FINAL REPORT TO
GEORGIA DEPARTMENT OF NATURAL RESOURCES

NORTHERN EARLY WARNING SYSTEM
NORTH ATLANTIC RIGHT WHALE (*Eubalaena glacialis)*
AERIAL SURVEYS, 2004 – 2005 SEASON

June 7, 2006

Submitted by:

WILDLIFE TRUST
AQUATIC CONSERVATION PROGRAM

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Introduction

The North Atlantic Right Whale (*Eubalaena glacialis*) is protected in U.S and territorial waters pursuant to the Marine Mammal Protection Act of 1972, and is classified as an endangered species under the Endangered Species Act of 1973. The only known calving ground for the North Atlantic right whale consists of Atlantic coastal waters in the southeastern United States. The area designated as the Southeastern United States Critical Habitat (SEUS) by NOAA Fisheries in 1994 encompasses the waters from Altamaha Sound, Georgia to Sebastian Inlet, Florida out to 5-15 nm from the shoreline (50 CFR Part 226). Minimizing sources of human-caused death, injury and disturbance is the first objective of the 1991 northern right whale (*Eubalaena glacialis*) recovery plan as well as the updated draft recovery plan (NMFS 1991, 2004). Within this objective, reducing ships strikes is the first point addressed. Vessel collisions are the greatest threat to right whale survival. The SEUS calving ground includes entrances to four major shipping channels, resulting in frequent usage of these waters by large commercial and military vessels. In hopes of eliminating the risk of collision, the Early Warning System (EWS) was created to alert military and commercial vessels of the presence of right whales in the area. Early Warning System surveys were initiated in 1994 to cover areas of high whale density along the coastline from Brunswick, Georgia to St. Augustine, Florida. Data collected since that time indicates that right whales regularly utilize waters outside of the initial EWS study area. In 2002, NMFS redesigned the EWS system to include three survey areas that replaced and expanded upon the original single EWS survey area. The redesigned EWS surveys were modified to cover the waters from mid Sapelo Island, GA to the southern end of St. Augustine Beach, FL. The survey effort described in this report covers the area from the northern end of Sapelo Island, GA to mid Cumberland Island, GA, referred to as the Northern Early Warning System (NEWS).

The prioritized objectives of the 2004-2005 NEWS surveys were to: "locate right whales in the designated study area; report right whale locations in near real-time to the US Navy; determine the spatial and temporal distribution/pattern of right whales and ships occurring in the study area; assist in determining the number of calves produced in the survey season; and recommend to the Georgia Department of Natural Resources (GDNR) additional measures which, based on experience with this program, may improve the effectiveness and efficiency of right whale detection and mitigation of possible vessel collisions" (GDNR, 2004). This report examines the results of the Wildlife Trust aerial survey efforts within the Northern Early Warning System (NEWS) survey area for the 2004-2005 calving season.

Methods

Study Area

The Northern Early Warning System (NEWS) survey season began on December 1, 2004 and concluded on March 31, 2005. The NEWS survey area for the 2004-2005 season extended from the northern end of Sapelo Island, GA to mid Cumberland Island, GA, and out to approximately 32 nautical miles offshore. Fourteen east/west transect lines of varied lengths (28.8 – 32.4 nm) were flown at 3nm intervals (Figure 1). A complete survey consisted of 442.8 nm of trackline (Table 1), not including miles flown in transit to, from, and between transect lines. Without any whale sightings, a complete survey took approximately five hours to finish.

Aerial Surveys

Surveys were scheduled to be flown daily from December 1, 2004 through March 31, 2005, weather permitting and under VFR (visual flight rules) conditions. During each normal survey day, the survey aircraft departed from Malcolm McKinnon airport on St. Simons Island, GA and returned to the same airfield. All but one of the NEWS surveys were conducted in a NOAA owned and operated DeHaviland Twin Otter aircraft. On March 24, 2005, a survey was flown in a twin engine Cessna Skymaster because of required maintenance on the NOAA Twin Otter. The survey aircrafts were equipped with Global

Positioning System navigation aids, radar, aviation VHF radio, marine VHF radio, a life raft, PFDs, survival suits, flares, EPIRB, an aircraft ELT and a satellite telephone. Additionally, individually registered GPIRBs, knives, streamers, and strobes were issued to the observers. Flight protocols also included mandatory use of PFDs and Nomex flight suits on all flights. All observers were also required to complete emergency egress training prior to the start of the survey season.

Table 1: Northern early warning system survey transects for the 2004-2005 Season.

Transect Number	**Length (NM)**	**Western Waypoint**		**Eastern Waypoint**	
1	31.5	30° 53 N	81° 22 W	30° 53 N	80° 47 W
2	31.5	30° 56 N	81° 22 W	30° 56 N	80° 47 W
3	31.5	30° 59 N	81° 22 W	30° 59 N	80° 47 W
4	32.4	31° 02 N	81° 23 W	31° 02 N	80° 47 W
5	32.4	31° 05 N	81° 23 W	31° 05 N	80° 47 W
6	29.7	31° 08 N	81° 20 W	31° 08 N	80° 47 W
7	32.4	31° 11 N	81° 20 W	31° 11 N	80° 44 W
8	28.8	31° 14 N	81° 16 W	31° 14 N	80° 44 W
9	32.4	31° 17 N	81° 16 W	31° 17 N	80° 40 W
10	31.5	31° 20 N	81° 15 W	31° 20 N	80° 40 W
11	33.3	31° 23 N	81° 15 W	31° 23 N	80° 38 W
12	31.5	31° 26 N	81° 13 W	31° 26 N	80° 38 W
13	32.4	31° 29 N	81° 10 W	31° 29 N	80° 34 W
14	31.5	31° 32 N	81° 09 W	31° 32 N	80° 34 W

Total NM 442.8

The NEWS surveys were flown at an altitude of 1000 ft (303 m) and at a ground speed of 100 knots. The surveys were typically begun at the western waypoint of the most northern trackline, transect 14, and flown north to south. However, the start point and direction of flight was determined daily based on weather conditions in the survey area and other survey factors. The necessary environmental conditions for a survey flight included a minimum ceiling of 455m, visibility greater than 2nm, wind speed less than 21 knots, and Beaufort sea state of 6 or less. The survey crew consisted of a pilot and co-pilot, two observers, data recorder, and a photographer. The survey crew would rotate between the two observer positions and photographer position every four tracklines throughout the duration of the survey. The observers were positioned on either side of the aircraft at the forward bubble windows and all sightings of marine animals were reported to the data recorder. The data recorder did not rotate and used a laptop computer to log all sightings into Logger 2000, a software program designed for marine data entry. The time, location, number, and species of all marine mammals, sea turtles, sharks, rays, and certain types of fish were recorded. In addition, all types of vessels observed in the survey area were recorded. Sighting angles for all large vessels were recorded using a digital inclinometer. The sighting distance for all large whales was calculated from exact overhead GPS locations.

When a right whale was observed, a GPS position was recorded along the trackline at the point of observation. The survey aircraft then broke track and flew directly over the right whale to obtain an exact GPS location. The aircraft also circled over each right whale encountered to obtain digital photographs and sketches. The circling for photographic documentation was generally limited to 15 minutes for each sighting. After the right whales were fully documented, the aircraft returned to the trackline at the point of departure to continue the survey. However during special events, such as a right whale entanglement or ship strike, the survey area was modified as needed and the time spent obtaining photographs was extended past the 15-minute limit.

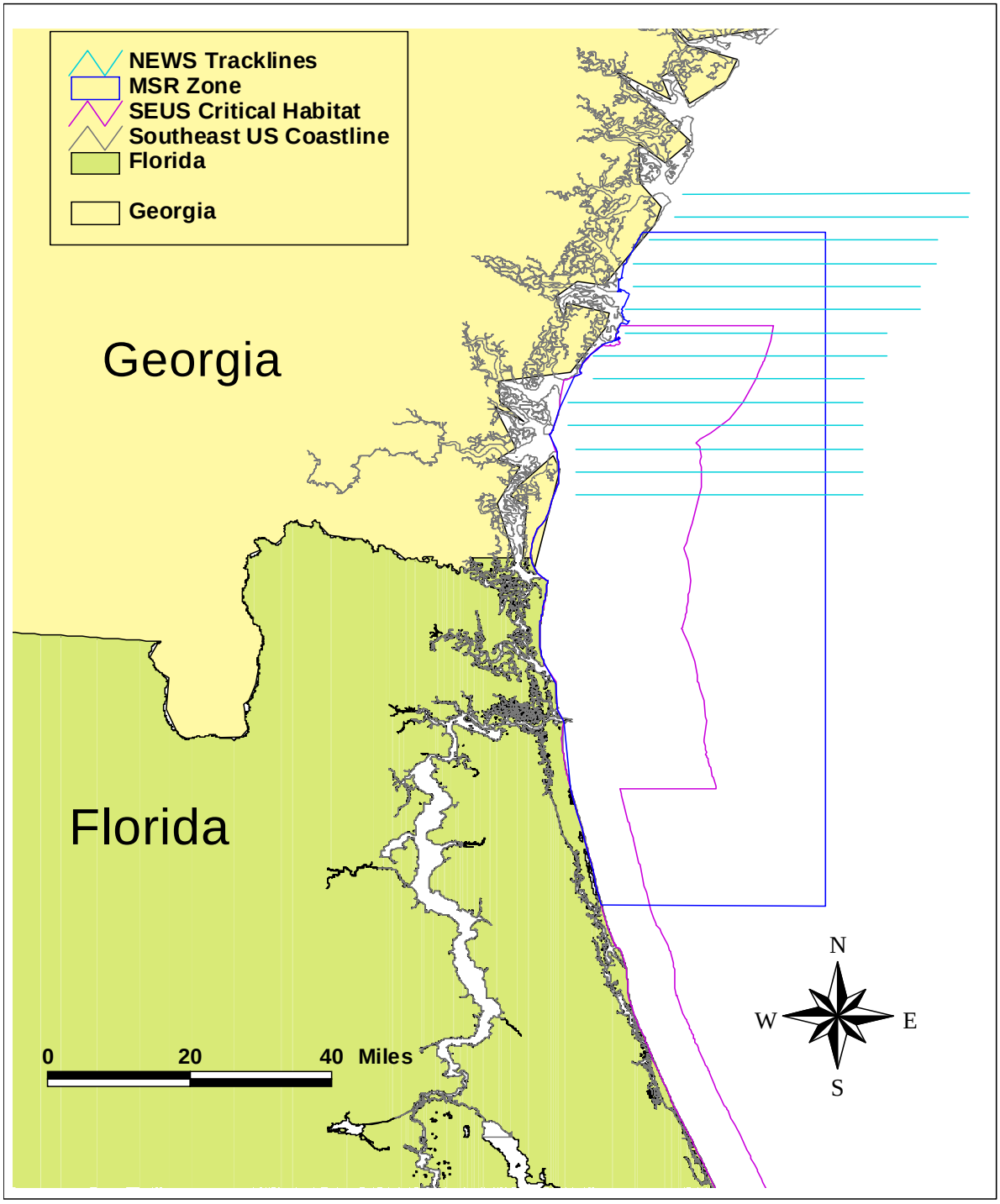

Figure 1: Map of NEWS survey tracklines flown from 01 December 2004 through 31 March 2005, including designated critical habitat and Mandatory Ship Reporting (MSR) zone.

Notification of Right Whale Sighting Information
Upon completing data collection for each right whale sighting, the survey aircraft would immediately attempt to contact the Fleet Area Control and Surveillance Facility (FACSFACJAX) at Naval Air Station Jacksonville. This was normally accomplished via satellite phone. If this method was unsuccessful, the information was either relayed via another survey aircraft or telephoned in immediately after the survey aircraft was on the ground. The right whale sighting information reported to the FACSFACJAX dispatcher included date, time, latitude and longitude, direction of movement, age class and number of right whales sighted. FACSFACJAX would then follow up the sighting by contacting all military ships and aircraft in the southeastern United States (SEUS) almost instantaneously with the right whale sighting information. In addition, the facility would notify all other military and non-military interests via an alphanumeric pager system and email (Taylor and Brooks 2002). These interests included all aerial survey teams, ship channel pilots, USCG NAVTEX, and state agencies. This near real-time notification of right whale sightings to various entities was put in place to help eliminate the possibility of right whale deaths due to ship strike. It also allows aerial survey teams to investigate and verify sightings reported from other sources such as the Coast Guard, military ships, dredges and other aircraft.

Determination of Sighting Distance from the Trackline
Sighting distance from the trackline for observed right whales was calculated whenever possible, using the lat/long position on the trackline perpendicular to the position of the whale sighting (lat_1, $long_1$), and the lat/long exact overhead position of the right whale (lat_2, $long_2$). The whale's distance in nautical miles from the trackline was determined by subtracting the distance between the two latitude positions, as 1 minute of latitude=1nm in the study area (Figure 2).

