

**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".

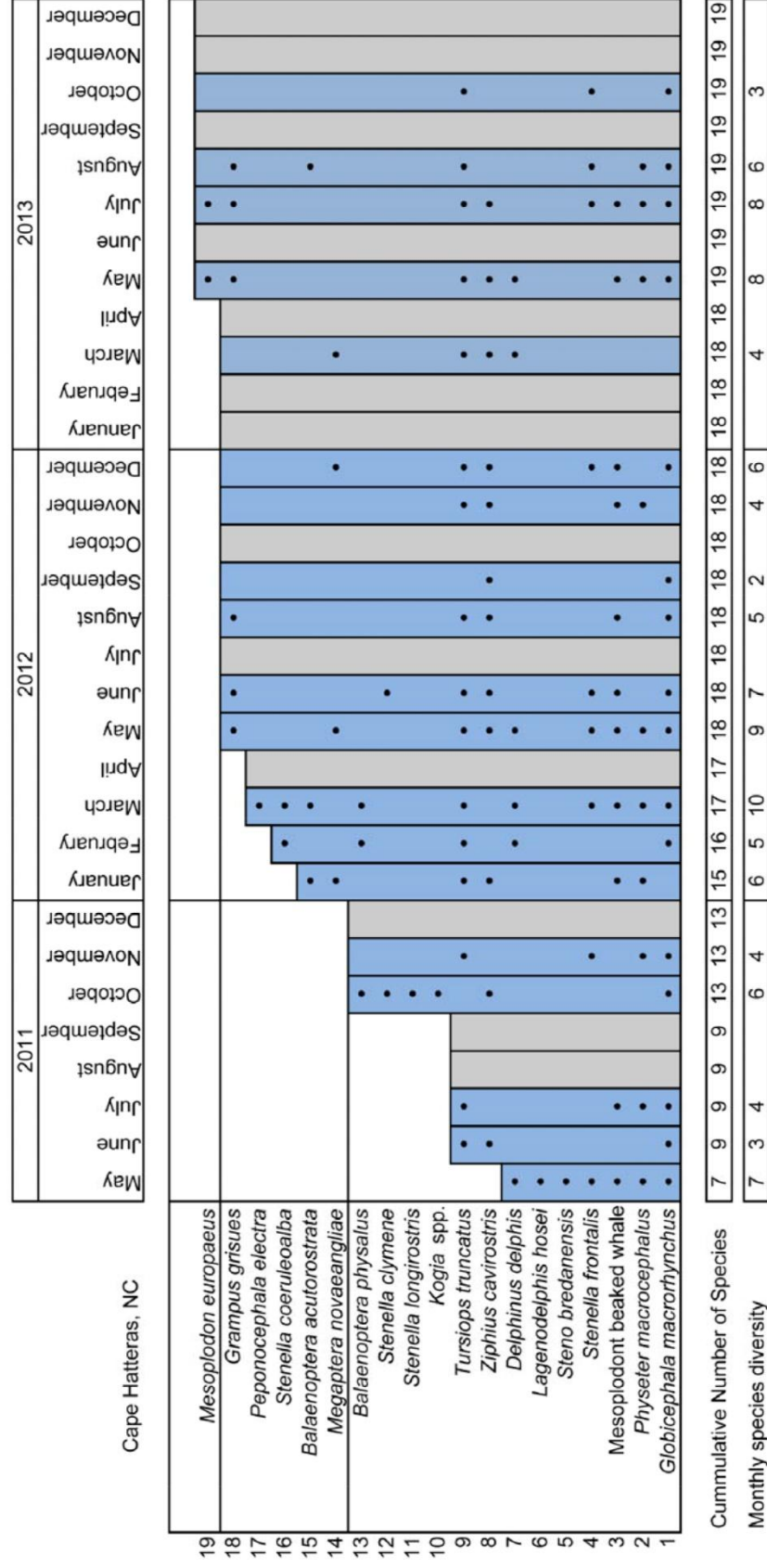
Fifty sea turtle sightings were recorded during this survey period. Forty two were identified as loggerhead sea turtles (*Caretta caretta*), and seven as a leatherback sea turtle (*Dermochelys coriacea*). Species identification could not be established with certainty for a single individual which is 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	100
Total individuals	0	0	100	0	373	0	475	616	0	393	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.



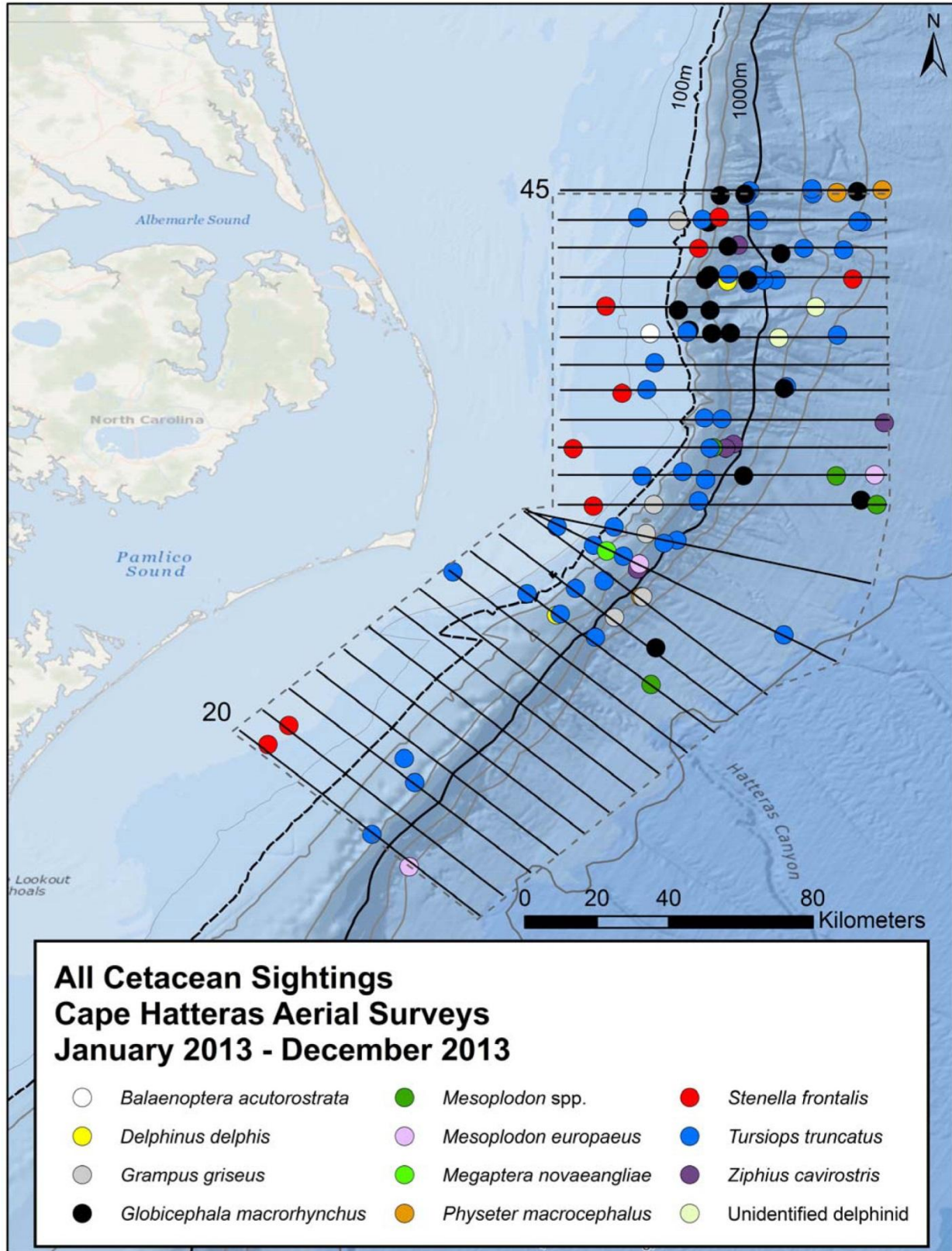


Figure 1. All cetacean sightings during aerial surveys conducted in Cape Hatteras, North Carolina from January 2013 to December 2013.

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	
Line	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

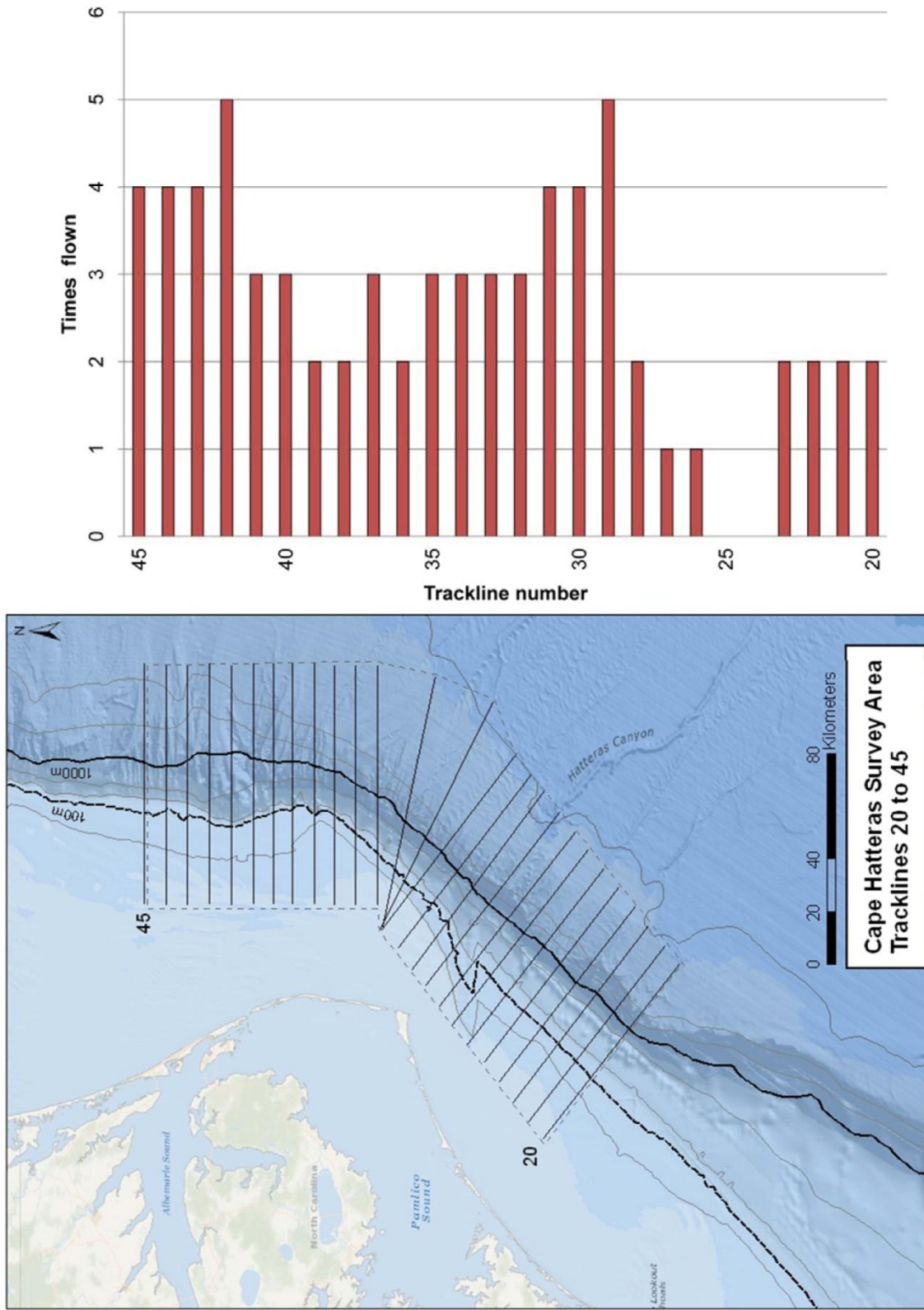


Figure 2. Survey tracklines and realized effort in the Cape Hatteras, North Carolina survey area.

