

Aerial Surveys for Protected Marine Species in the Jacksonville OPAREA: 2016 Annual Progress Report

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Prepared by

Erin Cummings, Ryan McAlarney, William A.
McLellan, and D. Ann Pabst

Department of Biology and Marine Biology
University of North Carolina Wilmington
601 S. College Road
Wilmington, NC 28403

Submitted by:



Virginia Beach, VA



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Risso's dolphins (*Grampus griseus*). Photo collected by the University of North Carolina Wilmington under NOAA General Authorization for Scientific Research #16185 to Duke University.

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Acronyms and Abbreviations

AFTT	Atlantic Fleet Training and Testing
BSS	Beaufort sea state
EPIRB	emergency positioning-indicating radio beacon
EWS	Early Warning SystemJAX Jacksonville
km	kilometer(s)
m	meter(s)
SD	standard deviation
U.S.	United States
USWTR	Undersea Warfare Training Range

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1. Introduction

This report forms part of a multi-institutional monitoring project intended to provide information on the species composition, population identity, density, and baseline behavior of marine mammals and sea turtles present in United States (U.S.) Navy range complexes along the U.S. Atlantic Coast. This program began in 2007, with baseline aerial and vessel surveys as well as a passive acoustic monitoring component in Onslow Bay, North Carolina, and has since expanded to include study areas off Jacksonville, Florida, and Cape Hatteras, North Carolina. In Onslow Bay, six years of monitoring yielded a comprehensive picture of the density, distribution, and abundance of marine mammals and sea turtles and provided new insights into residency patterns among pelagic delphinid cetaceans in this region ([Read et al. 2014](#)). More than six years of monitoring off Jacksonville at the U.S. Navy's Undersea Warfare Training Range (USWTR) site has provided similar information on the density and distribution of marine mammals and sea turtles in this area. Off Cape Hatteras, almost five years of surveys have provided preliminary information on the complex patterns of distribution and diversity of the marine mammals and sea turtles in this highly productive area. The current report builds on this past body of work and describes monitoring activities that occurred at the Jacksonville survey area in 2016.

2. Summary of Jacksonville Aerial Surveys

This document is an annual progress report to the U.S. Navy on aerial surveys conducted in the offshore waters of Jacksonville, Florida, from January through December 2016. The objective was to conduct two days of effort each month from January through May. From May through October, effort shifted to support U.S. Navy's Full Ship Shock Trials. This report only reflects surveys during the five-month period from January through May 2016. A total of 56 tracklines covering 4,111.90 kilometers (km), including extended offshore lines (see Section 3 Methods) was surveyed across four of the five months.

A total of 22 sightings of 287 cetaceans was recorded while on effort in the study area. Four species of cetaceans were observed while on effort, including bottlenose dolphin (*Tursiops truncatus*; 15 sightings of 129 individuals), Atlantic spotted dolphin (*Stenella frontalis*; 4 sightings of 99 individuals), rough-toothed dolphin (*Steno bredanensis*; 1 sighting of 50 individuals), and Risso's dolphin (*Grampus griseus*; 1 sighting of 8 individuals). During one sighting of a single dolphin, species identity could not be established with certainty, and this sighting is reported as "unidentified delphinid." Four off-effort sightings were recorded. These included one sighting of short-finned pilot whales (*Globicephala macrorhynchus*; 25 individuals), and three sightings of bottlenose dolphins (for a total of 38 individuals). These off-effort sightings are included in species sighting maps and tables, but are excluded from all other calculations.

A total of 98 sightings of 116 sea turtles was recorded during the study period. Of these individual sea turtle sightings, 108 of the 116 turtles were identified as loggerhead sea turtles (*Caretta caretta*), six as leatherback sea turtles (*Dermochelys coriacea*) and two as "unidentified sea turtles." Sea turtles were detected during each day of survey effort.

As has been demonstrated in earlier reports and in other aerial survey studies, sightings decrease dramatically as the Beaufort sea state (BSS) increases (e.g., Gómez de Segura et al. 2006, DeMaster et al. 2001, McAlarney et al. 2014). Effort-corrected cetacean and sea turtle sightings were higher in BSS of 1 and 2 than in $BSS \geq 3$ during this survey period.

In addition to cetaceans and sea turtles, other pelagic marine vertebrates including ocean sunfish (*Mola mola*) and multiple species of sharks and rays were observed. Military, commercial, and recreational vessel traffic also was recorded inside the Jacksonville survey area.

All historical data from this project is made publically available through the [Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations](#) (OBIS-SEAMAP).

3. Methods

3.1 Survey Design and Logistics

The University of North Carolina Wilmington provided experienced aerial observers and contracted Orion Aviation (Siler City, North Carolina) to provide appropriate planes and certified pilots. Surveys were conducted using National Oceanic and Atmospheric Administration–Southeast Regional Minimum Aircraft and Crew Provisions Guidelines (NOAA SER 2013), which require that aircraft are Code of Federal Regulations § 135 certified and that pilots have demonstrated experience working below 305 meters (m) in support of biological observational studies. Surveys were flown in a Cessna 337 Skymaster at 305 m altitude and 185 km/hour speed, with a pilot, co-pilot, and two observers. Each observer wore a Nomex® fire-retardant suit, a Switlik® inflatable life jacket, a personal emergency position-indicating radio beacon (EPIRB), and additional safety equipment. An inflatable life raft, plane EPIRB, and satellite phone were also onboard at all times. A detailed description of survey methods is included in [McAlarney et al. \(2017\)](#).

The Jacksonville survey area consists of ten 86-km-long tracklines spaced 7.4 km apart covering 5,727 square kilometers. The existing survey tracklines were extended by 43.6 km to the east in 2016 in order to establish a better understanding the habitat usage of pelagic cetaceans found beyond the eastern portion of the Jacksonville survey area. The extended survey area covers an additional 2,903 square kilometers (**Table 1, Figure 1**) and was surveyed in March and May. These tracklines are labeled “1–10 Off” in the sighting tables and are also added to the species sightings maps with a slight gap displayed between the two areas.

Table 1. Coordinates for trackline end points for the Jacksonville survey area.

Transect Line	Western Waypoint		Eastern Waypoint		Offshore Eastern Waypoint	
	Latitude (°N)	Longitude (°W)	Latitude (°N)	Longitude (°W)	Latitude (°N)	Longitude (°W)
1	29.965011	-80.700000	29.965011	-79.801416	29.965011	-79.348467
2	30.031263	-80.700000	30.031263	-79.801416	30.031264	-79.348467
3	30.099694	-80.700000	30.099694	-79.801416	30.099694	-79.348467
4	30.165763	-80.700000	30.165763	-79.801416	30.165764	-79.348467
5	30.232227	-80.700000	30.232227	-79.801416	30.232228	-79.348467
6	30.299477	-80.700000	30.299477	-79.801416	30.299477	-79.348467
7	30.365152	-80.700000	30.365152	-79.801416	30.365153	-79.348467
8	30.432797	-80.700000	30.432797	-79.801416	30.432797	-79.348467
9	30.198866	-80.700000	30.198866	-79.801416	30.498867	-79.348467
10	30.566233	-80.700000	30.566233	-79.801416	30.566233	-79.348467

This survey area is located offshore of the primary calving grounds for the endangered North Atlantic right whale (*Eubalaena glacialis*), which is located off the coast of the southeastern United States (reviewed in Waring et al. 2015, but see Foley et al. 2011). Aerial Early Warning System (EWS) surveys have been conducted in northern Florida and southern Georgia for the past 19 years to warn mariners in real time about the presence of right whales in the region. These surveys are conducted on a daily basis, weather permitting, from December through March. Aerial survey effort in the Jacksonville survey area provided additional coverage, both of the surrounding geographic region and during the months preceding and following the EWS surveys. In past years, this effort has resulted in a number of additional right whale sightings. No right whales were sighted in 2016 from these.

Safety and communication protocols for transiting through the EWS areas were established in January 2009 when our offshore survey effort began for the proposed Undersea Warfare Training Range off Jacksonville, Florida (JAX USWTR). The JAX USWTR offshore survey team reviewed protocols with researchers from the Florida Fish and Wildlife Service prior to the start of EWS surveys. The protocols outlined coordination between survey team leaders on the morning of a survey, plane-to-plane communication at the start of an aerial survey, and the maintenance of a 1,000-m altitude for the offshore survey plane while transiting through the EWS area between December and March. The protocols also established the 9.3-km “buffer zone” between the western margin of the JAX USWTR offshore survey area and the eastern margin of the EWS surveys (**Figure 1**). We maintained these safety and communication protocols throughout the reporting period.

All aerial surveys were based out of the local Fixed-base Operator in Fernandina Beach, Florida. Prior to an aerial survey, pilots with Orion Aviation would contact SeaLord at Fleet Area Control and Surveillance Facility, Jacksonville, to get event codes for passage out of and into U.S. territorial waters.

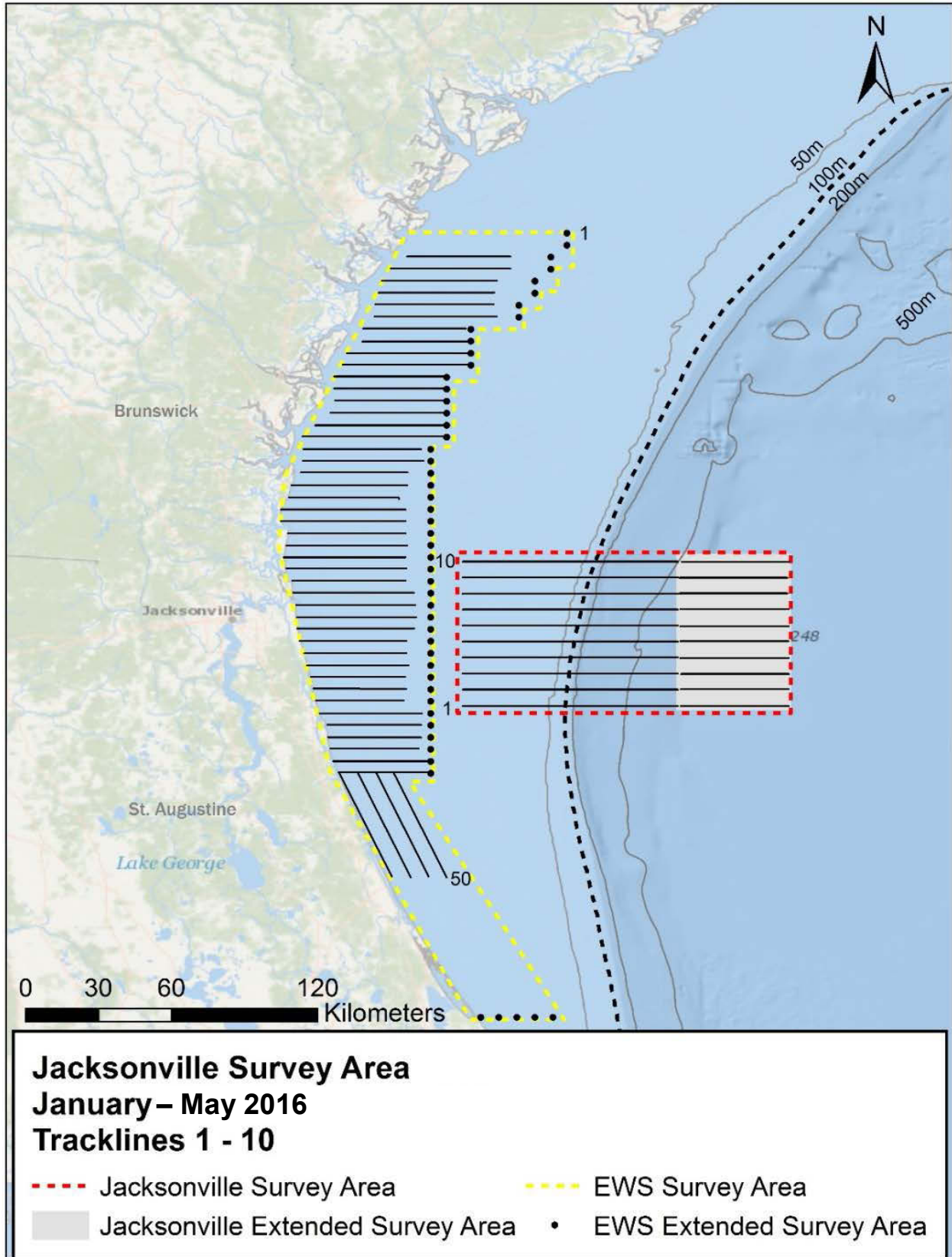


Figure 1. Jacksonville survey area and aerial tracklines for 2016.

4. Results

A total of 56 tracklines comprising 4,112 km was surveyed from January through May 2016 (**Table 2**).

Table 2. Tracklines, km flown, and Hobbs hours during aerial surveys of the Jacksonville survey area from January through May 2016. Trackline numbers are listed in the order in which they were flown.

Date	Tracklines Flown AM	Tracklines Flown PM	Total km Flown	Hobbs Hours
20-Jan-2016	N/A	10 to 5	512.65	3.8
21-Jan-2016	5 to 8	N/A	324.55	3.9
29-Feb-2016	5 to 10	1 to 4	858.80	6.7
1-Mar-2016	1 Off to 10 Off	7 to 10	776.40	6.8
2-Mar-2016	1 to 6	N/A	518.60	4.0
24-May-2016	N/A	1 to 4	338.90	3.2
25-May-2016	5 to 10	1 Off to 6 Off	782.00	7.1
7 days	56 tracklines		4,111.90 km	35.5 hr

An average BSS value was calculated each survey month to compare conditions across time, weighted by the distance flown at each BSS. Survey effort was terminated when BSS values persisted above 5. Survey conditions ranged from BSS 0 to 6, with the majority of the surveys flown in BSS 3 (39 percent) (**Figures 2a-c**). Cetacean sighting rates dropped off dramatically at BSS greater than 2 (**Figures 3a-c**).

The mean sighting distance for all cetacean sightings was 0.78 km, with 90 percent of sightings occurring within 1.2 km of the trackline (**Figure 4a**). The mean sighting distance varied less than 0.03 km across the BSS values recorded (**Figure 4b**). Average sighting distances were calculated after removing a single outlier (2.33 km from trackline), which was in excess of three standard deviations from the mean, and removing one with no sighting distance information.

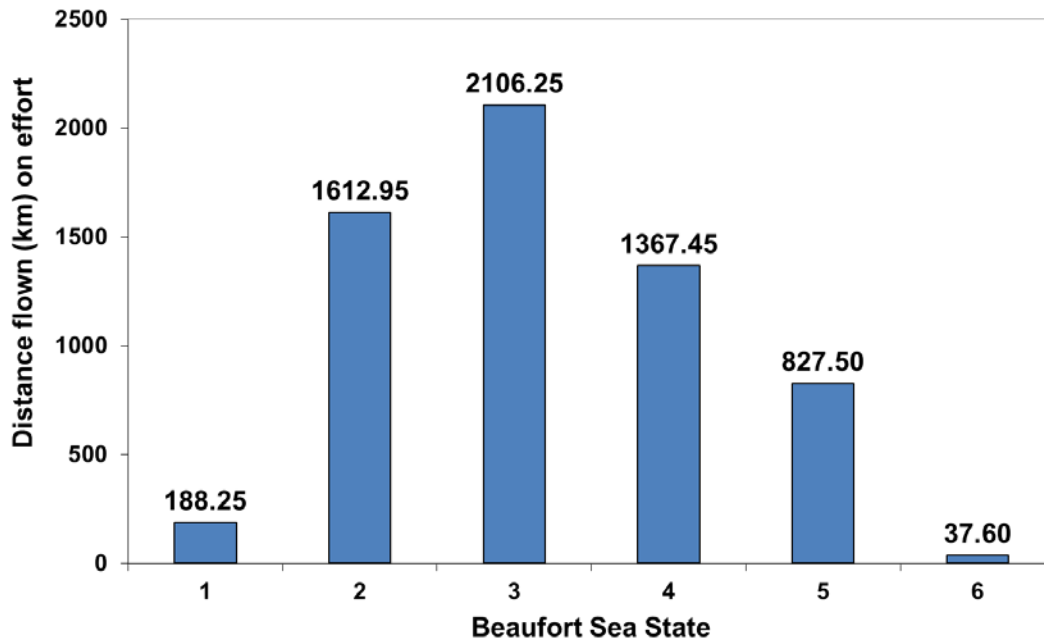


Figure 2a. Total distance surveyed per BSS category from from January through May 2016 during aerial surveys in the Jacksonville survey area.

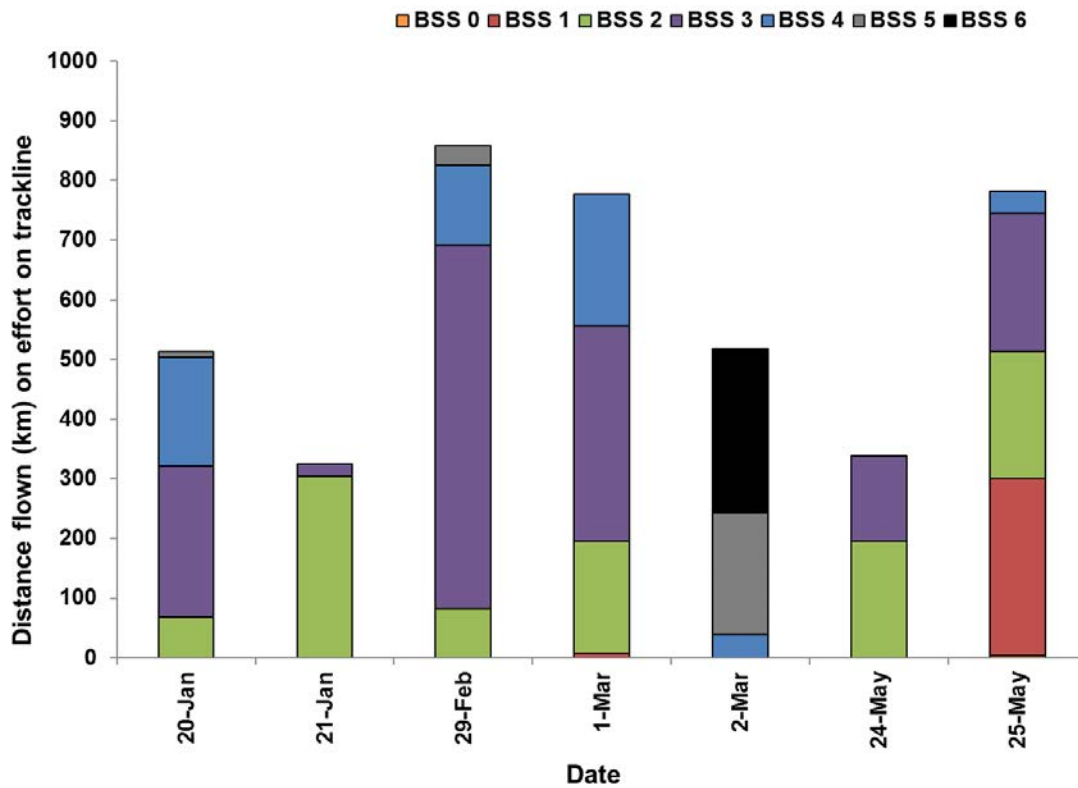


Figure 2b. Effort by BSS category for each day from January through May 2016 during aerial surveys in the Jacksonville survey area.

