

Virginia Capes (VACAPES) FIREX with IMPASS

Marine Species Monitoring

AERIAL MONITORING SURVEYS

TRIP REPORT



13-15 July 2011

HDR

ACRONYMS AND ABBREVIATIONS

ASW	Anti-Submarine Warfare
ESA	Endangered Species Act
FIREX	Firing Exercise
HDR EOC	HDR Environmental, Operations and Construction, Inc
IMPASS	Integrated Maritime Portable Acoustic Scoring and Simulator
ICMP	Integrated Comprehensive Monitoring Program
km	kilometer(s)
km ²	square kilometers
m	meter(s)
MMPA	Marine Mammal Protection Act
NM	nautical mile(s)
OPAREA	operating area
SPUE	Sightings Per Unit Effort
SOCAL	Southern California Range Complex
VACAPES	Virginia Capes Range Complex

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Section 1 Introduction

Between 13 and 15 July 2011, a Firing Exercise (FIREX) with Integrated Maritime Portable Acoustic Scoring and Simulator (IMPASS) Exercise occurred off the coast of Virginia in the U.S. Navy's Virginia Capes Range Complex (VACAPES). These types of events occur periodically throughout the year and allow the Navy to fulfill essential training requirements.

As part of the compliance requirements of the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA) of 1973, the U.S. Navy developed the Integrated Comprehensive Monitoring Program (ICMP). The ICMP applies by regulation to those activities on Navy training ranges and operating areas (OPAREAs) for which the Navy sought and received incidental take authorizations. In order to support the Navy in meeting regulatory requirements for monitoring established under the Final Rules and to provide a mechanism to assist with coordination of program objectives under the ICMP, monitoring of marine mammals and sea turtles during this exercise included visual surveys from a fixed-wing aircraft.

The results of marine mammal monitoring reported here are part of a long-term monitoring effort under the U.S. Navy's Marine Species Monitoring Program (Contract # N62470-10-D-3011) issued to HDR Environmental, Operations and Construction, Inc. (HDR EOC).

Section 2 Methods

Study Area

The Navy's VACAPES OPAREA lies primarily off the coast of Virginia. Protected marine species monitoring conducted during the VACAPES FIREX training event was focused within the U.S. Navy's VACAPES OPAREA boxes 7C and 7D with boxes 8C and 8D directly adjacent to the west being used as alternate observation areas if 7C/7D were closed out during live-fire exercises (see **Figure 1**). The 7C/7D training exercise area is approximately 21 kilometers (km) offshore, covers an area approximately 1,730 square kilometers (km²) in size, and ranges in bottom depth from 20 to 50 meters (m).

Aerial-Based Monitoring

Aerial-based monitoring effort was performed over a 3-day period from 13 to 15 July 2011 (see **Table 1**). Survey methods were consistent with currently accepted Distance Sampling theory (Buckland et al. 2001) and followed a well-established protocol used for surveys in the Southern California (SOCAL) Range Complex (Smultea et al. 2009). A survey altitude of approximately 1,000 feet and 100 knots was attempted while on-effort, but might have varied slightly based on weather conditions in the area. Once a marine mammal sighting was made, a focal follow circling session may have been attempted at 1,000 feet or higher. A lower altitude of approximately 700 to 800 feet was established after focal follows for photography purposes to provide sharper images required for species identification.