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

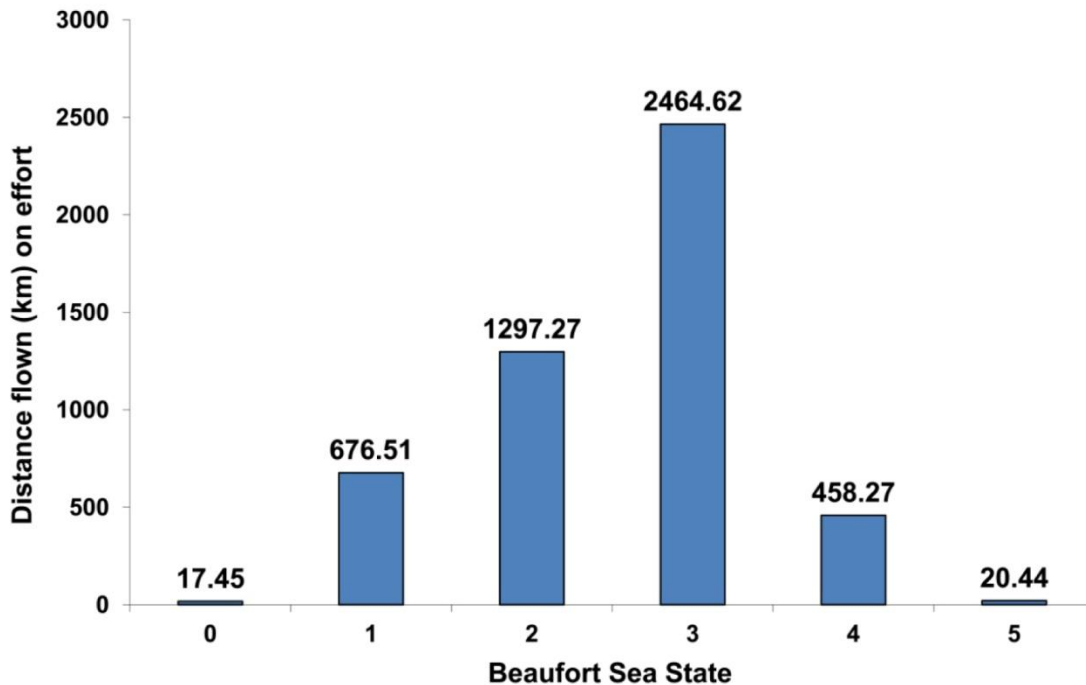


Figure 3a. Total distance surveyed per Beaufort Sea State from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

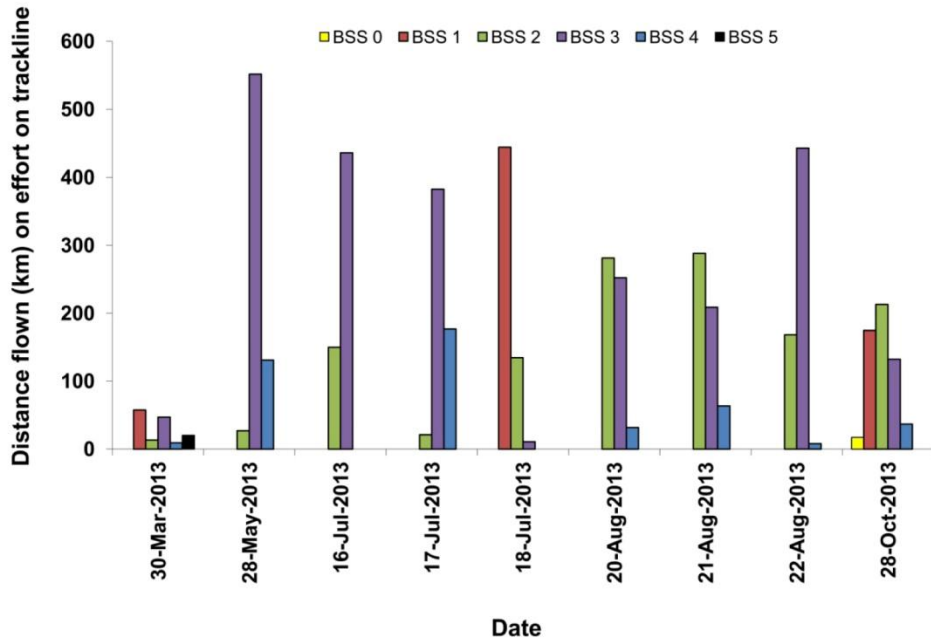


Figure 3b. Effort by Beaufort Sea State for each day from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

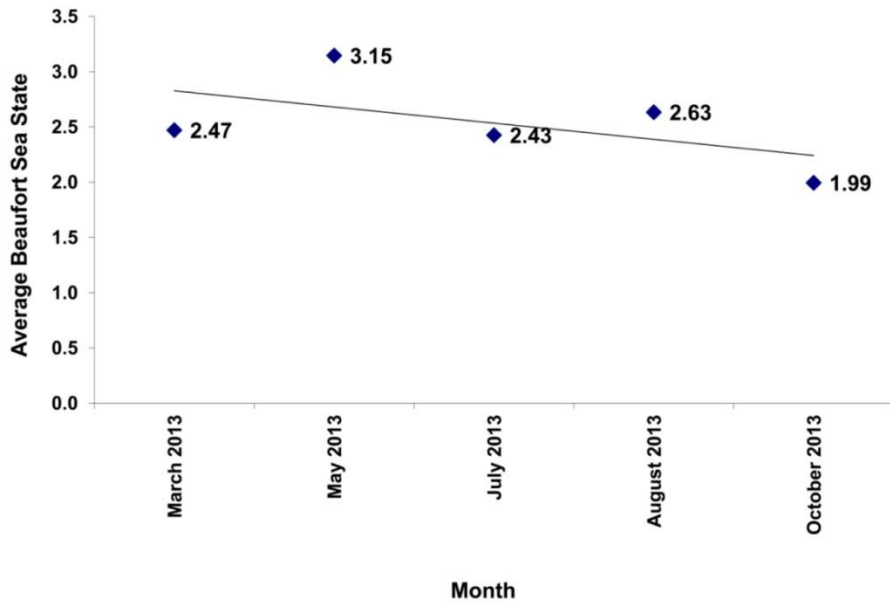


Figure 3c. Average Beaufort Sea State for each month from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area. Values were calculated using the formula $AvgBSS = [(Distance @ 1*1) + \dots / Total\ distance\ flown\ that\ day]$

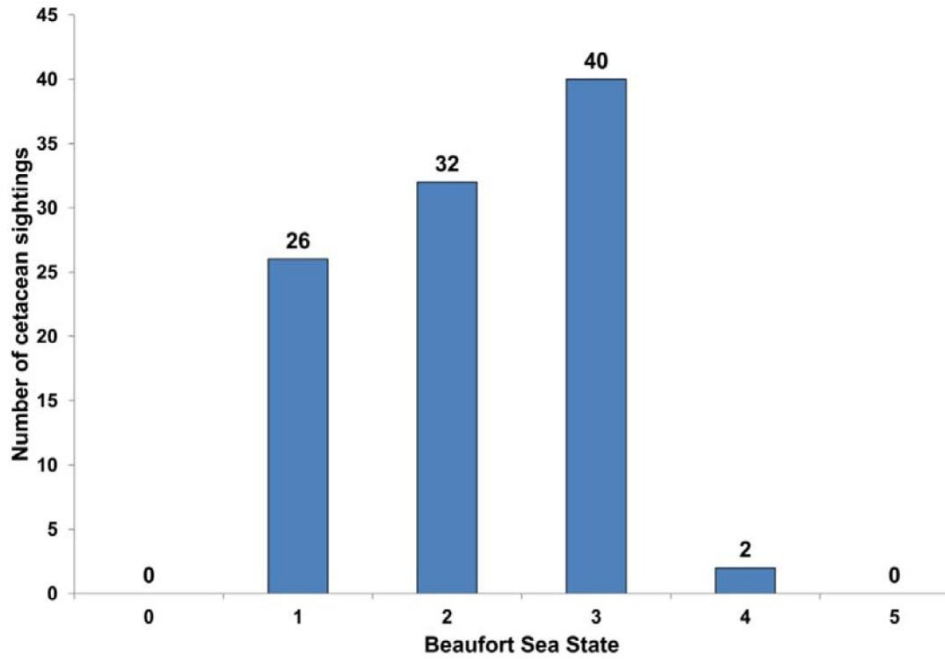


Figure 4a. Number of cetacean sightings per Beaufort Sea State from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

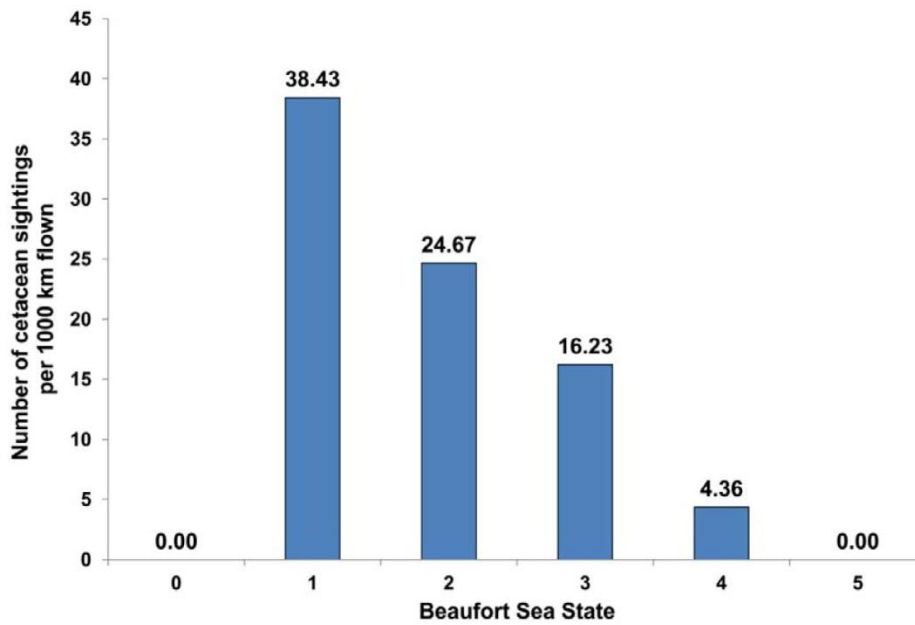


Figure 4b. Cetacean sightings per 1000 km flown by Beaufort Sea State from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

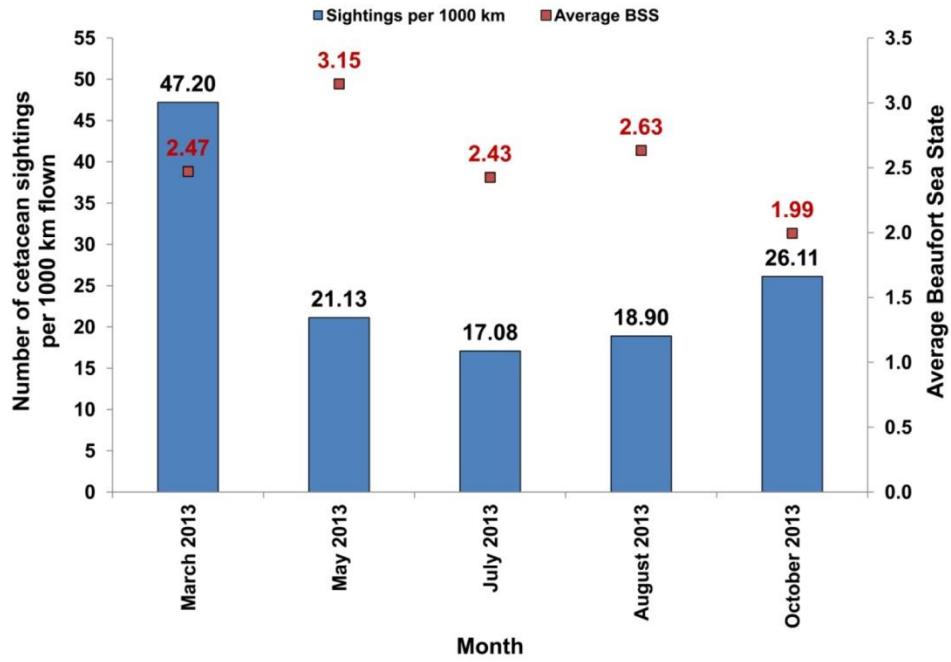


Figure 4c. Cetacean sightings per 1000 km surveyed and the average Beaufort Sea State per month from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