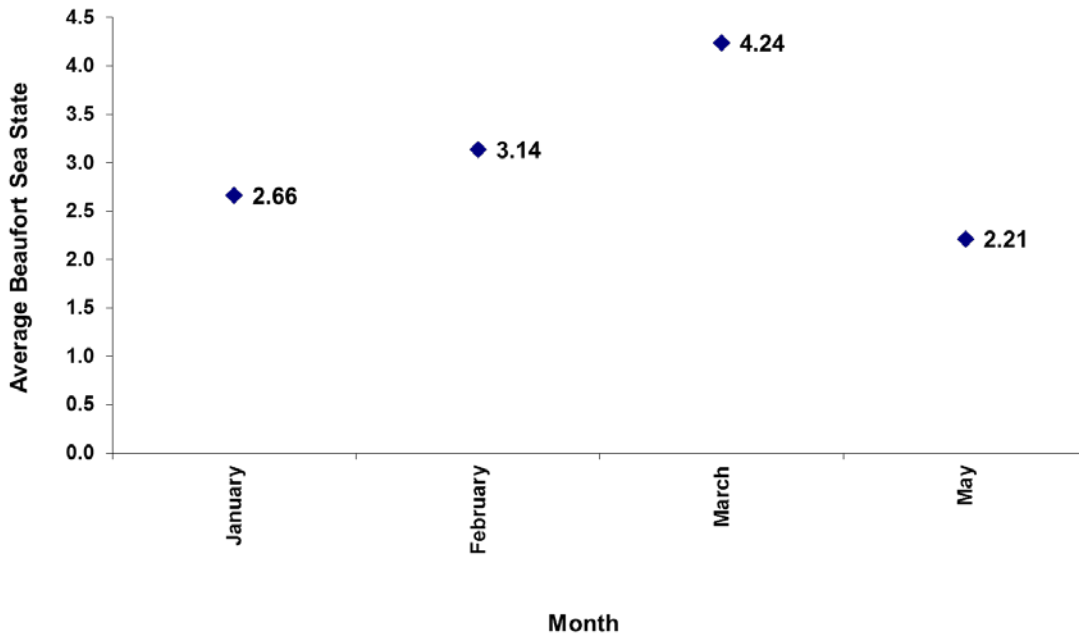


Figure 2c. Distance-weighted average BSS for each month from January through May 2016 during aerial surveys in the Jacksonville survey area.

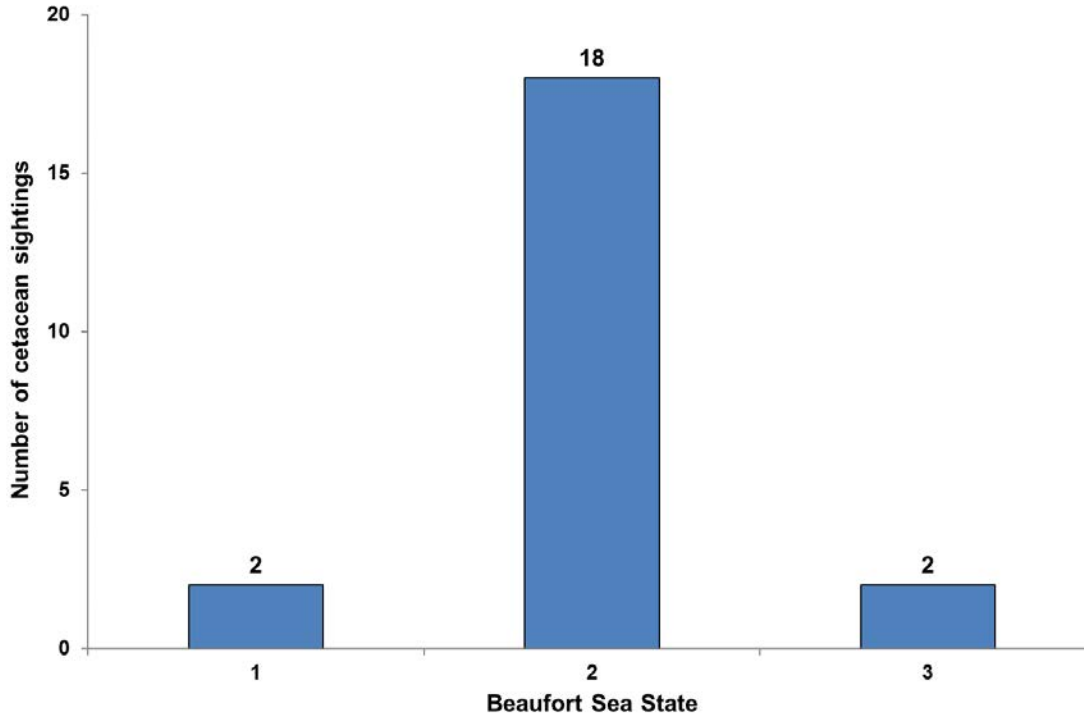


Figure 3a. Number of cetacean sightings per BSS category from January through May 2016 during aerial surveys in the Jacksonville survey area.

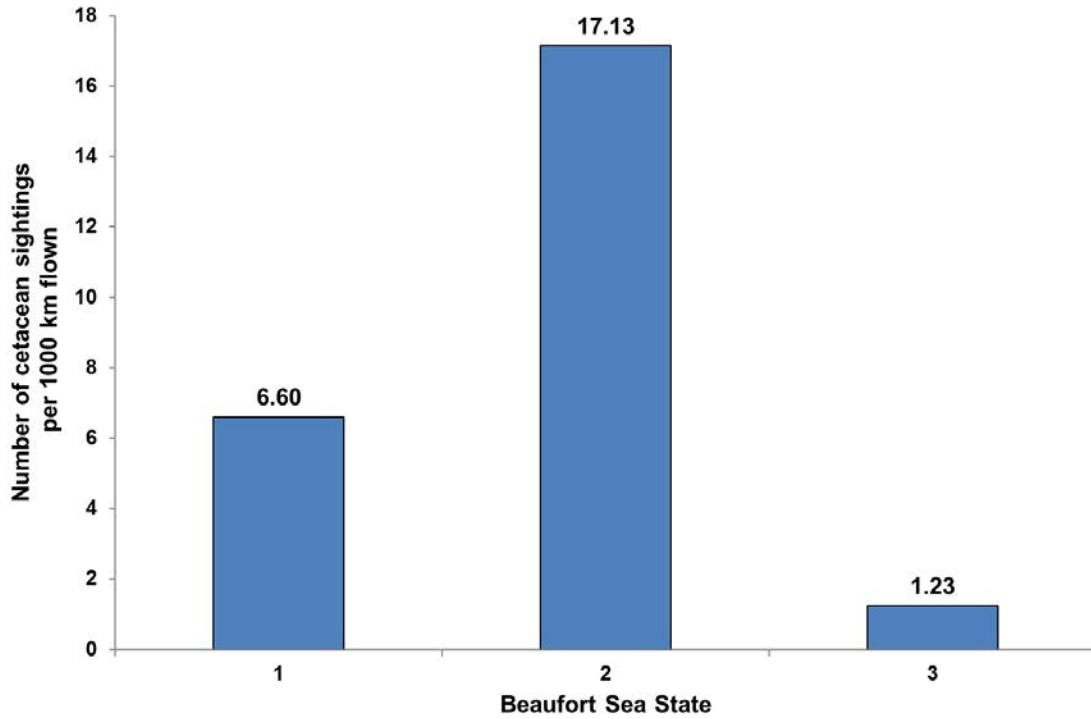


Figure 3b. Cetacean sightings per 1,000 km flown by BSS category from January through May 2016 during aerial surveys in the Jacksonville survey area.

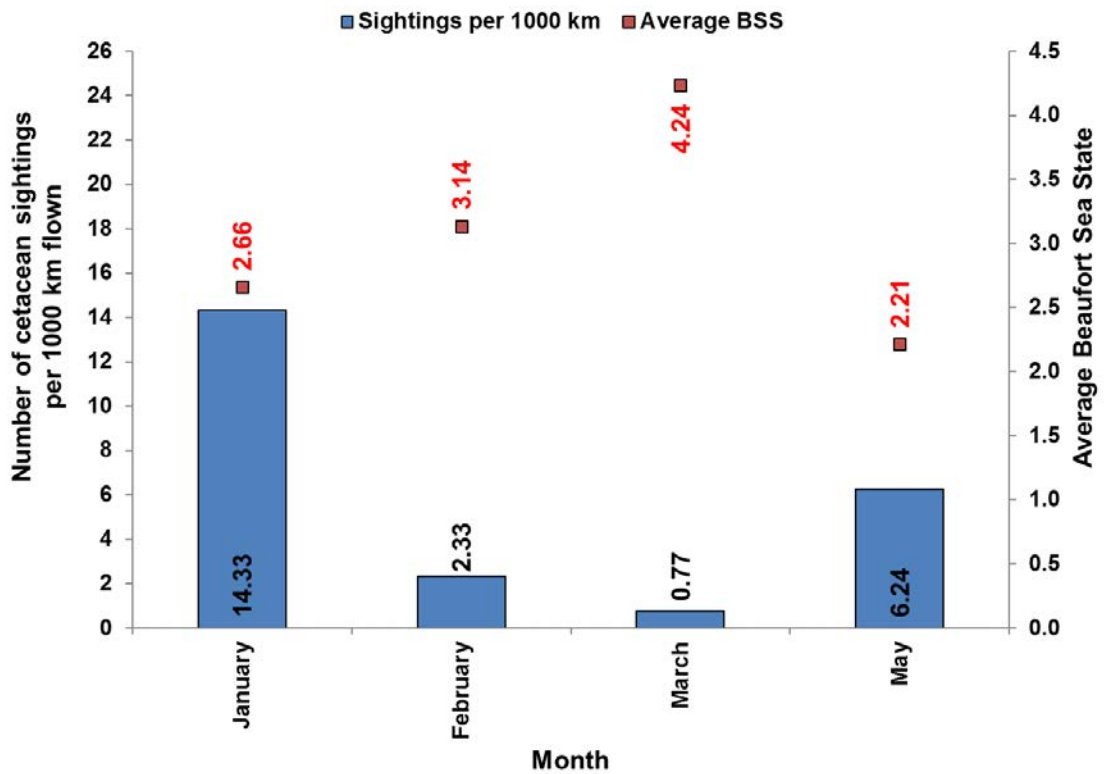


Figure 3c. Cetacean sightings per 1,000 km surveyed and the average BSS per month from January through May 2016 during aerial surveys in the Jacksonville survey area.

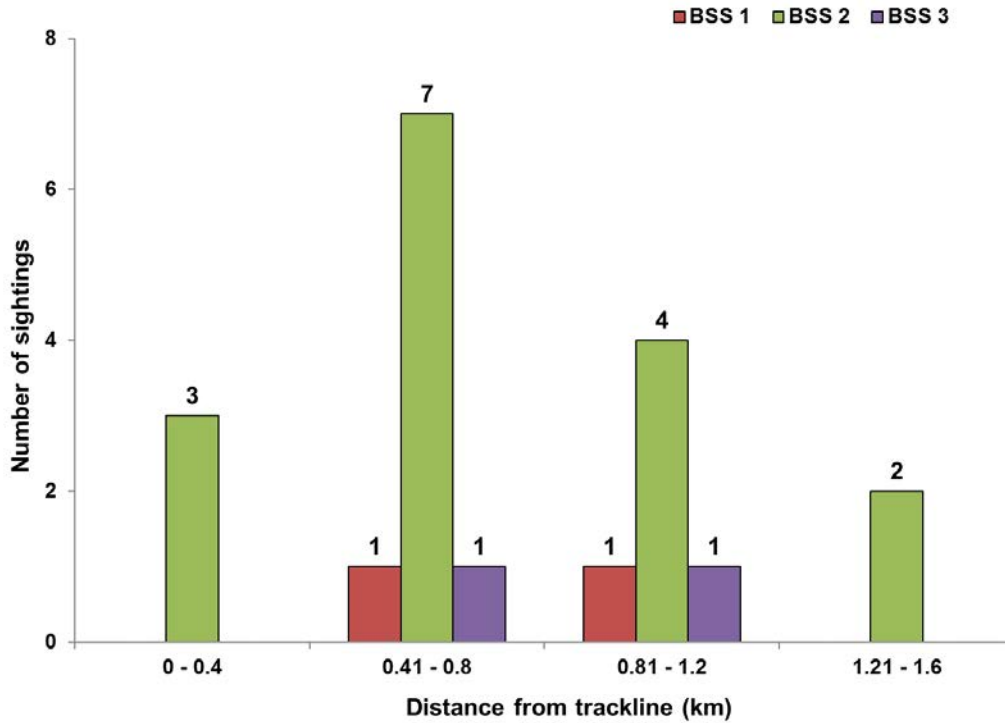


Figure 4a. Sighting distances by BSS category for 20 of 22 on-effort cetacean sightings from January through May 2016 during aerial surveys in the Jacksonville survey area.

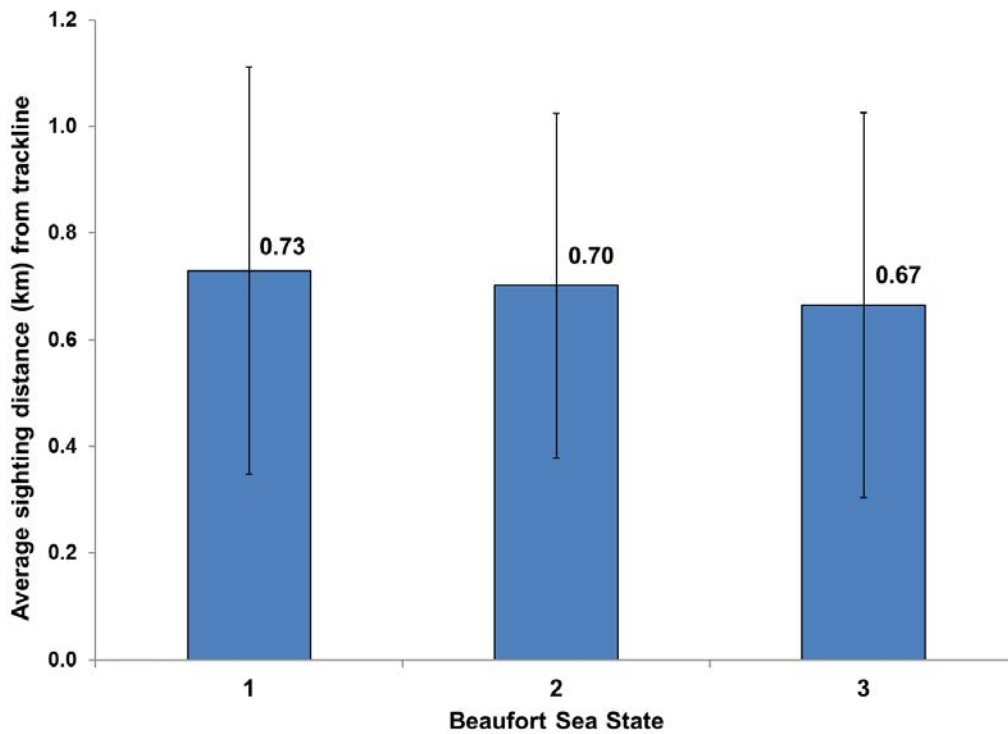


Figure 4b. Average sighting distances by BSS category for 20 of 22 on-effort cetacean sightings from January through May 2016 during aerial surveys in the Jacksonville survey area. Error bars denote standard deviation for each category.

4.1 Marine Mammal Sightings

A total of 22 sightings of 287 individual cetaceans, representing four species, was recorded while on effort during the reporting period (**Table 3, Figure 5**). There were also one off-effort sighting of short-finned pilot whales and three off-effort sightings of bottlenose dolphins. Information on data sheets, event codes, sighting summary sheets, and details of each sighting are given in **Appendices A through D**.

Table 3. Total numbers of on-effort sightings and individuals for each species by month from January through May 2016 for the Jacksonville survey area.

