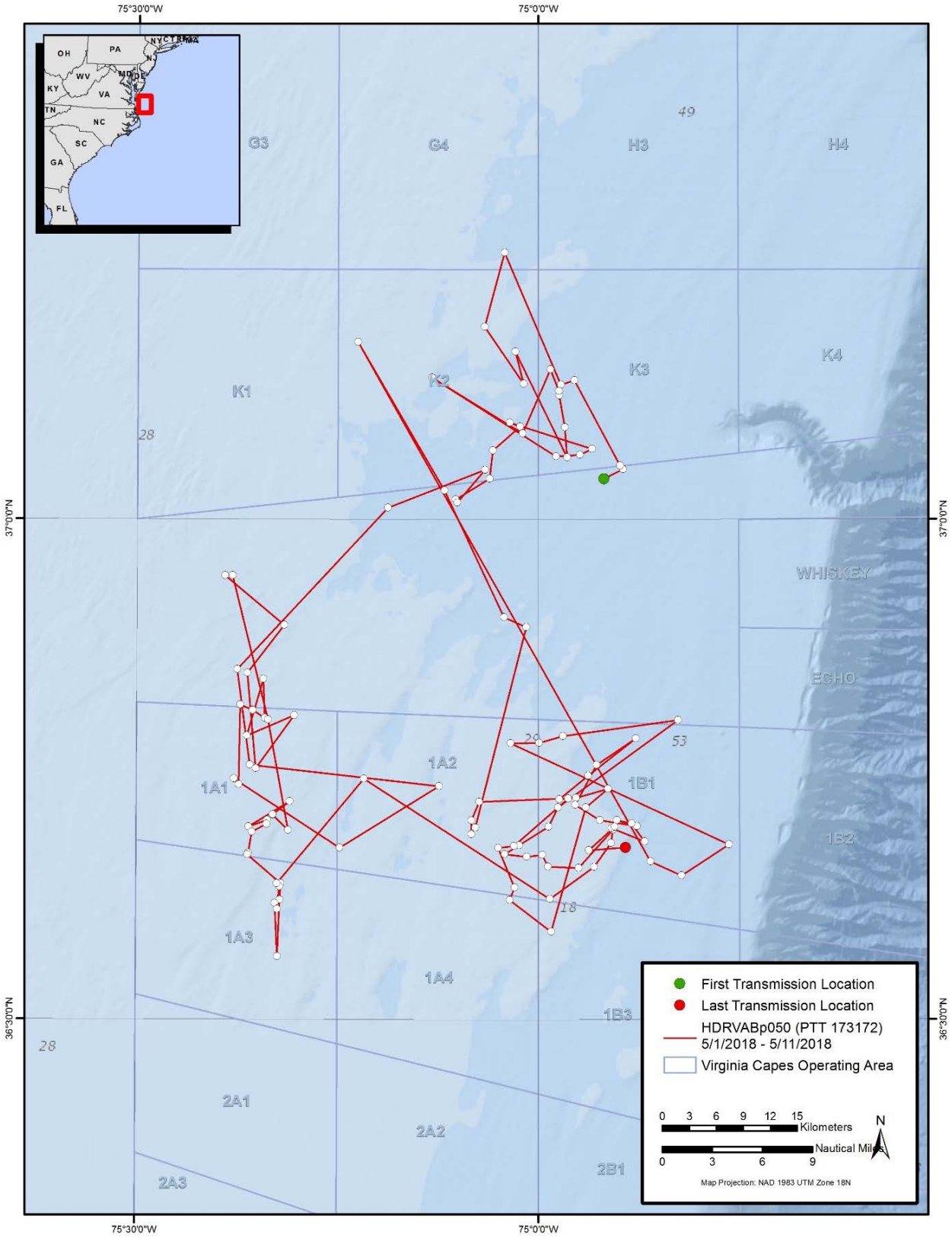


Figure 21. Filtered locations (white dots) and track of fin whale HDRVABp050 over 10.1 days.

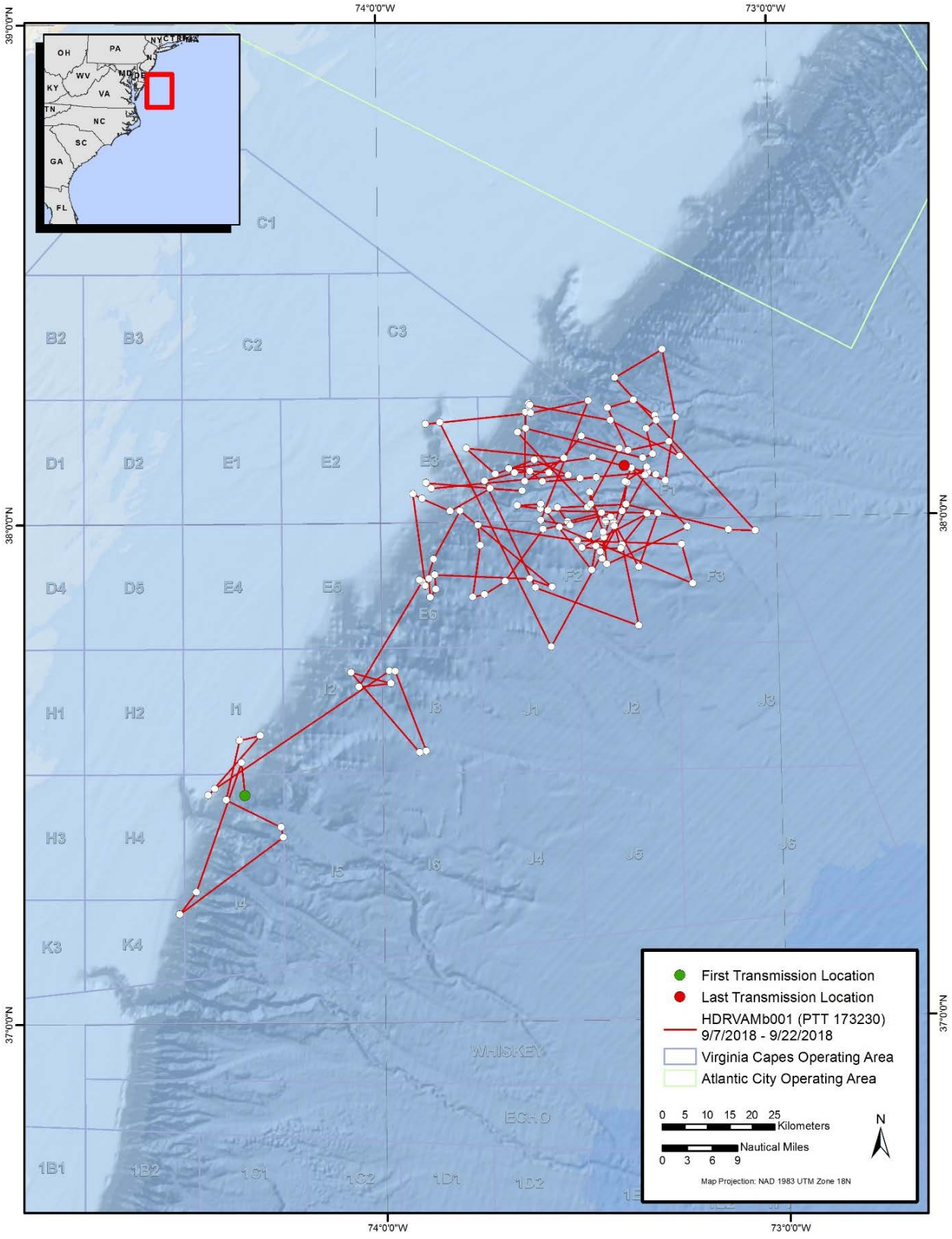


Figure 22. Filtered locations (white dots) and track of fin whale HDRVAMb001 over 14.5 days.