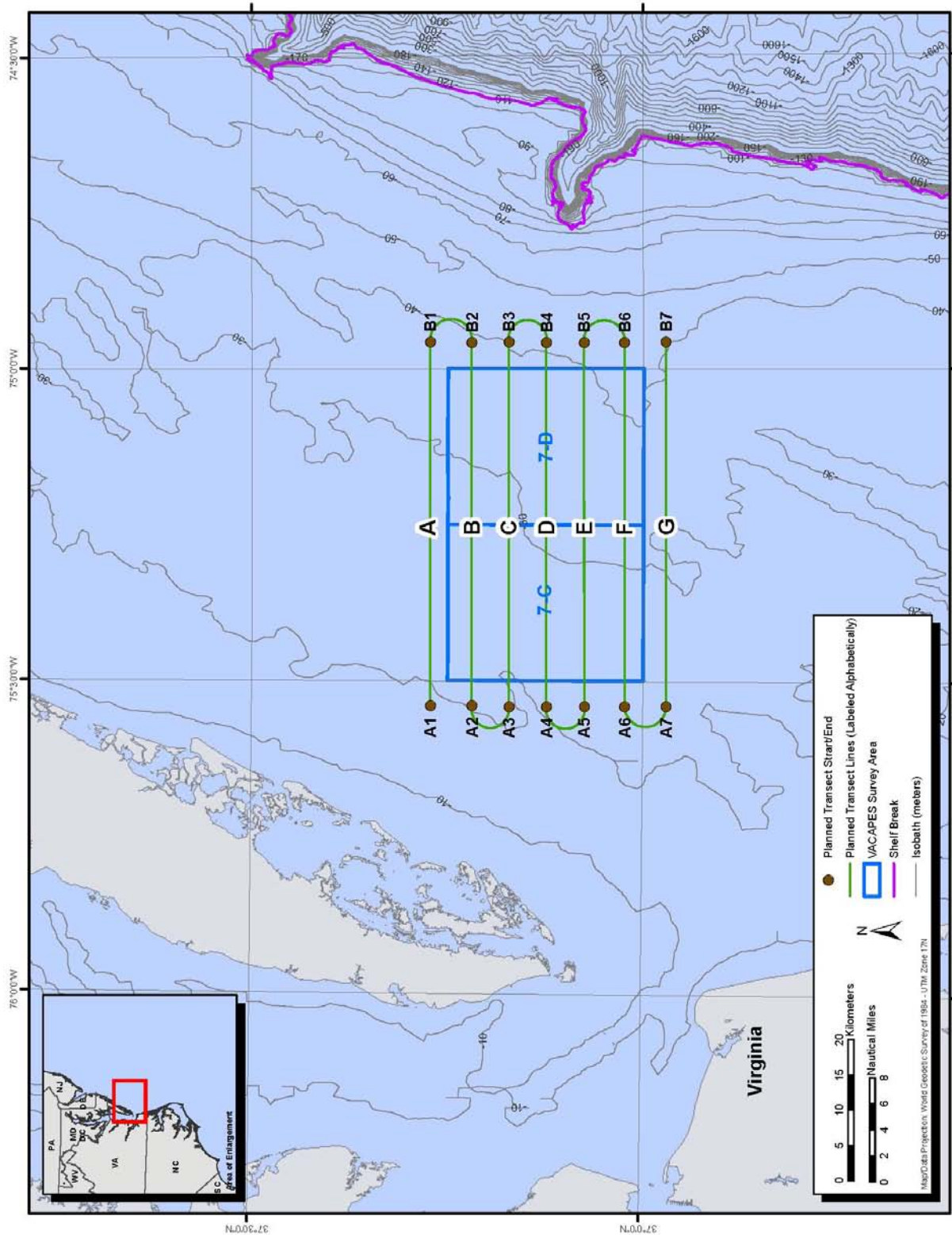


Figure 1. Predetermined Tracklines for the Survey Effort for VACAPES FIREX 2011.

Table 1. Summary of VACAPES FIREX Monitoring Effort

Date	Description	Start Time	Stop Time	Total Survey Minutes*	Total On-Effort Minutes	Trackline On-Effort Distance (km)
July 13	Transect survey (Pre-Event)	1211	1507	176	121	442
July 14 (FIREX)	Transect survey (During-Event)	1359	1600	121	88	282
July 15	Transect survey (Post-Event)	0832	1112	160	116	403
Total				457 (≈7.6 hrs)	325 (≈5.4 hrs)	1,127 km

Note: * Total Survey Minutes reflect minutes occupied in the range/area of interest and include both on-effort (systematic) and off-effort (random) totals minutes.

The observation platform was a Cessna T337H Turbo Skymaster aircraft operating out of Norfolk International Airport in Norfolk, Virginia. A total of two surveys were conducted on 13 and 15 July following pre-determined transect lines covering the 7C/7D range boxes (approximately 1,730 km²) and consisted of waypoints designed to extend beyond the entire range (if permitted by U.S. Navy flight operations) during each survey day during each 4-hour maximum survey flight time window (see **Table 1, Figure 1**). Due to area restrictions on 14 July, a single survey was conducted following pre-determined transect lines covering the 8C/8D range boxes (approximately 1,340 km²) immediately to the east of boxes 7C/7D and consisted of waypoints shortened on the western side so as not to enter the 7C/7D boxes (see **Table 1, Figure 4**).

Both aerial observers (see **Table 2**) were experienced with line-transect survey methodology, had experience in identification of Atlantic marine mammal and sea turtle species, were knowledgeable of marine mammal biology and behavior, and had previous experience conducting marine mammal and sea turtle observations from aircraft.

Table 2. Observers and Roles

Observer	Role(s)
Dan Engelhaupt	Chief Scientist/Observer
Lenisa Blair	Observer

Seven parallel tracklines running from west to east, measuring 51 km, and spaced approximately 5.8 km apart were observed during “systematic” efforts throughout the surveys and provided a total survey coverage area for boxes 7C/7D of approximately 1,730 km² (see **Figure 1**). Original lines were followed when possible, but exact transects followed were subject to modifications as a result of range exclusion by live-fire U.S. Navy exercises in the area, unfavorable weather conditions on the range, or hourly contact with Naval flight operations via increasing the planes altitude (see **Table 1, Figures 2 through 5**).

