Jacksonville (JAX) Gunnery Exercise (GUNEX)

Marine Species Monitoring

Aerial Monitoring Surveys

Trip Report

3-7 October 2010

ACRONYMS AND ABBREVIATIONS

ESA	Endangered Species Act
FIREX	Firing Exercise
GUNEX	Gunnery Exercise
HDR|e²M	HDR|engineering-environmental Management, Inc.
ICMP	Integrated Comprehensive Monitoring Program
IMPASS	Integrated Maritime Portable Acoustic Scoring and Simulator
JAX	Jacksonville Range Complex
km	kilometer(s)
km^2	square kilometers
m	meter(s)
MMPA	Marine Mammal Protection Act
NM	nautical mile(s)
OPAREA	operating area
SOCAL	Southern California Range Complex
SPUE	Search Per Unit Effort

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Section 1 Introduction

Between 3 and 7 October 2010, two separate Gunnery Exercise (GUNEX) events occurred in the Jacksonville Range Complex (JAX) off the eastern coast of Florida within the U.S. Navy's Firing Exercise (FIREX) boxes, BB and CC. Warships USS 58 and USS 64 were involved with the GUNEX events that included an Integrated Maritime Portable Acoustic Scoring and Simulator (IMPASS) component over a five day period. GUNEX 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 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|engineering-environmental Management, Inc. (HDR|e²M).

Section 2 Methods

Study Area

The Navy's Jacksonville OPAREA lies off the eastern coast of the Georgia/Florida border. Protected marine species monitoring conducted during the JAX GUNEX training event was focused on the BB and CC boxes within the JAX OPAREA (see **Figure 1**). This area is approximately 81 to 167 (44 to 90 nautical miles (NM)) offshore, covers an area approximately 1,431 square kilometers (km^2) in size, and ranges in bottom depth from 30 to 610 meters (m).

Aerial-Based Monitoring

Aerial-based monitoring effort was performed over a 5-day period from 3 to 7 October 2010 (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 lower altitude of approximately 700 to 800 feet was established for photography purposes to allow for sharper images needed for species identification.

Table 1. Summary of JAX GUNEX Monitoring Effort

Date	Description	Start Time	Stop Time	Total Survey Minutes*	Total On-Effort Minutes	Trackline On-Effort Distance (km)
October 3	Transect survey (Pre-Event)	1231	1544	193	170	546
October 4	Transect survey (Pre-Event)	1016	1349	213	172	546
October 5 **(GUNEX)**	Transect survey (Pre/During-Event)	806	1030	144	115	386
October 5 **(GUNEX)**	Transect survey (Post-Event)	1410	1546	96	86	288
October 6 **(GUNEX)**	Transect survey (Pre/During-Event)	811	945	94	83	288
October 6 **(GUNEX)**	Transect survey (Post/During-Event)	1318	1426	68	61	203
October 7	Transect survey (Post-Event)	813	1139	206	165	546
Total				**1,014 (17 hrs)**	**852 (14 hrs)**	**2,803 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 Fernandina Beach Municipal Airport in Fernandina Beach, Florida. A total of seven surveys were conducted following pre-determined transect lines covering the entire BB and CC boxes (see **Table 1**, **Figure 1**). Due to overlapping exercises operating in the same area by USS 58 and USS 64, some surveys acted both as a pre for one ship and a post for the other ship. Pre- and post-event surveys on the day of the GUNEX events occurred on both 5 and 6 October. After providing transect coverage for lines A and B, the pre-event survey on October 5 was required to relocate to an alternate non-exercise box (CC) due to live-fire exercises occurring within the BB box. The post-event survey immediately after the GUNEX event on October 5 provided coverage for the entire BB box. The pre-event survey on October 6 covered the entire BB box before the GUNEX event, while the post-event survey provided no coverage within the BB box due to live-fire exercises occurring within the BB box and only covered lines C, D, E, and F in the alternate non-exercise box (CC).

