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NORTH ATLANTIC RIGHT WHALE SIGHTING SURVEY (NARWSS)

The North Atlantic Right Whale Sighting Survey (NARWSS) is a NOAA Fisheries program, which locates and records the seasonal distribution of North Atlantic right whales (*Eubalaena glacialis*) off the northeastern coast of the United States. NARWSS flights conducted in 2014 followed systematic tracklines with randomized starting locations within 12 primary survey blocks: Cashes Ledge, coastal Maine, Franklin Basin, Georges Basin, Georges Shoal, Great South Channel, Howell Swell, Jeffreys Ledge, Jordan Basin, Lindenkohl Basin, Rhode Island Sound, and Stellwagen Bank (Figure 1). During 2014, NARWSS flew 245 hours over 55 surveys (Table 1), including a directed flight over right whales in Cape Cod Bay and 2 sawtooth flights in Atlantis Canyon. NARWSS detected 278 right whales (including possible duplicate sightings of the same individuals), with 244 right whales sighted within survey blocks and 34 right whales sighted during transit to or from survey areas. Table 1 summarizes survey effort and right whale sightings by month. Figure 2(a-d) displays the locations of right whales and survey effort by season. In 2014, NARWSS did not conduct aerial surveys from February - March or August - October. In July, surveys were conducted in Canadian waters and are detailed in a separate report (Cole and Henry 2015). A comparison of NARWSS flights, flight hours, and right whale sightings from 2002 through 2014 is included (Figure 3, Table 2). Although sightings in 2014 rebounded compared to the low rates in 2013, the number of right whales seen per flight hour was still lower than observed between 2007 and 2011. Internal and external requests for NARWSS survey data are summarized in Table 3.

RIGHT WHALE SIGHTING ADVISORY SYSTEM (RWSAS)

In 2009, the Right Whale Sighting Advisory System (RWSAS) was re-engineered to support new regulations to reduce the probability of lethal injury to right whales from collisions with ships (50 CFR Part 224). The regulations established speed restrictions of 10 knots or less for all vessels of length 65 feet (19.8 m) or greater within Seasonal Management Areas (SMAs). The SMAs encompass areas of high risk for whale-vessel collision along the US Atlantic seaboard where right whale sightings predictably and consistently occur each year¹. If at least 3 right whales are sighted with a density of at least 0.04 right whales per square nautical mile outside of SMAs, a Dynamic Management Area (DMA) is established for 15 days (Clapham and Pace 2001) and mariners are requested to either avoid the area or travel through it at 10 knots or less. Unlike SMAs, compliance is voluntary for DMAs. The size of the DMA depends on the number of right whales sighted in the area. Mariners are notified of DMAs via email, an interactive Google Map website², the Whale Alert iPad/iPhone app³, Broadcast Notice to Mariners (BNM), NOAA Weather Radio, and the Mandatory Ship Reporting system (MSR). In 2014, 12 DMAs (including extensions) were triggered by validated RWSAS reports, none of which were triggered by NARWSS survey sightings (Table 4). The RWSAS collected sighting reports from aerial research surveys, shipboard research surveys, commercial whale watch vessels, the US Coast Guard, and other sources (commercial ships, fishing vessels, and the general public). The most common source of reports in 2014 was aerial surveys (478 reports - 64%; see Figure 4(a-c), Figure 5, and Table 5). Most reports in Canada were from dedicated right whale

¹ <http://www.nmfs.noaa.gov/pr/shipstrike/>

² <http://www.nefsc.noaa.gov/psb/surveys/>

³ <http://www.whalealert.org/>

shipboard surveys (Table 5 and Figure 4a). Most sightings were in the Northeast (New York to Maine), where the number of reports per month ranged from 1 in November to 321 in April (Table 5 and Figure 4b). Most reports in the Mid-Atlantic (New Jersey through Virginia) were from other sources (commercial ships, fishing vessels, and the general public) (Table 5 and Figure 4c). Logging acoustic detections into the RWSAS was discontinued in 2009 in favor of publicly available automated acoustic detection websites maintained by the Bioacoustics Research Program at the Cornell Lab of Ornithology⁴, which provide the information in near real-time.

ACKNOWLEDGEMENTS

We would like to extend our gratitude to NARWSS aerial observers (Corey Accardo, Karen Vale, and Heather Nicotri), NOAA Aircraft Operations Center, the NOAA Twin Otter pilots, and the United States Coast Guard Air Station Cape Cod.