The sighting distance from the trackline for large vessels was determined using angles obtained from a digital inclinometer at the time of the vessel's sighting. The angle was obtained when the vessel was directly perpendicular to the point on the trackline where the location was marked. Using the altitude of the aircraft (y) and the known angle (A) of the object, the distance (x) of the vessel from the trackline could be determined from the following equation (Figure 2):

$$x=y(\tan A), \text{ where } y=\text{aircraft altitude in meters}$$

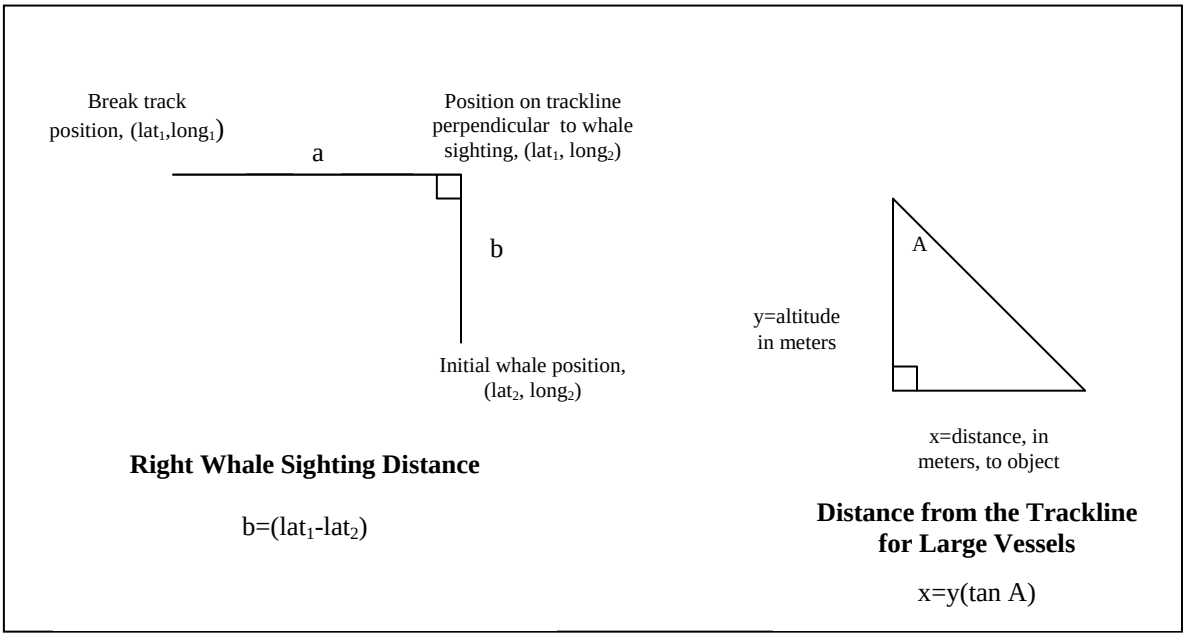

Figure 2: Diagram of methods for determining sighting distances for right whales and large vessels.

Documentation of Whale/Vessel Interactions
Due to the significant impact of ship collisions and other anthropogenic activities on the North Atlantic right whale (NMFS 1991, 2004), the Wildlife Trust survey team documented any incident in which a vessel was observed heading directly towards or approaching within a close proximity to right whales. The survey team would suspend the normal survey to document the location, number, heading and behavior of the whales involved in the episode. The location, name, type, length, speed and heading of each of the vessels involved were also recorded throughout the event. Observations of the incident were documented until the vessels were no longer in the same vicinity as the right whales. Photographic and video documentation were taken whenever possible. Also, attempts were made to contact the vessels over VHF to make them aware of the presence and location of the right whales. All the information collected for each whale/vessel interaction was entered into detailed report forms and then submitted to the National Oceanographic and Atmospheric Association (NOAA), the Georgia Department of Natural Resources (GDNR) and the Florida Wildlife Research Institute (FWRI).

Photographic Identification
Right whales are individually identified by the patterns of cornified skin primarily located on the top of the head between the tip of the rostrum and the blowhole (Payne *et al.* 1983; Kraus *et al.* 1986). Photographs of these right whale callosity patterns and other features, including scars, are used for identification and the cataloging of individual right whales. Right whales observed during the NEWS aerial surveys were photographed and sketched in order to identify individual animals using these unique patterns and features.

During a right whale sighting, the left-side observer recorded whale behaviors and sketched the callosity patterns and body scarring of the whales being observed. The right-side observer would shift to the left side of the plane and assist in observing the whales' behaviors. The crewmember in the photographer position would remove the window next to the left rear seat. The survey aircraft would circle at an altitude of 1000 ft (303m) while animals were photographed through the open window. Photographs were taken of whales using a Canon D60 digital camera with a 100-400 mm lens, or a Canon 10D digital camera with a fixed 300 mm lens. In addition, a photographic technique developed by Peter Duley and Tim Cole of the NOAA Northeast Fisheries Science Center was utilized during certain surveys throughout the 2004-2005 NEWS survey season. The technique consisted of a belly mounted Canon Mark II 1Ds digital camera connected to a laptop. The system was used to photograph right whales while flying directly over the animals, instead of banking at tight angles in order to photograph out of the side window. The connection to the laptop also allowed for real time viewing of images. Whenever the belly mounted camera system was utilized, additional identification photographs were obtained from the side window. These additional side window images were acquired because the belly mounted camera system is still in a testing phase for use in the SEUS right whale aerial surveys.

All the photographs obtained during the 2004-2005 NEWS survey season were compared against each other and against the New England Aquarium's catalog of North Atlantic right whales in order to determine the probable identity of each individual whale encountered. This preliminary photoanalysis by the Wildlife Trust team and initial verification by New England Aquarium (NEA) has been completed and all photographs taken during the 2004-2005 season have been sent to the researchers at the New England Aquarium for final comparison and confirmation.

Results

Surveys
A total of 67 NEWS surveys were flown during the 121 available survey days of the 2004-2005 North Atlantic right whale calving season (Table 2). A total of 323.0 hours of hobbs time was logged for the NEWS surveys, averaging 4.8 hours of hobbs time per survey. Overall, 23,220.9 nautical miles of

trackline were flown, with 12,089.1 nm (52%) of this total flown in a sea state of 3 or less. The complete survey area (442.8 nautical miles of trackline) was covered during 28 of the NEWS surveys. On 39 of the NEWS flights, the survey area was partially covered due to factors such as inclement weather, limited available daylight hours or special events. During eight of these 39 partial surveys, over 90% of the total 442.8 nautical miles of trackline was covered. Days with no survey effort in the NEWS survey area were mostly due to unacceptable weather conditions. Other factors contributing to no fly days were aircraft related reasons, such as required rest for survey pilots after six days of flying, and logistics associated with required 100-hour safety inspections and other plane maintenance (Table 3).

Beyond the NEWS surveys conducted during the 2004 – 2005 season, the Wildlife Trust survey team was also involved in six flights which were conducted under special circumstances dealing with a dead right whale (EGNO-2143), an entangled right whale (EGNO-3314) and a right whale struck by a vessel (EGNO-2425) (Table 4). On December 21, 2004, the Wildlife Trust survey team located an entangled whale at the northern end of the NEWS survey area. The whale was later identified as EGNO-3314 (Yellowfin). The Wildlife Trust survey team spent 4.3 hours that day observing the entangled whale and acting as aerial support for a disentanglement effort. On December 30 and 31, 2004, the Wildlife Trust team was involved in another disentanglement attempt for Yellowfin (EGNO 3314) through locating, tracking by telemetry and observing the entangled whale off the coast of South Carolina. On January 13, 2005, the survey team assisted in locating a dead pregnant right whale female (EGNO-2143) that had been spotted off of Cumberland Island, GA the previous day. Following the Super Bowl in Jacksonville, the Wildlife Trust team surveyed the Fernandina channel area as part of a contingency plan to intensely cover the main channels outside Jacksonville as cruise ships left the area. Finally, the Wildlife Trust survey team documented a right whale struck by a 43-foot vessel on March 10, 2005. These six special circumstance flights involved a total of 16.1 hours of flight hobbs time (Table 4).

Table 2: NEWS Right Whale Surveys Conducted from 01 December 2004 through 31 March 2005.

Date	Survey Name	Complete Surveys	Partial Surveys	Survey Hobbs Time	Total trackline nmiles flown	Trackline nmiles flown in Beaufort SS ≤ 3	Number of Whales Seen
02-Dec-04	NEWS041202	1		5.2	442.8	36.0	0
03-Dec-04	NEWS041203		1	5.0	416.5	63.0	0
05-Dec-04	NEWS041205	1		5.2	442.8	424.1	0
06-Dec-04	NEWS041206	1		5.6	442.8	442.8	1
07-Dec-04	NEWS041207	1		5.6	442.8	0.0	2
09-Dec-04	NEWS041209	1		5.3	442.8	74.7	0
12-Dec-04	NEWS041212		1	3.9	315.9	5.4	0
16-Dec-04	NEWS041216		1	1.9	86.7	0.0	0
17-Dec-04	NEWS041217		1	3.0	206.2	0.0	0
18-Dec-04	NEWS041218	1		5.1	442.8	199.6	0
19-Dec-04	NEWS041219		1	3.6	281.4	0.0	0
21-Dec-04	NEWS041221		1	1.5	8.1	8.1	4
22-Dec-04	NEWS041222	1		6.2	442.8	204.0	3
24-Dec-04	NEWS041224		1	3.4	250.5	15.4	0
27-Dec-04	NEWS041227		1	3.7	283.3	0.0	0
28-Dec-04	NEWS041228		1	2.0	113.4	0.0	0
29-Dec-04	NEWS041229	1		5.9	442.8	437.1	0

Date	Survey Name	Complete Surveys	Partial Surveys	Survey Hobbs Time	Total trackline nmiles flown	Trackline nmiles flown in Beaufort SS ≤ 3	Number of Whales Seen
31-Dec-04	NEWS041231	1		6.1	442.8	240.9	3
01-Jan-05	NEWS050101	1		6.1	442.8	441.2	2
02-Jan-05	NEWS050102	1		6.9	442.8	387.5	5
03-Jan-05	NEWS050103		1	4.5	378.9	147.6	0
04-Jan-05	NEWS050104		1	4.2	218.7	218.7	6
06-Jan-05	NEWS050106	1		5.4	442.8	442.8	0
07-Jan-05	NEWS050107		1	6.6	410.4	410.4	7
08-Jan-05	NEWS050108		1	4.5	378.9	334.3	0
09-Jan-05	NEWS050109		1	3.3	192.6	192.6	0
11-Jan-05	NEWS050111		1	6.6	432.4	432.4	10
13-Jan-05	NEWS050113		1	1.9	77.4	4.5	1
19-Jan-05	NEWS050119	1		5.7	442.8	166.1	3
20-Jan-05	NEWS050120		1	5.6	409.7	93.6	4
21-Jan-05	NEWS050121		1	6.5	378.9	267.3	5
24-Jan-05	NEWS050124	1		5.6	442.8	54.9	3
25-Jan-05	NEWS050125		1	4.8	390.0	121.7	0
26-Jan-05	NEWS050126	1		5.4	442.8	18.9	0
27-Jan-05	NEWS050127		1	2.5	140.0	0.0	0
31-Jan-05	NEWS050131		1	3.4	242.3	0.0	0
06-Feb-05	NEWS050206		1	1.5	71.5	0.0	0
07-Feb-05	NEWS050207		1	3.0	250.2	0.0	0
08-Feb-05	NEWS050208		1	5.1	394.7	261.3	4
09-Feb-05	NEWS050209	1		5.3	442.8	373.7	2
11-Feb-05	NEWS050211		1	2.7	198.0	50.9	2
12-Feb-05	NEWS050212		1	5.5	415.2	88.5	5
13-Feb-05	NEWS050213	1		6.5	442.8	410.8	2
14-Feb-05	NEWS050214		1	5.7	409.4	63.8	4
16-Feb-05	NEWS050216		1	3.8	312.2	202.3	0
18-Feb-05	NEWS050218		1	5.5	337.5	172.7	11
19-Feb-05	NEWS050219		1	6.1	397.1	344.8	4
20-Feb-05	NEWS050220	1		6.4	442.8	442.8	10
21-Feb-05	NEWS050221	1		6.1	442.8	54.1	4
22-Feb-05	NEWS050222		1	5.1	389.9	99.0	0
28-Feb-05	NEWS050228		1	5.0	352.1	91.2	7
02-Mar-05	NEWS050302		1	5.5	364.9	0.0	6
04-Mar-05	NEWS050304	1		7.2	442.8	357.2	11
05-Mar-05	NEWS050305		1	7.0	409.6	13.1	13
07-Mar-05	NEWS050307	1		6.8	442.8	72.5	18
09-Mar-05	NEWS050309	1		5.9	442.8	327.6	2

Date	Survey Name	Complete Surveys	Partial Surveys	Survey Hobbs Time	Total trackline nmiles flown	Trackline nmiles flown in Beaufort SS ≤ 3	Number of Whales Seen
10-Mar-05	NEWS050310		1	2.5	136.4	57.3	6
11-Mar-05	NEWS050311		1	3.3	249.2	8.6	0
14-Mar-05	NEWS050314		1	1.6	85.0	17.9	0
18-Mar-05	NEWS050318		1	1.9	34.2	27.7	4
19-Mar-05	NEWS050319		1	5.2	403.4	175.2	0
20-Mar-05	NEWS050320	1		5.7	442.8	390.4	4
21-Mar-05	NEWS050321	1		5.4	442.8	442.8	2
24-Mar-05	NEWS050324	1		7.6	442.8	406.9	2
29-Mar-05	NEWS050329	1		5.7	442.8	381.0	2
30-Mar-05	NEWS050330	1		5.4	442.8	442.8	0
31-Mar-05	NEWS050331	1		5.3	442.8	426.7	0
Total	**67 Surveys**	**28**	**39**	**323.0**	**23220.9**	**12089.1**	**185**

Table 3: Aircraft related reasons for partial or no survey by Wildlife Trust in the NEWS survey area during the 2004 - 2005 calving season.