3.4 State-Space Modeling

After examining all candidate models, a model with a 12-hour time interval and a span parameter of 0.2 was selected as the best sperm whale model. A model with a six-hour time interval and a span parameter of 0.2 was selected as the best fin whale model. Parameter convergence was generally good, and the tracks were not overly smoothed between reported locations.

Of 249 modeled locations in the 12-hour sperm whale model, 8 were identified as traveling, 34 were of indeterminate behavior, and the remaining 207 were identified as area restricted search (**Figure 23**). In the fin whale model, of 1,317 locations, 75 were identified as traveling, 299 were identified as intermediate, and the remaining 868 locations were identified as ARS (**Figure 24**).

Upon review, it was decided not to produce home ranges for the sperm whale tags. The short tag durations and selected 12-hour state-space model yielded few locations for use in the home range analysis. It was felt that the resulting home ranges would not yield meaningful information on habitat use by these animals.

Home ranges were calculated for locations identified as ARS by the state-space model for fin whales. Combining the UDs for all fin whales, 194 cells were contained within the 90% UD of at least one animal (**Figure 25**). For the 50% UDs, 69 cells were identified by at least one animal. The majority of cells identified were located on the continental shelf with a few cells over the continental slope. No ARS home range was identified close to shore. Variation between animals was high and few cells were identified where home range overlapped for more than 2-3 animals.

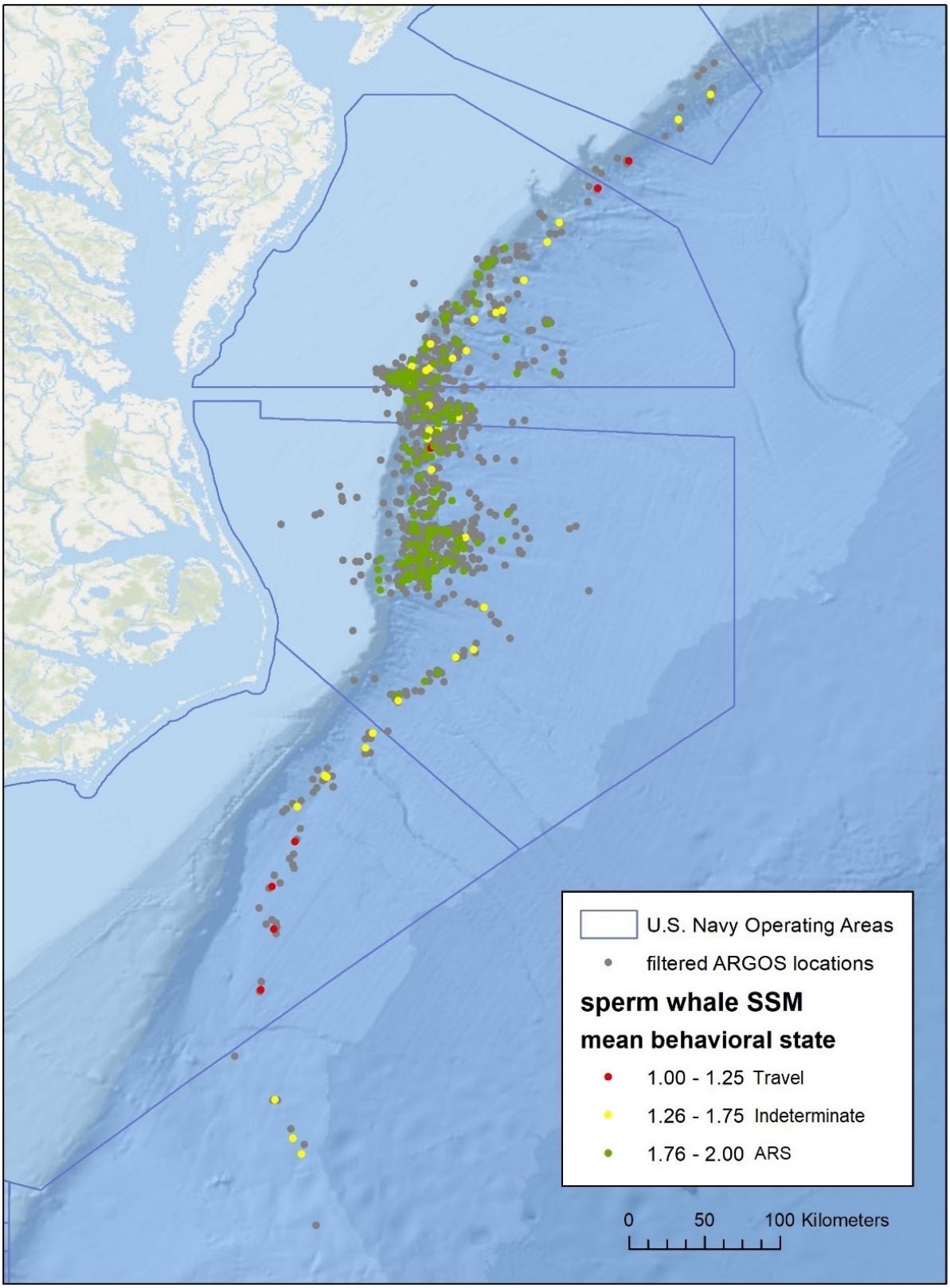


Figure 23. State Space Modeling results and tag locations for all 2017 sperm whale tags included in preliminary SSM analysis.

