Jacksonville (JAX) Maverick Missile Exercise (MAVEX)

Marine Species Monitoring

Aerial Monitoring Surveys

Trip Report

Naval Facilities Engineering Command

26-29 September 2012

Suggested citation:

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Cover photo: Bottlenose dolphins (*Tursiops truncatus*) in JAX. Photo taken under National Marine Fisheries Service permit no. 14551.

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Acronyms and Abbreviations

BSS	Beaufort sea state
hr	hour(s)
ICMP	Integrated Comprehensive Monitoring Program
JAX	Jacksonville
km	kilometer(s)
km^2	square kilometer(s)
MAVEX	Maverick Missile Exercise
m	meter(s)
min	minute(s)
MMO	Marine Mammal Observer
OPAREA	operating area
SPUE	Sightings Per Unit Effort
U.S.	United States

Section 1 Introduction

Aerial marine species monitoring occurred 26 through 29 September 2012 for a Maverick Missile Exercise (MAVEX) training event that occurred in the Jacksonville (JAX) Range Complex off the eastern coast of Florida within the United States (U.S.) Navy's BB and CC range boxes. These types of events occur periodically throughout the year and allow the U.S. Navy to fulfill essential training requirements.

As part of the compliance requirements of the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973, the U.S. Navy developed the Integrated Comprehensive Monitoring Program (ICMP). The ICMP applies by regulation to those activities on U.S. Navy training ranges and operating areas (OPAREAs) for which the U.S. Navy sought and received incidental take authorizations. In order to support the U.S. 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 herein 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).

Section 2 Methods

Study Area

The U.S. Navy's JAX OPAREA lies off the Atlantic coast of the United States near the Georgia/Florida border. Protected marine species monitoring conducted during the MAVEX training event was focused on the BB and CC boxes within the JAX OPAREA (see **Figure 1**). This area is approximately 81 to 167 kilometers (km) offshore and covers an area approximately 1,376 square kilometers (km^2) in size, ranging in bottom depth from 30 to 800 meters (m).

Event Details

The MAVEX event commenced at 09:30 Eastern Daylight Time on 28 September 2012, with a total of two PD63 missiles fired. No live-explosive rounds were used during the MAVEX event; therefore, no animals were exposed to explosive sounds during this training event.

Aerial-Based Monitoring

Aerial-based monitoring was performed before, during, and after a MAVEX event within the JAX OPAREA from 26 through 29 September 2012 (see **Figure 1, Table 1**). Survey methods were consistent with currently accepted Distance Sampling theory (Buckland et al. 2001) and followed a well-established protocol used for aerial surveys throughout all U.S. Navy Range Complexes (Smultea et al. 2009). A survey altitude of approximately 305 m at 185 km/hour was maintained 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 session was initiated at 305 m

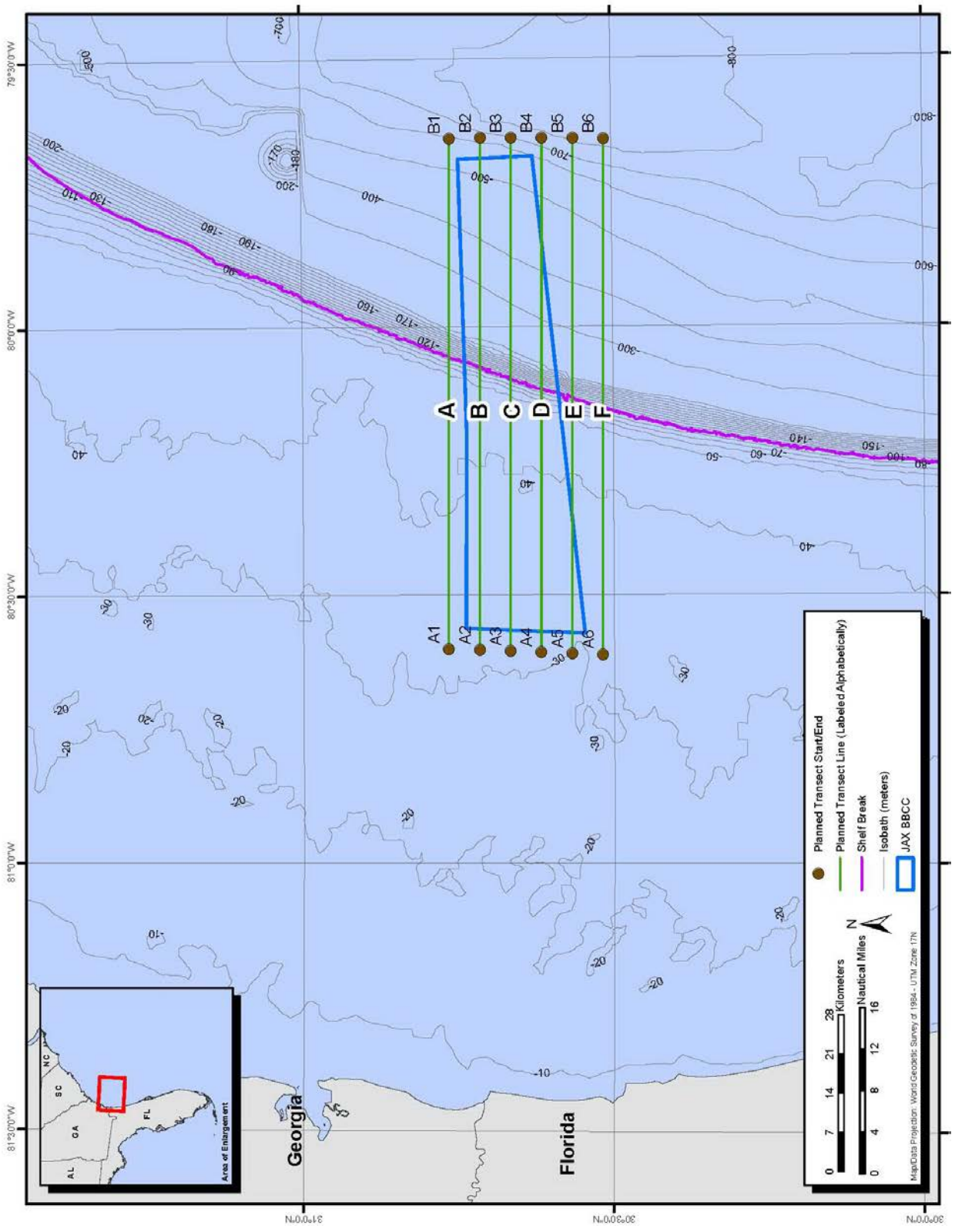

Figure 1. Planned Tracklines for the Survey Effort for JAX MAVEX Monitoring.

Table 1. Summary of Monitoring Effort for the JAX MAVEX Event.