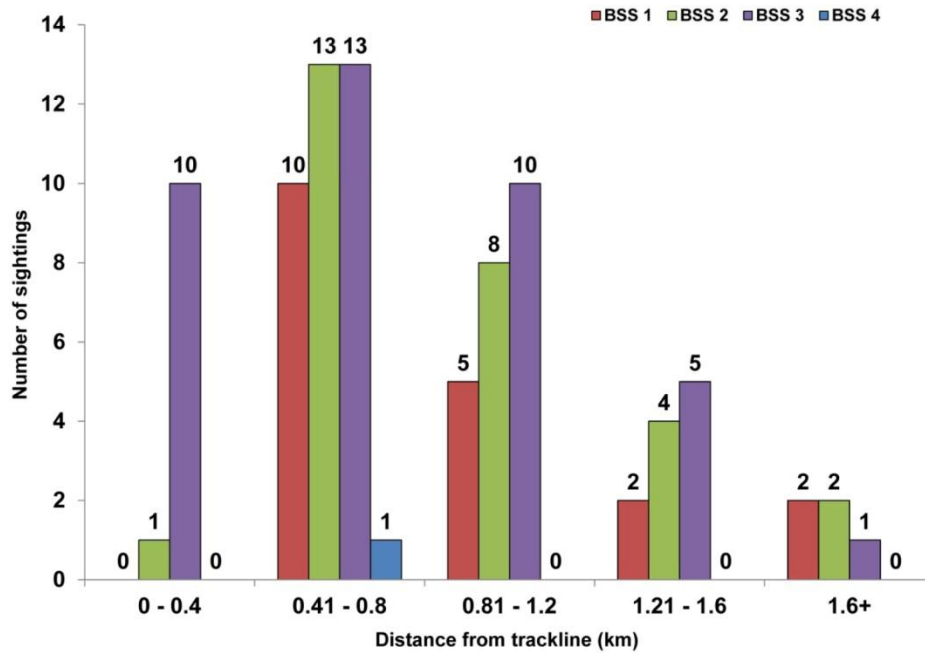


Figure 5a. Sighting distances by Beaufort Sea State for 87 of 100 on effort cetacean sightings from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area.

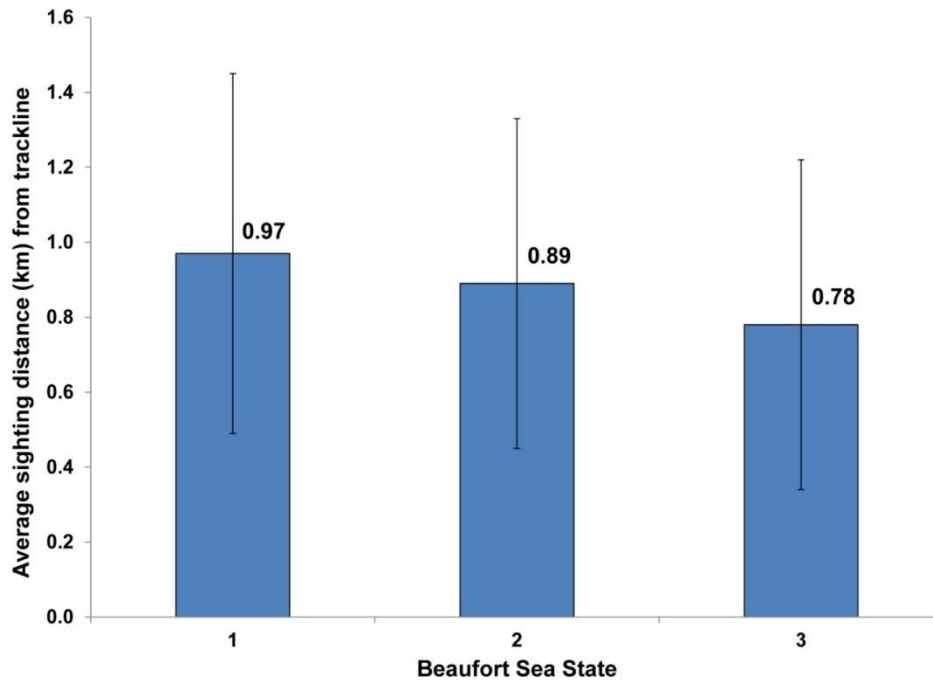


Figure 5b. Average sighting distances by Beaufort Sea State for 87 of 100 on effort cetacean sightings from January 2013 to December 2013 during aerial surveys in the Cape Hatteras, North Carolina survey area. Error bars denote standard deviation for each category.

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

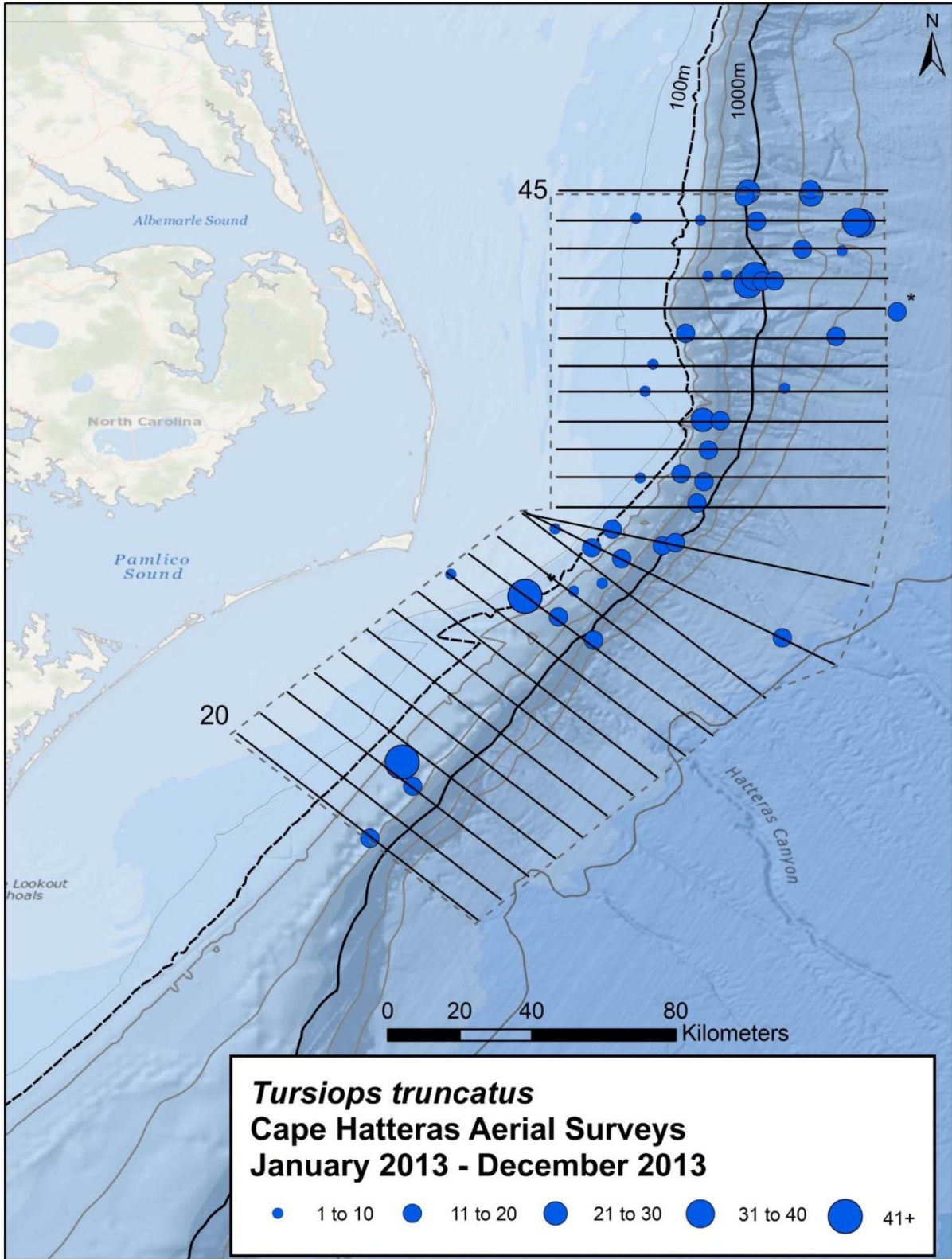


Figure 6. Bottlenose dolphin (*Tursiops truncatus*) sightings indicating group size. Asterisk denotes off effort sightings.

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

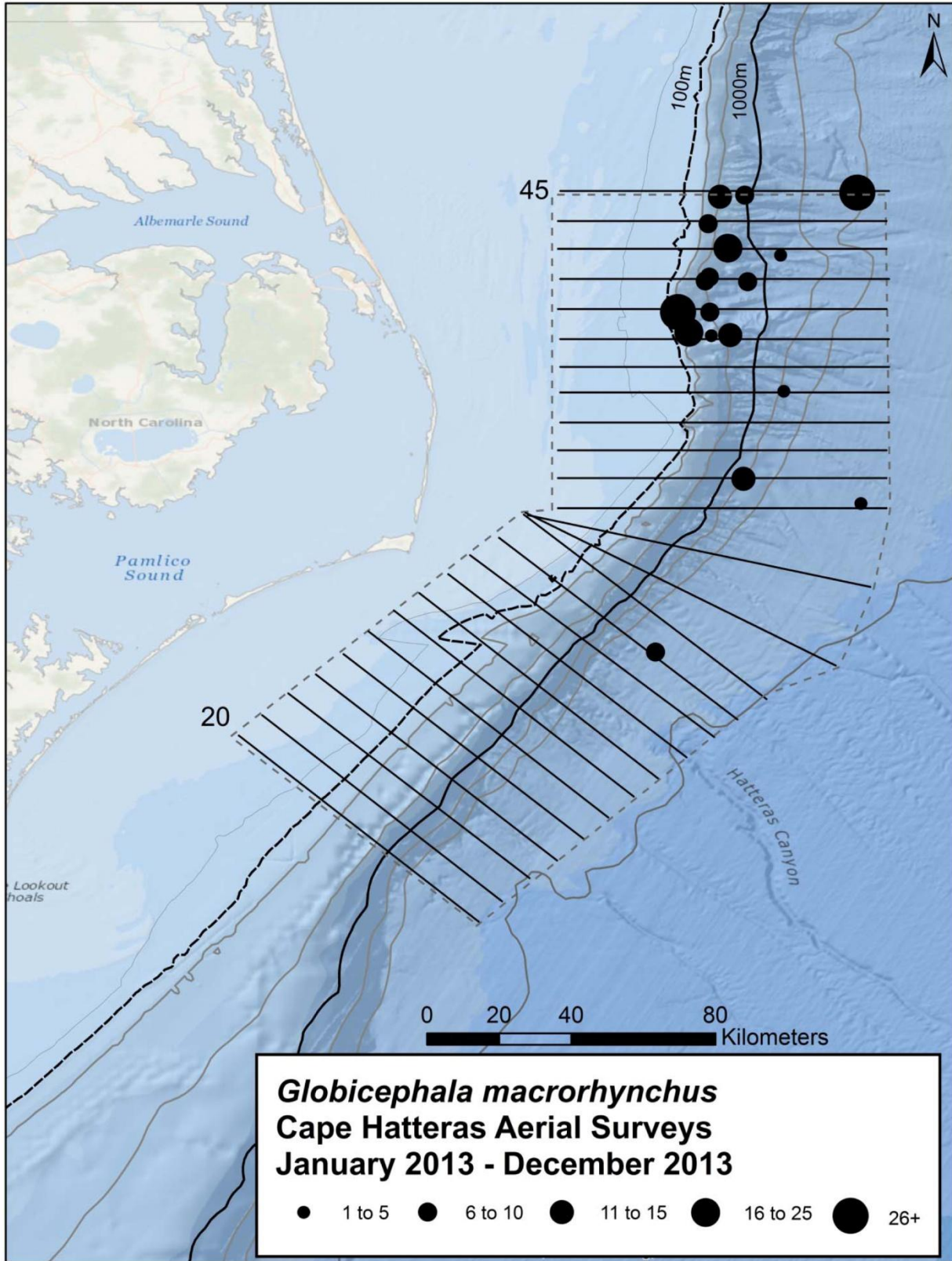


Figure 7. Short-finned pilot whale (*Globicephala macrorhynchus*) sightings indicating group size.