Species	Number of:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
CETACEANS														
<i>Tursiops truncatus</i>	Sightings	8	1	1		5								15
	Individuals	73	3	7		46								129
<i>Stenella frontalis</i>	Sightings	2	1			1								4
	Individuals	28	21			50								99
<i>Steno bredanensis</i>	Sightings	1												1
	Individuals	50												50
<i>Grampus griseus</i>	Sightings					1								1
	Individuals					8								8
Unidentified delphinid	Sightings	1												1
	Individuals	1												1
Total	Total sightings	12	2	1		7								22
	Total individuals	152	24	7		104								287
SEA TURTLES														
<i>Caretta caretta</i>	Sightings	33	15	3		39								90
	Individuals	40	16	3		49								108
<i>Dermochelys coriacea</i>	Sightings	3	2	1										6
	Individuals	3	2	1										6
Unidentified sea turtle	Sightings					2								2
	Individuals					2								2
Total	Total sightings	36	17	4		41								98
	Total individuals	43	18	4		51								116

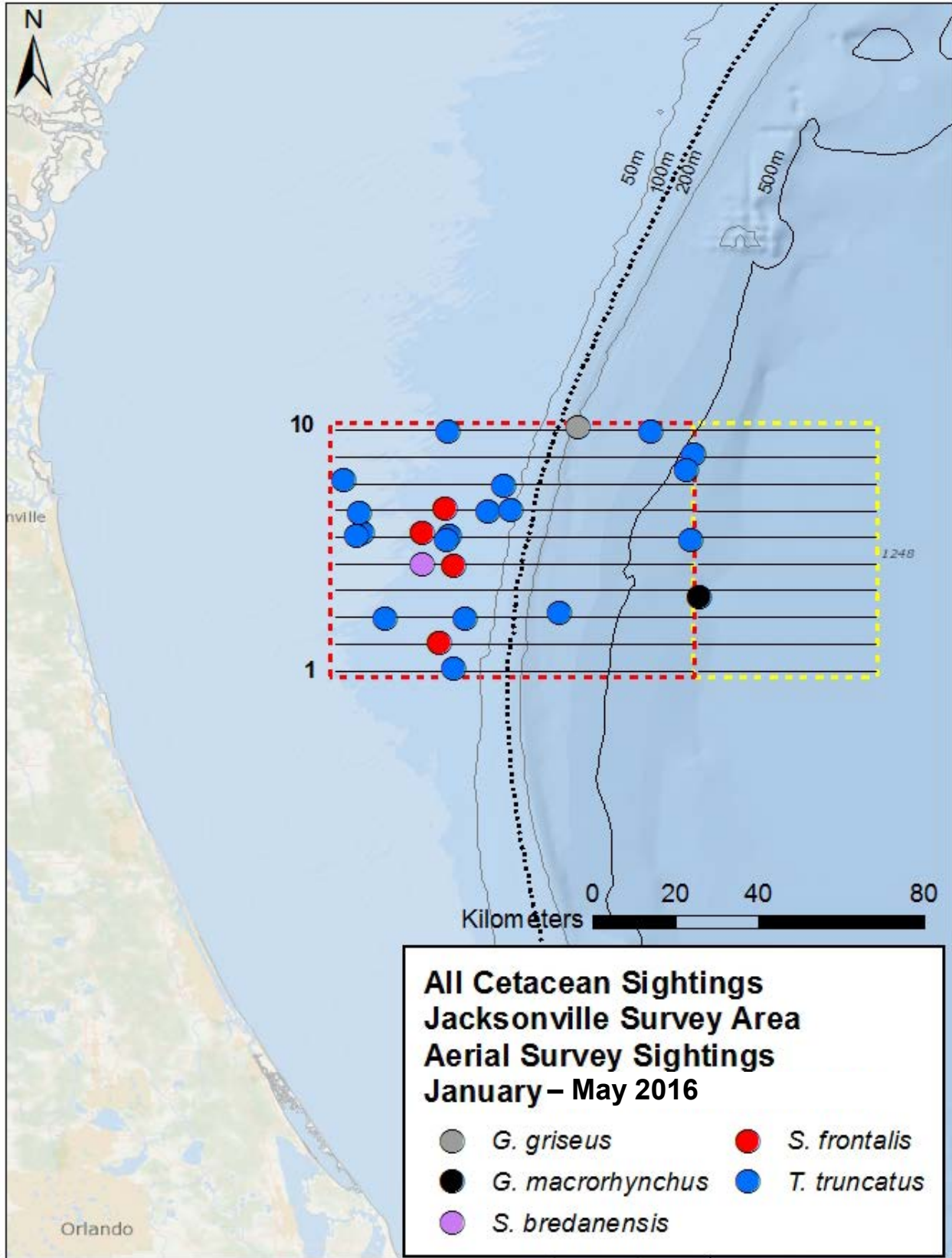


Figure 5. All cetacean sightings during aerial surveys conducted in Jacksonville survey area from January through May 2016

4.2 Dolphins

4.2.1 Bottlenose Dolphin (*Tursiops truncatus*)

Bottlenose dolphins were encountered 15 times on effort for a total of 129 individuals. The bottlenose dolphin was numerically the most frequently encountered species in the Jacksonville survey area (**Table 4**). This species was encountered during all months surveyed. While group size ranged from 1 to 40 individuals (mean=8.6, standard deviation [SD]=9.7), 80 percent of sightings contained 10 or fewer individuals. Three off-effort sightings totaling 38 individuals occurred. Based upon the distance from shore (e.g., greater than 34 km), the bottlenose dolphins observed in this study are most likely of the offshore ecotype (Torres et al. 2003). Bottlenose dolphins were encountered throughout the core study area, and in the extended offshore area, and there was no obvious relationship between group size and bathymetry (**Figure 6**).

Table 4. Bottlenose dolphin (*Tursiops truncatus*) sightings in the Jacksonville survey area from January through May 2016. Asterisk denotes off-effort sightings.

Date	Time	Way Point	Latitude (°N)	Longitude (°W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Off Effort (*)
20-Jan-2016	12:17:21	12	30.563429	-80.418608	10	2	2	60°	8	
20-Jan-2016	14:20:15	37	30.302830	-80.416197	6	3	1	70°	2	
21-Jan-2016	9:51:46	20	30.292392	-80.422111	6	2	2	110°	10	
21-Jan-2016	10:17:49	28	30.309623	-80.635031	6	2	1	120°	40	
21-Jan-2016	10:55:31	43	30.363600	-80.320091	7	2	1	90°	3	
21-Jan-2016	10:59:51	47	30.366561	-80.261960	7	2	1	90°	3	
21-Jan-2016	11:33:50	55	30.426874	-80.282085	8	2	2	100°	6	
21-Jan-2016	11:54:44	60	30.442949	-80.678881	8	2	1	90°	1	
29-Feb-2016	11:17:33	26	30.504532	-79.805698			1	90°	7	*
29-Feb-2016	15:02:51	53	30.096328	-80.577207	3	2	1	90°	3	
1-Mar-2016	11:17:36	29	30.468218	-79.821688		3	1	90°	3	*
1-Mar-2016	14:06:39	40	30.358468	-80.641980	7	3	3	60°	7	
24-May-2016	15:59:31	6	29.971570	-80.406622	1	2	2	90°	6	
24-May-2016	16:57:53	24	30.095991	-80.378351	3	2	3	90°	8	
24-May-2016	17:09:48	29	30.110250	-80.142873	3	2	2	45°	15	
25-May-2016	10:00:32	13	30.301343	-80.646774	6	2	1	90°	2	
25-May-2016	11:40:58	37	30.564468	-79.912369	10	1	2	45°	15	
25-May-2016	16:09:33	69	30.292277	-79.813807		3	2	110°	28	*

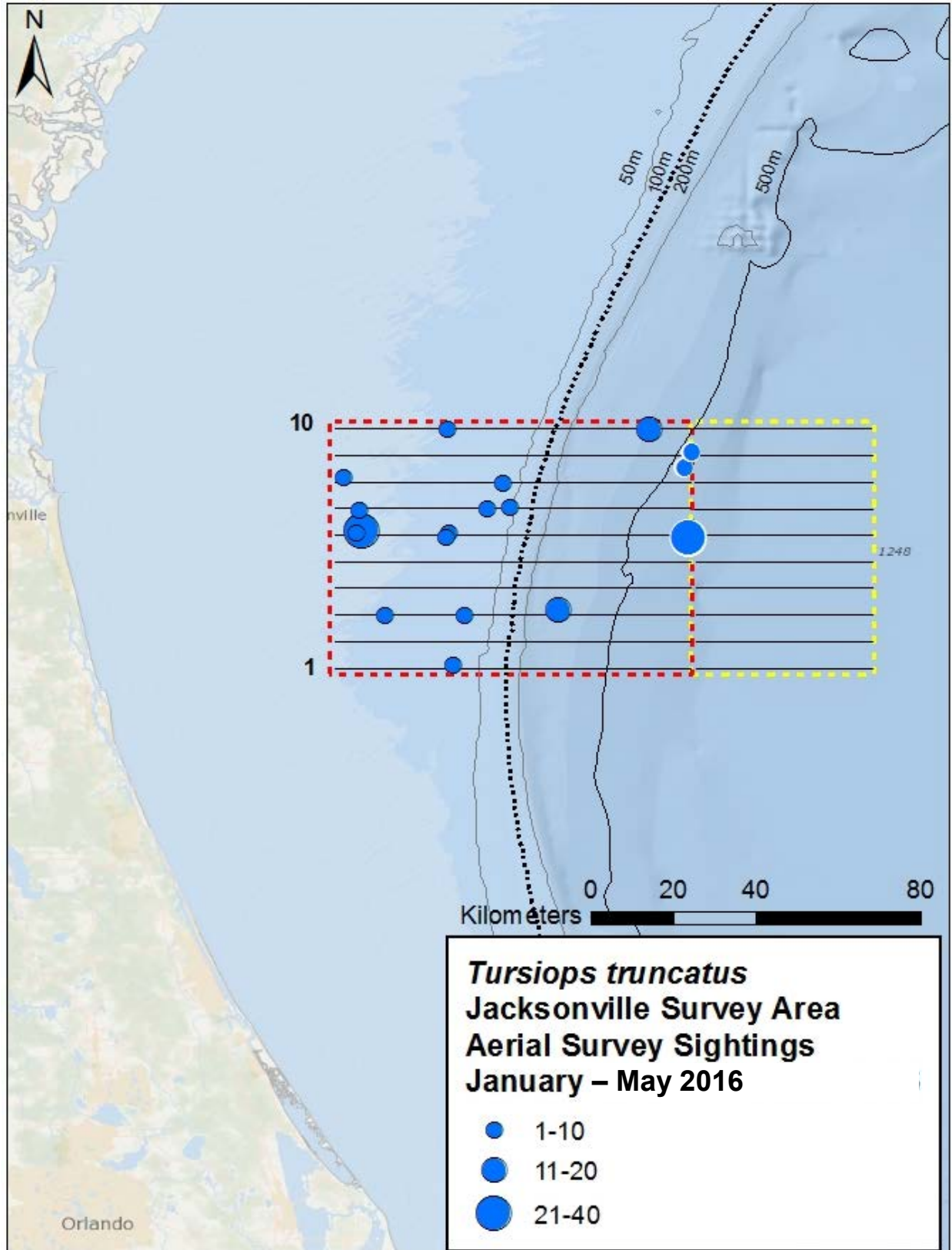


Figure 6. Bottlenose dolphin (*Tursiops truncatus*) sightings in the Jacksonville survey area from January through May 2016 (N=18). Symbol size indicates group size. White outline denotes off-effort sightings.

4.2.2 Atlantic Spotted Dolphin (*Stenella frontalis*)

Atlantic spotted dolphins were sighted four times on effort for a total of 99 individuals. Spotted dolphins were seen in every month surveyed, except March (**Table 5**). Group size ranged from 3 to 50 individuals (mean=13.8, SD=19.4). This species was encountered predominantly in shallow waters over the continental shelf (**Figure 7**). There are two distinct forms, or ecotypes, of the Atlantic spotted dolphin in the western North Atlantic—a heavily spotted form that typically occurs on the continental shelf and is most often encountered at or inshore of the 200-m isobath, and a less spotted, smaller form that occurs farther offshore and around island archipelagoes (Perrin et al. 1987, 1994). It is likely, based upon the features observed, that the Atlantic spotted dolphins seen during the present study belong to the continental shelf form.

Table 5. Atlantic spotted dolphin (*Stenella frontalis*) sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Off Effort (*)
21-Jan-2016	10:01:20	24	30.309310	-80.483154	6	2	2	90°	25	
21-Jan-2016	10:37:58	39	30.370781	-80.426192	7	2	2	110°	3	
29-Feb-2016	14:38:46	44	30.035751	-80.440427	2	2	2	90°	21	
25-May-2016	9:11:52	4	30.228263	-80.406950	5	2	3	100°	50	

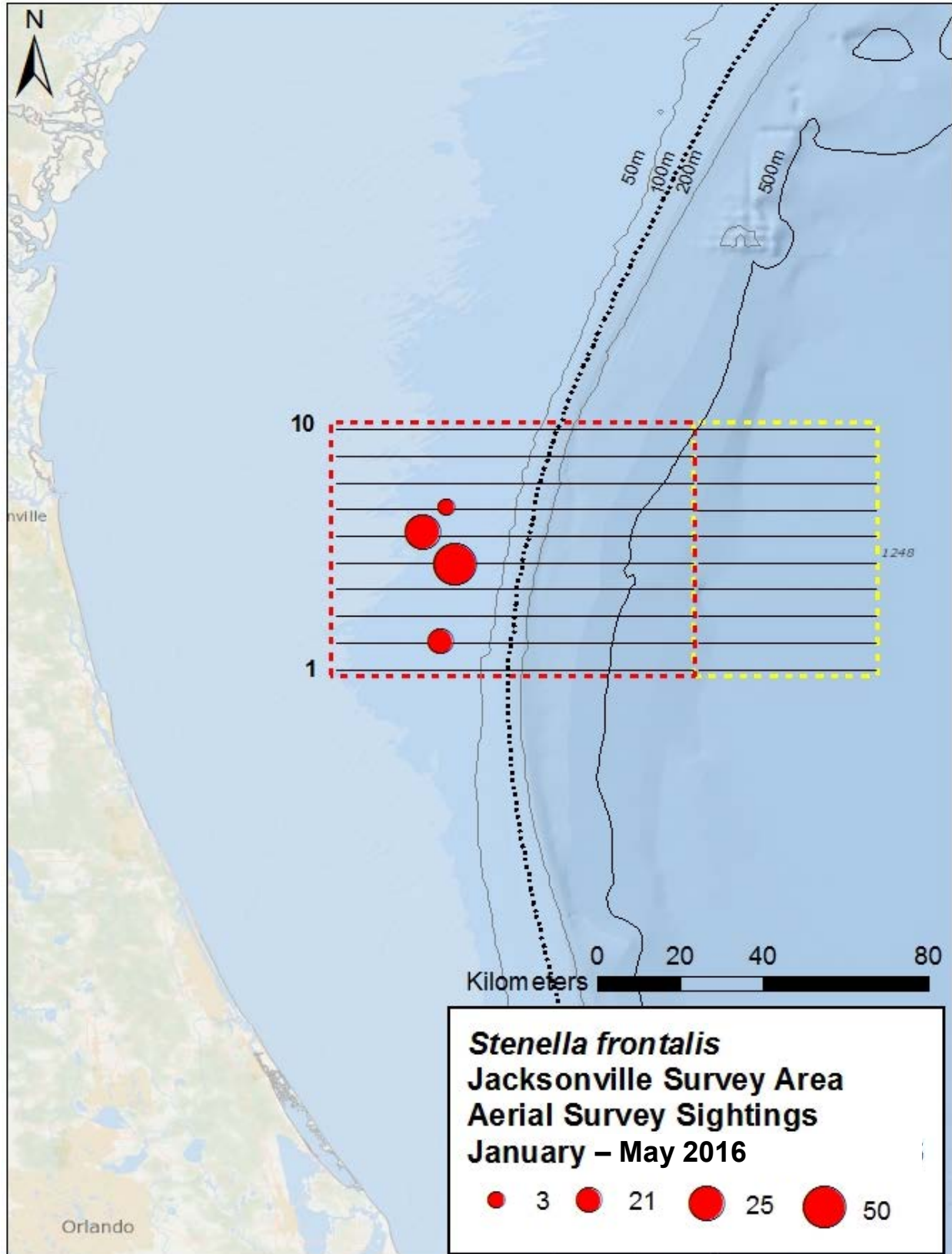


Figure 7. Atlantic spotted dolphin (*Stenella frontalis*) sightings in the Jacksonville survey area from January through May 2016 (N=4). Symbol size indicates group size.

4.2.3 Rough-toothed Dolphin (*Steno bredanensis*)

A single sighting of 50 rough-toothed dolphins occurred in January (**Table 6**). As in past years, this sighting occurred in continental shelf waters inshore of the 100-m isobath (**Figure 8**).

Table 6. Rough-toothed dolphin (*Steno bredanensis*) sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Off Effort (*)
21-Jan-2016	8:59:53	6	30.230647	-80.483711	5	2	2	90°	50	

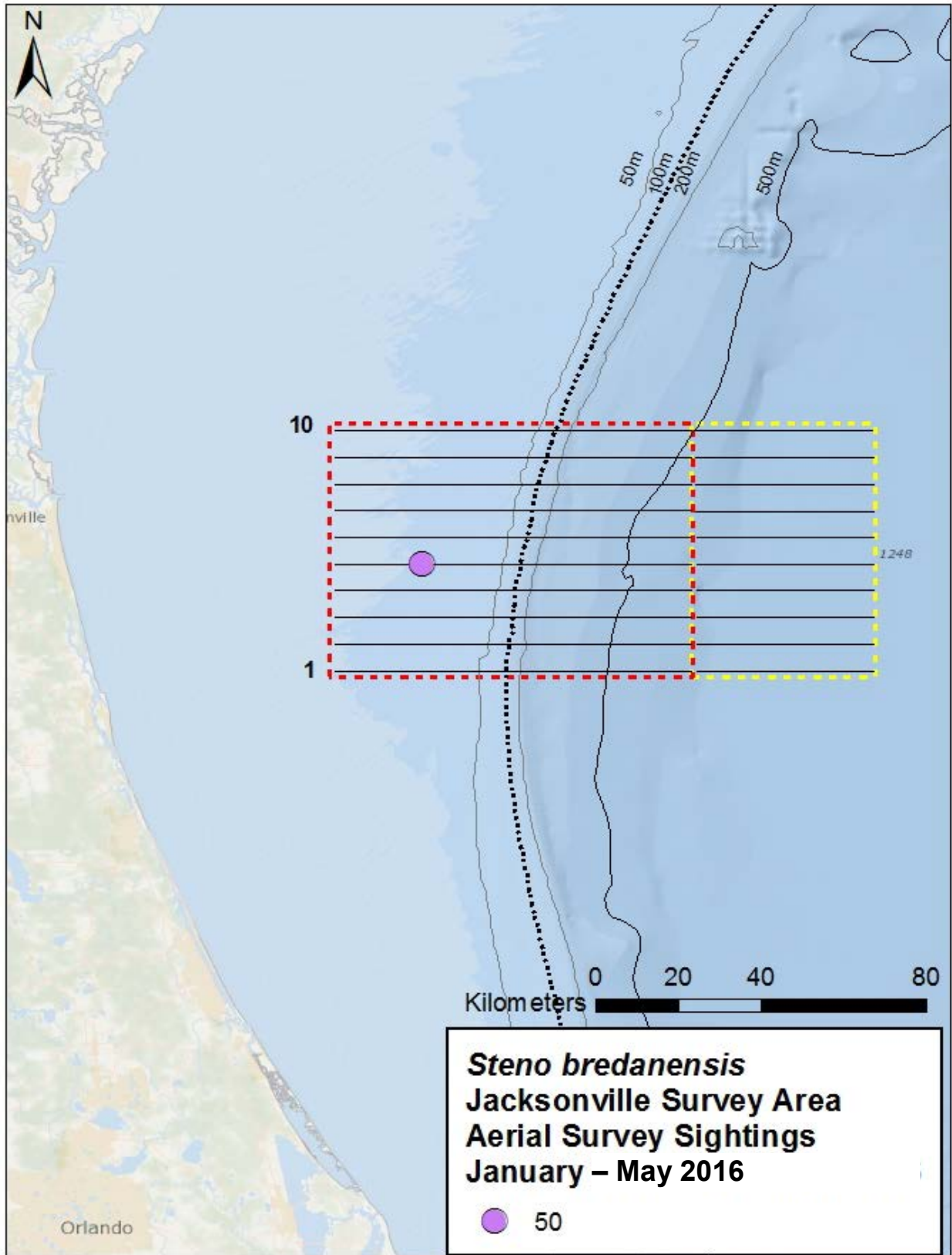


Figure 8. Rough-toothed dolphin (*Steno bredanensis*) sighting in the Jacksonville survey area in January 2016.

4.2.4 Risso’s Dolphin (*Grampus griseus*)

A single sighting of 8 Risso’s dolphins occurred in May 2016 just east of the 200-m isobath (Table 7, Figure 9). Risso’s dolphins have been found along the mid-Atlantic continental shelf break year-round, with some movement north during spring, summer, and fall, and into the mid-Atlantic Bight during winter (Waring et al. 2016).