Date	Description	Start Time	Stop Time	Total Survey Minutes*	Total On-Effort Minutes	Trackline On-Effort Distance (km)
26 September (Morning)	Transect Survey (Pre-Event)	08:28	11:18	170	160	544.2
26 September (Afternoon)		13:18	16:09	172	161	531.7
27 September	Transect Survey (Pre-Event)	Cancelled due to poor weather				
28 September (Morning)	Transect Survey (During-Event)	07:58	10:30	152	97	323.5
28 September (Afternoon)		13:47	16:16	150	133	432.1
29 September	Transect Survey (Post-Event)	08:18	11:25	187	165	546.6
Total				**831 (≈14 hr)**	**716 (≈12 hr)**	**2,378.1 km**

Note: * Total Survey Minutes reflect minutes occupied in the range/area of interest and include both on-effort (systematic) and off-effort (cross-legs between transects, and circling for focal follows or species ID) total minutes. Total Survey Minutes may not match the difference between Start Time and Stop Time in the table due to differences in rounding.

or higher if conditions were appropriate (Smultea et al. 2009; refer to the survey methods on page 4 of this document). A lower altitude of 214 m was established after focal-follow sessions for photography purposes to provide sharper images required for species identification.

The observation platform was a Cessna T337H Turbo Skymaster aircraft operating out of Fernandina Beach Municipal Airport in Fernandina Beach, Florida. Five surveys were conducted following pre-planned transect lines covering and extending approximately 1.8 km beyond the boundaries of the BB and CC boxes (see **Figure 1**). Each survey was limited to a 5-hour (hr) maximum flight time window based on fuel limitations. No surveys were conducted on 27 September due to poor weather resulting in unsafe flying conditions. The during-MAVEX monitoring on 28 September's morning flight resulted in an alternate survey area and just two (A5 and A6) lines surveyed due to the U.S. Navy's request to exit the primary area.

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, and were knowledgeable of marine mammal biology and behavior.

Table 2. Observers and Roles.

Observer	Role(s)
Lenisa Blair	Chief Scientist/Observer
Mark Cotter	Observer

Survey effort included the entirety of the BB and CC boxes (approximately 1,376 km^2). Six parallel tracklines running west-east, measuring 92 km in length and spaced approximately 5.3 km apart, were flown during "systematic" efforts throughout the monitoring period. Based on the geometry of the JAX MAVEX survey area, our total survey coverage area was 3,312 km^2 (see **Figure 1**). Planned lines were followed when possible, but exact transects flown for each survey day 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 requiring an increase in the plane's altitude (see **Table 1, Figures 2 through 7**). Without prior notification to the monitoring team, the MAVEX target location was relocated to the south of the primary BB/CC range boxes. This shift resulted in the monitoring team surveying the area adjacent to the actual MAVEX event location (see **Figures 2 through 7**).

The following describe the general survey approach:

1. Pre-planned transect lines and waypoints were followed using methods described by Smultea et al. (2009) until a marine mammal/sea turtle group was sighted. Standard environmental and oceanographic parameters such as Beaufort sea state (BSS), glare, visibility, and cloud cover were recorded at the start of each transect line as well as when conditions changed during flight.
2. Upon sighting a marine mammal/sea turtle group, basic sighting information was recorded per established protocol (see Smultea et al. 2009). As outlined in the *Jacksonville Range Complex Monitoring Plan*, information included: (1) species identification and group size; (2) location and relative distance from the MAVEX target location if available; (3) the behavior of marine mammals and sea turtles; (4) date, time, visual conditions, and environmental and oceanographic parameters associated with each observation; (5) direction of travel relative to true North; and (6) duration of the observation.
3. If the species appeared suitable for a focal follow, the aircraft increased altitude to approximately 365 to 455 m and radial distance increased to approximately 0.5 to 1.0 km. Then, the aircraft circled the sighting to obtain detailed behavioral information as long as possible and logistically feasible. Focal follows were attempted for a minimum of 5 minutes (min). When conditions allowed, high-definition video and digital photographs of the group were also collected.
4. If the sighting was not selected for a focal follow, and species and group size were unknown, the aircraft circled the sighting to obtain digital photographs for species identification confirmation and to estimate group size/composition.

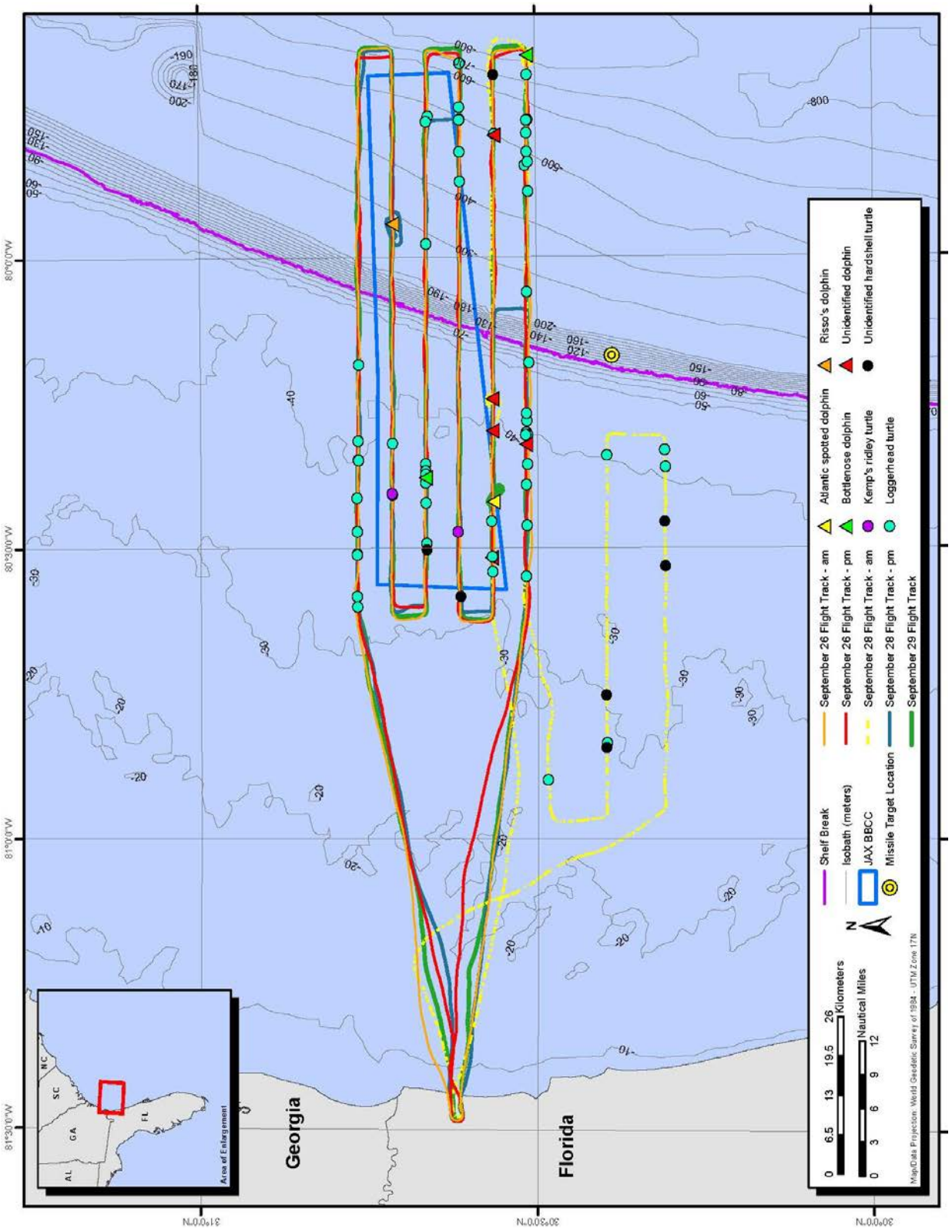

Figure 2. Locations of All Cetacean and Sea Turtle Sightings Recorded During JAX MAVEX Monitoring (26-29 September).