⁴ <http://www.listenforwhales.org/>

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- Cole TVN, Gerrior P, Merrick RL. 2007. Methodologies and preliminary results of the NOAA National Marine Fisheries Service aerial survey program for right whales (*Eubalaena glacialis*) in the northeast U.S., 1998-2006. U.S. Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 07-02; 11 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.
- Cole TVN, Henry AG. 2015. Scotian Shelf Right Whale Aerial Survey Project July 18-30, 2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-09; 8 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543- 1026, or online at <http://nefsc.noaa.gov/publications/>

Table 1. Summary of North Atlantic Right Whale Sighting Survey (NARWSS) flights conducted in 2014 by month including the survey block, number of flights, flight hours, and right whale (*Eubalaena glacialis*) sightings. Gray font indicates months with no flights in regular survey blocks.

Month	Total Number of Flights in Each Survey Block													Flights	Flight Hours ¹	Right Whales ²	
	Cashes Ledge	Coastal Maine	Franklin Basin	Georges Basin	Georges Shoal	Great South Channel	Howell Swell	Jeffreys Ledge	Jordan Basin	Lindenkolh Basin	Rhode Island Sound	Stellwagen Bank	Other				
January														1	1	4.8	0
February																	
March																	
April	1	1				2		1	1		2	1	1		10	44.0	51
May			1	1		6	1	3	1		2	1			16	70.9	116
June	1		3	1		5	2		1			1	1		15	65.3	73
July				1											1	5.2	2
August																	
September																	
October																	
November							1	1			1				3	11.7	0
December	2			1		1	1	1	1		1	1			9	43.0	2
Flights	4	1	4	4	0	14	5	6	4	0	6	4	3		55		
Flight Hours¹	20.6	5.4	17.7	21.9	0	59.3	25.5	26.8	17.7	0	19.5	19.5	11.1			244.9	
Right Whales²	0	0	8	27	0	116	41	3	0	0	1	15	33				244

¹ Flight Hours - includes transit, survey, and circling to photograph whales; does not include flights that were aborted due to bad weather
² Right Whales - includes duplicate individuals; does not include whales seen on transit

Table 2. Comparison of the total number of right whale (*Eubalaena glacialis*) sightings per flight hour by month and year from the North Atlantic Right Whale Sighting Survey (NARWSS) flights. Numbers indicate the number of right whales seen per flight hour in a given month and year with heat map ranging from blue (no right whale sightings) to hot pink (maximum 6.2 right whales per flight hour in May of 2008).

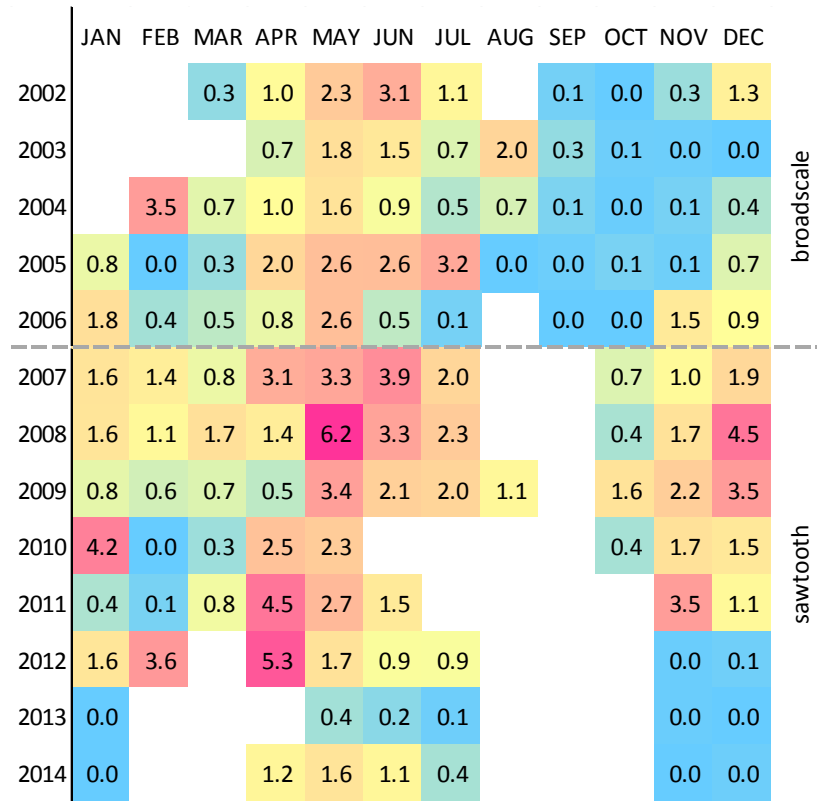


Table 3. Summary of data requests made in 2014 for North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) data.