Table 7. Risso’s dolphin (*Grampus griseus*) sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Off Effort (*)
25-May-2016	11:49:52	41	30.572562	-80.095279	10	1	3	90°	8	

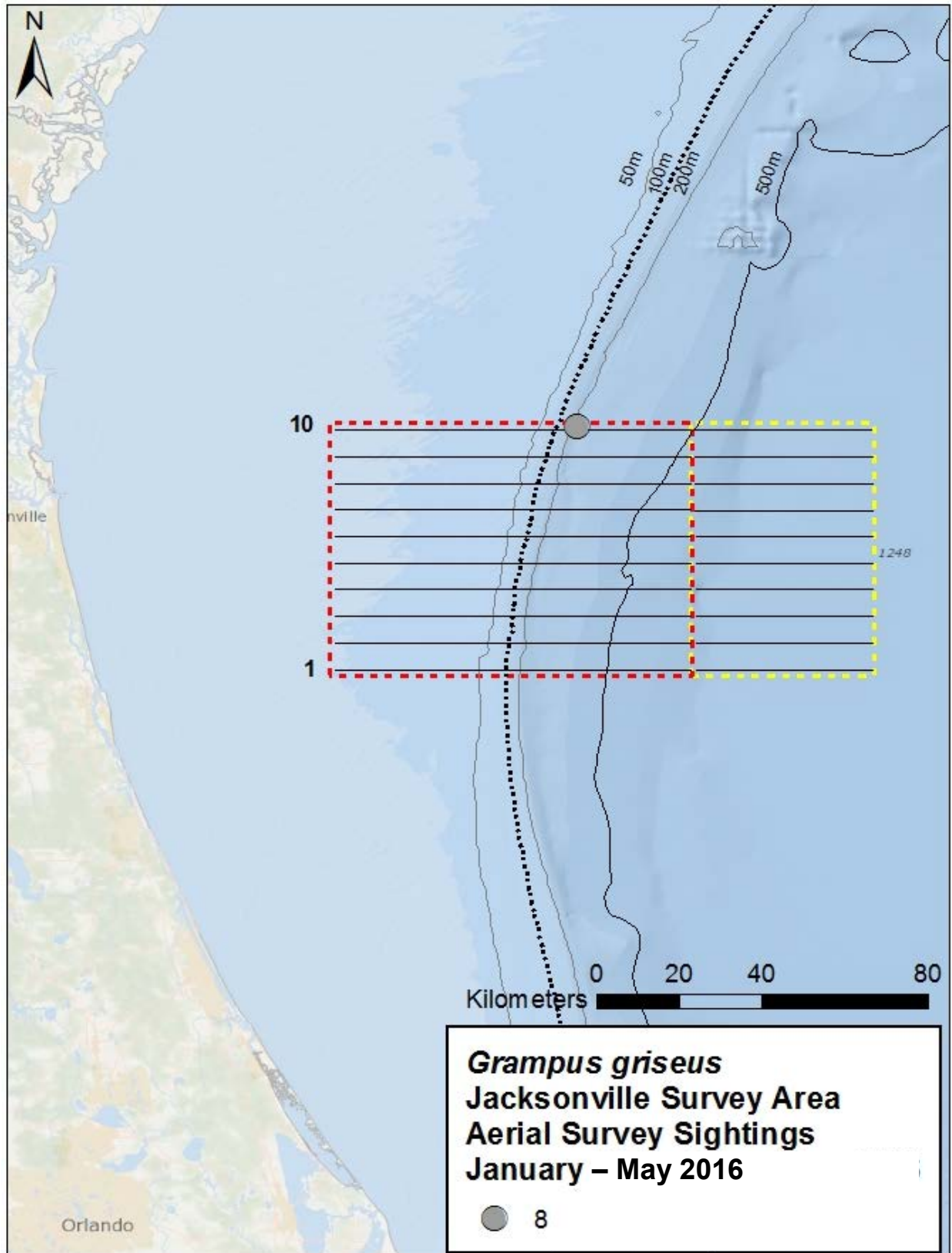


Figure 9. Risso's dolphin (*Grampus griseus*) sighting in the Jacksonville survey area in May 2016.

4.3 Whales

4.3.1 Short-finned Pilot Whale (*Globicephala macrorhynchus*)

A single off-effort sighting of 25 short-finned pilot whales occurred in May in the deep waters of the extended offshore tracklines added this year (**Table 8**). This single sighting continues the recent trend of short-finned pilot whale sightings being observed farther east than in past years (**Figure 10**).

Table 8. Short-finned pilot whale (*Globicephala macrorhynchus*) sightings in the Jacksonville survey area from January through May 2016. Asterisk denotes off-effort sighting.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Off Effort (*)
24-May-2016	17:27:45	34	30.148040	-79.790518	3	3	1	120°	25	*

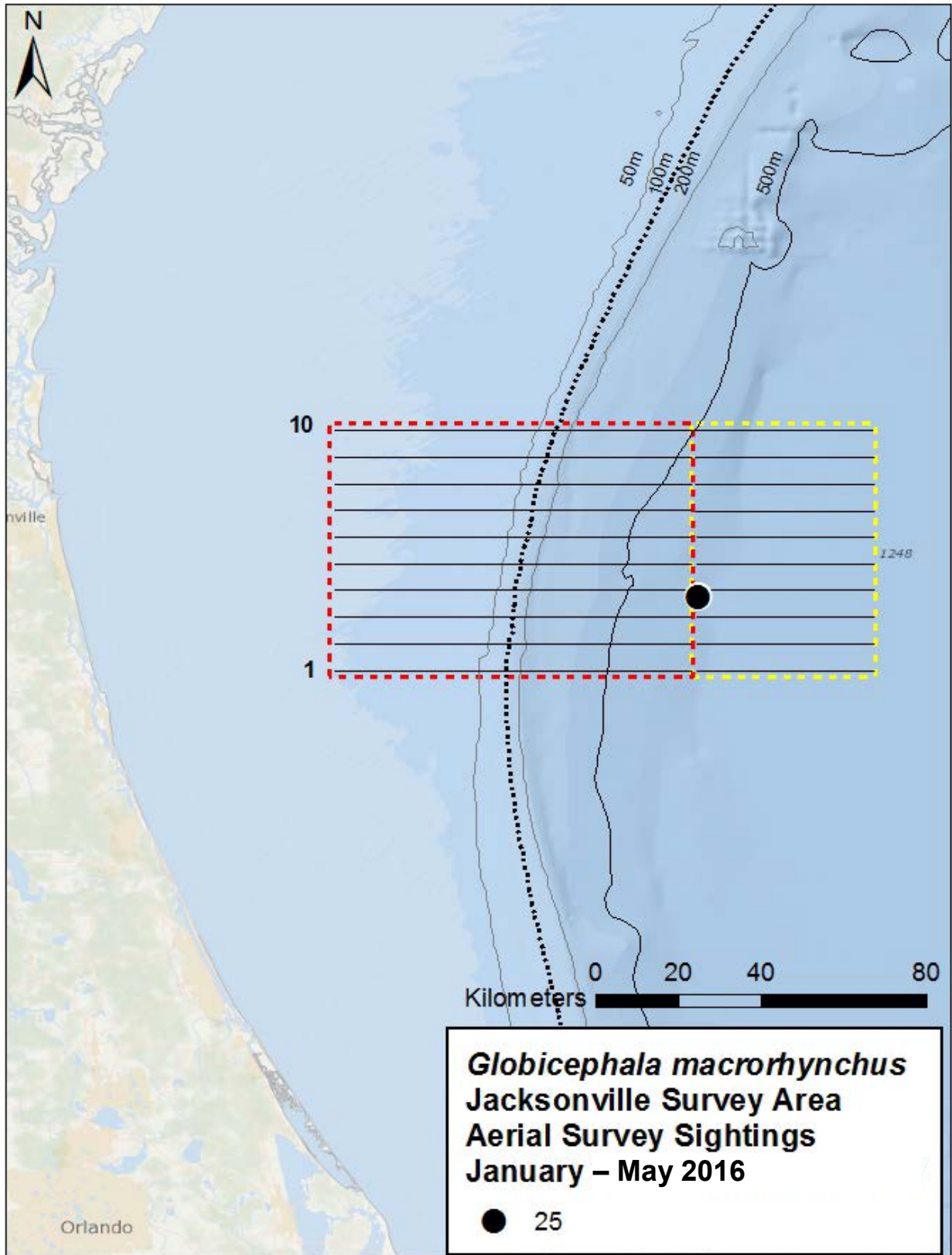


Figure 10. Short-finned pilot whale (*Globicephala macrorhynchus*) sighting in the Jacksonville survey area in May 2016. White outline denotes off-effort sighting.

4.4 Sea Turtles

A total of 98 sightings of 116 sea turtles was recorded during the reporting period (**Tables 9 and 10**). Sighting rates of sea turtles were negatively correlated with BSS (**Figures 11a and 11b**). Sea turtles were observed every day of survey effort, with the highest sighting rates occurring in January (**Figure 11c**). Observation rates ranged from a low of 3.09/1,000 km flown in March to a high of 51.36/1,000 km in January (**Figure 11c**). Loggerhead sea turtles (*Caretta caretta*) constituted the majority of sea turtles sighted (93.1 percent), followed by leatherback sea turtles (5.2 percent). Turtles labeled as unidentified (1.7 percent of sightings) were typically either of small size, submerged, or too far away for the observers to make an accurate identification to species.

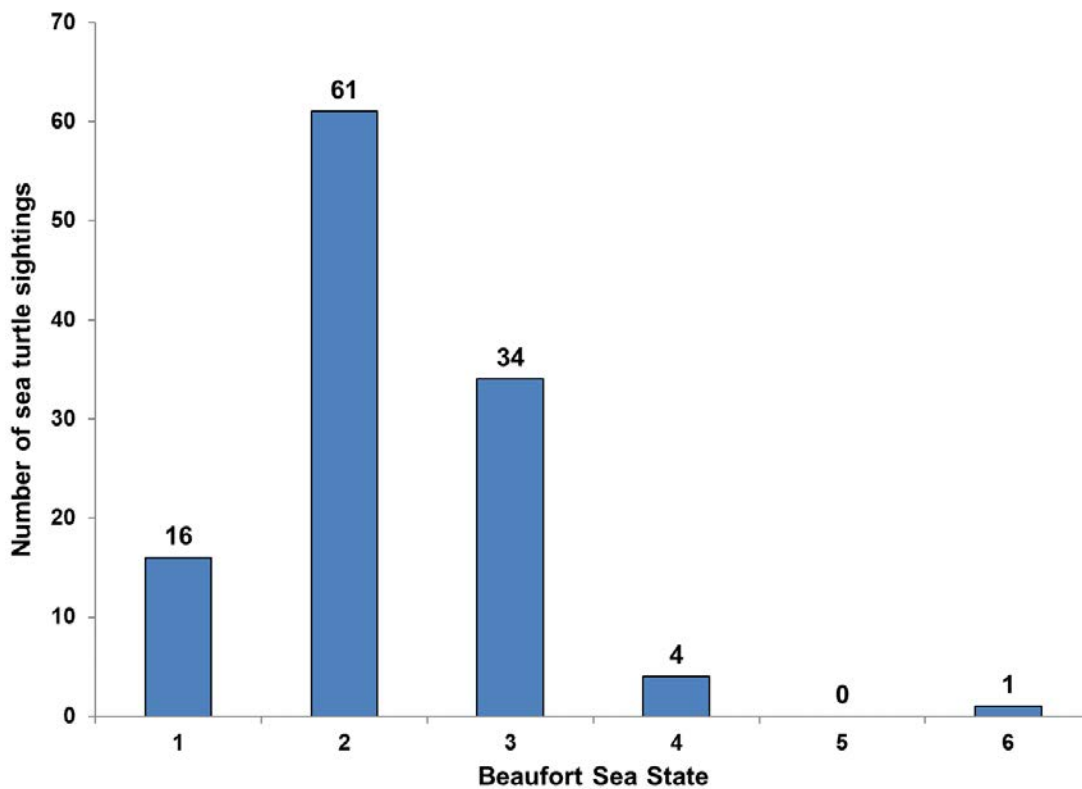


Figure 11a. Total numbers of sea turtle sightings by BSS category in the Jacksonville survey area in 2016.

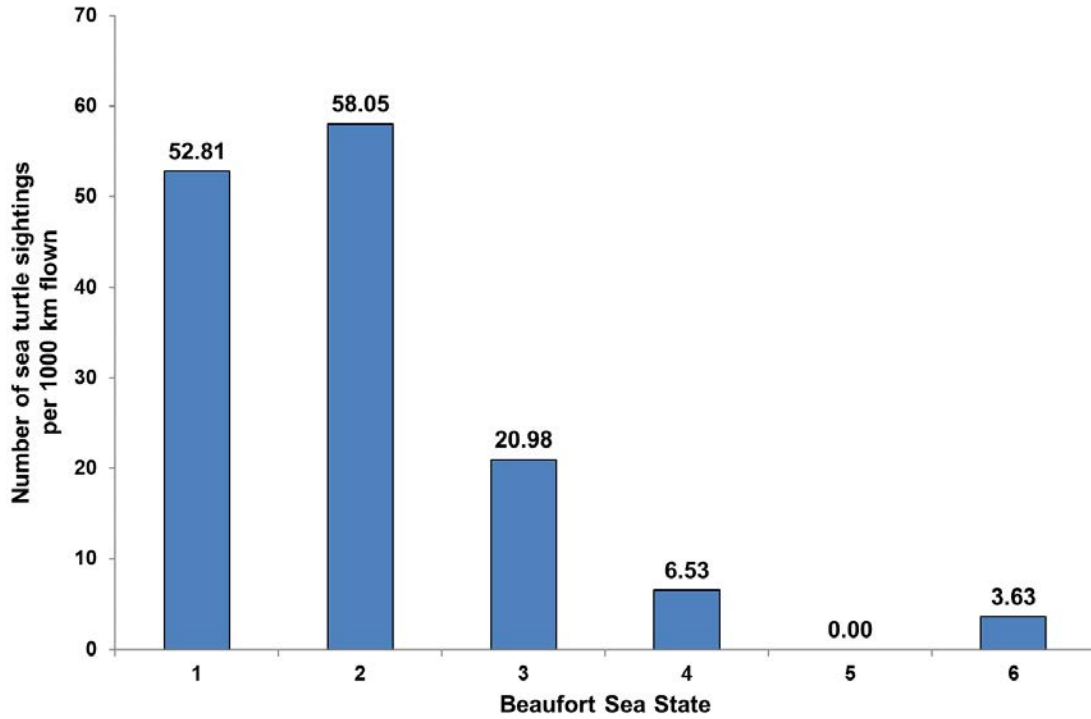


Figure 11b. Sea turtle sightings per 1,000 km flown by BSS category in the Jacksonville survey area in 2016.

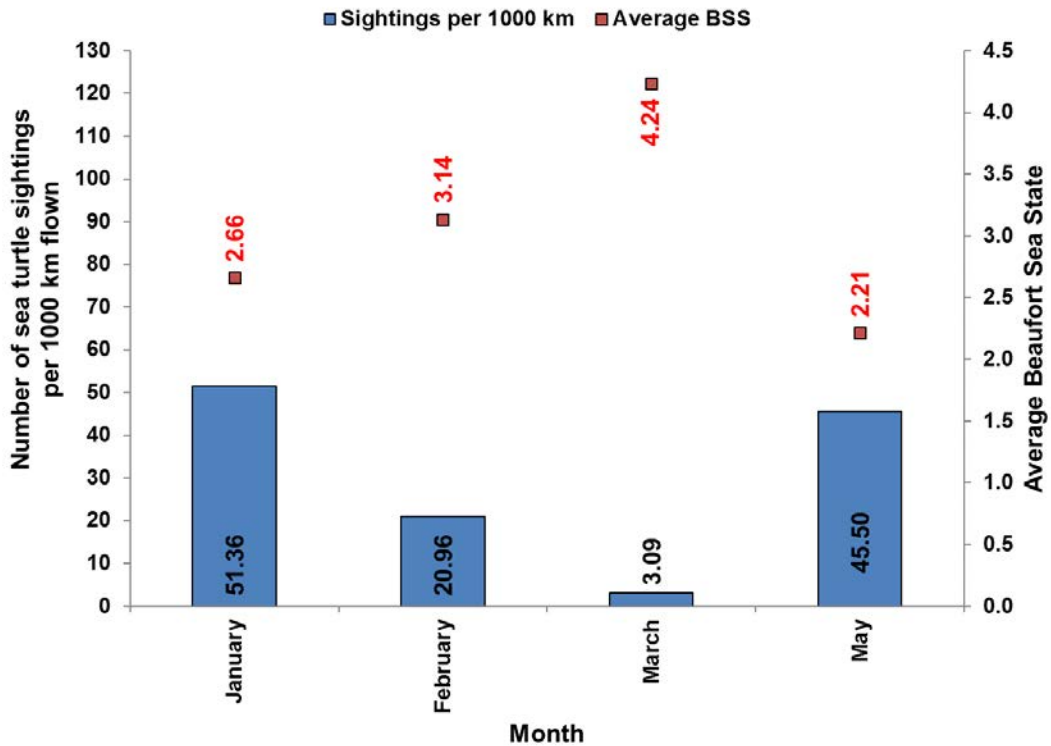


Figure 11c. Sea turtle sightings per 1,000 km surveyed and the distance-weighted average BSS per month in the Jacksonville survey area in 2016.

4.4.1 Loggerhead Sea Turtle (*Caretta caretta*)

A total of 90 sightings representing 108 loggerhead sea turtles was logged (**Table 9**). This species was encountered on every day of survey effort. Loggerheads were predominantly recorded in the shallower waters over the continental shelf, although a small number of individuals occurred beyond the shelf break (**Figure 12**).