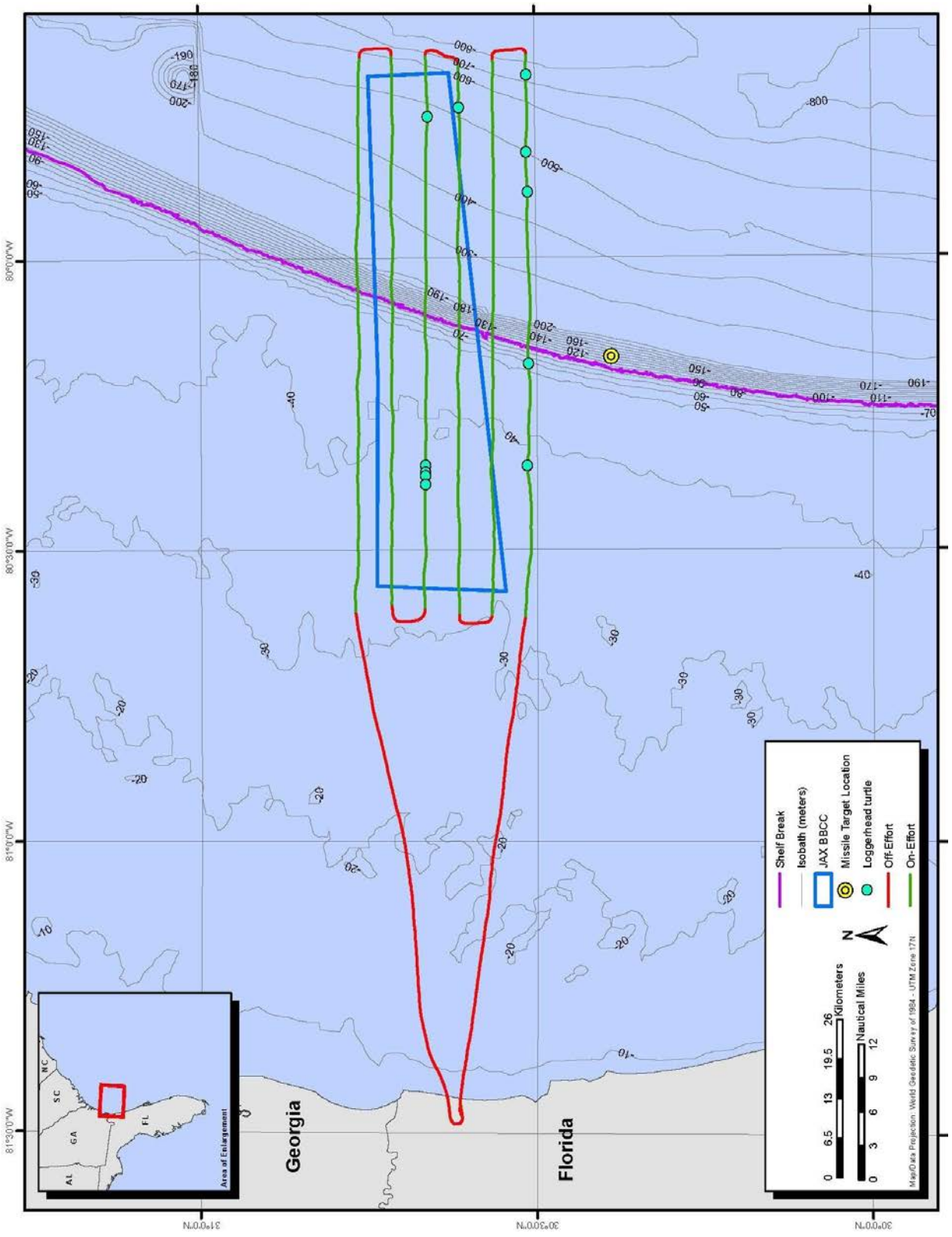

Figure 3. Locations of Sea Turtle Sightings Recorded Pre-MAVEX Training (26 September Morning Flight).

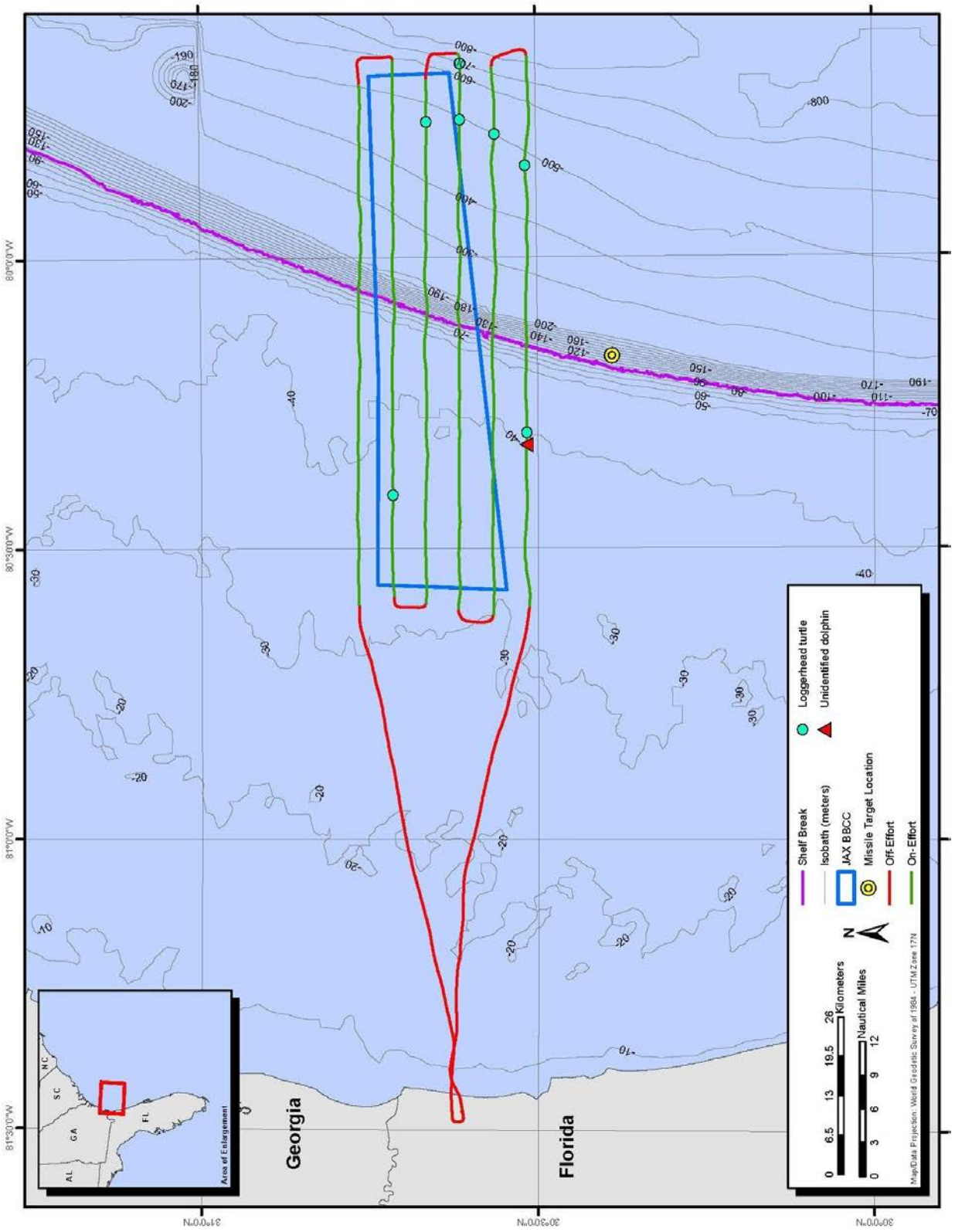

Figure 4. Locations of Cetacean and Sea Turtle Sightings Recorded Pre-MAVEX Training (26 September Afternoon Flight).

