

**Protected Species Monitoring in the Virginia Capes OPAREA
Cape Hatteras, North Carolina
January 2013 – December 2013**



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Introduction

This report forms part of a multi-institutional monitoring project intended to provide information on the species composition, population identity, density and baseline behavior of marine mammals and sea turtles present in Navy range complexes along the Atlantic coast. This program began in 2007, with baseline aerial and vessel surveys and a passive acoustic monitoring program in Onslow Bay, North Carolina and has since expanded to include study areas off Jacksonville, Florida and Cape Hatteras, North Carolina. In Onslow Bay, six years of monitoring have yielded a comprehensive picture of the density, distribution and abundance of marine mammals and sea turtles and provided new insights into residency patterns among pelagic delphinid cetaceans in this region. More than four years of monitoring in Jacksonville have provided similar information on the density and distribution of marine mammals and sea turtles in this area. In Cape Hatteras, almost three years of surveys have provided preliminary information on the complex patterns of distribution and diversity of the marine mammals and sea turtles in this highly productive area. The current report builds on this past body of work and describes monitoring activities that occurred between January and December 2013.

Acknowledgements

For collaborative efforts we thank our colleagues at Duke University Marine Lab (Kim Urian, Andy Read, Heather Foley, Zach Swaim, Jennifer Dunn, and Lynne Hodge) and St. Andrews University (Charles Paxton). We thank Ed Coffman, owner and operator of Orion Aviation, and his highly skilled pilots: Dave Huddle, Stan Huddle, Cameron Radford, Ryan Macgregor, Greg Souther, Collin Mendenhall, Rocky Walker, John Esties, and Bob Stickle, for excellent flying and a high level of professionalism. We thank Joel Bell for his support of this work. Surveys are conducted under NOAA Scientific Permit No 16473, held by UNCW, and NOAA General Authorization Letter of Confirmation No. 16185 held by Duke University.

Summary of Cape Hatteras Aerial Surveys

This chapter describes the aerial surveys conducted in the Cape Hatteras, North Carolina study area between January 2013 and December 2013. The aim was to conduct two days of effort each month, flying a subset of the 26 tracklines that cover the area. Survey effort occurred in five of twelve months; unfavorable weather conditions and plane complications precluded any effort during January, February, April, June, September, November, and December. Two or more survey days were achieved for two of the five months, with a single day of effort occurring in the remaining three. A total of 68 tracklines (4935.9 km) were covered in the Cape Hatteras survey site during this reporting period. While survey conditions were dominated by Beaufort Sea State (BSS) 1-3, time was also spent in higher sea states. Other aerial surveys have demonstrated that the rate of cetacean sightings is negatively affected by an increase in the BSS (e.g. Gómez de Segura *et al.* 2006, DeMaster *et al.* 2001, McAlarney *et al.* 2012). This trend was also apparent in the present effort, as sightings dropped from 38.43 to 4.36 sightings per 1000 km as BSS increased from 1 to 4.

A total of 100 sightings of 1957 cetaceans were encountered while on effort during the nine days of aerial surveys in the study area (Table 1, Figure 1). Ten species of cetaceans were photo-documented, including bottlenose dolphins (*Tursiops truncatus*; 46 sightings of 794 individuals), short-finned pilot whales (*Globicephala macrorhynchus*; 18 sightings of 252 individuals), Atlantic spotted dolphins (*Stenella frontalis*; nine sightings of 563 individuals), Risso's dolphins (*Grampus griseus*; five sightings of 90 individuals), Cuvier's beaked whales (*Ziphius cavirostris*; 5 sightings of 14 individuals), sperm whales (*Physeter macrocephalus*; four sightings of seven individuals), mesoplodont beaked whales (*Mesoplodon* spp; four sightings of nine individuals), Gervais' beaked whale (*Mesoplodon europaeus* three sightings for 11 individuals), common dolphins (*Delphinus delphis*; three sighting of 206 individuals), humpback whales (*Megaptera novaeangliae*; three sightings for four individuals), and minke whales (*Balaenoptera acutorostrata*; one sighting of one individual). There was one sighting (six individuals) of dolphins where species identity could not be established with 100% certainty and is listed as "unidentified delphinid".

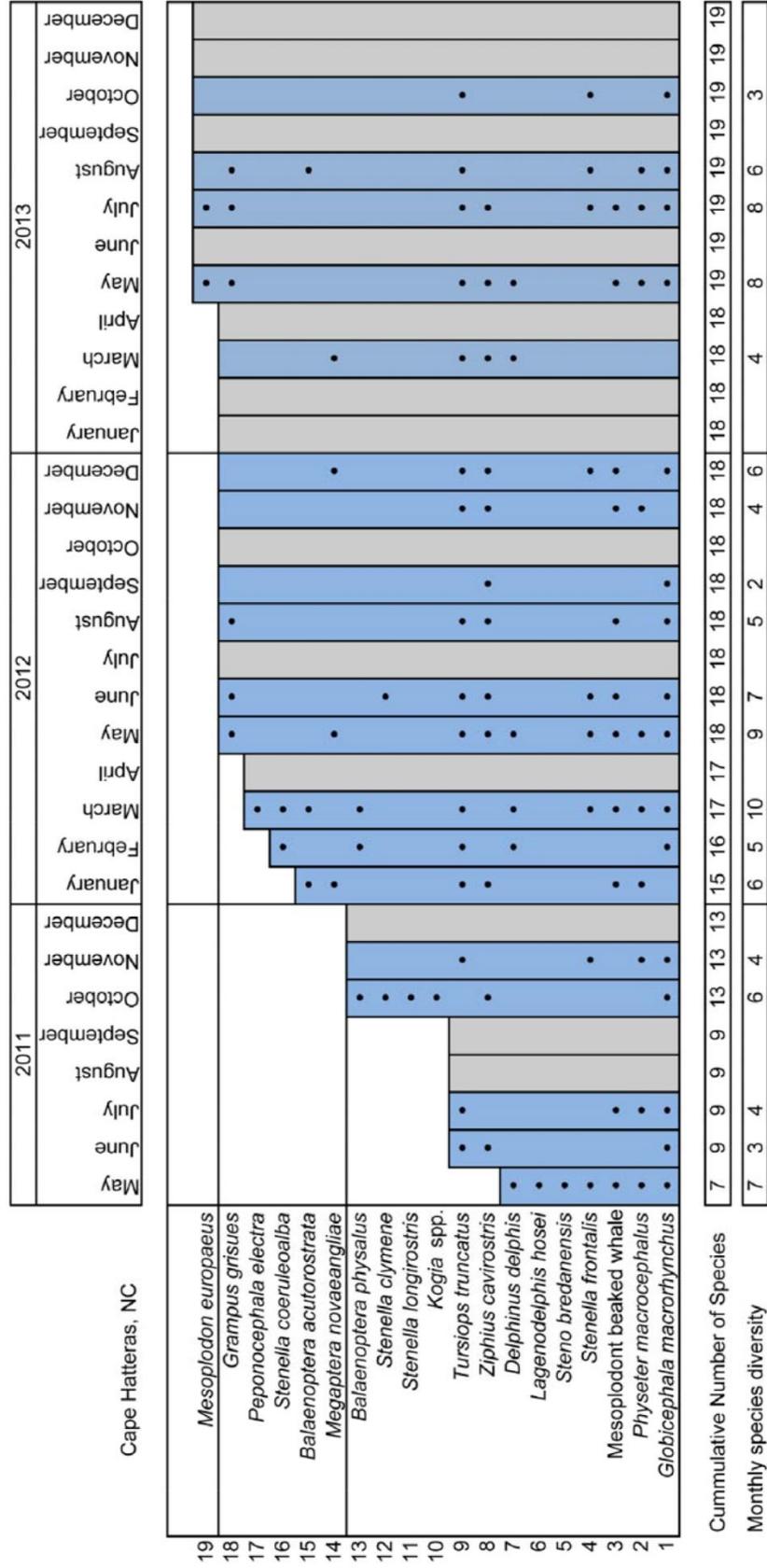
Fifty sea turtle sightings were recorded during this survey period. Forty two were identified as loggerhead sea turtles (*Caretta caretta*), and seven as a leatherback sea turtle (*Dermochelys coriacea*). Species identification could not be established with certainty for a single individual which is listed as “unidentified sea turtle” (Tables 15-16, Figures 17a-c & 18).

In addition to cetaceans and sea turtles, other pelagic marine vertebrates (*e.g.* manta rays, cownose rays, ocean sunfish, and unidentified sharks) were observed (Tables 17-20, Figure 19). Commercial, military and recreational vessels were also encountered in the survey area (Tables 21-23, Figures 20-22).

Table 1a. Total number of sightings and individuals for each species by month from January 2013 to December 2013 for the Cape Hatteras, North Carolina survey area.

| | 2013 | | | | | | | | | | | | Total | |
|-----------------------------------|---------|----------|-------|-------|-----|------|------|--------|-----------|---------|----------|----------|-------|------|
| | January | February | March | April | May | June | July | August | September | October | November | December | | |
| <i>Tursiops truncatus</i> | | | 3 | | 4 | | 15 | 14 | | 10 | | | | 46 |
| # of individuals | | | 68 | | 81 | | 252 | 246 | | 147 | | | | 794 |
| <i>Giobicephale macrorhynchus</i> | | | | | 3 | | 4 | 7 | | 4 | | | | 18 |
| # of individuals | | | | | 90 | | 46 | 95 | | 21 | | | | 252 |
| <i>Stenella frontalis</i> | | | | | | | 1 | 7 | | 1 | | | | 9 |
| # of individuals | | | | | | | 75 | 263 | | 225 | | | | 563 |
| <i>Grampus griseus</i> | | | | | 2 | | 2 | 1 | | | | | | 5 |
| # of individuals | | | | | 11 | | 73 | 6 | | | | | | 90 |
| <i>Ziphius cavirostris</i> | | | 1 | | 1 | | 3 | | | | | | | 5 |
| # of individuals | | | 2 | | 3 | | 9 | | | | | | | 14 |
| <i>Mesoplodon</i> spp. | | | | | 2 | | 2 | | | | | | | 4 |
| # of individuals | | | | | 5 | | 4 | | | | | | | 9 |
| <i>Physeter macrocephalus</i> | | | | | 1 | | 1 | 2 | | | | | | 4 |
| # of individuals | | | | | 1 | | 1 | 5 | | | | | | 7 |
| <i>Delphinus delphis</i> | | | 2 | | 1 | | | | | | | | | 3 |
| # of individuals | | | 26 | | 180 | | | | | | | | | 206 |
| <i>Mesoplodon europaeus</i> | | | | | 1 | | 2 | | | | | | | 3 |
| # of individuals | | | | | 2 | | 9 | | | | | | | 11 |
| <i>Balaenoptera acutorostrata</i> | | | | | | | | 1 | | | | | | 1 |
| # of individuals | | | | | | | | 1 | | | | | | 1 |
| <i>Megaptera novaeangliae</i> | | | 1 | | | | | | | | | | | 1 |
| # of individuals | | | 4 | | | | | | | | | | | 4 |
| Unidentified delphinid | | | | | | | 1 | | | | | | | 1 |
| # of individuals | | | | | | | 6 | | | | | | | 6 |
| Total sightings | 0 | 0 | 7 | 0 | 15 | 0 | 31 | 32 | 0 | 15 | 0 | 0 | 0 | 100 |
| Total individuals | 0 | 0 | 100 | 0 | 373 | 0 | 475 | 616 | 0 | 393 | 0 | 0 | 0 | 1957 |

Table 1b. Cetacean discovery curve from May 2011 to December 2013 for the Cape Hatteras, North Carolina survey area. Dots denote months in which a species was observed. Grey bars denote months in which no survey effort was conducted.



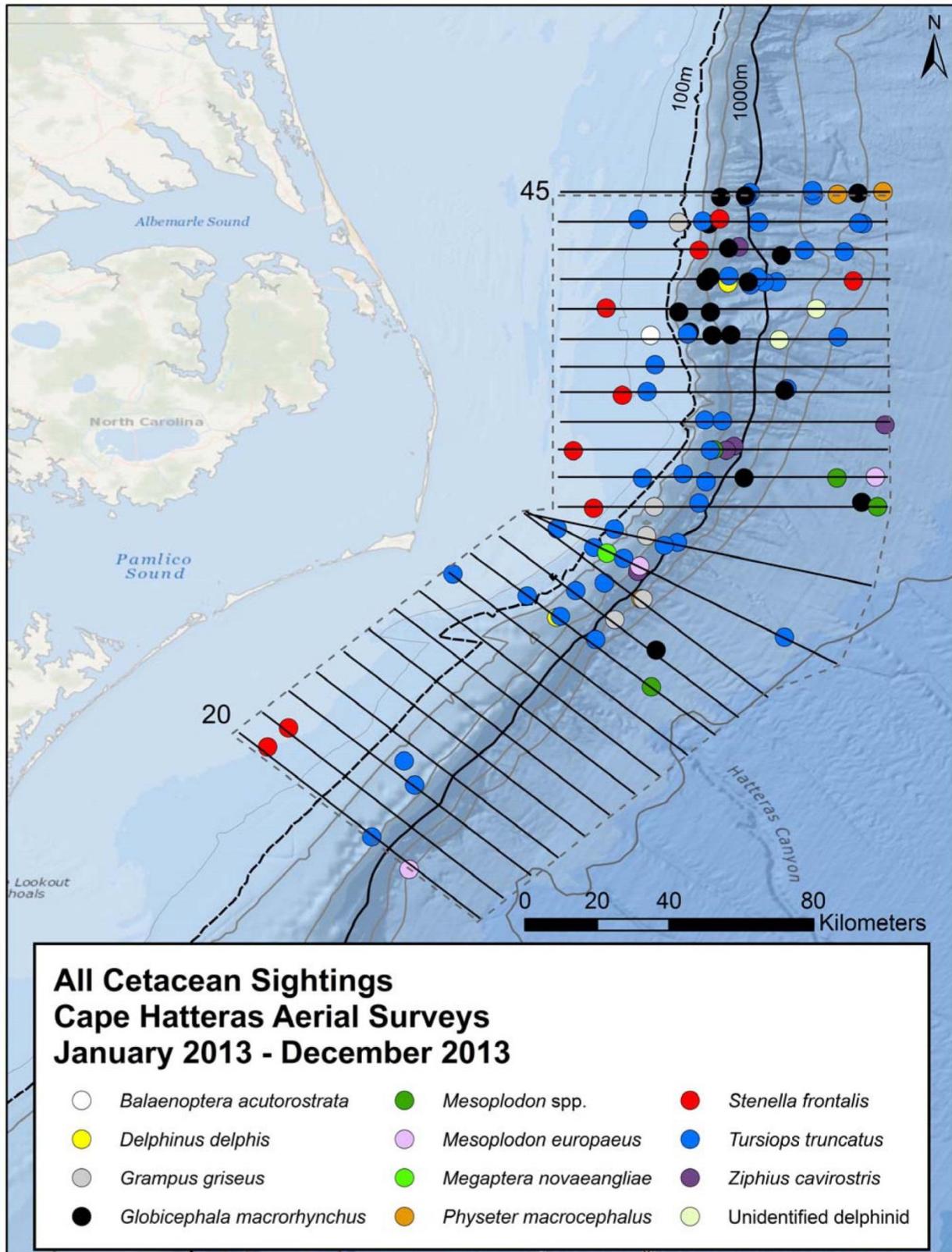


Figure 1. All cetacean sightings during aerial surveys conducted in Cape Hatteras, North Carolina from January 2013 to December 2013.

Methodology

Survey Design and Logistics

Aerial survey effort was initiated in the waters off Cape Hatteras, North Carolina in May of 2011 to assess the distribution and abundance of offshore cetacean species and sea turtles. These surveys are included in the Navy's Atlantic Fleet Active Sonar Training (AFAST) Monitoring Program, established to document marine species that could potentially be impacted by naval activities. The approximately 16000 km² survey area covers continental shelf waters as well as deeper waters beyond the shelf break. Placement of the survey area was designed to incorporate a large portion of the Cape Hatteras Special Research Area (CHSRA) in support of current research assessing fishery interactions between short-finned pilot whales and the local fisheries. The survey area excludes coastal waters to minimize survey effort in areas where the spatial distribution and relative abundance of coastal bottlenose dolphins has previously been established (Torres *et al.* 2003; Torres *et al.* 2005). Twenty six tracklines, ranging from 73.5 to 81.5 km long and orientated perpendicular to the coastline were evenly placed across the survey site.

Survey flights originated from the Fixed-base Operator (FBO) in Wilmington, NC with additional effort being conducted from the Dare County Regional Airport in Manteo, NC. Utilizing both airports maximized "on effort" survey time by decreasing transit time to and from the tracklines surveyed. A complete description of survey methods can be found in the Methodology section in the JAX Aerial Survey chapter of this report.

Table 2. Coordinates for trackline end points for the Hatteras survey area.

| Transect Line | Eastern Waypoint | | Western Waypoint | |
|---------------|------------------|------------|------------------|------------|
| | Latitude | Longitude | Latitude | Longitude |
| 20 | 34.770853 | -75.954044 | 34.315878 | -75.364928 |
| 21 | 34.819136 | -75.891558 | 34.365250 | -75.298656 |
| 22 | 34.870261 | -75.824811 | 34.418267 | -75.226703 |
| 23 | 34.919967 | -75.760906 | 34.469392 | -75.166111 |
| 24 | 34.972511 | -75.691319 | 34.522408 | -75.097944 |
| 25 | 35.023633 | -75.625994 | 34.571642 | -75.039247 |
| 26 | 35.073339 | -75.562089 | 34.617083 | -74.971081 |
| 27 | 35.118783 | -75.502444 | 34.668208 | -74.908594 |
| 28 | 35.169908 | -75.435697 | 34.721228 | -74.840431 |
| 29 | 35.219611 | -75.371792 | 34.768564 | -74.77605 |
| 30 | 35.270736 | -75.303628 | 34.817794 | -74.711672 |
| 31 | 35.319019 | -75.242561 | 34.868919 | -74.649186 |
| 32 | 35.319019 | -75.242561 | 34.948447 | -74.469303 |
| 33 | 35.319019 | -75.242561 | 35.139689 | -74.384097 |
| 34 | 35.340331 | -75.161133 | 35.340331 | -74.333672 |
| 35 | 35.410389 | -75.161133 | 35.410389 | -74.333672 |
| 36 | 35.48045 | -75.161133 | 35.48045 | -74.333672 |
| 37 | 35.550508 | -75.161133 | 35.550508 | -74.333672 |
| 38 | 35.620569 | -75.161133 | 35.620569 | -74.333672 |
| 39 | 35.690628 | -75.161133 | 35.690628 | -74.333672 |
| 40 | 35.762581 | -75.161133 | 35.762581 | -74.333672 |
| 41 | 35.832642 | -75.161133 | 35.832642 | -74.333672 |
| 42 | 35.906486 | -75.161133 | 35.906486 | -74.333672 |
| 43 | 35.978439 | -75.161133 | 35.978439 | -74.333672 |
| 44 | 36.048500 | -75.161133 | 36.048500 | -74.333672 |
| 45 | 36.122344 | -75.161133 | 36.122344 | -74.333672 |

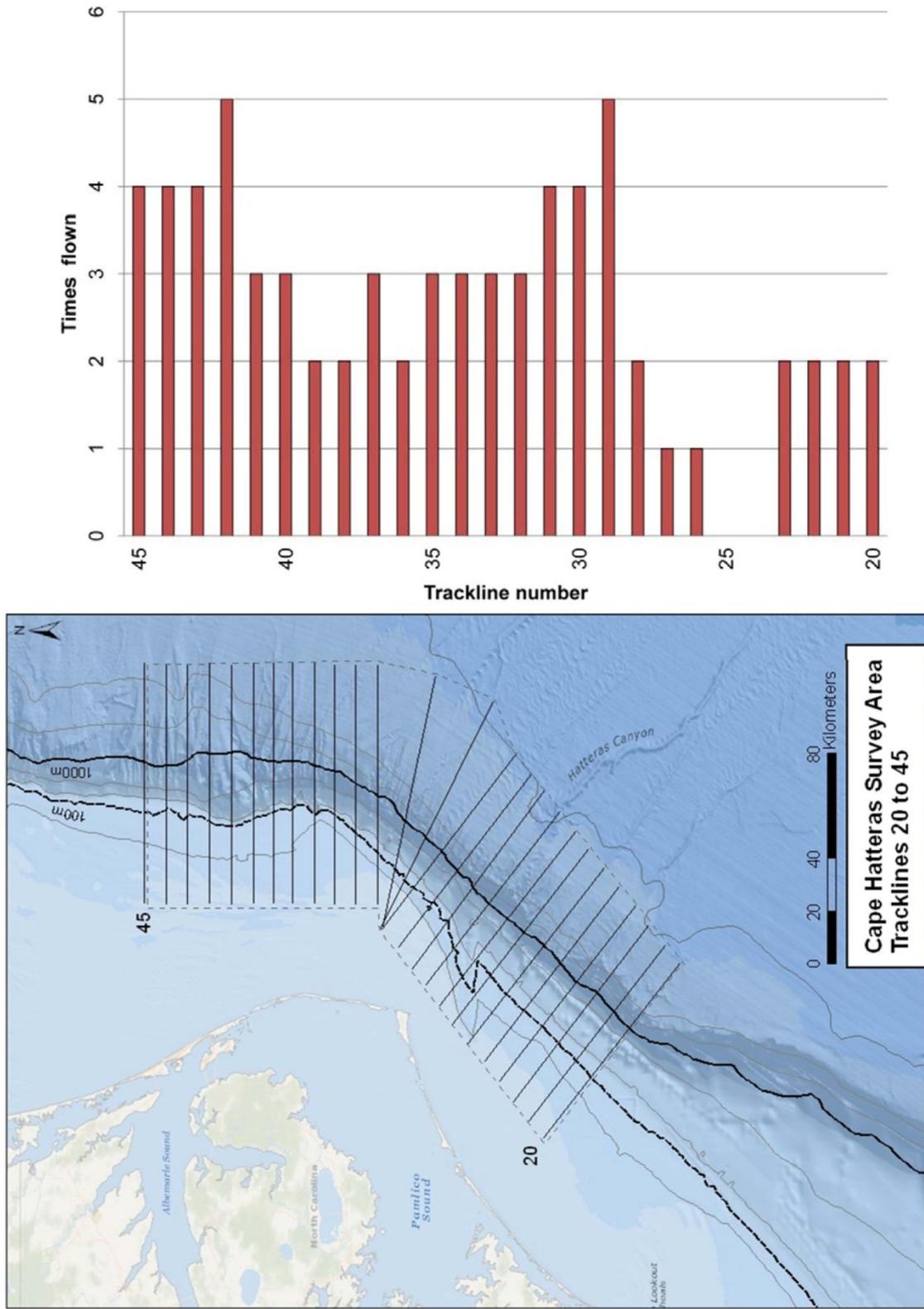


Figure 2. Survey tracklines and realized effort in the Cape Hatteras, North Carolina survey area.