Table 9. Loggerhead sea turtle (*Caretta caretta*) sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #
20-Jan-2016	12:09:09	5	30.565862	-80.667707	10	2	3	90°	1
20-Jan-2016	12:09:46	6	30.565876	-80.645745	10	2	3	90°	1
20-Jan-2016	12:10:20	7	30.565847	-80.626511	10	2	3	100°	1
20-Jan-2016	12:12:02	9	30.566171	-80.569163	10	2	3	90°	1
20-Jan-2016	12:14:34	3	30.566282	-80.480703	10	3	1	45°	1
20-Jan-2016	12:29:32	7	30.565970	-80.264422	10	3	1	60°	1
20-Jan-2016	12:30:59	8	30.566031	-80.214248	10	3	2	60°	1
20-Jan-2016	12:31:35	15	30.566428	-80.192878	10	3	2	100°	1
20-Jan-2016	13:00:19	15	30.500310	-80.303937	9	2	2	90°	1
20-Jan-2016	13:08:45	17	30.499504	-80.591804	9	3	2	90°	2
20-Jan-2016	13:10:21	20	30.499600	-80.644911	9	2	1	90°	3
20-Jan-2016	13:15:40	23	30.431863	-80.664169	8	2	1	90°	2
20-Jan-2016	13:17:40	27	30.432505	-80.591089	8	2	3	100°	1
20-Jan-2016	14:00:25	30	30.366406	-80.421788	7	3	1	90°	1
20-Jan-2016	14:05:57	31	30.366098	-80.609270	7	3	2	90°	3
20-Jan-2016	14:16:50	35	30.285119	-80.479004	6	3	2	90°	1
20-Jan-2016	14:34:15	42	30.299444	-79.900193	6	4	1	90°	1
21-Jan-2016	8:52:54	3	30.231358	-80.670136	5	2	1	100°	1
21-Jan-2016	9:07:39	10	30.231998	-80.323088	5	2	3	90°	1
21-Jan-2016	9:32:43	9	30.301131	-80.103226	6	2	2	90°	1
21-Jan-2016	9:35:55	13	30.300908	-80.220794	6	2	1	90°	2
21-Jan-2016	9:38:09	15	30.300962	-80.305855	6	2	2	90°	1
21-Jan-2016	9:47:35	13	30.303725	-80.434347	6	2	3	90°	1
21-Jan-2016	10:28:45	35	30.364444	-80.651269	7	2	1	90°	1
21-Jan-2016	10:31:14	37	30.364877	-80.557522	7	2	1	90°	1
21-Jan-2016	11:30:20	32	30.434006	-80.187591	8	2	2	80°	1
21-Jan-2016	11:32:57	34	30.434186	-80.286732	8	3	1	90°	1
21-Jan-2016	11:42:34	37	30.408813	-80.289988	8	3	1	100°	1

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #
21-Jan-2016	11:44:15	38	30.408813	-80.289988	8	3	4	100°	1
21-Jan-2016	11:48:16	41	30.432310	-80.623233	8	3	1	90°	1
21-Jan-2016	11:48:40	42	30.432405	-80.638629	8	3	3	90°	1
21-Jan-2016	11:48:44	43	30.432409	-80.640965	8	3	3	90°	1
21-Jan-2016	11:49:05	44	30.432395	-80.654114	8	3	3	90°	1
29-Feb-2016	10:42:25	16	30.432639	-80.602049	8	3	1	90°	1
29-Feb-2016	10:44:47	20	30.432249	-80.691380	8	3	1	45°	1
29-Feb-2016	10:50:55	23	30.500026	-80.574645	9	3	2	90°	1
29-Feb-2016	11:41:27	22	30.566475	-80.262662	10	3	2	90°	1
29-Feb-2016	11:43:12	23	30.566227	-80.326599	10	3	2	90°	1
29-Feb-2016	11:47:09	24	30.566252	-80.471311	10	3	2	90°	1
29-Feb-2016	11:51:38	25	30.565989	-80.633101	10	3	2	90°	1
29-Feb-2016	13:55:32	34	29.966207	-80.559984	1	2	2	90°	1
29-Feb-2016	13:57:19	35	29.966446	-80.494608	1	2	1	90°	1
29-Feb-2016	13:58:44	31	29.966377	-80.443141	1	2	1	90°	1
29-Feb-2016	14:35:34	37	30.031434	-80.369110	2	3	2	90°	1
29-Feb-2016	14:44:50	41	30.031638	-80.467948	2	3	2	90°	1
29-Feb-2016	14:56:47	51	30.100621	-80.610024	3	2	1	90°	1
29-Feb-2016	15:11:25	57	30.095164	-80.472598	3	3	2	90°	1
29-Feb-2016	15:14:18	58	30.100683	-80.366884	3	3	2	60°	2
01-Mar-2016	14:11:17	43	30.366586	-80.569926	7	3	2	90°	1
01-Mar-2016	15:12:47	56	30.500793	-80.244252	9	4	2	90°	1
02-Mar-2016	9:34:36	6	30.030746	-80.274149	2	6	2	90°	1
24-May-2016	15:52:29	3	29.970041	-80.520362	1	2	2	90°	2
24-May-2016	15:55:04	4	29.969579	-80.431390	1	2	1	90°	1
24-May-2016	16:01:46	5	29.970392	-80.359862	1	2	2	90°	2
24-May-2016	16:05:01	6	29.970309	-80.249853	1	2	2	90°	1
24-May-2016	16:39:40	15	30.026109	-80.537334	2	2	2	100°	1
24-May-2016	16:42:04	16	30.027182	-80.626207	2	2	1	90°	3
24-May-2016	16:43:42	14	30.025892	-80.686669	2	2	1	90°	1
24-May-2016	16:48:57	19	30.104772	-80.658926	3	2	2	90°	2
24-May-2016	16:50:02	17	30.104713	-80.621531	3	2	3	90°	1
24-May-2016	16:50:37	20	30.104771	-80.601297	3	2	1	90°	2
24-May-2016	16:52:39	18	30.104860	-80.530554	3	2	3	90°	1
24-May-2016	16:54:10	19	30.104764	-80.477674	3	2	2	90°	2
24-May-2016	16:55:45	20	30.105204	-80.420365	3	2	3	90°	1

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #
24-May-2016	16:56:11	22	30.105216	-80.404668	3	2	1	90°	1
24-May-2016	17:05:25	23	30.102732	-80.265541	3	2	3	90°	1
24-May-2016	17:50:43	38	30.161933	-80.460640	4	2	1	90°	1
24-May-2016	17:56:24	34	30.162321	-80.569064	4	2	2	90°	1
25-May-2016	9:06:23	4	30.234014	-80.570387	5	2	2	90°	1
25-May-2016	9:21:17	7	30.234753	-80.250733	5	2	1	90°	1
25-May-2016	9:22:38	8	30.234150	-80.201535	5	2	2	90°	1
25-May-2016	9:22:43	9	30.234227	-80.198265	5	2	1	60°	1
25-May-2016	9:50:06	13	30.296849	-80.305006	6	1	2	90°	2
25-May-2016	9:57:05	16	30.296924	-80.564487	6	2	1	90°	1
25-May-2016	10:11:48	18	30.369619	-80.595164	7	2	1	90°	1
25-May-2016	10:16:35	19	30.368240	-80.417753	7	2	2	90°	1
25-May-2016	10:18:37	22	30.368906	-80.342298	7	1	1	90°	1
25-May-2016	10:57:52	26	30.429899	-80.597351	8	1	2	90°	1
25-May-2016	11:07:46	31	30.501816	-80.548384	9	1	1	110°	1
25-May-2016	11:15:18	34	30.501653	-80.289557	9	1	2	90°	1
25-May-2016	11:39:06	42	30.563917	-79.885159	10	2	2	90°	1
25-May-2016	11:55:43	49	30.564380	-80.227724	10	1	1	90°	1
25-May-2016	11:57:21	50	30.564833	-80.285933	10	1	1	90°	1
25-May-2016	11:59:23	46	30.564139	-80.360118	10	1	1	90°	2
25-May-2016	12:00:47	48	30.565192	-80.411134	10	1	2	90°	1
25-May-2016	12:03:13	49	30.564160	-80.501244	10	1	1	90°	1
25-May-2016	12:03:46	52	30.564480	-80.521716	10	1	1	90°	2
25-May-2016	12:08:23	54	30.564073	-80.692392	10	2	1	45°	1
25-May-2016	15:02:05	57	30.024146	-79.632631	2 Off	4	1	90°	1
25-May-2016	15:02:18	58	30.024479	-79.641211	2 Off	3	1	90°	1

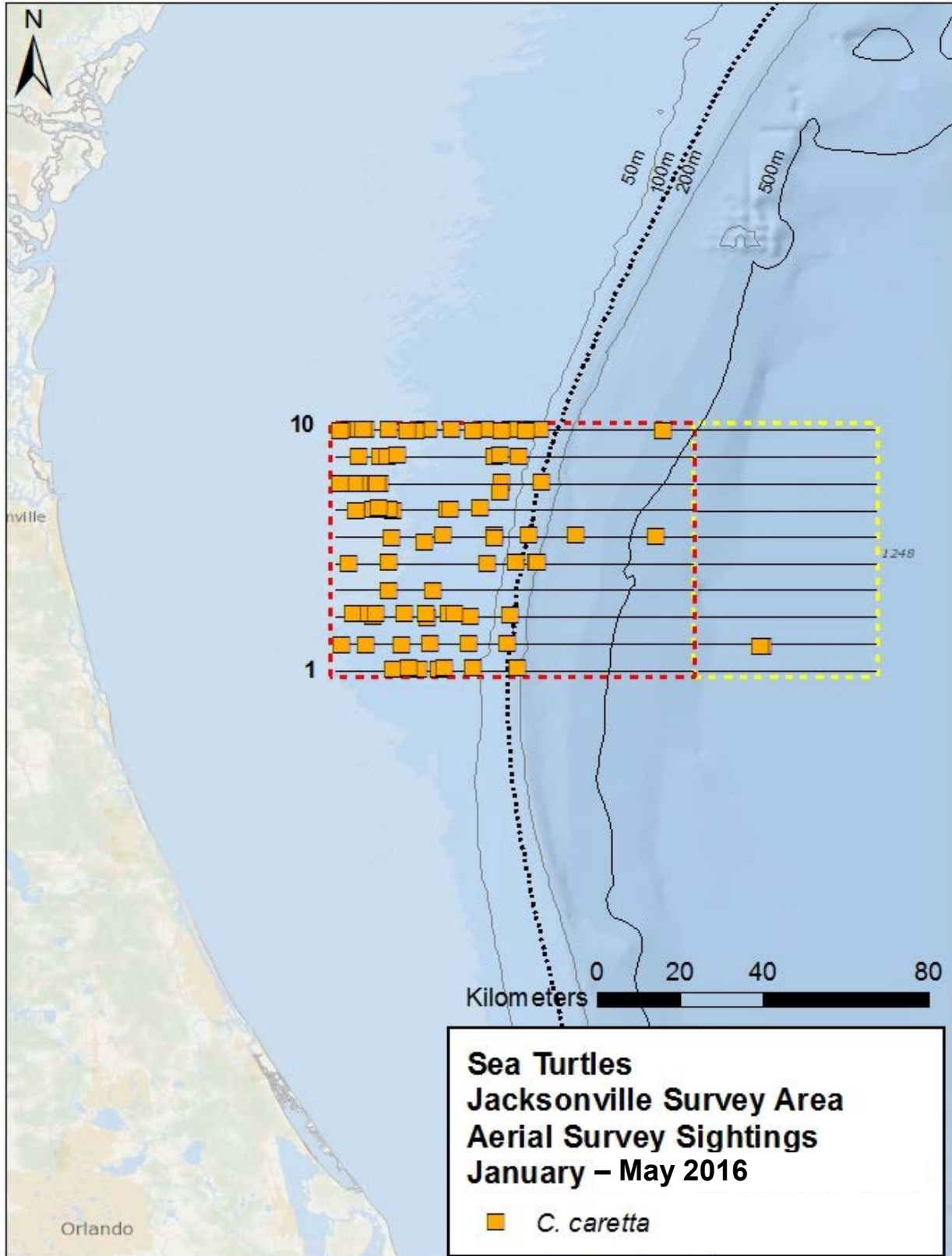


Figure 12. Loggerhead sea turtle (*Caretta caretta*) sightings in the Jacksonville survey area from January through May 2016 (N=90).

4.4.2 Leatherback Sea Turtle (*Dermochelys coriacea*)

A total of six sightings, each of a single leatherback sea turtle, was recorded (**Table 10, Figure 13**). This species was observed in three of the four months surveyed (absent in May).

Leatherbacks were recorded predominantly in the shallower waters over the continental shelf, inshore of the 100-m isobaths, although one individual occurred beyond the shelf break.

Table 10. Leatherback sea turtle (*Dermochelys coriacea*) sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #
20-Jan-2016	12:11:00	8	30.566006	-80.603666	10	2	3	90°	1
21-Jan-2016	10:28:13	34	30.364305	-80.670891	7	2	1	90°	1
21-Jan-2016	11:47:23	40	30.432273	-80.590191	8	3	1	90°	1
29-Feb-2016	14:47:32	43	30.031061	-80.559439	2	2	3	90°	1
29-Feb-2016	15:41:05	53	30.165717	-80.089852	4	3	2	90°	1
01-Mar-2016	14:20:27	46	30.366982	-80.217770	7	4	2	90°	1

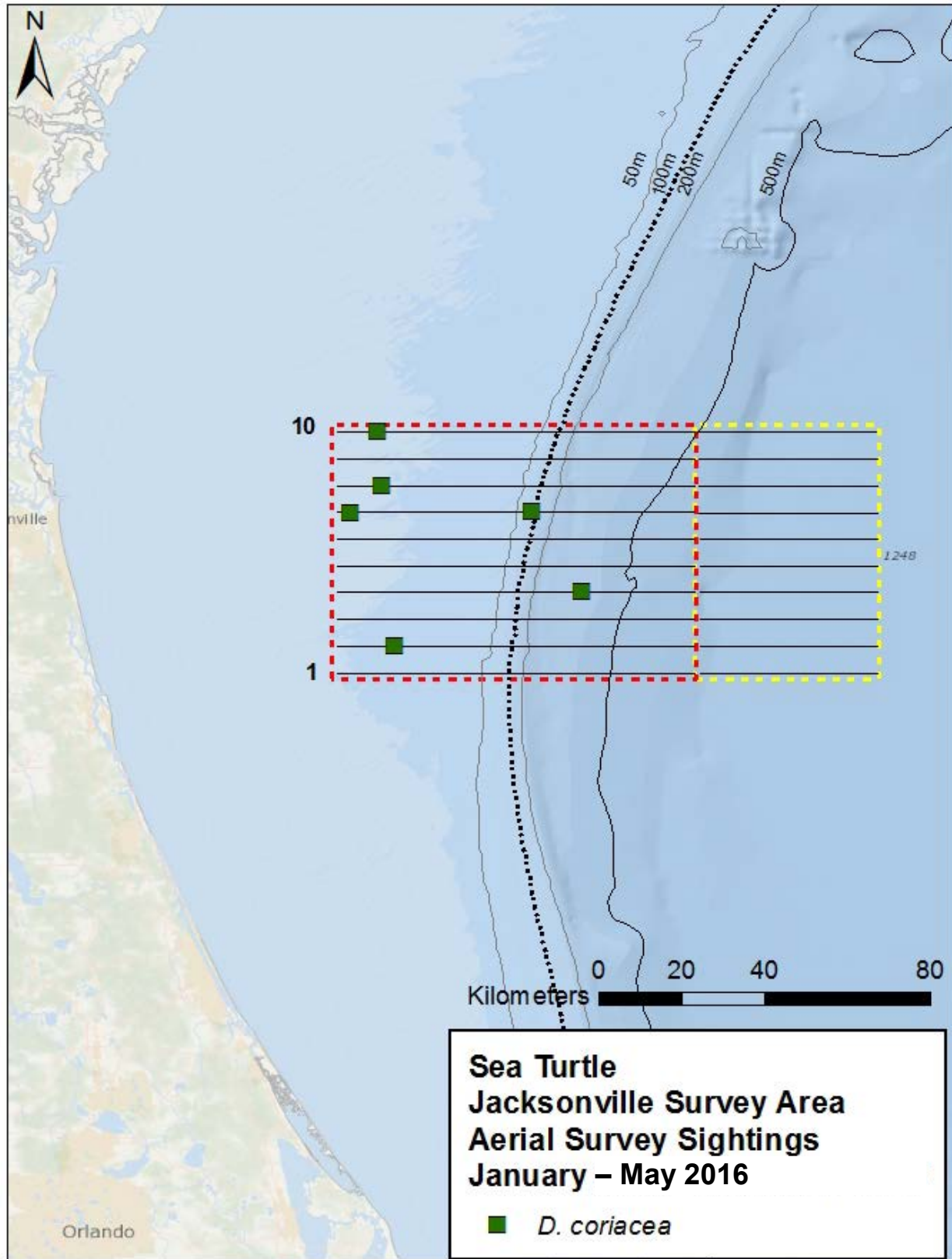


Figure 13. Leatherback sea turtle (*Dermochelys coriacea*) sightings in the Jacksonville survey area from January through May 2016 (N=6).

4.5 Fish

4.5.1 Pelagic Bony Fishes (Osteichthyes)

Six ocean sunfish were recorded, five in January and one in March (**Table 11**). Four of the sunfish were seen in relatively shallow water near the western edge of the survey area; the other two were much farther offshore closer to the 500-m isobath (**Figure 14**)

Table 11. Ocean sunfish (*Mola mola*) sightings in the Jacksonville survey area from from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #
20-Jan-2016	13:15:48	26	30.433374	-80.659197	8	2	3	90°	1
21-Jan-2016	10:13:45	18	30.304398	-80.615053	6	2	1	90°	1
21-Jan-2016	10:24:29	31	30.298153	-80.666875	6	2	2	90°	1
21-Jan-2016	11:22:16	31	30.436098	-79.884564	8	2	1	90°	1
21-Jan-2016	11:49:24	45	30.432328	-80.666138	8	3	1	90°	1
01-Mar-2016	14:39:04	51	30.432698	-79.981750	8	3	2	90°	1

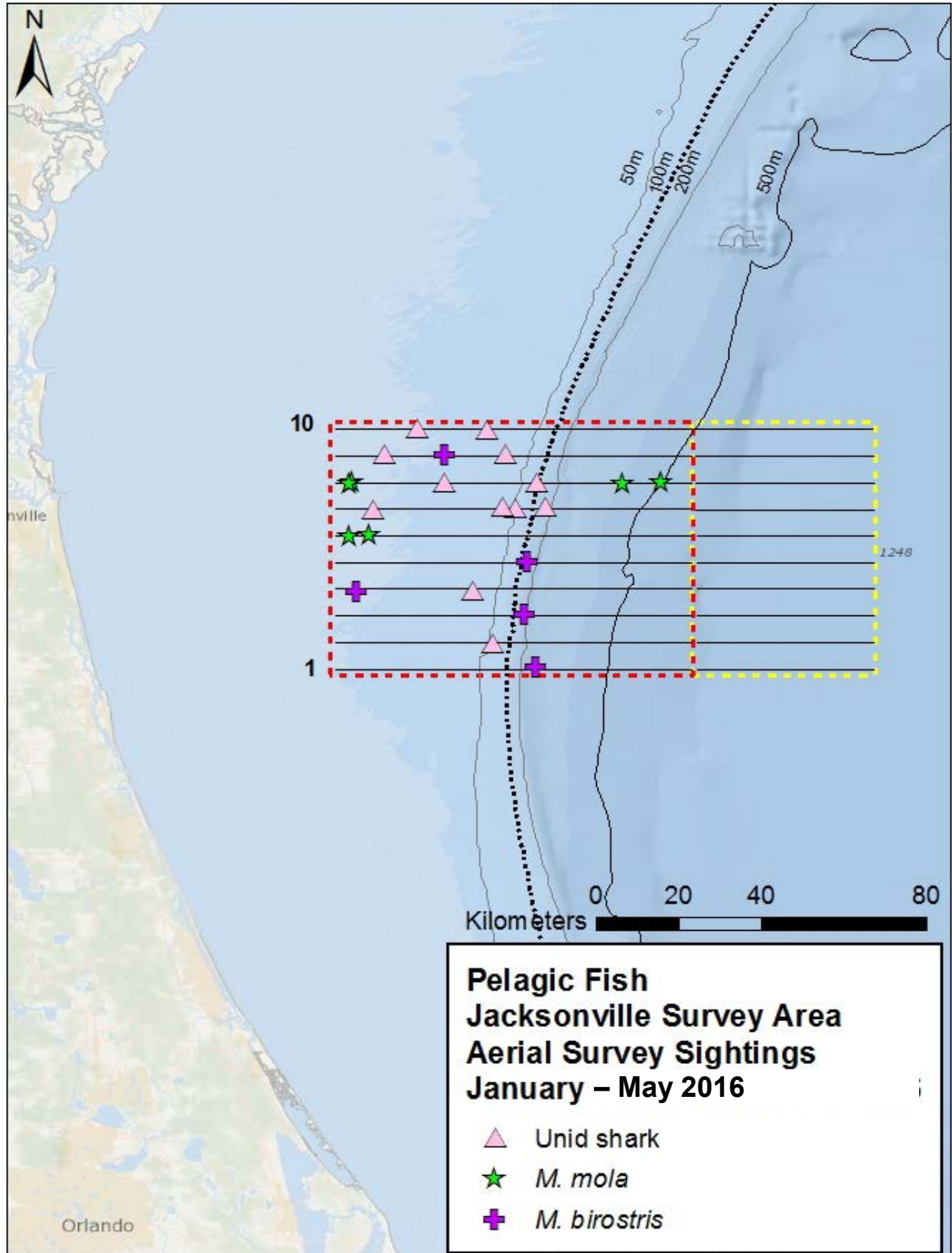


Figure 14. Manta ray (*Manta birostris*), ocean sunfish (*Mola mola*), and shark sightings in the Jacksonville survey area from January through May 2016 (N=23).