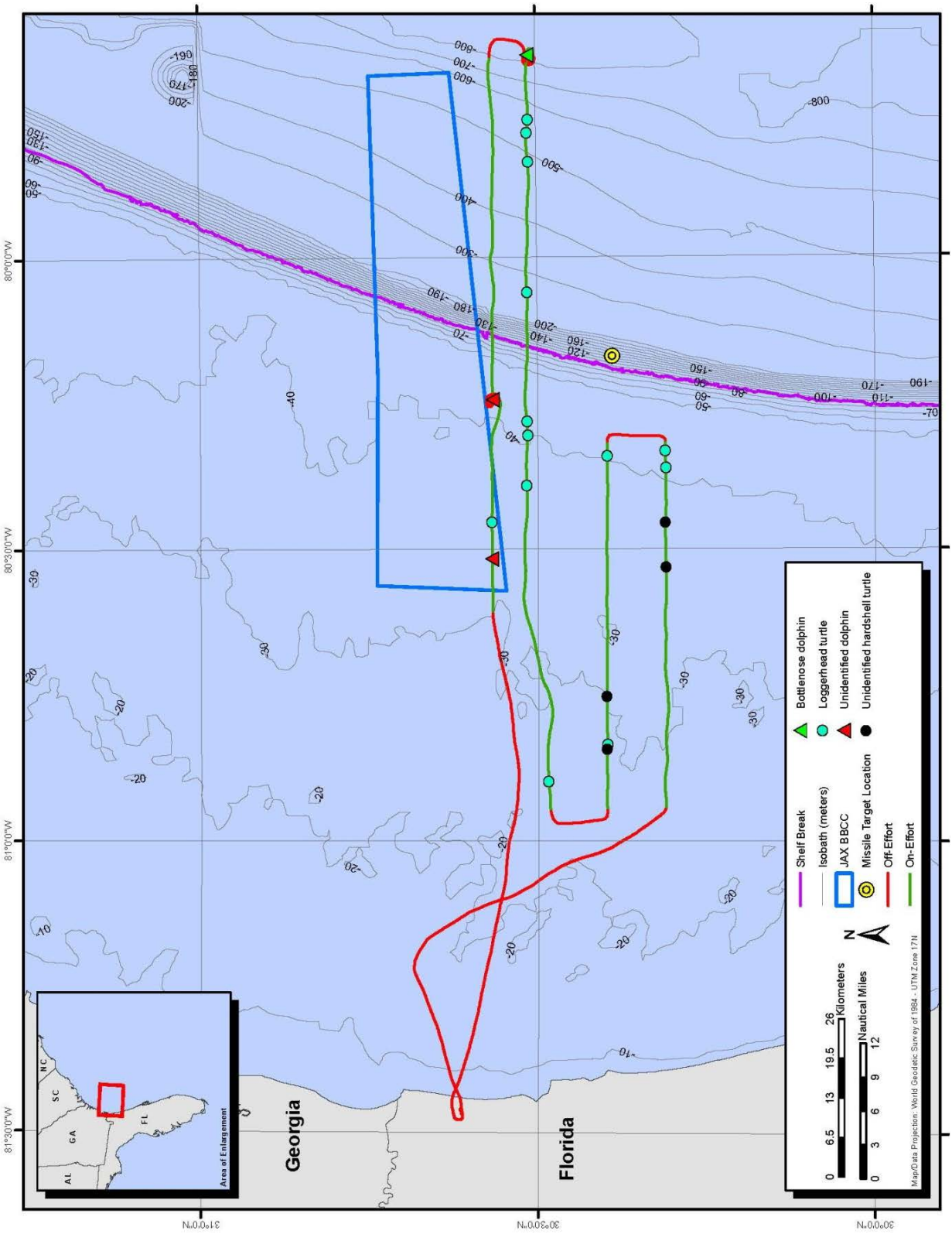

Figure 5. Locations of Cetacean and Sea Turtle Sightings Recorded During-MAVEX Training (28 September Morning Flight).