Results

Sixty eight tracklines totaling 4935.9 km were surveyed from January 2013 to December 2013. Conditions during the 9 survey days ranged from a BSS 0 to 5 with 90% of effort in sea states less than or equal to a BSS 3.

An average Beaufort Sea State (BSS) value was calculated each month as a way to compare conditions across time. This average was calculated by taking the distance flown at each sea state multiplied by the BSS number (*i.e.* BSS 1 x distances would be multiplied by 1). These values were summed and then divided by the total distance flown that month. Survey conditions for this reporting period ranged from a BSS 0 to 5, with the majority of the surveys flown in a BSS 3 [BSS 0: 17.45 (<1%), BSS 1: 676.51 km (13.7%), BSS 2: 1297.27 km (26.3%), BSS 3: 2464.62 km (50%), BSS 4: 458.27 km (9.2%), BSS 5: 20.44 km (<1%)(Fig. 3a-c)]. Cetacean sighting rates dropped off as BSS increased, with 38.43 sightings/1000 km surveyed in BSS 1, 24.67 sightings/1000 km surveyed in BSS 2, 16.23 sightings/1000 km surveyed in BSS 3, 4.36 sightings/1000 km surveyed in BSS 4, and zero sightings/1000 km surveyed in BSS 5(Fig. 4a-c).

Mean sighting distance for all cetacean sightings was 0.91 km (SD=0.57). Sighting distances across sea states varied by less than 0.19 km (Fig.5a-b). Average sighting distances are normally calculated after removing outliers, defined as any value in excess of three standard deviations from the mean (Mean=0.91 km, SD=0.57*3=1.71, Outlier >2.62km). Two of the sighting distances were identified as outliers during this reporting period, one in BSS 2 of 3.08km and the other in BSS 4 of 3.49km. The only other sighting in a BSS 4 was at a distance of 0.5km, this single sighting is not presented in Figure 5b. In addition, eleven sightings did not have associated sighting distances, and were excluded from these calculations.

Table 3. Tracklines, km flown and Hobbs hours during aerial surveys of the Cape Hatteras, North Carolina survey area from January 2013 to December 2013. Trackline numbers are listed in the order in which they were flown.

| Date | Tracklines Flown | | Total km Flown | Hobbs Hours |
|-------------|--------------------|----------------|----------------|-------------|
| | AM | PM | | |
| 30-Mar-2013 | 32, 29 | N/A | 148.3 | 4.4 |
| 28-May-2013 | 29 to 31, 33 to 35 | 37, 40 to 42 | 709.8 | 7.8 |
| 16-Jul-2013 | 20 to 23 | 45 to 42 | 585.9 | 6.8 |
| 17-Jul-2013 | 41, 37 to 39 | 29 to 26 | 580.6 | 5.1 |
| 18-Jul-2013 | 30 to 33 | 40, 36 to 34 | 590.2 | 7.4 |
| 20-Aug-2013 | 36 to 39 | 40 to 43 | 565.5 | 6.1 |
| 21-Aug-2013 | 44, 45, 35, 34 | 20 to 23 | 561.1 | 6.3 |
| 22-Aug-2013 | 33, 32, 31, 30, 29 | 45 to 42 | 619.7 | 6.7 |
| 28-Oct-2013 | 45, 44, 43, 42 | 31, 30, 29, 28 | 574.8 | 5.9 |
| 9 days | 68 tracklines | | 4935.9 km | 56.5 hrs |

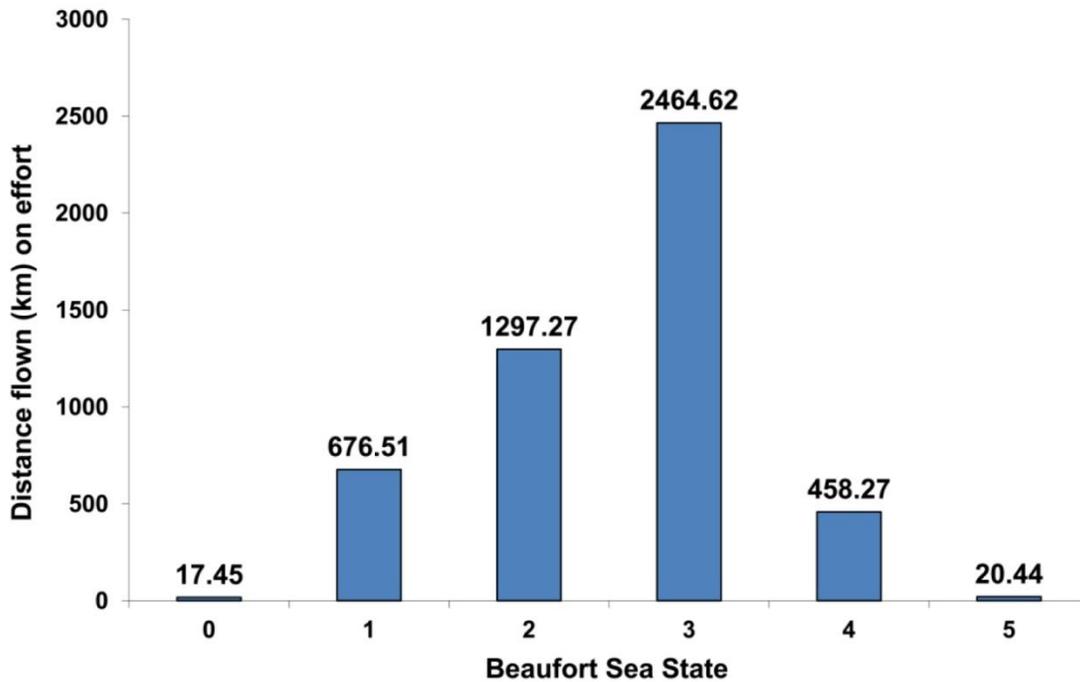


Figure 3a. Total distance surveyed per Beaufort Sea State from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

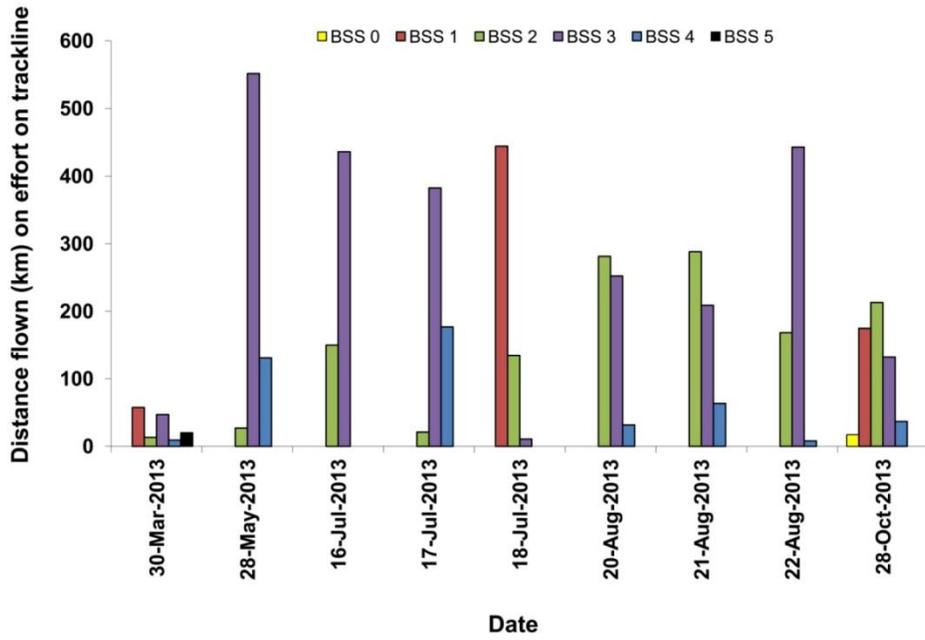


Figure 3b. Effort by Beaufort Sea State for each day from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

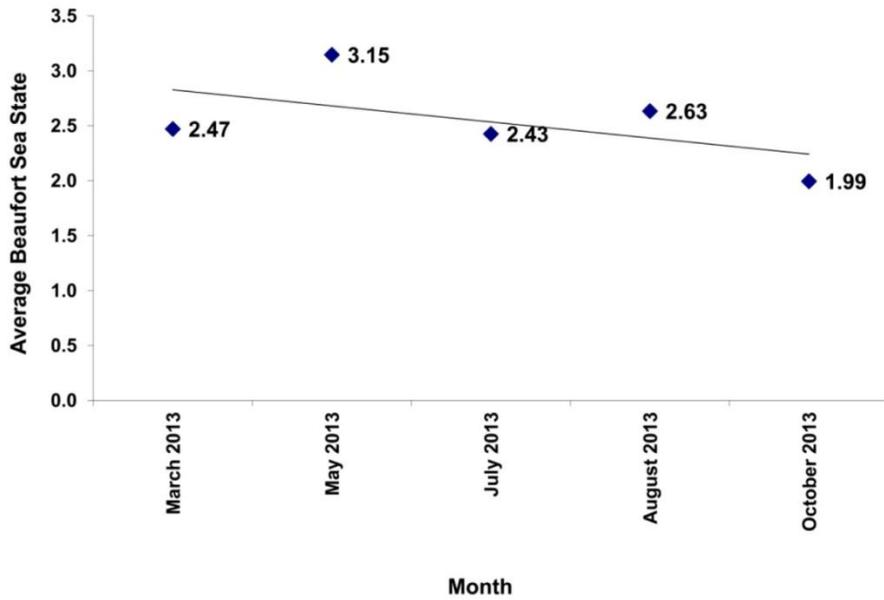


Figure 3c. Average Beaufort Sea State for each month from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area. Values were calculated using the formula $AvgBSS = [(Distance @ 1*1) + \dots / Total\ distance\ flown\ that\ day]$

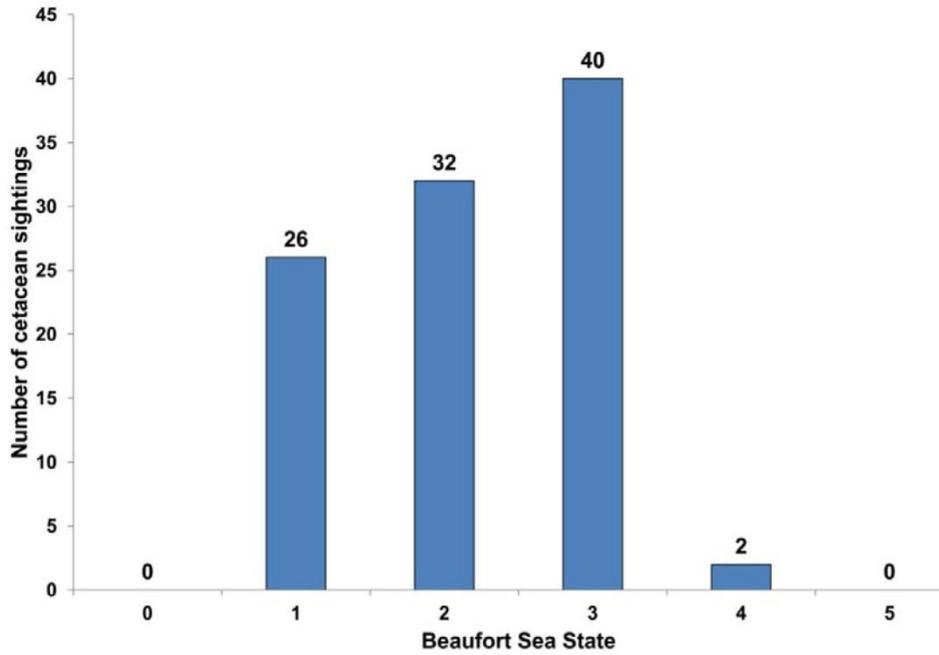


Figure 4a. Number of cetacean sightings per Beaufort Sea State from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

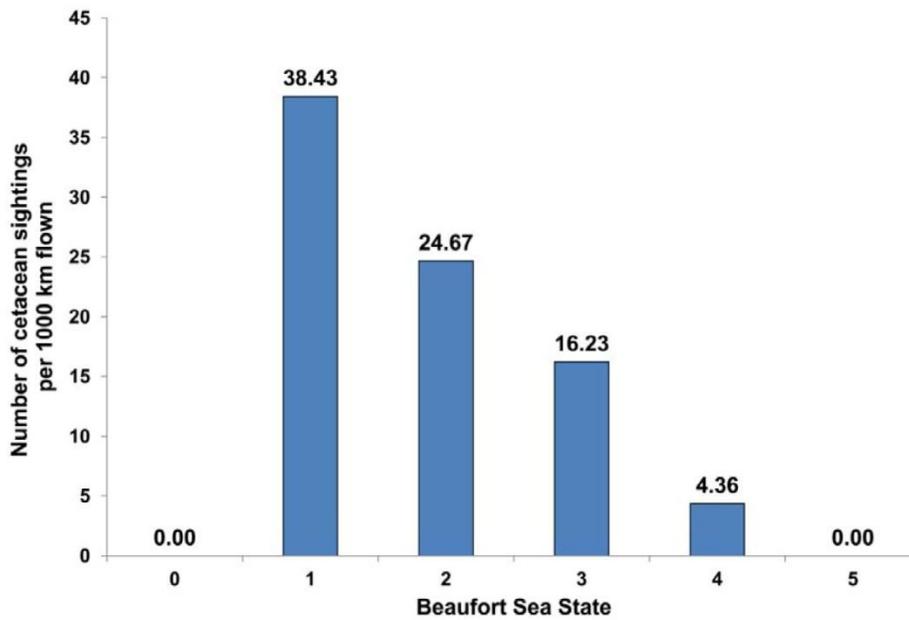


Figure 4b. Cetacean sightings per 1000 km flown by Beaufort Sea State from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

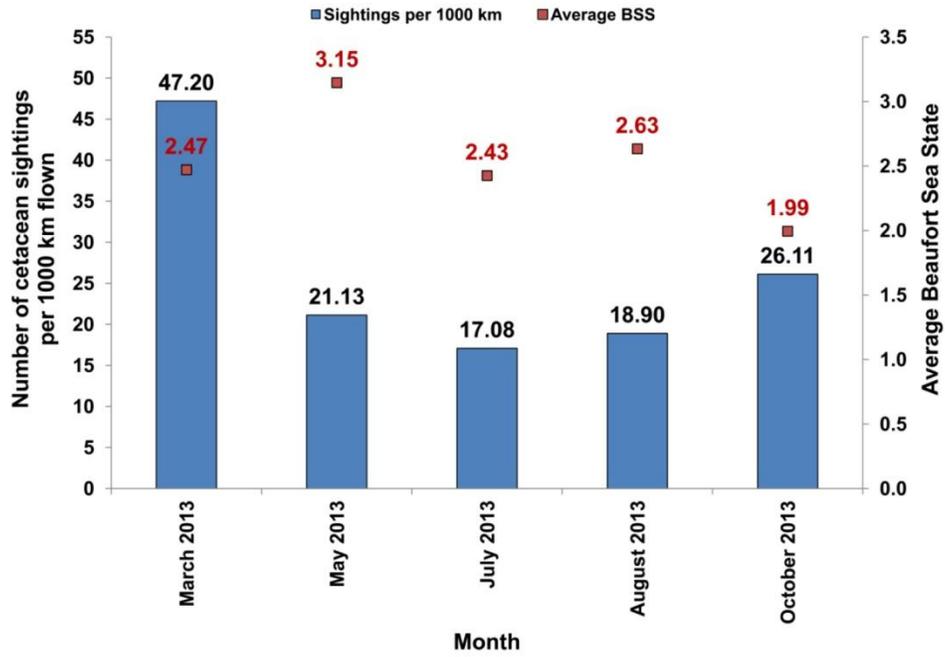


Figure 4c. Cetacean sightings per 1000 km surveyed and the average Beaufort Sea State per month from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

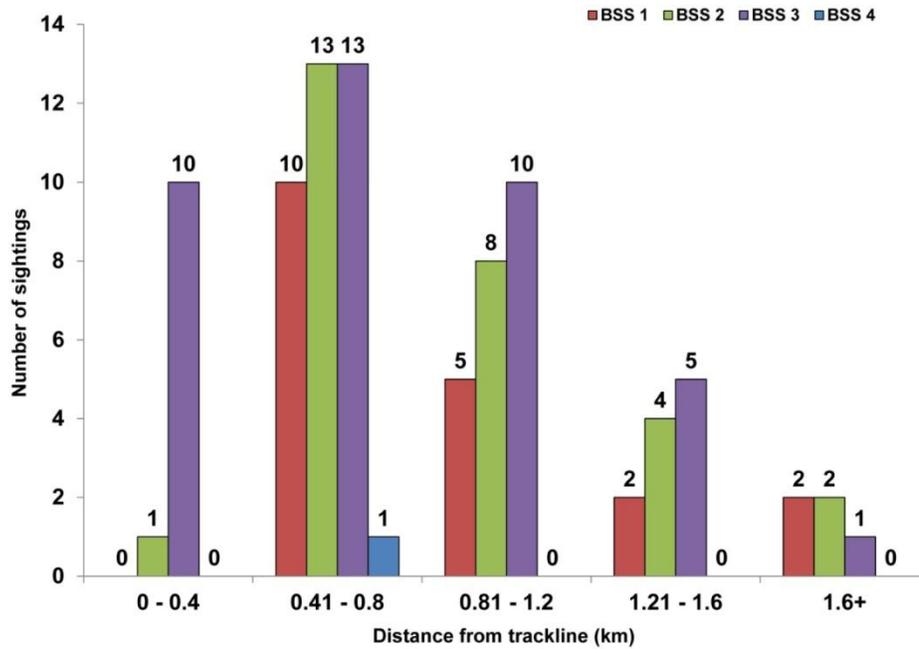


Figure 5a. Sighting distances by Beaufort Sea State for 87 of 100 on effort cetacean sightings from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

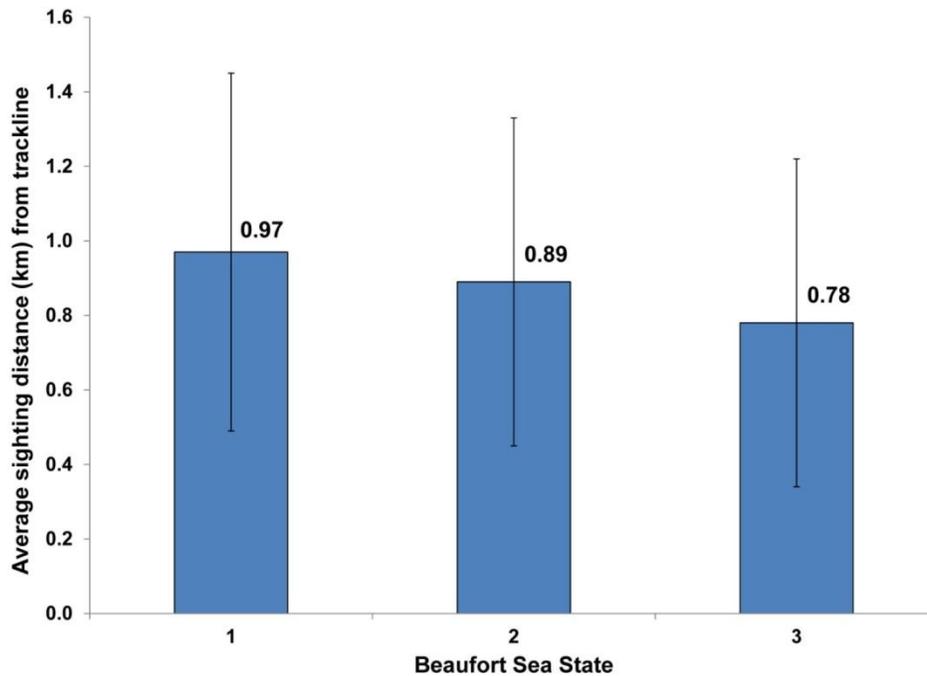


Figure 5b. Average sighting distances by Beaufort Sea State for 87 of 100 on effort cetacean sightings from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area. Error bars denote standard deviation for each category.