4.5.2 Cartilaginous Fishes (Chondrichthyes)

Five manta rays (*Manta birostris*) were observed, all in May, and inshore of the 500-m isobath (Table 12, Figure 14). There were 11 sightings of sharks, totaling 12 animals, recorded during the reporting period. Seven were unidentified by the observers. Four of the shark sightings could be identified as hammerhead sharks (*Sphyrna* sp.) based on head shape, but since none of these sightings could be identified to species they are included here with the unidentified sharks (Table 13). There was also one sighting of 45 unidentified rays on 24 May 2016, which is also included in Table 13 with the sharks. Sharks were seen throughout the study period with no discernable spatial or temporal trends (Figure 14). All sharks and rays are listed as unidentified Chondrichthyan fishes in Figure 14.

Table 12. Manta ray (*Manta birostris*) sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #
24-May-2016	16:06:34	7	29.969677	-80.197307	1	2	2	90°	1
24-May-2016	17:06:31	24	30.104343	-80.227530	3	2	3	90°	1
24-May-2016	17:58:25	35	30.161440	-80.648516	4	2	1	90°	1
25-May-2016	9:22:05	8	30.234046	-80.221614	5	2	1	90°	1
25-May-2016	11:11:15	32	30.501893	-80.427584	9	2	1	90°	1

Table 13. Shark and ray sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Comments
20-Jan-2016	12:14:11	10	30.566488	-80.494533	10	2	2	90°	1	Hammerhead shark
21-Jan-2016	10:29:56	36	30.364706	-80.606807	7	2	1	90°	1	Shark
29-Feb-2016	10:37:49	15	30.432656	-80.427075	8	3	2	60°	1	Shark
1-Mar-2016	14:19:36	45	30.367462	-80.249779	7	4	2	90°	1	Hammerhead shark
24-May-2016	16:33:41	13	30.027299	-80.304777	2	2	2	90°	1	Shark
24-May-2016	17:48:02	31	30.161448	-80.354244	4	2	3	90°	45	Rays
25-May-2016	10:20:19	23	30.370107	-80.279633	7	1	1	90°	1	Shark
25-May-2016	10:23:09	24	30.369132	-80.174723	7	1	2	90°	1	Shark
25-May-2016	10:46:35	24	30.430158	-80.193209	8	1	1	90°	1	Hammerhead shark
25-May-2016	11:06:56	30	30.501692	-80.577543	9	1	2	90°	1	Shark
25-May-2016	11:15:46	35	30.501696	-80.273796	9	1	1	90°	1	Hammerhead shark
25-May-2016	11:58:18	51	30.564504	-80.320506	10	1	2	90°	2	Sharks

4.6 Vessel Sightings

4.6.1 Commercial Vessels

A total of 15 commercial vessels was observed in the study site, including cargo vessels, commercial fishing vessels, tugs & barges, cruise ships, and tankers (**Table 14, Figure 15**).

Table 14. Commercial vessel sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Comments
20-Jan-2016	12:59:42	21	30.499233	-80.281886	9	3	4	90°	1	Cargo vessel
20-Jan-2016	13:06:18	22	30.499588	-80.509808	9	3	4	60°	1	Commercial fishing vessel
20-Jan-2016	13:42:55	28	30.366089	-79.845034	7	4	3	60°	1	Commercial fishing vessel
20-Jan-2016	14:16:33	35	30.287730	-80.488851	6	3	2	60°	1	Tug and barge
20-Jan-2016	14:57:40	45	30.233100	-80.394953	5	2	4	60°	1	Cruise ship
20-Jan-2016	15:05:27	46	30.232919	-80.672119	5	2	4	60°	2	Commercial fishing vessels
21-Jan-2016	11:09:54	27	30.365262	-79.953624	7	2	4	40°	1	Commercial fishing vessel
21-Jan-2016	11:40:03	58	30.436660	-80.302542	8	2	2	60°	1	Cargo vessel
01-Mar-2016	15:02:20	54	30.499760	-80.638865	9	3	2	60°	1	Cruise ship
02-Mar-2016	8:56:11	3	29.965257	-80.693359	1	5	1	60°	1	Cargo vessel
24-May-2016	17:03:58	27	30.098991	-80.311920	3	2	1	45°	1	Cruise ship
25-May-2016	9:46:40	12	30.297367	-80.177320	6	1	2	60°	1	Commercial fishing vessel
25-May-2016	9:52:03	14	30.298301	-80.377113	6	1	4	60°	1	Tanker
25-May-2016	16:01:11	73	30.288400	-79.509591	6 Off	3	4	60°	1	Tug and barge

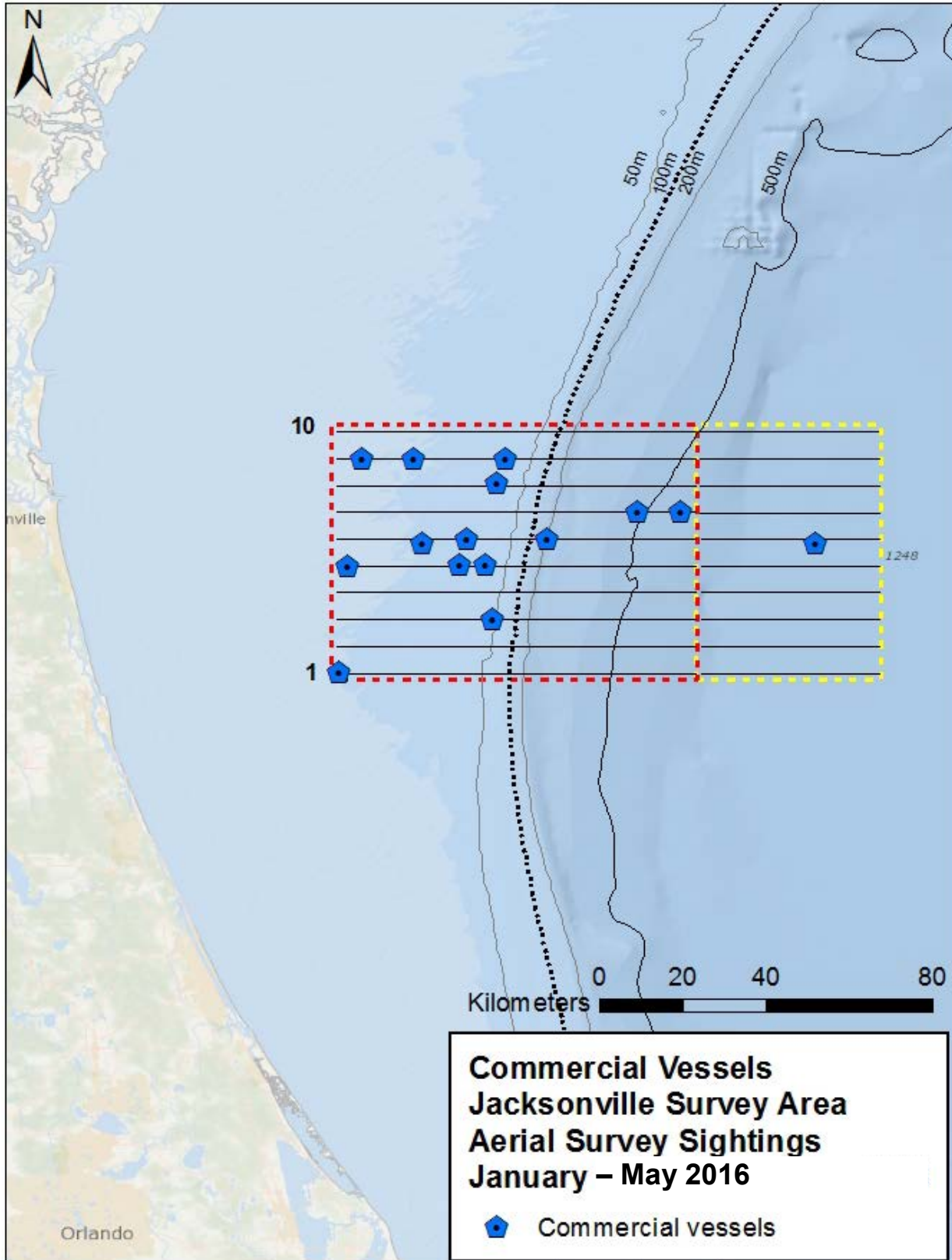


Figure 15. Commercial vessel sightings in the Jacksonville survey area from January through May 2016 (N=15).

4.6.2 Military

Two U.S. military vessels were observed during the reporting period (**Table 15, Figure 16**).

Table 15. Military vessel sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Comments
20-Jan-2016	12:26:37	6	30.566273	-80.360521	10	3	4	90°	1	Military
25-May-2016	9:03:10	3	30.233518	-80.686222	5	2	4	60°	1	Military

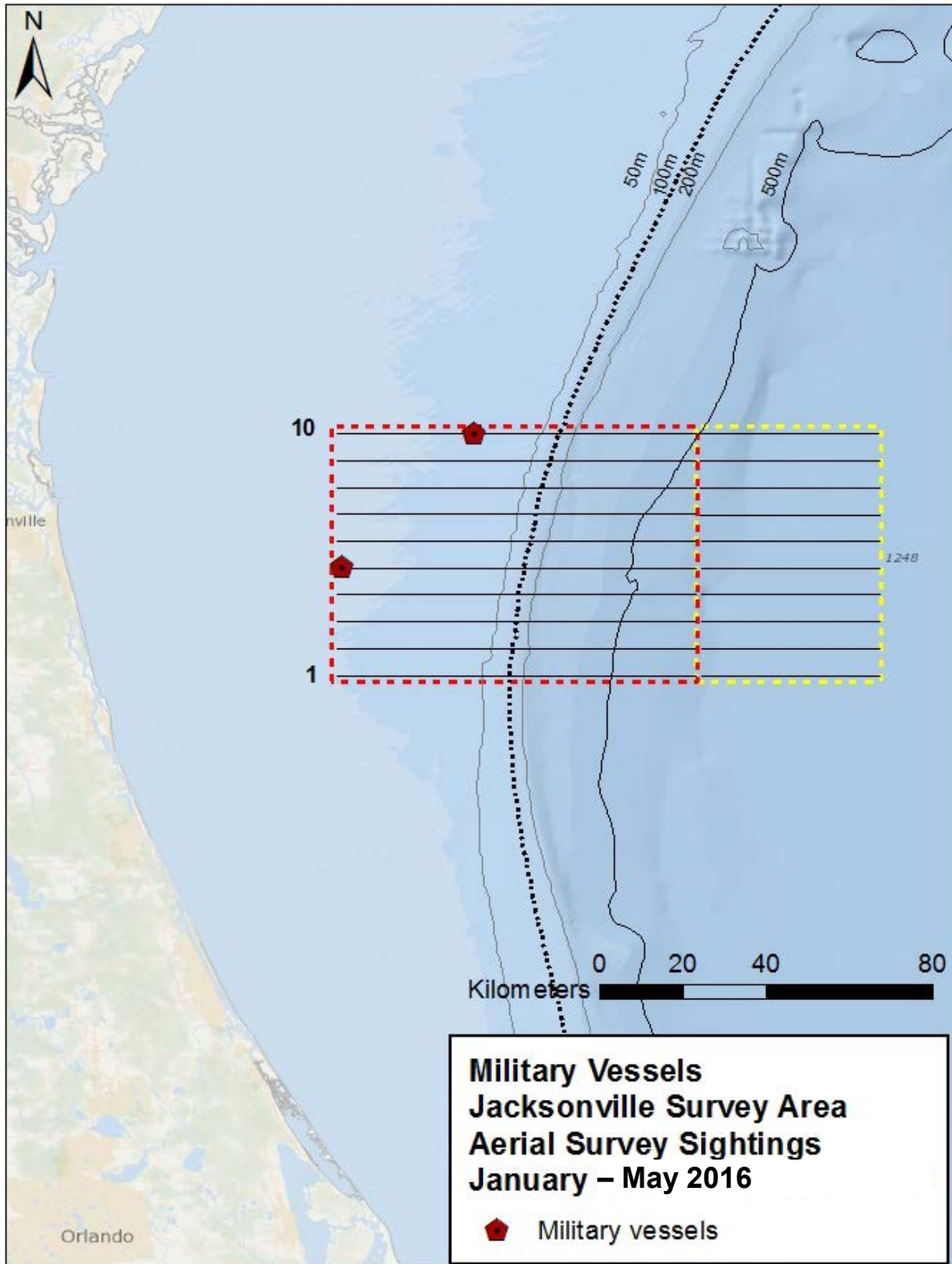


Figure 16. Military vessel sightings in the Jacksonville survey area from January through May 2016 (N=2).

4.6.3 Other Vessels

A total of 64 other vessels, classified as recreational fishing vessels, and sailboats, was recorded in the survey area (Table 16, Figure 17).

Table 16. Other vessel sightings in the Jacksonville survey area from January through May 2016.

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Comments
20-Jan-2016	13:09:06	18	30.499481	-80.603435	9	3	2	60°	1	Recreational fishing vessel
20-Jan-2016	14:24:15	38	30.298660	-80.265296	6	3	3	90°	2	Recreational fishing vessels
20-Jan-2016	14:55:32	44	30.233441	-80.319936	5	2	2	90°	2	Recreational fishing vessels
21-Jan-2016	8:52:40	3	30.230116	-80.677860	5	2	3	90°	1	Recreational fishing vessel
21-Jan-2016	8:56:19	4	30.231589	-80.543833	5	2	3	45°	1	Recreational fishing vessel
21-Jan-2016	9:05:06	9	30.231892	-80.416954	5	2	2	45°	1	Recreational fishing vessel
21-Jan-2016	9:05:44	5	30.234618	-80.390779	5	2	3	100°	2	Recreational fishing vessels
21-Jan-2016	9:07:45	6	30.233957	-80.317081	5	2	3	70°	1	Recreational fishing vessel
21-Jan-2016	9:36:21	14	30.300882	-80.237853	6	2	1	90°	1	Recreational fishing vessel
21-Jan-2016	9:36:47	10	30.301119	-80.255959	6	2	4	60°	1	Recreational fishing vessel
21-Jan-2016	11:45:00	39	30.408813	-80.289988	8	3	1	90°	1	Recreational fishing vessel
29-Feb-2016	9:12:28	3	30.233971	-80.341204	5	3	2	30°	1	Recreational fishing vessel
29-Feb-2016	9:41:57	9	30.298990	-80.292957	6	4	1	90°	1	Recreational fishing vessel
29-Feb-2016	9:49:05	11	30.299423	-80.577170	6	3	1	90°	1	Recreational fishing vessel
29-Feb-2016	10:03:33	11	30.366446	-80.374881	7	3	2	90°	1	Recreational fishing vessel
29-Feb-2016	10:04:10	15	30.366872	-80.352956	7	4	4	60°	3	Recreational fishing vessels
29-Feb-2016	10:34:10	14	30.433032	-80.286714	8	3	2	60°	1	Recreational fishing vessel
29-Feb-2016	10:56:37	19	30.500461	-80.360715	9	3	1	90°	1	Recreational fishing vessel
29-Feb-2016	13:53:51	33	29.965965	-80.621016	1	2	4	90°	3	Recreational fishing vessels

Date	Time	Way Point	Latitude (N)	Longitude (W)	Track Number	BSS	Angle Out	Degree Forward	Best #	Comments
29-Feb-2016	13:58:02	30	29.966416	-80.468434	1	2	3	30°	2	Recreational fishing vessels
29-Feb-2016	13:59:40	37	29.966683	-80.408933	1	3	4	90°	5	Recreational fishing vessels
29-Feb-2016	14:02:34	38	29.966678	-80.302906	1	3	1	90°	1	Recreational fishing vessel
29-Feb-2016	14:44:21	40	30.033587	-80.452676	2	3	2	90°	3	Recreational fishing vessels
29-Feb-2016	14:46:03	47	30.031104	-80.509607	2	3	1	90°	1	Recreational fishing vessel
29-Feb-2016	15:10:11	56	30.093969	-80.517120	3	3	3	90°	2	Recreational fishing vessels
29-Feb-2016	15:12:39	48	30.100953	-80.427457	3	2	3	45°	3	Recreational fishing vessels
29-Feb-2016	15:14:23	49	30.100690	-80.363729	3	2	2	45°	1	Recreational fishing vessel
29-Feb-2016	15:16:43	59	30.101132	-80.278868	3	3	4	90°	4	Recreational fishing vessels
29-Feb-2016	15:50:29	65	30.165643	-80.414075	4	3	1	90°	1	Recreational fishing vessel
01-Mar-2016	14:17:11	45	30.367115	-80.342180	7	4	1	60°	1	Recreational fishing vessel
01-Mar-2016	14:48:13	51	30.432820	-80.323013	8	4	3	90°	1	Recreational fishing vessel
01-Mar-2016	14:48:38	53	30.432971	-80.338868	8	4	2	60°	1	Recreational fishing vessel
01-Mar-2016	15:04:38	56	30.500214	-80.552272	9	3	2	60°	1	Recreational fishing vessel
01-Mar-2016	15:43:04	60	30.565936	-80.406413	10	4	2	90°	1	Recreational fishing vessel
24-May-2016	16:11:51	10	29.969912	-80.015956	1	3	3	90°	1	Sailboat
24-May-2016	16:21:32	11	30.028283	-79.839749	2	3	2	60°	1	Sailboat
24-May-2016	16:25:57	13	30.026911	-80.010337	2	3	2	90°	1	Sailboat
24-May-2016	16:52:39	21	30.104923	-80.530683	3	2	4	60°	1	Recreational fishing vessel
25-May-2016	11:06:05	29	30.502039	-80.606727	9	1	1	90°	1	Recreational fishing vessel
25-May-2016	11:52:52	48	30.565931	-80.121474	10	1	4	90°	1	Recreational fishing vessel
25-May-2016	11:53:41	44	30.564628	-80.151862	10	1	2	60°	1	Recreational fishing vessel
25-May-2016	11:59:59	47	30.564168	-80.381845	10	1	2	90°	1	Recreational fishing vessel
25-May-2016	16:06:58	74	30.296043	-79.738150	6 Off	3	4	60°	1	Sailboat

