

***Appendix C – July 5-9, 2011 Monitoring Report***

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**Naval Surface Warfare Center  
Panama City Division (NSWC PCD)**

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**Marine Species Monitoring**

**AERIAL MONITORING SURVEYS**

**TRIP REPORT**



**September 2011**

**ACRONYMS AND ABBREVIATIONS**

DON	Department of the Navy
GOM	Gulf of Mexico
HFAS	High-frequency Active Sonar
ICMP	Integrated Comprehensive Monitoring Program
NSWC PCD	Naval Surface Warfare Center Panama City Division
OPAREA	Operating Area
RDT&E	Research, Development, Test, and Evaluation
SPUE	Sightings Per Unit Effort
SOCAL	Southern California Range Complex
U.S.	United States

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## **Section 1 Introduction**

Aerial marine-species monitoring for an AN/AQS-20 sonar research, development, test, and evaluation (RDT&E) event occurred with daily marine-species surveys from 5–9 July 2011. These surveys were taken off the coast of Florida in the Naval Surface Warfare Center Panama City Division (NSWC PCD) Study Area in the Gulf of Mexico (GOM). The AN/AQS-20 is a high-frequency active sonar (HFAS) system used in mine countermeasures detection.

As part of the compliance requirements of the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973, the United States (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. 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 test event included visual surveys from a fixed-wing aircraft.

## **Section 2 Methods**

### **Study Area**

The NSWC PCD Study Area lies primarily off the coast of Florida in the GOM. The area includes both territorial waters 0 to 22 km (0 to 12 nmi) and non-territorial waters (waters that are beyond the 22 km [12 nmi] limit). Monitoring conducted for protected marine species during the AN/AQS-20 sonar test event was focused within the Tango Field of the NSWC PCD Study Area. The Tango Field includes a portion of waters under Warning Area W-151 and is specifically located in the Panama City OPAREA (Figure 1). The testing area for the AN/AQS-20 sonar system is approximately 22 km (12 nmi) offshore, covers an area approximately 21 km<sup>2</sup> (6 nmi<sup>2</sup>) in size, and ranges in bottom depth from 28 to 35 (m) (92 to 115 ft).

### **Aerial-Based Monitoring**

Aerial-based monitoring was performed over a five-day period from 5–9 July 2011 (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 U.S. Navy's Southern California (SOCAL) Range Complex (i.e., Smultea et al., 2009). A survey altitude of approximately 305 m (1,000 ft) and 185 km/h (100 kn) 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 would be attempted at 305 m (1,000 ft) or higher. A lower altitude of approximately 210–250 m (700–800 ft) was established after focal-follow sessions for photography purposes to provide sharper images required for species identification.

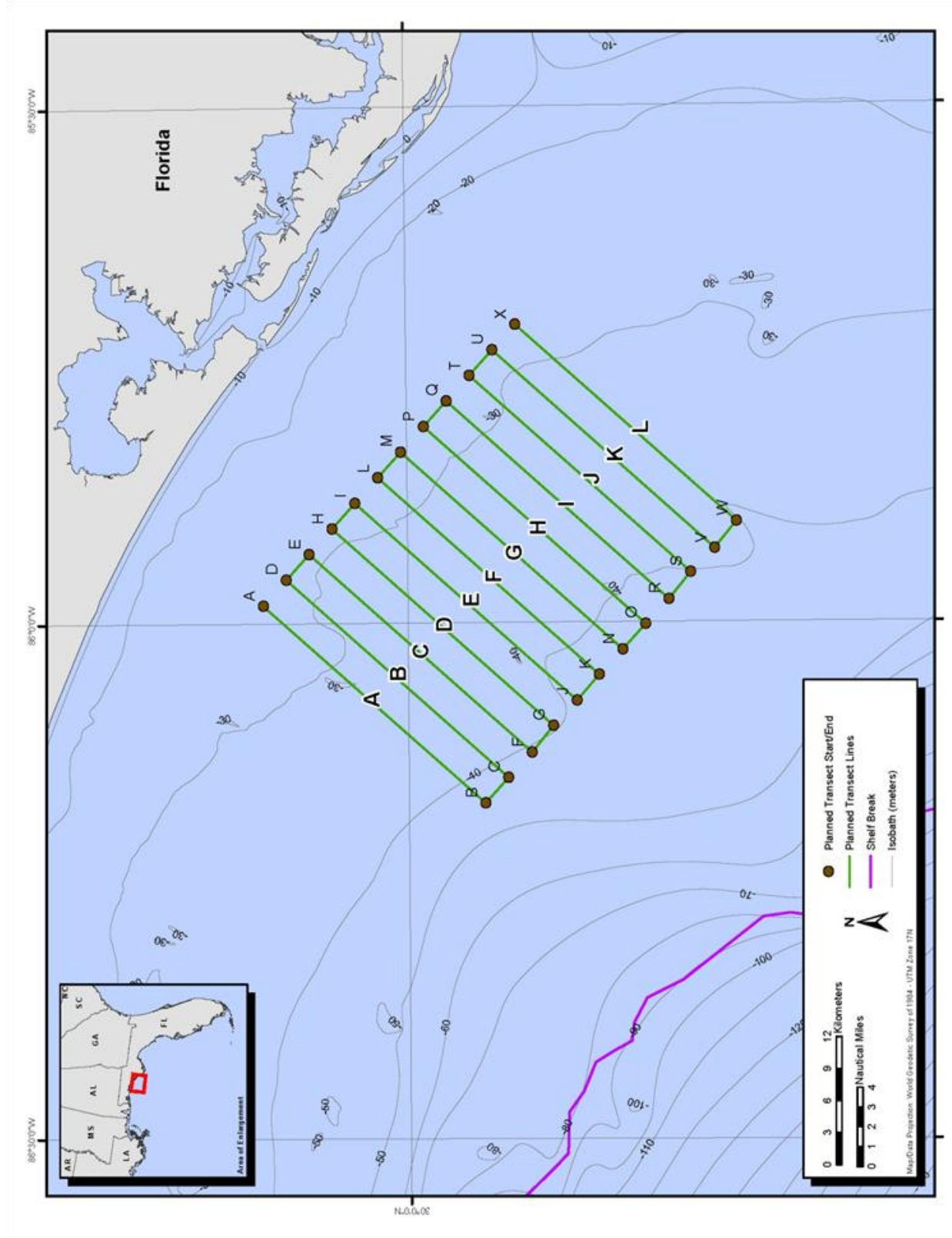


Figure 1. Predetermined Track Lines for the Monitoring Effort for AN/AQS-20 Sonar Test Events for 5-9 July 2011 in the NSWC PCD Study Area



**Table 1. Summary of NSWC PCD Monitoring Effort**

Date (July 2011)	Description	Start Time	Stop Time	Total Survey Minutes*	Total On-Effort Minutes	Trackline On-Effort Distance (km)
5	Transect survey (Pre-Event)	14:22	16:43	140	101	321
6	Transect survey (During-Event)	09:49	11:41	111	86	303
6	Transect survey (During-Event)	13:19	15:16	117	88	269
7	Transect survey (During-Event)	11:36	14:14	158	99	292
8	Transect survey (During-Event)	09:20	12:11	171	136	429
9	Transect survey (Post-Event)	08:31	11:16	165	134	453
<b>Total</b>				<b>862 (≈14.4 h)</b>	<b>644 (≈10.7 h)</b>	<b>2,067 km</b>

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.