Date	Fly-able Day	Survey Attempted by WT	Aircraft Related Reasons for Partial or No Survey by Wildlife Trust
04-Dec-04	Yes	No	Required Pilot Downtime due to 6 Day Rule
05-Jan-05	Yes	No	Required Pilot Downtime due to 6 Day Rule
10-Jan-05	No	No	Switching Survey Planes - Required Maintenance on NOAA57 Finished
12-Jan-05	Yes	No	Required Pilot Downtime due to 6 Day Rule
10-Feb-05	Yes	No	Required Pilot Downtime due to 6 Day Rule
17-Feb-05	Yes	No	100 hr. Scheduled Maintenance on NOAA57
18-Feb-05	Yes	Partial	NOAA57 Maintenance Finished at Noon - Only Partial Survey Possible
03-Mar-05	Yes	No	Mechanical Problems with NOAA57
06-Mar-05	Yes	No	Required Pilot Downtime due to 6 Day Rule

Table 4: Wildlife Trust special circumstance flights during the 2004-2005 aerial survey season.

Date	Flight Name	Flight Hobbs Time	Description of Flight	Number of Whales Seen
21-Dec-04	ENTG041221	4.3	Yellowfin (EGNO-3314) Disentanglement Support off GA	1
30-Dec-04	ENTG041230	3.6	Locate Entangled Whale, Yellowfin (EGNO-3314), off SC	1
31-Dec-04	ENTG041231	1.0	Transit from Charleston, SC to Georgia	0
13-Jan-05	NEWS050113	1.7	Search for Dead Whale (EGNO-2143) off GA	1 (Dead)
07-Feb-05	EWS050207	2.2	Survey of Fernandina Channel after the Super bowl	0
10-Mar-05	NEWS050310	3.3	Document Right Whale Vessel Strike (EGNO-2425)	2
	Total	**16.1**		

On three days in which the Wildlife Trust survey team was unavailable to fly the NEWS survey due to aircraft related reasons or special circumstance flights, the portion of the NEWS survey area covering the Brunswick channel was flown by the NEA or FWRI aerial survey teams. The FWRI team surveyed the Brunswick channel on December 30, 2004 and January 12, 2005. On February 24, 2005, the NEA survey team flew the Brunswick channel to search for a right whale that was possibly hit by a dredge. In total, there were four sightings consisting of five adults and one mother/calf pair on these three days (Table 5).

Table 5: NEA and FWRI right whale sightings in the NEWS survey area during the 2004-2005 season.

Sighting Number	Month	Day	Year	Time	DecLat	DecLong	Right Whales Sighted	Time Report	NRW Number	Comments
1	12	30	2004	13:56	31.150	-80.967	1 Adult	14:45	NRW05040	Sighted by FWRI
2	01	12	2005	12:59	30.867	-81.267	2 Adults	13:41	NRW05134	Sighted by FWRI
3	01	12	2005	15:36	31.167	-81.500	2 Adults	15:55	NRW05138	Sighted by FWRI
4	02	24	2005	11:56	31.067	-81.200	Mother/calf pair	13:55	NRW05417	Sighted by NEA

Right Whale Sightings and Identifications

The Wildlife Trust survey team documented a total of 185 right whales during 79 sightings while conducting the NEWS surveys (Appendix 1). Thirty-six mother/calf pairs, 18 single animals, 16 groups of 2 or 3 adult/juvenile right whales and 9 groups of 4 or more right whales were observed during these sightings (Figure 3). These totals do not include any sightings by other aerial survey teams in the NEWS area, nor do they include one additional whale sighting by the Wildlife Trust survey team off of South Carolina. This sighting of the entangled whale, Yellowfin (EGNO-3314), off of Charleston, South Carolina was the only sighting by the Wildlife Trust team outside of the NEWS survey area during the 2004-2005 calving season. If this sighting is included in the overall totals, the Wildlife Trust survey team observed 186 whales during 80 sightings.

Six of the total sightings, involving eight whales, resulted in no photographic documentation due to elusive behavior by the animals. Preliminary photo analysis of all other sightings by the Wildlife Trust team and initial verification by New England Aquarium has resulted in the identification of 16 individual mother/calf pairs seen by the Wildlife Trust survey team during the 2004-2005 calving season. An additional 61 individual adult/juvenile whales were observed during the NEWS surveys. Thirty-four of the 61 individual adult/juvenile whales still do not have a confirmed identification. Any preliminary identifications (EGNOs) of the 93 total individual whales for the season have been included in the "EGNO" column of Appendix 1. The numbers and codes listed in the "EGNO" column of Appendix 1 include EGNO numbers for known whales and intermatch codes (i.e. BK02 or CT07). These intermatch codes were provided by NEA to assist in the preliminary matching of juvenile whales until they are assigned EGNOs However, all right whale identifications listed within this report should be considered unverified until NEA has analyzed all photographs from the 2004-2005 southeast calving season. All of the images and data for the NEWS surveys have been forwarded to NEA for this final confirmation process that will most likely be completed sometime in 2006. Thus, all identification results within this report should be viewed as preliminary and subject to change.

Of the 93 total individual whales observed in the NEWS area during the 2004-2005 season, 43 animals have been initially identified and assigned their EGNO number from the North Atlantic Right Whale Catalog. Basic demographic information for these individuals is provided below (Table 6). Preliminary photo analysis by NEA indicates that EGNO 1207, EGNO 1624 and possibly two unidentified whales were only observed in the NEWS survey area during the 2004-2005 SEUS right whale season.

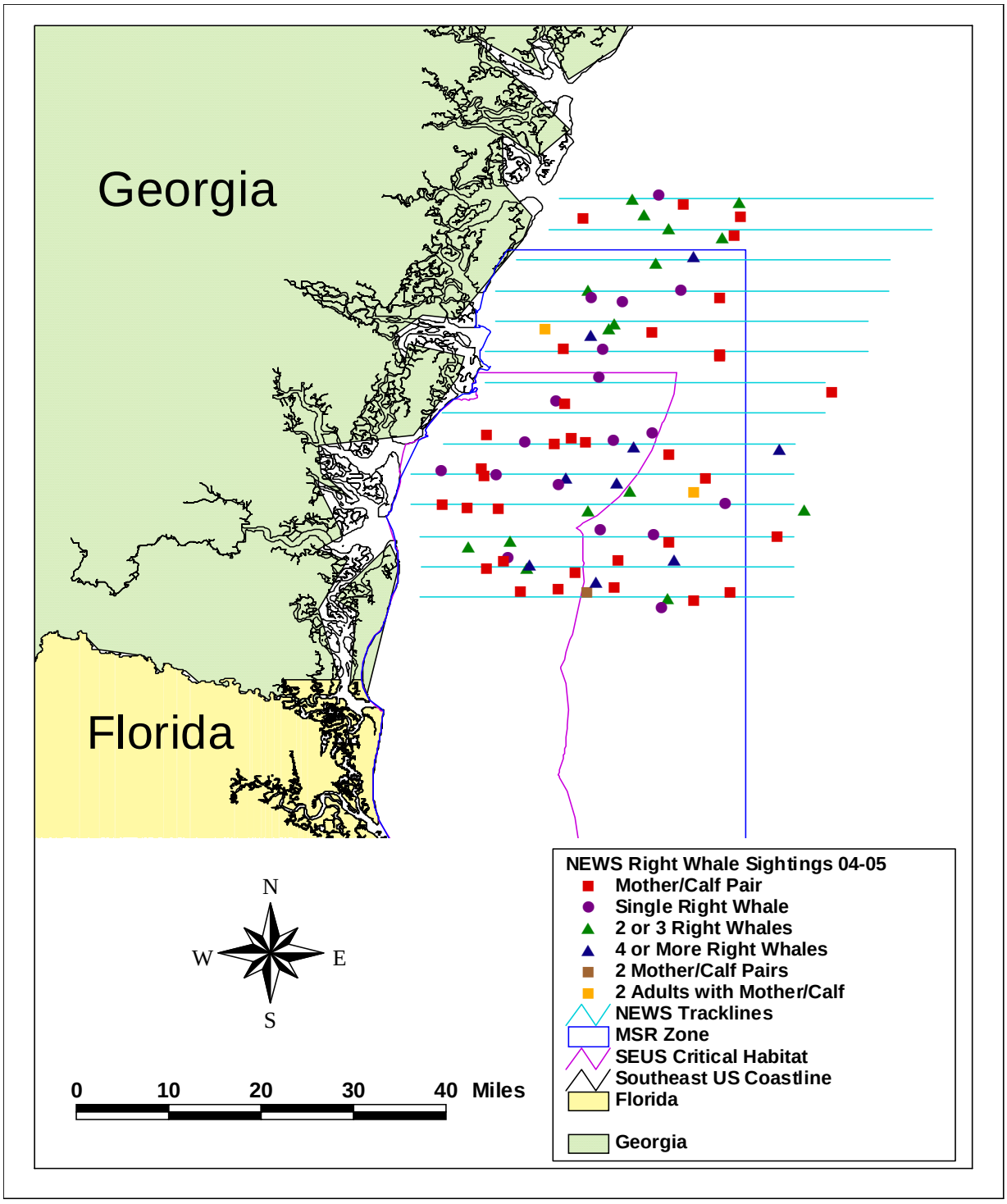

Figure 3: Right whale sightings documented during the 2004-2005 NEWS right whale aerial surveys.

Table 6: Demographic information for identified right whales sighted in the NEWS survey area during the 2004-2005 season. (Provided by NEA)

EGNO	Sex	Age	Mother in 04-05 season	Last Calving	Number of Calves (including 04-05 season)
1012	F	Unknown	Yes	2001	6
1013	F	Unknown	Yes	1997	6
1039	F	25	Yes	2001	2
1131	M	Unknown	No	N/A	N/A
1145	F	Unknown	Yes	2002	6
1158	F	Unknown	No	N/A	N/A
1179	F	Unknown	Yes	2002	2
1204	F	Unknown	Yes	2002	6
1207	M	Unknown	No	N/A	N/A
1241	F	23	Yes	2002	4
1245	F	23	Yes	2001	3
1246	F	Unknown	Yes	2002	6
1323	M	Unknown	No	N/A	N/A
1327	M	Unknown	No	N/A	N/A
1334	F	Unknown	Yes	2000	7
1408	F	21	Yes	2002	3
1423	U	Unknown	No	N/A	N/A
1622	F	Unknown	Yes	2002	3
1624	M	Unknown	No	N/A	N/A
1632	F	Unknown	Yes	2002	2
1703	F	18	Yes	2001	2
1712	M	Unknown	No	N/A	N/A
1803	M	17	No	N/A	N/A
2010	M	15	No	N/A	N/A
2040	F	Unknown	Yes	2002	2
2143	F	14	No	N/A	N/A
2425	F	11	No	N/A	N/A
2427	M	11	No	N/A	N/A
2541	M	10	No	N/A	N/A
2602	M	9	No	N/A	N/A
2611	F	9	No	N/A	N/A
2614's yearling	U	1	No	N/A	N/A
2630	M	Unknown	No	N/A	N/A
2645	F	Unknown	No	N/A	N/A
2681	M	9	No	N/A	N/A
2790	F	Unknown	Yes	N/A	1
2795	U	Unknown	No	N/A	N/A
3040	M	Unknown	No	N/A	N/A
3160	U	4	No	N/A	N/A
3308	U	2	No	N/A	N/A
3314	M	2	No	N/A	N/A
3346	M	2	No	N/A	N/A
3351	U	2	No	N/A	N/A

As of mid March 2005, a total of 27 mother/calf pairs had been identified in the Southeast US. Since that time, another mother (EGNO 3010) for the 2004-2005 calving season was identified off of Jacksonville, FL in mid April. This addition brings the total number of mother/calf pairs to 28 as of the end of May 2005. According to the New England Aquarium, this is the second highest number of recorded births in the SEUS since 1990. The highest number of births was 31 during the 2000-2001 SEUS right whale calving season (Heather Pettis, New England Aquarium, written communication). It is also important to note that at least 13 of the mothers observed during the 2004-2005 season last gave birth three years ago, and the overall calving interval for the season is 3.65 years (Monica Zani, New England Aquarium, personal communication). The typical calving interval for North Atlantic right whales had been concluded to range from 3 to 5 years, but the calving intervals had been increasing in the 1990's (Kraus and Hatch, 2001). It is important to note that this is the second calving season in a row in which a large number of the documented mothers last gave birth three or less years previous. It will be interesting to note if this general trend of high numbers of births and shorter calving intervals continues in the coming calving seasons, or if it is simply a short-term anomaly.