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

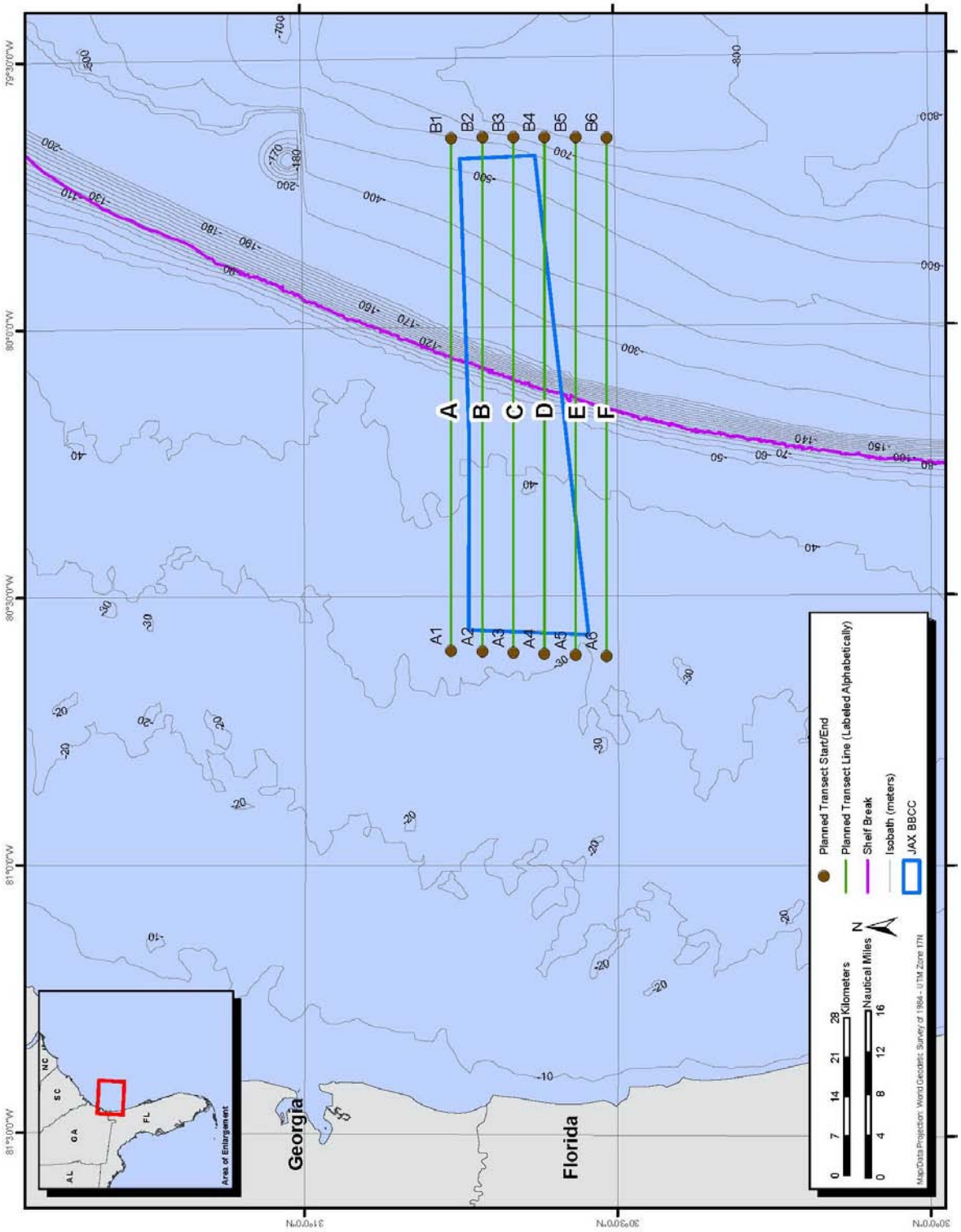

Figure 1. Predetermined Tracklines for the Survey Effort for JAX GUNEX 2010.

Survey effort included the entirety of the BB and CC boxes (approximately 1,431 km^2) and consisted of waypoints designed to extend beyond the entire range during each 4-hour maximum survey flight time window. Six parallel tracklines running from west to east, measuring 91 kilometers (km), and spaced approximately 5.3 km apart were observed during "systematic" efforts throughout the surveys and provided a total survey coverage area of approximately 2,513 km^2 (see **Figure 1**). Original lines were followed when possible, but exact transects followed were subject to modifications depending on Navy range closures of up to 15 NM around the GUNEX ship during live-fire exercises (see **Table 1, Figures 2–5**).