The observation platform was a Cessna T337H Turbo Skymaster aircraft operating out of Northwest Florida Beaches International Airport, Panama City Beach, Florida. Six surveys were conducted following predetermined transect lines covering the study area (approximately 986 km<sup>2</sup> [287 nmi<sup>2</sup>]). The lines consisted of waypoints designed to extend beyond the entire range (if permitted by U.S. Navy and U.S. Air Force flight operations) during each survey day for a total flight-time window up to 4 h (Table 1, Figure 1).

The three aerial observers (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.

**Table 2. Observers and Roles**

Observer	Role(s)
Dan Engelhaupt	Chief Scientist/Observer
Lenisa Blair	Observer
Jennifer Latusek-Nabholz	Observer

Twelve parallel track lines running from north to south, measuring 27.8 km (15 nmi) in length, and spaced approximately 3.7 km (2 nmi) apart were flown during “systematic” efforts throughout the surveys and provided a total survey coverage area of approximately 986 km<sup>2</sup> (287 nmi<sup>2</sup>) (Figure 1). Original lines were followed when possible, but exact transects followed for each survey day were subject to modifications as a result of range exclusion by U.S. Navy and U.S. Air Force operations in the area, or unfavorable weather conditions in the Tango Field of the NSWC PCD Study Area (Table 1, Figures 2 through 7).

The general survey approach was as follows:

1. Followed predetermined transect lines and waypoints using methods described by Smultea et al. (2009) until a sighting occurred. Variables such as sea state, glare, and visibility were recorded.
2. Upon sighting a marine mammal/sea turtle group, recorded basic sighting information per established protocol (Smultea et al. 2009). As outlined in the NSWC PCD Study Area Monitoring Plan (DON, 2010), information included: (1) species identification and group size; (2) location (relative to observation platform); (3) the behavior of marine mammals and sea turtles; (4) date, time, and environmental and oceanographic conditions associated with each observation; (5) direction of travel; 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 (1,200 to 1,500 ft) and radial distance increased approximately 0.5 to 1.0 km (0.3 to 0.5 nmi). Then, the aircraft circled the sighting to obtain detailed behavioral information as long as possible and logistically feasible (i.e., Beaufort sea state, visibility, group size, behavior, dive times, aircraft considerations [e.g., fuel], etc.). Focal-follows occurred for a minimum of 5 min and included an observer taking digital photographs of the group when possible.
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 confirmation on species identification and to estimate group size/composition.

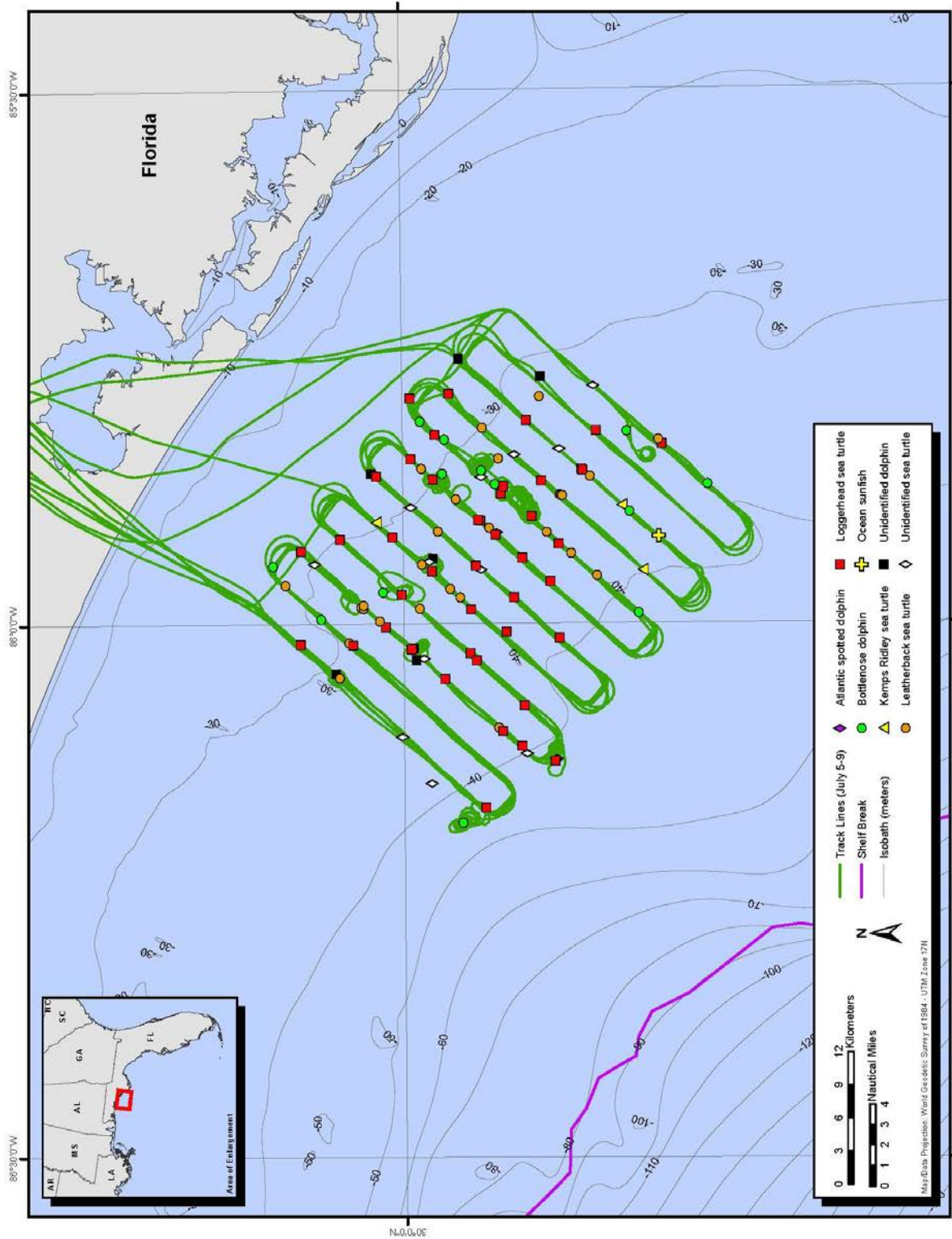


Figure 2. Location of All Cetacean and Sea Turtle Sightings Recorded During the AN/AQS-20 Survey Period (5-9 July 2011)