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

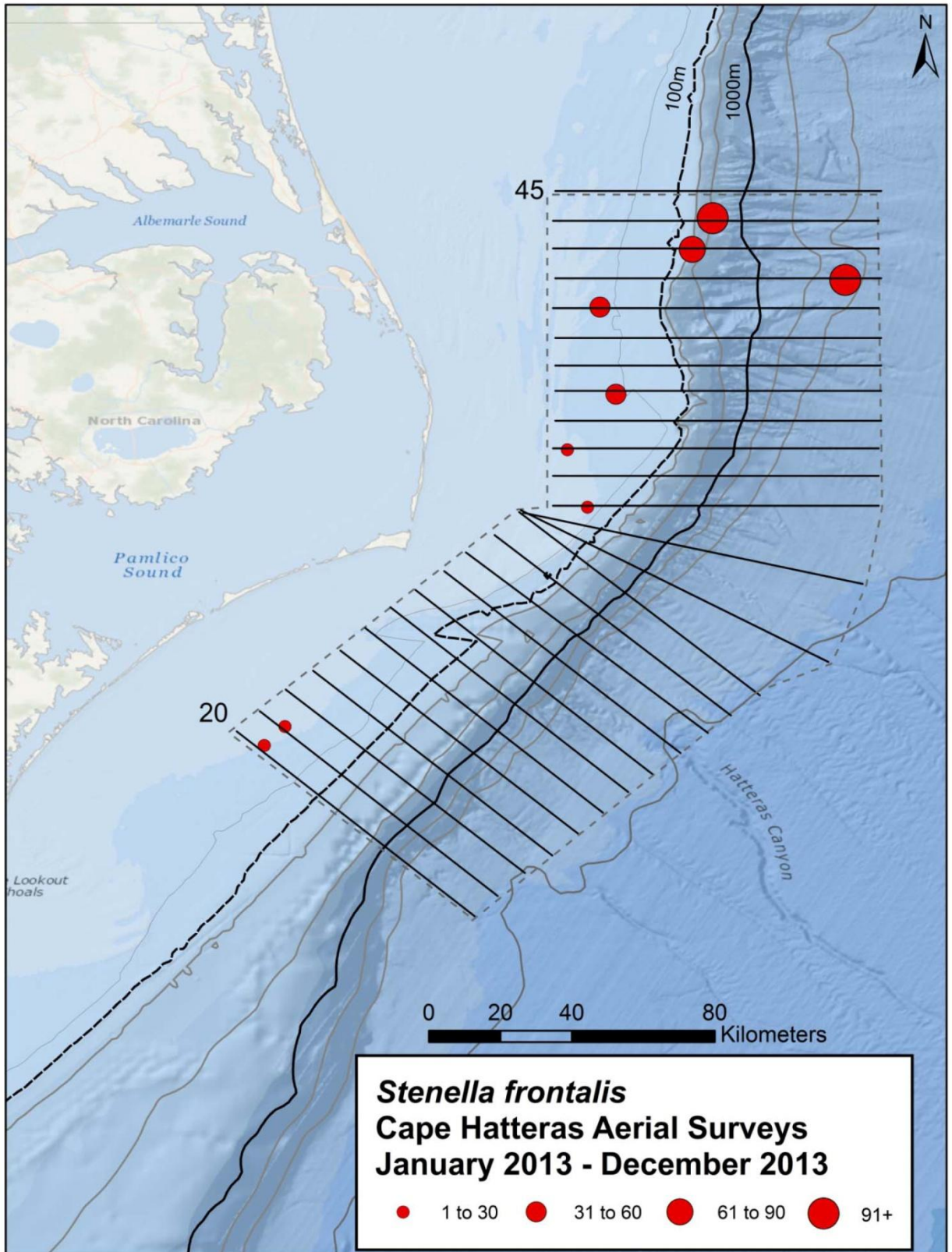


Figure 8. Atlantic spotted dolphin (*Stenella frontalis*) sightings indicating group size.

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 *

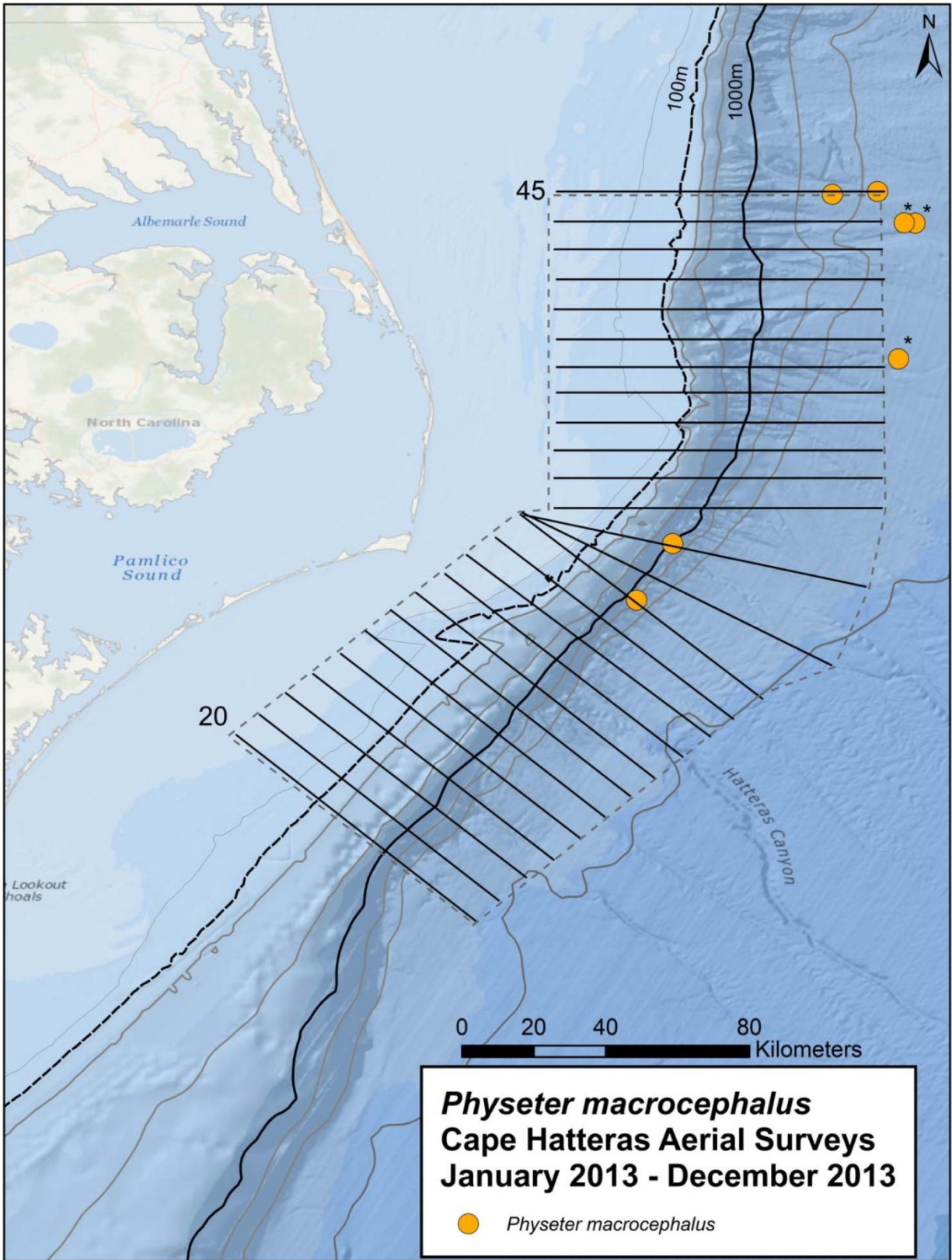


Figure 9. Sperm whale (*Physeter macrocephalus*) sightings. Asterisk denotes off effort sightings.

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

*

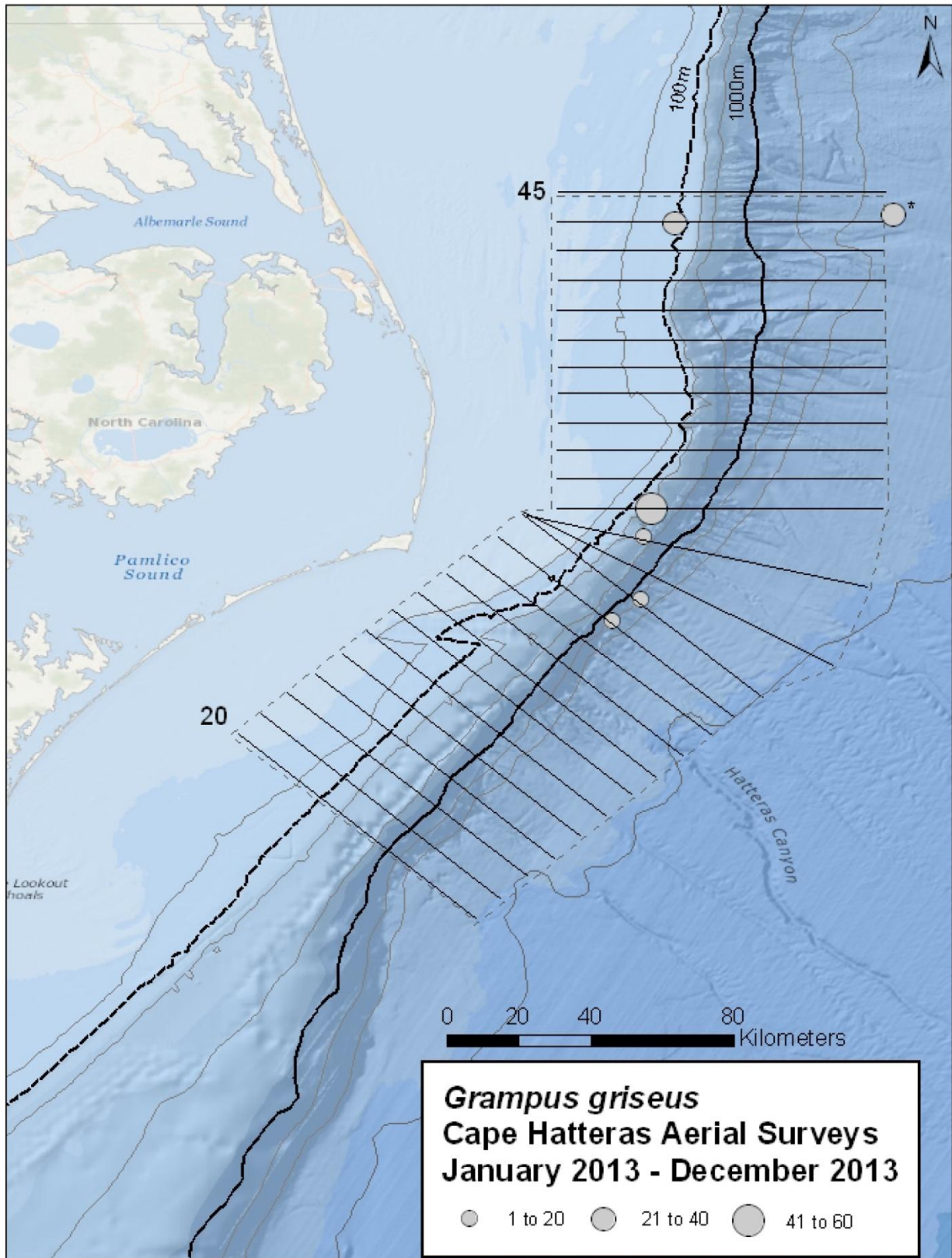


Figure 10. Risso's dolphin (*Grampus griseus*) sightings indicating group size.