Beyond the high number of mother/calf pairs observed during the calving season, some interesting associations were noted for mother/calf pairs in the NEWS survey area. On two occasions, mother/calf pairs were seen associated with 2 adults/juveniles (EGNO 1246/calf on March 7, 2005 and EGNO 1632/calf on March 18) (Appendix 1). Also on one occasion, two mother/calf pairs (EGNO 1408/calf and EGNO 1241/calf) were observed together. These two right whale mother/calf pairs were sighted at 30º53.470N and 81º06.540W at 13:18(L) on February 8, 2005, approximately 17 miles off of Cumberland Island, GA (Figure 3). At the beginning of the sighting, the mothers and calves were 40-50 meters apart, but as observations continued they swam within about 20 meters of each other. Overall, all four animals were slowly swimming to the northeast. Both calves were within one body length of their mother throughout the 13 minutes of observation. The mothers never engaged in any interaction or body contact with the other mother, nor did the calves interact with each other. The only body contact observed was between the mothers and their respective calves. At one point, 1408 was seen swimming on her side with her left pectoral fin out of the water and her calf next to her. She was also seen rolling at the surface (exposing a white belly) and staying ventral for a few seconds before rolling back to a dorsal position. This rolling behavior occurred when the mother/calf pairs were in generally close proximity. During the sighting, it appeared as if EGNO 1241's calf might have been nursing, as indicated by the long period of time the calf spent positioned underneath EGNO 1241. EGNO 1241 could also be seen just below the surface, seldom surfacing during the observation period. On the other hand, EGNO 1408 and her calf remained at the surface for most of the sighting. Overall, it appeared that despite the close proximity of the two mother/calf pairs there was no physical interaction between them, but also no obvious avoidance.

Temporal and Spatial Movements of Right Whales

Figure 4 illustrates the NEWS right whale sightings classified by survey month. All December sightings were located in the northern half of the survey zone. The January and February sightings were spread throughout the NEWS area, but a majority of the sightings occurred in the southern section of tracklines. Finally, the March sightings were generally spread throughout the northern and southern sections of the survey area. These sightings follow the trend of right whales moving into the NEWS area during the month of December, moving further south during the months of January and February, and then heading north during the month of March. It is interesting to note that every survey month had a substantial number of sightings occurring outside of the designated critical habitat and the Mandatory Ship Reporting (MSR) Zone. Overall, 59% of all right whale sightings documented during the 2004-2005 NEWS surveys were located outside of the currently designated right whale critical habitat. It should also be noted that in Figures 3 and 4, there is an obvious absence of right whale sightings on the eastern ends of the top six NEWS tracklines (tracklines 9-14). This absence does not necessarily indicate a lack of right whale presence in this area, but is more likely due to the fact that the eastern ends of these tracklines were often truncated during surveys due to very high sea states.

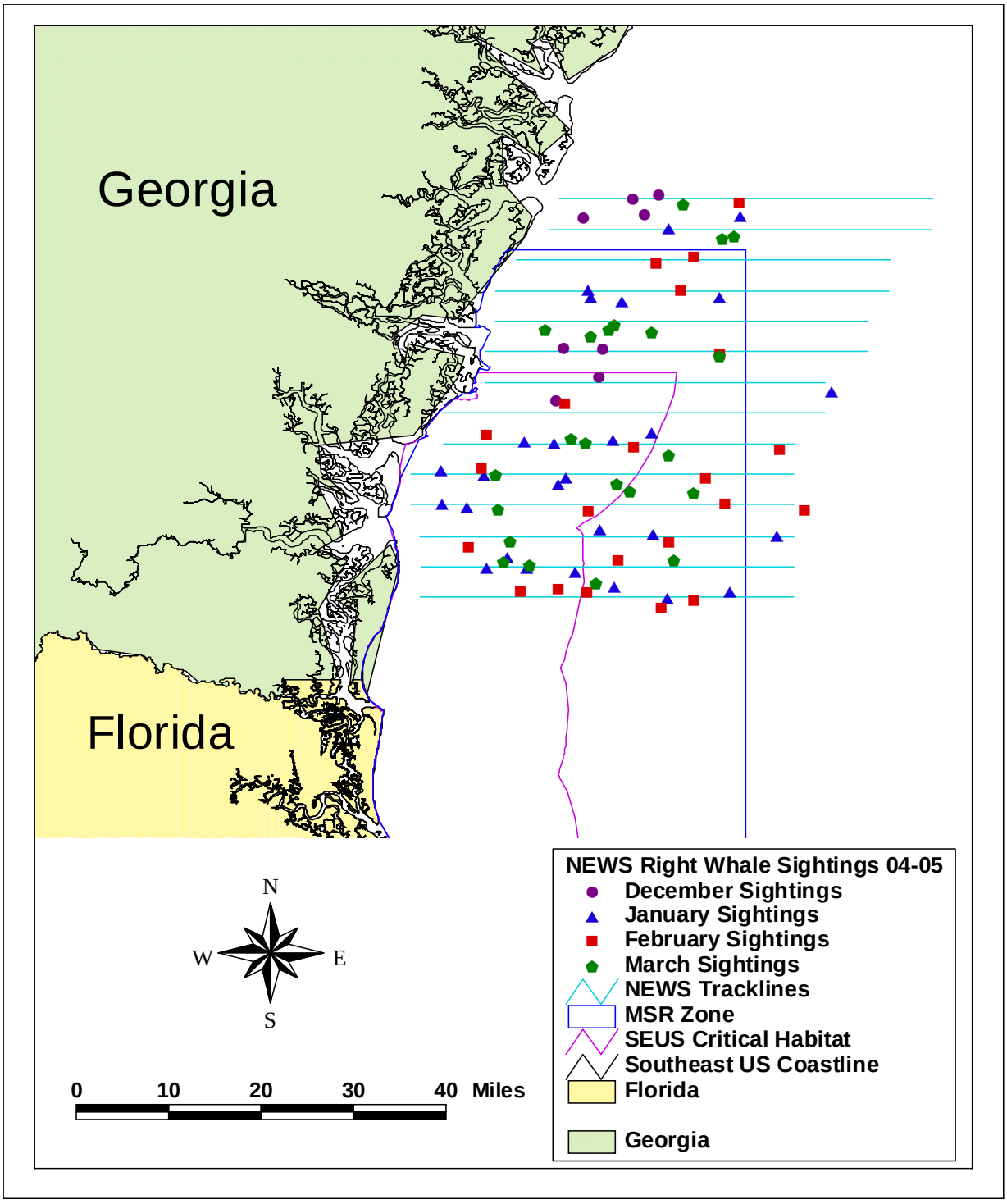

Figure 4: Northern Early Warning System 2004-2005 right whale sightings classified by month.

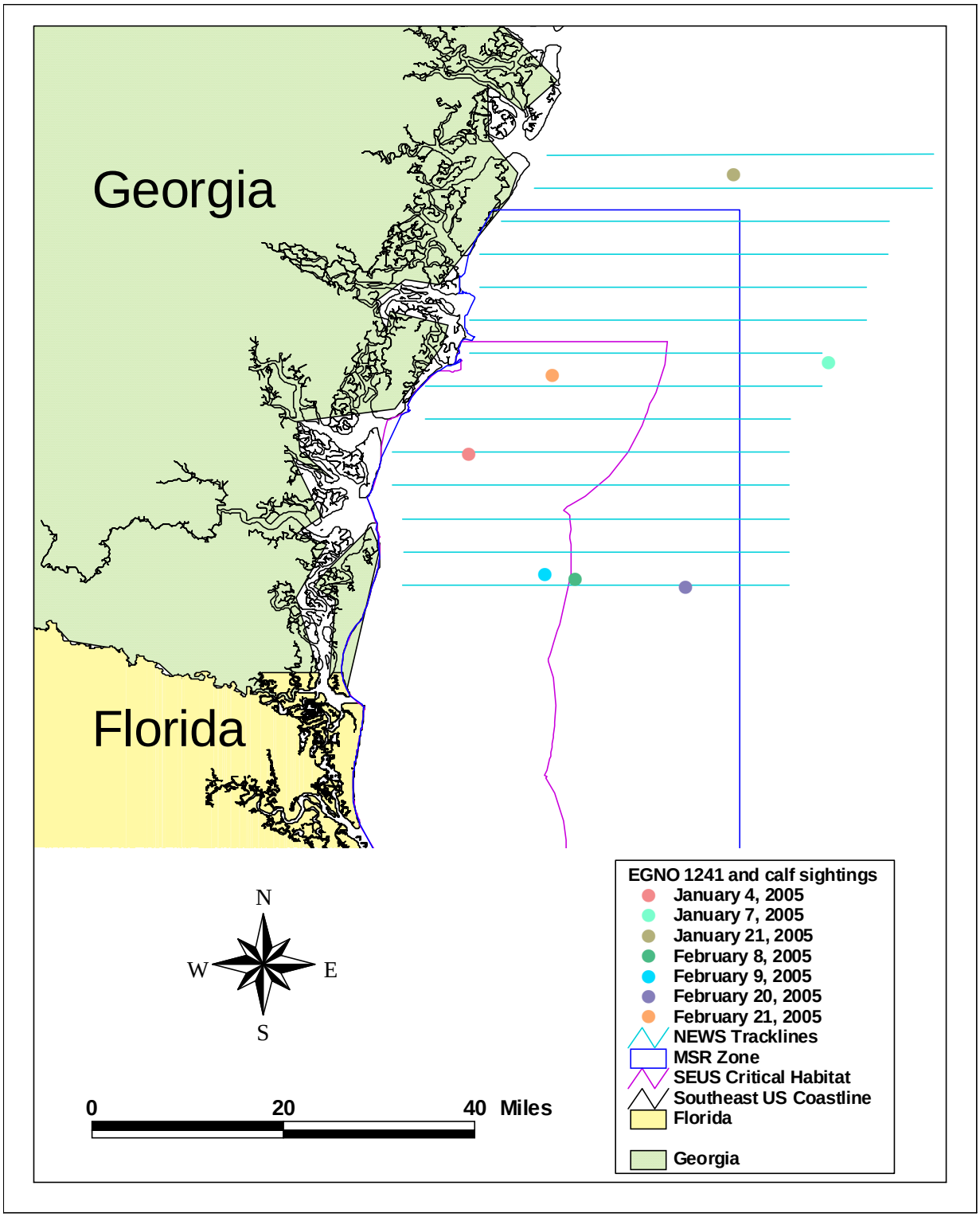

Figure 5: EGNO 1241 and calf NEWS sightings between 04 January 2005 and 21 February 2005.

Many of the whales observed in the NEWS area were resighted on multiple occasions by the Wildlife Trust team. Five adults/juveniles and a mother/calf pair were sighted three times within the NEWS area. Three adult right whales were observed on four occasions, and two mother/calf pairs were sighted five times. The greatest number of resights occurred with EGNO 1241 and her calf. This mother/calf pair was sighted seven times from January 4, 2005 through February 21, 2005 for a residency period in the SEUS of at least 2 months. Figure 5 depicts the sightings of EGNO 1241 and her calf off the Georgia coastline. EGNO 1241 and her calf were observed on January 4, 7 and 21, and then sighted on February 8, 9, 20 and 21. The February 8 sighting was the occasion in which EGNO 1241 and her calf were observed in close association to EGNO 1408 and her calf (as described early in this report). Following along the trend for the overall NEWS sightings, four out of seven sightings of EGNO 1241 and her calf occurred outside of the critical habitat, and two of the sightings were outside the Mandatory Ship Reporting (MSR) Zone.

Sighting Distances for Right Whales

Sighting distances for right whale sightings were calculated whenever possible, and the average sighting distance was 0.56 nm (SD=0.49). The sighting distances ranged from 0.0 nm to 1.73 nm, with the majority of sightings occurring from 0.0nm to 1.0 nm (Figure 6).

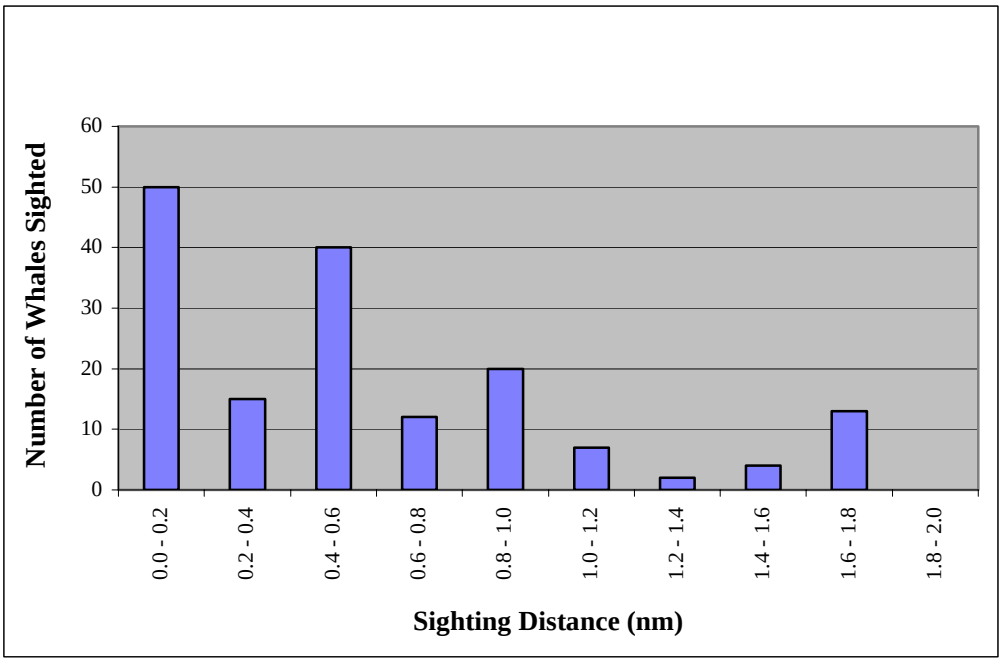

Figure 6: Right Whale Sighting Distances for the 2004-2005 NEWS aerial survey season.