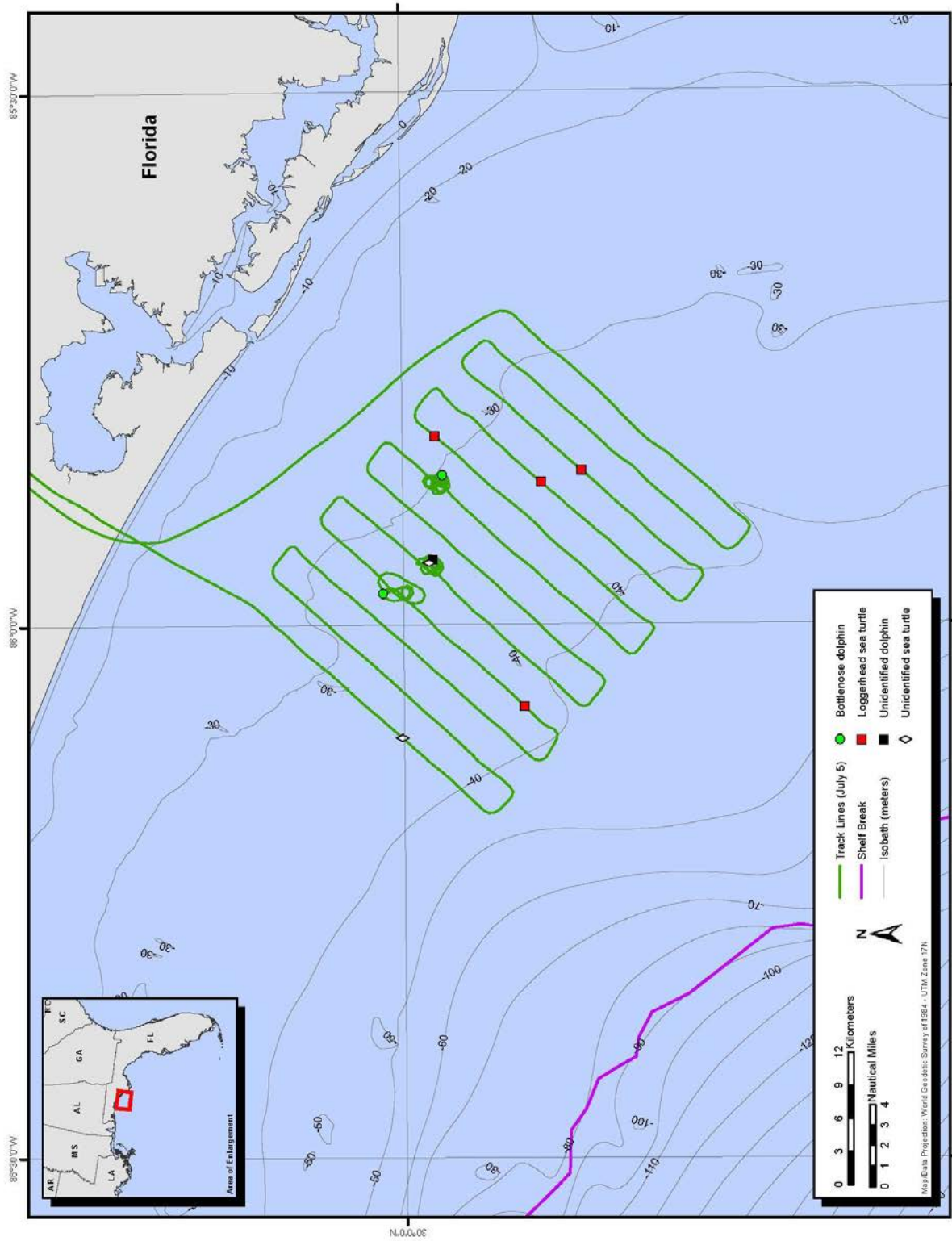


Figure 3. Location of Cetacean and Sea Turtle Sightings Recorded Before the AN/AQS-20 Sonar Test Event (5 July 2011)

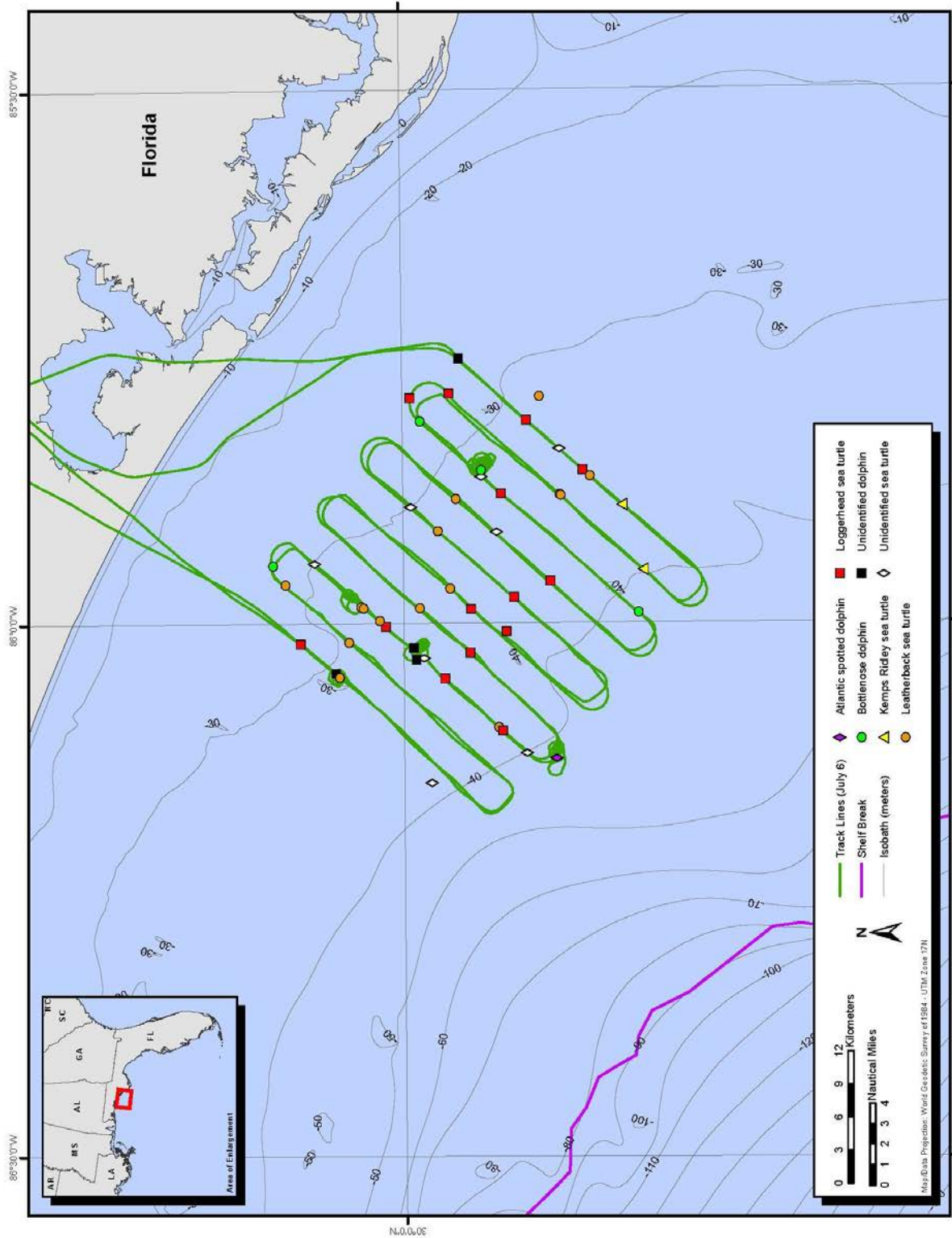


Figure 4. Location of Cetacean and Sea Turtle Sightings Recorded During AN/AQS-20 Sonar Event (6 July 2011)