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

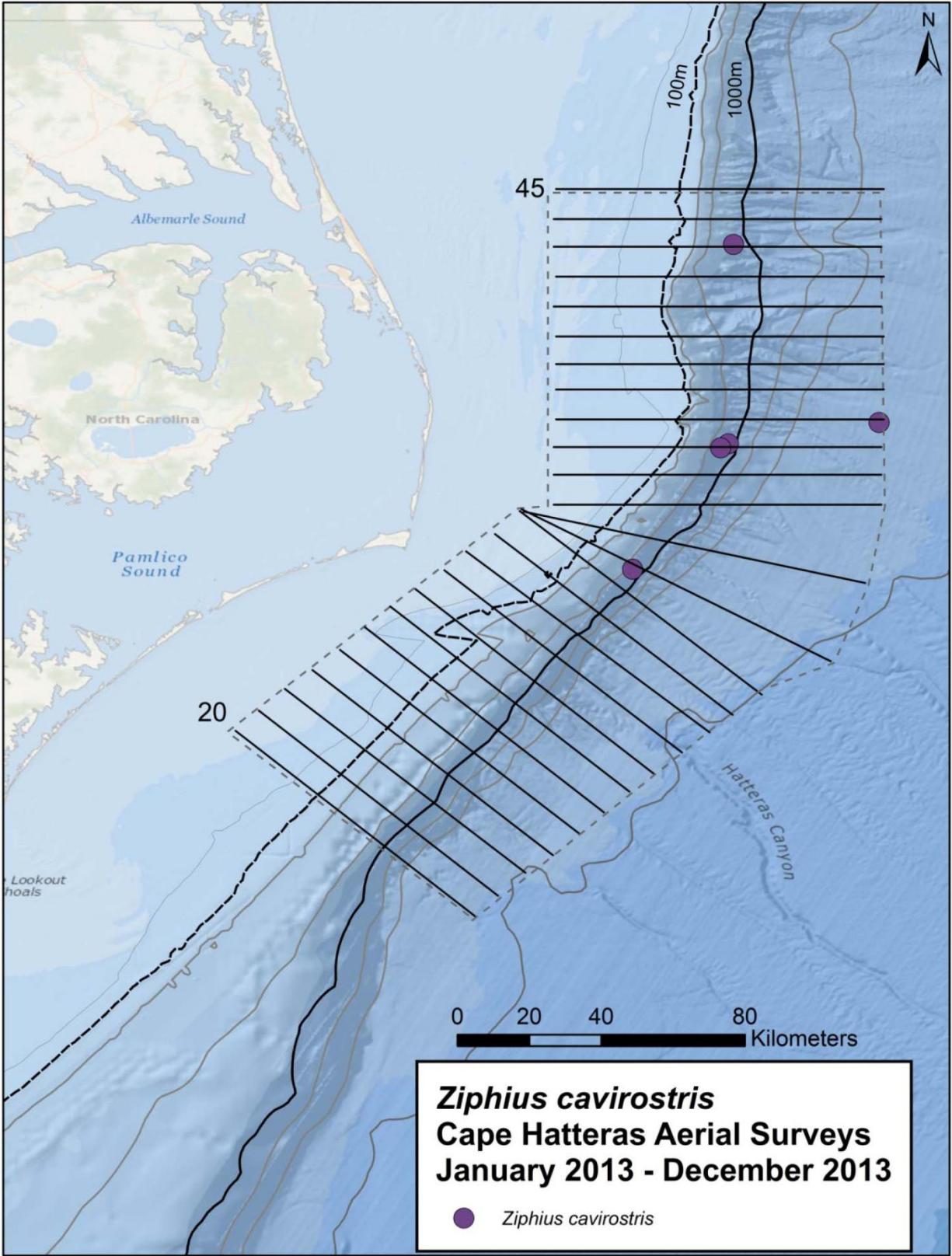


Figure 11. Cuvier's beaked whale (*Ziphius cavirostris*) sightings.

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

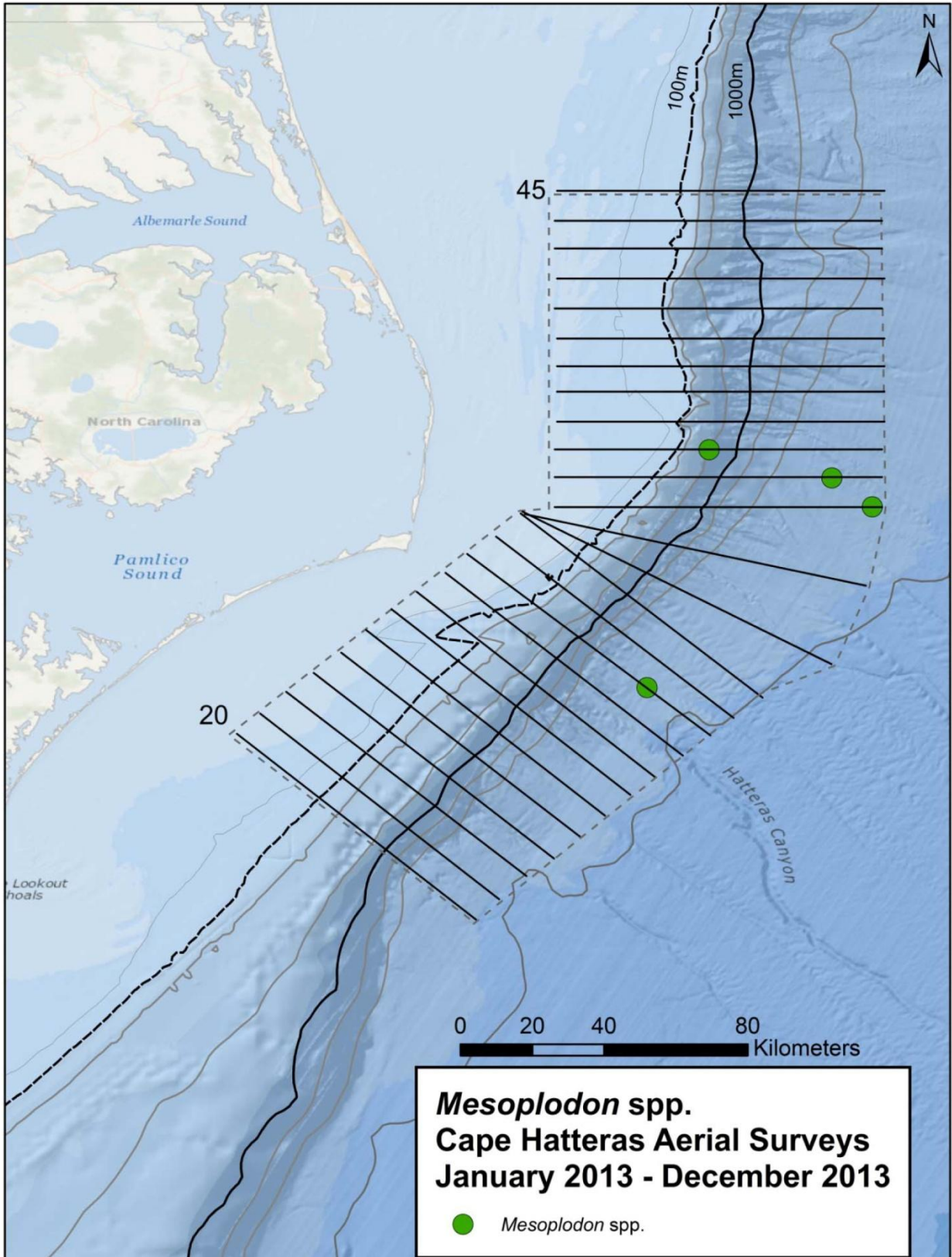


Figure 12. Unidentified *Mesoplodon* species sightings.

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

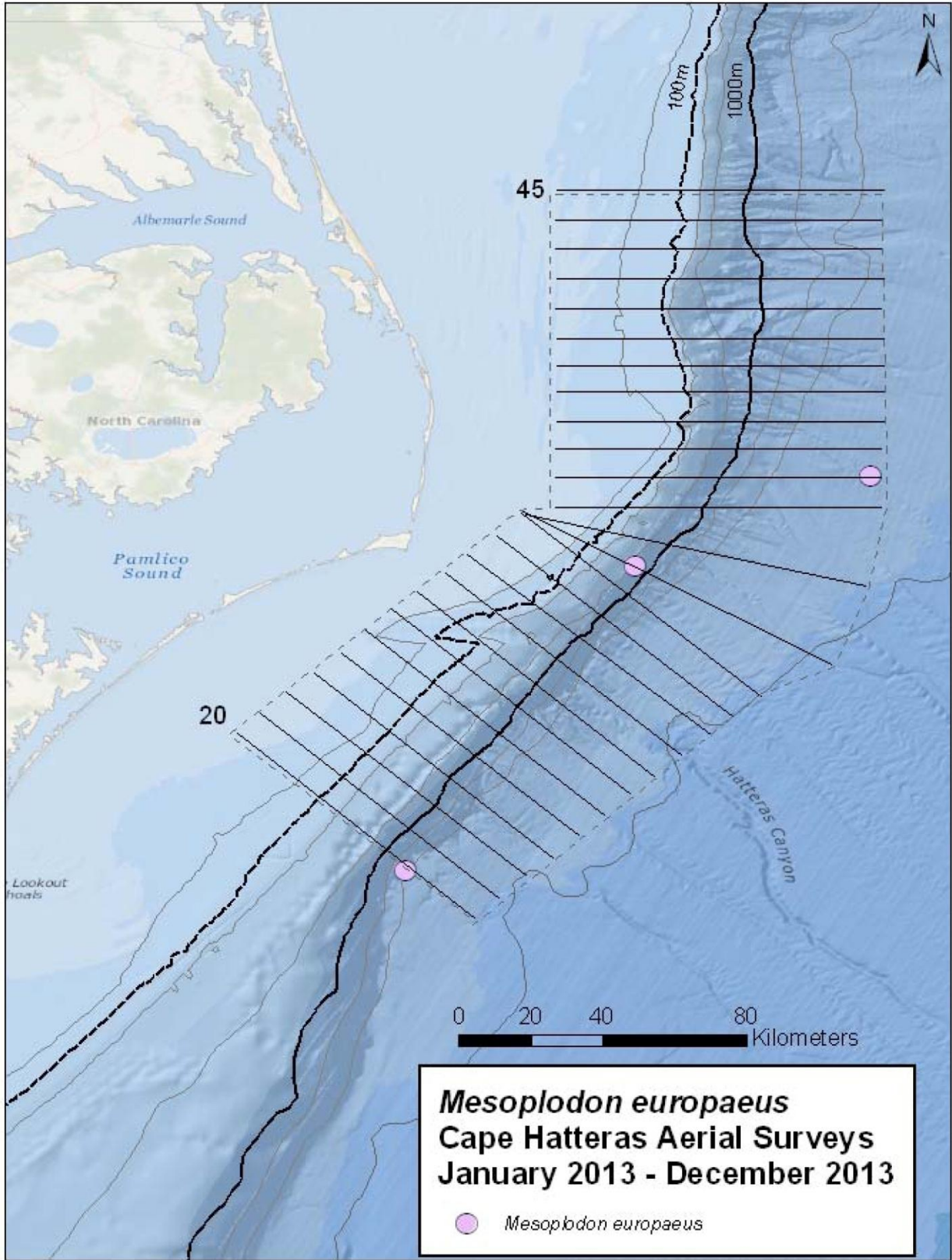


Figure 13. Gervais' beaked whale (*Mesoplodon europaeus*) sightings.