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 JAX Range Complex Monitoring Plan February 2009, information is to include (1) species identification and group size; (2) location and relative distance from the IMPASS 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 possible and logical, for a minimum of 5 minutes, including digital photographs and video.
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 2,803 km of systematic (on-effort) trackline and 3,006 km of combined systematic and random (lines covered in transit to the next trackline) tracklines during 5 days for more than 14 hours of on-effort status (see **Table 1**). Beaufort sea state ranged from 3 to 6 and all sightings were made in Beaufort sea states between 3 and 5 (see **Table 3**). A detailed description of environmental, oceanographic, and sighting conditions was collected using the program VisSurvey and is available as an MS Access database file. Sightings per unit effort (SPUE) was calculated as the total survey effort (hours/km/NM) divided by the total number of marine mammal sightings (n=6) or sea turtles (n=34). For this monitoring exercise, the SPUE for marine mammals was equal to 1 sighting per 2.8 hours, 501 km, and 270.5 NM and the SPUE for sea turtles was equal to 1 sighting per 0.4 hours, 88.4 km, and 47.7 NM.

Sightings

Six sightings of cetaceans and 34 sightings of sea turtles were recorded during 17 hours of survey flight time (see **Figure 2**, **Table 3**). Four sightings of marine mammals and 16 sightings of sea turtles were made on the pre-GUNEX survey days October 3 and 4 (see **Figure 3**, **Table 3**). No sightings of marine mammals and only six sightings of sea turtles were made on the GUNEX event days (October 5 and 6) however, both days had a Beaufort sea state of 4, 5, and 6 making sightings of animals extremely difficult (see **Figure 4**, **Table 3**). Two sightings of marine mammals and 12 sightings of sea turtles were made on the post-GUNEX survey day of October 7 (see **Figure 5**, **Table 3**). All but one sighting of a loggerhead sea turtle was sighted on the track lines during on-effort status. Digital photographs were collected during three cetacean sightings and used to determine or confirm species identification when possible. Sightings included three groups of Atlantic spotted dolphins (*Stenella frontalis*) in water depths between 30 and 50 meters, three groups of unidentified cetaceans in water depths between 300 and 500 meters, 33 sightings of loggerhead sea turtles (*Caretta caretta*) in water depths between 30 and 800 m, and one unidentified sea turtle in 30 meters of water (see **Figure 2, Table 3**).

Behavior

No visible evidence of distress or unusual behavior was observed for the pre-GUNEX surveys, during GUNEX surveys, and post-GUNEX surveys (see **Table 3**). Dolphin groups that were initially sighted in close proximity to one another and then observed to gradually dissipate with respect to tight formation (see **Table 3**) might have been reacting to the plane circling above for species ID confirmation. Detailed focal follow sessions were not possible after initial sightings due to gradual dispersion during species ID circling and difficulties associated with relocating small groups of dolphins in choppy seas and intense bouts of sun glare. Given this project's focus, future surveys will attempt to conduct high altitude (>1000 feet) focal follow behavioral observations before conducting species ID circling at lower altitudes (>700 feet).