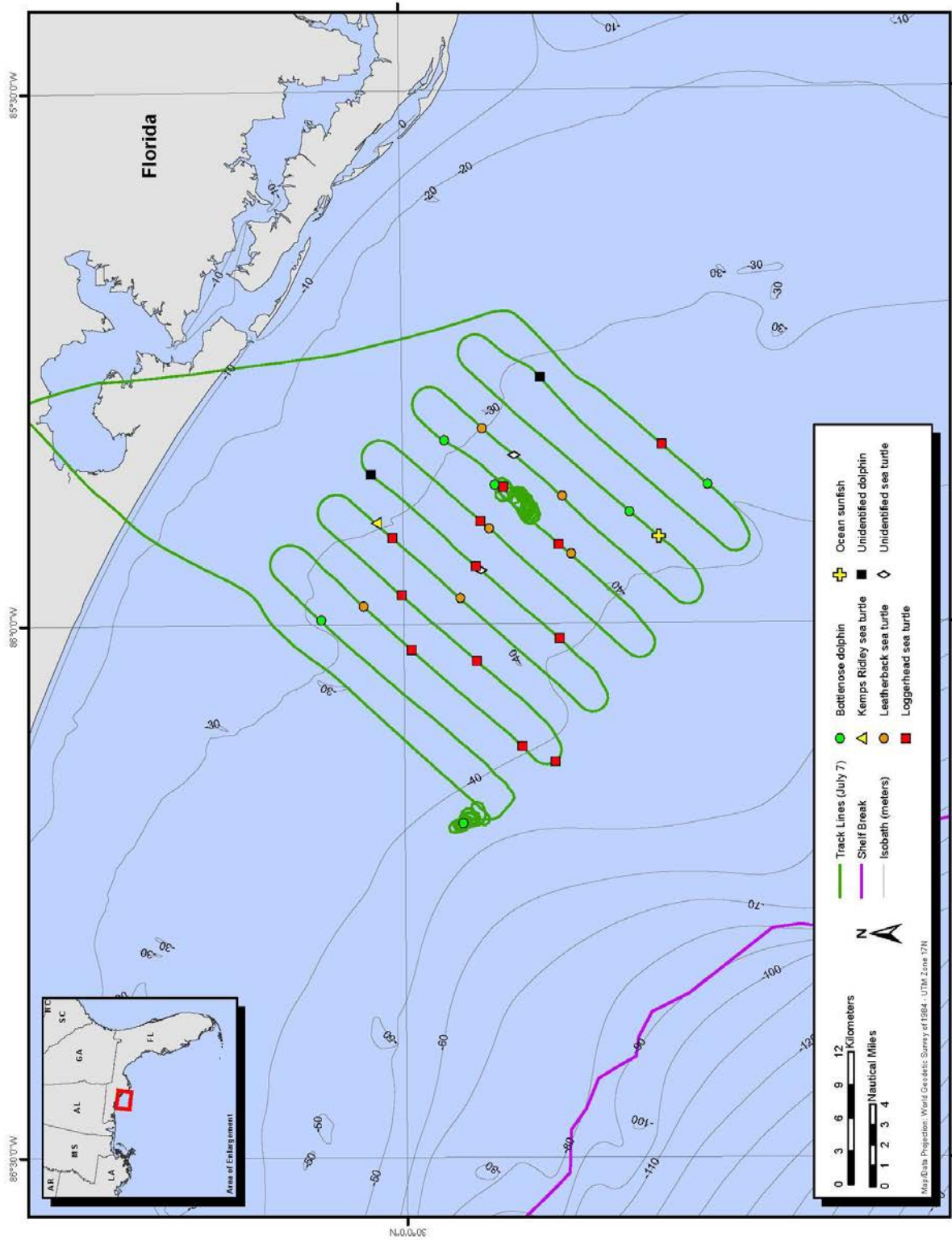


Figure 5. Location of Cetacean and Sea Turtle Sightings Recorded During AN/AQS-20 Sonar Event (7 July 2011)

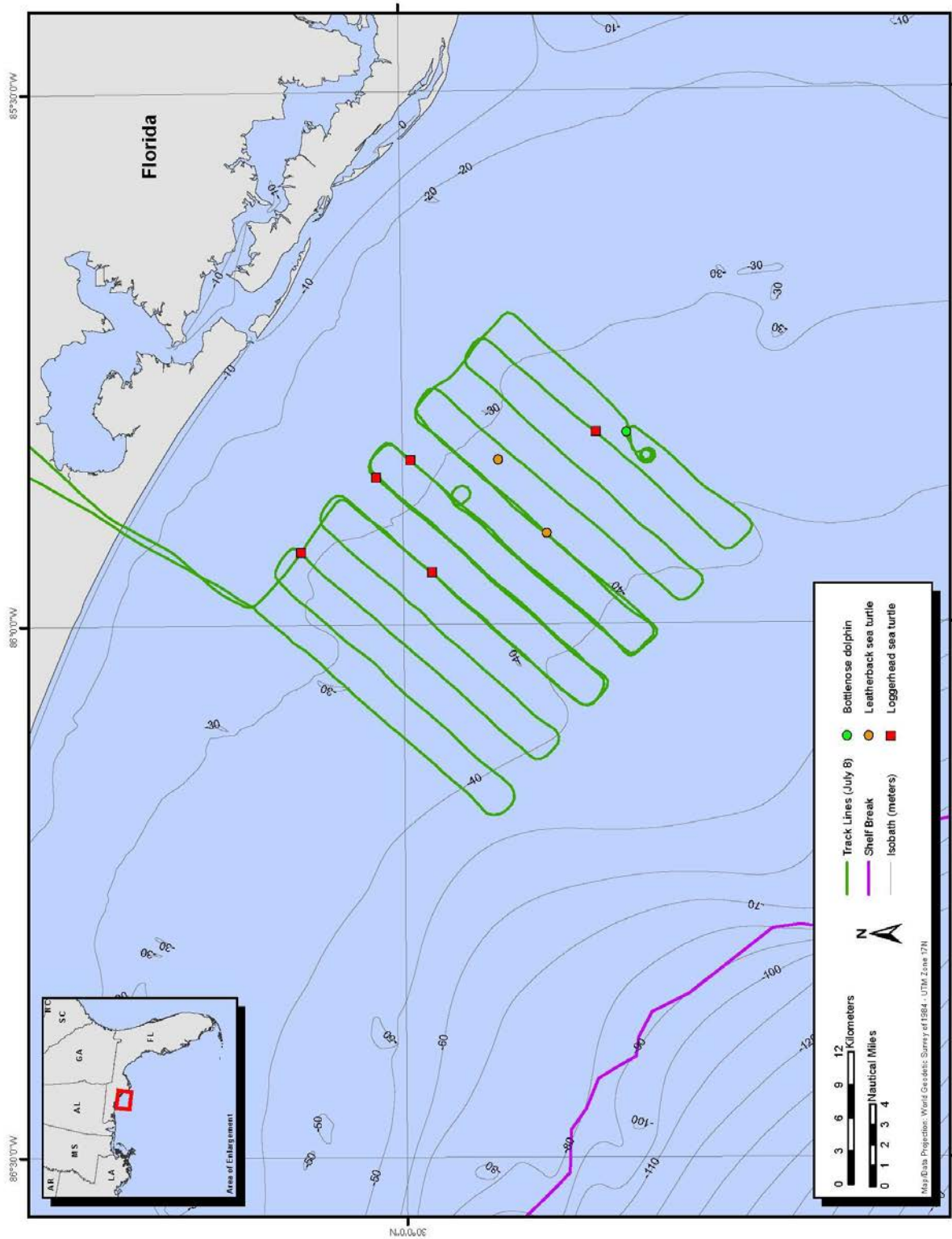


Figure 6. Location of Cetacean and Sea Turtle Sightings Recorded During AN/AQS-20 Sonar Test Event (8 July 2011)