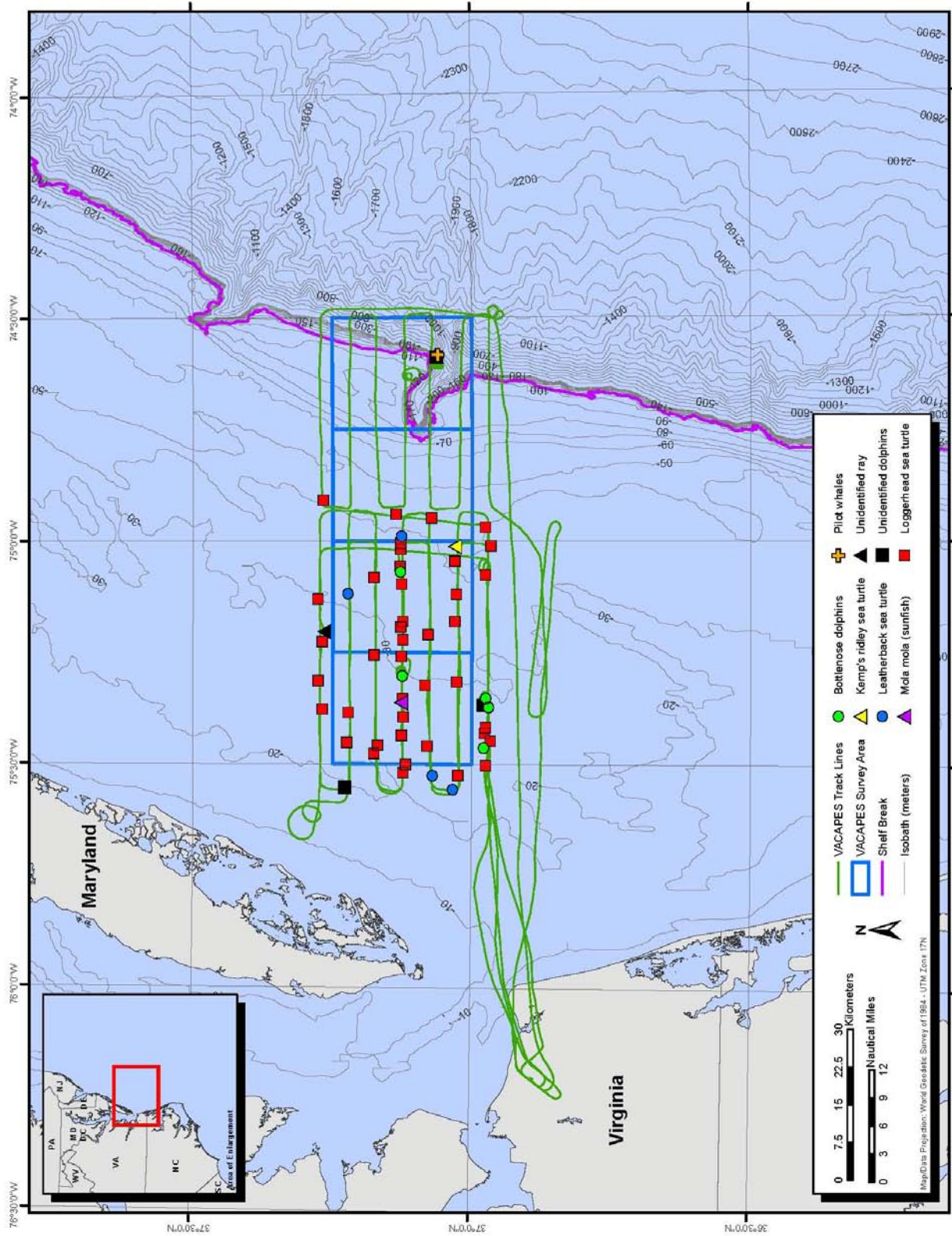


Figure 2. Location of All Cetacean and Sea Turtle Sightings Seen During Survey Period (13 -15 July).

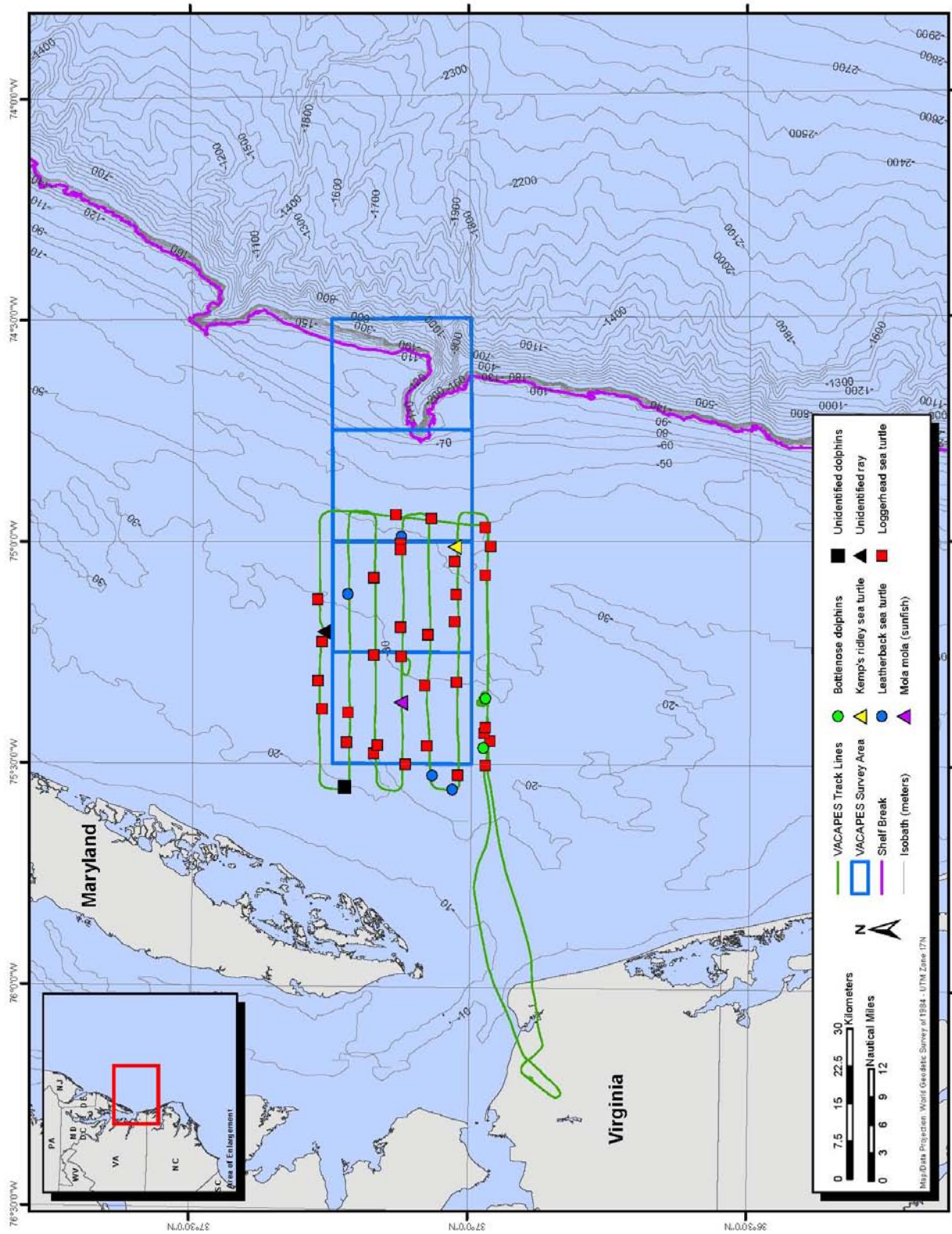


Figure 3. Location of Cetacean and Sea Turtle Sightings Seen Pre-FIREX (13 July).