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

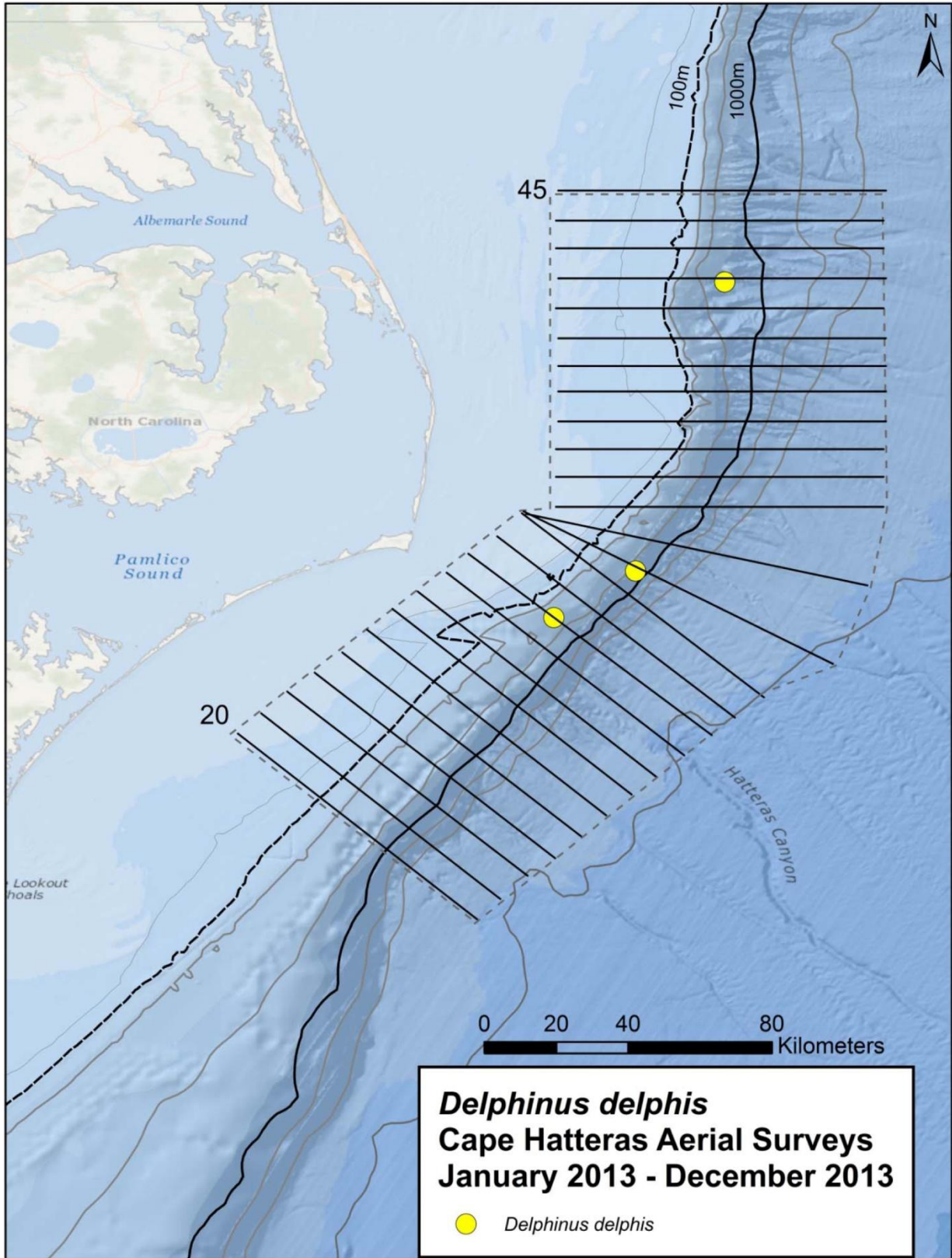


Figure 14. Common dolphin (*Delphinus delphis*) sightings.

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 *

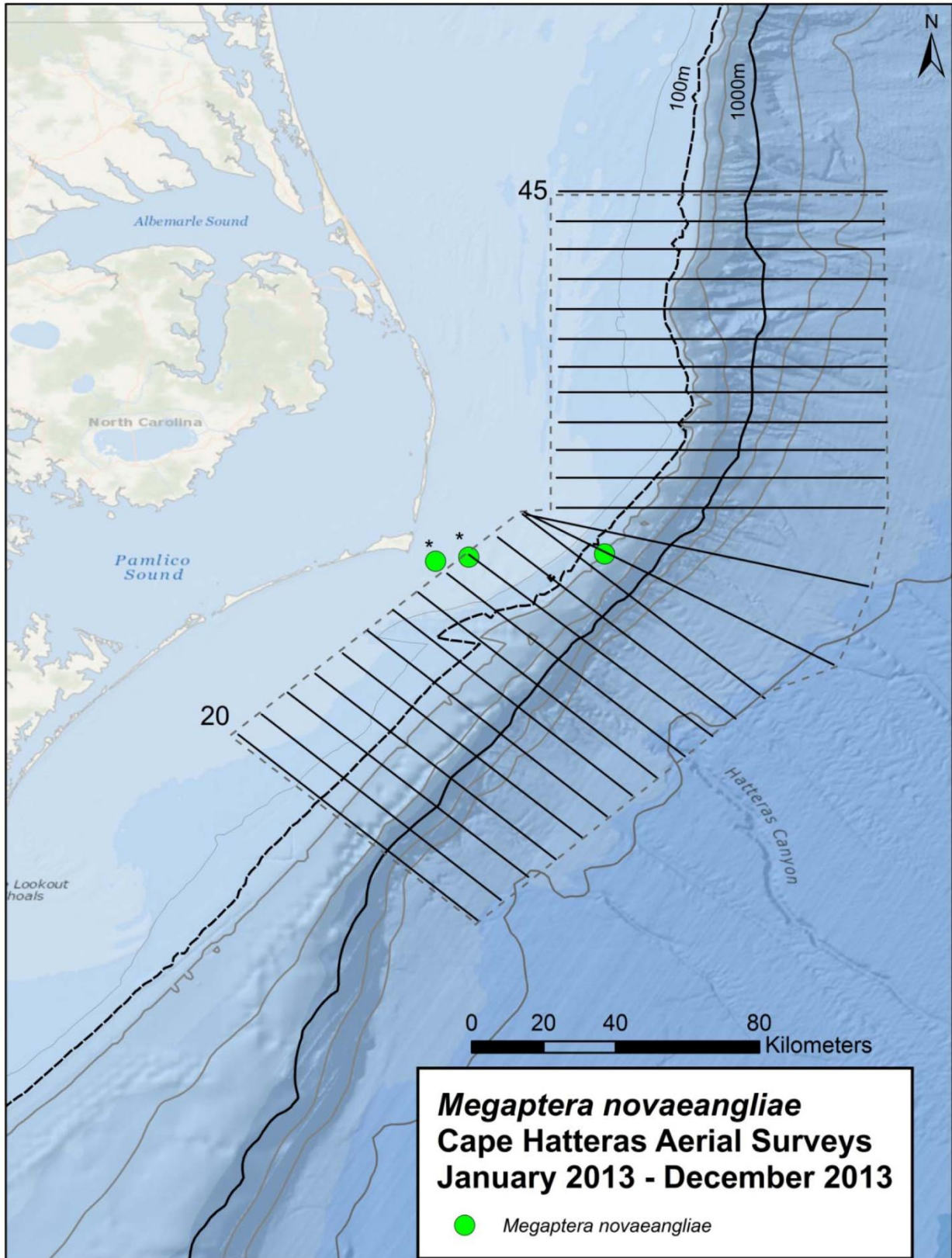


Figure 15. Humpback whale (*Megaptera novaeangliae*) sightings.

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

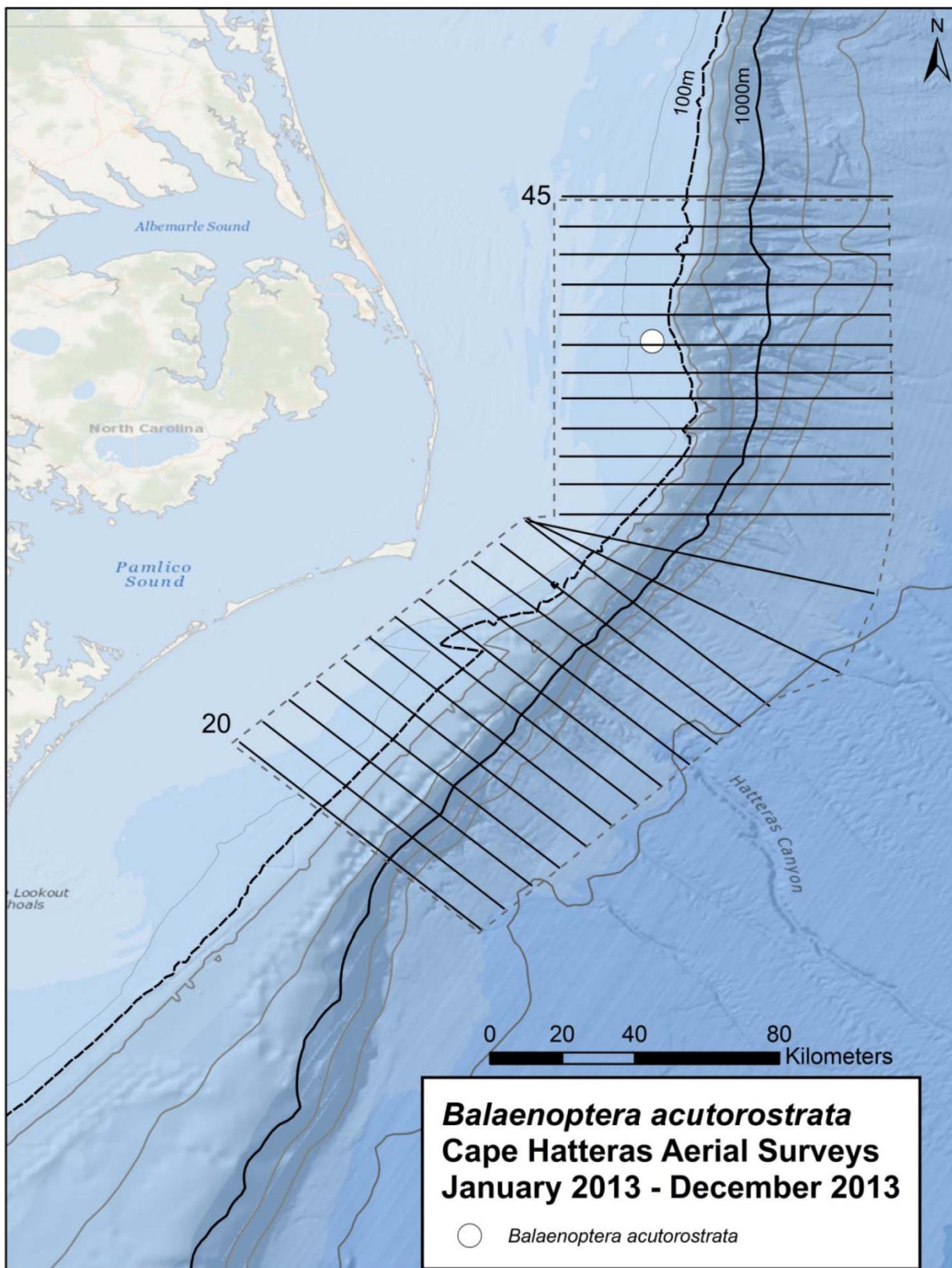


Figure 16. Minke whale (*Balaenoptera acutorostrata*) sighting.

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”.

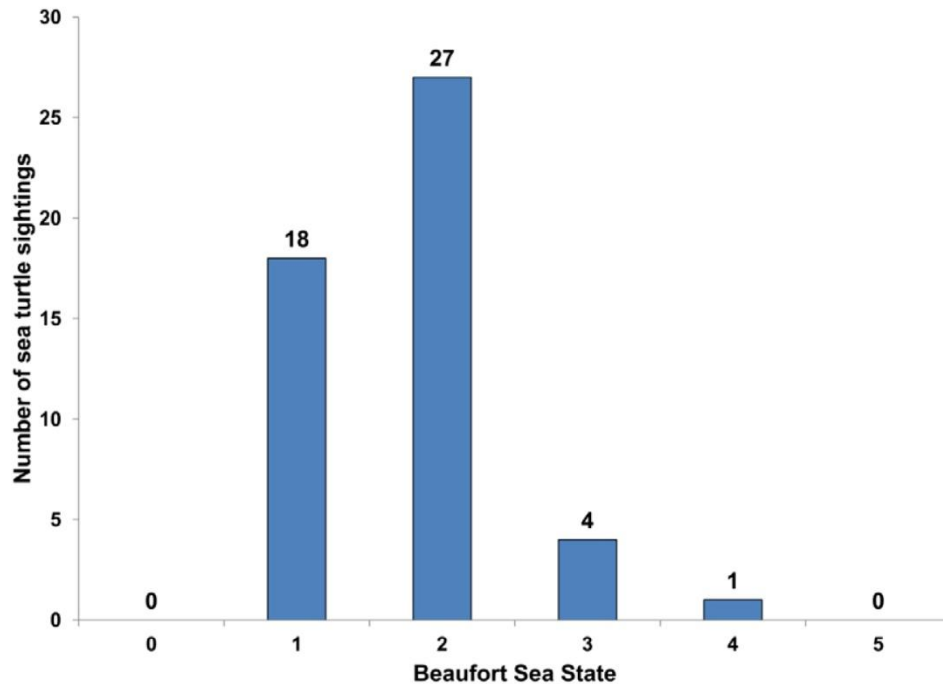


Figure 17a. Total number of sea turtle sightings by Beaufort Sea State in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