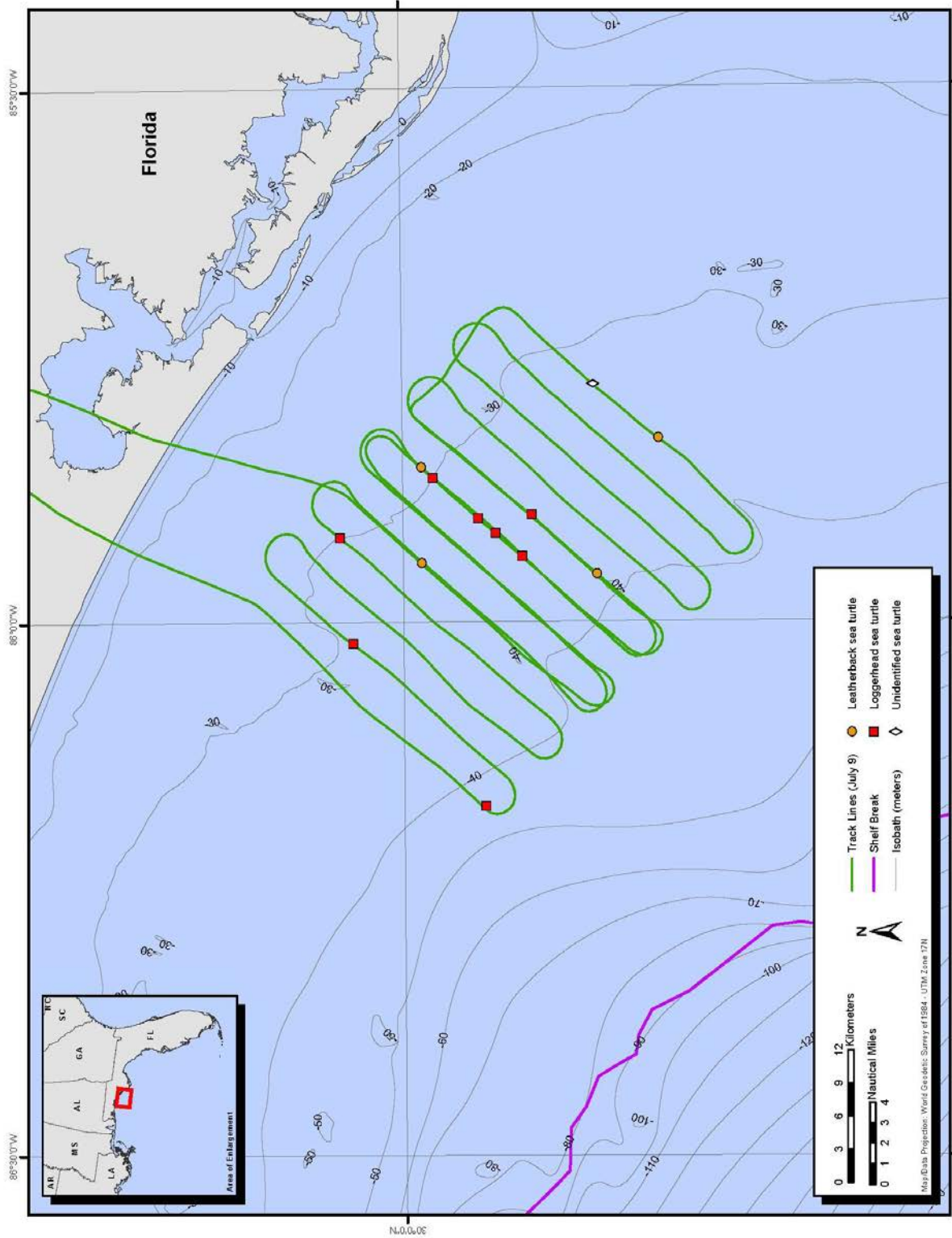


Figure 7. Location of Cetacean and Sea Turtle Sightings Recorded After AN/AQS-20 Sonar Test Event (9 July 2011)



## Section 3 Results

### Survey Effort

Observers visually surveyed 2,067 km (1,116 nmi) of systematic (on-effort) track line and 2,749 km (1,484 nmi) of total track line (including the systematic transects, cross-legs between transects, and circling for focal-follows or species ID) during five days for 10.7 h of on-effort status (Table 1). Beaufort sea state ranged from 1 to 4 and all sightings were made in Beaufort sea states between 1 and 4 (Table 3). A detailed description of environmental, oceanographic, and sighting conditions was recorded and is available, if requested. Sightings per unit effort (SPUE) was calculated as the total survey effort (h/km [nmi]) divided by the total number of cetacean (n=21) or sea turtle (n=84) sightings. Then, an estimate for the number of sightings per h and per km was calculated. For this monitoring event, the SPUE for cetaceans was equal to two sightings per h or 0.0051 sightings per km (0.041 sightings per 0.54 NM) and the SPUE for sea turtles was equal to eight sightings per h or 0.041 sightings per km (0.041 sightings per 0.54 nmi).

Twenty-one sightings of cetaceans, 84 sightings of sea turtles, and 1 sighting of an ocean sunfish (*Mola mola*) were recorded during 14.3 h of total survey flight time within the survey area (Figure 2, Table 3).

Three sightings of cetaceans and six sightings of sea turtles were made prior to the test event on 5 July 2011 (Figure 3, Table 3). Eighteen sightings of cetaceans, 68 sightings of sea turtles, and 1 sighting of an ocean sunfish were made during the sonar test event during 6–8 July 2011 (Figures 4–6, Table 3). Thirteen sightings of sea turtles were made after the test event on 9 July 2011 (Figure 7, Table 3). No cetaceans were seen during the post-test survey.

Due to difficulties associated with relocating small groups of cetaceans in a high Beaufort sea state and heavy glare, digital photographs to determine or confirm species identification could not be collected for all dolphin sightings; therefore, some groups could not be identified. Sightings included 13 groups of bottlenose dolphins (*Tursiops truncatus*); 1 group of Atlantic spotted dolphins (*Stenella frontalis*); 7 groups of unidentified dolphins; 44 groups of loggerhead sea turtle (*Caretta caretta*); 27 groups of leatherback sea turtles (*Dermochelys coriacea*); 3 groups of Kemp's ridley sea turtles (*Lepidochelys kempii*); 13 groups of unidentified sea turtles; and 1 ocean sunfish (Figure 2, Table 3). Table 4 provides a summary of the sightings made, which includes group information and environmental data. Bottom depths for each sighting were estimated in 10 m (30 ft) ranges from the maps and were not estimated more precisely for individual sightings.