Sighting Distances for Large Vessels

Sighting angles were obtained for all large commercial and military ships whenever possible, and used to calculate distance from the trackline. Average distance from the trackline for all large vessels was 4,461.49 m (SD=5,621.15). See Appendix 2 for all sightings of large ships during the 2004-2005 NEWS surveys.

Marine Animal Sightings

All marine mammals, sea turtles, sharks, rays, and certain fish species were recorded while conducting the NEWS surveys. Date, time, lat/long position, species and number, aircraft heading and altitude, and environmental conditions such as overall weather trend, Beaufort sea state, glare, and visibility were

also entered into the data logger program. The only NEWS survey during which no marine animal sightings were recorded was March 24, 2005. This survey was flown in a Cessna Skymaster with only two observers. Due to the limitations of data recording in the Skymaster, only right whale and large vessel sightings were recorded during the survey. Table 7 summarizes the marine animal sightings for all the NEWS surveys during which marine animals sightings were recorded.

Table 7: Summary of other marine animal sightings during the 2004-2005 NEWS right whale surveys.

Survey Date	LETU	LOTU	RITU	UNTU	BODO	ASDO	UNDO	OCSU	UNSH	BASH	UNRA	CNRA	MARA	UNLW	HUWH	SCFI	UNID	UNST	HHSH	MANA
02-Dec-04	1	24	0	1	24	0	0	1	0	0	0	150	0	0	0	3	1	0	0	0
03-Dec-04	0	12	0	0	99	0	0	9	0	0	0	0	0	0	0	1	0	0	0	0
05-Dec-04	1	89	6	0	164	0	0	34	0	0	1	881	0	0	0	20	0	0	0	0
06-Dec-04	8	152	10	2	316	0	4	25	0	0	5	1426	0	0	0	16	0	0	0	0
07-Dec-04	0	20	0	0	41	0	0	2	0	0	1	10	0	0	0	1	0	0	0	0
09-Dec-04	0	23	3	0	78	0	0	3	0	0	1	189	0	0	0	1	0	0	0	0
12-Dec-04	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
16-Dec-04	0	1	0	0	12	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0
17-Dec-04	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Dec-04	0	20	2	1	77	0	0	2	1	0	0	3	0	0	0	3	0	0	0	0
19-Dec-04	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-Dec-04	0	0	0	0	39	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
22-Dec-04	1	17	0	0	39	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0
24-Dec-04	0	3	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-Dec-04	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-Dec-04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Dec-04	0	72	2	0	149	0	1	11	0	3	1	0	0	0	0	3	0	0	0	0
31-Dec-04	0	26	0	0	119	0	1	6	1	0	0	0	0	0	0	1	0	0	0	0
01-Jan-05	3	83	2	1	124	0	0	31	1	0	1	15	0	0	0	4	1	0	0	0
02-Jan-05	6	77	0	1	145	0	0	36	0	9	1	0	1	0	0	5	0	0	0	0
03-Jan-05	2	35	0	2	187	0	0	14	1	1	0	0	0	0	0	0	0	0	0	0
04-Jan-05	15	103	0	0	246	0	2	71	1	14	1	37	0	0	0	6	0	0	0	0
06-Jan-05	6	70	0	0	185	0	0	27	1	15	0	0	0	0	0	2	1	0	0	0
07-Jan-05	4	87	0	0	228	0	0	38	1	50	1	0	0	0	0	2	0	0	0	0
08-Jan-05	3	59	0	2	200	0	0	50	0	9	0	0	0	0	0	0	0	0	0	0
09-Jan-05	0	24	0	0	123	0	0	10	0	4	0	10	0	0	0	0	0	20	0	0
11-Jan-05	11	82	1	4	265	0	27	69	1	43	0	0	1	0	0	7	0	0	0	0
13-Jan-05	0	1	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Jan-05	0	14	0	3	55	0	0	4	0	0	1	0	0	0	0	1	0	0	0	0
20-Jan-05	1	5	0	1	38	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
21-Jan-05	2	11	0	0	71	0	0	6	0	5	0	0	0	0	0	1	0	0	0	0
24-Jan-05	0	11	0	0	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-Jan-05	1	3	0	0	71	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
26-Jan-05	0	2	0	0	7	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
27-Jan-05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-Jan-05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Survey Date	LETU	LOTU	RITU	UNTU	BODO	ASDO	UNDO	OCSU	UNSH	BASH	UNRA	CNRA	MARA	UNLW	HUWH	SCFI	UNID	UNST	HHSH	MANA
06-Feb-05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07-Feb-05	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08_Feb-05	0	12	0	0	136	0	0	0	0	1	0	0	0	0	0	2	0	0	0	0
09_Feb-05	1	34	0	0	154	0	1	3	0	1	0	0	0	0	0	6	0	0	0	0
11-Feb-05	0	0	0	0	9	0	0	0	0	1	0	0	0	0	0	4	0	0	0	0
12-Feb-05	0	4	0	0	53	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
13-Feb-05	4	63	0	0	132	0	0	29	1	2	0	0	0	0	0	7	0	0	0	0
14-Feb-05	0	10	0	0	39	0	0	4	0	1	0	0	0	0	0	1	0	0	0	0
16-Feb-05	0	23	0	2	42	0	14	7	0	2	0	0	0	0	0	4	0	70	0	0
18-Feb-05	0	14	0	1	19	0	0	0	3	0	0	2	0	0	0	0	0	0	0	0
19-Feb-05	1	25	0	1	56	0	1	1	0	1	0	0	0	0	0	0	0	50	0	0
20-Feb-05	2	72	0	0	63	0	0	26	1	1	0	0	0	0	0	15	0	20	0	0
21-Feb-05	0	1	0	0	5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
22-Feb-05	0	9	0	0	49	0	7	0	2	2	0	0	0	0	0	2	0	0	0	0
28-Feb-05	0	6	0	0	2	0	0	3	0	1	0	0	0	0	0	0	0	0	0	0
02-Mar-05	1	0	0	0	24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
04-Mar-05	0	62	0	0	123	0	2	43	3	0	0	0	0	0	0	2	0	82	0	0
05-Mar-05	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
07-Mar-05	0	5	0	0	36	0	4	1	0	0	0	0	0	0	0	3	0	0	0	0
09-Mar-05	0	49	0	0	49	0	0	16	0	6	0	0	0	0	0	4	0	0	0	0
10-Mar-05	1	0	0	0	36	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0
11-Mar-05	0	3	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-Mar-05	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-Mar-05	0	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-Mar-05	0	13	0	0	32	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
20-Mar-05	2	108	2	0	59	0	22	3	2	1	0	0	0	0	0	8	0	0	0	0
21-Mar-05	0	94	0	0	79	0	24	14	1	0	0	0	0	0	0	1	0	70	0	0
24-Mar-05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-Mar-05	3	126	0	0	80	0	2	17	3	0	0	1091	0	0	0	2	0	47	0	0
30-Mar-05	17	370	1	0	152	0	7	29	0	2	1	31211	0	0	0	5	0	10	0	0
31-Mar-05	11	248	0	0	67	0	39	53	1	0	3	127981	0	0	0	0	0	30	0	0
Totals	**108**	**2502**	**29**	**22**	**4673**	**0**	**159**	**702**	**25**	**182**	**18**	**163031**	**2**	**0**	**0**	**149**	**5**	**399**	**0**	**0**

LETU=leatherback turtle; LOTU=loggerhead turtle; RITU=ridley turtle; UNTU=unidentified turtle; BODO=bottlenose dolphin; ASDO=Atlantic Spotted Dolphin; UNDO=unidentified dolphin; OCSU=ocean sunfish; UNSH = unidentified shark; BASH = basking shark; UNRA=unidentified ray; CNRA=cownose ray; MARA=manta ray; UNLW=unidentified large whale; HUWH=humpback whale, SCFI= fish school, UNID=unidentified animal, UNST=Unidentified Stenella, HHSH=hammerhead shark, MANA=manatee

Whale/Vessel Interactions

The Wildlife Trust survey team observed eight whale/vessel interactions ("close calls") during the 2004-2005 season. This number represents a fourfold increase in the number of whale/vessel interactions

observed compared to the 2003-2004 season. The whale/vessel interactions during the 2004-2005 season were also of note because the incidents involved vessels only ranging between 15 feet to 60 feet, some of the whales involved were approached by vessels on more than one occasion and in different areas, and one incident involved a vessel strike of a right whale.

The first incidents occurred on December 21, 2004 and December 30, 2004, and both involved the entangled whale, Yellowfin (EGNO 3314). The first incident on December 21 occurred off of Sapelo Island, GA. A recreational vessel was observed traveling at about 30 knots and 200 yards to the south of the entangled whale. The vessel passed by the whale without stopping. The whale increased its' downtime from five minutes to 11 minutes immediately after the vessel's close pass, but returned to a five minute downtime after only one surfacing. During the second incident, two recreational vessels off of Charleston, SC approached and stopped about a half mile from EGNO 3314. They then left the area traveling at about 25 knots. During the time the vessels were in close proximity to the entangled whale, Yellowfin was swimming in circles and diving to avoid a NOAA RIB that was attempting to disentangle it. The whale appeared to be reacting to the very close proximity of the NOAA RIB and did not appear to react to the recreational vessels.

The next interaction involved EGNO 2040 and her calf being approached within 150-300 yards by two recreational vessels off of Sapelo Island, GA on December 31, 2004. During this incident, the mother and calf did not appear to react to the close proximity of the vessels. However, on January 2, 2005, the same mother and calf had a definite change in behavior when a shrimp boat off of Jekyll Island approached within about 200-300 yards of the pair's location. Initially the mother and calf were closely associated and observed milling. However, as the shrimp boat approached, the mother changed activity when the calf moved about 100 yards away from her. EGNO 2040 rolled on her side and displayed the following behaviors: pec slapping, fluke slapping and exhaling underwater. After the calf returned to the mother's side, the mother continued to pec slap for a couple minutes longer. When the shrimp boat changed direction and started to move away from the whales, the mother and calf went back to milling.

The next three whale/vessel interactions were all observed on February 19, 2005 near Gray's Reef National Marine Sanctuary and involved a group of four right whales involved in SAG behavior. On this date, four recreational vessels were observed approaching the group of whales at different times, sometimes within about 60 feet of the animals. During the times the whales were being approached, the animals could be seen stopping their SAG behavior and breaking into two groups of two whales. The Wildlife Trust survey team reported the harassment of these whales to the local authorities and a verbal warning of violation of the Marine Mammal Protection Act was issued to one of the four recreational vessels.

The final whale/vessel interaction occurred on March 10, 2005 in the southeastern portion of the NEWS survey area. The Wildlife Trust survey team received a report of a right whale being struck by a vessel at 30° 57.64 N and 81° 14.9 W. The survey team was instructed by the SEUS Right Whale Coordinator to proceed to that location and document any evidence of the ship strike. Upon arriving at the scene, the Wildlife Trust team documented a 43-foot yacht that had been traveling through the NEWS survey area and had apparently struck an adult right whale. Two right whales were observed in the area, one animal (EGNO 2425) with a large bleeding gash half way from the peduncle insertion point to the left tip of the fluke. The wound extended from the left leading edge of the tail to three quarters of the way to the left trailing edge of the fluke. This injury caused the left tip of the tail to hang perpendicular when the fluke was raised out of the water. The other whale in the area (EGNO 1158) did not appear to have sustained any injury. Both of these whales were resighted again off the Georgia coast and off South Carolina during the following weeks.

All required whale/vessel interaction forms were completed for the eight described whale/ship interactions and forwarded to the proper authorities within NOAA, GDNR and FWRI.

Discussion and Recommendations

The right whale calving ground is extremely important to the reproducing population of the North Atlantic right whale and is vital to military and commercial shipping interests. The EWS system attempts to provide protection for right whales from ship collisions within this region. While there have been no documented right whale mortalities due to ship collision in the SEUS in many years, a definite vessel strike on an adult right whale was documented this past season. Also, a possible collision between a dredge and right whale was reported near Brunswick, GA. Both of these events point toward the continued need for the EWS system. However, the increasing number of right whales being observed in Georgia waters outside of the designated critical habitat and the Mandatory Ship Reporting (MSR) Zone also point to the need for expansion of the current boundaries of the critical habitat.

The large number of whales being documented in the SEUS also emphasizes the need to pursue appropriate shipping management measures to reduce the risk of whales being injured or killed by ships. These whale/vessel interactions have been shown to involve large vessels but also smaller recreational vessels, as well. The large number of interactions between recreational vessels and right whales this past season emphasizes the need for greater public education emphasizing individual responsibility and appropriate behavior near right whales and the need for increased monitoring of vessel activities within the SEUS calving area and beyond.