Marine Mammal Sightings

A total of 100 sightings of 1957 individual cetaceans representing ten species were observed while on effort during the reporting period. Two endangered species – humpback (*Megaptera novaeangliae*) and sperm (*Physeter macrocephalus*) whales – were encountered in the survey area. All identified species sighted are listed below in order of decreasing number of sightings (*i.e.* most commonly sighted species first). Four cetacean species had additional sightings that were recorded while off effort. These sightings are included in the below tables and maps for each species but are excluded from any calculations. A sighting was considered off effort if it occurred while transiting to or from the survey area or between tracklines. Any cetaceans the survey team encountered while investigating a separate sighting cue were also labeled off effort. If two species were seen associated with the same sighting cue both were considered on effort. Total number of individuals is based upon the best estimate of group size. Information on individual sighting summaries are in Appendix A. Daily sightings are summarized in Appendix B.

Bottlenose dolphin (*Tursiops truncatus*) (Table 4, Figure 6)

This species was the most commonly observed cetacean species with 46 sightings for 943 individuals. This species was observed during every month of survey effort during this reporting period. Group size ranged between three and 60 individuals (mean=17). One off effort sighting of 14 individuals was recorded on the offshore end of our survey area. The majority of sightings occurred at distances greater than 37 km from shore and in waters beyond the 100 m isobaths. Based upon the distance from shore (*i.e.* greater than 34 km), these bottlenose dolphins were most likely the offshore ecotype (Torres *et al.* 2003). Genetic analysis of biopsy samples (n=30) collected inside the survey area confirm that all dolphins sampled belong to the offshore ecotype (Swaim *et al.* 2013) The current best estimate of offshore bottlenose dolphin in the western Atlantic, between central Florida and Canada, is 81588 (CV=0.17) (Waring *et al.* 2008). The status of the offshore bottlenose dolphins stock in the Northwest Atlantic is unknown.

Table 4. Bottlenose dolphin (*Tursiops truncatus*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013. Asterisk denotes off effort sightings.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 30-Mar-13 | 11:33 | 4 | 35.283833 | -75.162713 | E | 32 | 3 | 90° | 3 |
| 30-Mar-13 | 11:38 | 7 | 35.236617 | -75.071242 | E | 32 | 3 | 90° | 12 |
| 30-Mar-13 | 12:58 | 21 | 35.115493 | -75.237638 | W | 29 | 3 | 90° | 53 |
| 28-May-13 | 14:27 | 50 | 35.556541 | -74.794313 | W | 37 | 3 | 90° | 26 |
| 28-May-13 | 14:34 | 54 | 35.554407 | -74.750403 | W | 37 | 2 | 90° | 18 |
| 28-May-13 | 15:04 | 66 | 35.764729 | -74.461337 | E | 40 | 2 | 100° | 19 |
| 28-May-13 | 16:02 | 83 | 35.903524 | -74.614975 | E | 42 | 2 | 90° | 18 |
| 16-Jul-13 | 10:53 | 5 | 34.511157 | -75.625345 | SE | 20 | 2 | 100° | 13 |
| 16-Jul-13 | 11:57 | 22 | 34.641013 | -75.518358 | SE | 22 | 3 | 100° | 18 |
| 16-Jul-13 | 14:46 | 38 | 36.126701 | -74.680803 | E | 45 | 2 | 90° | 25 |
| 16-Jul-13 | 15:08 | 44 | 36.048312 | -74.399638 | W | 44 | 1 | 90° | 35 |
| 16-Jul-13 | 16:39 | 74 | 35.902641 | -74.645998 | W | 42 | 1 | 100° | 15 |
| 17-Jul-13 | 9:31 | 12 | 35.826554 | -74.308735 | E | 41 | 1 | 90° | 14 |
| 18-Jul-13 | 9:22 | 90 | 35.128454 | -75.116241 | SE | 30 | 1 | 100° | 7 |
| 18-Jul-13 | 10:05 | 99 | 35.147892 | -75.044946 | NW | 31 | 1 | 90° | 9 |
| 18-Jul-13 | 11:15 | 117 | 35.249551 | -74.862564 | NW | 33 | 3 | 90° | 20 |
| 18-Jul-13 | 11:28 | 122 | 35.283093 | -75.020068 | NW | 33 | 2 | 60° | 20 |
| 18-Jul-13 | 13:25 | 138 | 35.772371 | -74.837177 | E | 40 | 2 | 90° | 12 |
| 18-Jul-13 | 14:12 | 157 | 35.480616 | -74.780087 | W | 36 | 2 | 90° | 12 |
| 18-Jul-13 | 14:39 | 167 | 35.421648 | -74.848720 | E | 35 | 2 | 90° | 20 |
| 18-Jul-13 | 14:44 | 171 | 35.402009 | -74.790934 | E | 35 | 1 | 90° | 15 |
| 18-Jul-13 | 15:31 | 186 | 35.348792 | -74.808742 | W | 34 | 3 | 90° | 17 |
| 20-Aug-13 | 12:09 | 22 | 35.627561 | -74.938017 | E | 38 | 2 | 90° | 6 |
| 20-Aug-13 | 12:32 | 28 | 35.635088 | -74.589241 | E | 38 | 2 | 90° | 4 |
| 20-Aug-13 | 13:01 | 36 | 35.695223 | -74.918406 | W | 39 | 1 | 90° | 5 |
| 20-Aug-13 | 16:19 | 83 | 35.918025 | -74.733924 | E | 42 | 3 | 90° | 8 |
| 20-Aug-13 | 16:23 | 87 | 35.895733 | -74.680760 | E | 42 | 3 | 60° | 33 |
| 21-Aug-13 | 9:24 | 9 | 36.055076 | -74.799332 | E | 44 | 2 | 90° | 4 |
| 21-Aug-13 | 10:06 | 32 | 36.119509 | -74.523369 | W | 45 | 1 | 90° | 26 |
| 21-Aug-13 | 10:53 | 47 | 35.411016 | -74.949978 | E | 35 | 1 | 90° | 7 |
| 21-Aug-13 | 14:50 | 83 | 34.701233 | -75.544753 | SE | 22 | 3 | 60° | 60 |
| 22-Aug-13 | 9:33 | 106 | 35.242160 | -74.895108 | E | 33 | 1 | 60° | 12 |
| 22-Aug-13 | 10:11 | 113 | 35.011683 | -74.595534 | W | 32 | 1 | 60° | 17 |
| 22-Aug-13 | 10:35 | 119 | 35.209608 | -74.996505 | W | 32 | 2 | 45° | 11 |
| 22-Aug-13 | 14:39 | 153 | 36.052323 | -74.659556 | W | 44 | 1 | 90° | 18 |
| 22-Aug-13 | 15:46 | 168 | 35.915245 | -74.662982 | W | 42 | 2 | 60° | 35 |
| 28-Oct-13 | 10:35 | 5 | 36.114021 | -74.689719 | E | 45 | 1 | 100° | 17 |
| 28-Oct-13 | 10:48 | 12 | 36.131832 | -74.525365 | E | 45 | 2 | 60° | 20 |
| 28-Oct-13 | 11:02 | 22 | 36.050359 | -74.410421 | W | 44 | 1 | 90° | 40 |
| 28-Oct-13 | 11:24 | 29 | 36.059610 | -74.960555 | W | 44 | 3 | 90° | 6 |
| 28-Oct-13 | 11:58 | 41 | 35.982661 | -74.545324 | E | 43 | 2 | 90° | 20 |
| 28-Oct-13 | 12:05 | 47 | 35.978777 | -74.446052 | E | 43 | 1 | 90° | 3 |
| 28-Oct-13 | 12:36 | 63 | 35.915063 | -74.780864 | W | 42 | 2 | 90° | 6 |
| 28-Oct-13 | 15:20 | 79 | 35.064253 | -75.154661 | SE | 29 | 2 | 120° | 11 |
| 28-Oct-13 | 15:29 | 83 | 35.005833 | -75.066890 | SE | 29 | 2 | 90° | 20 |
| 28-Oct-13 | 16:08 | 91 | 35.170267 | -75.423025 | NW | 28 | 3 | 110° | 4 |

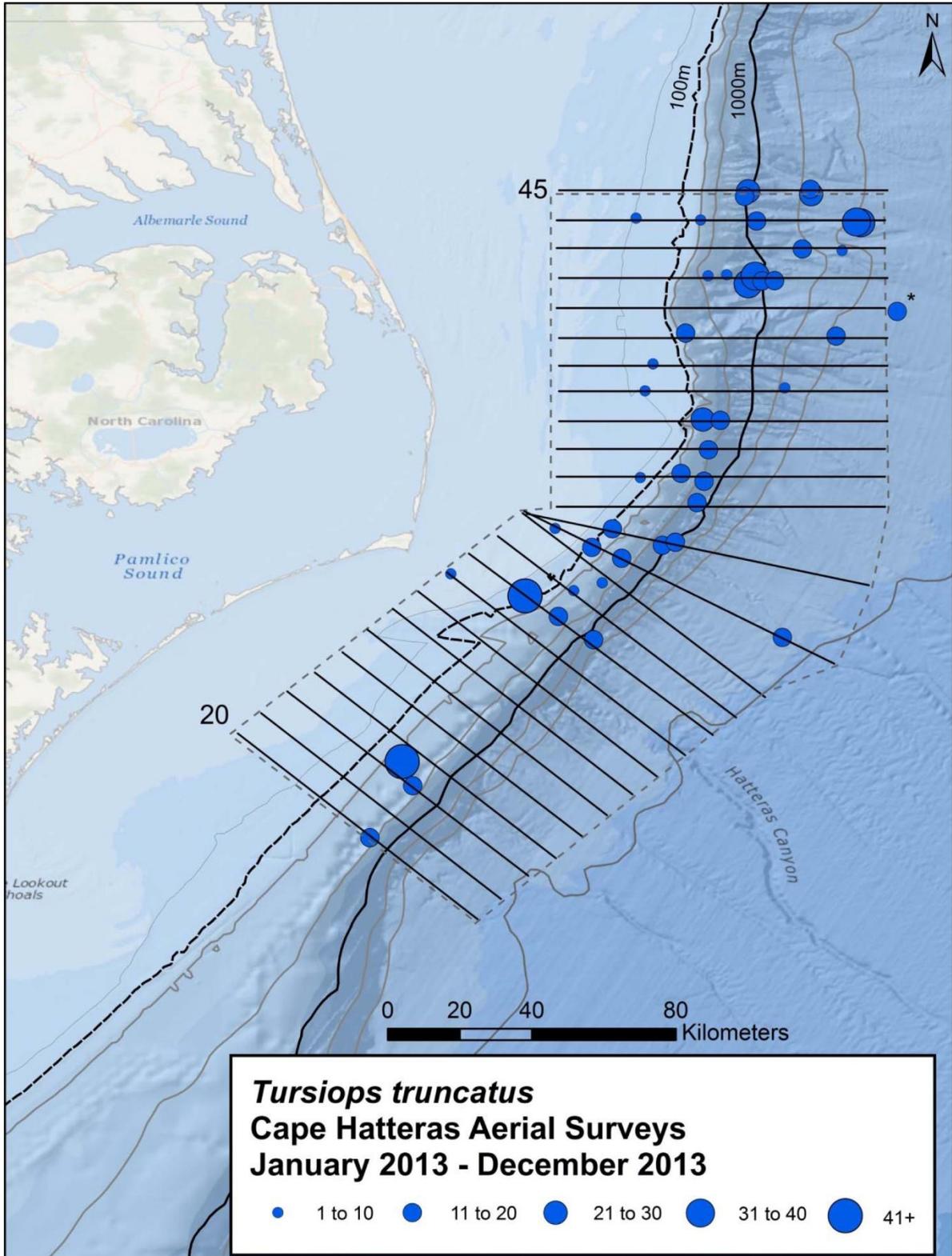


Figure 6. Bottlenose dolphin (*Tursiops truncatus*) sightings indicating group size. Asterisk denotes off effort sightings.

Short-finned pilot whale (*Globicephala macrorhynchus*) (Table 5, Figure 7)

This species was observed 18 times for a total of 252 individuals and was seen in four of the five months in which surveys were conducted. Group sizes ranged from one to 80 individuals (mean=14).

Sightings of pilot whales in the western North Atlantic occur primarily near the continental shelf break (Waring *et al.* 2010), and sightings in the Cape Hatteras survey area followed this pattern. Pilot whales were observed from the 100 m isobath to waters greater than 2000 m deep (Figure 7). As both species of *Globicephala* have been reported in the waters north of Cape Hatteras, careful examination of all photos was conducted to determine whether long-finned pilot whales (*Globicephala melas*) were encountered. All sightings were identified as *Globicephala macrorhynchus*. The difficulty of differentiating short-finned and long-finned pilot whales at sea results in NMFS reporting stock numbers and status for both species grouped as *Globicephala* spp. (Waring *et al.* 2011). The abundance estimate of *Globicephala* spp. (24674, CV=0.45) is based upon shipboard surveys along the outer continental shelf of the U.S. Atlantic between Florida and Maryland in 2004 (Waring *et al.* 2011). These estimates were combined with spatial distribution analysis, as well as genetic analyses, to generate the current value of 24674. The status of short-finned pilot whales in the U.S. Atlantic is currently unknown (Waring *et al.* 2011).

Table 5. Short-finned pilot whale (*Globicephala macrorhynchus*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 10:26 | 12 | 34.979820 | -74.915520 | NW | 30 | 2 | 100° | 6 |
| 28-May-13 | 12:15 | 32 | 35.350653 | -74.402770 | E | 34 | 2 | 90° | 4 |
| 28-May-13 | 15:35 | 75 | 35.827554 | -74.859116 | W | 41 | 2 | 90° | 80 |
| 16-Jul-13 | 15:25 | 48 | 36.047800 | -74.784396 | W | 44 | 2 | 90° | 10 |
| 16-Jul-13 | 16:48 | 78 | 35.904796 | -74.791456 | W | 42 | 1 | 90° | 8 |
| 18-Jul-13 | 13:23 | 137 | 35.777435 | -74.832254 | E | 40 | 2 | 90° | 16 |
| 18-Jul-13 | 14:49 | 175 | 35.411805 | -74.695952 | E | 35 | 1 | 90° | 12 |
| 20-Aug-13 | 12:33 | 29 | 35.630449 | -74.595169 | E | 38 | 2 | 90° | 2 |
| 20-Aug-13 | 15:10 | 51 | 35.769053 | -74.776011 | E | 40 | 3 | 90° | 2 |
| 20-Aug-13 | 15:14 | 54 | 35.769931 | -74.728976 | E | 40 | 2 | 90° | 13 |
| 20-Aug-13 | 15:44 | 68 | 35.827280 | -74.780002 | W | 41 | 3 | 100° | 8 |
| 20-Aug-13 | 16:49 | 94 | 35.987213 | -74.734562 | W | 43 | 1 | 90° | 19 |
| 21-Aug-13 | 10:17 | 38 | 36.115082 | -74.754407 | W | 45 | 2 | 90° | 11 |
| 22-Aug-13 | 13:59 | 142 | 36.125361 | -74.412052 | E | 45 | 2 | 90° | 40 |
| 28-Oct-13 | 10:41 | 6 | 36.118893 | -74.692822 | E | 45 | 1 | 100° | 8 |
| 28-Oct-13 | 11:51 | 37 | 35.969512 | -74.602950 | E | 43 | 4 | 90° | 1 |
| 28-Oct-13 | 12:33 | 58 | 35.903083 | -74.685450 | W | 42 | 2 | 90° | 6 |
| 28-Oct-13 | 12:39 | 64 | 35.914425 | -74.781194 | W | 42 | 2 | 90° | 6 |

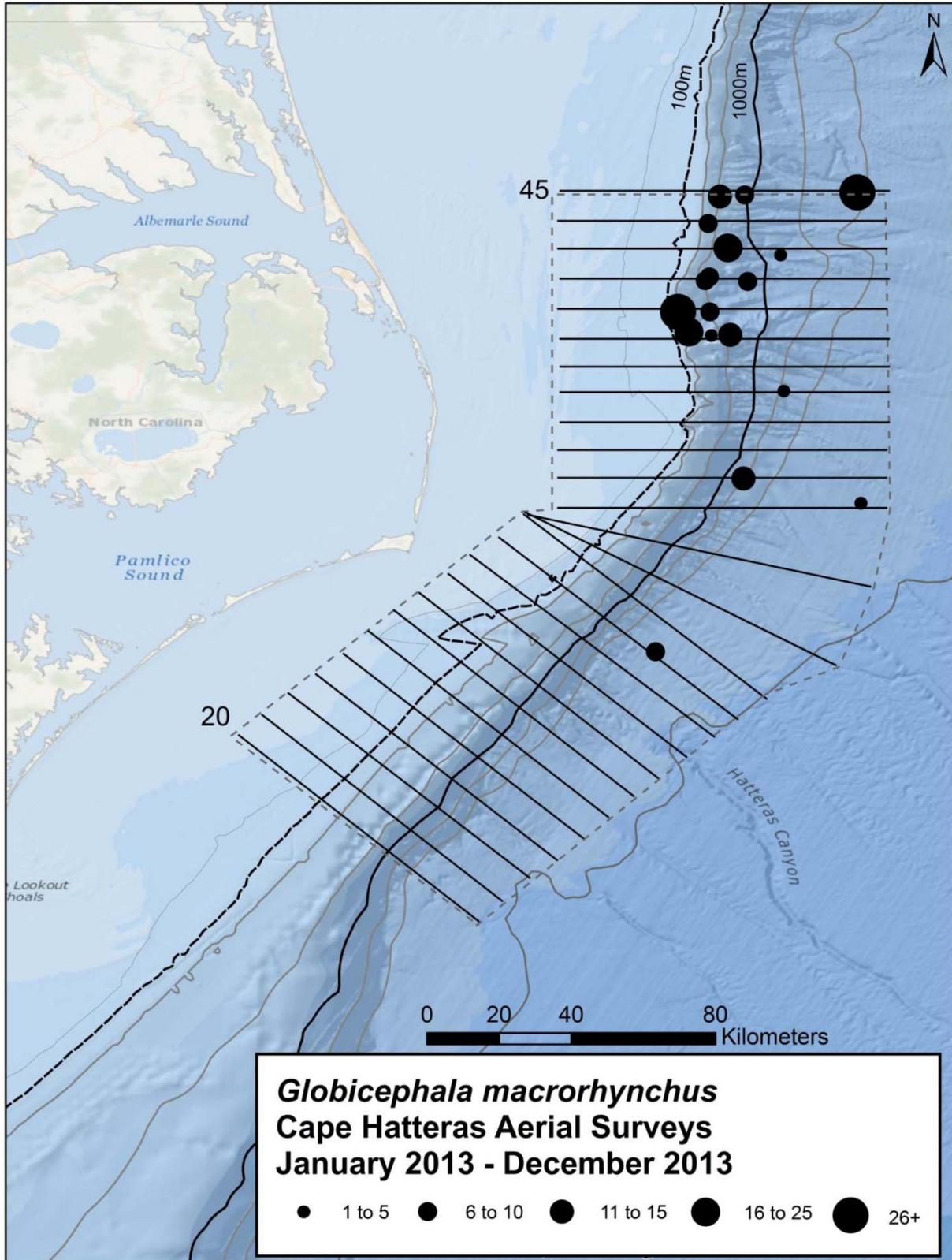


Figure 7. Short-finned pilot whale (*Globicephala macrorhynchus*) sightings indicating group size.