**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
<b>Pre-Event Sightings</b>																
1	7/05/11	Unid ST	1	1	1	-	14:28	-	3	30.002	-86.106	050	0.3	045	30	Unidentified sea turtle resting at the surface. No disturbance detected.
2	7/05/11	CC	1	1	1	-	14:54	-	3	29.902	-86.077	041	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
3	7/05/11	TT	1	1	1	-	14:59	-	3	30.017	-85.971	030	0.5	135	30	Lone bottlenose dolphin was heading south-southeast.
4	7/05/11	Unid	1	1	1	-	15:15	-	3	29.976	-85.939	005	3.5	135	30	Lone unidentified dolphin travelling. No disturbance detected.
5	7/05/11	Unid ST	1	1	1	-	15:17	-	3	29.979	-85.942	035	0.4	Unk.	30	Unidentified sea turtle resting at the surface. Possibly leatherback but sighting lost before confirmed. No disturbance detected.
6	7/05/11	TT	2	3	1	-	15:38	-	3	29.968	-85.860	035	0.4	225	30	Two bottlenose dolphins travelling slowly to the southwest. Lost quickly in glare.
7	7/05/11	CC	1	1	1	-	16:03	-	4	29.974	-85.823	052	0.2	Unk.	20	Loggerhead turtle resting at the surface. No disturbance detected.
8	7/05/11	CC	1	1	1	-	16:09	-	4	29.887	-85.867	035	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
9	7/05/11	CC	1	1	1	-	16:19	-	4	29.854	-85.856	039	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
<b>During Event Sightings</b>																
10	7/06/11	Unid	3	3	3	-	09:52	09:55	1	30.056	-86.047	030	0.5	225	30	Three unidentified dolphins travelling slowly. Group lost during turn. No disturbance detected.
11	7/06/11	TT	1	1	1	-	10:10	10:13	1	30.107	-85.946	030	0.5	235	20	Lone bottlenose dolphin travelling slowly toward a large fishing boat. No disturbance detected.

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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
12	7/06/11	Unid ST	1	1	1	-	10:13	-	1	30.073	-85.944	028	0.6	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
<b>During Event Sightings (Continued)</b>																
13	7/06/11	DC	2	2	2	-	10:14	-	1	30.035	-85.985	035	0.4	235	30	Two leatherback turtles travelling slowly at the surface. No disturbance detected.
14	7/06/11	CC	1	1	1	-	10:20	-	1	30.015	-86.003	045	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
15	7/06/11	Unid	2	2	2	-	10:21	-	1	29.992	-86.023	050	0.3	Unk.	30	Two unidentified dolphins sighted. No disturbance detected.
16	7/06/11	Unid ST	1	1	1	-	10:21	-	1	29.984	-86.033	042	0.3	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
17	7/06/11	CC	2	2	2	-	10:23	-	1	29.967	-86.052	042	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
18	7/06/11	DC	1	1	1	-	10:24	-	1	29.923	-86.098	045	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
19	7/06/11	Unid ST	1	1	1	-	10:25	-	1	29.900	-86.122	050	0.3	Unk.	40	Unidentified sea turtle resting at the surface. No disturbance detected.
20	7/06/11	SF	30	40	25	0	10:27	10:32	1	29.876	-86.127	035	0.4	120	40	Multiple subgroups of Atlantic spotted dolphins travelling slowly to the southeast during circling. No disturbance detected.
21	7/06/11	CC	1	1	1	-	10:48	-	1	29.945	-85.987	040	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
22	7/06/11	CC	1	1	1	-	10:57	-	2	29.910	-85.976	051	0.2	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
23	7/06/11	Unid ST	1	1	1	-	11:00	-	2	29.994	-85.891	030	0.5	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
24	7/06/11	Unid ST	1	1	1	-	11:07	-	2	29.924	-85.915	035	0.4	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
25	7/06/11	DC	1	1	1	-	11:08	-	2	29.888	-85.788	031	0.6	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.

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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
26	7/06/11	TT	1	1	1	0	11:21	-	2	29.986	-85.811	043	0.3	Unk.	30	One bottlenose dolphin detected at surface. No disturbance detected.
27	7/06/11	CC	1	1	1	-	11:22	-	2	29.994	-85.789	030	0.5	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
<b>During Event Sightings (Continued)</b>																
28	7/06/11	CC	1	1	1	-	11:23	-	2	29.962	-85.785	041	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
29	7/06/11	DC	2	2	2	-	11:27	-	2	29.872	-85.880	054	0.2	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
30	7/06/11	CC	1	1	1	-	11:37	-	2	29.853	-85.857	030	0.5	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
31	7/06/11	Unid	2	2	2	-	11:41	-	2	29.954	-85.752	030	0.5	090	30	Two unidentified dolphins travelling slowly at surface. Did not circle; no disturbance detected.
32	7/06/11	CC	1	1	1	-	13:20	-	1	30.085	-86.019	050	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
33	7/06/11	DC	1	1	1	-	13:21	-	1	30.053	-86.051	042	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
34	7/06/11	Unid ST	1	1	1	-	13:26	-	1	29.978	-86.150	033	0.5	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
35	7/06/11	DC	1	1	1	-	13:34	-	1	30.045	-86.018	042	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
36	7/06/11	DC	1	1	1	-	13:36	-	1	30.097	-85.964	051	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
37	7/06/11	DC	1	1	1	-	13:41	-	1	30.033	-85.986	028	0.6	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
38	7/06/11	DC	1	1	1	-	13:42	-	1	30.020	-85.998	033	0.5	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
39	7/06/11	Unid	20	22	18	2	13:45	-	1	29.990	-86.034	038	0.4	150	30	Group of 20 unidentified dolphins travelling slowly. No disturbance detected.

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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
40	7/06/11	CC	1	1	1	-	13:55	-	1	29.920	-86.101	032	0.5	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
41	7/06/11	CC	1	1	1	-	14:01	-	1	29.946	-86.028	045	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
42	7/06/11	CC	1	1	1	-	14:02	-	1	29.9165	-86.008	038	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
<b>During Event Sightings (Continued)</b>																
43	7/06/11	DC	1	1	1	-	14:03	-	1	29.987	-85.986	037	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
44	7/06/11	DC	2	2	2	-	14:12	-	1	29.962	-85.968	035	0.4	Unk.	30	Two leatherback turtles resting at the surface. No disturbance detected.
45	7/06/11	DC	1	1	1	-	14:24	-	1	29.972	-85.914	060	0.2	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
46	7/06/11	DC	1	1	1	-	14:30	-	1	29.957	-85.884	055	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
47	7/06/11	CC	1	1	1	-	14:34	-	1	29.880	-85.961	045	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
48	7/06/11	TT	1	1	1	-	14:38	-	1	29.808	-85.991	050	0.3	Unk.	30	Lone bottlenose dolphin sighted at surface. No disturbance detected.
49	7/06/11	CC	1	1	1	-	14:43	-	1	29.920	-85.879	042	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
50	7/06/11	Unid ST	1	1	1	-	14:44	-	1	29.936	-85.863	032	0.5	Unk.	40	Unidentified sea turtle resting at the surface. No disturbance detected.
51	7/06/11	TT	12	15	8	0	14:45	-	1	29.936	-85.857	060	0.2	Unk.	20	Group of 12 bottlenose dolphins traveling slowly. No disturbance detected.
52	7/06/11	DC	1	1	1	-	15:03	-	1	29.871	-85.881	052	0.2	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
53	7/06/11	KR	1	1	1	-	15:06	-	1	29.804	-85.951	044	0.3	Unk.	30	Kemp's ridley turtle resting at the surface. No disturbance detected.