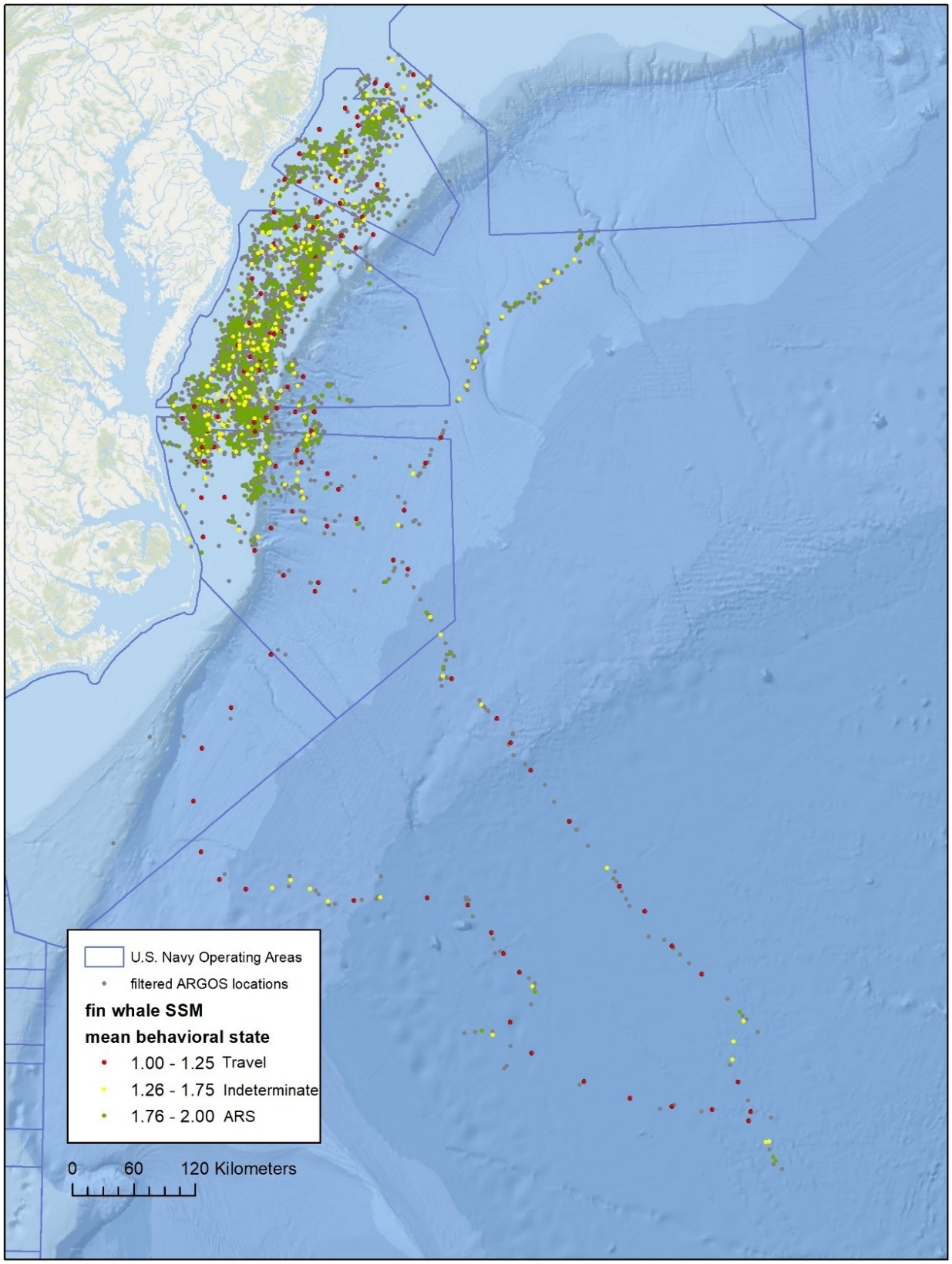
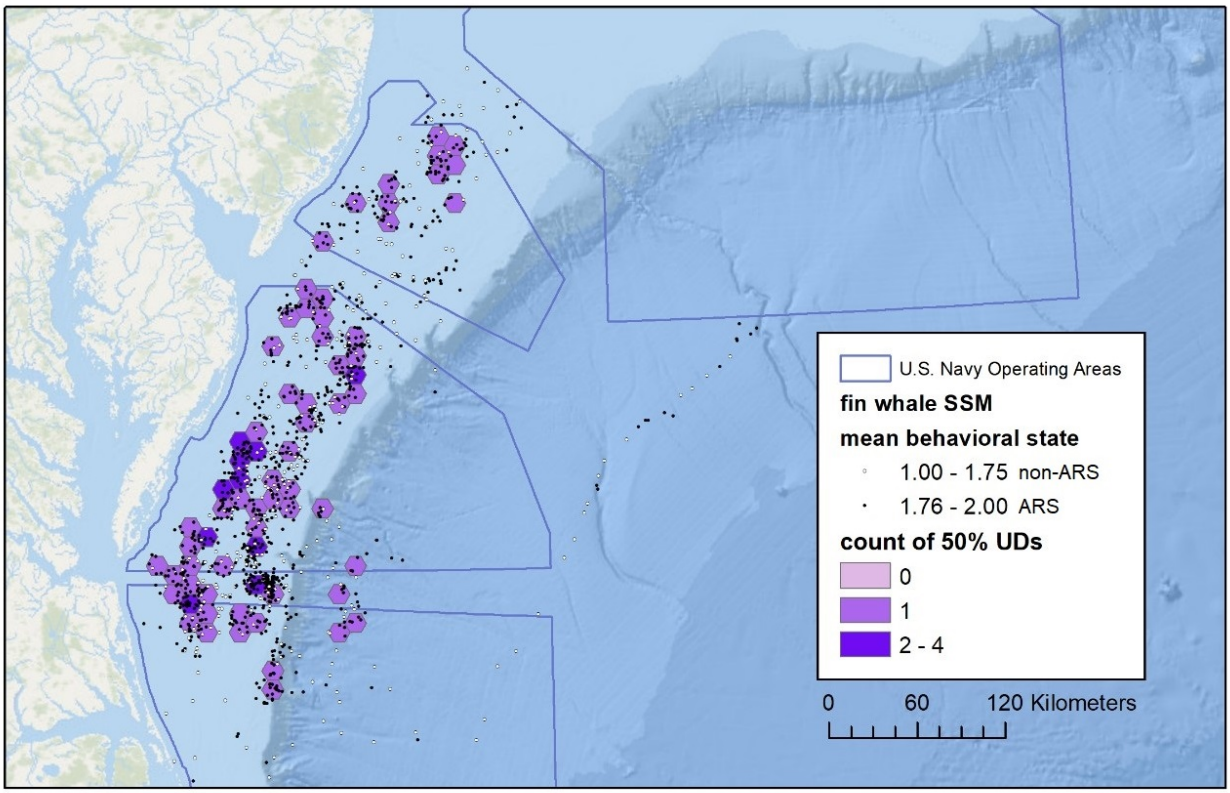


Figure 24. State Space Modeling results and tag locations for all 2017 and 2018 fin whale tags included in analysis.



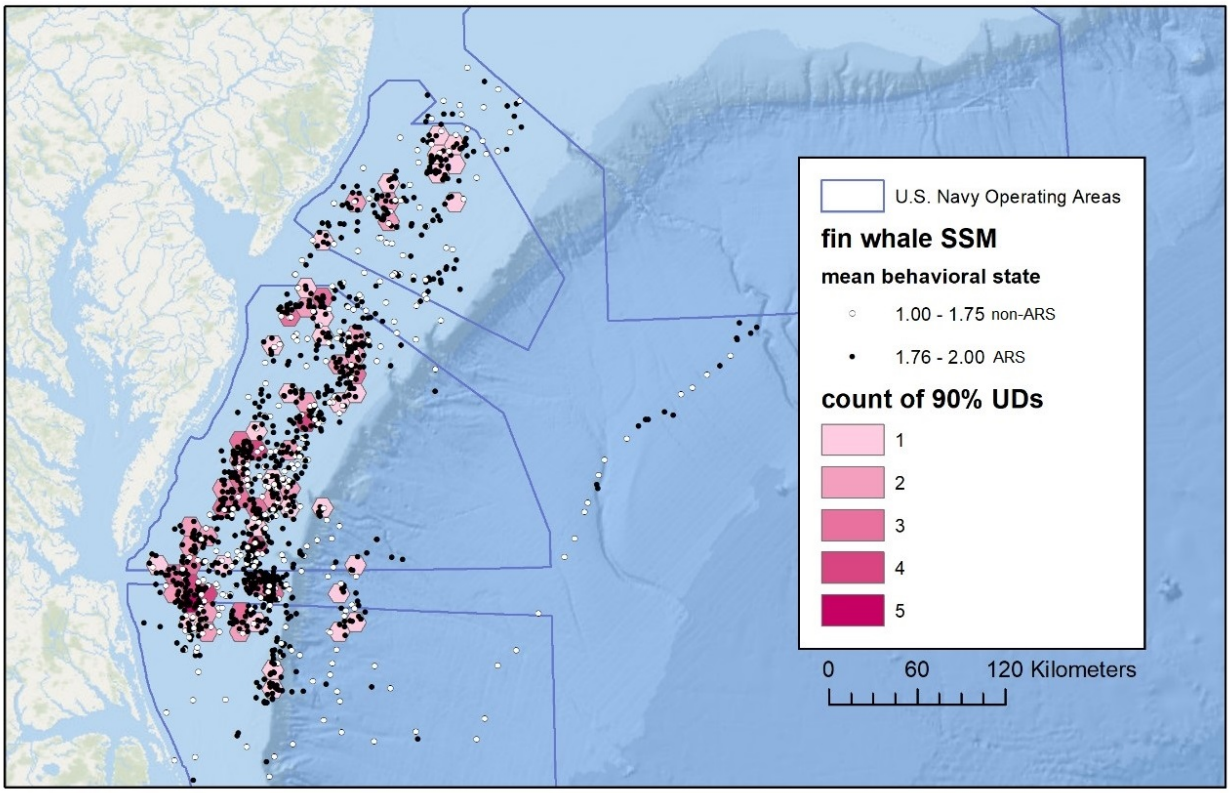


Figure 25. Count of fin whale 50% and 90% utilization distribution (UD) cells created using SSM results and tag locations for all fin whale tags included in analysis.