Section 4 Acknowledgements

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

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)	Behavioral Summary
1	10/3/10	Unid	6	6	6	-	13:07	13:12	5	30.712	-79.857	37	0.4	-	300	Two glimpses of dolphin group only. Lost in rough seas on circle-back.
2	10/3/10	CC	1	1	1	-	13:49	-	5	30.662	-80.492	35	0.4	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
3	10/4/10	CC	1	1	1	-	10:24	-	3	30.767	-80.347	50	0.2	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
4	10/4/10	SF	50	60	25	-	10:26	10:43	3	30.766	-80.244	50	0.2	160	40	Slow travel towards S-SE. Initial group of 25 sighted was not the first one circled for pictures as it was N of the trackline and DE spotted group S of trackline. Appears to be two separate groups of approximately 25 dolphins each. Moving from N to SE. Both group's members are close together with Min = 1 / Max = 4 Dispersal. Group began to disperse as we circled for species ID and deemed not good for focal follows as the plane might have already influenced their behavior.
5	10/4/10	CC	1	1	1	-	10:38	-	3	30.758	-80.249	25	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
6	10/4/10	CC	1	1	1	-	10:46	-	3	30.766	-80.230	20	0.8	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
7	10/4/10	CC	1	1	1	-	10:48	-	3	30.764	-80.149	25	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
8	10/4/10	CC	1	1	1	-	10:49	-	3	30.764	-80.116	28	0.5	-	< 50	Loggerhead turtle 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
9	10/4/10	CC	1	1	1	-	10:49	-	3	30.764	-80.110	26	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
10	10/4/10	CC	1	1	1	-	10:49	-	3	30.764	-80.093	35	0.4	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
11	10/4/10	CC	1	1	1	-	11:19	-	3	30.717	-80.152	30	0.5	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
12	10/4/10	CC	1	1	1	-	11:25	-	3	30.717	-80.343	30	0.5	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
13	10/4/10	CC	1	1	1	-	11:46	-	3	30.666	-80.240	40	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
14	10/4/10	CC	1	1	1	-	11:47	-	3	30.665	-80.216	40	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
15	10/4/10	Unid	1	1	1	-	12:15	12:15	3	30.617	-79.957	70	0.1	30	250	Very slow moving just under the surface. Unable to relocate for species ID. Appeared larger than an average dolphin, smaller than a whale.
16	10/4/10	CC	1	1	1	-	12:30	-	3	30.615	-80.220	25	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
17	10/4/10	CC	1	1	1	-	12:53	-	3	30.566	-80.330	45	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
18	10/4/10	CC	1	1	1	-	12:53	-	3	30.567	-80.312	40	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
19	10/4/10	CC	1	1	1	-	12:57	-	3	30.565	-80.202	25	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
20	10/4/10	Unid	1	1	1	-	13:22	13:22	3	30.516	-79.876	65	0.1	270	400	Lone individual under surface. Unable to relocate for species ID.
21	10/5/10 GUNEX	CC	1	1	1	-	08:25	-	5	30.713	-80.169	35	0.4	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
22	10/5/10 GUNEX	CC	1	1	1	-	10:13	-	4	30.515	-79.645	65	0.1	-	800	Loggerhead turtle 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
23	10/5/10 GUNEX	CC	1	1	1	-	14:31	-	4	30.717	-80.298	40	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
24	10/5/10 GUNEX	CC	1	1	1	-	14:49	-	4	30.667	-80.386	50	0.2	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
25	10/5/10 GUNEX	CC	1	1	1	-	15:10	-	4	30.619	-80.530	25	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
26	10/6/10 GUNEX	CC	1	1	1	-	09:08	-	5	30.618	-80.421	40	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
27	10/7/10	CC	1	1	1	-	08:18	-	3	30.766	-80.427	20	0.8	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
28	10/7/10	CC	1	1	1	-	08:19	-	3	30.767	-80.393	35	0.4	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
29	10/7/10	CC	1	1	1	-	08:36	-	4	30.763	-79.820	35	0.4	-	300	Loggerhead turtle at the surface. No disturbance detected.
30	10/7/10	SF	30	40	20	Yes	09:02	09:19	3	30.717	-80.332	30	0.5	45	30	Group started off relatively tightly packed together with a Min = 1 / Max = 3 Dispersal. Small tuna-sized fish seen in pictures near dolphins. Slow travel to the NE. After circling to get species ID, group began to split apart. Lost the majority of the larger group with remaining individuals still moving NE. Too elusive for focal follow.
31	10/7/10	Unid ST	1	1	1	-	10:23	-	3	30.619	-80.439	25	0.6	-	< 50	Unidentified sea turtle at the surface. No disturbance detected.
32	10/7/10	CC	1	1	1	-	10:28	-	3	30.617	-80.606	30	0.5	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
33	10/7/10	CC	1	1	1	-	10:34	-	3	30.565	-80.474	25	0.6	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
34	10/7/10	CC	1	1	1	-	10:35	-	3	30.566	-80.431	35	0.4	-	< 50	Loggerhead turtle 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
35	10/7/10	SF	20	20	15	Yes	10:37	10:46	3	30.566	-80.354	60	0.1	95	30	Slow travel to E. Started with 20 individuals with a Max = 1 / Min = 4 Dispersal. Kept losing them in the glare and they dispersed as we circled to get species ID and reacquire them. Mom/calf and a few others still heading E before we left them and resumed track.
36	10/7/10	CC	1	1	1	-	11:09	-	4	30.561	-79.690	50	0.2	-	600	Loggerhead turtle at the surface. No disturbance detected.
37	10/7/10	CC	1	1	1	-	11:15	-	3	30.513	-79.762	60	0.1	-	500	Loggerhead turtle at the surface. No disturbance detected.
38	10/7/10	CC	1	1	1	-	11:29	-	3	30.519	-80.260	45	0.3	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
39	10/7/10	CC	1	1	1	-	11:30	-	3	30.519	-80.303	30	0.5	-	< 50	Loggerhead turtle at the surface. No disturbance detected.
40	10/7/10	CC	1	1	1	-	11:36	-	3	30.520	-80.511	50	0.2	-	< 50	Loggerhead turtle at the surface. No disturbance detected.