Organization	Database	Data Request Description
Duke University	NARWSS and RWSAS	Right whales (<i>Eubalaena glacialis</i>) in the mid-Atlantic
George Mason University	NARWSS	Right whales from 2008 - 2013
George Mason University	RWSAS	Right whale sighting thru 5/1/2014 north of 36 degrees 35 min
George Mason University	NARWSS	Effort data
Mystic Seaport museum	NARWSS	Sperm whale (<i>Physeter macrocephalus</i>) distribution
New England Aquarium	NARWSS	Right whale sightings, particularly unusual distribution in 2013
Duke University	NARWSS	Declination angles from 2013 spring data
Center for Coastal Studies	NARWSS	2013 basking shark (<i>Cetorhinus maximus</i>) sightings
NOAA	NARWSS	Summary data and total numbers of species seen
Woods Hole Oceanographic Institute	NARWSS	All data in the months November, December, January, and February
Granite State Whale Watch	NARWSS	Sightings from 12/22 flight on Jeffreys Ledge

Table 4. Summary of Dynamic Management Areas (DMA) in 2014, triggered by a confirmed report to the Right Whale Sighting Advisory System (RWSAS) of 3 or more right whales (*Eubalaena glacialis*) in close proximity to each other outside of any active Seasonal Management Areas (SMA).

ID	DMA Name	# Whales	North	South	West	East	Start Date	End Date
356	Cape Cod Bay MA	8	42.32	41.53	-70.67	-69.70	26-Dec-13	1-Jan-14
396	46nm SE Nantucket MA	3	41.07	40.40	-69.63	-68.75	15-Jan-14	18-Jan-14
415	26nm S Nantucket MA	5	41.07	40.40	-70.43	-69.55	18-Jan-14	30-Jan-14
417	Nantucket MA	3	41.22	40.55	-70.60	-69.73	1-Mar-14	16-Mar-14
436	4nm SE Nantucket MA	11	41.63	40.83	-70.83	-69.77	6-Mar-14	20-Mar-14
456	28nm S Nantucket MA	8	41.20	40.48	-70.68	-69.75	3-Apr-14	17-Apr-14
476	13nm NE of Nantucket MA	7	41.92	41.18	-70.35	-69.35	7-Apr-14	21-Apr-14
496	70nm E Portland ME	3	43.98	43.33	-69.07	-68.17	1-Aug-14	15-Aug-14
497	13nm S Portsmouth NH	5	43.22	42.52	-71.20	-70.23	8-Aug-14	22-Aug-14
498	13nm SE Nantucket MA	10	41.58	40.93	-69.93	-70.77	13-Dec-14	27-Dec-14
518	Cape Cod Bay MA	7	42.18	41.43	-70.72	-69.77	23-Dec-14	1-Jan-15
519	13 nm South of Nantucket MA	8	41.58	40.93	-70.77	-69.93	27-Dec-14	10-Jan-15

Table 5. The total number of right whale (*Eubalaena glacialis*) sighting reports to the Right Whale Sighting Advisory System (RWSAS) in 2014 by reporting source and month within Canadian waters, the Northeast region (New York to Maine), and the Mid-Atlantic region (New Jersey through Virginia). The category “Other” includes reports made by the general public, commercial ships, and fishing vessels. Unconfirmed reports were excluded.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
Canada	Aerial Survey						4	7					1	12	17%
	Shipboard Survey								23	16				39	57%
	Whale watch						1	2	2					5	7%
	Coast Guard													0	0%
	Other				1	2	1	8			1			13	19%
	Canada Totals				1	2	6	17	25	16	1			1	69
Northeast	Aerial Survey	13	41	108	235	36	21						12	466	71%
	Shipboard Survey		6	24	10									40	6%
	Whale watch				29	2	1	1	1		1	1		36	5%
	Coast Guard	1	1	4	4		5							15	2%
	Other	3	1	31	43	1	1	7	2	2	1		9	101	15%
	Northeast Totals	17	49	167	321	39	28	8	3	2	2	1	21	658	100%
Mid-Atlantic	Aerial Survey													0	0%
	Shipboard Survey													0	0%
	Whale watch													0	0%
	Coast Guard				1					1				2	13%
	Other	3	5	2	2		1						1	14	88%
	Mid-Atlantic Totals	3	5	2	3		1			1			1	16	100%