4. Discussion

Data collection and analyses for this project are ongoing; however, preliminary results show a high degree of marine mammal diversity in the study area. Surveys conducted in 2018 continued to provide coverage in the Norfolk Canyon region spread across seasons, but also into deeper waters (>1,500 m) past the shelf break than in previous years (see Engelhaupt et al. 2018, Engelhaupt et al. 2017). Sightings of fifteen species of marine mammals and two species of sea turtles were made over fourteen surveys, showing a wide distribution throughout the study area. Species encountered during 2018 not previously sighted during this study include North Atlantic Right Whales (*Eubalaena glacialis*), a blue whale (*Balaenoptera musculus*), Sowerby's beaked whales (*Mesoplodon bidens*), pygmy sperm whales (*Kogia breviceps*), and dwarf sperm whales (*Kogia sima*), bringing the total number of marine mammal species encountered in the study area over the duration of the project to nineteen. Aerial survey and PAM data from the region show similar species occurrence (McAlarney et al. 2018a, 2018b; Rafter et al. 2018).

As expected, sightings of deep-diving species including sperm whales, pilot whales, and beaked whales were concentrated near the shelf break and into deeper offshore waters, while baleen whales were encountered both over the shelf and past the shelf break. Aggregations of baleen whale sightings occurred, notably on 11 April 2018, when North Atlantic right whales, humpback whales, fin whales, and a blue whale were all sighted feeding within an approximate five km^2 area. Dolphin species were sighted throughout the core study area and transit areas, and all sea turtles were sighted over the shelf in waters less than 150 m, with the exception of one loggerhead sea turtle sighted in deeper water.

Sightings of marine mammal species in U.S. Navy range boxes in and around the Norfolk Canyon (K3, K4, and I4) were frequent, showing the potential for overlap between these species and U.S. Navy training activities. It should be noted that the Norfolk Canyon is also an area heavily utilized by both recreational and commercial fishing vessels.

The number of individuals in our photo-identification catalogs continue to increase for baleen and sperm whales. This technique is valuable yet requires years to accumulate sufficient data to produce meaningful results through techniques such as mark-recapture, so further effort will be required to properly investigate site fidelity by specific individuals within the study area. However, results are already becoming evident for some species with 12% (seven) of the 59 cataloged sperm whale individuals being re-sighted, one on three occasions, up to 428 days after initial encounter. Nine of the 13 fin whale matches are of encounters during different years (re-sightings ranging from 247 to 355 days from initial encounter). Initial sighting locations and those of re-sighted fin whales are all in water over the continental shelf, suggesting an importance of this habitat to the species. HDR will continue to coordinate data sharing with other local and regional researchers and agencies. These comparisons, along with further processing of existing photo-ID data collected to-date for non-priority species, will allow for a better understanding of seasonal movements and residency in the area by some species. Ongoing effort is likely to result in additional re-sightings that over time may help address questions of seasonal variation, social affiliations, and may eventually address questions related to population-level consequences.

Locations from satellite-tagged whales show movements through numerous VACAPES range boxes, both over the continental shelf and beyond the slope **(Figures 8 through 22**). Sperm and fin whales show a high percentage of locations within the range boxes. Both species also show periods of localized movements and of directional travel; but as expected differ in their primary depth of occurrence.

State Space Modeling analysis of sperm whale tag data showed ARS behavior centered around marine canyons for several individuals. While there were only few tags available for analysis at this point, these preliminary results show a strong preference for these environments and are consistent with the known ecology of this species. No ARS home range was identified close to shore for fin whales. Variation between animals was high and few cells were identified where home range overlapped for more than 2-3 animals. Animals may be using ephemeral foraging features or foraging patches may be common where animals can spread out to minimize competition for resources. More in-depth research into environmental conditions and timing of foraging is required to address this in greater detail. It is unlikely that the full ARS home range of these animals is represented here due to the relatively short tag attachment durations, though it provides a robust first step for the time period and season during which the animals were tracked. Future analysis could include parsing out temporal patterns of use, adding more tags, simulating longer tracks, exploring environmental conditions/habitat modeling, and investigating 3D home ranges (by incorporating dive data).

The dive data from the first satellite-monitored location dive behavior tag to be deployed on a Sowerby's beaked whale has provided valuable insight with respect to the behavior of this highly cryptic species potentially at higher risk of influence from anthropogenic noise (Cox et al. 2006, Tyack et al. 2011).

Working 60 NM from shore requires exploiting short and infrequent weather window opportunities combined with limited access to restricted U.S. Navy training areas. With every survey completed, this project provides a more comprehensive understanding of how numerous species (including Endangered Species Act-listed) utilize this critical offshore habitat. As more surveys are completed and tags are deployed, the HDR team of researchers continues to expand their coverage across multiple seasons which allows us to explore questions of intra and inter-seasonal species occurrence and variation. The results of this multi-year effort are expected to provide the U.S. Navy with the level of detailed information required to make informed decisions with regards to future training and testing mitigation measures within the survey area as a means to minimize potential impacts on both marine mammals and sea turtles.

5. Acknowledgements

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A

Data Fields Recorded in COMPASS

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Data fields to be recorded

Placement	Field / Attribute	
Survey/ Environmental	• Date/Time • Platform • Survey ID • Beaufort Scale • Visibility • Wind Direction	• Swell • Percent Cloud Cover • Effort Status • Personnel • Leg Notes
Sighting	• Sighting Number • Date/Time • Latitude/Longitude • Relative Bearing • Angle to Sighting • Distance to Animal • Animal's Heading • Species Name (Common) • Species Name (Scientific) • Min Group Size • Max Group Size • Best Group Size • Count (Calves) • Count (Juveniles) • Behavior State • Multiple Sightings • Recorder • Observer • Reaction • Depth • Temperature	• Navy Ship within 500 m? (Y/N) • Cargo Ship within 500 m? (Y/N) • Fishing/Rec Boat within 500 m? (Y/N) • Within 500 m of Shipping Channel? (Y/N) • Notes • Photos Taken (Y/N) (If Yes – Frame numbers, camera, photographer) • Video (Y/N) (If Yes – Frame numbers, camera, photographer) • Biopsy (Y/N) (If Yes – Shooter, hit/miss, sample location, reaction, others present/reacting, sample, sample name, comments) • Tagging (Y/N) (If Yes – Shooter, hit/miss, tag location, reaction, others present/reacting, tag number, tag type, comments) • Maximum Distance between Nearest Neighbor • Minimum Distance between Nearest Neighbor
Focal (Related to Focal Individual Only)	• Date/Time • Latitude/Longitude • Group ID • Behavioral State (Travel; Feed; Mill; Social; Rest; Log; Unknown) • Behavioral Event (Blow; Dive/Peduncle arch; FUD; FDD; Side fluke; Lunge; Tail slap; Pec slap; Spy hop; Breach; Bubbles; Start follow; Stop follow; Footprint WP; First surfacing; Head slap; Peduncle slap; Chase; Brood side display; Head lunge; Linear bubble trail; charge)	• Bearing • Distance to Sighting • Heading of the Animal • Relative Movement of Vessel and Animal's Bearing • Sighting Notes

***** Upon each entry and time stamp and GPS coordinate is recorded for the position of the vessel. Variables may be modified as deemed necessary by the Chief Scientist.