Key:
CC = loggerhead turtle (*Caretta caretta*)
Unid ST = Unidentified sea turtle
SF = Atlantic spotted dolphin (*Stenella frontalis*)
Unid = Unidentified cetacean

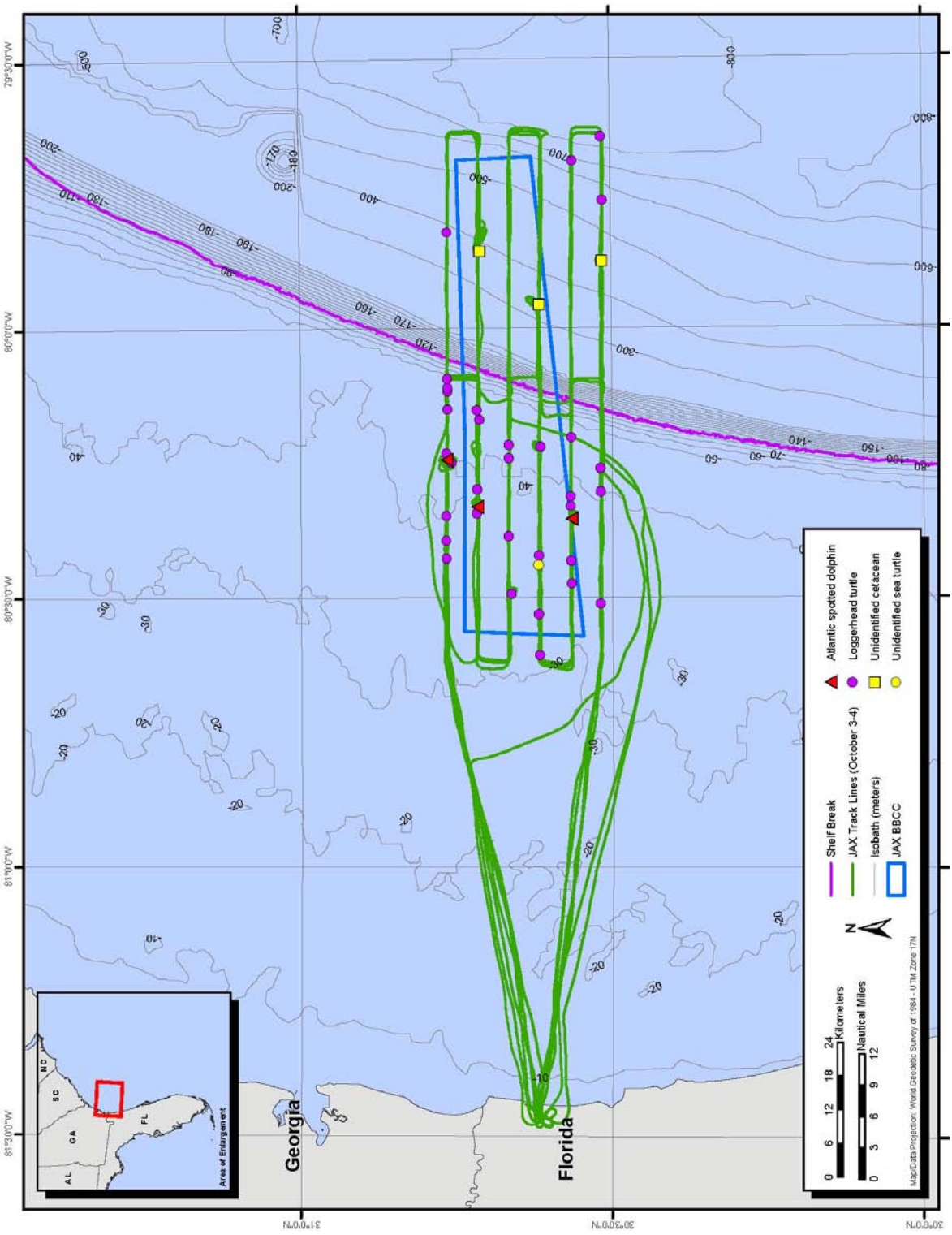