Large areas of the US east coast not previously part of any consistent survey efforts are starting to be covered in developing survey projects, and if we are to protect this species, these efforts must continue and expand. However, limitations of these aerial survey efforts must also be addressed. If our goal is to provide maximum protection for right whales, we must investigate new technologies that may provide a more reliable means for detecting and protecting right whales throughout their range. Without moving forward on these fronts it is unlikely that we will ever reach a potential biological removal level of zero for North Atlantic right whales, as calculated by NMFS in the right whale recovery plan.

While we highly recommend identifying other methods of right whale detection and protection, we recognize that in the interim the current survey program is the most effective method we have for protecting right whales from vessel collisions. We recommend continuing Northern Early Warning System surveys from 1 December 2005 through 31 March 2006.

Acknowledgements

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References

Georgia Department of Natural Resources. 2004. Georgia Department of Natural Resources and Wildlife Trust 2004-2005 Contract for Northern Early Warning System Right Whale Aerial Surveys. Georgia Department of Natural Resources, Wildlife Resources Division, Nongame Wildlife & Natural Heritage Section. 20pp.

Kraus, S.D. and J.J. Hatch. 2001. Mating Strategies in North Atlantic Right Whales. Pp. 237-244. Journal of Cetacean Research and Management: Special Issue 2.

Kraus, S.D., K.E. Moore, C.A. Price, M.J. Crone, W.A. Watkins, H.E. Winn and J.H. Prescott. 1986. The use of photographs to identify individual North Atlantic right whales (*Eubalaena glacialis*). Pp. 145-151. *In:* R.L. Brownell, P.B. Best and J.H. Prescott (eds.) Right Whales: Past and Present Status, Special Issue 10. International Whaling Commission, Cambridge, England. 289pp.

National Marine Fisheries Service. 1991. Final Recovery Plan for the Northern Right Whale, *Eubalaena glacialis.* U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. 86 pp.

National Marine Fisheries Service. 2004. Recovery Plan for the Northern Right Whale (*Eubalaena glacialis)* Revision. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. 138 pp.

Payne, R., O. Brazier, E.M. Dorsey, J.S. Perkins, V.J. Roundtree and A. Titus. 1983. External features in southern right whales (*Eubalaena australis*) and their use in identifying individuals, pp. 371-445. *In:* R. Payne (ed) Communication and Behavior of Whales. Westview Press, Boulder, CO.

Taylor, C.R. and W.B. Brooks Jr. 2002. Dissemination of northern right whale (*Eubalaena glacialis*) sighting information to the Southeast U.S. maritime community. Marine Technology Society Journal 36(2).

Budget Summary –Northern Early Warning System Surveys

Cost Elements	Proposed Contract Estimate – Total Cost	Actual Contract - Total Costs (through May 20, 2005)
Direct Labor	$ 85,514.00	$ 75,392.80
Travel/Subsistence	$ 21,325.00	$ 19,721.49
Other Direct Costs	$ 1,500.00	$ 3,751.92
Wildlife Trust Overhead, 10%	$ 10,834.00	$ 8,307.35
Total	**$ 119, 173.00**	**$ 107,173.56**

Appendix 1. NEWS Right Whale Sightings from 01 December 2004 through 31 March 2005.

Whale Number	Month	Day	Year	Time (Local)	Survey Name	Latitude	Longitude	RIWH Letter	EGNO	Time of Report (Local)	NRW Number	Comments	Sighting Distance (nm)
1	12	6	2004	12:15	NEWS041206	31.204	-81.158	A	1245	12:37	NRW05006	Female	1.66
2	12	7	2004	11:39	NEWS041207	31.505	-81.020	A	No Photos	12:03	NRW05009	No Photos	1.22
3	12	7	2004	11:39	NEWS041207	31.505	-81.020	B	No Photos	12:03	NRW05009	No Photos	1.22
4	12	21	2004	10:40	NEWS041221	31.531	-81.038	A	BK02/CT07	11:27	NRW05021		0.42
5	12	21	2004	10:40	NEWS041221	31.531	-81.038	B	3351	11:27	NRW05021		0.42
6	12	21	2004	10:40	NEWS041221	31.531	-81.038	C	BK24	11:27	NRW05021		0.42
7	12	21	2004	10:54	NEWS041221	31.537	-80.997	D	3314	11:27	NRW05022	Entgled	0.06
8	12	22	2004	12:45	NEWS041222	31.287	-81.085	A	3314	14:00	NRW05027	Entgled	0.83
9	12	22	2004	13:24	NEWS041222	31.289	-81.145	B	1703	14:00	NRW05028	w/ Calf	0.26
10	12	22	2004	13:24	NEWS041222	31.289	-81.145	C	N/A	14:00	NRW05028	Calf	0.26
11	12	31	2004	11:58	NEWS041231	31.500	-81.116	A	2040	12:36	NRW05043	w/ Calf	N/A
12	12	31	2004	11:58	NEWS041231	31.500	-81.116	B	N/A	12:36	NRW05043	Calf	N/A
13	12	31	2004	12:24	NEWS041231	31.241	-81.091	C	BK10	13:07	NRW05044		0.44
14	1	1	2005	12:35	NEWS050101	31.135	-81.206	A	BK10	12:53	NRW05050		0.00
15	1	1	2005	14:50	NEWS050101	30.984	-81.005	B	No Photos	15:11	NRW05051		0.00
16	1	2	2005	10:42	NEWS050102	31.382	-81.107	A	BK10	11:42	NRW05058		0.04
17	1	2	2005	10:42	NEWS050102	31.382	-81.107	B	2614's Yearling	11:42	NRW05058	Yearling	0.04
18	1	2	2005	10:58	NEWS050102	31.370	-81.103	C	3314	11:42	NRW05059	Gear free	N/A
19	1	2	2005	14:42	NEWS050102	31.030	-81.296	D	2040	15:11	NRW05061	w/ Calf	0.19
20	1	2	2005	14:42	NEWS050102	31.030	-81.296	E	N/A	15:11	NRW05061	Calf	0.19
21	1	4	2005	14:02	NEWS050104	31.081	-81.270	A	1241	14:21	NRW05079	w/ Calf	N/A
22	1	4	2005	14:02	NEWS050104	31.081	-81.270	B	N/A	14:21	NRW05079	Calf	N/A
23	1	4	2005	16:24	NEWS050104	30.929	-81.266	C	1703	17:00	NRW05081	w/ Calf	0.09
24	1	4	2005	16:24	NEWS050104	30.929	-81.266	D	N/A	17:00	NRW05081	Calf	0.09
25	1	4	2005	16:31	NEWS050104	30.930	-81.203	E	2790	17:00	NRW05082		0.14
26	1	4	2005	16:31	NEWS050104	30.930	-81.203	F	2143	17:00	NRW05082		0.14
27	1	7	2005	10:49	NEWS050107	31.218	-80.726	A	1241	11:05	NRW05091	w/ Calf	0.08
28	1	7	2005	10:49	NEWS050107	31.218	-80.726	B	N/A	11:05	NRW05091	Calf	0.08
29	1	7	2005	13:16	NEWS050107	30.900	-81.066	C	1622	13:30	NRW05095	w/ Calf	0.90
30	1	7	2005	13:16	NEWS050107	30.900	-81.066	D	N/A	13:30	NRW05095	Calf	0.90
31	1	7	2005	15:51	NEWS050107	31.370	-80.901	E	1204	16:22	NRW05098	w/ Calf	0.80
32	1	7	2005	15:51	NEWS050107	31.370	-80.901	F	N/A	16:22	NRW05098	Calf	0.80
33	1	7	2005	16:02	NEWS050107	31.365	-81.054	G	UNK 1	16:22	NRW05099		1.07
34	1	11	2005	13:29	NEWS050111	31.134	-81.159	A	1632	13:45	NRW05115	w/ Calf	0.03
35	1	11	2005	13:29	NEWS050111	31.134	-81.159	B	N/A	13:45	NRW05115	Calf	0.03
36	1	11	2005	14:04	NEWS050111	31.077	-81.142	C	UNK 2	15:00	NRW05119		0.40
37	1	11	2005	14:04	NEWS050111	31.077	-81.142	D	2427	15:00	NRW05119		0.40
38	1	11	2005	14:04	NEWS050111	31.077	-81.142	E	UNK 3	15:00	NRW05119		0.40
39	1	11	2005	14:04	NEWS050111	31.077	-81.142	F	UNK 4	15:00	NRW05119		0.40
40	1	11	2005	14:33	NEWS050111	31.067	-81.153	G	UNK 1	15:00	NRW05120		N/A

Whale Number	Month	Day	Year	Time (Local)	Survey Name	Latitude	Longitude	RIWH Letter	EGNO	Time of Report (Local)	NRW Number	Comments	Sighting Distance (nm)
41	1	11	2005	15:55	NEWS050111	30.890	-80.884	H	1013	16:03	NRW05123	w/ Calf	0.40
42	1	11	2005	15:55	NEWS050111	30.890	-80.884	I	N/A	16:03	NRW05123	Calf	0.40
43	1	11	2005	16:29	NEWS050111	31.088	-81.337	J	No Photos	16:40	NRW05125	No Photos	N/A
44	1	13	2005	11:02	NEWS050113	30.949	-81.234	A	2143	11:42	NRW05142	Dead	0.28
45	1	19	2005	13:14	NEWS050119	30.992	-81.089	A	2790	13:32	NRW05150		0.27
46	1	19	2005	14:11	NEWS050119	30.881	-80.982	B	BK02/CT07	15:00	NRW05151		0.11
47	1	19	2005	14:11	NEWS050119	30.881	-80.982	C	2427	15:00	NRW05151		0.11
48	1	20	2005	12:43	NEWS050120	30.983	-80.811	A	1179	13:10	NRW05155	w/ Calf	0.01
49	1	20	2005	12:43	NEWS050120	30.983	-80.811	B	N/A	13:10	NRW05155	Calf	0.01
50	1	20	2005	13:29	NEWS050120	30.924	-81.127	C	1632	13:36	NRW05156	w/ Calf	0.41
51	1	20	2005	13:29	NEWS050120	30.924	-81.127	D	N/A	13:36	NRW05156	Calf	0.41
52	1	21	2005	10:47	NEWS050121	31.502	-80.869	A	1241	11:22	NRW05159	w/ Calf	1.07
53	1	21	2005	10:47	NEWS050121	31.502	-80.869	B	N/A	11:22	NRW05159	Calf	1.07
54	1	21	2005	13:44	NEWS050121	31.150	-81.006	C	2611	14:17	NRW05162		0.96
55	1	21	2005	14:46	NEWS050121	31.034	-81.336	D	1246	15:03	NRW05163	w/ Calf	0.02
56	1	21	2005	14:46	NEWS050121	31.034	-81.336	E	N/A	15:03	NRW05163	Calf	0.02
57	1	24	2005	9:44	NEWS050124	31.483	-80.981	A	2611	10:00	NRW05168		0.00
58	1	24	2005	9:44	NEWS050124	31.483	-80.981	B	CT17	10:00	NRW05168		0.00
59	1	24	2005	12:11	NEWS050124	31.138	-81.069	C	2645	12:19	NRW05170		0.25
60	2	8	2005	13:18	NEWS050208	30.891	-81.109	A	1408	14:01	NRW05205	w/ Calf	0.46
61	2	8	2005	13:18	NEWS050208	30.891	-81.109	B	N/A	14:01	NRW05205	Calf	0.46
62	2	8	2005	13:18	NEWS050208	30.891	-81.109	C	1241	14:01	NRW05205	w/ Calf	0.46
63	2	8	2005	13:18	NEWS050208	30.891	-81.109	D	N/A	14:01	NRW05205	Calf	0.46
64	2	9	2005	13:40	NEWS050209	30.898	-81.154	A	1241	14:20	NRW05209	w/ Calf	0.90
65	2	9	2005	13:40	NEWS050209	30.898	-81.154	B	N/A	14:20	NRW05209	Calf	0.90
66	2	11	2005	12:31	NEWS050211	30.945	-81.059	A	1408	12:59	NRW05225	w/ Calf	0.52
67	2	11	2005	12:31	NEWS050211	30.945	-81.059	B	N/A	12:59	NRW05225	Calf	0.52
68	2	12	2005	10:43	NEWS050212	31.279	-80.900	A	1012	11:09	NRW05229	w/ Calf	0.18
69	2	12	2005	10:43	NEWS050212	31.279	-80.900	B	N/A	11:09	NRW05229	Calf	0.18
70	2	12	2005	12:57	NEWS050212	30.972	-80.980	C	1408	13:05	NRW05236	w/ Calf	0.00
71	2	12	2005	12:57	NEWS050212	30.972	-80.980	D	N/A	13:05	NRW05236	Calf	0.00
72	2	12	2005	13:42	NEWS050212	30.867	-80.992	E	UNK 5	14:06	NRW05237		0.85
73	2	13	2005	13:28	NEWS050213	31.024	-81.106	A	2611	13:52	NRW05250		0.50
74	2	13	2005	13:28	NEWS050213	31.024	-81.106	B	BK25	13:52	NRW05250		0.50
75	2	14	2005	9:23	NEWS050214	30.893	-81.212	A	1408	9:33	NRW05262	w/ Calf	0.31
76	2	14	2005	9:23	NEWS050214	30.893	-81.212	B	N/A	9:33	NRW05262	Calf	0.31
77	2	14	2005	10:06	NEWS050214	30.964	-81.294	C	BK25	10:24	NRW05266		1.73
78	2	14	2005	10:06	NEWS050214	30.964	-81.294	D	UNK 6	10:24	NRW05266		1.73
79	2	18	2005	14:00	NEWS050218	31.127	-81.036	A	1327	14:33	NRW05325		0.53
80	2	18	2005	14:00	NEWS050218	31.127	-81.036	B	1323	14:33	NRW05325		0.53
81	2	18	2005	14:00	NEWS050218	31.127	-81.036	C	1803	14:33	NRW05325		0.53