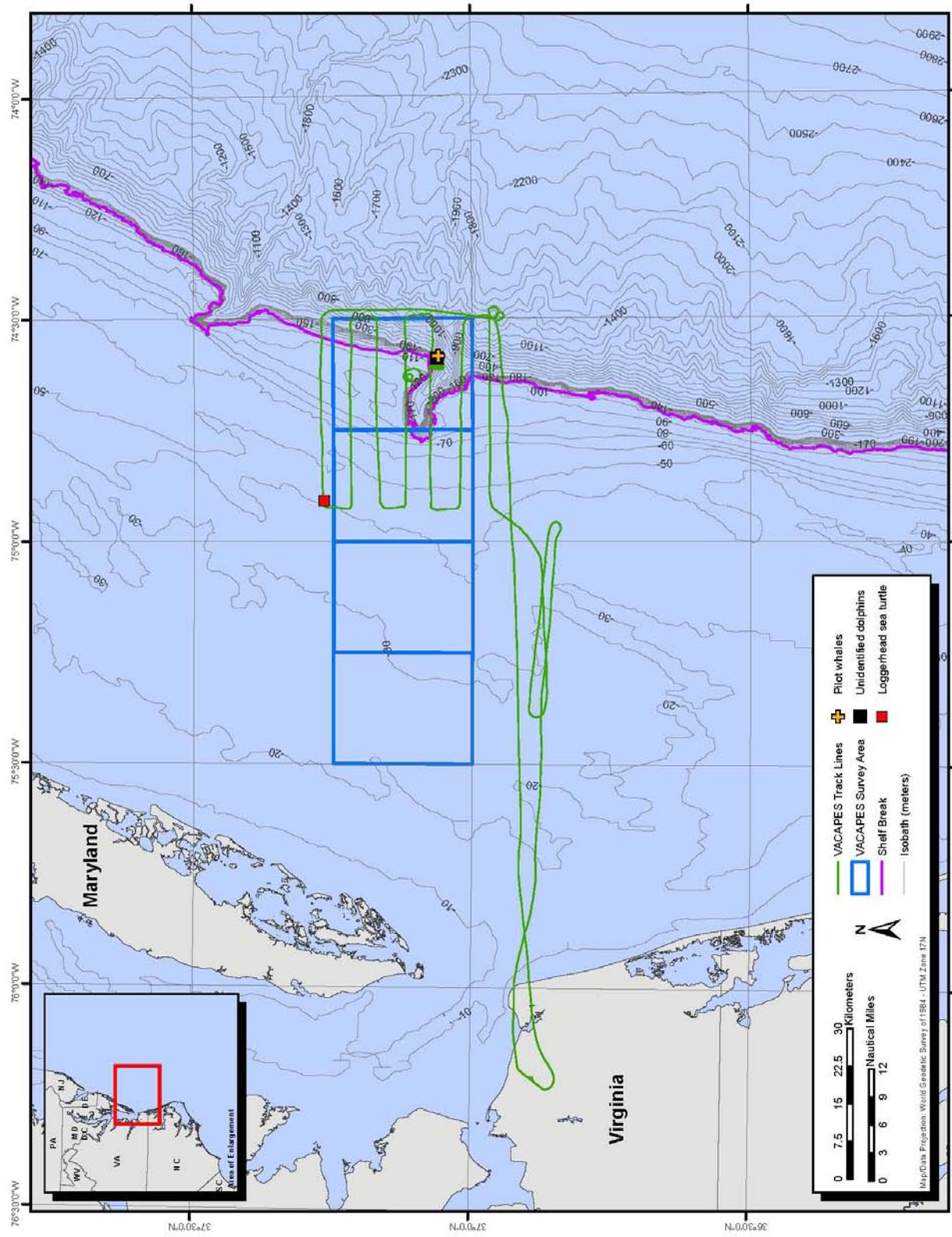


Figure 4. Location of Cetacean and Sea Turtle Sightings Seen During FIREX (14 July).