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B

Marine Mammal Sightings 2018

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Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
09-Feb-18	7:44	*Balaenoptera physalus*	Fin whale	1	36.9334	75.3809
09-Feb-18	8:30		Unidentified large whale	1	36.9730	75.2227
09-Feb-18	8:33	*Megaptera novaeangliae*	Humpback whale	2	36.9751	75.2085
09-Feb-18	9:34	*Delphinus delphis*	Common dolphin	50	36.9713	75.2016
09-Feb-18	13:39		Unidentified large whale	1	37.0420	74.5033
09-Feb-18	13:53	*Globicephala* sp.	Unidentified pilot whale	18	36.9969	74.5070
09-Feb-18	15:00	*Delphinus delphis*	Common dolphin	4	36.9261	74.7473
09-Feb-18	15:41		Unidentified dolphin	10	36.8950	75.0565
09-Feb-18	16:26	*Delphinus delphis*	Common dolphin	6	36.8762	75.3905
09-Feb-18	16:32	*Delphinus delphis*	Common dolphin	30	36.8739	75.4354
11-Apr-18	8:25	*Megaptera novaeangliae*	Humpback whale	1	37.2084	74.9422
11-Apr-18	10:09	*Balaenoptera physalus*	Fin whale	1	37.2461	74.8316
11-Apr-18	10:26	*Eubalaena glacialis*	North Atlantic right whale	1	37.2204	74.8448
11-Apr-18	10:31	*Eubalaena glacialis*	North Atlantic right whale	1	37.2111	74.8467
11-Apr-18	10:34	*Balaenoptera physalus*	Fin whale	1	37.2191	74.8424
11-Apr-18	11:03	*Delphinus delphis*	Common dolphin	4	37.2107	74.8071
11-Apr-18	11:10	*Balaenoptera physalus*	Fin whale	1	37.2079	74.8013
11-Apr-18	12:18	*Megaptera novaeangliae*	Humpback whale	3	37.1906	74.8504
11-Apr-18	12:49	*Megaptera novaeangliae*	Humpback whale	1	37.1995	74.8574
11-Apr-18	13:15	*Balaenoptera musculus*	Blue whale	1	37.1887	74.8491
11-Apr-18	13:43	*Balaenoptera physalus*	Fin whale	1	37.2065	74.8409
11-Apr-18	14:04	*Balaenoptera physalus*	Fin whale	2	37.1949	74.8369
11-Apr-18	14:24	*Megaptera novaeangliae*	Humpback whale	1	37.1723	74.8432
22-Apr-18	8:24	*Balaenoptera physalus*	Fin whale	12	37.0805	74.9926
22-Apr-18	12:02	*Tursiops truncatus*	Common bottlenose dolphin	12	37.0926	74.9604
22-Apr-18	12:16	*Delphinus delphis*	Common dolphin	70	37.0904	74.8702
22-Apr-18	12:49	*Physeter macrocephalus*	Sperm whale	7	37.0742	74.6764
22-Apr-18	15:01	*Grampus griseus*	Risso's dolphin	50	37.0583	74.6142
22-Apr-18	15:46	*Delphinus delphis*	Common dolphin	50	37.0262	74.8031

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
22-Apr-18	16:01	*Balaenoptera physalus*	Fin whale	5	36.9994	74.9168
22-Apr-18	17:41	*Megaptera novaeangliae*	Humpback whale	1	36.8820	75.6327
28-Apr-18	8:01	*Balaenoptera physalus*	Fin whale	2	36.7340	75.1982
28-Apr-18	8:51	*Balaenoptera physalus*	Fin whale	3	36.7257	75.1907
28-Apr-18	10:59	*Balaenoptera physalus*	Fin whale	3	36.6876	74.9248
28-Apr-18	11:30	*Balaenoptera acutorostrata*	Minke whale	2	36.6771	74.8598
28-Apr-18	11:41	*Delphinus delphis*	Common dolphin	50	36.6665	74.8479
28-Apr-18	11:52	*Balaenoptera physalus*	Fin whale	3	36.6789	74.8411
28-Apr-18	12:24	*Tursiops truncatus*	Common bottlenose dolphin	6	36.6532	74.7285
28-Apr-18	12:36	*Globicephala* sp.	Unidentified pilot whale	6	36.6512	74.6625
28-Apr-18	13:15	*Grampus griseus*	Risso's dolphin	1	36.6245	74.4957
28-Apr-18	14:24	*Delphinus delphis*	Common dolphin	65	36.7617	74.5606
28-Apr-18	14:48	*Delphinus delphis*	Common dolphin	22	36.7778	74.6354
28-Apr-18	15:29	*Delphinus delphis*	Common dolphin	25	36.7718	74.7596
28-Apr-18	15:38	*Balaenoptera physalus*	Fin whale	2	36.7858	74.8565
28-Apr-18	16:16	*Balaenoptera physalus*	Fin whale	1	36.8007	74.9165
28-Apr-18	17:18	*Balaenoptera physalus*	Fin whale	1	36.8176	75.0981
28-Apr-18	17:35	*Balaenoptera physalus*	Fin whale	2	36.8132	75.1579
28-Apr-18	17:43	*Balaenoptera physalus*	Fin whale	1	36.7967	75.1505
28-Apr-18	17:52	*Balaenoptera physalus*	Fin whale	2	36.8061	75.1982
28-Apr-18	18:00	*Balaenoptera physalus*	Fin whale	2	36.8100	75.2222
01-May-18	8:33	*Balaenoptera physalus*	Fin whale	2	36.8664	75.3048
01-May-18	9:17	*Balaenoptera physalus*	Fin whale	1	36.8556	75.2989
01-May-18	11:03	*Balaenoptera physalus*	Fin whale	1	36.8434	75.3219
01-May-18	12:16	*Balaenoptera physalus*	Fin whale	1	36.9940	74.9353
01-May-18	12:37	*Balaenoptera physalus*	Fin whale	1	37.0357	74.8845
01-May-18	12:40	*Balaenoptera physalus*	Fin whale	2	37.0434	74.8894
01-May-18	13:18	*Stenella frontalis*	Atlantic spotted dolphin	14	37.0592	74.8733
01-May-18	14:12	*Tursiops truncatus*	Common bottlenose dolphin	120	37.0343	74.7081