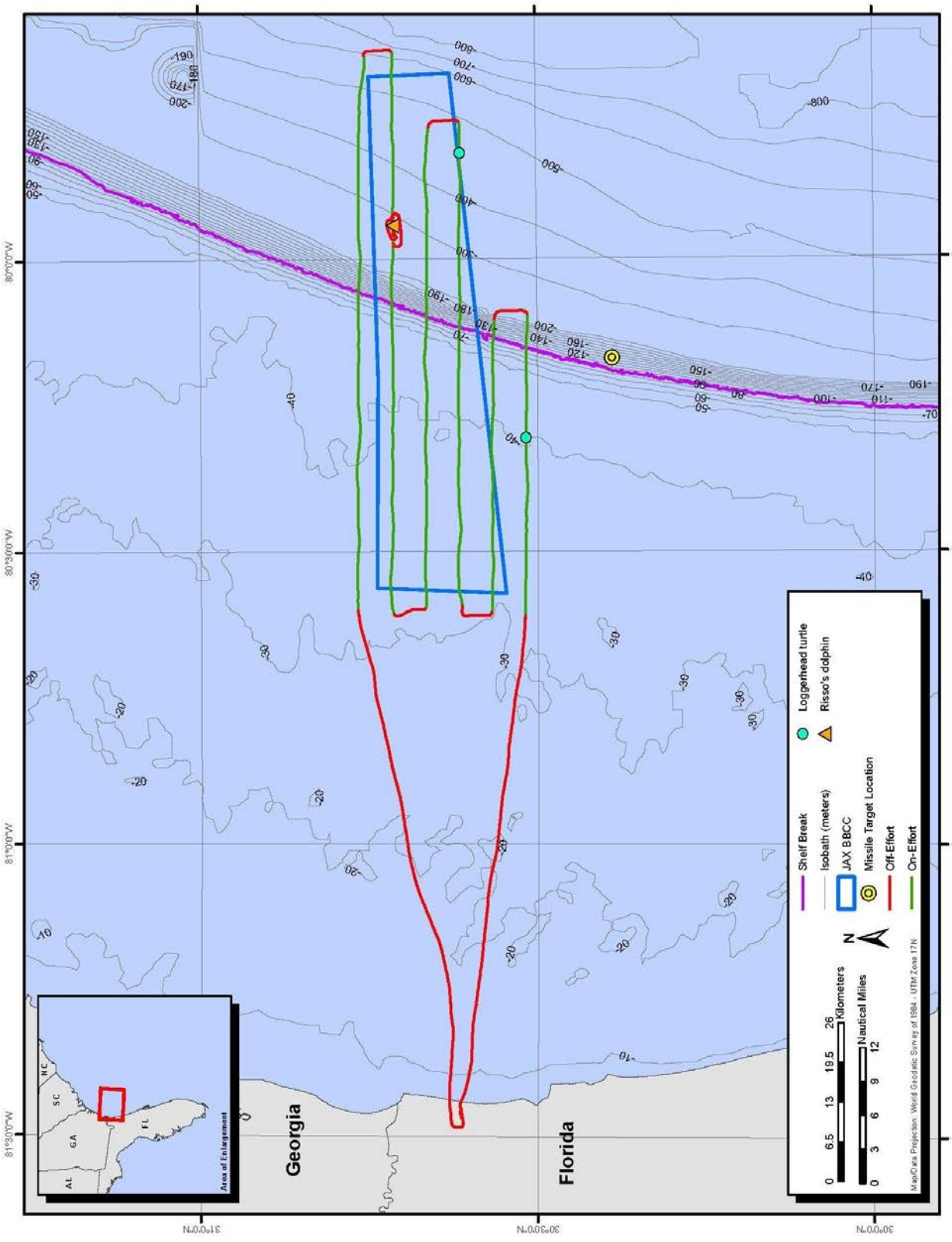

Figure 6. Locations of Cetacean and Sea Turtle Sightings Recorded During-MAVEX Training (28 September Afternoon Flight).

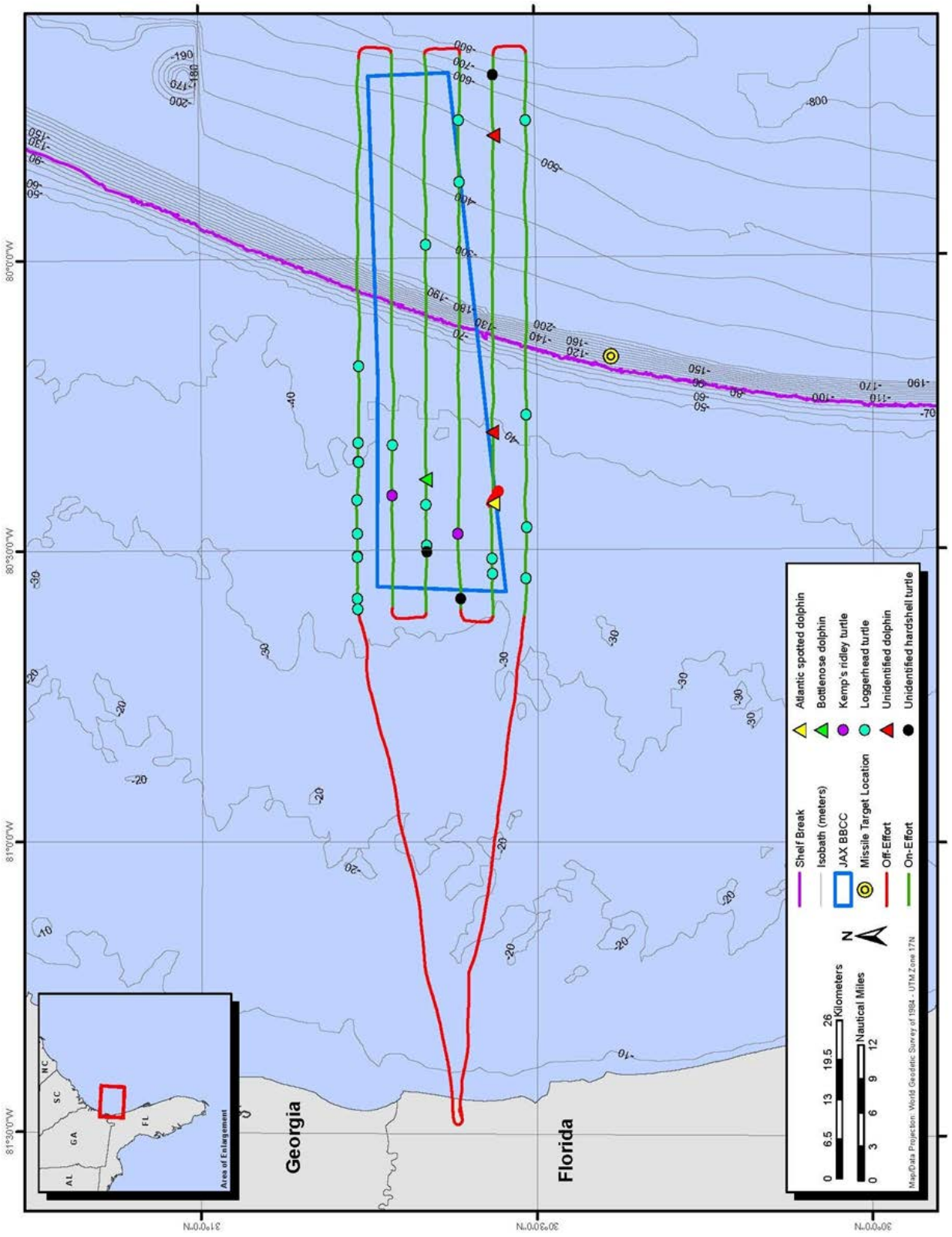

Figure 7. Locations of Cetacean and Sea Turtle Sightings Recorded Post-MAVEX Training (29 September).

Section 3 Results

Survey Effort

Observers visually surveyed 2,378.1 km of on-effort trackline and an additional 398.2 km of off-effort trackline (connector lines and circling for focal follow or species identification) during 3 survey days for approximately 12 hr of on-effort status (see **Table 1**; **Figures 2 through 7**). BSS ranged from 2 to 5 (**Appendix A**), and sightings were made during all sea states (see **Table 3**). Only one potential survey flight (27 September) was cancelled due to heavy rain, lightning, and low cloud ceilings that restricted both visibility and safe flying conditions. **Appendix A** contains a detailed description of environmental, oceanographic, and sighting conditions.

Sightings

Nine sightings of cetaceans and 64 sightings of sea turtles were recorded during approximately 14 hr of total survey flight time (includes on-effort and off-effort intervals) within the survey area (see **Figure 2**, **Table 3**). Eleven sightings of sea turtles were made during the morning of the 1-day pre-MAVEX survey on 26 September (see **Figure 3**, **Table 3**). One sighting of an unidentified dolphin and seven sightings of sea turtles were made during the afternoon of the 1-day pre-MAVEX survey period on 26 September (see **Figure 4, Table 3**). Three sightings of dolphins and 17 sightings of sea turtles were made during the morning of the 1-day during-MAVEX survey period on 28 September (see **Figure 5, Table 3**). One sighting of a dolphin and two sightings of sea turtles were made on the afternoon of the during-MAVEX survey period on 28 September (see **Figure 6, Table 3**). Four sightings of dolphins and 28 sightings of sea turtles were made throughout the 1-day post-MAVEX survey period on 29 September (see **Figure 7, Table 3**). Sightings over the 4-day period included two sightings of bottlenose dolphins (*Tursiops truncatus*), one sighting of Atlantic spotted dolphins (*Stenella frontalis*), one sighting of Risso's dolphins (*Grampus griseus*), five sightings of unidentified dolphins, two sightings of Kemp's ridley turtles (*Lepidochelys kempii*), 55 sightings of loggerhead turtles (*Caretta caretta*), and seven sightings of unidentified hardshell turtles. When conditions allowed, photographs and/or video were taken to assist with species identification, confirm group size estimates, and document behavior (see **Table 3**). Several unidentified species sightings were unable to be confirmed with photographs due to difficulties in relocating and circling small groups. **Table 4** provides a summary of information on sightings and associated bottom depths. Bottom depths for each sighting were estimated in 10-m ranges from plots of latitude and longitude for each sighting within a Geographic Information System.