Atlantic spotted dolphin (*Stenella frontalis*) (Table 6, Figure 8)

Nine sightings of 563 individuals were observed while on effort in the Cape Hatteras survey area. Group size ranged between six and 225 (mean=62). There are two distinct forms, or ecotypes, of the Atlantic spotted dolphin in the western north Atlantic: a heavily spotted, larger form that typically occurs on the continental shelf and is most often encountered around the 200 m isobath or shallower water, and a less spotted and smaller form that occurs further offshore and around islands (Perrin *et al.* 1987, 1994). Examination of photos collected during each sighting and the animals' physical location in both shallow and deep waters suggests both ecotypes are present within the survey area. The abundance estimate for *S. frontalis* in the western north Atlantic is 26798 (CV=0.66); the status of the stock(s) is/are unknown (Waring *et al.* 2012).

Table 6. Atlantic spotted dolphin (*Stenella frontalis*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 16-Jul-13 | 16:00 | 62 | 35.982496 | -74.808348 | E | 43 | 2 | 90° | 75 |
| 20-Aug-13 | 11:05 | 5 | 35.479552 | -75.122299 | E | 36 | 2 | 90° | 10 |
| 20-Aug-13 | 12:01 | 18 | 35.618659 | -75.000186 | E | 38 | 2 | 45° | 48 |
| 20-Aug-13 | 15:56 | 73 | 35.837502 | -75.040347 | W | 41 | 1 | 90° | 35 |
| 21-Aug-13 | 9:28 | 13 | 36.060786 | -74.756754 | E | 44 | 3 | 90° | 150 |
| 21-Aug-13 | 11:33 | 58 | 35.335280 | -75.071666 | W | 34 | 2 | 90° | 8 |
| 21-Aug-13 | 13:45 | 66 | 34.736882 | -75.885247 | SE | 20 | 2 | 90° | 6 |
| 21-Aug-13 | 14:30 | 76 | 34.784271 | -75.833001 | NW | 21 | 2 | 60° | 6 |
| 28-Oct-13 | 12:23 | 53 | 35.905673 | -74.423186 | W | 42 | 3 | 100° | 225 |

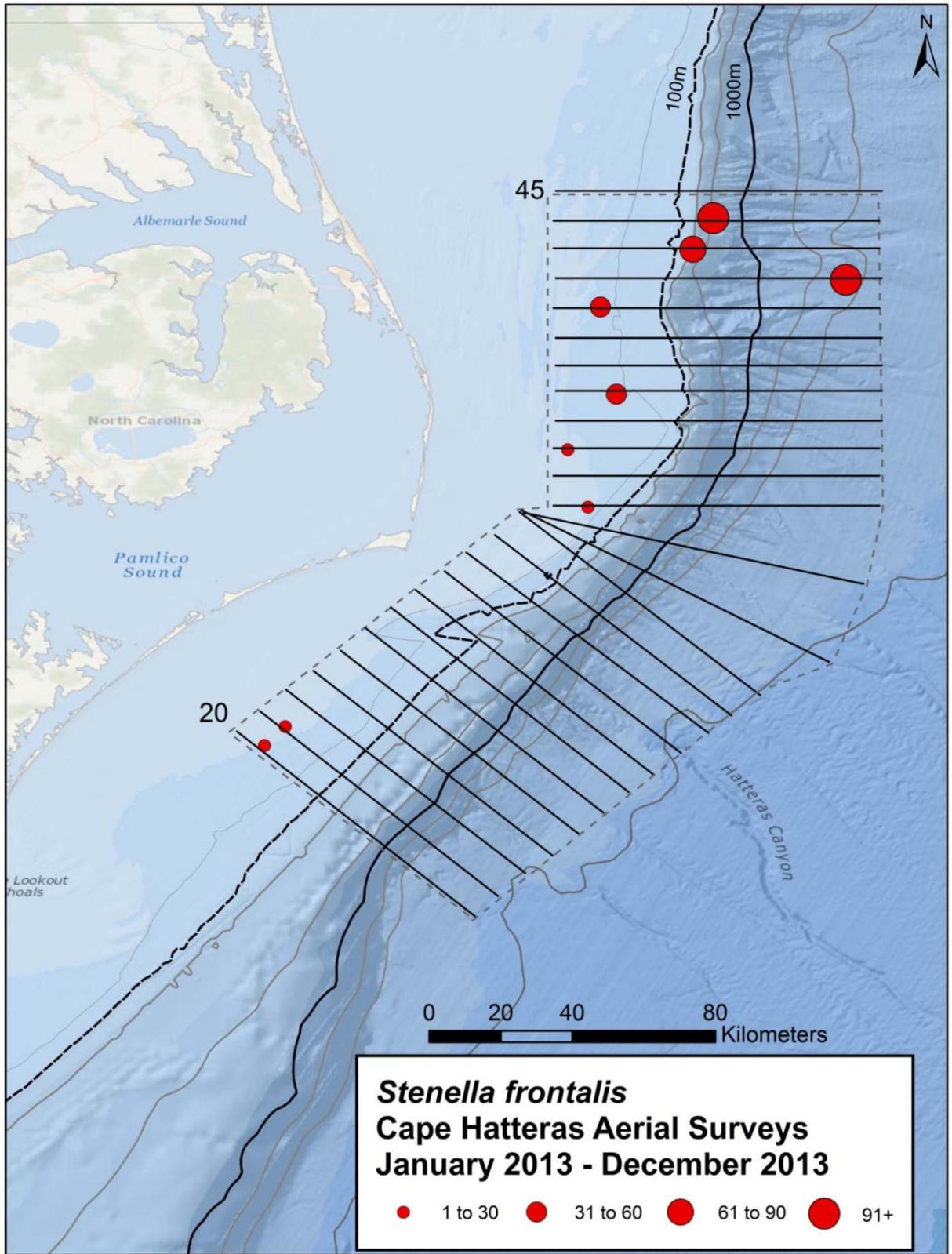


Figure 8. Atlantic spotted dolphin (*Stenella frontalis*) sightings indicating group size.

Sperm whale (*Physeter macrocephalus*) (Table 7, Figure 9)

This species was observed four times, for a total of seven individuals while on effort, and was seen in three of the five months surveyed this reporting period. Group size ranged between one and four individuals. All sightings were recorded beyond the continental shelf, in depths greater than 1000m. Three additional off effort sightings of this species were recorded this year all located in the waters beyond our survey area. On May 28, a trio of adult animals was observed offshore of trackline 39. On August 22, off of trackline 44, we observed a large disturbance caused by a breach a single adult sperm whale. Shortly after breaking from this sighting a group of two adult sperm whales and a mom-calf pair were observed while transiting back to the survey site. The adult female and calf stayed in close proximity to each other and the calf was observed moving into a suckling positioning multiple times. All animals remained at the surface and close to one another throughout our observations. Sperm whales are listed as endangered under the Endangered Species Act, and the current best population estimate for the species, based upon survey effort from North Carolina to the southern Bay of Fundy, is 1593 (CV=0.36) (Waring *et al.* 2012).

*Table 7. Sperm whale (*Physeter macrocephalus*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013. Asterisk denotes off effort sightings.*

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 10:58 | 20 | 35.108432 | -74.952876 | SE | 31 | 1 | 90° | 1 |
| 28-May-13 | 14:54 | 63 | 35.710991 | -74.297119 | N | | 3 | 90° | 3 * |
| 18-Jul-13 | 11:15 | 117 | 35.249551 | -74.862564 | NW | 33 | 3 | 90° | 1 |
| 21-Aug-13 | 9:57 | 24 | 36.129123 | -74.349572 | W | 45 | 3 | 90° | 1 |
| 21-Aug-13 | 10:02 | 28 | 36.122438 | -74.462890 | W | 45 | 2 | 60° | 4 |
| 22-Aug-13 | 14:21 | 147 | 36.050282 | -74.255742 | E | | 3 | 90° | 1 * |
| 22-Aug-13 | 14:23 | 149 | 36.050945 | -74.282777 | E | | 3 | 90° | 4 * |

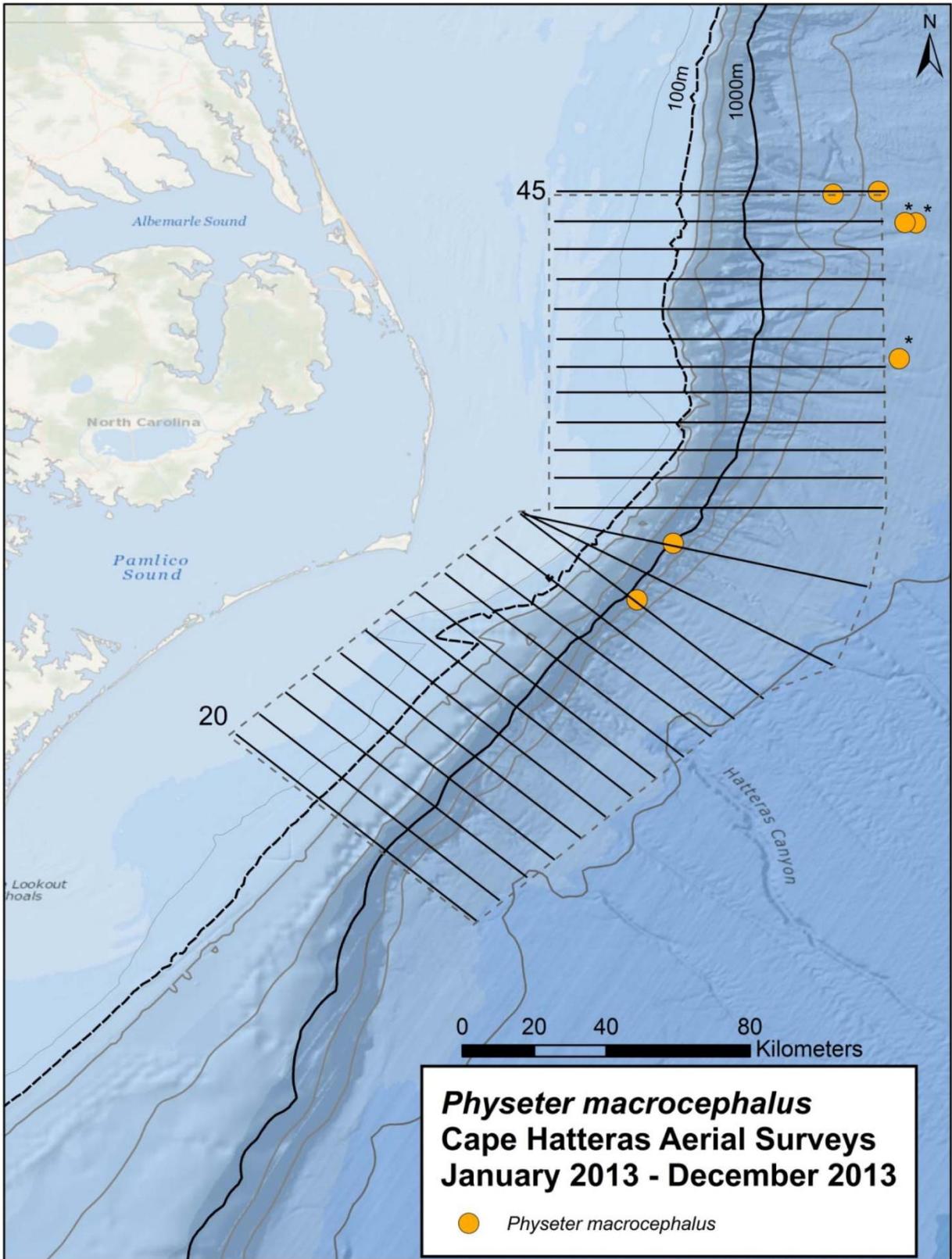


Figure 9. Sperm whale (*Physeter macrocephalus*) sightings. Asterisk denotes off effort sightings.

Risso's dolphin (*Grampus griseus*) (Table 8, Figure 10)

This species was encountered five times while on effort for a total of 90 individuals (Figure 10). Group size for this species ranged from 4 to 50 individuals (mean=20). One additional off effort sighting was made on the offshore end of trackline 44. Risso's dolphins were recorded in three of the five months surveyed, and were sighted from inside the 100m isobath to greater than 2000m. Risso's dolphins have been found along the mid-Atlantic continental shelf edge year round, with some movement north during spring, summer and fall, and into the mid-Atlantic Bight during winter (Waring *et al.* 2011). The best available estimate for Risso's dolphins, based on results from two US Atlantic surveys conducted in 2011, is 15197 (CV=0.55) (Waring *et al.* 2012). Data are currently insufficient to determine the population trend for this species in the western Atlantic (Waring *et al.* 2012).

Table 8. Risso's dolphin (*Grampus griseus*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013. Asterisk denotes off effort sightings.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 10:35 | 15 | 35.055930 | -75.018661 | NW | 30 | 2 | 100° | 4 |
| 28-May-13 | 11:40 | 26 | 35.266043 | -74.939789 | W | 33 | 2 | 45° | 7 |
| 16-Jul-13 | 15:34 | 52 | 36.051731 | -74.859693 | W | 44 | 2 | 90° | 23 |
| 18-Jul-13 | 15:40 | 190 | 35.339014 | -74.920563 | W | 34 | 2 | 90° | 50 |
| 21-Aug-13 | 9:52 | 20 | 36.072366 | -74.313114 | E | 44 | | | 30 |
| 22-Aug-13 | 11:01 | 124 | 35.107765 | -74.948416 | SE | 31 | 1 | 90° | 6 |

*

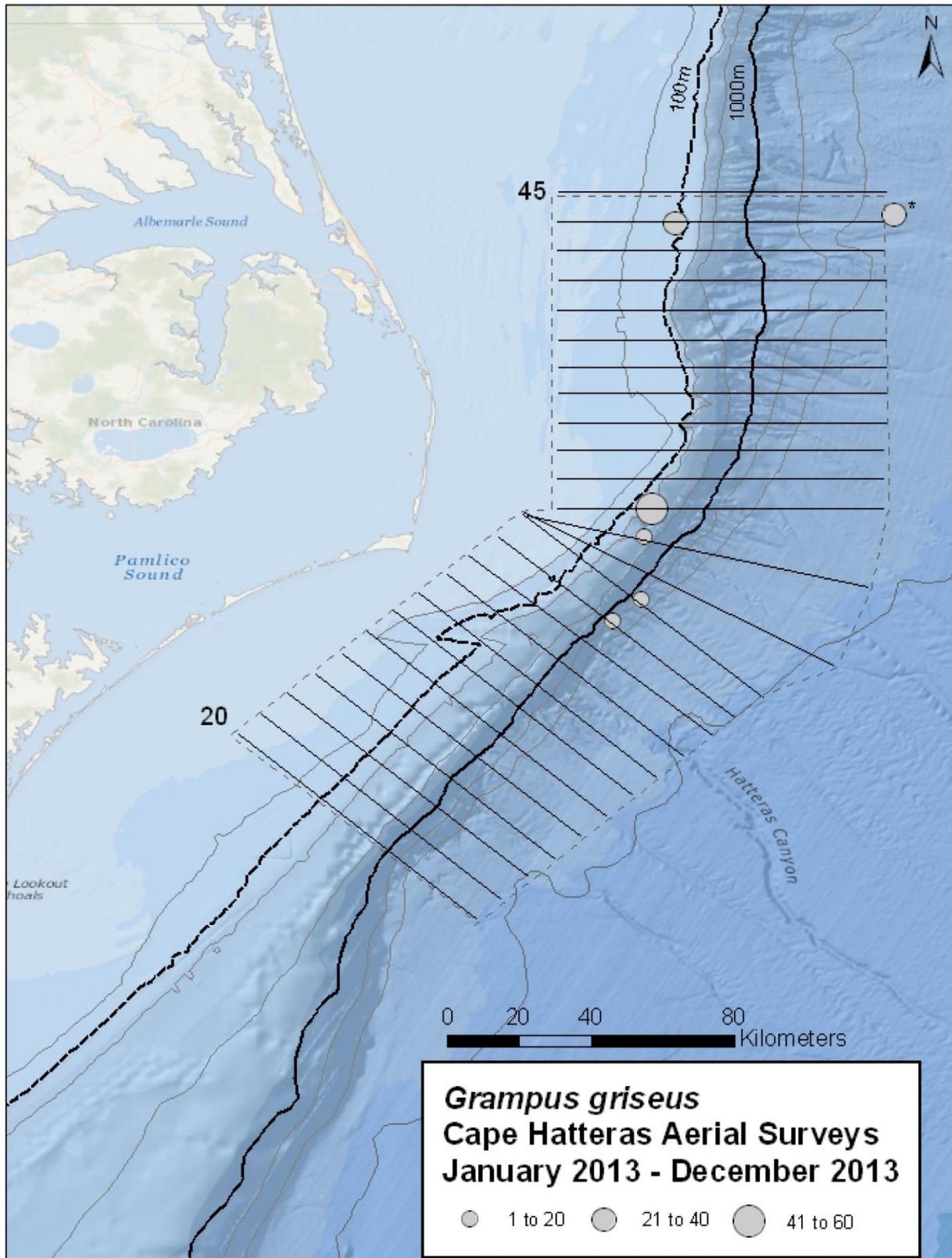


Figure 10. Risso's dolphin (*Grampus griseus*) sightings indicating group size.

Cuvier's beaked whale (*Ziphius cavirostris*) (Table 9, Figure 11)

Five sightings of 14 individuals occurred while on effort in the Cape Hatteras survey area, and this species was observed in three of the five months in which surveys were conducted. Group sized ranged from pairs up to four individuals. Sighting occurred from just inshore the 1000m isobaths out to 2000m. The best estimate for population size for this species, based upon 2011 survey data, is 4962 (CV=0.37). Data are currently insufficient to determine the population trend for this species in the western Atlantic (Waring *et al.* 2012).