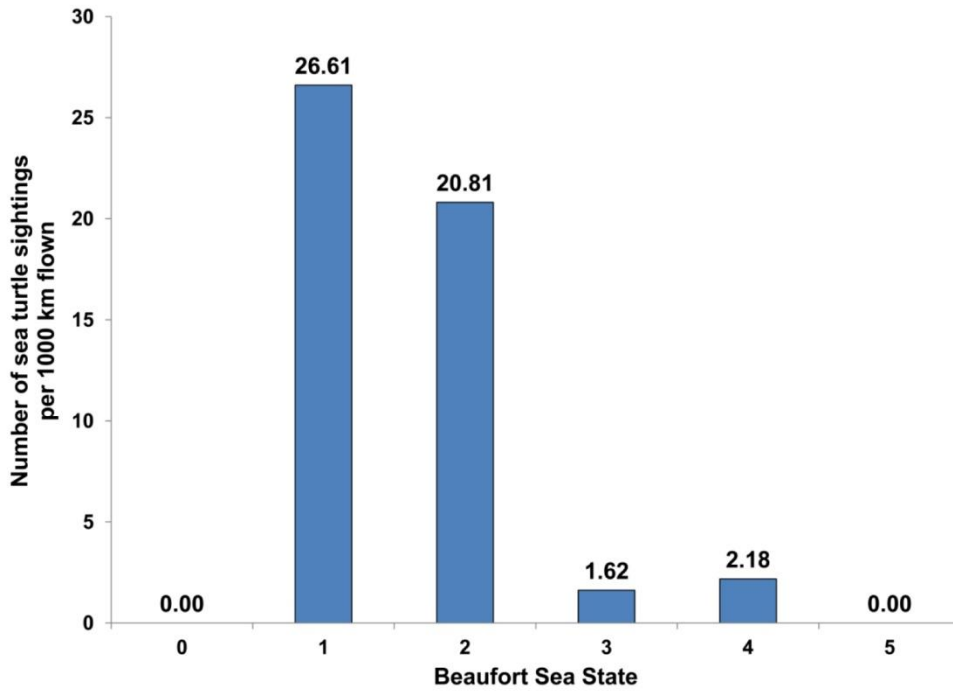


Figure 17b. Sea turtle sightings per 1000 km flown by Beaufort Sea State in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

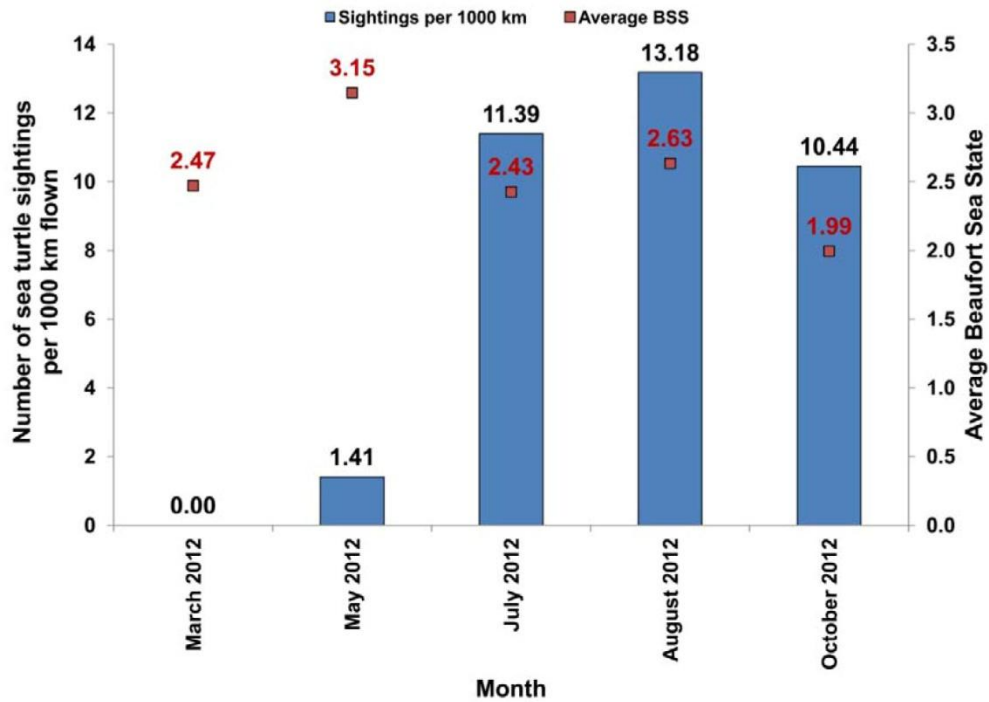


Figure 17c. Sea turtle sightings per 1000 km surveyed and the average Beaufort Sea State per month in the Cape Hatteras, North Carolina survey area from January 2013 to December 2013.

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.

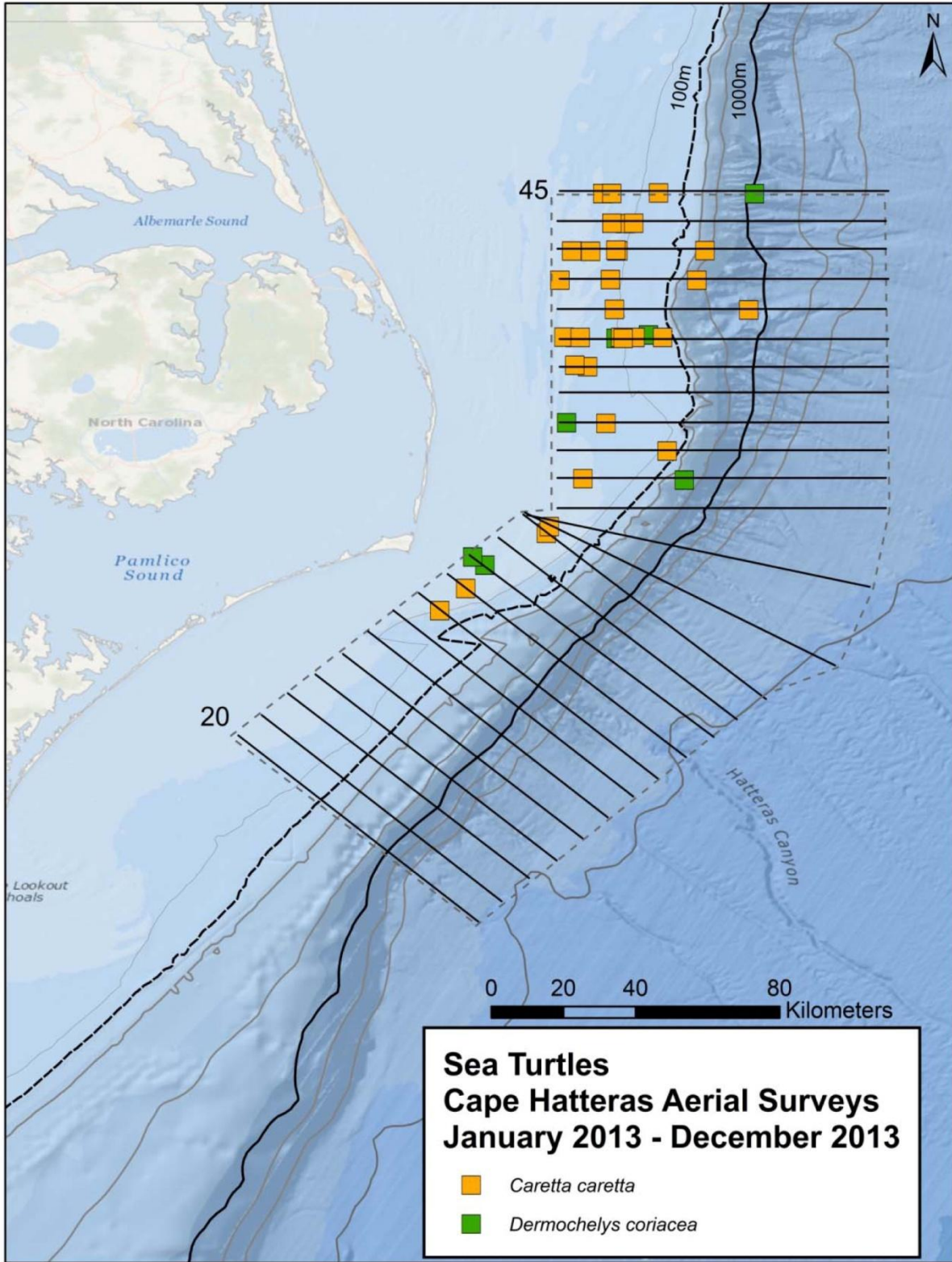


Figure 18. Loggerhead (*Caretta caretta*) and leatherback sea turtle (*Dermochelys coriacea*) sightings.

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

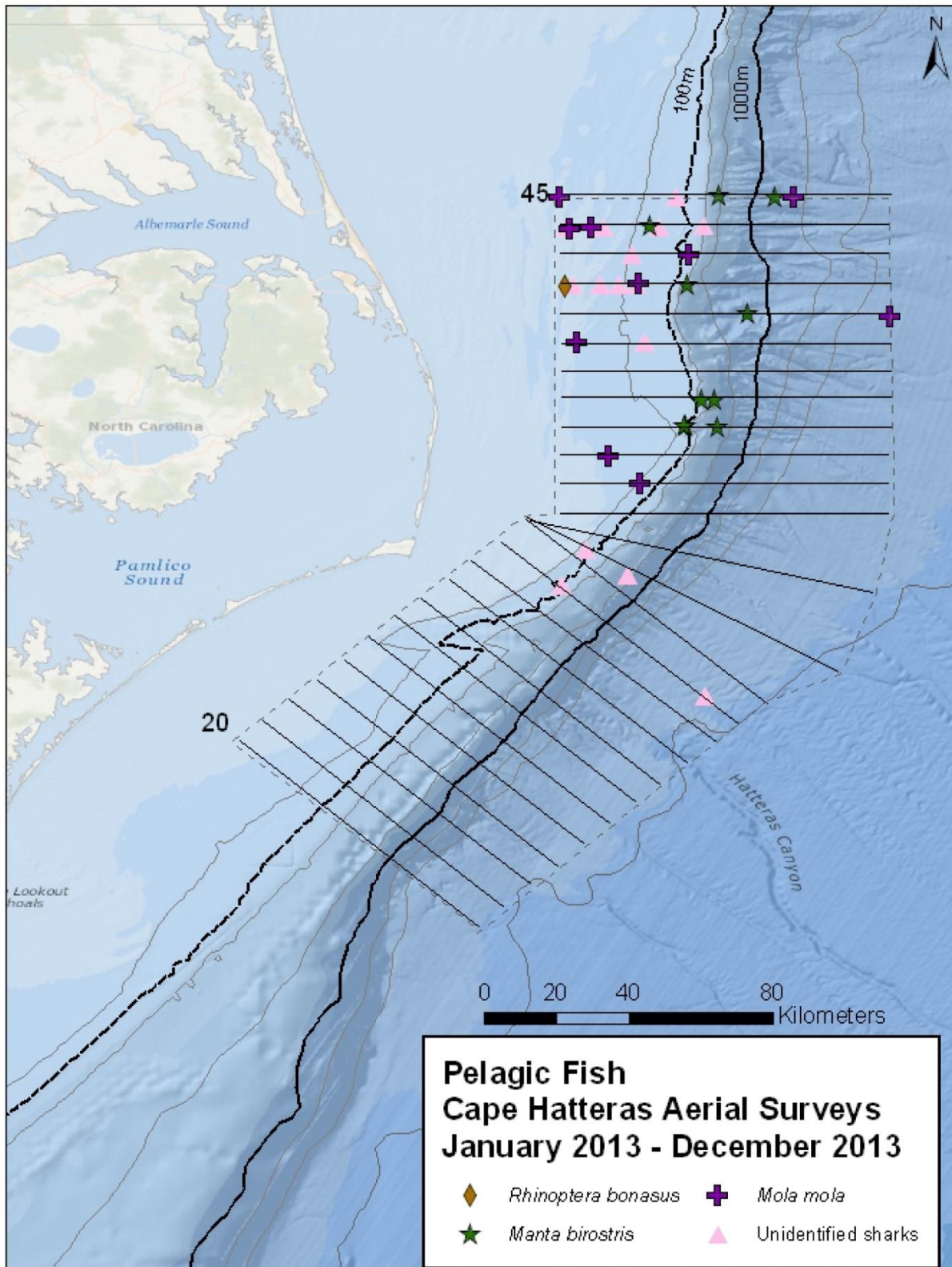


Figure 19. Manta ray (*Manta birostris*), ocean sunfish (*Mola mola*), cownose ray (*Rhinoptera bonasus*), and unidentified shark sightings.