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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
54	7/06/11	KR	1	1	1	-	15:11	-	1	29.821	-85.890	049	0.3	Unk.	30	Kemp's ridley turtle resting at the surface. No disturbance detected.
55	7/06/11	DC	2	2	2	-	15:12	-	1	29.847	-85.863	051	0.3	Unk.	30	Two leatherback turtles resting at the surface. No disturbance detected.
56	7/06/11	Unid ST	1	1	1	-	15:13	-	1	29.872	-85.837	030	0.5	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
57	7/06/11	CC	2	2	2	-	15:15	-	1	29.899	-85.810	063	0.2	Unk.	30	Two loggerhead turtles resting at the surface. No disturbance detected.
<b>During Event Sightings (Continued)</b>																
58	7/07/11	TT	100	100	70	5	11:43	11:55	3	29.953	-86.187	015	1.1	225	40	Group of approximately 100 bottlenose travelling slowly in many subgroups. Varying levels of dispersion, some splashes and aerial activity. See Appendix for focal-follow data.
59	7/07/11	TT	6	6	6	0	12:05	-	3	30.068	-85.996	038	0.4	Unk.	30	Six bottlenose dolphins sighted milling; no distinct heading.
60	7/07/11	DC	1	1	1	-	12:10	-	3	30.033	-85.983	040	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
61	7/07/11	CC	1	1	1	-	12:12	-	2	29.994	-86.024	040	0.4	Unk.	40	Loggerhead turtle resting at the surface. No disturbance detected.
62	7/07/11	CC	1	1	1	-	12:16	-	2	29.904	-86.115	036	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
63	7/07/11	CC	1	1	1	-	12:17	-	2	29.877	-86.129	050	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
64	7/07/11	CC	1	1	1	-	12:22	-	2	29.941	-86.035	045	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
65	7/07/11	CC	1	1	1	-	12:24	-	2	30.002	-85.973	043	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
66	7/07/11	KR	1	1	1	-	12:30	-	2	30.022	-85.905	035	0.4	Unk.	20	Kemp's ridley turtle resting at the surface. No disturbance detected.

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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
67	7/07/11	CC	1	1	1	-	12:31	-	2	30.009	-85.919	045	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
68	7/07/11	DC	1	1	1	-	12:33	-	2	29.954	-85.976	043	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
69	7/07/11	CC	1	1	1	-	12:41	-	2	29.873	-86.014	045	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
70	7/07/11	Unid ST	1	1	1	-	12:44	-	2	29.937	-85.950	037	0.4	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
71	7/07/11	CC	1	1	1	-	12:44	-	2	29.941	-85.946	050	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
<b>During Event Sightings (Continued)</b>																
72	7/07/11	Unid	3	3	3	0	12:48		2	30.026	-85.859	035	0.4	220	20	Three unidentified dolphins travelling slowly. No disturbance detected.
73	7/07/11	CC	1	1	1	-	12:53	-	2	29.937	-85.904	040	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
74	7/07/11	DC	1	1	1	-	12:54	-	2	29.930	-85.911	038	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
75	7/07/11	DC	1	1	1	-	13:03	-	2	29.863	-85.935	035	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
76	7/07/11	CC	1	1	1	-	13:04	-	2	29.873	-85.926	035	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
77	7/07/11	TT	21	25	21	0	13:06	13:28	2	29.925	-85.870	021	0.8	220	30	Group of 21 bottlenose dolphins travelling at varied pace. Some surface activity and changes in group formation. See Appendix for focal-follow data.
78	7/07/11	CC	1	1	1	-	13:30	-	2	29.918	-85.872	032	0.5	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
79	7/07/11	TT	1	1	1	0	13:31	-	2	29.966	-85.828	051	0.2	210	20	Lone dolphin travelling slowly. Within 1 nmi of U.S. Navy sonar ship.
80	7/07/11	DC	1	1	1	-	13:36	-	3	29.935	-85.817	050	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.

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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
81	7/07/11	Unid ST	1	1	1	-	13:37	-	3	29.909	-85.842	033	0.5	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
82	7/07/11	DC	1	1	1	-	13:39	-	3	29.870	-85.881	044	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
83	7/07/11	MM	1	1	1	-	13:47	-	3	29.791	-85.919	051	0.2	Unk.	30	Ocean sunfish resting at the surface. No disturbance detected.
84	7/07/11	TT	1	1	1	0	13:48	-	3	29.815	-85.896	024	0.7	310	30	Lone bottlenose dolphin travelling slowly. No disturbance detected.
85	7/07/11	Unid	1	1	1	0	13:57	-	3	29.887	-85.769	050	0.3	320	30	Lone unidentified dolphin travelling with some surface activity. No disturbance detected.
<b>During Event Sightings (Continued)</b>																
86	7/07/11	CC	1	1	1	-	14:00	-	3	29.788	-85.833	048	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
87	7/07/11	TT	4	4	4	0	14:07	-	3	29.751	-85.871	042	0.3	Unk.	30	Four bottlenose dolphins milling. No disturbance detected.
88	7/07/11	CC	1	1	1	-	14:09	-	3	29.788	-85.833	048	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
89	7/08/11	CC	1	1	1	-	09:40	-	3	30.084	-85.932	045	0.3	Unk.	20	Loggerhead turtle resting at the surface. No disturbance detected.
90	7/08/11	CC	1	1	1	-	10:02	-	3	29.977	-85.951	040	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
91	7/08/11	CC	1	1	1	-	10:17	-	3	30.022	-85.862	030	0.5	Unk.	20	Loggerhead turtle resting at the surface. No disturbance detected.
92	7/08/11	CC	1	1	1	-	11:02	-	2	29.842	-85.820	040	0.4	Unk.	20	Loggerhead turtle resting at the surface. No disturbance detected.
93	7/08/11	TT	2	2	2	0	11:13	-	2	29.817	-85.821	020	0.8	-	30	Two bottlenose dolphins milling behind a recreational fishing boat. No disturbance detected.
94	7/08/11	DC	1	1	1	-	11:32	-	2	29.883	-85.915	045	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.



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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											
95	7/08/11	DC	1	1	1	-	11:42	-	2	29.922	-85.846	040	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
96	7/08/11	CC	1	1	1	-	11:47	-	2	29.994	-85.846	035	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
<b>Post-Event Sightings</b>																
97	7/09/11	CC	1	1	1	-	08:42	-	3	29.934	-86.173	020	0.8	Unk.	40	Loggerhead turtle resting at the surface. No disturbance detected.
98	7/09/11	CC	1	1	1	-	8:49	-	3	30.042	-86.020	035	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
99	7/09/11	CC	1	1	1	-	09:11	-	3	30.052	-85.921	041	0.4	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
100	7/09/11	DC	1	1	1	-	09:47	-	3	29.842	-85.956	045	0.3	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.
<b>Post-Event Sightings (continued)</b>																
101	7/09/11	CC	1	1	1	-	09:49	-	3	29.895	-85.900	042	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
102	7/09/11	DC	1	1	1	-	10:28	-	3	29.791	-85.829	048	0.3	Unk.	20	Leatherback turtle resting at the surface. No disturbance detected.
103	7/09/11	Unid ST	1	1	1	-	10:31	-	3	29.844	-85.778	010	1.7	Unk.	30	Unidentified sea turtle resting at the surface. No disturbance detected.
104	7/09/11	CC	1	1	1	-	10:52	-	3	29.903	-85.939	029	0.6	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
105	7/09/11	CC	1	1	1	-	10:53	-	3	29.925	-85.917	033	0.5	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
106	7/09/11	CC	1	1	1	-	10:53	-	3	29.939	-85.903	050	0.3	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
107	7/09/11	CC	1	1	1	-	10:55	-	3	29.976	-85.865	030	0.5	Unk.	30	Loggerhead turtle resting at the surface. No disturbance detected.
108	7/09/11	DC	1	1	1	-	10:55	-	3	29.985	-85.855	032	0.6	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.