*Table 9. Cuvier's beaked whale (*Ziphius cavirostris*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.*

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 30-Mar-13 | 12:03 | 9 | 35.176384 | -74.961141 | E | 32 | 3 | 90° | 2 |
| 28-May-13 | 14:47 | 59 | 35.544498 | -74.344333 | W | 37 | 2 | 90° | 3 |
| 16-Jul-13 | 16:15 | 66 | 35.990592 | -74.708755 | E | 43 | 3 | 45° | 4 |
| 18-Jul-13 | 14:01 | 147 | 35.491165 | -74.721264 | W | 36 | 2 | 60° | 2 |
| 18-Jul-13 | 14:05 | 151 | 35.480761 | -74.740742 | W | 36 | 1 | 90° | 3 |

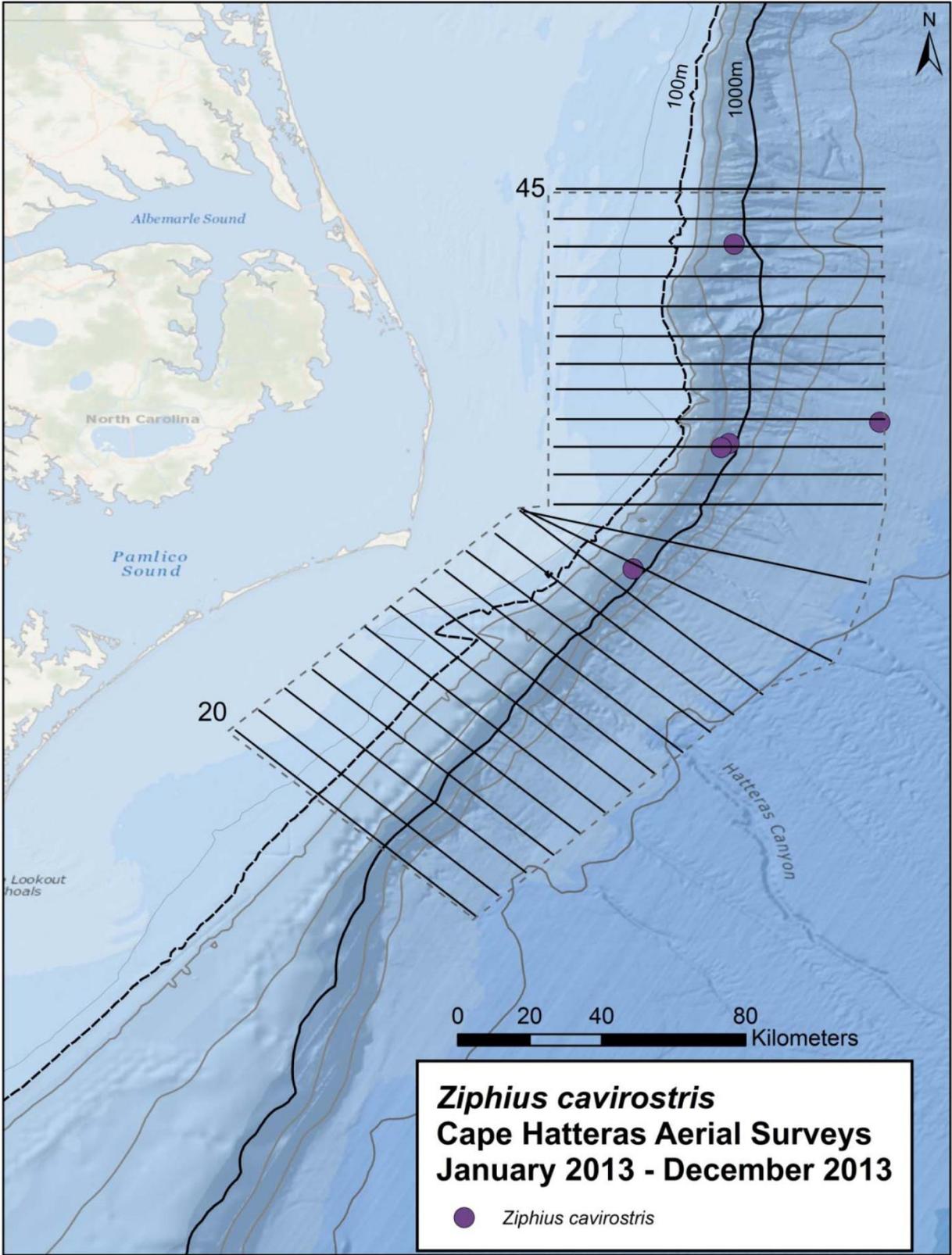


Figure 11. Cuvier's beaked whale (*Ziphius cavirostris*) sightings.

Beaked whale (*Mesoplodon* spp.) (Table 10, Figure 12)

On four occasions animals were identified as beaked whales but were determined not to be either Gervais' beaked whales (*Mesoplodon europaeus*) or *Z. cavirostris*. Since no species ID could be established they are listed here as *Mesoplodon* spp. Sightings occurred from just inside the 1000m isobaths to waters greater than 2000m. The difficulty in differentiating the various species of mesoplodont whales has led NMFS to create a single combined stock estimate for all species in the western Atlantic. Surveys conducted in 2004 from Maryland to Florida resulted in an estimate abundance at 674 animals (CV=0.36). The status of the various beaked whales stock in the Northwest Atlantic is unknown (Waring *et al.* 2012).

Table 10. Unidentified *Mesoplodon* species sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 10:04 | 6 | 34.887077 | -74.927528 | SE | 29 | 1 | 120° | 3 |
| 28-May-13 | 12:36 | 42 | 35.411508 | -74.464577 | W | 35 | 2 | 90° | 2 |
| 18-Jul-13 | 14:07 | 154 | 35.481844 | -74.772154 | W | 36 | 1 | 90° | 2 |
| 18-Jul-13 | 15:12 | 181 | 35.339282 | -74.363218 | W | 34 | 1 | 90° | 2 |

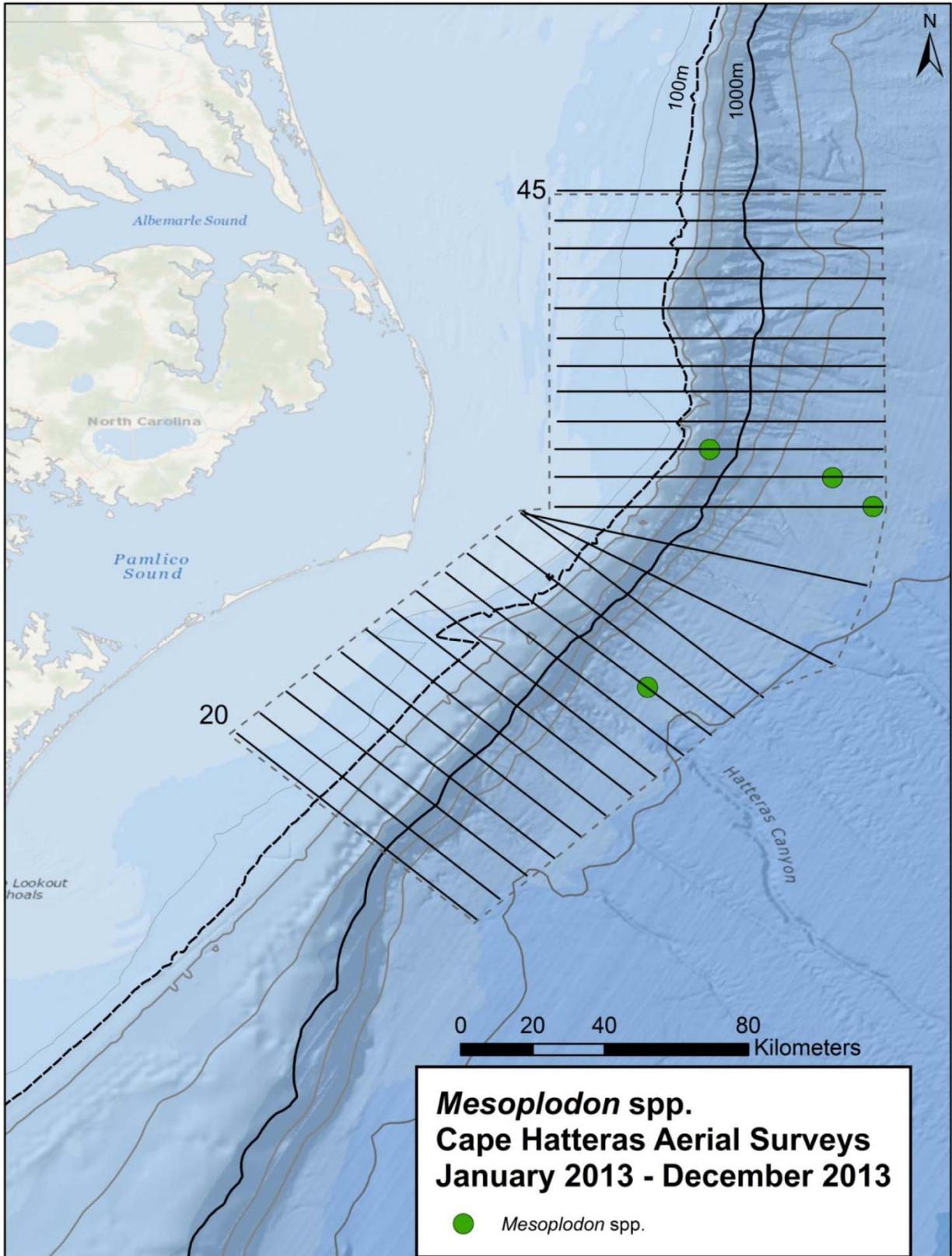


Figure 12. Unidentified *Mesoplodon* species sightings.

Gervais beaked whale (*Mesoplodon europaeus*) (Table 11, Figure 13)

This year the examination of all of our beaked whale sightings allowed for three sightings to be classified to species as Gervais' beaked whales (*Mesoplodon europaeus*). The position of erupted teeth in one adult male animal sighted was used for species identification; these images were compared to those collected during other beaked whale encounters resulting in two more groups being labeled as Gervais beaked whales. As noted above NMFS gives a single combined stock estimate for all species in the western Atlantic. The status of the various beaked whales stock in the Northwest Atlantic is unknown (Waring *et al.* 2009).

Table 11. Gervais' beaked whale (Mesoplodon europaeus) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 12:23 | 38 | 35.414108 | -74.368509 | W | 35 | 2 | 45° | 2 |
| 16-Jul-13 | 11:03 | 10 | 34.430081 | -75.532243 | SE | 20 | 3 | 90° | 4 |
| 18-Jul-13 | 10:29 | 109 | 35.190215 | -74.956620 | SE | 32 | 2 | 90° | 5 |

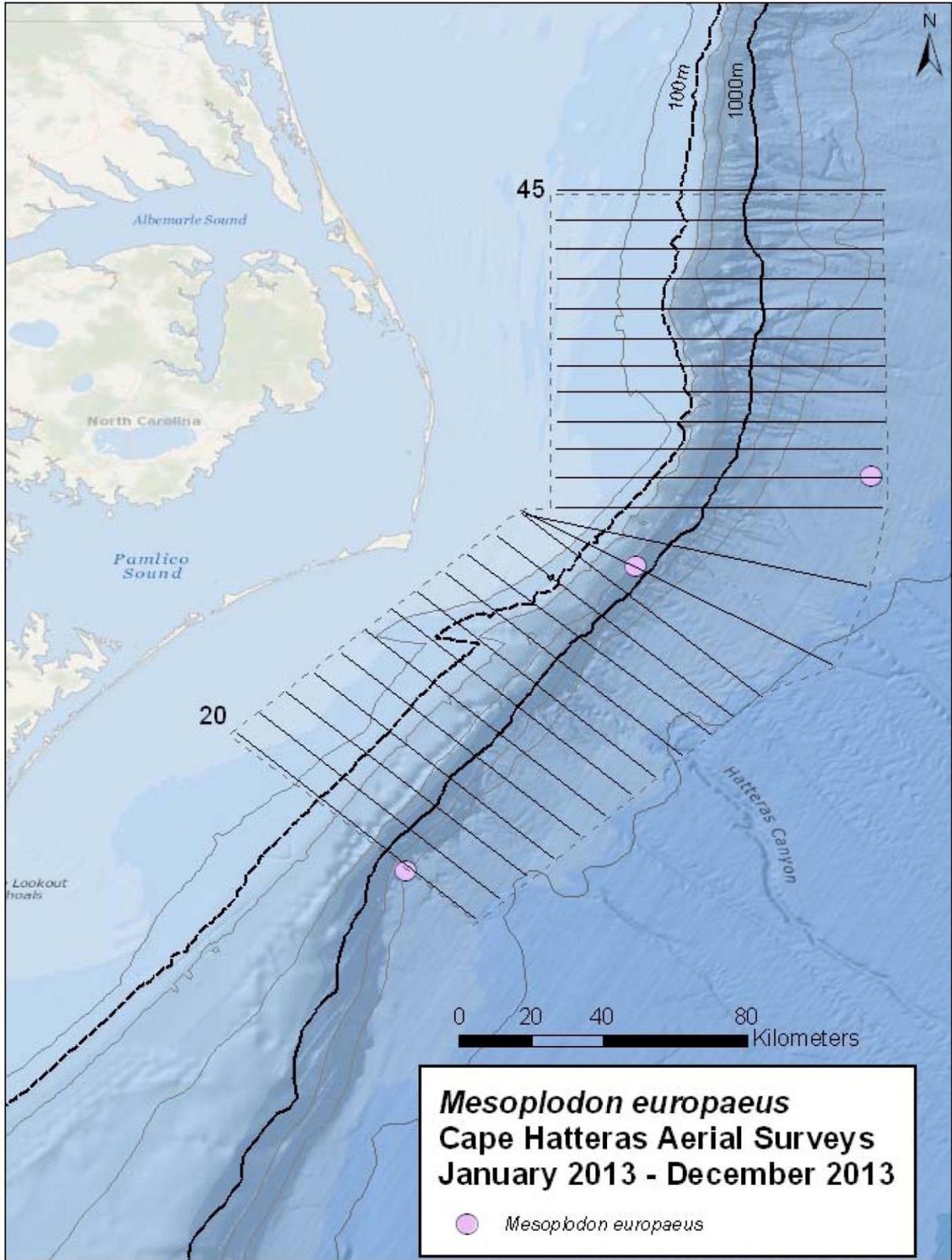


Figure 13. Gervais' beaked whale (*Mesoplodon europaeus*) sightings.

Common dolphin (*Delphinus delphis*) (Table 12, Figure 14)

Three sightings of 206 individuals of common dolphins were observed between the 100m and 1000m isobath. Group sizes were highly variable; two groups had fewer than 20 animals while the third contained 180 individuals. The current best estimate of common dolphins in the western Atlantic Ocean is 67191 (0.29 CV) based upon 2011 survey efforts (Waring *et al.* 2012). NOAA has stated that there are no trend analyses completed for this species. The status of the common dolphins stock in the Northwest Atlantic is unknown.

Table 12. Common dolphin (*Delphinus delphis*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 30-Mar-13 | 12:03 | 10 | 35.177930 | -74.959396 | E | 32 | 3 | 90° | 16 |
| 30-Mar-13 | 12:49 | 19 | 35.061714 | -75.163866 | W | 29 | 3 | 90° | 10 |
| 28-May-13 | 16:13 | 87 | 35.900667 | -74.736156 | E | 42 | 2 | 90° | 180 |

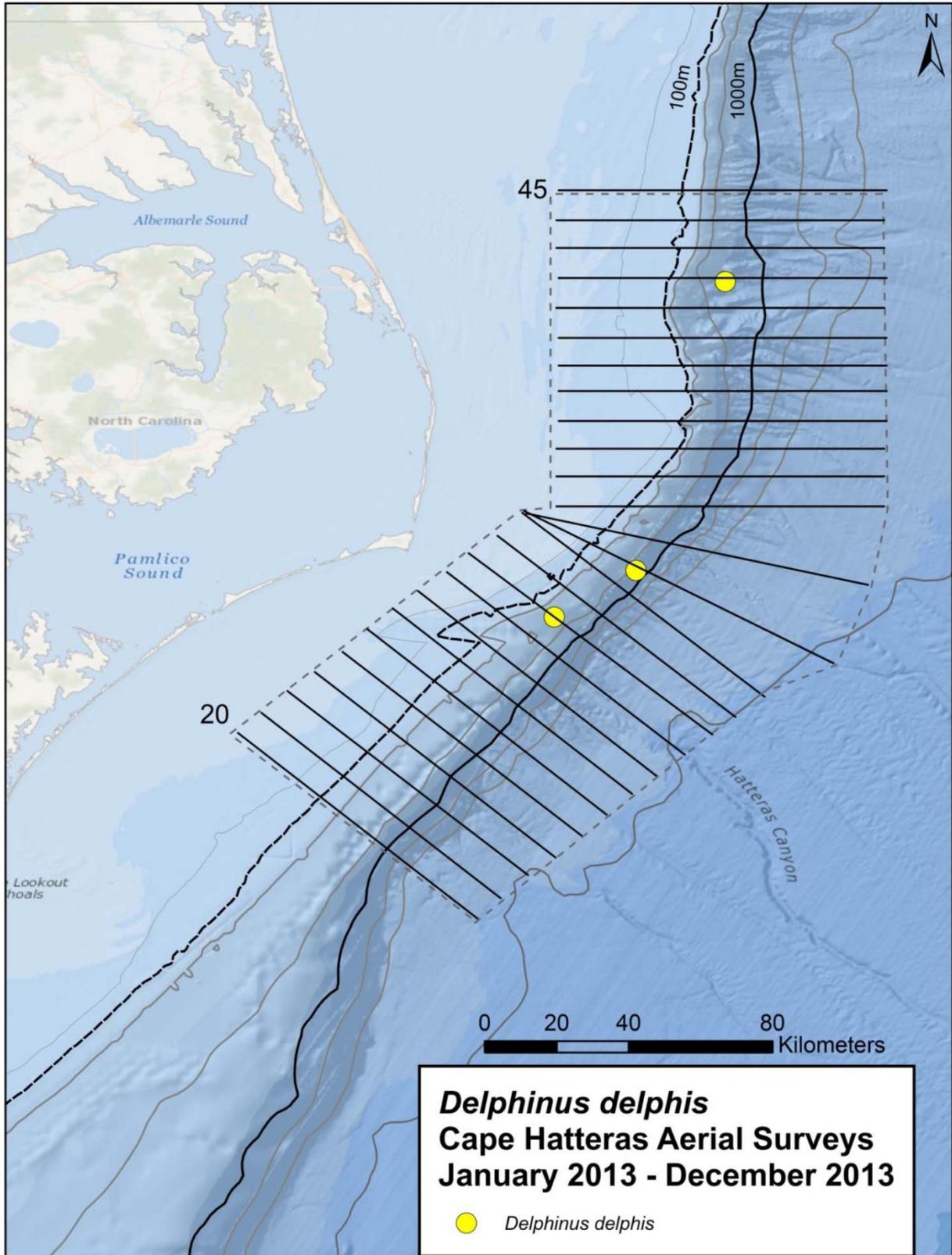


Figure 14. Common dolphin (*Delphinus delphis*) sightings.

Humpback whale (*Megaptera novaeangliae*) (Table 13, Figure 15)

A single on effort sighting of two pairs of humpback whales was recorded over the continental shelf. One animal in each pair breached multiple times followed by periods out of sight below the surface. Two off effort sightings, both of single animals, were recorded between tracklines on the inshore portion of the survey area. Currently, humpback whales in the western North Atlantic are treated as a single stock despite genetic evidence identifying smaller sub-stocks (Waring *et al.* 2012). Population estimates vary depending upon methods utilized, and range between 7698 (genetic tagging methods) and 11570 (photographic mark-recapture methods) (reviewed in Waring *et al.* 2012). This species is listed as endangered under the Endangered Species Act.