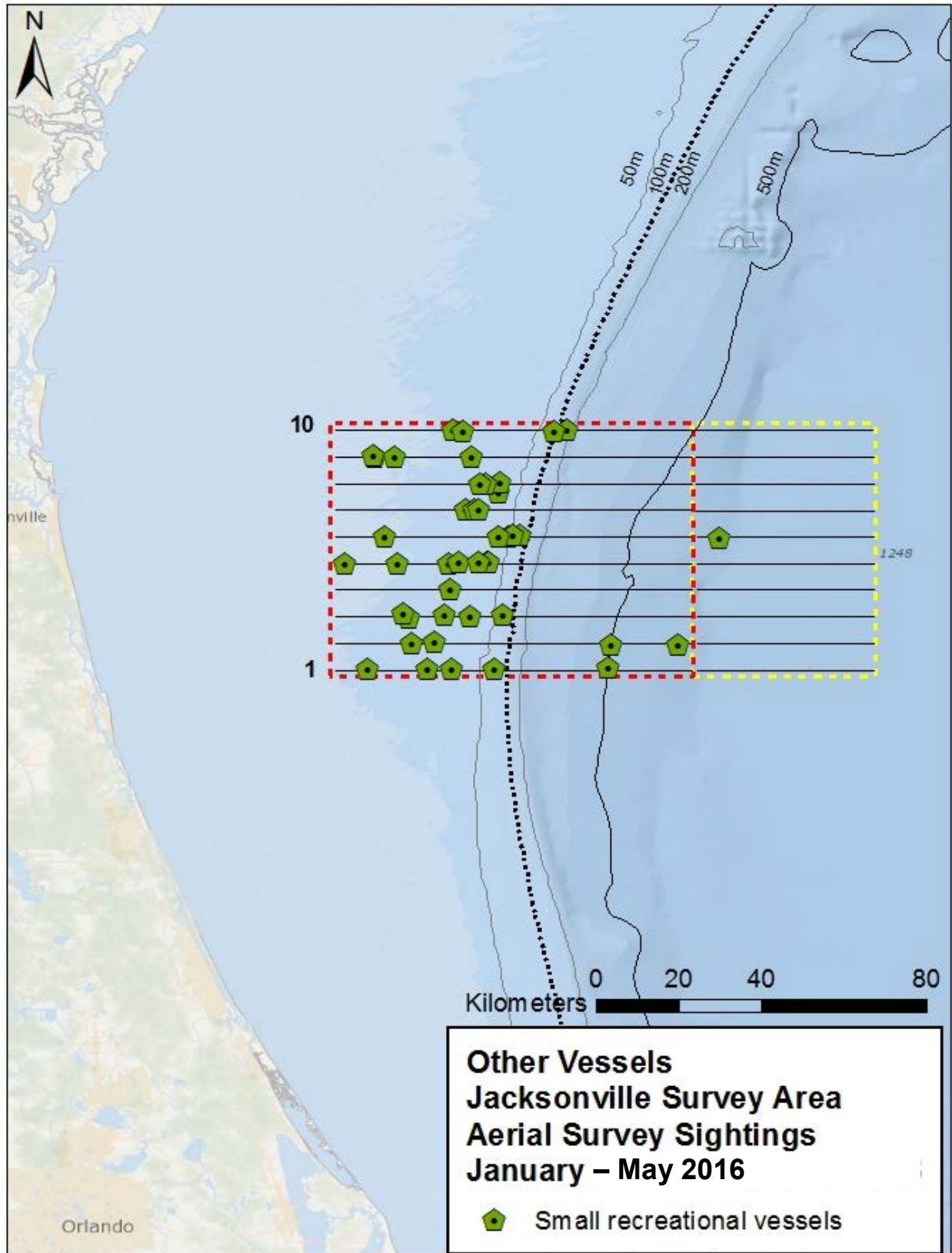


Figure 17. Other vessel sightings in the Jacksonville survey area from January through May 2016 (N=43).

5. Acknowledgements

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A

Aerial Survey Data Sheet



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AERIAL SURVEY DATA SHEET

Date: _____ Appendix A Observer Side: _____ GPS#: _____ Page __ of __
 Pilot/Co-Pilot _____ Observers Left/Right: _____ Hobbs: _____


Time	Waypoint #	Event	Heading	Track #	Observer R / L	Visibility	BSS	Cloud	Glare L	Glare R	Vertical Angle	Horizontal degree	Sighting Cue	Species	Reliability	Min #	Max #	Best Est	Comments		

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B

Event Codes and Species List



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Codes for Variables on USWTR Aerial Survey Data Sheet

Date: Month, Day, Year

Track#: opportunistic track line=99

Event:

- | | |
|--|---|
| 1.1 = On effort/on track | 2.0 = Sighting-breaking track/off effort (real time) |
| 1.2 = Off effort | 2.3 = Vessel sighting |
| 3.1 = Change in environmental conditions | 2.4 = Sighting of marine mammal (real location) |
| 10.0 = Opportunistic sighting(s) | 2.41 = Location of Sighting Cue, No Animals sighted |
| PF = Preflight | 2.42 = Break from sighting |
| XB = Cross Beach | 2.7 = Sighting of sea turtle (real location) |
| WU = Wheels Up | 2.8 = Sighting of large vessel (Military, commercial, etc.) |
| WD = Wheels Down | 2.9 = Unidentified sighting, requires comments |
| TE = Transit Leg on Effort | |

Confidence of cue

- 1 = definite
- 2 = probable
- 3 = possible/unsure

Visibility:

- 1 = clear to horizon
- 2 = half the distance to the horizon
- 3 = less than half the distance to the horizon

Beaufort Sea State:

- 0 = slick, calm, mirror-like
- 1 = small waves
- 2 = whitecaps 0-33%, waves 1-2 feet
- 3 = whitecaps 33-50%, waves 2-3 feet
- 4 = whitecaps 50-65%, waves 3-5 feet
- 5 = whitecaps >65%, waves >5 feet
- 6 = too rough too survey

Sighting Cues:

- 1 = Blow
- 2 = Splash
- 3 = Body Part
- 4 = Breach
- 5 = Other (needs comments)

Cloud Cover:

- 01 = clear
- 02 = partly cloudy
- 03 = continuous layer of clouds
- 04 = rain
- 05 = haze
- 99 = other, requires comments

Vertical Angle is given in rough increments of 20 degrees with 1 being directly on the trackline and 4 being anything outside of survey wide to horizon

Horizontal Angle is given assuming the nose of the plane is 0 degrees and directly off the wing is 90 degrees – measurements are taken from 1-180 on each side of the plane.

Glare

- | | |
|--------------|------------|
| 0 = No glare | 1 = 0-25 % |
| 2 = 25 -50 % | 3 = >50% |

Species List for Aerial Surveys		
Common Name	Scientific Name	Species Code
Cetaceans		
North Atlantic right whale	<i>Eubalaena glacialis</i>	Egl
Minke whale	<i>Balaenoptera acutorostrata</i>	Bac
sei whale	<i>Balaenoptera borealis</i>	Bbo
fin whale	<i>Balaenoptera physalus</i>	Bph
Brydes whale	<i>Balaenoptera edeni</i>	Bed
humpback whale	<i>Megaptera novaeangliae</i>	Mno
unidentified balaenopterid	Family <i>Balaenopteridae</i>	BALA
sperm whale	<i>Physeter macrocephalus</i>	Pma
pygmy sperm whale	<i>Kogia breviceps</i>	Kbr
dwarf sperm whale	<i>Kogia sima</i>	Ksi
unidentified Kogia	<i>Kogia spp.</i>	KOGI
Northern bottlenose whale	<i>Hyperoodon ampullatus</i>	Ham
Cuvier's beaked whale	<i>Ziphius cavirostris</i>	Zca
Mesoplodon beaked whale	Genus <i>Mesoplodon</i>	MESO
unidentified beaked whale	Family <i>Ziphiidae</i>	ZIPH
harbor porpoise	<i>Phocoena phocoena</i>	Pph
killer whale	<i>Orcinus orca</i>	Oor
melon-headed whale	<i>Peponocephala electra</i>	PeI
pygmy killer whale	<i>Feresa attenuata</i>	Fat
false killer whale	<i>Pseudorca crassidens</i>	Per
Risso's dolphin	<i>Grampus griseus</i>	Ggr
long-finned pilot whale	<i>Globicephala melas</i>	Gme
short-finned pilot whale	<i>Globicephala macrorhynchus</i>	Gma
unidentified pilot whale	Genus <i>Globicephala</i>	GLOB
rough-toothed dolphin	<i>Steno bredanensis</i>	Sbr
Atlantic white-sided dolphin	<i>Lagenorhynchus acutus</i>	Lac
Fraser's dolphin	<i>Lagenodelphis hosei</i>	Lho
common dolphin	<i>Delphinus delphis</i>	Dde
bottlenose dolphin	<i>Tursiops truncatus</i>	Ttr
spotted dolphin	<i>Stenella frontalis</i>	Sfr
striped dolphin	<i>Stenella coeruleoalba</i>	Sco
spinner dolphin	<i>Stenella longirostris</i>	Scl
unidentified <i>Stenella</i>	Genus <i>Stenella</i>	STEN
unidentified delphinid	Family <i>Delphinidae</i>	DELPH
unidentified cetacean		CETA
Pinnipeds		
gray seal	<i>Halichoerus grypus</i>	Hgr
harbor seal	<i>Phoca vitulina</i>	Pvi
harp seal	<i>Phoca groenlandica</i>	Pgr
hooded seal	<i>Cystophora cristata</i>	Ccr
unidentified phocid	Family <i>Phocidae</i>	PHOC
Sea Turtles		
loggerhead	<i>Caretta caretta</i>	Cca
leatherback	<i>Dermochelys coriacea</i>	Dco
green	<i>Chelonia mydas</i>	Cmy
Kemp's ridley	<i>Leptochelys kempii</i>	Lke
hawksbill	<i>Eretmochelys imbricata</i>	Eim
unidentified sea turtle		TURT
Other interesting sightings		
ocean sunfish	<i>Mola mola</i>	Mmo
basking shark	<i>Cetorhinus maximus</i>	Cma
whale shark	<i>Rhincodon typus</i>	Rty
manta ray	<i>Manta birostris</i>	Mbi
cownose rays	<i>Rhinoptera bonasus</i>	Rbo



C

Notes on Sighting Summary Sheets



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The Sighting Summary Sheet

The Sighting Summary, adapted from the Sighting Data Sheet used in the field, integrates data gathered in the field with results from lab analyses to provide a full summary of each marine mammal sighting (note – this sheet only deals with marine mammal sightings). A Sighting Summary is to be completed for all sightings, including sightings made while off-effort during transits between survey legs, as well as sighting cues that never led to a sighting that was relocated.

The Sighting Summary sheet is broken into four sections; “Initial Sighting on Track”, “Time and Position of Sighting”, “Final Time and Position of Sighting”, and “Behavior and Additional Comments”. Each section and sub-heading will be detailed below.

Initial Sighting on Track

Time: The time the “break track” GPS way-point was taken.

WP#: GPS way-point number of the break track.

Lat/Long: The latitude and longitude associated with the break track way-point.

Track Line: The track line surveyed when the sighting was made.

On/Off Effort: Whether the sighting was made during an active survey track line (*i.e.* on effort) or during transit BETWEEN track lines (*i.e.* off effort). Sightings made during off effort transit to and from the range are NOT included in the sighting summaries.

Sighting Cue: Whether the initial sighting was a splash, a breach or body part.

Vertical Angle: Vertical “angle” between 1 and 4, the lower edge of view (“1”) to the horizon (“4”). A subjective and relative measure of how far away from the track line the initial sighting occurred.

Horizontal Bearing in Degrees: The horizontal degrees from front to back (0 to 180) at which the sighting occurred.

Observer: Three lettered initial of the observer who made the sighting.

Observer Side: On which side of the plane in the direction of travel the sighting occurred.

Time and Position of Sighting

Time: The time the GPS way-point was taken while relocating animals and circling above.

WP#: GPS way-point number of the sighting.

Lat/Long: The latitude and longitude associated with the way point obtained while circling over animals.

Beaufort Sea State: The sea state observed during the sighting.

Species: Scientific binomial name of the marine mammal species involved in the sighting. When species identity could not be established unequivocally, the next higher taxonomic level to which identity could be established was used. If a cetacean was identified as a dolphin but images obtained during the encounter were not sufficient to establish species ID, the designation “unidentified delphinid” or “*T. truncatus*/*S. frontalis*” is used. If the animal could be ID’d as a cetacean only, then “unidentified cetacean” is used. If a large body was observed but it could not be established whether a cetacean, fish/shark or turtle was involved in the sighting, the designation “unidentified marine vertebrate” is used.

Criteria used to identify species: Which species specific diagnostic features were used in classifying a sighting to species (see information on diagnosis of species).

Best images used for species ID: The images obtained during the sighting that best displayed the features used to establish species.

Numbers (Low/ High/ Best): Low, high, and best estimate of number of animals involved in the sighting.

Calves observed? Whether any calves were observed during the encounter. A conservative measure is used, in that only animals roughly half the size of the associated larger animal (the presumed mother) are designated as calves.

Calculated Distance from Track Line: The distances between the break track waypoint (2.0) and the initial position of each sighting (2.4) is calculated using the online software Scripts Movable

Type (<http://www.movable-type.co.uk/scripts/latlong.html>). Since there is a bias in estimating the location of a group of mobile marine mammals from a fast moving airplane, the distances calculated between break track and sighting are rounded to 0.1 km.

Photographer: Three lettered initials of observer seated in the right camera seat.

Card #: Memory card on which the photos from the particular sighting was made.

Frame Numbers: Starting and ending frame number.

Spacer: Image used to separate sighting to clarify when one sighting ends and the next begins. Image typically of interior of plane or a 45 degree angle shot of the horizon. If taking a shot of the interior of the plane, put the camera focus setting on "manual", take the picture, then immediately set it back to "automatic".

Final Time and Position of Sighting

Time: WP#: Lat: Long: Calculated Distance traveled: → see section above.

Behavior and Additional Comments

Any behavioral notes obtained during the sighting (*e.g.* group formation, relative travel speed, feeding events or presumed copulation attempts, presence of other cetaceans or sharks in or around the animal(s) in the sighting, interaction with inanimate objects such marine debris). This section also includes notes on altitude of the survey plane during the encounter as well as any indications (or lack thereof) of the animal(s) reacting to the presence of the plane.



D

Sighting Summary Sheets



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Wednesday, January 20, 2016 Sighting # 1

Initial sighting on Track

Time: 12:16 WP#: 4 Lat: 30.566685 Long: -80.421801
Vertical Angle: 2 Horizontal Bearing in Degrees: 60 Sighting Cue: Body
On/Off Effort: On Trackline: 10 Beaufort Sea State: 3
Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 12:17 WP#: 12 Lat: 30.563429 Long: -80.418608
Species: *Tursiops truncatus* Numbers (Low/High/Best): 8 / 8 / 8
Features used in Species ID: Robust body and uniform gray

Representative images used for Species ID: 5485, 5486, 5500
Photographer: Erin Frame numbers: 5484 - 5505 Spacer: 5506
Calculated distance from Trackline: 0.47 km

Final Time and Position of Sighting

Time: 12:24 WP#: 13 Lat: 30.565784 Long: -80.418991
Calculated Distance Traveled: 0.26 km

Behavior and Additional Comments

Tight group of four animals with the rest scattered.

Wednesday, January 20, 2016 Sighting # 2

Initial sighting on Track

Time: 14:18 WP#: 36 Lat: 30.299721 Long: -80.418512
Vertical Angle: 1 Horizontal Bearing in Degrees: 70 Sighting Cue: Body
On/Off Effort: On Trackline: 6 Beaufort Sea State: 3
Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 14:20 WP#: 37 Lat: 30.302830 Long: -80.416197
Species: *Tursiops truncatus* Numbers (Low/High/Best): 2 / 2 / 2
Features used in Species ID: Robust body and uniform gray

Representative images used for Species ID: 5511, 5512, 5513
Photographer: Erin Frame numbers: 5508 - 5514 Spacer: 5515
Calculated distance from Trackline: 0.41 km

Final Time and Position of Sighting

Time: 14:20 WP#: 38 Lat: 30.302763 Long: -80.413660
Calculated Distance Traveled: 0.24 km

Behavior and Additional Comments

Two animals traveling together.