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
01-May-18	14:29	*Tursiops truncatus*	Common bottlenose dolphin	5	37.0226	74.6259
01-May-18	15:44	*Physeter macrocephalus*	Sperm whale	1	37.0448	74.6225
01-May-18	15:54	*Physeter macrocephalus*	Sperm whale	3	37.0519	74.6322
01-May-18	17:07	*Balaenoptera physalus*	Fin whale	2	37.0213	74.8432
01-May-18	17:24	*Balaenoptera physalus*	Fin whale	5	37.0126	74.9633
01-May-18	17:38	*Megaptera novaeangliae*	Humpback whale	1	37.0186	74.9939
25-May-18	7:28	*Stenella frontalis*	Atlantic spotted dolphin	45	37.0147	74.9251
25-May-18	8:11	*Grampus griseus*	Risso's dolphin	11	37.0569	74.6485
25-May-18	9:11	*Tursiops truncatus*	Common bottlenose dolphin	4	37.0182	74.6375
25-May-18	9:49	*Tursiops truncatus*	Common bottlenose dolphin	24	37.0546	74.6023
25-May-18	9:56		Unidentified delphinid	3	37.0572	74.5875
25-May-18	10:38	*Physeter macrocephalus*	Sperm whale	5	37.0132	74.4800
25-May-18	11:38	*Physeter macrocephalus*	Sperm whale	1	37.0190	74.4681
25-May-18	11:47	*Grampus griseus*	Risso's dolphin	5	37.0312	74.4503
25-May-18	11:49	*Delphinus delphis*	Common dolphin	160	37.0363	74.4588
25-May-18	12:17	*Physeter macrocephalus*	Sperm whale	9	37.0359	74.4426
08-Jun-18	6:54	*Tursiops truncatus*	Common bottlenose dolphin	3	36.9126	75.6305
08-Jun-18	8:49	*Balaenoptera physalus*	Fin whale	2	37.1223	74.7652
08-Jun-18	8:56	*Delphinus delphis*	Common dolphin	15	37.1300	74.7483
08-Jun-18	10:49	*Delphinus delphis*	Common dolphin	15	37.1501	74.6141
08-Jun-18	10:58	*Delphinus delphis*	Common dolphin	45	37.1403	74.5606
08-Jun-18	11:06	*Globicephala* sp.	Unidentified pilot whale	18	37.1438	74.5293
08-Jun-18	13:00	*Globicephala macrorhynchus*	Short-finned pilot whale	6	37.0784	74.2972
08-Jun-18	13:17	*Globicephala macrorhynchus*	Short-finned pilot whale	25	37.0507	74.3284
08-Jun-18	13:34		Unidentified delphinid	12	37.0357	74.3563
08-Jun-18	14:00	*Grampus griseus*	Risso's dolphin	7	36.9775	74.3547
08-Jun-18	15:13	*Delphinus delphis*	Common dolphin	155	36.8897	74.6008
08-Jun-18	15:27	*Delphinus delphis*	Common dolphin	5	36.8908	74.6818
08-Jun-18	15:42	*Tursiops truncatus*	Common bottlenose dolphin	10	36.8852	74.7951

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
06-Aug-18	8:23	*Stenella frontalis*	Atlantic spotted dolphin	4	36.3318	74.9289
06-Aug-18	8:31	*Tursiops truncatus*	Common bottlenose dolphin	8	36.3147	74.9075
06-Aug-18	8:54	*Globicephala* sp.	Unidentified pilot whale	22	36.2617	74.7700
06-Aug-18	9:06	*Globicephala* sp.	Unidentified pilot whale	12	36.2465	74.7404
06-Aug-18	9:18	*Tursiops truncatus*	Common bottlenose dolphin	150	36.2119	74.7302
06-Aug-18	9:50	*Stenella frontalis*	Atlantic spotted dolphin	100	36.2536	74.6566
06-Aug-18	10:01	*Physeter macrocephalus*	Sperm whale	1	36.2693	74.6489
06-Aug-18	10:30	*Stenella coeruleoalba*	Striped dolphin	100	36.2846	74.6446
06-Aug-18	10:36	*Grampus griseus*	Risso's dolphin	26	36.2927	74.6484
06-Aug-18	10:52	*Grampus griseus*	Risso's dolphin	45	36.3332	74.6408
06-Aug-18	10:54	*Globicephala macrorhynchus*	Short-finned pilot whale	8	36.3366	74.6353
06-Aug-18	11:04	*Tursiops truncatus*	Common bottlenose dolphin	10	36.3515	74.5983
06-Aug-18	11:28	*Grampus griseus*	Risso's dolphin	6	36.3468	74.4841
06-Aug-18	11:34	*Kogia sima*	Dwarf sperm whale	2	36.3491	74.4638
06-Aug-18	12:21	*Tursiops truncatus*	Common bottlenose dolphin	3	36.3595	74.3852
06-Aug-18	12:43	*Physeter macrocephalus*	Sperm whale	18	36.4157	74.3256
06-Aug-18	14:11	*Tursiops truncatus*	Common bottlenose dolphin	25	36.5298	74.4575
06-Aug-18	14:26	*Tursiops truncatus*	Common bottlenose dolphin	3	36.5776	74.5448
06-Aug-18	14:38	*Globicephala macrorhynchus*	Short-finned pilot whale	14	36.6114	74.6187
06-Aug-18	14:48	*Globicephala macrorhynchus*	Short-finned pilot whale	6	36.6562	74.6569
06-Aug-18	15:25	*Balaenoptera physalus*	Fin whale	2	36.8428	74.8057
06-Aug-18	15:33	*Balaenoptera acutorostrata*	Minke whale	1	36.8573	74.7992
06-Aug-18	16:09	*Balaenoptera physalus*	Fin whale	2	36.8467	74.8530
03-Sep-18	6:52		Unidentified medium dolphin	5	36.8857	75.4131
03-Sep-18	8:56	*Globicephala* sp.	Unidentified pilot whale	8	36.9522	74.5590
03-Sep-18	9:16	*Globicephala* sp.	Unidentified pilot whale	10	36.9873	74.4974
03-Sep-18	10:27	*Tursiops truncatus*	Common bottlenose dolphin	20	37.0460	74.4585
03-Sep-18	10:49	*Globicephala macrorhynchus*	Short-finned pilot whale	9	37.0298	74.4935
03-Sep-18	11:00	*Globicephala* sp.	Unidentified pilot whale	12	37.0466	74.5484

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
03-Sep-18	11:02	*Globicephala* sp.	Unidentified pilot whale	21	37.0277	74.5487
03-Sep-18	11:31	*Tursiops truncatus*	Common bottlenose dolphin	10	37.0485	74.6362
03-Sep-18	12:36	*Stenella frontalis*	Atlantic spotted dolphin	130	37.1879	74.8564
03-Sep-18	14:08	*Stenella frontalis*	Atlantic spotted dolphin	50	37.0280	74.8725
07-Sep-18	8:46	*Delphinus delphis*	Common dolphin	45	37.2198	74.6701
07-Sep-18	9:18	*Globicephala* sp.	Unidentified pilot whale	45	37.2085	74.4937
07-Sep-18	9:21	*Globicephala* sp.	Unidentified pilot whale	5	37.1942	74.5015
07-Sep-18	9:41	*Tursiops truncatus*	Common bottlenose dolphin	20	37.1981	74.4491
07-Sep-18	9:48	*Globicephala* sp.	Unidentified pilot whale	16	37.1884	74.4261
07-Sep-18	9:58	*Tursiops truncatus*	Common bottlenose dolphin	42	37.1990	74.4218
07-Sep-18	10:06	*Globicephala* sp.	Unidentified pilot whale	30	37.2009	74.3973
07-Sep-18	11:00	*Mesoplodon bidens*	Sowerby's beaked whale	3	37.2597	74.3502
07-Sep-18	12:12	*Tursiops truncatus*	Common bottlenose dolphin	12	37.2335	74.3707
07-Sep-18	12:32	*Grampus griseus*	Risso's dolphin	23	37.2501	74.3113
07-Sep-18	13:15	*Globicephala* sp.	Unidentified pilot whale	15	37.2921	74.3597
07-Sep-18	13:32	*Globicephala* sp.	Unidentified pilot whale	15	37.3187	74.3548
07-Sep-18	13:34	*Globicephala* sp.	Unidentified pilot whale	25	37.3339	74.3445
07-Sep-18	13:39	*Tursiops truncatus*	Common bottlenose dolphin	8	37.3451	74.3396
07-Sep-18	13:49	*Globicephala* sp.	Unidentified pilot whale	9	37.3677	74.3540
07-Sep-18	13:51	*Globicephala* sp.	Unidentified pilot whale	10	37.3832	74.3442
07-Sep-18	14:35	*Tursiops truncatus*	Common bottlenose dolphin	16	37.3776	74.5373
14-Oct-18	8:44	*Stenella frontalis*	Atlantic spotted dolphin	80	36.9914	74.9621
14-Oct-18	9:28	*Delphinus delphis*	Common dolphin	110	37.0326	74.6742
14-Oct-18	9:52	*Globicephala* sp.	Unidentified pilot whale	9	37.0460	74.5831
14-Oct-18	10:12	*Globicephala* sp.	Unidentified pilot whale	35	37.0423	74.5148
14-Oct-18	10:17	*Globicephala* sp.	Unidentified pilot whale	15	37.0470	74.4908
14-Oct-18	10:24	*Tursiops truncatus*	Common bottlenose dolphin	60	37.0472	74.4755
14-Oct-18	11:04		Unidentified cetacean	5	37.0899	74.4181
14-Oct-18	11:55	*Globicephala* sp.	Unidentified pilot whale	70	37.0928	74.4162