Table 13. Humpback whale (*Megaptera novaeangliae*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013. Asterisk denotes off effort sightings.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 30-Mar-13 | 11:06 | 2 | 35.204615 | -75.461175 | | | 2 | 90° | 1 * |
| 30-Mar-13 | 11:42 | 9 | 35.222878 | -75.038577 | E | 32 | 4 | 90° | 4 |
| 30-Mar-13 | 13:08 | 24 | 35.215145 | -75.378190 | W | 29 | 3 | 90° | 1 * |

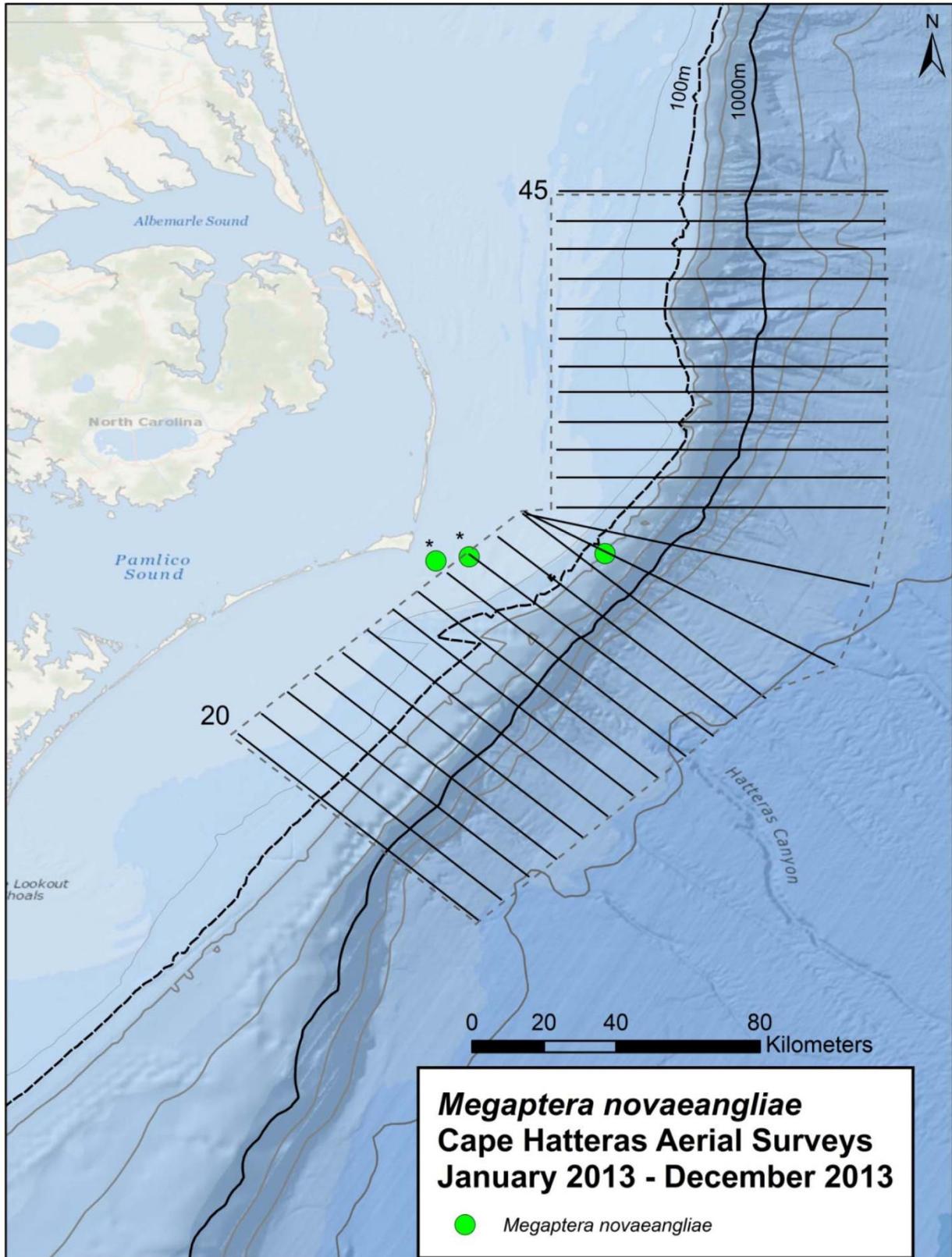


Figure 15. Humpback whale (*Megaptera novaeangliae*) sightings.

Minke whale (*Balaenoptera acutorostrata*) (Table 14, Figure 16)

A single minke whale was observed in the 70m of water in August of this year. This sighting is unique as all previous minke sightings have occurred in colder months and have been seen in waters greater than 2000m. Minke whales inhabiting waters off the U.S. east coast are considered part of the Canadian East Coast stock, which occurs from the western portion of the Davis Strait (45°W) south to the Gulf of Mexico. The best available abundance estimate for this stock is 20741 (CV=0.30) (Waring *et al.* 2012).

Table 14. Minke whale (*Balaenoptera acutorostrata*) sighting in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 20-Aug-13 | 14:46 | 47 | 35.768810 | -74.929746 | E | 40 | 2 | 100° | 1 |

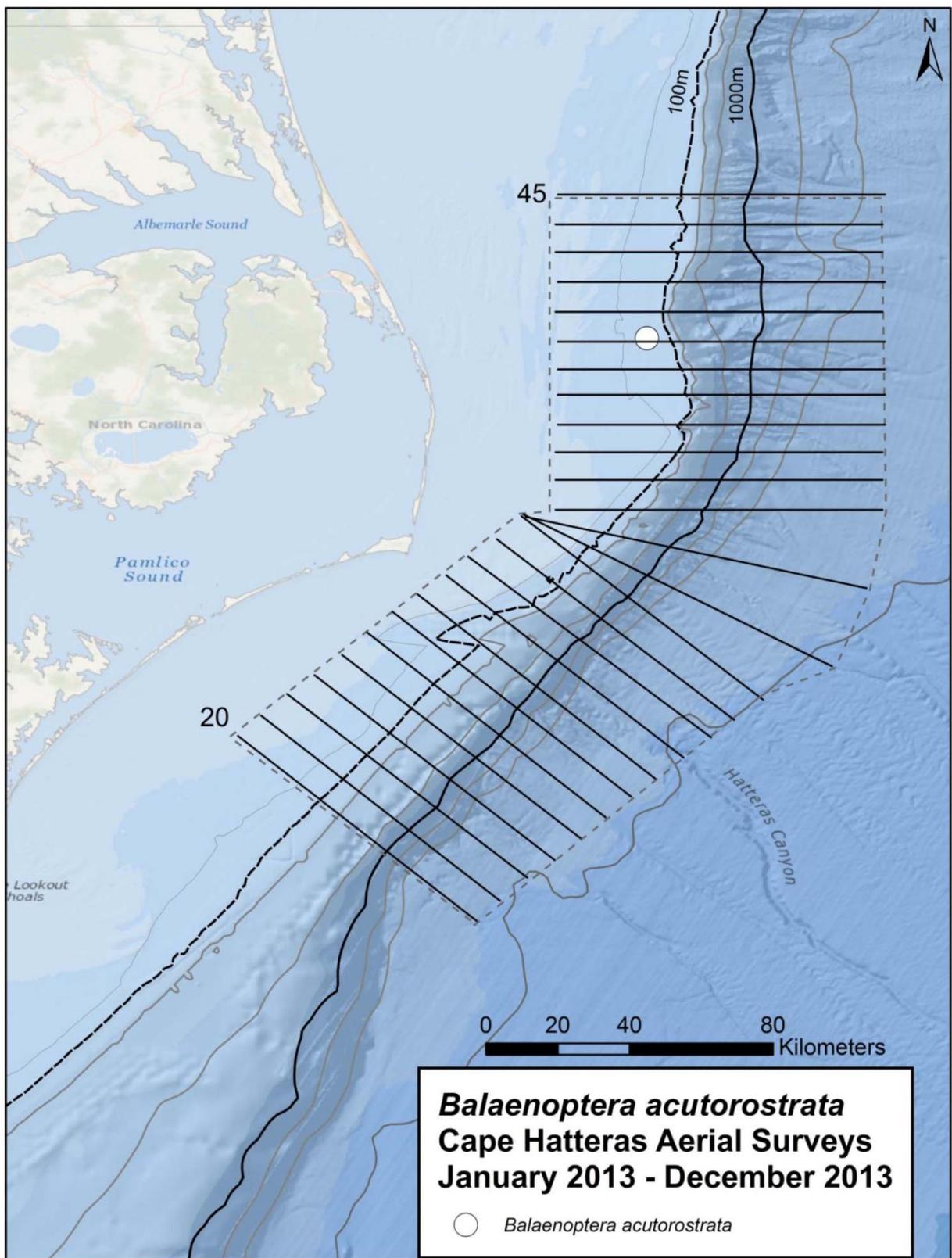


Figure 16. Minke whale (*Balaenoptera acutorostrata*) sighting.

Sea Turtles (Tables 15 & 16, Figures 17a-c and 18)

Fifty sea turtles were observed during the reporting period. Sighting rates were negatively correlated with Beaufort Sea State, with rates sharply declining at sea states greater than BSS 2 (Figures 17a-b). Sea turtles were recorded in every month surveyed except March; with July, August and October having roughly equivalent sighting rates (Figure 17c). Loggerhead sea turtles (*Caretta caretta*) represented the majority of sea turtle sightings (84%). The only other sea turtle species that was identified in the Cape Hatteras survey site was the leatherback sea turtle (*Dermochelys coriacea*) (14%). For the remaining 2% of sightings, species identification could not be made with 100% certainty and they are, therefore, listed as “unidentified sea turtles”.

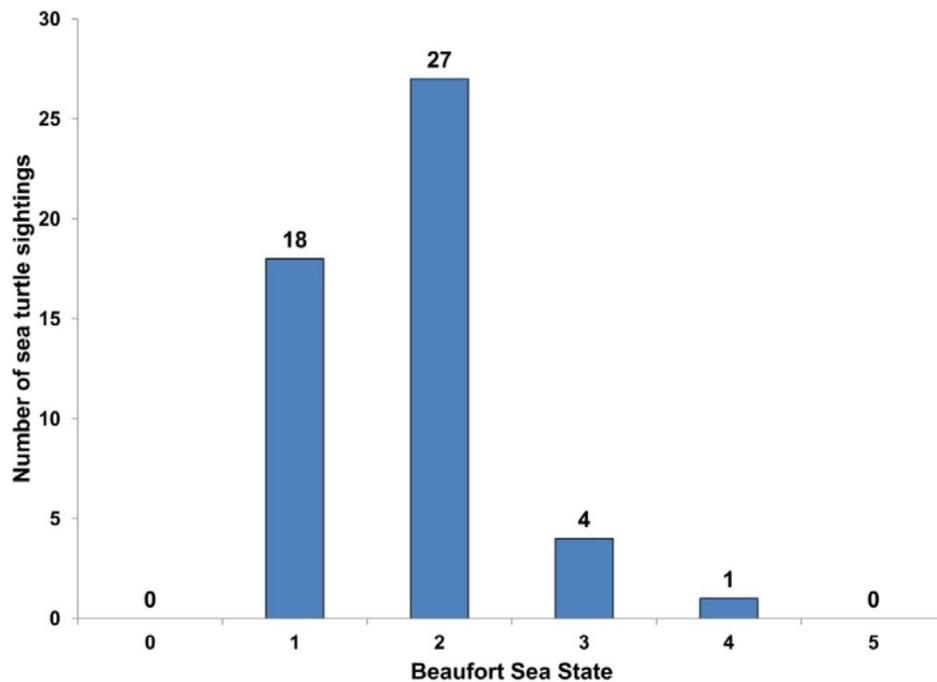


Figure 17a. Total number of sea turtle sightings by Beaufort Sea State in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

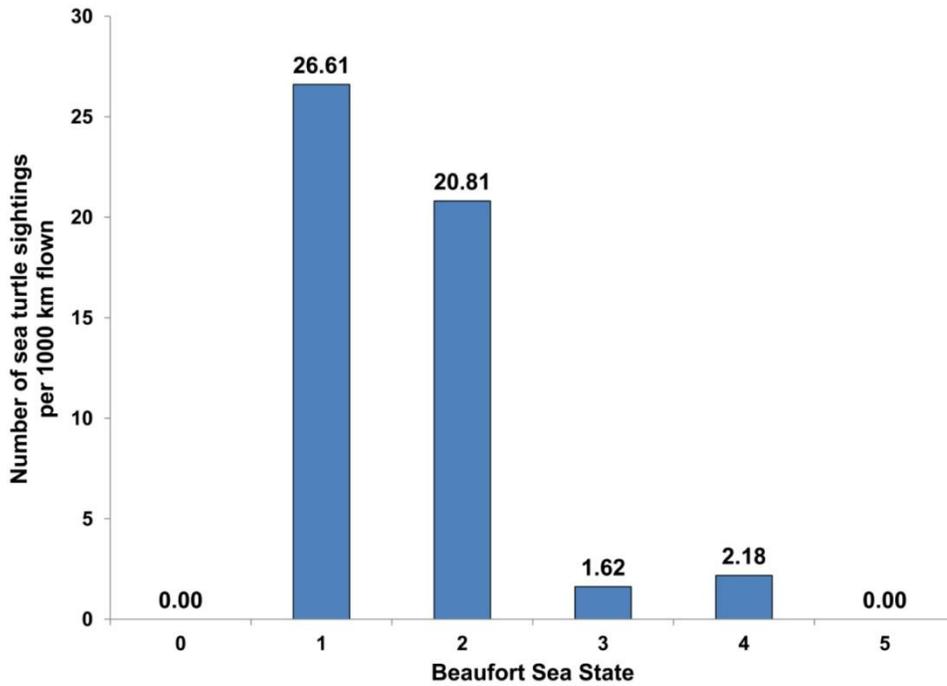


Figure 17b. Sea turtle sightings per 1000 km flown by Beaufort Sea State in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

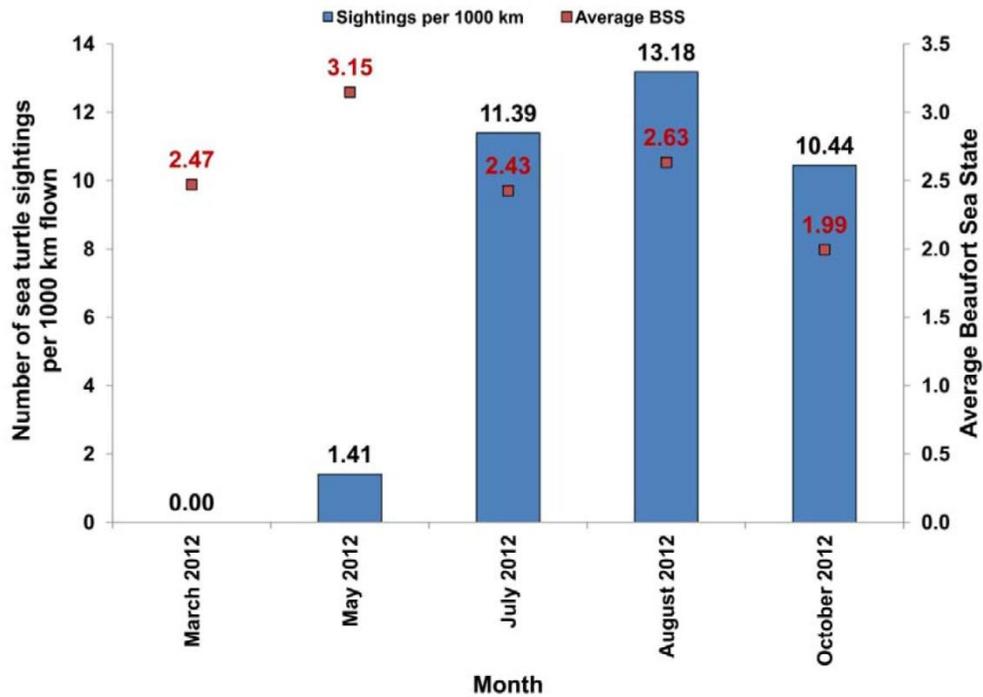


Figure 17c. Sea turtle sightings per 1000 km surveyed and the average Beaufort Sea State per month in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

Loggerhead sea turtle (*Caretta caretta*)(Table 15, Figure 18)

Sightings of loggerhead sea turtles occurred in three of the five months surveyed, for a total of 42 animals. The vast majority of sightings were over the continental shelf inside of the 100m isobath. For management purposes, loggerheads along the U.S. Atlantic east coast fall into the Northwest Atlantic Ocean distinct population segment (DPS), which is separated into five separate recovery units (NOAA 2011). The Northern Recovery Unit (defined as loggerheads originating from nests between southern VA through the FL/GA border) is currently listed as threatened under the Endangered Species Act (NMFS 2008).

Table 15. Loggerhead sea turtle (*Caretta caretta*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 16-Jul-13 | 14:39 | 34 | 36.123914 | -74.906324 | E | 45 | 1 | 90° | 1 |
| 16-Jul-13 | 15:41 | 56 | 36.047762 | -74.989266 | W | 44 | 1 | 90° | 1 |
| 16-Jul-13 | 15:52 | 59 | 35.979910 | -75.011103 | E | 43 | 3 | 90° | 1 |
| 17-Jul-13 | 10:50 | 23 | 35.690908 | -75.083553 | W | 39 | 1 | 90° | 1 |
| 17-Jul-13 | 13:41 | 39 | 35.082486 | -75.452289 | SE | 27 | 2 | 90° | 1 |
| 18-Jul-13 | 10:16 | 104 | 35.275347 | -75.186223 | NW | 31 | 1 | 90° | 1 |
| 18-Jul-13 | 10:21 | 69 | 35.291765 | -75.179218 | SE | 32 | 1 | 90° | 1 |
| 18-Jul-13 | 13:13 | 130 | 35.763715 | -75.114731 | E | 40 | 1 | 90° | 1 |
| 18-Jul-13 | 13:16 | 133 | 35.763570 | -75.000971 | E | 40 | 1 | 90° | 6 |
| 18-Jul-13 | 13:17 | 85 | 35.763537 | -74.965164 | E | 40 | 3 | 90° | 2 |
| 18-Jul-13 | 13:19 | 135 | 35.763533 | -74.896326 | E | 40 | 1 | 90° | 1 |
| 18-Jul-13 | 14:15 | 102 | 35.480178 | -74.885236 | W | 36 | 1 | 90° | 1 |
| 18-Jul-13 | 14:28 | 106 | 35.411618 | -75.095267 | E | 35 | 2 | 90° | 1 |
| 20-Aug-13 | 11:49 | 13 | 35.549259 | -75.037858 | NW | 37 | 2 | 90° | 1 |
| 20-Aug-13 | 13:15 | 30 | 35.694409 | -75.115595 | W | 39 | 2 | 90° | 1 |
| 20-Aug-13 | 14:36 | 35 | 35.764452 | -75.142481 | E | 40 | 1 | 90° | 1 |
| 20-Aug-13 | 14:37 | 36 | 35.763721 | -75.101938 | E | 40 | 1 | 90° | 1 |
| 20-Aug-13 | 14:40 | 44 | 35.761257 | -74.994964 | E | 40 | 2 | 90° | 1 |
| 20-Aug-13 | 15:40 | 53 | 35.832251 | -74.681485 | W | 41 | 2 | 90° | 1 |
| 20-Aug-13 | 15:54 | 71 | 35.833541 | -75.016404 | W | 41 | 2 | 90° | 1 |
| 20-Aug-13 | 16:10 | 79 | 35.907825 | -75.026202 | E | 42 | 1 | 90° | 1 |
| 20-Aug-13 | 16:16 | 81 | 35.906368 | -74.810701 | E | 42 | 1 | 90° | 1 |
| 20-Aug-13 | 16:51 | 97 | 35.980109 | -74.790664 | W | 43 | 1 | 90° | 1 |
| 20-Aug-13 | 16:57 | 99 | 35.979384 | -75.007576 | W | 43 | 1 | 90° | 2 |
| 21-Aug-13 | 9:18 | 4 | 36.048549 | -75.022778 | E | 44 | 1 | 90° | 3 |
| 21-Aug-13 | 9:19 | 5 | 36.048352 | -74.968497 | E | 44 | 2 | 100° | 1 |
| 22-Aug-13 | 15:09 | 161 | 35.979289 | -75.122980 | E | 43 | 1 | 90° | 1 |
| 22-Aug-13 | 15:12 | 162 | 35.981347 | -75.013091 | E | 43 | 1 | 90° | 1 |
| 28-Oct-13 | 10:25 | 2 | 36.122434 | -75.045803 | E | 45 | 2 | 90° | 1 |
| 28-Oct-13 | 10:26 | 3 | 36.122860 | -75.023162 | E | 45 | 2 | 90° | 1 |
| 28-Oct-13 | 11:37 | 34 | 35.978429 | -75.076011 | E | 43 | 1 | 90° | 1 |
| 28-Oct-13 | 12:50 | 51 | 35.906238 | -75.152820 | W | 42 | 1 | 90° | 1 |
| 28-Oct-13 | 16:06 | 73 | 35.137776 | -75.387738 | W | 28 | 2 | 90° | 1 |

Leatherback sea turtle (*Dermochelys coriacea*) (Table 16, Figure 18)

Seven leatherback sea turtle were observed from the inshore waters out to 1000m. The most recent population estimates for the North Atlantic ranges from 34000 to 94000 adult leatherbacks (Turtle Expert Working Group 2007). Leatherbacks throughout their range are listed as endangered under the Endangered Species Act (NMFS 1992).