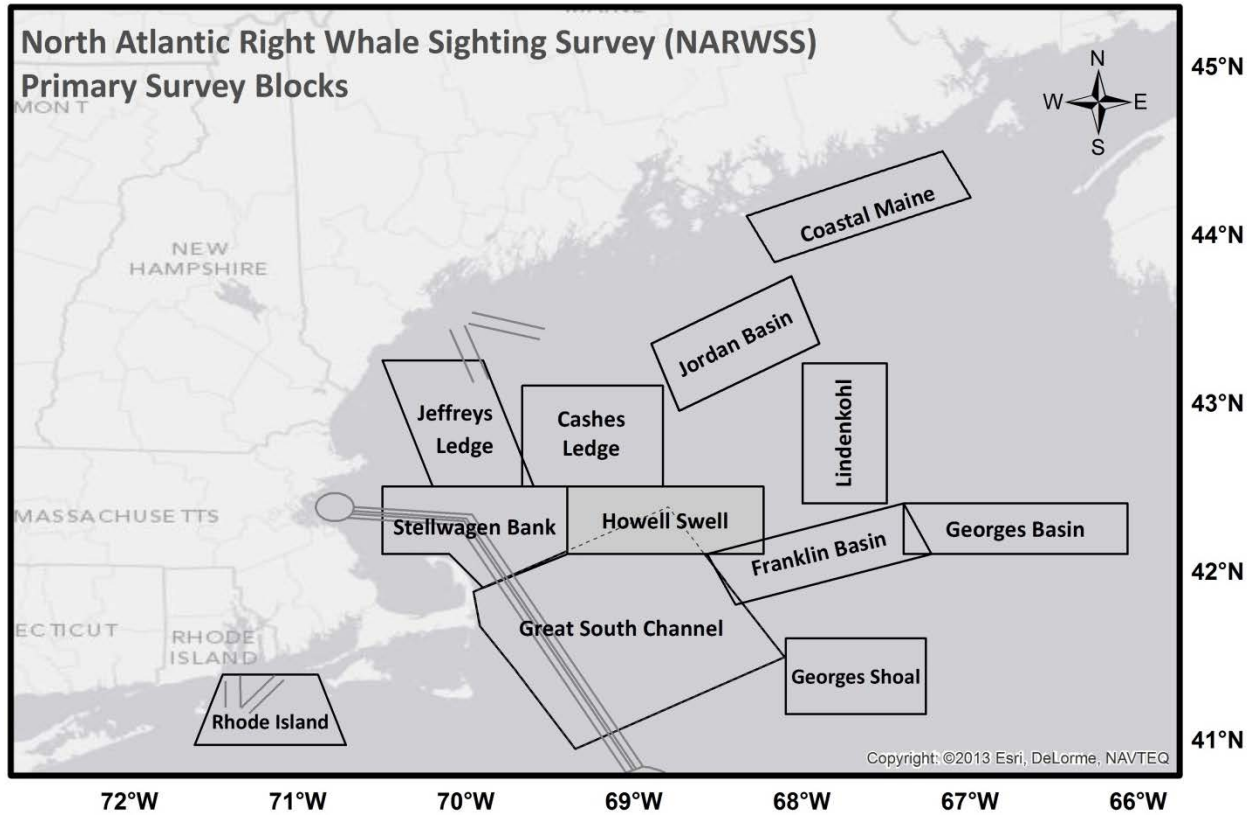


Figure 1. North Atlantic Right Whale Sighting Survey (NARWSS) blocks. Shipping lanes are denoted in gray.