Figure 2. Location of All Cetacean and Sea Turtle Sightings Seen During Survey Period (October 3–7).

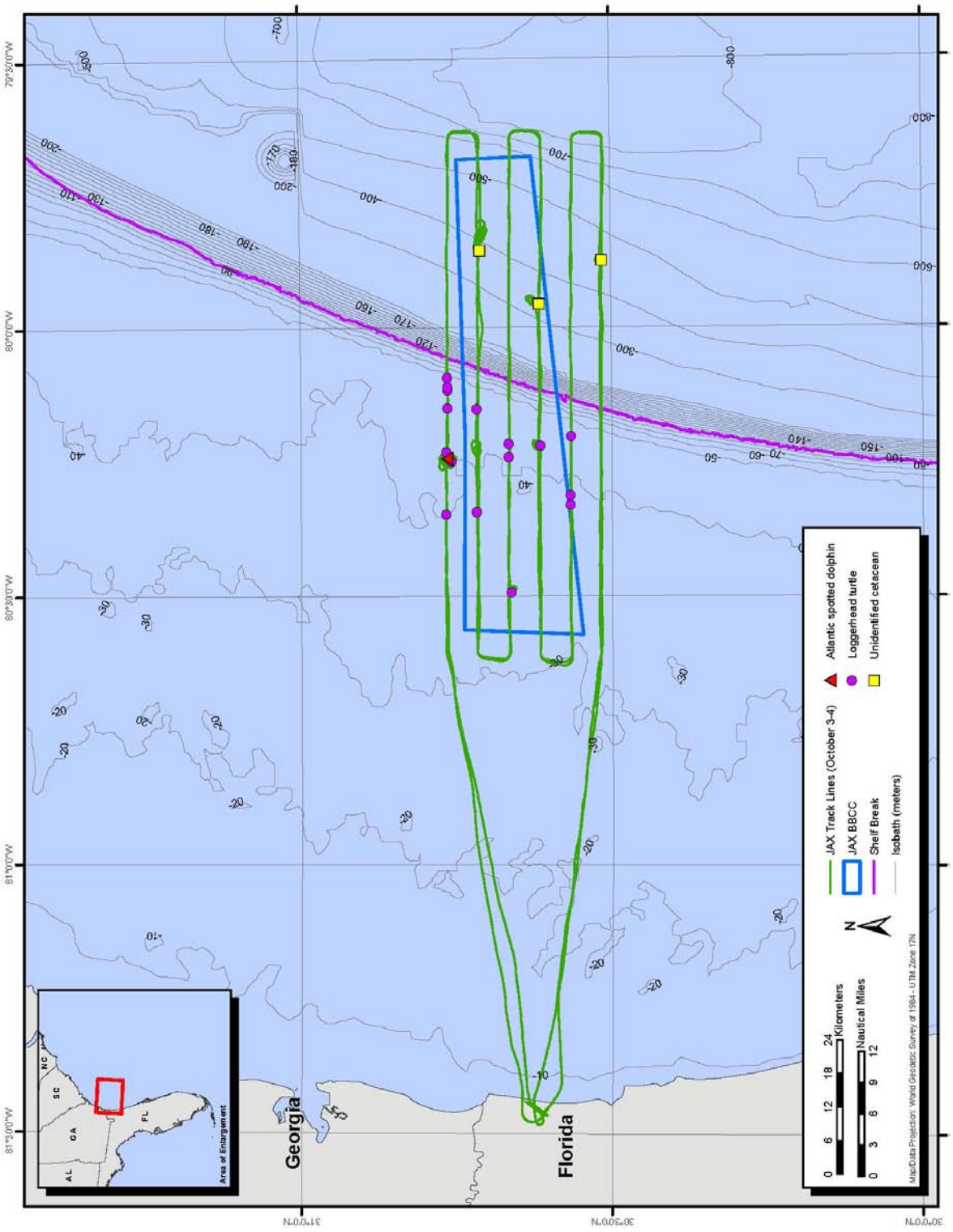

Figure 3. Location of Cetacean and Sea Turtle Sightings Seen Pre-GUNEX (October 3–4).