*Table 16. Leatherback sea turtle (*Dermochelys coriacea*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.*

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 9:45 | 3 | 35.195920 | -75.339753 | SE | 29 | 1 | 90° | 1 |
| 20-Aug-13 | 11:52 | 14 | 35.550855 | -75.136088 | NW | 37 | 1 | 90° | 1 |
| 20-Aug-13 | 14:39 | 37 | 35.761168 | -75.012651 | E | 40 | 1 | 90° | 1 |
| 20-Aug-13 | 14:41 | 45 | 35.769749 | -74.931561 | E | 40 | 1 | 90° | 1 |
| 21-Aug-13 | 10:12 | 36 | 36.122075 | -74.666949 | W | 45 | 1 | 90° | 1 |
| 21-Aug-13 | 10:58 | 51 | 35.407876 | -74.842273 | E | 35 | 2 | 90° | 1 |
| 28-Oct-13 | 15:07 | 62 | 35.216455 | -75.370175 | E | 29 | 2 | 90° | 1 |

Unidentified sea turtles

Turtles labeled as unidentified were typically either of small size, submerged, or too far away for observers to make an accurate identification to species. This occurred on one occasion and the species is listed as unidentified.

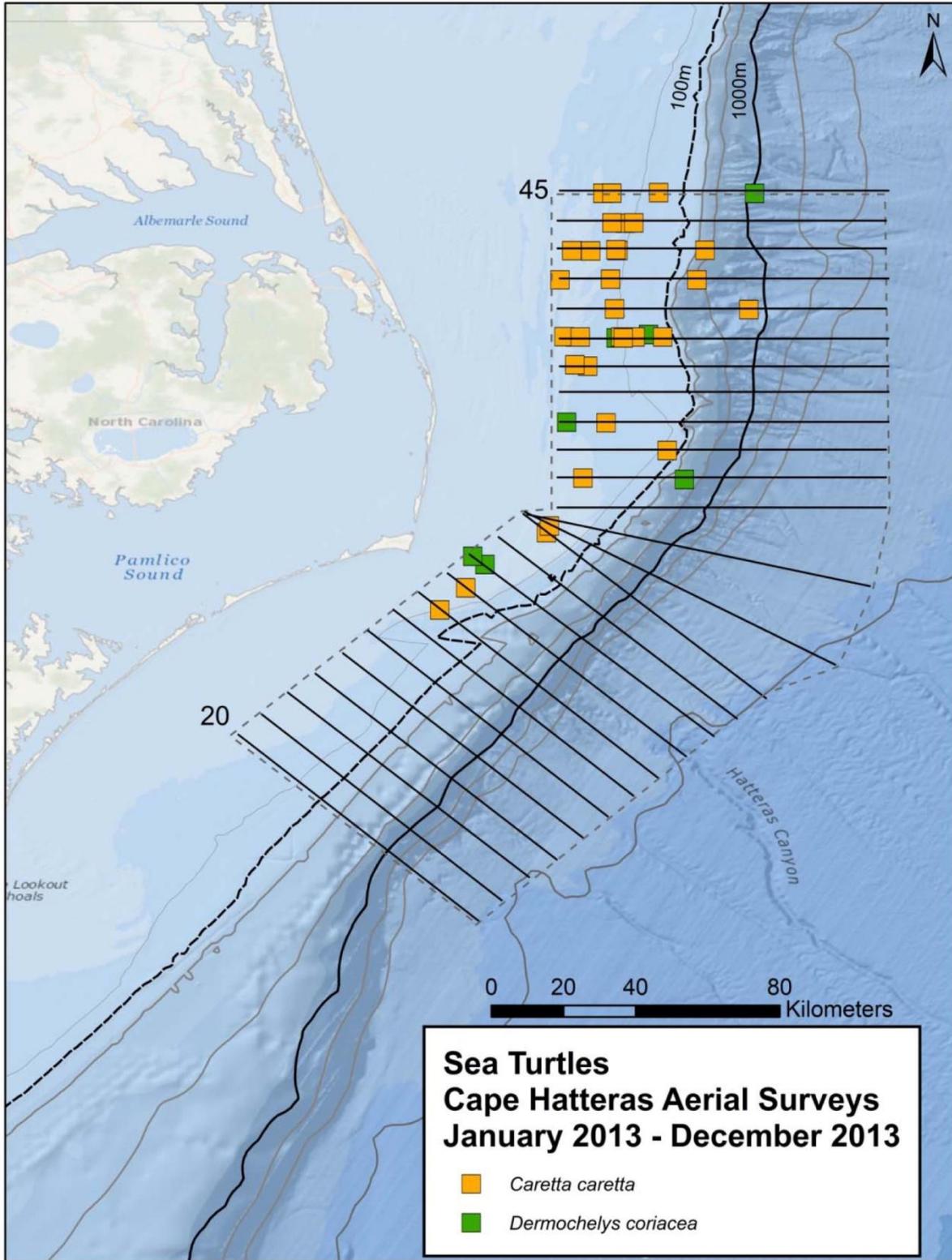


Figure 18. Loggerhead (*Caretta caretta*) and leatherback sea turtle (*Dermochelys coriacea*) sightings.

Other Marine Vertebrate Sightings (Tables 17-20, Figure 19)

Chondrichthyan fishes

Twenty unidentified shark sightings were recorded during the reporting period. Most sharks were seen in the area inside the 100m isobath with the majority of sighting occurring in October. Seventeen manta rays (*Manta birostris*) were observed during the study period, and occurred in four of the five months surveyed. A single sighting of 225 individuals of cownose rays were observed in May inside the 100m isobaths.

Other fishes

Eleven sightings of ocean sunfish (*Mola mola*) were recorded with the majority off of the 200m isobath. All sightings occurred in either March or May.

Table 17. Manta ray (Manta birostris) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 14:25 | 48 | 35.555007 | -74.842433 | W | 37 | 2 | 90° | 3 |
| 28-May-13 | 14:25 | 39 | 35.554988 | -74.846766 | E | 37 | 2 | 90° | 2 |
| 16-Jul-13 | 16:52 | 82 | 35.906200 | -74.840620 | W | 42 | 2 | 90° | 1 |
| 17-Jul-13 | 10:16 | 15 | 35.618951 | -74.771526 | E | 38 | 2 | 90° | 1 |
| 20-Aug-13 | 11:42 | 11 | 35.551814 | -74.763596 | NW | 37 | 1 | 90° | 3 |
| 20-Aug-13 | 12:18 | 26 | 35.620762 | -74.802606 | E | 38 | 1 | 90° | 1 |
| 20-Aug-13 | 15:40 | 65 | 35.832403 | -74.688097 | W | 41 | 2 | 90° | 2 |
| 21-Aug-13 | 10:11 | 35 | 36.123725 | -74.622973 | W | 45 | 2 | 90° | 2 |
| 22-Aug-13 | 13:44 | 104 | 36.126283 | -74.761181 | E | 45 | 1 | 90° | 1 |
| 28-Oct-13 | 11:22 | 27 | 36.049894 | -74.932001 | W | 44 | 2 | 90° | 1 |

Table 18. Ocean sunfish (*Mola mola*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 15:51 | 79 | 35.827462 | -74.335548 | W | 41 | 2 | 90° | 2 |
| 16-Jul-13 | 15:56 | 60 | 35.980199 | -74.835194 | E | 43 | 1 | 90° | 1 |
| 18-Jul-13 | 14:20 | 160 | 35.480224 | -75.034710 | W | 36 | 1 | 90° | 1 |
| 20-Aug-13 | 14:37 | 43 | 35.763929 | -75.113957 | E | 40 | 1 | 90° | 1 |
| 20-Aug-13 | 16:12 | 80 | 35.908643 | -74.960514 | E | 42 | 1 | 90° | 1 |
| 21-Aug-13 | 9:15 | 3 | 36.044641 | -75.134276 | E | 44 | 1 | 90° | 1 |
| 21-Aug-13 | 10:30 | 22 | 36.121343 | -75.158077 | W | 45 | 2 | 90° | 1 |
| 21-Aug-13 | 10:52 | 45 | 35.410818 | -74.956622 | E | 35 | 1 | 90° | 1 |
| 22-Aug-13 | 15:03 | 115 | 36.049253 | -75.078877 | W | 44 | 1 | 90° | 1 |
| 28-Oct-13 | 10:45 | 7 | 36.122379 | -74.574804 | E | 45 | 1 | 120° | 1 |

Table 19. Cownose ray (*Rhinoptera bonasus*) sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 16:29 | 90 | 35.903389 | -75.144966 | E | 42 | 2 | 90° | 225 |

Table 20. Unidentified shark sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|
| 28-May-13 | 10:16 | 11 | 34.882225 | -74.795968 | NW | 30 | 1 | 90° | 1 |
| 18-Jul-13 | 10:11 | 102 | 35.184473 | -74.989762 | NW | 31 | 2 | 90° | 2 |
| 18-Jul-13 | 10:24 | 107 | 35.248862 | -75.094097 | SE | 32 | 1 | 90° | 3 |
| 18-Jul-13 | 13:17 | 134 | 35.763534 | -74.948187 | E | 40 | 2 | 90° | 1 |
| 28-Oct-13 | 10:30 | 3 | 36.124676 | -74.868516 | E | 45 | 1 | 100° | 1 |
| 28-Oct-13 | 11:19 | 19 | 36.052243 | -74.799090 | W | 44 | 1 | 90° | 1 |
| 28-Oct-13 | 11:22 | 20 | 36.049231 | -74.912655 | W | 44 | 1 | 110° | 1 |
| 28-Oct-13 | 11:28 | 24 | 36.049028 | -75.051282 | W | 44 | 3 | 100° | 2 |
| 28-Oct-13 | 11:31 | 25 | 36.047368 | -75.143988 | W | 44 | 3 | 100° | 1 |
| 28-Oct-13 | 11:40 | 35 | 35.980850 | -74.977838 | E | 43 | 2 | 90° | 1 |
| 28-Oct-13 | 12:45 | 47 | 35.906951 | -74.967875 | W | 42 | 1 | 100° | 1 |
| 28-Oct-13 | 12:46 | 48 | 35.905641 | -75.010223 | W | 42 | 1 | 90° | 1 |
| 28-Oct-13 | 12:47 | 49 | 35.905170 | -75.057867 | W | 42 | 1 | 90° | 1 |
| 28-Oct-13 | 12:49 | 50 | 35.905859 | -75.125066 | W | 42 | 1 | 90° | 1 |
| 28-Oct-13 | 14:59 | 59 | 35.159487 | -75.155402 | W | 30 | 2 | 100° | 2 |

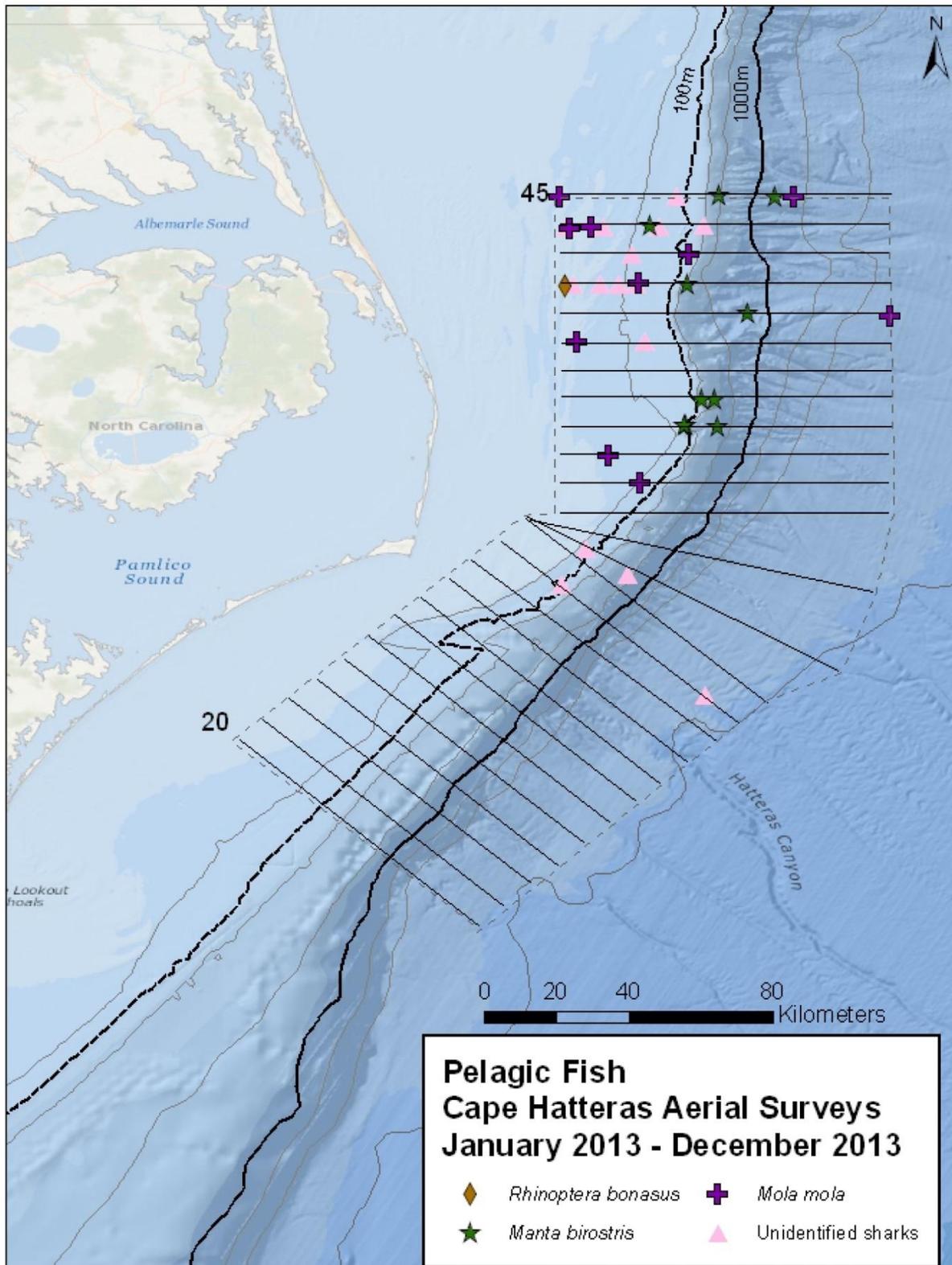


Figure 19. Manta ray (*Manta birostris*), ocean sunfish (*Mola mola*), cownose ray (*Rhinoptera bonasus*), and unidentified shark sightings.

Vessel Sightings Commercial (Table 21, Figure 20)

A total of 17 commercial vessels (e.g. tankers, car carriers, and container vessels) were observed in the survey site.

Table 21. Commercial vessel sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # | Comments |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|---------------------------|
| 28-May-13 | 9:49 | 4 | 35.105152 | -75.218739 | SE | 29 | 3 | 60° | 1 | Cargo vessel |
| 28-May-13 | 14:44 | 57 | 35.553293 | -74.470275 | W | 37 | 1 | 90° | 1 | Tanker |
| 16-Jul-13 | 11:01 | 8 | 34.476122 | -75.579322 | SE | 20 | 2 | 60° | 1 | Tanker |
| 16-Jul-13 | 11:29 | 11 | 34.605134 | -75.611558 | NW | 21 | 3 | 60° | 1 | RORO car carrier |
| 16-Jul-13 | 11:35 | 16 | 34.730817 | -75.773575 | NW | 21 | 1 | 90° | 2 | Tug and Barge |
| 16-Jul-13 | 16:37 | 72 | 35.906037 | -74.589128 | W | 42 | 3 | 45° | 1 | Cargo vessel |
| 18-Jul-13 | 10:15 | 66 | 35.255693 | -75.159692 | NW | 31 | 3 | 60° | 1 | Cargo vessel |
| 18-Jul-13 | 11:03 | 75 | 35.162943 | -74.494962 | NW | 33 | 1 | 60° | 1 | Tanker |
| 20-Aug-13 | 15:34 | 51 | 35.836386 | -74.452984 | W | 41 | 1 | 60° | 1 | Cargo vessel |
| 20-Aug-13 | 15:36 | 52 | 35.833859 | -74.504902 | W | 41 | 3 | 60° | 1 | Cargo vessel |
| 21-Aug-13 | 9:45 | 17 | 36.042971 | -74.490553 | E | 44 | 2 | 90° | 1 | Commercial fishing vessel |
| 22-Aug-13 | 9:27 | 77 | 35.284369 | -75.046607 | SE | 33 | 3 | 60° | 1 | Cargo vessel |
| 22-Aug-13 | 10:06 | 82 | 34.950653 | -74.482702 | NW | 32 | 2 | 45° | 1 | Commercial fishing vessel |
| 22-Aug-13 | 10:09 | 111 | 34.988447 | -74.550224 | W | 32 | 3 | 45° | 1 | Cargo vessel |
| 22-Aug-13 | 15:01 | 113 | 36.047985 | -75.020198 | W | 44 | 3 | 45° | 1 | Tanker |
| 28-Oct-13 | 12:41 | 46 | 35.906859 | -74.831259 | W | 42 | 4 | 90° | 1 | Research vessel |

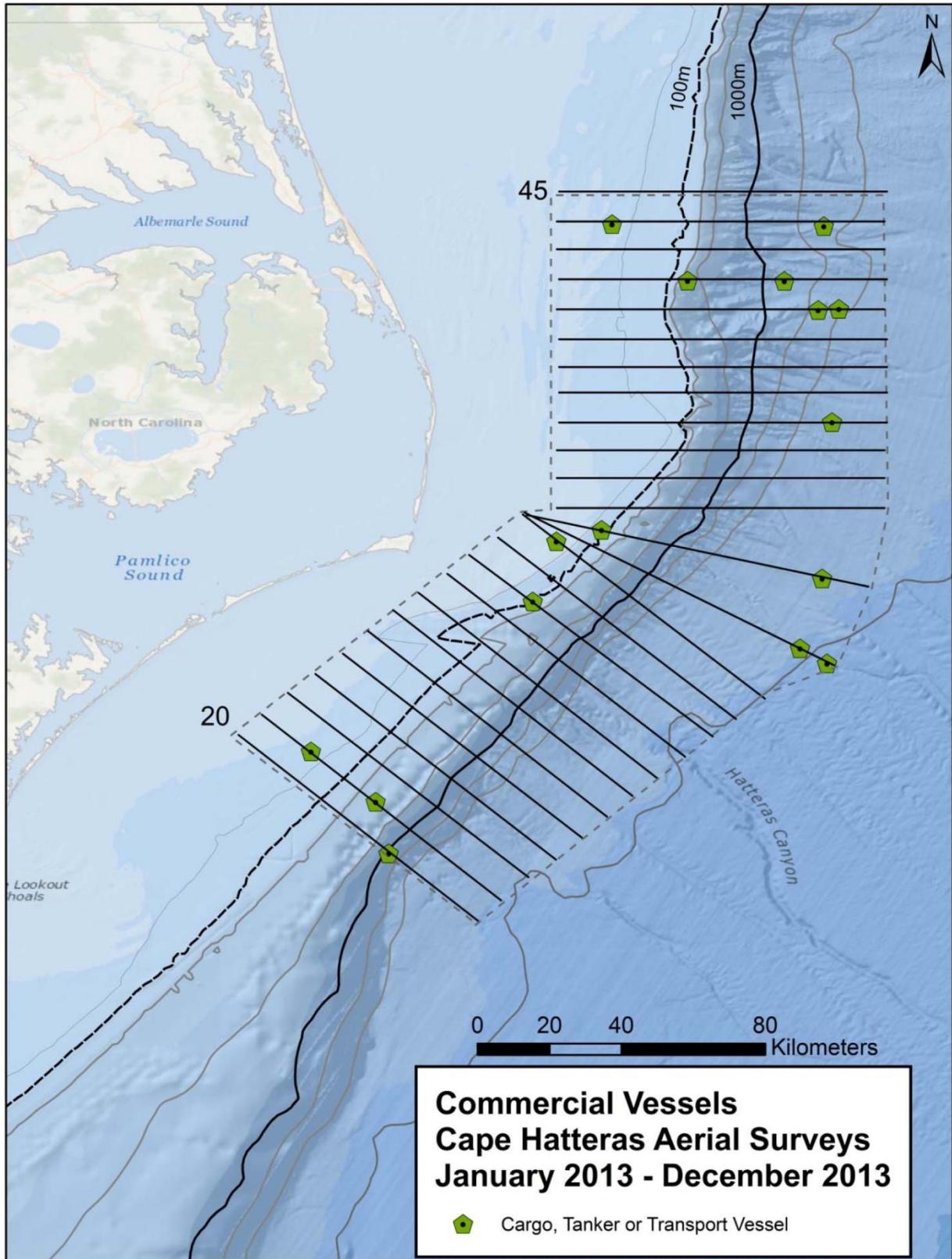


Figure 20. Large commercial shipping vessel sightings.