Sightings Per Unit Effort

Sightings Per Unit Effort (SPUE) was calculated as the total number of marine mammal sightings (n=9), and sea turtle sightings (n=64) divided by the total survey effort (hr and km). For this monitoring effort, the SPUE for marine mammals was equal to 0.647 sightings/hr and 0.003 sightings/km. SPUE for sea turtles was equal to 4.604 sightings/hr and 0.023 sightings/km.

Table 3. Summary of Sightings.

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)	Photos/ Videos Taken	Behavioral Summary
Pre-MAVEX Sightings on 26 September 2012 – Morning																	
1	09/26/12	CC	1	1	1	-	08:35	-	4	30.515	-80.357	060	0.45	090	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
2	09/26/12	CC	1	1	1	-	08:41	-	4	30.513	-80.182	050	0.46	090	50-60	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
3	09/26/12	CC	1	1	1	-	08:50	-	5	30.512	-79.888	040	0.54	090	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
4	09/26/12	CC	1	1	1	-	08:52	-	5	30.514	-79.820	046	0.47	260	500-600	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
5	09/26/12	CC	1	1	1	-	08:56	-	5	30.513	-79.688	060	0.41	250	700-800	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
6	09/26/12	CC	1	1	1	-	09:52	-	5	30.614	-79.743	042	0.50	090	500-600	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
7	09/26/12	CC	1	1	1	-	09:59	-	4	30.660	-79.758	034	0.56	180	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
8	09/26/12	CC	1	1	1	-	10:14	-	4	30.666	-80.356	050	0.42	090	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
9	09/26/12	CC	1	1	1	-	10:14	-	4	30.666	-80.368	040	0.50	270	30-40	No/No	Loggerhead turtle resting at the surface then dove abruptly. 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)	Photos/ Videos Taken	Behavioral Summary
Pre-MAVEX Sightings on 26 September 2012 – Morning (continued)																	
10	09/26/12	CC	1	1	1	-	10:14	-	4	30.667	-80.374	050	0.43	120	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
11	09/26/12	CC	1	1	1	-	10:15	-	4	30.667	-80.388	049	0.43	120	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
Pre-MAVEX Sightings on 26 September 2012 – Afternoon																	
1	09/26/12	Unid	1	1	1	0	13:26	-	4	30.517	-80.322	035	0.66	0	30-40	No/No	An unidentified dolphin sighted traveling fast. No disturbance detected.
2	09/26/12	CC	1	1	1	-	13:27	-	4	30.516	-80.302	040	0.56	0	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
3	09/26/12	CC	1	1	1	-	13:40	-	4	30.517	-79.843	050	0.56	0	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
4	09/26/12	CC	1	1	1	-	13:51	-	5	30.562	-79.789	051	0.37	30	500-600	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
5	09/26/12	CC	1	1	1	-	14:41	-	4	30.613	-79.764	045	0.54	180	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
6	09/26/12	CC	1	1	1	-	14:44	-	4	30.612	-79.667	047	0.53	120	600-700	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
7	09/26/12	CC	1	1	1	-	14:49	-	4	30.663	-79.767	058	0.39	360	400-500	No/No	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)	Photos/ Videos Taken	Behavioral Summary
Pre-MAVEX Sightings on 26 September 2012 – Afternoon (continued)																	
8	09/26/12	CC	1	1	1	-	15:18	-	4	30.716	-80.409	052	0.58	180	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
Pre-MAVEX 27 September 2012 – CANCELLED																	
During-MAVEX Sightings on 28 September 2012 - Morning																	
1	09/28/12	UnidHST	1	1	1	-	08:10	-	3	30.311	-80.532	042	0.48	250	1	No/No	Unidentified hardshell turtle resting at the surface. No disturbance detected.
2	09/28/12	UnidHST	1	1	1	-	08:12	-	3	30.312	-80.455	038	0.50	090	2	No/No	Unidentified hardshell turtle resting at the surface. No disturbance detected.
3	09/28/12	CC	1	1	1	-	08:15	-	3	30.311	-80.362	043	0.52	095	3	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
4	09/28/12	CC	1	1	1	-	08:16	-	3	30.312	-80.333	053	0.45	170	4	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
5	09/28/12	CC	1	1	1	-	08:21	-	3	30.398	-80.342	048	0.44	180	5	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
6	09/28/12	UnidHST	1	1	1	-	08:32	-	3	30.399	-80.753	043	0.47	090	6	No/No	Unidentified hardshell turtle resting at the surface. No disturbance detected.
7	09/28/12	CC	1	1	1	-	08:34	-	3	30.398	-80.836	036	0.56	180	7	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
8	09/28/12	UnidHST	1	1	1	-	08:34	-	3	30.399	-80.844	039	0.53	270	8	No/No	Unidentified hardshell 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)	Photos/ Videos Taken	Behavioral Summary
During-MAVEX Sightings on 28 September 2012 - Morning (continued)																	
9	09/28/12	CC	1	1	1	-	08:42	-	3	30.486	-80.899	042	0.50	000	9	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
10	09/28/12	CC	1	1	1	-	08:58	-	2	30.517	-80.392	057	0.39	270	10	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
11	09/28/12	CC	1	1	1	-	09:01	-	2	30.515	-80.306	037	0.57	000	11	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
12	09/28/12	CC	1	1	1	-	09:02	-	2	30.516	-80.282	041	0.51	110	12	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
13	09/28/12	CC	1	1	1	-	09:08	-	3	30.515	-80.061	046	0.48	030	13	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
14	09/28/12	CC	2	2	2	-	09:15	-	4	30.513	-79.837	058	0.39	240	14	No/No	Two loggerhead turtles resting at the surface. No disturbance detected.
15	09/28/12	CC	1	1	1	-	09:16	-	4	30.514	-79.788	044	0.48	220	15	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
16	09/28/12	CC	1	1	1	-	09:16	-	4	30.514	-79.788	044	0.48	220	15	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
17	09/28/12	TT	35	50	20	1	09:20	09:54	4	30.512	-79.654	045	0.45	210	17	Yes/Yes	Group of approximately 35 bottlenose dolphins travelling in a tight group. Little surface activity. See focal-follow data in **Appendix B**.