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
14-Oct-18	12:06	*Globicephala* sp.	Unidentified pilot whale	15	37.1308	74.3934
14-Oct-18	12:25	*Kogia breviceps*	Pygmy sperm whale	2	37.1642	74.3605
14-Oct-18	12:38	*Globicephala* sp.	Unidentified pilot whale	6	37.2089	74.3325
14-Oct-18	12:42		Unidentified beaked whale	2	37.2236	74.3250
14-Oct-18	12:53	*Globicephala* sp.	Unidentified pilot whale	25	37.2438	74.3421
14-Oct-18	13:54	*Globicephala* sp.	Unidentified pilot whale	4	37.2846	74.3469
14-Oct-18	13:57	*Globicephala* sp.	Unidentified pilot whale	6	37.2832	74.3502
14-Oct-18	14:07	*Globicephala* sp.	Unidentified pilot whale	12	37.3170	74.3459
14-Oct-18	14:12	*Globicephala* sp.	Unidentified pilot whale	8	37.3270	74.3536
14-Oct-18	14:14	*Tursiops truncatus*	Common bottlenose dolphin	3	37.3318	74.3497
14-Oct-18	14:44	*Globicephala* sp.	Unidentified pilot whale	15	37.3451	74.4119
19-Oct-18	9:19	*Globicephala* sp.	Unidentified pilot whale	12	36.8629	74.5937
19-Oct-18	9:25	*Globicephala* sp.	Unidentified pilot whale	7	36.8631	74.5660
19-Oct-18	9:37	*Globicephala* sp.	Unidentified pilot whale	15	36.8559	74.5570
19-Oct-18	9:40	*Grampus griseus*	Risso's dolphin	18	36.8487	74.5371
19-Oct-18	9:41		Unidentified small dolphin	35	36.8455	74.5302
19-Oct-18	10:25	*Tursiops truncatus*	Common bottlenose dolphin	4	36.8289	74.4277
19-Oct-18	10:40	*Kogia breviceps*	Pygmy sperm whale	2	36.8091	74.3875
19-Oct-18	10:52	*Tursiops truncatus*	Common bottlenose dolphin	15	36.7934	74.3885
19-Oct-18	11:37	*Grampus griseus*	Risso's dolphin	35	36.7122	74.3592
19-Oct-18	12:12	*Tursiops truncatus*	Common bottlenose dolphin	25	36.6677	74.3468
19-Oct-18	12:54	*Tursiops truncatus*	Common bottlenose dolphin	80	36.6146	74.4679
13-Dec-18	7:32	*Balaenoptera physalus*	Fin whale	2	36.9689	75.4195
13-Dec-18	8:03	*Balaenoptera physalus*	Fin whale	1	36.9882	75.4159
13-Dec-18	8:27	*Megaptera novaeangliae*	Humpback whale	3	37.0041	75.4300
13-Dec-18	10:00	*Delphinus delphis*	Common dolphin	45	37.1235	75.0624
13-Dec-18	11:03	*Tursiops truncatus*	Common bottlenose dolphin	12	37.0980	74.7019
13-Dec-18	12:04	*Balaenoptera physalus*	Fin whale	3	37.0354	74.5623
13-Dec-18	12:29	*Balaenoptera physalus*	Fin whale	3	37.0264	74.5410

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
13-Dec-18	12:30	*Globicephala* sp.	Unidentified pilot whale	18	37.0161	74.5416
13-Dec-18	13:21	*Globicephala* sp.	Unidentified pilot whale	40	37.0422	74.5325
13-Dec-18	14:35	*Delphinus delphis*	Common dolphin	55	37.0833	74.5300
19-Dec-18	7:48	*Delphinus delphis*	Common dolphin	12	36.9721	75.2895
19-Dec-18	8:37	*Delphinus delphis*	Common dolphin	35	37.0342	74.9643
19-Dec-18	8:54	*Delphinus delphis*	Common dolphin	25	37.0500	74.8413
19-Dec-18	9:51	*Tursiops truncatus*	Common bottlenose dolphin	4	37.0390	74.5942
19-Dec-18	10:05	*Mesoplodon bidens*	Sowerby's beaked whale	7	37.0361	74.5492
19-Dec-18	12:01	*Delphinus delphis*	Common dolphin	150	37.0399	74.5308
19-Dec-18	13:55	*Delphinus delphis*	Common dolphin	300	37.0068	74.5110
19-Dec-18	14:46		Unidentified medium whale	1	37.0239	74.6345
19-Dec-18	16:01	*Delphinus delphis*	Common dolphin	28	36.9499	75.1360
19-Dec-18	16:35	*Delphinus delphis*	Common dolphin	22	36.9096	75.3853

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C

Sea Turtle Sightings 2018

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Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
25-May-18	6:24	*Caretta caretta*	Loggerhead sea turtle	1	36.9343	75.3911
25-May-18	6:31	*Caretta caretta*	Loggerhead sea turtle	4	36.9406	75.3380
25-May-18	7:06	*Dermochelys coriacea*	Leatherback sea turtle	1	36.9866	75.0722
25-May-18	7:22	*Caretta caretta*	Loggerhead sea turtle	2	37.0031	74.9725
25-May-18	12:54	*Caretta caretta*	Loggerhead sea turtle	1	37.0526	74.4210
25-May-18	14:35	*Caretta caretta*	Loggerhead sea turtle	1	36.9403	74.8260
25-May-18	14:47	*Caretta caretta*	Loggerhead sea turtle	3	36.9324	74.9172
08-Jun-18	15:54	*Caretta caretta*	Loggerhead sea turtle	1	36.8829	74.8976
06-Aug-18	7:08	*Caretta caretta*	Loggerhead sea turtle	1	36.5722	75.4234
06-Aug-18	7:17	*Dermochelys coriacea*	Leatherback sea turtle	1	36.5424	75.3609
06-Aug-18	7:37	*Caretta caretta*	Loggerhead sea turtle	1	36.4775	75.2237
06-Aug-18	7:41	*Dermochelys coriacea*	Leatherback sea turtle	1	36.4673	75.2053
06-Aug-18	7:51	*Caretta caretta*	Loggerhead sea turtle	1	36.4353	75.1384
06-Aug-18	7:54	*Dermochelys coriacea*	Leatherback sea turtle	1	36.4254	75.1175
06-Aug-18	8:01		Unidentified hardshell turtle	1	36.4034	75.0721
06-Aug-18	8:02	*Dermochelys coriacea*	Leatherback sea turtle	1	36.3979	75.0654
06-Aug-18	8:05	*Caretta caretta*	Loggerhead sea turtle	1	36.3902	75.0460
06-Aug-18	8:05	*Caretta caretta*	Loggerhead sea turtle	1	36.3881	75.0413
06-Aug-18	16:36	*Dermochelys coriacea*	Leatherback sea turtle	2	36.8417	75.0730
06-Aug-18	16:56	*Dermochelys coriacea*	Leatherback sea turtle	1	36.8422	75.2373
03-Sep-18	6:48	*Dermochelys coriacea*	Leatherback sea turtle	1	36.8819	75.4448
03-Sep-18	7:28	*Caretta caretta*	Loggerhead sea turtle	1	36.9083	75.1413
03-Sep-18	12:20	*Caretta caretta*	Loggerhead sea turtle	2	37.1505	74.7809
03-Sep-18	13:18	*Caretta caretta*	Loggerhead sea turtle	2	37.1983	74.8889
03-Sep-18	13:46	*Caretta caretta*	Loggerhead sea turtle	1	37.1046	74.8820
03-Sep-18	14:28	*Caretta caretta*	Loggerhead sea turtle	1	36.9925	74.9332
03-Sep-18	14:36	*Dermochelys coriacea*	Leatherback sea turtle	1	36.9821	74.9893
07-Sep-18	15:34	*Caretta caretta*	Loggerhead sea turtle	2	37.2332	74.9763
07-Sep-18	15:40	*Dermochelys coriacea*	Leatherback sea turtle	1	37.2130	75.0230