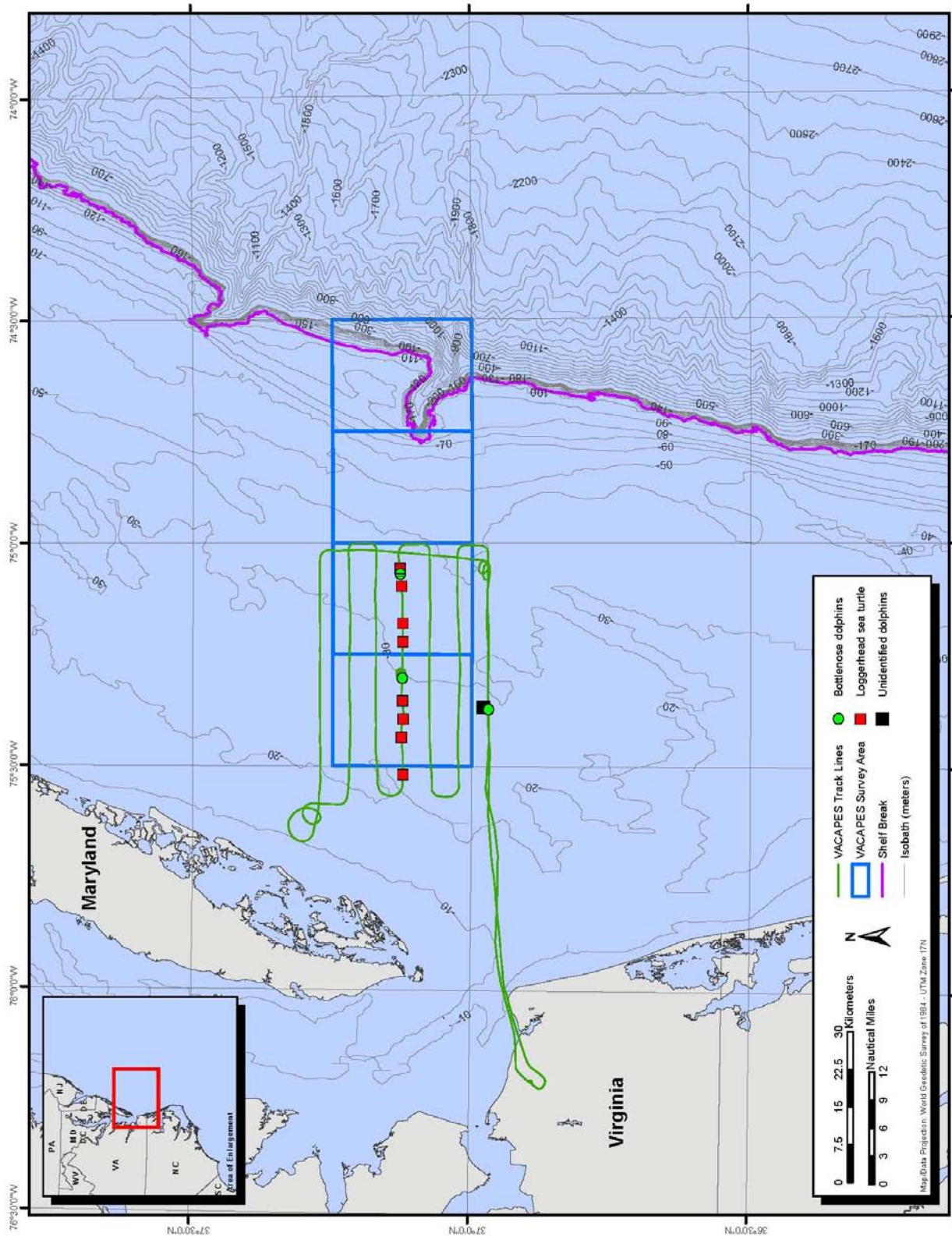


Figure 5. Location of Cetacean and Sea Turtle Sightings Seen Post-FIREX (15 July).

The general survey approach was as follows:

1. Follow pre-determined transect lines and waypoints using methods described by Smultea et al. (2009) until a sighting is made. Variables such as sea state, glare, and visibility are recorded.
2. Upon sighting a marine mammal/sea turtle group, record basic sighting information per established protocol (see Smultea et al. 2009). As outlined in the VACAPES Range Complex Monitoring Plan February 2009, information is to include (1) species identification and group size; (2) location and relative distance from the Anti-Submarine Warfare (ASW) site if available; (3) the behavior of marine mammals and sea turtles including standard environmental and oceanographic parameters; (4) date, time, and visual conditions associated with each observation; (5) direction of travel relative to true North; and (6) duration of the observation.
3. If the species appears suitable for a focal follow, the aircraft increases altitude to approximately 365 to 455 m and radial distance increases approximately 0.5 to 1.0 km and the aircraft circles the sighting to obtain detailed behavior information as long as possible and logical, for a minimum of 5 minutes, including a combination of both video and digital photographs if possible.
4. If the species is not selected for a focal follow, and species and group size are unknown, the aircraft circles the sighting to obtain digital photographs for species identification confirmation and estimate group size/composition.

Section 3 Results

Survey Effort

Observers visually surveyed approximately 1,127 km of systematic (on-effort) trackline and 1,509 km of combined systematic, random (lines covered in transit to the next trackline), and circling (focal follow or species ID) tracklines during 3 days for approximately 5.4 hours of on-effort status (see **Table 1**). Beaufort sea state ranged from 1 to 5 and all sightings were made in Beaufort sea states between 1 and 5 (see **Table 3**). A detailed description of environmental, oceanographic, and sighting conditions was recorded and is available if requested. Due to an extremely high sighting rate of sea turtles in the range after the first survey day, surveys for sea turtles were limited to one random transect line on subsequent days (14 and 15 July). Sightings for sea turtles on the chosen random transect line were multiplied by 7 (number of transect lines) for total estimated sightings required for sightings per unit effort (SPUE) calculations. SPUE was calculated as the total survey effort (hours/km/nautical miles [NM]) divided by the total number of marine mammal sightings (n=9) or sea turtles (n=107 [includes 13 July (n=37), 14 July (n=7), and 15 July (n=63) – see description above]). For this monitoring exercise, the SPUE for marine mammals was equal to one sighting per 0.8 hours, 125.2 km, and 67.6 NM and the SPUE for sea turtles was equal to one sighting per 0.07 hours, 10.5 km, and 5.7 NM.

Sightings

Nine sighting of cetaceans and 107 sightings of sea turtles were recorded during 7.6 hours of total survey flight time within the survey area (see **Figure 2, Table 3**).