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)	Photos/ Videos Taken	Behavioral Summary
During-MAVEX Sightings on 28 September 2012 - Morning (continued)																	
18	09/28/12	Unid	6	10	6	-	10:14	-	2	30.567	-80.244	052	0.40	180	18	No/No	Group of approximately six unidentified dolphins traveling south. No disturbance detected.
19	09/28/12	CC	1	1	1	-	10:26	-	3	30.569	-80.454	047	0.43	270	19	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
20	09/28/12	Unid	10	15	5	-	10:28	-	3	30.569	-80.517	032	0.61	270	20	No/No	Group of approximately 10 unidentified dolphins with some surface activity. No disturbance detected.
During-MAVEX Sightings on 28 September 2012 – Afternoon																	
1	09/28/12	CC	1	1	1	-	13:55	-	3	30.518	-80.306	035	0.68	090	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
2	09/28/12	CC	1	1	1	-	14:44	-	4	30.614	-79.819	046	0.50	260	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
3	09/28/12	GG	4	6	3	-	15:32	-	4	30.713	-79.942	042	0.53	190	200-300	No/No	Group of approximately 4 Risso's dolphins traveling south. Attempted to circle the group, but were unsuccessful in relocating them. No disturbance detected.
Post-MAVEX Sightings on 29 September 2012																	
1	09/29/12	CC	1	1	1	-	08:20	-	2	30.518	-80.550	046	0.48	090	30-40	No/No	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)	Photos/ Videos Taken	Behavioral Summary
Post-MAVEX Sightings on 29 September 2012 (continued)																	
2	09/29/12	CC	1	1	1	-	08:22	-	2	30.517	-80.462	035	0.59	000	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
3	09/29/12	CC	1	1	1	-	08:27	-	3	30.516	-80.269	054	0.43	210	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
4	09/29/12	CC	1	1	1	-	08:41	-	3	30.514	-79.766	040	0.50	170	500-600	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
5	09/29/12	UnidHST	1	1	1	-	08:48	-	3	30.562	-79.687	050	0.40	090	600-700	No/No	Unidentified hardshell turtle resting at the surface. No disturbance detected.
6	09/29/12	Unid	1	1	1	-	08:51	-	3	30.562	-79.791	022	0.78	270	400-600	No/No	An unidentified dolphin sighted traveling west. No disturbance detected.
7	09/29/12	Unid	2	2	2	-	09:06	-	2	30.566	-80.299	045	0.41	225	30-40	No/No	Group of approximately 2 unidentified dolphins slowly traveling southwest. No disturbance detected.
8	09/29/12	SF	6	7	6	-	09:09	09:20	2	30.566	-80.421	050	0.42	135	30-40	Yes/No	Group of approximately 6 Atlantic spotted dolphins quickly traveling southeast. No disturbance detected.
9	09/29/12	CC	1	1	1	-	09:24	-	2	30.568	-80.515	033	0.54	225	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
10	09/29/12	CC	1	1	1	-	09:25	-	2	30.568	-80.541	042	0.45	090	30-40	No/No	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)	Photos/ Videos Taken	Behavioral Summary
Post-MAVEX Sightings on 29 September 2012 (continued)																	
11	09/29/12	UnidHST	1	1	1	-	09:30	-	2	30.615	-80.584	054	0.43	270	30-40	No/No	Unidentified hardshell turtle resting at the surface. No disturbance detected.
12	09/29/12	LK	1	1	1	-	09:33	-	2	30.619	-80.473	053	0.51	280	30-40	No/No	Kemp's ridley turtle resting at the surface, then dove abruptly. No disturbance detected.
13	09/29/12	CC	1	1	1	-	09:51	-	3	30.614	-79.870	052	0.54	270	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
14	09/29/12	CC	1	1	1	-	09:54	-	3	30.613	-79.765	046	0.49	315	400-500	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
15	09/29/12	CC	1	1	1	-	10:09	-	2	30.664	-79.977	047	0.41	225	200-300	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
16	09/29/12	TT	4	4	4	-	10:20	-	2	30.666	-80.379	043	0.44	090	30-40	No/No	Group of approximately 4 bottlenose dolphins were slowly traveling E. No disturbance detected.
17	09/29/12	CC	1	1	1	-	10:22	-	2	30.666	-80.423	060	0.36	045	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
18	09/29/12	CC	1	1	1	-	10:24	-	2	30.666	-80.493	054	0.40	090	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
19	09/29/12	UnidHST	1	1	1	-	10:24	-	2	30.665	-80.503	030	0.63	225	30-40	No/No	Unidentified hardshell 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)	Photos/ Videos Taken	Behavioral Summary
Post-MAVEX Sightings on 29 September 2012 (continued)																	
20	09/29/12	LK	1	1	1	-	10:35	-	3	30.716	-80.406	063	0.41	290	30-40	No/No	Kemp's ridley turtle resting at the surface. No disturbance detected.
21	09/29/12	CC	1	1	1	-	10:37	-	2	30.716	-80.320	035	0.58	340	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
22	09/29/12	CC	1	1	1	-	11:14	-	2	30.765	-80.185	028	0.69	225	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
23	09/29/12	CC	1	1	1	-	11:17	-	2	30.766	-80.316	049	0.43	135	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
24	09/29/12	CC	1	1	1	-	11:18	-	2	30.767	-80.349	028	0.69	000	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
25	09/29/12	CC	1	1	1	-	11:18	-	2	30.767	-80.349	031	0.63	000	40-50	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
26	09/29/12	CC	2	2	2	-	11:20	-	2	30.769	-80.414	038	0.52	100	30-40	No/No	Two loggerhead turtles resting at the surface. No disturbance detected.
28	09/29/12	CC	1	1	1	-	11:22	-	2	30.769	-80.472	044	0.45	135	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
29	09/29/12	CC	1	1	1	-	11:22	-	2	30.769	-80.510	034	0.53	090	30-40	No/No	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)	Photos/ Videos Taken	Behavioral Summary
Post-MAVEX Sightings on 29 September 2012 (continued)																	
30	09/29/12	CC	1	1	1	-	11:23	-	2	30.769	-80.512	035	0.52	090	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
31	09/29/12	CC	1	1	1	-	11:25	-	2	30.769	-80.583	040	0.50	180	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.
32	09/29/12	CC	1	1	1	-	11:25	-	2	30.768	-80.601	059	0.36	270	30-40	No/No	Loggerhead turtle resting at the surface. No disturbance detected.

Key:

CC = Loggerhead turtle (*Caretta caretta*)
GG = Risso's dolphin *(Grampus griseus)*
LK = Kemp's ridley turtle (*Lepidochelys kempii*)
SF = Atlantic spotted dolphin (*Stenella frontalis*)
TT = Bottlenose dolphin (*Tursiops truncatus*)
Unid = Unidentified dolphin
UnidHST = Unidentified hardshell turtle

Table 4. Summary of Sightings Recorded During Monitoring for JAX MAVEX Training.

Species	Number of Sightings	Bottom Depths (m)
Atlantic spotted dolphin	1	30-40
Bottlenose dolphin	2	30-900
Risso's dolphin	1	200-300
Unidentified dolphin	5	30-600
Kemp's ridley turtle	2	30-40
Loggerhead turtle	55	20-800
Unidentified hardshell turtle	7	20-700

Behavior

No visible evidence of unusual behavior was observed for the pre-MAVEX, during-MAVEX, or post-MAVEX surveys (see **Table 3**). The survey team conducted one focal follow during the during-MAVEX morning flight of 28 September. The focal follow was a period of approximately 16 min spent with a group of approximately 35 bottlenose dolphins. Photographs and video were both taken during the focal-follow event. Detailed behavioral observations made during the focal follow are presented in **Appendix B**.