Date	Sighting Time (local)	Scientific Name	Common Name	Group Size	Latitude (°N)	Longitude (°W)
14-Oct-18	15:27	*Caretta caretta*	Loggerhead sea turtle	1	37.2421	74.7571
14-Oct-18	15:44	*Caretta caretta*	Loggerhead sea turtle	1	37.2007	74.8888
14-Oct-18	16:04	*Caretta caretta*	Loggerhead sea turtle	1	37.1444	75.0414
14-Oct-18	16:09		Unidentified turtle	1	37.1277	75.0819
14-Oct-18	16:31	*Caretta caretta*	Loggerhead sea turtle	1	37.0726	75.2508
19-Oct-18	7:38	*Dermochelys coriacea*	Leatherback sea turtle	1	36.8441	75.3116
06-Aug-18	7:51	*Caretta caretta*	Loggerhead sea turtle	1	36.4353	75.1384

D

Photo-identified Priority Species Individuals 2018

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HDR ID #	Species	Sighting Date(s)	Biopsy?	Satellite Tag? / Argos ID
HDRVABp043	*Balaenoptera physalus*	11-Apr-18	No	No
HDRVABp062	*Balaenoptera physalus*	11-Apr-18	No	No
HDRVABp044	*Balaenoptera physalus*	11-Apr-18	No	No
HDRVABp045	*Balaenoptera physalus*	11-Apr-18	No	No
HDRVAEg002	*Eubalaena glacialis*	11-Apr-18	No	No
HDRVAEg006	*Eubalaena glacialis*	11-Apr-18	No	No
HDRVABp029	*Balaenoptera physalus*	22-Apr-18	No	No
HDRVABp030	*Balaenoptera physalus*	22-Apr-18	No	No
HDRVABp040	*Balaenoptera physalus*	22-Apr-18	No	No
HDRVABp046	*Balaenoptera physalus*	22-Apr-18	Yes	SPLASH10-F / 172530
HDRVABp047	*Balaenoptera physalus*	22-Apr-18	No	SPOT6 / 173176
HDRVABp048	*Balaenoptera physalus*	22-Apr-18	Yes	SPLASH10-F / 172531
HDRVABp049	*Balaenoptera physalus*	22-Apr-18	Yes	No
HDRVABp050	*Balaenoptera physalus*	22-Apr-18, 01-May-18	No	SPOT6 / 173172
HDRVAPm032	*Physeter macrocephalus*	22-Apr-18	Yes	SPLASH10 / 171883
HDRVAPm034	*Physeter macrocephalus*	22-Apr-18	Yes	SPLASH10 / 163793
HDRVAPm033	*Physeter macrocephalus*	22-Apr-18, 01-May-18	Yes	SPOT6 / 173177
HDRVAPm035	*Physeter macrocephalus*	22-Apr-18, 01-May-18	Yes	SPLASH10 / 171882
HDRVABa009	*Balaenoptera acutorostrata*	28-Apr-18	No	No
HDRVABp018	*Balaenoptera physalus*	28-Apr-18, 01-May-18	No	No
HDRVABp019	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp023	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp051	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp052	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp053	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp054	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp055	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp056	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp057	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp058	*Balaenoptera physalus*	28-Apr-18	No	No

HDR ID #	Species	Sighting Date(s)	Biopsy?	Satellite Tag? / Argos ID
HDRVABp059	*Balaenoptera physalus*	28-Apr-18, 01-May-18	No	No
HDRVABp060	*Balaenoptera physalus*	28-Apr-18, 01-May-18	No	SPLASH10-F / 172532
HDRVABp061	*Balaenoptera physalus*	28-Apr-18	No	No
HDRVABp020	*Balaenoptera physalus*	01-May-18	No	No
HDRVABp063	*Balaenoptera physalus*	01-May-18	No	No
HDRVABp064	*Balaenoptera physalus*	01-May-18	No	No
HDRVABp065	*Balaenoptera physalus*	01-May-18	No	No
HDRVABp029	*Balaenoptera physalus*	01-May-18	No	No
HDRVAPm003	*Physeter macrocephalus*	01-May-18	No	No
HDRVAPm010	*Physeter macrocephalus*	25-May-18	Yes	SPLASH10-F / 173233
HDRVAPm012	*Physeter macrocephalus*	25-May-18	Yes	SPLASH10 / 171884
HDRVAPm036	*Physeter macrocephalus*	25-May-18	Yes	SPOT6 / 173174
HDRVAPm037	*Physeter macrocephalus*	25-May-18	No	No
HDRVAPm038	*Physeter macrocephalus*	25-May-18	No	No
HDRVAPm039	*Physeter macrocephalus*	25-May-18	Sloughed skin	SPOT6 / 173175
HDRVAPm040	*Physeter macrocephalus*	25-May-18	No	No
HDRVABp066	*Balaenoptera physalus*	08-Jun-18	No	No
HDRVABp067	*Balaenoptera physalus*	08-Jun-18	No	No
HDRVABa010	*Balaenoptera acutorostrata*	06-Aug-18	No	No
HDRVABp068	*Balaenoptera physalus*	06-Aug-18	No	No
HDRVABp069	*Balaenoptera physalus*	06-Aug-18	No	No
HDRVAPm041	*Physeter macrocephalus*	06-Aug-18	No	SPLASH10 / 173229
HDRVAPm042	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm043	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm044	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm045	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm046	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm047	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm048	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm049	*Physeter macrocephalus*	06-Aug-18	No	No

HDR ID #	Species	Sighting Date(s)	Biopsy?	Satellite Tag? / Argos ID
HDRVAPm050	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm051	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm052	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm053	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm054	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm055	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm056	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm057	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm058	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAPm059	*Physeter macrocephalus*	06-Aug-18	No	No
HDRVAMb001	*Mesoplodon bidens*	07-Sep-18	No	SPLASH10 / 173230
HDRVAMb002	*Mesoplodon bidens*	07-Sep-18	No	No
HDRVABp070	*Balaenoptera physalus*	13-Dec-18	No	No
HDRVABp071	*Balaenoptera physalus*	13-Dec-18	No	No
HDRVAMb003	*Mesoplodon bidens*	19-Dec-18	No	No
HDRVAMb004	*Mesoplodon bidens*	19-Dec-18	No	No
HDRVAMb005	*Mesoplodon bidens*	19-Dec-18	No	No
HDRVAMb006	*Mesoplodon bidens*	19-Dec-18	No	No