Table 3. Summary of Sightings

Sighting No.	Date	Species	Group Size			Calves	Start Time	Stop Time	Beaufort Sea State	Latitude	Longitude	Vert. Angle	Distance off Track (km)	Heading	Bottom Depth (m)	Behavioral Summary
			Best	High	Low											
1	7/13/11	CC	1	1	1	-	12:12	12:13	2	36.976	-75.501	29	0.6	270	<50	Loggerhead turtle at the surface. No disturbance detected.
2	7/13/11	CC	1	1	1	-	12:13	-	2	36.968	-75.447	40	0.4	090	<50	Loggerhead turtle at the surface. No disturbance detected.
3	7/13/11	CC	1	1	1	-	12:14	-	2	36.978	-75.430	27	0.7	000	<50	Loggerhead turtle at the surface. No disturbance detected.
4	7/13/11	TT	15	14	15	1	12:16	12:30	2	36.976	-75.325	20	0.9	300	20	Group of 15 bottlenose dolphins travelling slowly. See Appendix A for focal follow data.
5	7/13/11	CC	1	1	1	-	12:38	-	2	36.977	-75.076	36	0.4	280	<50	Loggerhead turtle resting at the surface. No disturbance detected.
6	7/13/11	CC	1	1	1	-	12:40	-	2	36.967	-75.012	33	0.5	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
7	7/13/11	CC	1	1	1	-	12:41	-	2	36.977	-74.969	27	0.6	290	<50	Loggerhead turtle at the surface. No disturbance detected.
8	7/13/11	KR	1	1	1	-	12:46	-	2	37.031	-75.012	32	0.5	180	<50	Kemps Ridley turtle resting at the surface. No disturbance detected.
9	7/13/11	CC	1	1	1	-	12:47	-	2	37.032	-75.045	25	0.5	Unk.	<50	Loggerhead turtle resting at the surface. No disturbance detected.
10	7/13/11	CC	1	1	1	-	12:49	-	2	37.029	-75.120	40	0.4	180	<50	Loggerhead turtle resting at the surface. No disturbance detected.
11	7/13/11	CC	1	1	1	-	12:51	-	2	37.032	-75.180	21	0.8	225	<50	Loggerhead turtle resting at the surface. No disturbance detected.
12	7/13/11	CC	1	1	1	-	12:55	-	2	37.028	-75.315	45	0.3	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
13	7/13/11	CC	1	1	1	-	13:01	-	2	37.025	-75.524	45	0.3	90	<50	Loggerhead turtle resting at the surface. No disturbance detected.
14	7/13/11	DC	1	1	1	-	13:02	-	2	37.035	-75.557	51	0.3	225	<50	Leatherback turtle resting at the surface. No disturbance detected.
15	7/13/11	DC	1	1	1	-	13:04	-	2	37.071	-75.525	44	0.3	125	<50	Leatherback turtle resting at the surface. No disturbance detected.

Sighting No.	Date	Species	Group Size			Calves	Start Time	Stop Time	Beaufort Sea State	Latitude	Longitude	Vert. Angle	Distance off Track (km)	Heading	Bottom Depth (m)	Behavioral Summary
			Best	High	Low											
16	7/13/11	CC	1	1	1	-	13:05	-	2	37.081	-75.459	27	0.6	110	<50	Loggerhead turtle resting at the surface. No disturbance detected.
17	7/13/11	CC	1	1	1	-	13:09	-	2	37.085	-75.323	30	0.6	145	<50	Loggerhead turtle resting at the surface. No disturbance detected.
18	7/13/11	CC	1	1	1	-	13:12	-	2	37.079	-75.209	30	0.6	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
19	7/13/11	DC	1	1	1	-	13:21	-	3	37.127	-75.990	50	0.3	270	<50	Leatherback turtle resting at the surface. No disturbance detected.
20	7/13/11	CC	1	1	1	-	13:21	-	3	37.128	-75.005	40	0.4	000	<50	Loggerhead turtle resting at the surface. No disturbance detected.
21	7/13/11	CC	1	1	1	-	13:22	-	3	37.129	-75.018	40	0.4	180	<50	Loggerhead turtle resting at the surface. No disturbance detected.
22	7/13/11	CC	1	1	1	-	13:27	-	3	37.128	-75.193	36	0.5	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
23	7/13/11	CC	2	2	2	-	13:28	-	3	37.128	-75.258	46	0.3	90	<50	Loggerhead turtle resting at the surface. No disturbance detected.
24	7/13/11	MM	1	1	1	-	13:34	-	3	37.128	-75.361	58	0.2	Unk.	<50	Sunfish logging at the surface. No disturbance detected.
25	7/13/11	CC	1	1	1	-	13:38	-	2	37.119	-75.450	30	0.6	270	<50	Loggerhead turtle resting at the surface, then dove.
26	7/13/11	CC	1	1	1	-	13:42	-	2	37.176	-75.476	40	0.4	90	<50	Loggerhead turtle resting at the surface. No disturbance detected.
27	7/13/11	CC	1	1	1	-	13:43	-	2	37.169	-75.457	39	0.4	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
28	7/13/11	CC	2	2	2	-	13:47	-	2	37.176	-75.255	47	0.3	90	<50	Loggerhead turtle resting at the surface. No disturbance detected.
29	7/13/11	CC	1	1	1	-	13:51	-	2	37.177	-75.082	50	0.3	100	<50	Loggerhead turtle resting at the surface. No disturbance detected.
30	7/13/11	DC	1	1	1	-	14:01	-	2	37.223	-75.118	50	0.3	225	<50	Leatherback turtle resting at the surface. No disturbance detected.
31	7/13/11	CC	1	1	1	-	14:09	-	2	37.223	-75.384	40	0.4	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
32	7/13/11	CC	1	1	1	-	14:11	-	1	37.224	-75.451	32	0.6	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.