Thursday, January 21, 2016 Sighting # 1

Initial sighting on Track

Time: 8:57 WP#: 5 Lat: 30.231739 Long: -80.483204
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 5 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 8:59 WP#: 6 Lat: 30.230647 Long: -80.483711
Species: *Steno bredanensis* Numbers (Low/High/Best): 45 / 55 / 50
Features used in Species ID: Slender, white around mouth, no melon, tall dorsal fin

Representative images used for Species ID: 5523, 5532, 5533, 5543
Photographer: Tiffany Frame numbers: 5517 - 5589 Spacer: 5590
Calculated distance from Trackline: 0.13 km

Final Time and Position of Sighting

Time: 9:03 WP#: 7 Lat: 30.231261 Long: -80.484016
Calculated Distance Traveled: 0.07 km

Behavior and Additional Comments

Slow travel, multiple groups

Thursday, January 21, 2016 Sighting # 2

Initial sighting on Track

Time: 9:38 WP#: 16 Lat: 30.300929 Long: -80.319853
Vertical Angle: 3 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 6 Beaufort Sea State: 2
Observer: Tiffany Observer side: Right

Actual Time and Position of Sighting

Time: 9:38 WP#: 16 Lat: 30.300929 Long: -80.319853
Species: *Unidentified Delphinid* Numbers (Low/High/Best): 1 / 1 / 1
Features used in Species ID: N/A

Representative images used for Species ID: N/A
Photographer: Tiffany Frame numbers: N/A Spacer: N/A
Calculated distance from Trackline: N/A

Final Time and Position of Sighting

Time: 9:44 WP#: 17 Lat: 30.300293 Long: -80.321017
Calculated Distance Traveled: N/A

Behavior and Additional Comments

No resight, no photos

Thursday, January 21, 2016 Sighting # 3

Initial sighting on Track

Time: 9:47 WP#: 19 Lat: 30.300828 Long: -80.430343
Vertical Angle: 2 Horizontal Bearing in Degrees: 110 Sighting Cue: Splash
On/Off Effort: On Trackline: 6 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 9:51 WP#: 20 Lat: 30.292392 Long: -80.422111
Species: *Tursiops truncatus* Numbers (Low/High/Best): 8 / 12 / 10
Features used in Species ID: Robust, uniform gray

Representative images used for Species ID: 5592, 5633
Photographer: Tiffany Frame numbers: 5591 - 5639 Spacer: 5640
Calculated distance from Trackline: 1.23 km

Final Time and Position of Sighting

Time: 9:58 WP#: 21 Lat: 30.298723 Long: -80.431123
Calculated Distance Traveled: N/A

Behavior and Additional Comments

Medium rate of travel, some individuals saying subsurface, no final location

Thursday, January 21, 2016 Sighting # 4

Initial sighting on Track

Time: 10:00 WP#: 23 Lat: 30.302441 Long: -80.483213
Vertical Angle: 2 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 6 Beaufort Sea State: 2
Observer: Tiffany Observer side: Right

Actual Time and Position of Sighting

Time: 10:01 WP#: 24 Lat: 30.309310 Long: -80.483154
Species: *Stenella frontalis* Numbers (Low/High/Best): 20 / 30 / 25
Features used in Species ID: Spotting, alternating light and dark pattern down body

Representative images used for Species ID: 5645, 5651, 5667, 5668, 5682, 5686
Photographer: Tiffany Frame numbers: 5641 - 5713 Spacer: 5714
Calculated distance from Trackline: 0.76 km

Final Time and Position of Sighting

Time: 10:09 WP#: 25 Lat: 30.317257 Long: -80.476337
Calculated Distance Traveled: 1.10 km

Behavior and Additional Comments

Spaced out, fast travel, breaching

Thursday, January 21, 2016 Sighting # 5

Initial sighting on Track

Time: 10:14 WP#: 27 Lat: 30.300197 Long: -80.656708
Vertical Angle: 1 Horizontal Bearing in Degrees: 120 Sighting Cue: Body
On/Off Effort: On Trackline: 6 Beaufort Sea State: 2
Observer: Tiffany Observer side: Right

Actual Time and Position of Sighting

Time: 10:17 WP#: 28 Lat: 30.309623 Long: -80.635031
Species: *Tursiops truncatus* Numbers (Low/High/Best): 35 / 45 / 40
Features used in Species ID: Robust, uniform gray

Representative images used for Species ID: 5737, 5750, 5766, 5816
Photographer: Tiffany Frame numbers: 5715 - 5857 Spacer: 5828
Calculated distance from Trackline: 2.33 km

Final Time and Position of Sighting

Time: 10:23 WP#: 29 Lat: 30.314618 Long: -80.636527
Calculated Distance Traveled: 0.57 km

Behavior and Additional Comments

Thursday, January 21, 2016 Sighting # 6

Initial sighting on Track

Time: 10:34 WP#: 38 Lat: 30.364819 Long: -80.424633
Vertical Angle: 2 Horizontal Bearing in Degrees: 110 Sighting Cue: Body
On/Off Effort: On Trackline: 7 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 10:37 WP#: 39 Lat: 30.370781 Long: -80.426192
Species: *Stenella frontalis* Numbers (Low/High/Best): 3 / 3 / 3
Features used in Species ID: Spotting, alternating light and dark pattern down body

Representative images used for Species ID: 5840, 5852
Photographer: Tiffany Frame numbers: 5829 - 5861 Spacer: 5861
Calculated distance from Trackline: 0.68 km

Final Time and Position of Sighting

Time: 10:45 WP#: 40 Lat: 30.370262 Long: -80.417062
Calculated Distance Traveled: 0.88 km

Behavior and Additional Comments

Traveling, infrequently surfacing, calf present

Thursday, January 21, 2016 Sighting # 7

Initial sighting on Track

Time: 10:48 WP#: 42 Lat: 30.365227 Long: -80.323535
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 7 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 10:55 WP#: 43 Lat: 30.363600 Long: -80.320091
Species: *Tursiops truncatus* Numbers (Low/High/Best): 3 / 3 / 3
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 5867
Photographer: Tiffany Frame numbers: 5862 - 5888 Spacer: 5889
Calculated distance from Trackline: 0.38 km

Final Time and Position of Sighting

Time: 10:56 WP#: 44 Lat: 30.364905 Long: -80.318258
Calculated Distance Traveled: 0.23 km

Behavior and Additional Comments

Evasive, traveling subsurface

Thursday, January 21, 2016 Sighting # 8

Initial sighting on Track

Time: 10:58 WP#: 46 Lat: 30.364989 Long: -80.259629
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 7 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 10:59 WP#: 47 Lat: 30.366561 Long: -80.261960
Species: *Tursiops truncatus* Numbers (Low/High/Best): 3 / 3 / 3
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 5906, 5908, 5909
Photographer: Tiffany Frame numbers: 5890 - 5913 Spacer: 5914
Calculated distance from Trackline: 0.28 km

Final Time and Position of Sighting

Time: 11:01 WP#: 48 Lat: 30.365042 Long: -80.258040
Calculated Distance Traveled: 0.41 km

Behavior and Additional Comments

Milling subsurface

Thursday, January 21, 2016 Sighting # 9

Initial sighting on Track

Time: 11:33 WP#: 54 Lat: 30.432810 Long: -80.287811
Vertical Angle: 2 Horizontal Bearing in Degrees: 100 Sighting Cue: Splash
On/Off Effort: On Trackline: 8 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 11:33 WP#: 55 Lat: 30.426874 Long: -80.282085
Species: *Tursiops truncatus* Numbers (Low/High/Best): 6 / 6 / 6
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 5926, 5963, 5977, 6013
Photographer: Tiffany Frame numbers: 5915 - 5026 Spacer: 6027
Calculated distance from Trackline: 0.86 km

Final Time and Position of Sighting

Time: 11:39 WP#: 56 Lat: 30.428905 Long: -80.275306
Calculated Distance Traveled: 0.69 km

Behavior and Additional Comments

Breaching, belly to belly swimming, circling

Thursday, January 21, 2016 Sighting # 10

Initial sighting on Track

Time: 11:49 WP#: 59 Lat: 30.433671 Long: -80.683764
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Blow
On/Off Effort: On Trackline: 8 Beaufort Sea State: 2
Observer: Tiffany Observer side: Right

Actual Time and Position of Sighting

Time: 11:54 WP#: 60 Lat: 30.442949 Long: -80.678881
Species: *Tursiops truncatus* Numbers (Low/High/Best): 1 / 1 / 1
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 6028
Photographer: Tiffany Frame numbers: 6028 - 6037 Spacer: 6038
Calculated distance from Trackline: 1.13 km

Final Time and Position of Sighting

Time: 11:59 WP#: 61 Lat: 30.442041 Long: -80.676292
Calculated Distance Traveled: 0.27 km

Behavior and Additional Comments

Assumed final position, evasive, deep dives

Monday, February 29, 2016 Sighting # 1

Initial sighting on Track

Time: 11:11 WP#: 25 Lat: 30.507989 Long: -79.790886
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: Off Trackline: N/A Beaufort Sea State: 3
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 11:17 WP#: 26 Lat: 30.504532 Long: -79.805698
Species: *Tursiops truncatus* Numbers (Low/High/Best): 3 / 9 / 7
Features used in Species ID: Uniform gray, robust, white peduncles

Representative images used for Species ID: 6120
Photographer: Ryan Frame numbers: 6120 Spacer: 6121
Calculated distance from Trackline: 1.47 km

Final Time and Position of Sighting

Time: 11:26 WP#: 27 Lat: 30.513138 Long: -79.802538
Calculated Distance Traveled: 1.00 km

Behavior and Additional Comments

2 groups close together, regular surfacing, assumed final location

Monday, February 29, 2016 Sighting # 2

Initial sighting on Track

Time: 14:37 WP#: 43 Lat: 30.031175 Long: -80.442385
Vertical Angle: 2 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 2 Beaufort Sea State: 2
Observer: Ryan Observer side: Right

Actual Time and Position of Sighting

Time: 14:38 WP#: 44 Lat: 30.035751 Long: -80.440427
Species: *Stenella frontalis* Numbers (Low/High/Best): 15 / 25 / 21
Features used in Species ID: Alternating light and dark pattern down the body, spotting

Representative images used for Species ID: 6134, 6135, 6136
Photographer: Ryan Frame numbers: 6122 - 6139 Spacer: 6140
Calculated distance from Trackline: 0.54 km

Final Time and Position of Sighting

Time: 14:43 WP#: 45 Lat: 30.039673 Long: -80.431233
Calculated Distance Traveled: 0.99 km

Behavior and Additional Comments

Slow travel, logging, tight group

Monday, February 29, 2016 Sighting # 3

Initial sighting on Track

Time: 14:57 WP#: 52 Lat: 30.100741 Long: -80.577633
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 3 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 15:02 WP#: 53 Lat: 30.096328 Long: -80.577207
Species: *Tursiops truncatus* Numbers (Low/High/Best): 3 / 3 / 3
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 6156, 6164
Photographer: Ryan Frame numbers: 6141 - 6173 Spacer: 6174
Calculated distance from Trackline: 0.49 km

Final Time and Position of Sighting

Time: 15:08 WP#: 54 Lat: 30.095728 Long: -80.582875
Calculated Distance Traveled: 0.55 km

Behavior and Additional Comments

Fast travel south, close together

Tuesday, March 1, 2016 Sighting # 1

Initial sighting on Track

Time: 11:17 WP#: 29 Lat: 30.468218 Long: -79.821688
 Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
 On/Off Effort: Off Trackline: N/A Beaufort Sea State: 3
 Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 11:17 WP#: 29 Lat: 30.468218 Long: -79.821688
 Species: *Tursiops truncatus* Numbers (Low/High/Best): 3 / 3 / 3
 Features used in Species ID: Uniform gray, robust, white peduncles

Representative images used for Species ID: N/A
 Photographer: Erin Frame numbers: N/A Spacer: N/A
 Calculated distance from Trackline: N/A

Final Time and Position of Sighting

Time: N/A WP#: N/A Lat: N/A Long: N/A
 Calculated Distance Traveled: N/A

Behavior and Additional Comments

Fast travel south, tight group, white peduncles

Tuesday, March 1, 2016 Sighting # 2

Initial sighting on Track

Time: 14:06 WP#: 39 Lat: 30.366174 Long: -80.638400
 Vertical Angle: 3 Horizontal Bearing in Degrees: 60 Sighting Cue: Splash
 On/Off Effort: On Trackline: 7 Beaufort Sea State: 3
 Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 14:06 WP#: 40 Lat: 30.358468 Long: -80.641980
 Species: *Tursiops truncatus* Numbers (Low/High/Best): 7 / 7 / 7
 Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 6182, 6183
 Photographer: Erin Frame numbers: 6181 - 6192 Spacer: 6192
 Calculated distance from Trackline: 0.92 km

Final Time and Position of Sighting

Time: 14:06 WP#: 41 Lat: 30.361140 Long: -80.642155
 Calculated Distance Traveled: 0.30 km

Behavior and Additional Comments

Scattered, group of 3 and a group of 4

Tuesday, May 24, 2016 Sighting # 1

Initial sighting on Track

Time: 15:56 WP#: 5 Lat: 29.969963 Long: -80.397071
Vertical Angle: 2 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 1 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 15:59 WP#: 6 Lat: 29.971570 Long: -80.406622
Species: *Tursiops truncatus* Numbers (Low/High/Best): 4 / 7 / 6
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 9293, 9298, 9299
Photographer: Ryan Frame numbers: 9293 - 9312 Spacer: 9313
Calculated distance from Trackline: 0.94 km

Final Time and Position of Sighting

Time: 16:00 WP#: 7 Lat: 29.976152 Long: -80.405064
Calculated Distance Traveled: 0.53 km

Behavior and Additional Comments

Traveling on the surface and subsurface, 2 groups

Tuesday, May 24, 2016 Sighting # 2

Initial sighting on Track

Time: 16:57 WP#: 23 Lat: 30.105341 Long: -80.371655
Vertical Angle: 3 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 3 Beaufort Sea State: 2
Observer: Ryan Observer side: Right

Actual Time and Position of Sighting

Time: 16:57 WP#: 24 Lat: 30.095991 Long: -80.378351
Species: *Tursiops truncatus* Numbers (Low/High/Best): 6 / 10 / 8
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 9331, 9333, 9335
Photographer: Ryan Frame numbers: 9314 - 9339 Spacer: 9340
Calculated distance from Trackline: 1.22 km

Final Time and Position of Sighting

Time: 17:01 WP#: 25 Lat: 30.095380 Long: -80.377245
Calculated Distance Traveled: 0.13 km

Behavior and Additional Comments

Slow subsurface travel, dove deep after a couple of circles, calves present

Tuesday, May 24, 2016 Sighting # 3

Initial sighting on Track

Time: 17:09 WP#: 28 Lat: 30.105106 Long: -80.140215
Vertical Angle: 2 Horizontal Bearing in Degrees: 45 Sighting Cue: Body
On/Off Effort: On Trackline: 3 Beaufort Sea State: 2
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 17:09 WP#: 29 Lat: 30.110250 Long: -80.142873
Species: *Tursiops truncatus* Numbers (Low/High/Best): 12 / 18 / 15
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 9358
Photographer: Ryan Frame numbers: 9341 - 9358 Spacer: 9359
Calculated distance from Trackline: 0.63 km

Final Time and Position of Sighting

Time: 17:14 WP#: 30 Lat: 30.108200 Long: -80.132843
Calculated Distance Traveled: 0.99 km

Behavior and Additional Comments

Traveling, spaced out

Tuesday, May 24, 2016 Sighting # 4

Initial sighting on Track

Time: 17:25 WP#: 33 Lat: 30.153236 Long: -79.785687
Vertical Angle: 1 Horizontal Bearing in Degrees: 120 Sighting Cue: Body
On/Off Effort: Off Trackline: N/A Beaufort Sea State: 3
Observer: Erin Observer side: Left

Actual Time and Position of Sighting

Time: 17:27 WP#: 34 Lat: 30.148040 Long: -79.790518
Species: *Globicephala macrorhynchus* Numbers (Low/High/Best): 20 / 30 / 25
Features used in Species ID: Dark body, blunt head, short pectorals

Representative images used for Species ID: 9370, 9371
Photographer: Ryan Frame numbers: 9360 - 9374 Spacer: 9375
Calculated distance from Trackline: 0.74 km

Final Time and Position of Sighting

Time: 17:32 WP#: 35 Lat: 30.154376 Long: -79.783640
Calculated Distance Traveled: 0.97 km

Behavior and Additional Comments

Milling subsurface, scattered, multiple groups

Wednesday, May 25, 2016 Sighting # 1

Initial sighting on Track

Time: 9:11 WP#: 3 Lat: 30.233360 Long: -80.400902
Vertical Angle: 3 Horizontal Bearing in Degrees: 100 Sighting Cue: Body
On/Off Effort: On Trackline: 5 Beaufort Sea State: 2
Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 9:11 WP#: 4 Lat: 30.228263 Long: -80.406950
Species: *Stenella frontalis* Numbers (Low/High/Best): 40 / 55 / 50
Features used in Species ID: Alternating light and dark pattern, spotting

Representative images used for Species ID: 9378, 9379
Photographer: Erin Frame numbers: 9376 - 9402 Spacer: 9403
Calculated distance from Trackline: 0.81 km

Final Time and Position of Sighting

Time: 9:16 WP#: 5 Lat: 30.232403 Long: -80.407827
Calculated Distance Traveled: 0.47 km

Behavior and Additional Comments

Decent sized group, well spaced, singles then group of 12, quick surfacings then traveling slow at the surface

Wednesday, May 25, 2016 Sighting # 2

Initial sighting on Track

Time: 9:59 WP#: 12 Lat: 30.295444 Long: -80.648820
Vertical Angle: 1 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 6 Beaufort Sea State: 2
Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 10:00 WP#: 13 Lat: 30.301343 Long: -80.646774
Species: *Tursiops truncatus* Numbers (Low/High/Best): 2 / 2 / 2
Features used in Species ID: Uniform gray, robust

Representative images used for Species ID: 9407
Photographer: Erin Frame numbers: 9404 - 9416 Spacer: 9417
Calculated distance from Trackline: 0.68 km

Final Time and Position of Sighting

Time: 10:03 WP#: 14 Lat: 30.301469 Long: -80.644731
Calculated Distance Traveled: 0.20 km

Behavior and Additional Comments

Dove deep

Wednesday, May 25, 2016 Sighting # 3

Initial sighting on Track

Time: 11:39 WP#: 36 Lat: 30.564004 Long: -79.907632
Vertical Angle: 2 Horizontal Bearing in Degrees: 45 Sighting Cue: Body
On/Off Effort: On Trackline: 10 Beaufort Sea State: 1
Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 11:40 WP#: 37 Lat: 30.564468 Long: -79.912369
Species: *Tursiops truncatus* Numbers (Low/High/Best): 12 / 16 / 15
Features used in Species ID: Uniform gray, robust, white peduncles

Representative images used for Species ID: 9420, 9431, 9439, 9442
Photographer: Erin Frame numbers: 9418 - 9444 Spacer: 9445
Calculated distance from Trackline: 0.46 km

Final Time and Position of Sighting

Time: 11:43 WP#: 38 Lat: 30.571623 Long: -79.914317
Calculated Distance Traveled: 0.82 km

Behavior and Additional Comments

2 groups each 6-8 animals, active at the surface, slow travel

Wednesday, May 25, 2016 Sighting # 4

Initial sighting on Track

Time: 11:48 WP#: 40 Lat: 30.563714 Long: -80.093569
Vertical Angle: 3 Horizontal Bearing in Degrees: 90 Sighting Cue: Body
On/Off Effort: On Trackline: 10 Beaufort Sea State: 1
Observer: Erin Observer side: Right

Actual Time and Position of Sighting

Time: 11:49 WP#: 41 Lat: 30.572562 Long: -80.095279
Species: *Grampus griseus* Numbers (Low/High/Best): 8 / 8 / 8
Features used in Species ID: Gray and white body, scaring, blunt mellon

Representative images used for Species ID: 9453, 9483, 9484
Photographer: Erin Frame numbers: 9446 - 9496 Spacer: 9497
Calculated distance from Trackline: 1.00 km

Final Time and Position of Sighting

Time: 11:51 WP#: 42 Lat: 30.570174 Long: -80.094638
Calculated Distance Traveled: 0.27 km

Behavior and Additional Comments

Hanging near surface, slow/no travel, calf present

Wednesday, May 25, 2016 Sighting # 5

Initial sighting on Track

Time: 16:08 WP#: 68 Lat: 30.299855 Long: -79.811491
Vertical Angle: 2 Horizontal Bearing in Degrees: 110 Sighting Cue: Splash
On/Off Effort: Off Trackline: N/A Beaufort Sea State: 3
Observer: Ryan Observer side: Left

Actual Time and Position of Sighting

Time: 16:09 WP#: 69 Lat: 30.292277 Long: -79.813807
Species: *Tursiops truncatus* Numbers (Low/High/Best): 25 / 30 / 28
Features used in Species ID: Uniform gray, robust, white peduncles

Representative images used for Species ID: 9504, 9505
Photographer: Erin Frame numbers: 9498 - 9506 Spacer: 9507
Calculated distance from Trackline: 0.87 km

Final Time and Position of Sighting

Time: 16:16 WP#: 70 Lat: 30.291568 Long: -79.811029
Calculated Distance Traveled: 0.28 km

Behavior and Additional Comments

A couple small groups, steady travel