Whale Number	Month	Day	Year	Time (Local)	Survey Name	Latitude	Longitude	RIWH Letter	EGNO	Time of Report (Local)	NRW Number	Comments	Sighting Distance (nm)
82	2	18	2005	14:00	NEWS050218	31.127	-81.036	D	2795	14:33	NRW05325		0.53
83	2	18	2005	14:00	NEWS050218	31.127	-81.036	E	UNK 7	14:33	NRW05325		0.53
84	2	18	2005	14:00	NEWS050218	31.127	-81.036	F	3040	14:33	NRW05325		0.53
85	2	18	2005	14:00	NEWS050218	31.127	-81.036	G	2602	14:33	NRW05325		0.53
86	2	18	2005	14:00	NEWS050218	31.127	-81.036	H	UNK 8	14:33	NRW05325		0.53
87	2	18	2005	14:00	NEWS050218	31.127	-81.036	I	1131	14:33	NRW05325		0.53
88	2	18	2005	16:32	NEWS050218	31.428	-81.001	J	2010	16:55	NRW05326		0.00
89	2	18	2005	16:32	NEWS050218	31.428	-81.001	K	1207	16:55	NRW05326		0.00
90	2	19	2005	13:09	NEWS050219	31.437	-80.942	A	2681	14:18	NRW05350		0.08
91	2	19	2005	13:09	NEWS050219	31.437	-80.942	B	3160	14:18	NRW05351		0.08
92	2	19	2005	13:09	NEWS050219	31.437	-80.942	C	2010	14:18	NRW05350		0.08
93	2	19	2005	13:09	NEWS050219	31.437	-80.942	D	2630	14:18	NRW05351		0.08
94	2	20	2005	10:10	NEWS050220	31.526	-80.871	A	2541	10:23	NRW05364		0.50
95	2	20	2005	10:10	NEWS050220	31.526	-80.871	B	BK25	10:23	NRW05364		0.50
96	2	20	2005	10:10	NEWS050220	31.526	-80.871	C	UNK 9	10:23	NRW05364		0.50
97	2	20	2005	11:21	NEWS050220	31.383	-80.962	D	1624	11:40	NRW05372		0.00
98	2	20	2005	13:11	NEWS050220	31.147	-81.266	E	1334	13:18	NRW05376	w/ Calf	0.00
99	2	20	2005	13:11	NEWS050220	31.147	-81.266	F	N/A	13:18	NRW05376	Calf	0.00
100	2	20	2005	13:38	NEWS050220	31.076	-80.924	G	1245	13:42	NRW05379	w/ Calf	0.51
101	2	20	2005	13:38	NEWS050220	31.076	-80.924	H	N/A	13:42	NRW05379	Calf	0.51
102	2	20	2005	15:02	NEWS050220	30.879	-80.941	I	1241	15:21	NRW05382	w/ Calf	0.11
103	2	20	2005	15:02	NEWS050220	30.879	-80.941	J	N/A	15:21	NRW05382	Calf	0.11
104	02	21	2005	12:04	NEWS050221	31.199	-81.144	A	1241	12:26	NRW05388	w/ Calf	1.12
105	02	21	2005	12:04	NEWS050221	31.199	-81.144	B	N/A	12:26	NRW05388	Calf	1.12
106	02	21	2005	14:53	NEWS050221	31.093	-81.274	C	1334	15:19	NRW05394	w/ Calf	N/A
107	02	21	2005	14:53	NEWS050221	31.093	-81.274	D	N/A	15:19	NRW05394	Calf	N/A
108	02	28	2005	15:03	NEWS050228	31.123	-80.807	A	UNK 10	15:15	NRW05440		0.69
109	02	28	2005	15:03	NEWS050228	31.123	-80.807	B	UNK 11	15:15	NRW05440		0.69
110	02	28	2005	15:03	NEWS050228	31.123	-80.807	C	UNK 12	15:15	NRW05440		0.69
111	02	28	2005	15:03	NEWS050228	31.123	-80.807	D	UNK 13	15:15	NRW05440		0.69
112	02	28	2005	15:51	NEWS050228	31.035	-80.893	E	UNK 14	16:21	NRW05443		0.05
113	02	28	2005	16:08	NEWS050228	31.026	-80.769	F	1327	16:21	NRW05444		0.42
114	02	28	2005	16:08	NEWS050228	31.026	-80.769	G	1131	16:21	NRW05444		0.42
115	03	02	2005	14:42	NEWS050302	31.142	-81.133	A	1408	15:05	NRW05448	w/ Calf	0.46
116	03	02	2005	14:42	NEWS050302	31.142	-81.133	B	N/A	15:05	NRW05448	Calf	0.46
117	03	02	2005	16:02	NEWS050302	30.945	-80.973	C	UNK 15	16:43	NRW05453		0.58
118	03	02	2005	16:02	NEWS050302	30.945	-80.973	D	2541	16:43	NRW05453		0.58
119	03	02	2005	16:02	NEWS050302	30.945	-80.973	E	3346	16:43	NRW05453		0.58
120	03	02	2005	16:02	NEWS050302	30.945	-80.973	F	UNK 16	16:43	NRW05453		0.58
121	03	04	2005	15:55	NEWS050304	30.936	-81.198	A	UNK 17	16:25	NRW05477		0.08
122	03	04	2005	15:55	NEWS050304	30.936	-81.198	B	UNK 18	16:25	NRW05477		0.08
123	03	04	2005	15:55	NEWS050304	30.936	-81.198	C	2010	16:25	NRW05477		0.08

Whale Number	Month	Day	Year	Time (Local)	Survey Name	Latitude	Longitude	RIWH Letter	EGNO	Time of Report (Local)	NRW Number	Comments	Sighting Distance (nm)
124	03	04	2005	15:55	NEWS050304	30.936	-81.198	D	2541	16:25	NRW05477		0.08
125	03	04	2005	15:55	NEWS050304	30.936	-81.198	E	UNK 7	16:25	NRW05477		0.08
126	03	04	2005	15:55	NEWS050304	30.936	-81.198	F	BK11	16:25	NRW05477		0.08
127	03	04	2005	15:55	NEWS050304	30.936	-81.198	G	UNK 19	16:25	NRW05477		0.08
128	03	04	2005	15:55	NEWS050304	30.936	-81.198	H	UNK 20	16:25	NRW05477		0.08
129	03	04	2005	16:54	NEWS050304	30.907	-81.094	I	3351	17:18	NRW05480		1.43
130	03	04	2005	16:54	NEWS050304	30.907	-81.094	J	UNK 21	17:18	NRW05480		1.43
131	03	04	2005	16:54	NEWS050304	30.907	-81.094	K	UNK 22	17:18	NRW05480		1.43
132	03	04	2005	16:54	NEWS050304	30.907	-81.094	L	2795	17:18	NRW05480		1.43
133	03	05	2005	13:06	NEWS050305	31.069	-81.062	A	2795	14:08	NRW05485		0.81
134	03	05	2005	13:06	NEWS050305	31.069	-81.062	B	3040	14:08	NRW05485		0.81
135	03	05	2005	13:06	NEWS050305	31.069	-81.062	C	UNK 17	14:08	NRW05485		0.81
136	03	05	2005	13:06	NEWS050305	31.069	-81.062	D	UNK 23	14:08	NRW05485		0.81
137	03	05	2005	13:06	NEWS050305	31.069	-81.062	E	UNK 19	14:08	NRW05485		0.81
138	03	05	2005	13:06	NEWS050305	31.069	-81.062	F	2010	14:08	NRW05485		0.81
139	03	05	2005	13:06	NEWS050305	31.069	-81.062	G	UNK 24	14:08	NRW05485		0.81
140	03	05	2005	13:06	NEWS050305	31.069	-81.062	H	UNK 20	14:08	NRW05485		0.81
141	03	05	2005	13:06	NEWS050305	31.069	-81.062	I	UNK 25	14:08	NRW05485		0.81
142	03	05	2005	13:41	NEWS050305	31.056	-81.041	J	BK23	14:08	NRW05485		1.62
143	03	05	2005	13:41	NEWS050305	31.056	-81.041	K	UNK 11	14:08	NRW05485		1.62
144	03	05	2005	13:41	NEWS050305	31.056	-81.041	L	2541	14:08	NRW05485		1.62
145	03	05	2005	14:09	NEWS050305	31.083	-81.251	M	UNK 26	14:33	NRW05486		0.05
146	03	07	2005	9:42	NEWS050307	31.524	-80.958	A	1039	09:55	NRW05496	w/ Calf	0.62
147	03	07	2005	9:42	NEWS050307	31.524	-80.958	B	N/A	09:55	NRW05496	Calf	0.62
148	03	07	2005	11:12	NEWS050307	31.320	-81.175	C	UNK 18	12:28	NRW05501		0.71
149	03	07	2005	11:12	NEWS050307	31.320	-81.175	D	BK11	12:28	NRW05501		0.71
150	03	07	2005	11:12	NEWS050307	31.320	-81.175	E	1246	12:28	NRW05501	w/ Calf	0.71
151	03	07	2005	11:12	NEWS050307	31.320	-81.175	F	N/A	12:28	NRW05501	Calf	0.71
152	03	07	2005	11:32	NEWS050307	31.309	-81.102	G	UNK 26	12:28	NRW05502		1.71
153	03	07	2005	11:32	NEWS050307	31.309	-81.102	H	UNK 21	12:28	NRW05502		1.71
154	03	07	2005	11:32	NEWS050307	31.309	-81.102	I	UNK 25	12:28	NRW05502		1.71
155	03	07	2005	11:32	NEWS050307	31.309	-81.102	J	No Photos	12:28	NRW05502		1.71
156	03	07	2005	11:32	NEWS050307	31.309	-81.102	K	UNK 24	12:28	NRW05502		1.71
157	03	07	2005	11:32	NEWS050307	31.309	-81.102	L	BK23	12:28	NRW05502		1.71
158	03	07	2005	11:32	NEWS050307	31.309	-81.102	M	UNK 27	12:28	NRW05502		1.71
159	03	07	2005	11:59	NEWS050307	31.320	-81.075	N	2795	12:28	NRW05500		N/A
160	03	07	2005	11:59	NEWS050307	31.320	-81.075	O	No Photos	12:28	NRW05500		N/A
161	03	07	2005	11:59	NEWS050307	31.320	-81.075	P	UNK 23	12:28	NRW05500		N/A
162	03	07	2005	12:11	NEWS050307	31.327	-81.067	Q	3351	12:28	NRW05500		N/A
163	03	07	2005	12:11	NEWS050307	31.327	-81.067	R	3308	12:28	NRW05500		N/A
164	03	09	2005	14:33	NEWS050309	30.942	-81.240	A	1145	14:47	NRW05506	w/ Calf	0.52
165	03	09	2005	14:33	NEWS050309	30.942	-81.240	B	N/A	14:47	NRW05506	Calf	0.52

Whale Number	Month	Day	Year	Time (Local)	Survey Name	Latitude	Longitude	RIWH Letter	EGNO	Time of Report (Local)	NRW Number	Comments	Sighting Distance (nm)
166	03	10	2005	10:16	NEWS050310	31.473	-80.879	A	1622	10:26	NRW05509	w/ Calf	N/A
167	03	10	2005	10:16	NEWS050310	31.473	-80.879	B	N/A	10:26	NRW05509	Calf	N/A
168	03	10	2005	12:03	NEWS050310	31.115	-80.981	C	No Photos	12:08	NRW05510	w/ Calf	1.05
169	03	10	2005	12:03	NEWS050310	31.115	-80.981	D	No Photos	12:08	NRW05510	Calf	1.05
170	03	10	2005	12:10	NEWS050310	30.974	-81.229	E	2425	14:15	NRW05511	Struck by boat	N/A
171	03	10	2005	12:10	NEWS050310	30.974	-81.229	F	1158	14:15	NRW05511		N/A
172	03	18	2005	14:51	NEWS050318	31.055	-80.942	A	2425	15:56	NRW05517		N/A
173	03	18	2005	14:51	NEWS050318	31.055	-80.942	B	1158	15:56	NRW05517		N/A
174	03	18	2005	14:51	NEWS050318	31.055	-80.942	C	1632	15:56	NRW05517	w/ Calf	N/A
175	03	18	2005	14:51	NEWS050318	31.055	-80.942	D	N/A	15:56	NRW05517	Calf	N/A
176	03	20	2005	12:16	NEWS050320	31.135	-81.111	A	1632	12:29	NRW05523	w/ Calf	0.03
177	03	20	2005	12:16	NEWS050320	31.135	-81.111	B	N/A	12:29	NRW05523	Calf	0.03
178	03	20	2005	13:06	NEWS050320	31.028	-81.248	C	1145	13:15	NRW05524	w/ Calf	0.34
179	03	20	2005	13:06	NEWS050320	31.028	-81.248	D	N/A	13:15	NRW05524	Calf	0.34
180	03	21	2005	12:20	NEWS050321	31.277	-80.900	A	1632	12:31	NRW05528	w/ Calf	0.54
181	03	21	2005	12:20	NEWS050321	31.277	-80.900	B	N/A	12:31	NRW05528	Calf	0.54
182	03	24	2005	10:06	NEWS050324	31.468	-80.896	A	1423	11:15	NRW05530		0.95
183	03	24	2005	10:06	NEWS050324	31.468	-80.896	B	1712	11:15	NRW05530		0.95
184	03	29	2005	12:33	NEWS050329	31.315	-81.006	A	2790	12:52	NRW05531	w/ Calf	0.95
185	03	29	2005	12:33	NEWS050329	31.315	-81.006	B	N/A	12:52	NRW05531	Calf	0.95

Appendix 2. Large vessel traffic recorded during the 2004-2005 NEWS right whale aerial surveys.