Sighting No.	Date	Species	Group Size Best/High/Low			Calves	Start Time	Stop Time	Beaufort Sea State	Latitude	Longitude	Vert. Angle	Distance off Track (km)	Heading	Bottom Depth (m)	Behavioral Summary
33	7/13/11	Unid	1	1	1	-	14:14	-	2	37.223	-75.552	40	0.4	0	10	Unidentified single dolphin travelling north. No disturbance detected.
34	7/13/11	CC	1	1	1	-	14:20	-	1	37.269	-75.376	33	0.5	270	<50	Loggerhead turtle resting at the surface. No disturbance detected.
35	7/13/11	CC	1	1	1	-	14:21	-	1	37.276	-75.313	50	0.3	250	<50	Loggerhead turtle resting at the surface. No disturbance detected.
36	7/13/11	CC	1	1	1	-	14:24	-	1	37.269	-75.226	45	0.3	Unk.	<50	Loggerhead turtle resting at the surface. No disturbance detected.
37	7/13/11	UR	1	1	1	-	14:25	-	1	37.265	-75.203	60	0.2	225	<50	Unidentified species of ray detected at surface. No disturbance detected.
38	7/13/11	CC	1	1	1	-	14:27	-	2	37.277	-75.130	40	0.4	285	<50	Loggerhead turtle resting at the surface. No disturbance detected.
39	7/13/11	CC	1	1	1	-	14:35	-	3	37.137	-74.940	40	0.4	290	<50	Loggerhead turtle resting at the surface. No disturbance detected.
40	7/13/11	CC	1	1	1	-	14:37	-	3	37.074	-74.949	42	0.4	300	<50	Loggerhead turtle resting at the surface. No disturbance detected.
41	7/13/11	CC	1	1	1	-	14:53	-	3	36.976	-74.418	32	0.5	90	<50	Loggerhead turtle resting at the surface. No disturbance detected.
42	7/13/11	TT	9	10	8	1	14:54	15:05	3	36.980	-75.463	18	1.0	270	20	Group of 9 bottlenose dolphins travelling quickly. Varying levels of dispersion. See Appendix A for focal follow data.
43	7/14/11	Unid	-	-	-	-	14:39	-	5	37.064	-74.589	22	0.8	Unk.	>500	Quick look at unidentified dolphin species. Details unknown.
44	7/14/11	GM	45	50	40	0	14:44	14:50	5	37.061	-74.583	60	0.2	90	>500	One large group and two smaller groups of pilot whales travelling slowly. Difficult to follow in choppy seas, abrupt dive. Travel direction change possibly a result of plane overhead.
45	7/14/11	CC	1	1	1	-	15:40	15:40	5	37.267	-74.909	43	0.3	90	<50	Loggerhead turtle resting at the surface. No disturbance detected.

Sighting No.	Date	Species	Group Size Best/High/Low			Calves	Start Time	Stop Time	Beaufort Sea State	Latitude	Longitude	Vert. Angle	Distance off Track (km)	Heading	Bottom Depth (m)	Behavioral Summary
46	7/15/11	TT	2	2	2	0	08:37	-	4	36.971	-75.372	40	0.4	320	20	Two bottlenose dolphins heading northwest, fast travel.
47	7/15/11	CC	2	2	2	-	09:23	-	3	37.130	-75.057	39	0.4	90	<50	Two loggerhead turtles resting at the surface. No disturbance detected.
48	7/15/11	CC	1	1	1	-	09:23	-	3	37.129	-75.063	38	0.4	Unk.	<50	Loggerhead turtle resting at the surface. No disturbance detected.
49	7/15/11	TT	1	1	1	0	09:23	-	3	37.129	-75.070	33	0.5	180	30	One bottlenose dolphins travelling.
50	7/15/11	CC	1	1	1	-	9:24	-	3	37.127	-75.097	41	0.4	090	<50	Loggerhead turtle resting at the surface. No disturbance detected.
51	7/15/11	CC	1	1	1	-	9:26	-	3	37.125	-75.180	42	0.3	000	<50	Loggerhead turtle resting at the surface. No disturbance detected.
52	7/15/11	CC	1	1	1	-	9:27	-	3	37.125	-75.221	49	0.3	090	<50	Loggerhead turtle resting at the surface. No disturbance detected.
53	7/15/11	TT	50	60	46	1	09:29	09:42	3	37.125	-75.303	80	0.1	000	20	2-5 Subgroups of bottlenose dolphins travelling slowly. Varying levels of dispersion. See Appendix A for focal follow data.
54	7/15/11	CC	1	1	1	-	09:44	-	3	37.125	-75.353	51	0.3	090	<50	Loggerhead turtle resting at the surface. No disturbance detected.
55	7/15/11	CC	1	1	1	-	09:45	-	3	37.124	-75.394	29	0.6	090	<50	Loggerhead turtle resting at the surface. No disturbance detected.
56	7/15/11	CC	1	1	1	-	09:46	-	3	37.127	-75.435	42	0.3	225	<50	Loggerhead turtle resting at the surface. No disturbance detected.
57	7/15/11	CC	1	1	1	-	09:48	-	3	37.124	-75.518	50	0.3	45	<50	Loggerhead turtle resting at the surface. No disturbance detected.
58	7/15/11	Unid	1	1	1	0	11:08	-	3	36.972	-75.367	61	0.2	220	20	One unidentified dolphin sighted just under the water's surface.

Key:

CC = loggerhead sea turtle (*Caretta caretta*)
 DC = Leatherback sea turtle (*Dermochelys coriacea*)
 Unid ST = Unidentified sea turtle
 TT = Bottlenose dolphin (*Tursiops truncatus*)

Unid = Unidentified cetacean
 KR = Kemp's Ridley sea turtle
 MM = Ocean sunfish (*Mola mola*)
 GM = Pilot whale (*Globicephala sp.*)
 UR = Unidentified ray

Three sightings of marine mammals, 37 sightings of sea turtles, one unidentified ray, and one sunfish were made during the pre-FIREX survey (see **Figure 3, Table 3**). Two sightings of marine mammals and one sighting of a sea turtle (n=7 after multiplier factor) was made in range boxes 8C/8D as a result of range exclusion for the survey aircraft on the FIREX event day (see **Figure 4, Table 3**). Four sightings of marine mammals and 9 sightings of sea turtles (n=63 after multiplier factor) were made during the post-FIREX survey (see **Figure 5, Table 3**). Due to difficulties associated with relocating small groups of marine mammals in a high Beaufort sea state and heavy glare, digital photographs to determine or confirm species identification were not collected for all unidentified dolphins in the area. Sightings included five groups of bottlenose dolphins in water depths between 20 and 40 m, one group of pilot whales located over Norfolk Canyon in water depths between 500 and 800 m, one group of unidentified dolphins in water depths between 10 and 20 m, one group of unidentified dolphins in water depths between 20 and 30 m, one group of unidentified dolphins in water depths between 500 and 800 m, 102 sightings of loggerhead sea turtles in water depths between 20 and 50 m, one Kemp's ridley sea turtle in water depths between 40 and 50 m, four leatherback sea turtles in water depths between 20 and 40 m, one unidentified ray in water depths between 20 and 30 m, and one mola mola (sunfish) in water depths between 20 and 30 m (see **Figure 2, Table 3**).