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

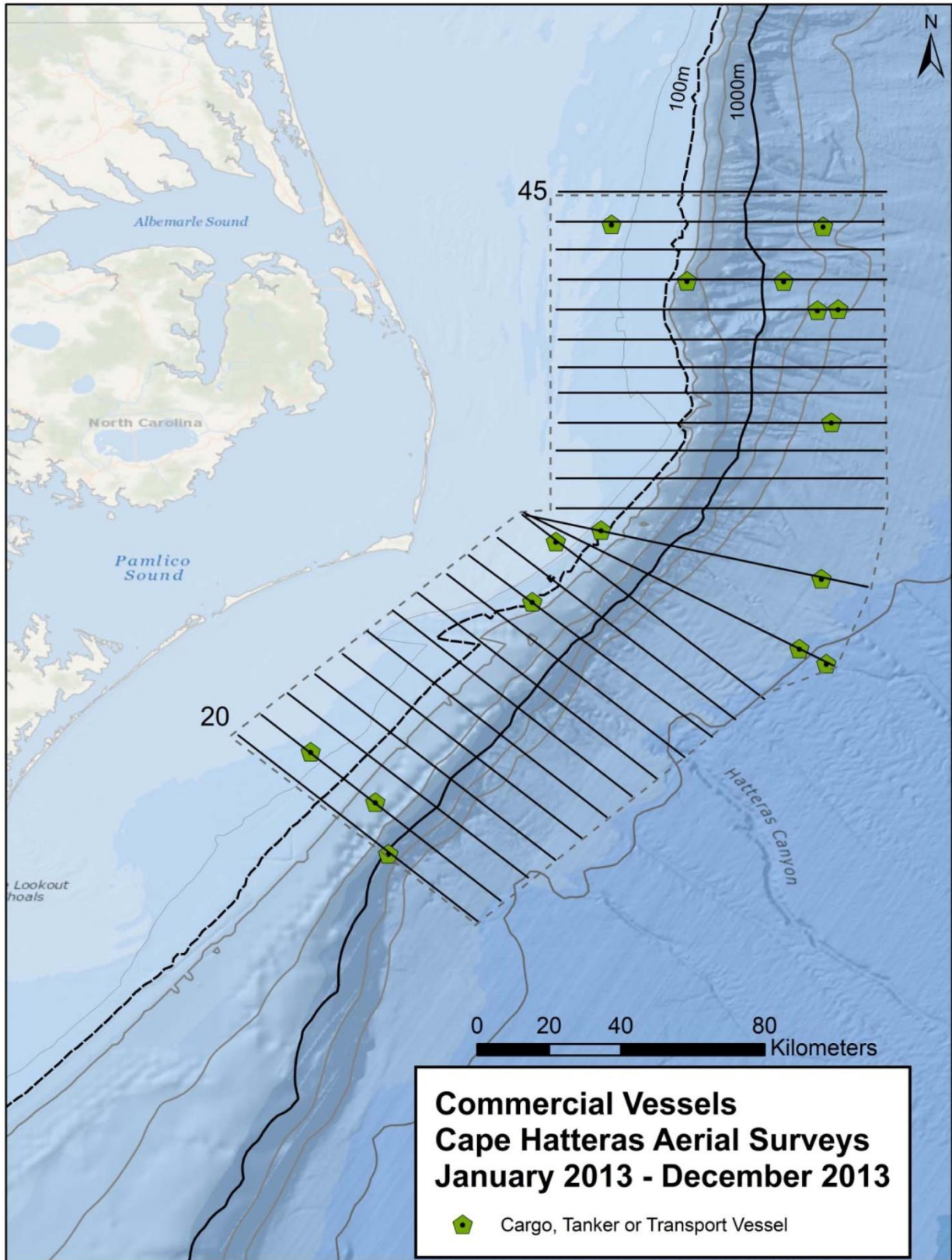


Figure 20. Large commercial shipping vessel sightings.

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

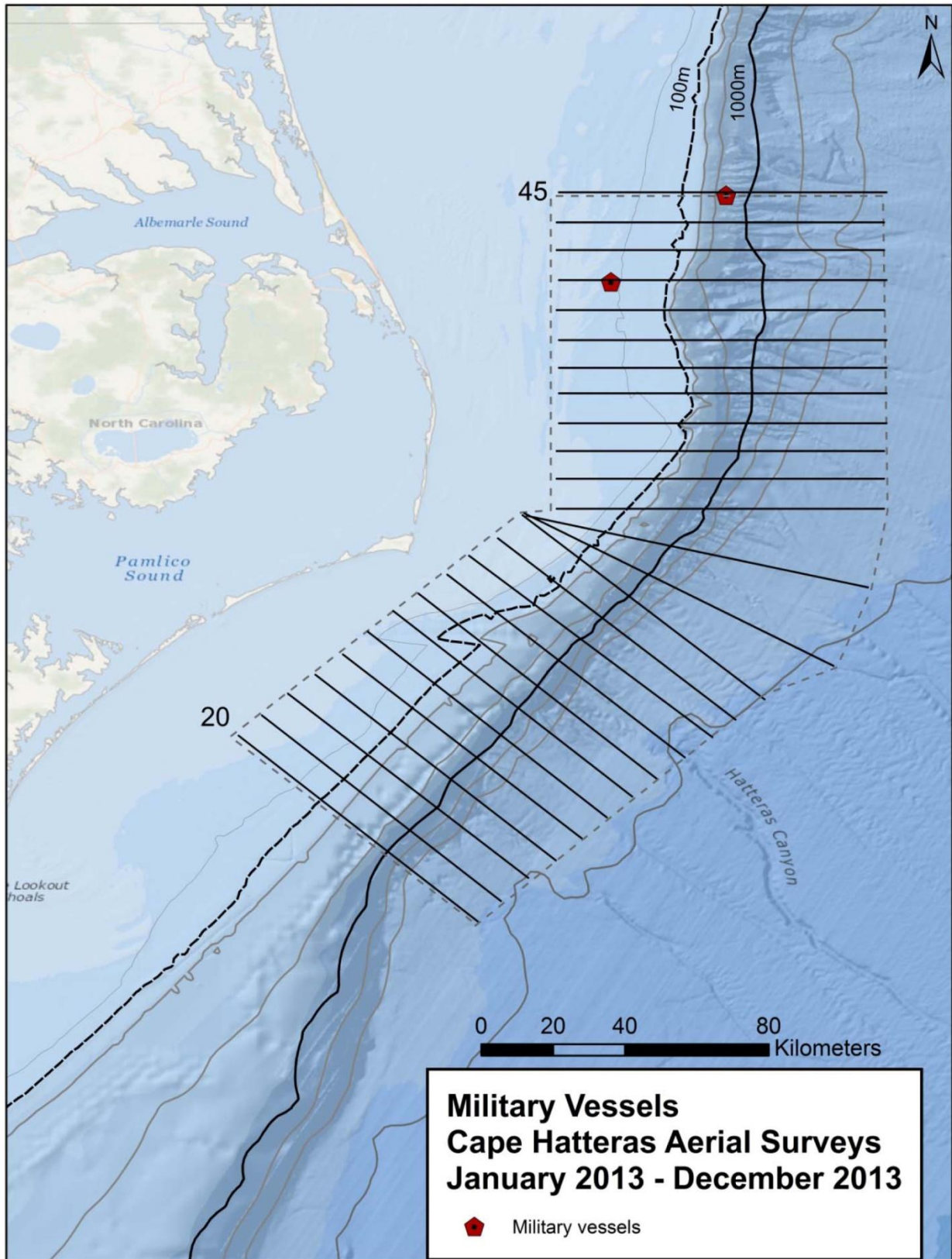


Figure 21. Military vessel sightings.

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

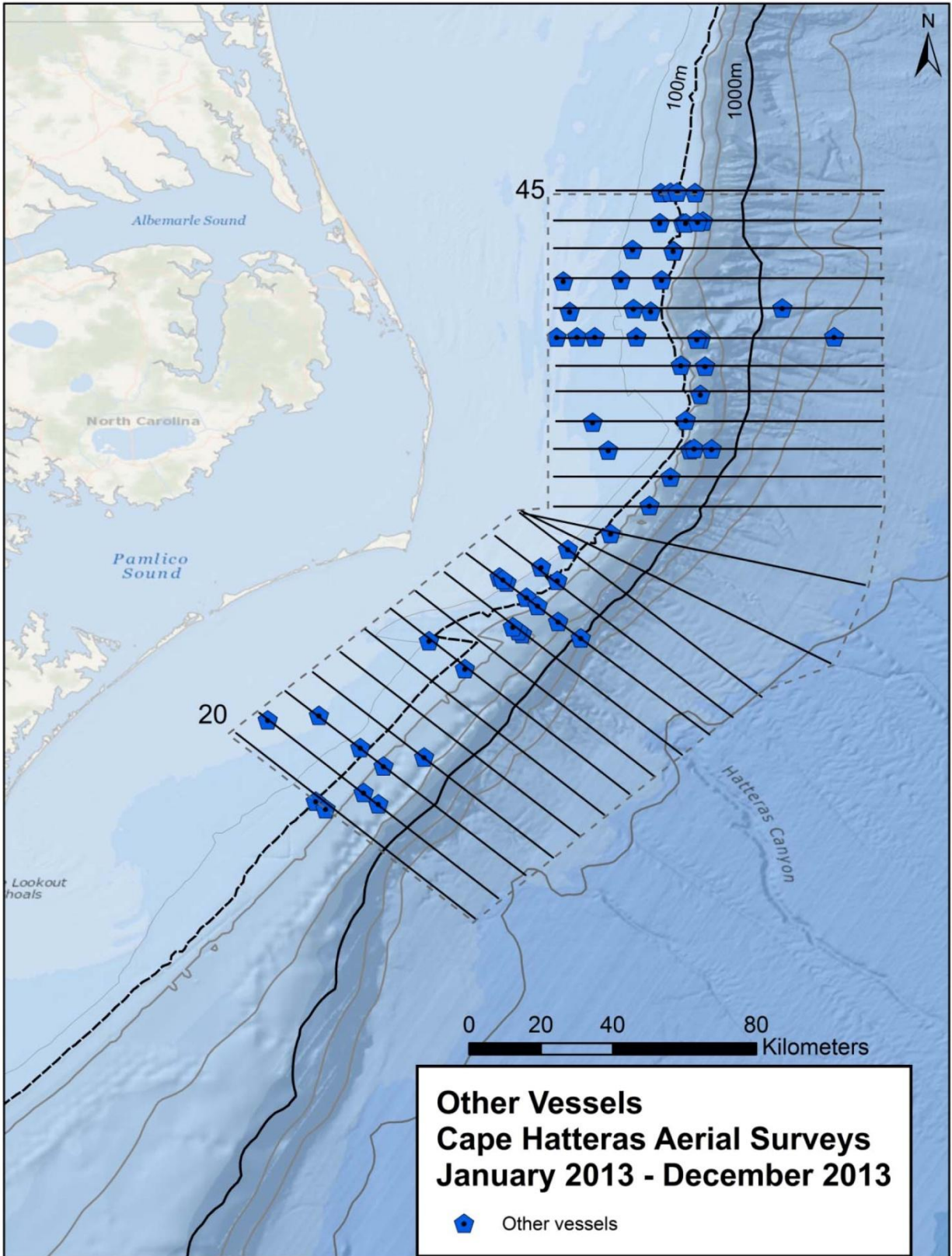


Figure 22. Other vessel sightings.

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