Date	Time	Latitude	Longitude	Altitude (ft)	Heading	Vessel	Anhead	Angle	Observer	Distance from Track Line (m)	Comments
02-Dec-04	145447	31.53391	-80.56703	1042	90.4	MV-C	07	88	P	9094.48	
02-Dec-04	145707	31.47783	-80.58028	1044	274.9	MV-B	02	83	P	2591.50	
03-Dec-04	143825	31.48925	-80.57743	1043	256.9	MV-L	08	86	P	4546.05	
05-Dec-04	182351	31.08522	-80.96085	961	266.7	MV-C	02	76	S	1174.75	
06-Dec-04	170011	31.2055	-80.72633	1033	4.3	MV-C	07	89	S	18037.35	
07-Dec-04	200357	30.98569	-80.90685	967	267.4	CG-C	02	83	P	2400.36	
09-Dec-04	183709	31.0847	-81.3854	950	260.1	MV-L	04	87	S	5524.86	
12-Dec-04	192506	31.03477	-81.26208	1100	89.8	FE-U	21	88	P	9600.69	
22-Dec-04	200631	31.03433	-81.19216	950	90.3	MV-C	21	84	P	2754.84	
24-Dec-04	172607	31.0335	-81.1235	1071	90.4	MV-C	00	76	S	1309.22	
27-Dec-04	161735	31.18367	-80.89367	1084	271.8	MV-C	02	87	P	6304.16	
27-Dec-04	173728	30.98433	-81.09151	1100	266.1	MV-C	12	84	P	3189.82	
29-Dec-04	160144	31.535	-80.58117	1031	88.8	MV-C	00	81	S	1983.99	
29-Dec-04	160324	31.50683	-80.54917	950	166.4	MV-C	06	88	P	8291.51	
29-Dec-04	160453	31.48233	-80.5725	1003	275.3	MV-B	15	77	P	1324.13	
29-Dec-04	204012	30.99866	-80.77166	1097	180.1	MV-C	08	89	P	19154.86	
29-Dec-04	204551	30.9835	-80.93567	1100	269.8	MV-C	00	80	S	1901.37	
31-Dec-04	200656	30.06667	-81.3955	1071	178	MV-C	21	75	S	1218.23	
01-Jan-05	193443	31.08667	-81.37566	1100	271.2	CRSH	14	77	P	1452.19	CASINO BOAT
01-Jan-05	210934	30.88433	-81.26217	1050	268.7	MV-C	21	88	S	9164.30	
01-Jan-05	212024	31.05133	-81.231	1064	320.8	MV-C	05	0	P	0.00	
02-Jan-05	193443	31.08667	-81.37566	1100	271.2	CRSH	14	77	P	1452.19	CASINO BOAT
02-Jan-05	210934	30.88433	-81.26217	1050	268.7	MV-C	21	88	S	9164.30	
02-Jan-05	212024	31.05133	-81.231	1064	320.8	MV-C	05	0	P	0.00	
03-Jan-05	161239	31.40283	-80.62283	1100	182.8	MV-C	0	61	P	604.83	
04-Jan-05	190019	31.08167	-81.30134	1011	123.3	MV-C	15	0	S	0.00	
04-Jan-05	190100	31.0725	-81.2775	1008	85.3	CG-B	21	0	P	0.00	
04-Jan-05	205153	31.03367	-80.9685	1063	90.2	RV-L	10	87	P	6182.03	
04-Jan-05	210054	30.98166	-80.81417	1050	275.8	MV-C	01	86	P	4576.56	
06-Jan-05	143634	31.524	-80.5555	1061	174.8	MV-B	15	81	P	2041.72	
06-Jan-05	155535	31.33333	-80.679	1066	90.2	MV-B	02	65	P	696.75	
06-Jan-05	181811	31.08067	-81.38583	1067	164.3	CG-B	07	84	P	3094.13	
07-Jan-05	171159	31.03367	-81.156	1067	90	MV-C	12	0	P	0.00	
07-Jan-05	215114	31.26617	-80.7065	1100	254.9	MV-C	04	89	P	19207.24	
08-Jan-05	181919	30.98667	-81.3695	1087	74.6	MV-C	08	57	P	510.16	
08-Jan-05	195913	31.23517	-80.72649	984	279	MV-B	10	88	S	8588.26	
09-Jan-05	143347	31.1555	-81.34383	1100	47.2	MV-B	06	80	S	1901.37	
19-Jan-05	152001	31.4345	-80.726	1087	89.6	MV-C	02	86	P	4737.83	
21-Jan-05	201359	31.03383	-80.86934	1062	90.1	MV-C	04	77	P	1402.02	
24-Jan-05	143138	31.48917	-80.54967	1025	182.1	MV-C	08	89	P	17897.66	
24-Jan-05	184015	30.93484	-80.79833	1001	89.3	MV-C	00	87	P	5821.46	

Date	Time	Latitude	Longitude	Altitude (ft)	Heading	Vessel	Anhead	Angle	Observer	Distance from Track Line (m)	Comments
25-Jan-05	190825	30.88333	-80.97117	971	270.1	MV-C	14	89	P	16954.76	
26-Jan-05	194840	31.0315	-81.22549	1077	311.9	MV-C	06	0	P	0.00	
31-Jan-05	181912	31.03433	-80.94017	1051	90	MV-C	04	78	S	1507.03	
11-Feb-05	170452	30.88267	-81.31499	1000	86.8	MV-C	12	89	S	17461.13	
11-Feb-05	181343	30.984	-80.84467	1034	90.8	MV-B	10	87	S	6013.38	
11-Feb-05	183334	31.0325	-81.27016	950	268.8	MV-C	05	75	S	1080.60	
12-Feb-05	173006	31.0825	-81.37117	1030	270.4	CRSH	21	77	S	1359.77	Casino Boat
13-Feb-05	175837	31.08283	-80.77883	971	267.2	MV-C	10	80	P	1678.40	
13-Feb-05	194210	30.8835	-80.77783	1066	266.6	MV-C	21	74	P	1133.06	
13-Feb-05	194440	30.88433	-80.86183	1060	269.1	NV-U	12	76	P	1295.77	
14-Feb-05	150227	30.9335	-81.19051	1100	269.9	MV-B	10	12	P	71.26	
16-Feb-05	201034	31.03483	-80.80433	1008	268.8	MV-C	02	65	S	658.84	
16-Feb-05	202506	31.03283	-81.27834	1032	270.9	MV-C	06	84	S	2992.63	
18-Feb-05	223055	31.24167	-81.1135	1056	236.6	MV-B	00	89	S	18438.95	
18-Feb-05	223916	31.10367	-81.33916	1100	129.2	DR-W	06	68	S	829.81	
18-Feb-05	224005	31.08883	-81.316	1100	124.4	DR-W	06	0	S	0.00	
19-Feb-05	153554	31.08333	-81.28217	1038	89.4	DR-T	06	69	P	824.16	RN WEEKS
19-Feb-05	153653	31.08383	-81.24917	1037	89.5	DR-T	10	86	S	4519.90	BE LINDHOLM
20-Feb-05	183311	31.08533	-80.78184	1074	258.8	CG-C	00	88	P	9373.77	
20-Feb-05	185131	31.08317	-81.31983	1023	269.7	DR-T	06	0	S	0.00	
20-Feb-05	185250	31.08317	-81.36484	1008	270.1	DR-W	21	82	S	2186.01	
20-Feb-05	185402	31.0735	-81.39483	1034	188.2	CRSH	04	87	S	6013.38	
20-Feb-05	202735	30.88333	-81.319	980	269.8	MV-C	05	89	P	17111.91	
21-Feb-05	141920	31.07684	-81.27433	1034	117.7	DR-T	12	66	S	707.83	BE LINDHOLM
21-Feb-05	144250	31.5345	-80.847	1050	90.5	MV-B	10	79	P	1646.38	
21-Feb-05	180925	31.08267	-81.30533	1079	270	DR-T	06	72	P	1012.14	RN WEEKS
21-Feb-05	181747	31.035	-81.24534	1097	92.2	DR-D	14	65	S	717.01	BE LINDHOLM
22-Feb-05	180345	31.10683	-81.4025	1030	145.1	DR-T	08	75	S	1171.60	BE LINDHOLM
22-Feb-05	182306	30.93534	-81.10583	1007	274.7	MV-B	08	81	S	1937.81	
22-Feb-05	182805	30.9335	-81.25034	1012	270	MV-B	08	74	P	1075.67	
22-Feb-05	190806	31.0845	-81.242	1014	91.1	DR-T	13	73	S	1010.86	RN WEEKS
22-Feb-05	211310	31.38433	-80.99966	996	90.5	CG-C	09	84	S	2888.24	
28-Feb-05	194827	31.13383	-81.31133	974	88.1	DR-W	12	70	S	815.62	BE LINDHOLM
28-Feb-05	194848	31.13417	-81.29951	978	87.8	DR-W	06	83	S	2427.67	RN WEEKS
28-Feb-05	201558	31.08084	-80.7715	1038	280.3	MV-C	13	85	P	3616.09	
28-Feb-05	212640	31.12617	-80.95983	1067	315.1	MV-B	05	85	S	3717.12	
02-Mar-05	173103	31.49167	-80.67166	1016	175.9	MV-C	14	89	P	17740.51	
02-Mar-05	183624	31.29217	-80.65717	1009	171.8	MV-C	08	89	P	17618.28	
02-Mar-05	190235	31.232	-81.19234	961	85.4	MV-B	10	12	P	62.26	
02-Mar-05	202637	31.08267	-81.34283	1068	271.4	DR-W	12	77	S	1409.94	BE LINDHOLM
02-Mar-05	202718	31.0835	-81.36533	1025	273.5	DR-W	04	81	S	1972.45	RN WEEKS
04-Mar-05	170426	31.53433	-80.631	1017	90.1	MV-C	00	86	S	4432.73	
05-Mar-05	193316	31.08633	-81.34917	988	269.9	CRSH	21	79	S	1549.17	CASINO BOAT
05-Mar-05	204350	31.03467	-81.20667	1100	89	MV-C	21	59	S	557.97	

Date	Time	Latitude	Longitude	Altitude (ft)	Heading	Vessel	Anhead	Angle	Observer	Distance from Track Line (m)	Comments
07-Mar-05	201718	30.9855	-80.7775	1039	268.3	MV-C	02	70	P	870.05	
07-Mar-05	203938	30.93467	-81.29501	1058	91	MV-B	08	55	P	460.52	
09-Mar-05	153335	31.53283	-81.07549	976	91.3	MV-B	08	85	P	3400.10	
09-Mar-05	200613	30.8825	-80.84267	1042	271.6	MV-C	12	89	P	18194.50	
11-Mar-05	154132	31.03517	-81.24717	950	269.3	MV-C	12	79	P	1489.58	
19-Mar-05	151420	31.53633	-81.14483	1064	110.3	MV-B	08	87	P	6187.85	
19-Mar-05	180135	31.08333	-81.383	996	271	CRSH	21	81	S	1916.64	CASINO BOAT
20-Mar-05	145002	31.48283	-80.686	1012	270.6	MV-C	08	86	P	4410.93	
21-Mar-05	152703	31.01583	-80.77034	1019	357.9	MV-C	08	89	S	17792.89	
24-Mar-05	145140	31.48535	-80.54649	1002	216.4	MV-C	08	73	P	998.90	
29-Mar-05	161745	31.51283	-80.54517	1031	163.5	MV-C	14	88	P	8998.47	
29-Mar-05	191348	31.08283	-80.87516	1100	272.6	MV-C	02	67	P	789.83	
30-Mar-05	143727	31.52833	-81.1455	1037	72.5	MV-B	02	73	P	1033.79	
31-Mar-05	153446	31.03367	-81.1515	1083	268.7	MV-C	02	75	S	1231.88	