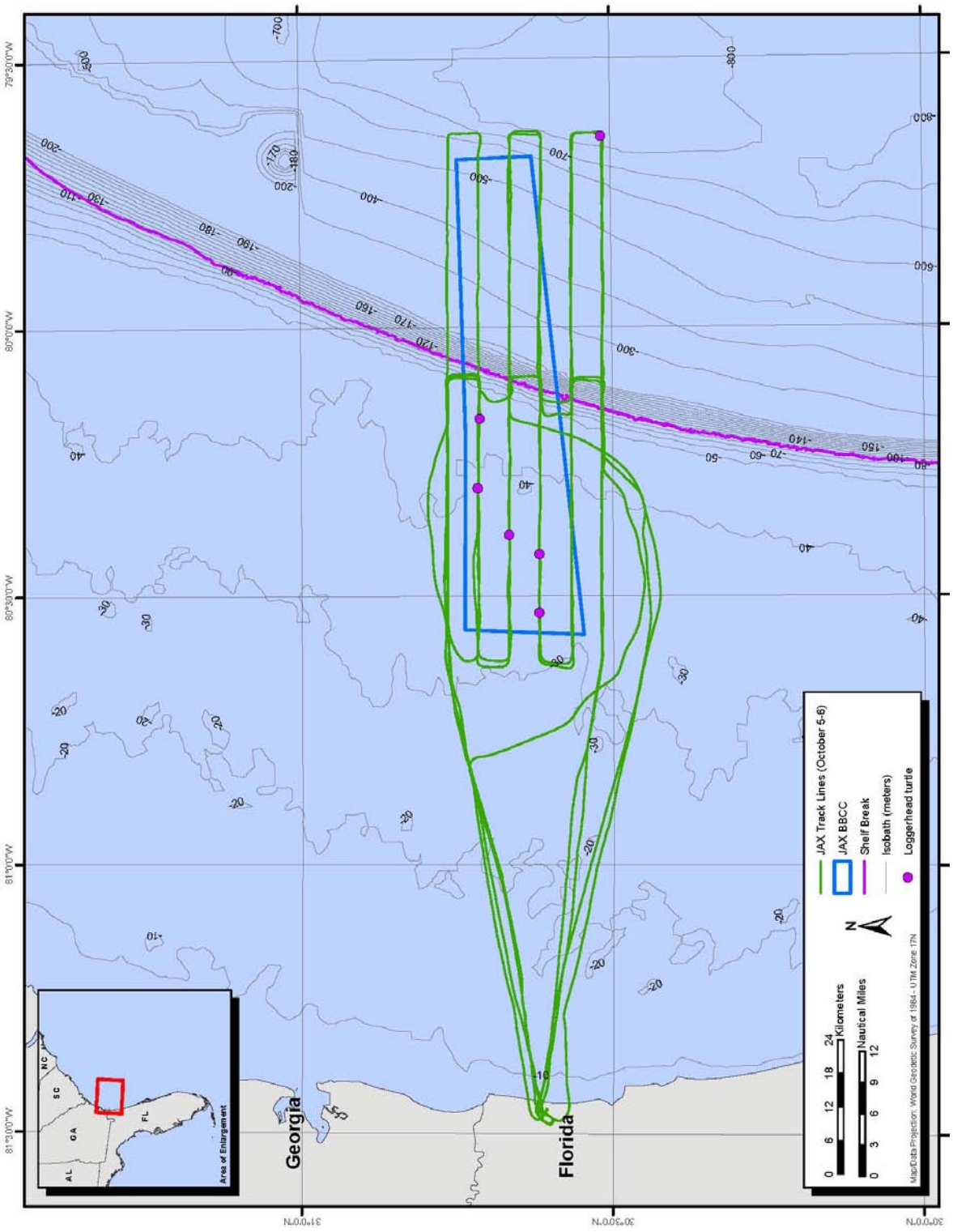

Figure 4. Location of Cetacean and Sea Turtle Sightings Seen During GUNEX (October 5–6).