Military / Coast Guard Vessels (Table 22, Figure 21)

A total of three military vessels were observed in the survey site.

Table 22. Military vessel sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # | Comments |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|----------------------------|
| 16-Jul-13 | 16:57 | 52 | 35.905797 | -75.022512 | W | 42 | 2 | 90° | 2 | Military Carrier and Cargo |
| 22-Aug-13 | 13:46 | 140 | 36.122483 | -74.734485 | E | 45 | 2 | 60° | 1 | Submarine |

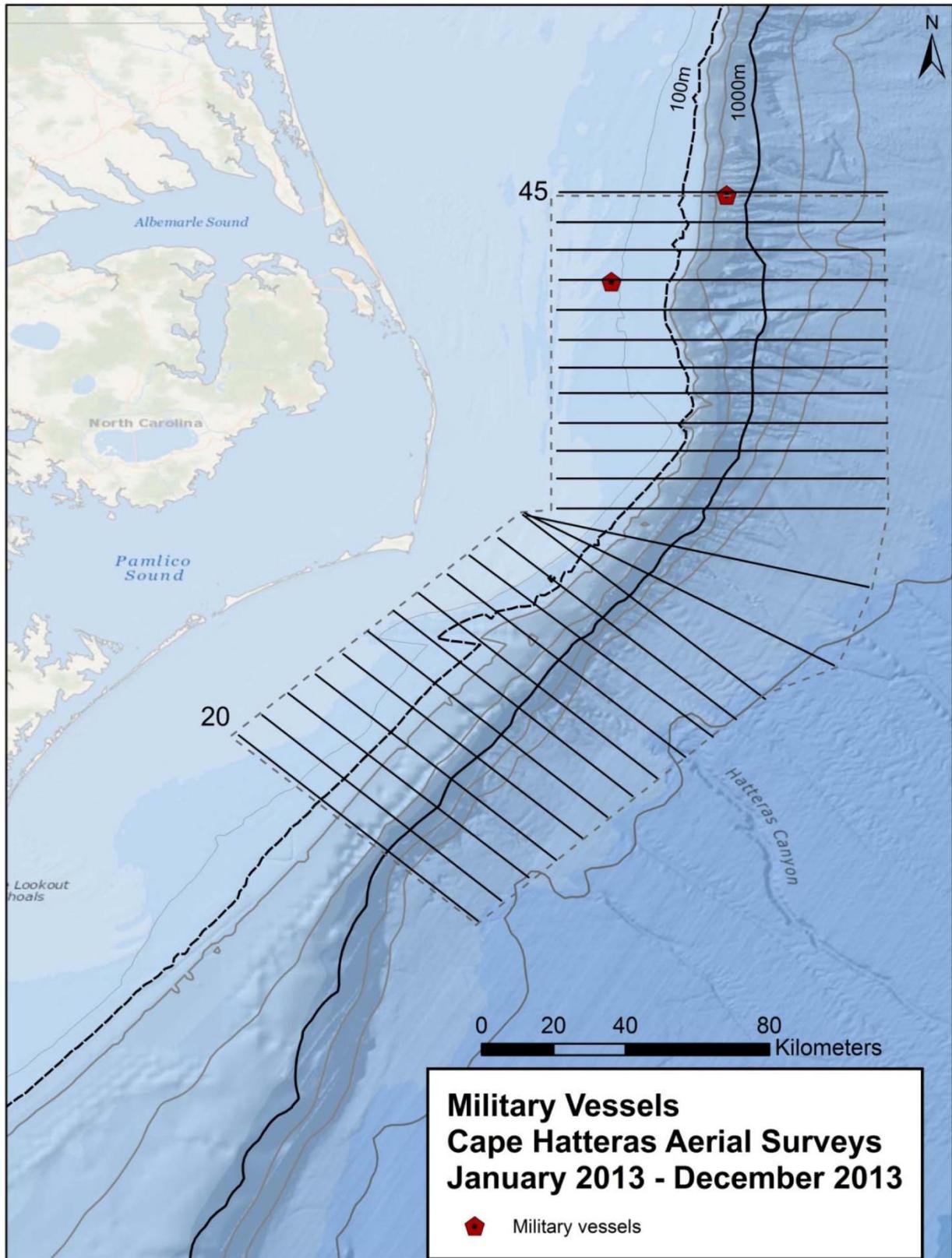


Figure 21. Military vessel sightings.

Other Vessels (Table 23, Figure 22)

A total of 295 other vessels were recorded in the survey site. Other than a single sailboat sighting all other vessels were categorized as recreational sport fishing vessels.

Table 23. Other vessel sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # | Comments |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|-----------------------------|
| 30-Mar-13 | 12:46 | 16 | 35.010146 | -75.091028 | W | 29 | 3 | 90° | 4 | Recreational fishing vessel |
| 28-May-13 | 9:47 | 3 | 35.162281 | -75.294855 | SE | 29 | 2 | 90° | 1 | Recreational fishing vessel |
| 28-May-13 | 9:47 | 4 | 35.149344 | -75.277456 | SE | 29 | 2 | 60° | 3 | Recreational fishing vessel |
| 28-May-13 | 9:52 | 6 | 35.051325 | -75.147699 | SE | 29 | 1 | 90° | 1 | Recreational fishing vessel |
| 28-May-13 | 11:43 | 28 | 35.271386 | -75.016329 | W | 33 | 1 | 90° | 1 | Recreational fishing vessel |
| 28-May-13 | 11:58 | 26 | 35.341522 | -74.918902 | SE | 34 | 2 | 60° | 2 | Recreational fishing vessel |
| 28-May-13 | 14:26 | 40 | 35.555027 | -74.828202 | E | 37 | 3 | 90° | 1 | Recreational fishing vessel |
| 28-May-13 | 15:15 | 69 | 35.757683 | -74.790254 | E | 40 | 2 | 90° | 6 | Recreational fishing vessel |
| 28-May-13 | 15:16 | 52 | 35.757630 | -74.800053 | W | 40 | 2 | 90° | 9 | Recreational fishing vessel |
| 28-May-13 | 15:28 | 72 | 35.826997 | -75.119029 | W | 41 | 1 | 45° | 1 | Recreational fishing vessel |
| 28-May-13 | 15:33 | 73 | 35.827575 | -74.915834 | W | 41 | 2 | 90° | 1 | Recreational fishing vessel |
| 16-Jul-13 | 10:44 | 3 | 34.601680 | -75.755230 | SE | 20 | 1 | 90° | 1 | Recreational fishing vessel |
| 16-Jul-13 | 10:45 | 3 | 34.582665 | -75.730365 | SE | 20 | 3 | 90° | 2 | Recreational fishing vessel |
| 16-Jul-13 | 11:28 | 10 | 34.595185 | -75.598374 | NW | 21 | 3 | 60° | 5 | Recreational fishing vessel |
| 16-Jul-13 | 11:30 | 15 | 34.623131 | -75.635263 | NW | 21 | 2 | 45° | 1 | Recreational fishing vessel |
| 16-Jul-13 | 11:39 | 12 | 34.805037 | -75.875282 | NW | 21 | 2 | 90° | 1 | Recreational fishing vessel |
| 16-Jul-13 | 11:50 | 19 | 34.735740 | -75.643742 | SE | 22 | 3 | 60° | 5 | Recreational fishing vessel |
| 16-Jul-13 | 11:51 | 20 | 34.689625 | -75.585457 | SE | 22 | 3 | 90° | 15 | Recreational fishing vessel |
| 16-Jul-13 | 12:30 | 27 | 34.712076 | -75.483538 | NW | 23 | 1 | 90° | 7 | Recreational fishing vessel |
| 16-Jul-13 | 14:39 | 35 | 36.124136 | -74.890811 | E | 45 | 2 | 90° | 1 | Recreational fishing vessel |
| 16-Jul-13 | 15:38 | 37 | 36.048759 | -74.892963 | E | 44 | 2 | 90° | 1 | Recreational fishing vessel |
| 16-Jul-13 | 16:53 | 51 | 35.906131 | -74.888622 | W | 42 | 3 | 90° | 2 | Recreational fishing vessel |
| 16-Jul-13 | 16:56 | 83 | 35.905887 | -74.990557 | W | 42 | 1 | 45° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 9:07 | 3 | 35.834074 | -74.958882 | E | 41 | 3 | 45° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 9:16 | 5 | 35.835652 | -74.586211 | E | 41 | 2 | 60° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 10:16 | 14 | 35.619510 | -74.791357 | E | 38 | 1 | 90° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 10:42 | 22 | 35.690115 | -74.779671 | W | 39 | 2 | 60° | 2 | Recreational fishing vessel |
| 17-Jul-13 | 12:54 | 28 | 35.111817 | -75.227134 | SE | 29 | 2 | 60° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 12:55 | 22 | 35.091335 | -75.199355 | SE | 29 | 3 | 90° | 13 | Recreational fishing vessel |
| 17-Jul-13 | 13:30 | 34 | 35.020683 | -75.238516 | NW | 28 | 1 | 90° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 13:30 | 25 | 35.028388 | -75.248050 | NW | 28 | 2 | 90° | 6 | Recreational fishing vessel |
| 17-Jul-13 | 13:31 | 35 | 35.037781 | -75.261178 | NW | 28 | 1 | 60° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 14:22 | 45 | 34.933195 | -75.381443 | NW | 26 | 3 | 90° | 1 | Recreational fishing vessel |
| 17-Jul-13 | 14:25 | 32 | 35.002898 | -75.471570 | NW | 26 | 2 | 90° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 9:21 | 89 | 35.154027 | -75.149568 | SE | 30 | 3 | 90° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 13:12 | 84 | 35.762898 | -75.151721 | E | 40 | 1 | 90° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 13:13 | 131 | 35.763606 | -75.100737 | E | 40 | 2 | 60° | 2 | Recreational fishing vessel |
| 18-Jul-13 | 13:15 | 132 | 35.763680 | -75.056107 | E | 40 | 2 | 90° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 13:17 | 86 | 35.763515 | -74.951838 | E | 40 | 3 | 60° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 13:36 | 141 | 35.763577 | -74.456426 | E | 40 | 2 | 90° | 1 | Sailboat |
| 18-Jul-13 | 14:14 | 101 | 35.481096 | -74.816944 | W | 36 | 3 | 60° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 14:19 | 103 | 35.479838 | -75.022017 | W | 36 | 3 | 60° | 1 | Recreational fishing vessel |
| 18-Jul-13 | 14:37 | 165 | 35.412550 | -74.866582 | E | 35 | 3 | 90° | 5 | Recreational fishing vessel |
| 20-Aug-13 | 11:16 | 8 | 35.484231 | -74.807071 | E | 36 | 2 | 90° | 1 | Recreational fishing vessel |
| 20-Aug-13 | 11:17 | 5 | 35.483146 | -74.763192 | SE | 36 | 1 | 90° | 1 | Recreational fishing vessel |
| 20-Aug-13 | 11:50 | 14 | 35.549583 | -75.061442 | W | 37 | 3 | 60° | 1 | Recreational fishing vessel |
| 20-Aug-13 | 12:57 | 27 | 35.692568 | -74.840392 | W | 39 | 1 | 90° | 1 | Recreational fishing vessel |
| 20-Aug-13 | 16:07 | 78 | 35.902894 | -75.135077 | E | 42 | 3 | 45° | 2 | Recreational fishing vessel |

Table 23 (Continued). Other vessel sightings in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

| Date | Time | Way Point | Latitude | Longitude-1 | Heading | Track Number | Angle out | Degree Forward | Best # | Comments |
|-----------|-------|-----------|-----------|-------------|---------|--------------|-----------|----------------|--------|-----------------------------|
| 20-Aug-13 | 16:53 | 98 | 35.978539 | -74.857741 | W | 43 | 2 | 90° | 1 | Recreational fishing vessel |
| 20-Aug-13 | 16:53 | 71 | 35.978659 | -74.859544 | W | 43 | 2 | 90° | 1 | Recreational fishing vessel |
| 21-Aug-13 | 9:22 | 4 | 36.048465 | -74.834874 | E | 44 | 3 | 60° | 7 | Recreational fishing vessel |
| 21-Aug-13 | 9:23 | 7 | 36.048555 | -74.828400 | E | 44 | 2 | 45° | 2 | Recreational fishing vessel |
| 21-Aug-13 | 10:21 | 41 | 36.124198 | -74.804531 | W | 45 | 2 | 90° | 2 | Recreational fishing vessel |
| 21-Aug-13 | 10:21 | 21 | 36.124204 | -74.805000 | W | 45 | 3 | 90° | 16 | Recreational fishing vessel |
| 21-Aug-13 | 14:43 | 50 | 34.816191 | -75.747150 | SE | 22 | 3 | 60° | 2 | Recreational fishing vessel |
| 22-Aug-13 | 13:41 | 139 | 36.125268 | -74.866526 | E | 45 | 3 | 90° | 20 | Recreational fishing vessel |
| 22-Aug-13 | 13:41 | 103 | 36.125580 | -74.849372 | E | 45 | 2 | 45° | 41 | Recreational fishing vessel |
| 22-Aug-13 | 14:54 | 112 | 36.053123 | -74.785066 | W | 44 | 1 | 90° | 65 | Recreational fishing vessel |
| 22-Aug-13 | 14:55 | 156 | 36.051236 | -74.798365 | W | 44 | 2 | 90° | 8 | Recreational fishing vessel |
| 22-Aug-13 | 15:13 | 163 | 35.982006 | -74.961436 | E | 43 | 2 | 60° | 6 | Recreational fishing vessel |
| 28-Oct-13 | 14:23 | 70 | 35.232174 | -75.123457 | SE | 31 | 1 | 90° | 1 | Recreational fishing vessel |
| 28-Oct-13 | 15:00 | 75 | 35.187465 | -75.190659 | NW | 30 | 3 | 45° | 1 | Recreational fishing vessel |
| 28-Oct-13 | 15:10 | 63 | 35.156535 | -75.286000 | E | 29 | 1 | 90° | 1 | Recreational fishing vessel |

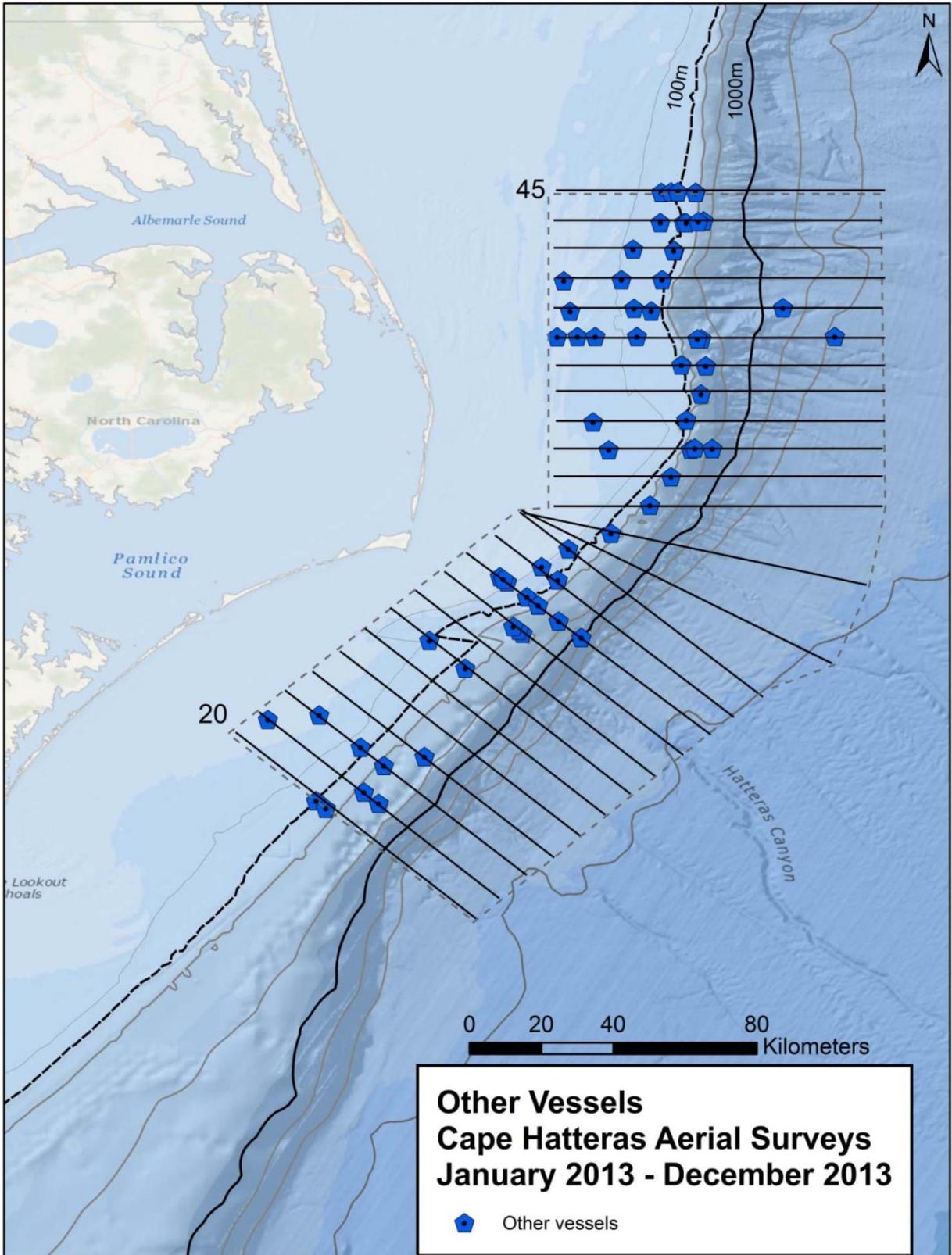


Figure 22. Other vessel sightings.

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