Section 4 Acknowledgements

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Section 5 References

Buckland et al. 2001 — Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. *Introduction to Distance Sampling: Estimating Abundance of Biological Populations*. Oxford University Press, Oxford, UK.

Smultea et al. 2009 — Smultea, M.A., J.R. Mobley, Jr., and K. Lomac-MacNair. 2009. *Aerial Survey Monitoring for Marine Mammals and Sea Turtles in Conjunction with US Navy Major Training Events off San Diego, California, 15-21 October and 15-18 November 2008, Final Report*. Prepared by Marine Mammal Research Consultants, Honolulu, HI, and Smultea Environmental Sciences, LLC., Issaquah, WA, under Contract No. N62742-08-P-1936 and N62742-08-P-1938 for NAVFAC Pacific, EV2 Environmental Planning, Pearl Harbor, HI.

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APPENDIX A
Environmental, Oceanographic, and Sighting Conditions

Table A-1 shows the environmental, oceanographic, and sighting conditions encountered by marine mammal observers (MMOs) during the pre-MAVEX, during-MAVEX, and post-MAVEX monitoring efforts.

Time	Beaufort Left MMO	Glare Left MMO*	Visibility Distance Left MMO (km)	Beaufort Right MMO	Glare Right MMO*	Visibility Distance Right MMO (km)	Cloud Cover (%)
Pre-MAVEX Survey Effort on 26 September 2012 (Morning)							
08:28	4	3	1.5	4	3	1	50
08:43	4	3	1.5	4	3	1.5	90
08:54	5	3	1	5	4	1	80
08:59	5	2	1	5	3	1.5	80
09:15	4	2	1.5	4	3	1	90
09:25	5	2	1	5	5	1	100
09:36	4	2	1.5	4	5	1	55
09:43	5	2	1	5	5	1	50
09:56	4	4	1	4	5	1	35
10:23	4	2	2	4	3	1	25
10:43	5	3	1	5	3	1	100
10:54	4	4	1.5	4	3	1.5	70
Pre-MAVEX Survey Effort on 26 September 2012 (Afternoon)							
13:18	4	4	0.5	4	4	1	90
13:48	4	5	0.5	4	2	2	45
14:15	3	2	1.5	3	5	1	60
14:47	4	5	0.5	4	2	1.5	95
15:13	3	2	1.5	3	4	1	60
15:44	4	5	1	4	2	1.5	50
During-MAVEX Survey Effort on 28 September 2012 (Morning)							
07:58	3	2	2.5	3	4	1	50
08:20	3	3	2	3	4	1	30
08:41	3	3	1.5	3	5	1	40
08:51	3	2	2	3	4	1.5	60
09:04	2	2	2	2	4	1.5	65
09:13	3	3	1.5	3	4	1.5	70
09:18	4	3	1.5	4	4	1	60
09:58	3	4	1	3	4	1.5	60

Time	Beaufort Left MMO	Glare Left MMO*	Visibility Distance Left MMO (km)	Beaufort Right MMO	Glare Right MMO*	Visibility Distance Right MMO (km)	Cloud Cover (%)
During-MAVEX Survey Effort on 28 September 2012 (Morning) (continued)							
10:12	2	3	2	2	4	1.5	40
10:21	3	4	1	3	4	1.5	45
During-MAVEX Survey Effort on 28 September 2012 (Afternoon)							
13:47	4	2	1.5	4	5	0.5	70
14:01	3	2	1.5	3	5	0.5	85
14:04	3	4	1	3	3	1	95
14:14	4	5	0.5	4	3	1	70
14:21	4	2	1	4	5	0.5	60
14:48	4	4	1	4	3	1.5	75
15:13	4	2	1.5	4	4	1	80
15:40	4	1	2	4	5	0.75	80
15:50	4	3	1	4	5	0.75	75
Post-MAVEX Survey Effort on 29 September 2012							
08:18	2	2	2.5	2	3	1.5	40
08:38	3	2	2	3	2	1.5	60
08:47	3	3	1.5	3	4	1	35
09:07	2	2	2.5	2	4	1	20
09:22	2	2	2	2	5	1	15
09:29	2	1	2.5	2	3	1.5	10
09:43	3	2	1.5	3	3	1.5	25
10:00	3	3	1.5	3	4	1	40
10:15	2	2	2	2	4	1	10
10:30	2	1	2	2	4	1	20
10:47	3	2	1.5	3	4	1	45
10:59	3	3	1	3	3	1	50
11:16	2	3	1.5	2	3	1	20

*Values for glare (0-5) are as follows:
0= 0%
1= 1-19%
2= 20-39%
3= 40-59%
4= 60-79%
5= 80-100%

APPENDIX B
Focal-Follow Data

Table B-1 shows the focal-follow behavioral data from the monitoring efforts for the 2012 JAX MAVEX event. One focal-follow event was conducted during the during-MAVEX morning survey on 28 September 2012—one group of bottlenose dolphins (*Tursiops truncatus*) within the survey area.

Record Number	Date	Time	Latitude	Longitude	Recorded Behavior
Sighting Number 17					
Species: *Tursiops truncatus*. Group size: approximately 35.					
1	09/28/2012	09:38:08	30.516	-79.665	Slow travel heading roughly 200-220. Min Dispersal = 0, Max Dispersal = 30. Group continued to mill in area.
2	09/28/2012	09:42:16	30.513	-79.655	Group slowly tightening formation. Min Dispersal = 0, Max Dispersal = 20.
3	09/28/2012	09:44:02	30.505	-79.667	Group slowly tightening formation. Min Dispersal = 0, Max Dispersal = 15.
4	09/28/2012	09:45:13	30.503	-79.658	Group slowly tightening formation. Min Dispersal = 0, Max Dispersal = 15. Very little change in behavior.
5	09/28/2012	09:46:30	30.509	-79.651	Slow travel heading 200-220. Min Dispersal = 0, Max Dispersal = 30. Fewer surface active individuals.
6	09/28/2012	09:47:29	30.517	-79.665	Very little change in behavior. Min Dispersal = 0, Max Dispersal = 15. Slowly traveling heading 200-220. No birds or fish have been sighted in area.
7	09/28/2012	09:48:33	30.501	-79.664	Group continued to mill in area. Min Dispersal = 0, Max Dispersal = 15.
8	09/28/2012	09:50:21	30.503	-79.667	Slow travel heading 200-220. Min Dispersal = 0, Max Dispersal = 8. Group continued to tighten and appearing more organized.
9	09/28/2012	09:52:31	30.513	-79.654	Slow travel heading 200-220. Min Dispersal = 0, Max Dispersal = 8. Group becoming more organized.
10	09/28/2012	09:53:39	30.511	-79.654	Slow travel heading 200-220. Min Dispersal = 0, Max Dispersal = 10. Becoming more surface active.
11	09/28/2012	09:54:42	30.513	-79.655	Slow travel heading 200-220. Min Dispersal = 0, Max Dispersal = 10. Group continued same behavior. Beginning to coalesce.

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