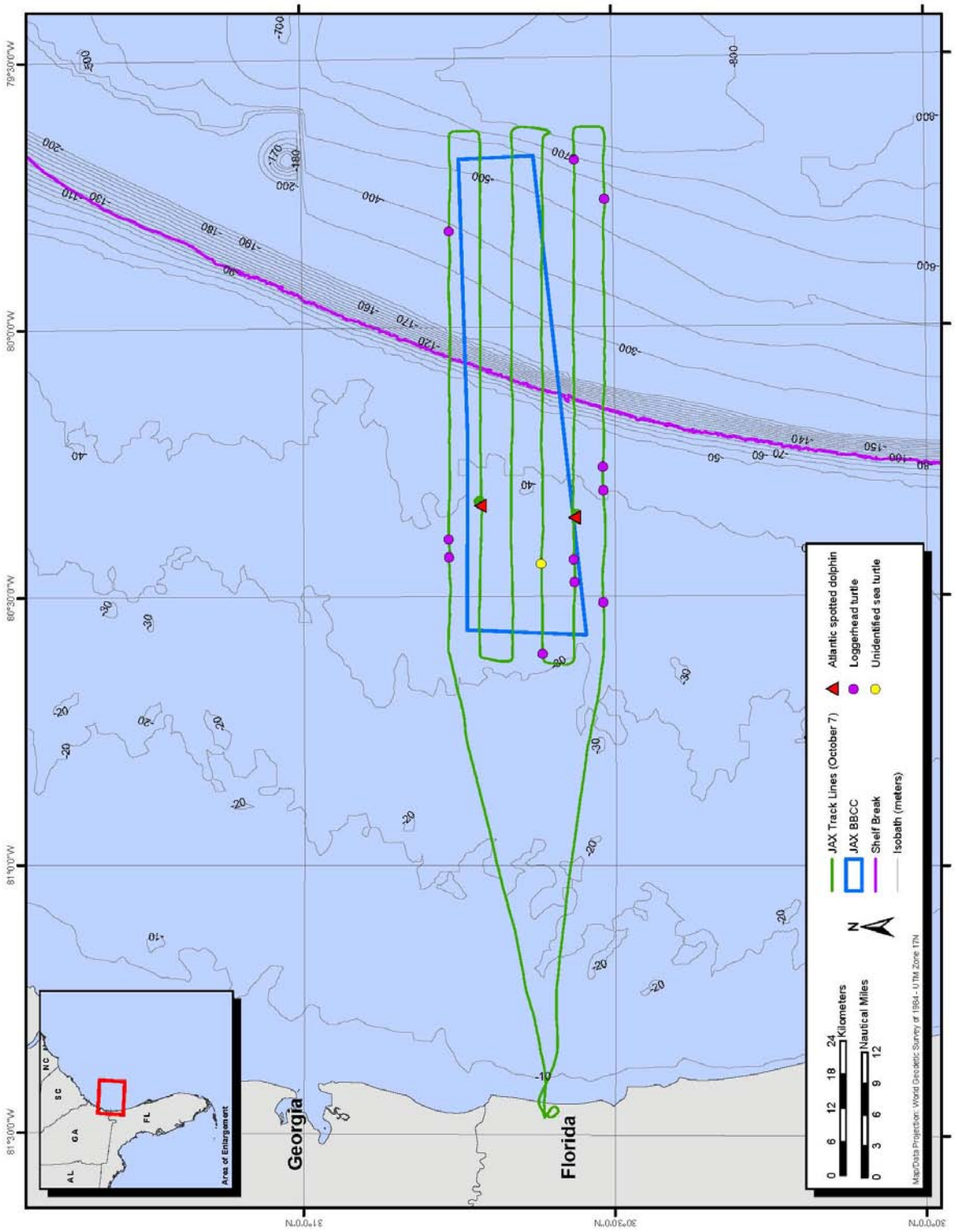

Figure 5. Location of Cetacean and Sea Turtle Sightings Seen Post-GUNEX (October 7).

Section 5 References

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