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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
109	7/09/11	DC	1	1	1	-	11:13	-	3	29.985	-85.945	040	0.4	Unk.	30	Leatherback turtle resting at the surface. No disturbance detected.

\*Key: CC = Loggerhead turtle (*Caretta caretta*); DC = Leatherback turtle (*Dermochelys coriacea*); Unid ST = Unidentified sea turtle; TT = Bottlenose dolphin (*Tursiops truncatus*); Unid = Unidentified cetacean; KR = Kemp's ridley turtle (*Lepidochelys kempii*); MM = Ocean sunfish (*Mola mola*); SF = Atlantic spotted dolphin (*Stenella frontalis*)

†Bottom depths were estimated by mapped figures. Precise estimation is not listed here, but is available upon request.

**Table 4. Summary of Sightings Recorded during Monitoring for AN/AQS-20 Sonar Tests**

Species	Number of sightings	Bottom Depths
Bottlenose dolphin	13	20–40 m (66–131 ft)
Atlantic spotted dolphin	1	40 m (131 ft)
Unidentified dolphin	7	20–40 m (66–131 ft)
Loggerhead turtle	44	20–50 m (66–164 ft)
Leatherback turtle	27	20–40 m (66–131 ft)
Kemp's ridley turtles	3	20–40 m (66–131 ft)
Unidentified sea turtles	13	30v50 m (98–164 ft)
Ocean sunfish	1	40 m (131 ft)

### Behavior

No visible evidence of distress or unusual behavior was observed during surveys before the test event, during the test event, or after the test event for the AN/AQS-20 sonar system (Table 3). The team was able to attempt two focal-follows on 7 July 2011 during the test event. The first focal-follow occurred for a period of 11 min spent with a group of approximately 100 bottlenose dolphins. The second focal-follow occurred for a period of 15 min spent with a group of 21 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 and sea turtles.

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**APPENDIX A****Focal-Follow Data**

**Table A-1.** Focal-follow behavioral data from the 5–9 July 2011 monitoring efforts before, during, and after the NSWC PCD AN/AQS-20 sonar RDT&E test event. Two focal-follow events were conducted on 7 July 2011; both were from groups of bottlenose dolphins within the survey area.

Record Number	Time	Date	Latitude	Longitude	Recorded Behavior
<b>Sighting Number 58</b>					
Species: <i>Tursiops truncatus</i> . Number: ≈100.					
1	11:44	7/07/11	29.950	-86.189	Slow travel heading 340. Min Dispersal = 1, Max Dispersal = 10. Straggling groups slowly cruising with occasional leaps.
2	11:46	7/07/11	29.952	-86.179	Slow travel heading 300. Min Dispersal = 1, Max Dispersal = 10.
3	11:47	7/07/11	29.943	-86.186	Slow travel heading 300. Min Dispersal = 1, Max Dispersal = 10. Spending a lot of time under water, small more splashing in front of groups, several small subgroups, more narrow longer group than a wider group.
4	11:48	7/07/11	29.946	-86.191	Slow travel heading 300. Min Dispersal = 1, Max Dispersal = 10. A little subgroup is 1/4 mile away from others. Still spending majority of time under water. Additional subgroup ahead of 2–3 individuals.
5	11:49	7/07/11	29.946	-86.186	Slow travel heading 300. Min Dispersal = 1, Max Dispersal = 10. 4–5 calves in bigger group. Group size may be up to 100 now. Little groups beginning to break off a little bit more. Body lengths in some groups of 1, some other groups 10 body lengths.
6	11:51	7/07/11	29.958	-86.186	Slow travel heading 330. Min Dispersal = 1, Max Dispersal = ¼ mile. Still slow travel. Group is longer than wider.
7	11:52	7/07/11	29.959	-86.190	Slow travel heading 330. Min Dispersal = 1, Max Dispersal = ¼ mile.
8	11:53	7/07/11	29.958	-86.194	Slow travel heading 330. Min Dispersal = 1, Max Dispersal = ¼ mile.
9	11:54	7/07/11	29.951	-86.192	Slow travel heading 330. Min Dispersal = 1, Max Dispersal = ¼ mile. Lead individual is moving fast and others are still slow travel.
10	11:55	7/07/11	29.958	-86.183	Slow travel heading 330. Min Dispersal = 1, Max Dispersal = ¼ mile. Lead dolphins are way ahead of the group. Rest of group still in same longer formation.

Record Number	Time	Date	Latitude	Longitude	Recorded Behavior
<b>Sighting Number 77</b>					
Species: <i>Tursiops truncatus</i> . Number: 21–25.					
1	13:13	7/07/11	29.897	-85.883	Slow travel heading 220, then started speeding up. Min Dispersal = 1, Max Dispersal = 4.
2	13:14	7/07/11	29.899	-85.878	Fast travel heading 220. Min Dispersal = 1, Max Dispersal = 4. Surface active with splashing as they break the surface.
3	13:15	7/07/11	29.898	-85.876	Fast travel heading 220. Min Dispersal = 1, Max Dispersal = 4. Same dispersal. Lots of splashing, surfacing frequently.
4	13:16	7/07/11	29.902	-85.878	Fast travel heading 220. Min Dispersal = 1, Max Dispersal = 4.
5	13:17	7/07/11	29.901	-85.978	Fast travel heading 220. Min Dispersal = 1, Max Dispersal = 4. More of a longer formation than wide. All down at the same time, then all up together more or less.
6	13:18	7/07/11	29.903	-85.887	Surface active travel heading 220. Min Dispersal = 1, Max Dispersal = 4.
7	13:19	7/07/11	29.902	-85.891	Surface active travel heading 220. Min Dispersal = 1, Max Dispersal = 4. Consistent with one dolphin at the lead. Mostly down at the same time, and then surfacing from the back and following to the front.
8	13:20	7/07/11	29.898	-85.896	Surface active travel heading 260. Min Dispersal = 1, Max Dispersal = 4.
9	13:21	7/07/11	29.897	-85.896	Surface active travel heading 270. Min Dispersal = 1, Max Dispersal = 4.
10	13:22	7/07/11	29.893	-85.889	Surface active travel heading 270. Min Dispersal = 1, Max Dispersal = 4. Slight direction changes.
11	13:23	7/07/11	29.900	-85.887	All underwater.
12	13:24	7/07/11	29.903	-85.901	Surface active travel heading 270. Min Dispersal = 1, Max Dispersal = 4.
13	13:25	7/07/11	29.891	-85.888	All underwater.
14	13:25	7/07/11	29.901	-85.903	Surface active travel heading 270. Min Dispersal = 1, Max Dispersal = 4. Group is more compacted into a ball instead of the above longer formation.
15	13:27	7/07/11	29.903	-85.903	Surface active travel heading 270. Min Dispersal = 1, Max Dispersal = 4.
16	13:28	7/07/11	29.888	-85.897	Underwater. More side-to-side formation then front to back.