Behavior

No visible evidence of distress or unusual behavior was observed for the pre-FIREX surveys, during FIREX surveys, and post-FIREX surveys (see **Table 3**). A mild response (travel direction shift) to the aircraft was noted from the group of pilot whales during circling attempts in Beaufort 5 conditions. The team was able to attempt three brief focal follows on 13 July and 15 July. The first focal follow was a period of 11 minutes spent with a group of 15 bottlenose dolphins. The second focal follow was a period of 7 minutes spent with a group of 9 bottlenose dolphins. The third focal follow was a period of 5 minutes spent with a group of 50 highly dispersed bottlenose dolphins. Detailed behavioral observations made during the focal follows are presented in **Appendix A**. Photographs of suitable quality for species identification purposes were collected during several sightings of dolphins, pilot whales, and sea turtles.

Section 4 Acknowledgements

We would like to thank Orion Aviation's Director Ed Coffman and pilots Stan Huddle and Cameron Radford. These data were obtained under National Marine Fisheries Service permit no. 14451 issued to Joseph R. Mobley, Jr.

Section 5 References

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APPENDIX A

Focal Follow Data

Table A-1 shows the focal follow behavioral data from the VACAPES FIREX 2011 monitoring efforts. Two focal follow events were conducted on 13 July 2011 and one on 15 July 2011; all were from groups of bottlenose dolphins within the survey area.

Table A-1. Focal Follow Behavior Data

Record Number	Time	Date	Latitude	Longitude	Recorded Behavior
Sighting Number 4					
Species: <i>Tursiops truncatus</i>					
1	12:19	7/13/11	36.973	-75.360	Slow travel heading 300. Min Dispersal = 1, Max Dispersal = 6.
2	12:21	7/13/11	36.985	-75.349	Slow travel heading 300. Min Dispersal = 1, Max Dispersal = 6.
3	12:22	7/13/11	36.976	-75.346	Lining up side-by-side wide instead of long. Slow travel heading 000. Min Dispersal = 1, Max Dispersal = 3.
4	12:23	7/13/11	36.977	-75.346	Still tight group. Tighter group more single file than across. Slow travel heading 240. Min Dispersal = 1, Max Dispersal = 3.
5	12:24	7/13/11	36.981	-75.350	Slow travel heading 240. Min Dispersal = 1, Max Dispersal = 6.
6	12:25	7/13/11	36.975	-75.362	Group wider than long. Slow travel heading 240. Min Dispersal = 1, Max Dispersal = 6.
7	12:26	7/13/11	36.985	-75.362	11 individuals in sight. Slow travel heading 210. Min Dispersal = 1, Max Dispersal = 6.
8	12:27	7/13/11	36.975	-75.362	Forming into a wider than longer group. Tighter group. Slow travel heading 210. Min Dispersal = 1, Max Dispersal = 3.
9	12:28	7/13/11	36.976	-75.354	Same group formation as above. Slow travel heading 180. Min Dispersal = 1, Max Dispersal = 3.
10	12:29	7/13/11	36.986	-75.359	All individuals under water.
11	12:30	7/13/11	36.985	-75.362	Slow travel heading 180. Min Dispersal = 1, Max Dispersal = 3.
Sighting Number 42					
Species: <i>Tursiops truncatus</i>					
1	14:57	7/13/11	36.978	-75.450	12 Individuals in group. Fast travel heading 240. Min Dispersal = 1, Max Dispersal = 4.
2	14:59	7/13/11	36.974	-75.463	One calf in group. Fast travel heading 240. Min Dispersal = 1, Max Dispersal = 6.
3	15:00	7/13/11	36.972	-75.452	Tightly packed now. Starting to group. Fast travel heading 210. Min Dispersal = 1, Max Dispersal = 3.
4	15:02	7/13/11	36.975	-75.451	Fast travel heading 210. Min Dispersal = 1, Max Dispersal = 3.

Record Number	Time	Date	Latitude	Longitude	Recorded Behavior
Sighting Number 42 (continued)					
5	15:03	7/13/11	36.973	-75.449	Plane directly over group. Difficulty keeping visual contact due to glare. Fast travel heading 210. Min Dispersal = 1, Max Dispersal = 3.
6	15:04	7/13/11	36.972	-75.453	Group spread out a little more. Highly likely this is the same group followed earlier in the survey given the sighting location.
Sighting Number 53					
Species: <i>Tursiops truncatus</i>					
1	09:37	7/15/11	37.133	-75.284	Five subgroups. Slow travel heading 090. Min Dispersal = 1, Max Dispersal = 10.
2	09:38	7/15/11	37.131	-75.298	Lost group in glare.
3	09:39	7/15/11	37.120	-75.290	Slow travel heading 090. Min Dispersal = 1, Max Dispersal = 10. 14 in one group. Roughly 46 total in area, at least one calf. Max dispersal between 2 groups = 10.
4	09:40	7/15/11	37.130	-75.281	Multiple subgroups formed into two main groups. Most surfacing around the same time. Slow travel heading 090. Min Dispersal = 1, Max Dispersal = 2.
5	09:42	7/15/11	37.127	-75.280	Slow travel. Difficulty staying with group.

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