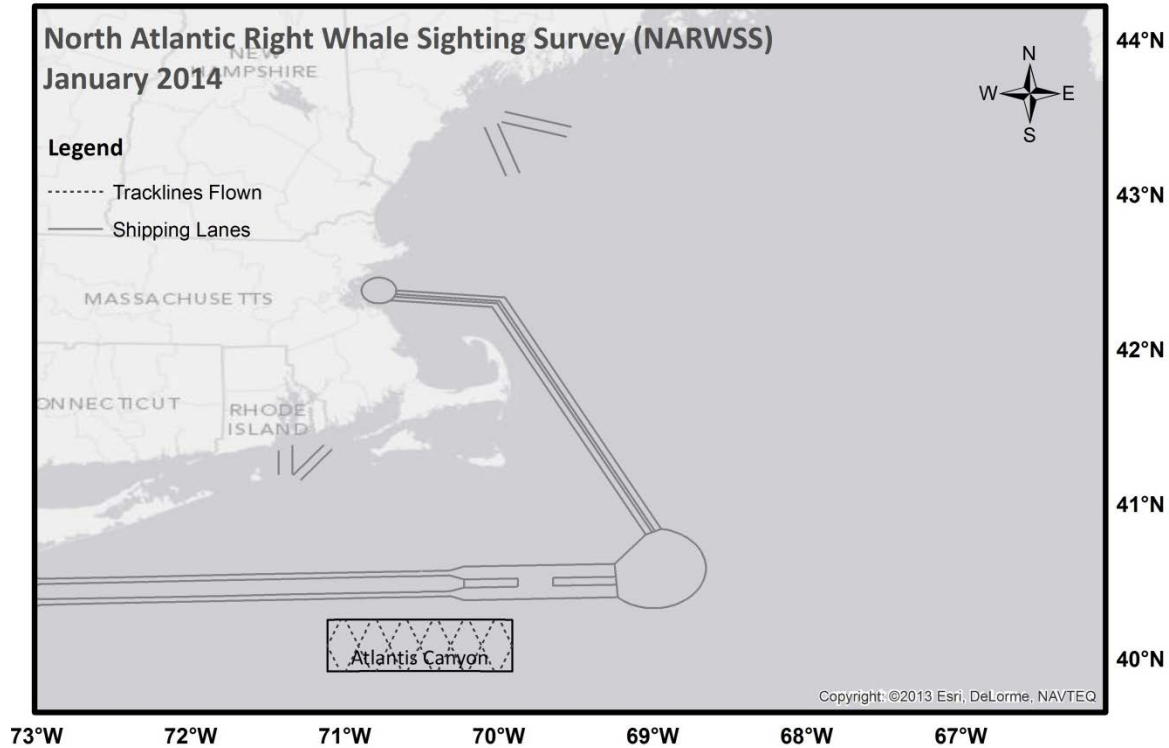


Figure 2a. North Atlantic Right Whale Sighting Survey (NARWSS) tracklines flown in January 2014. There were no right whales (*Eubalaena glacialis*) seen. No surveys were flown in February or March of 2014.

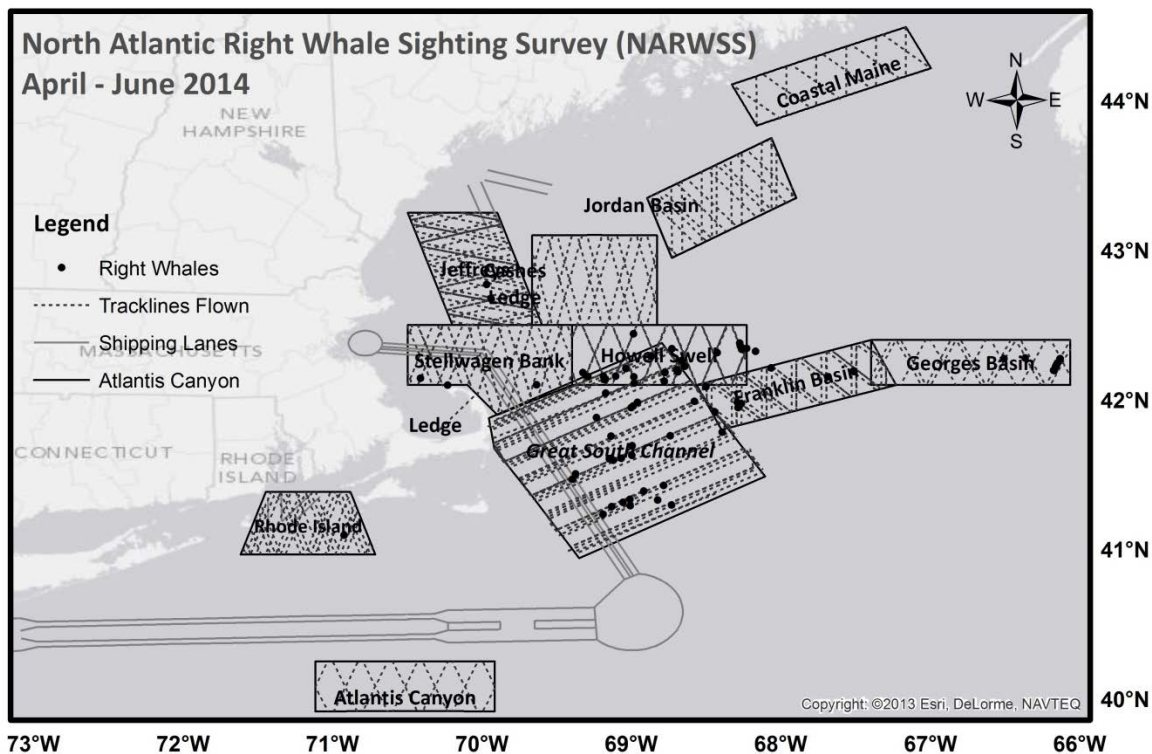


Figure 2b. North Atlantic Right Whale Sighting Survey (NARWSS) tracklines flown and right whale (*Eubalaena glacialis*) sightings from April through June 2014.

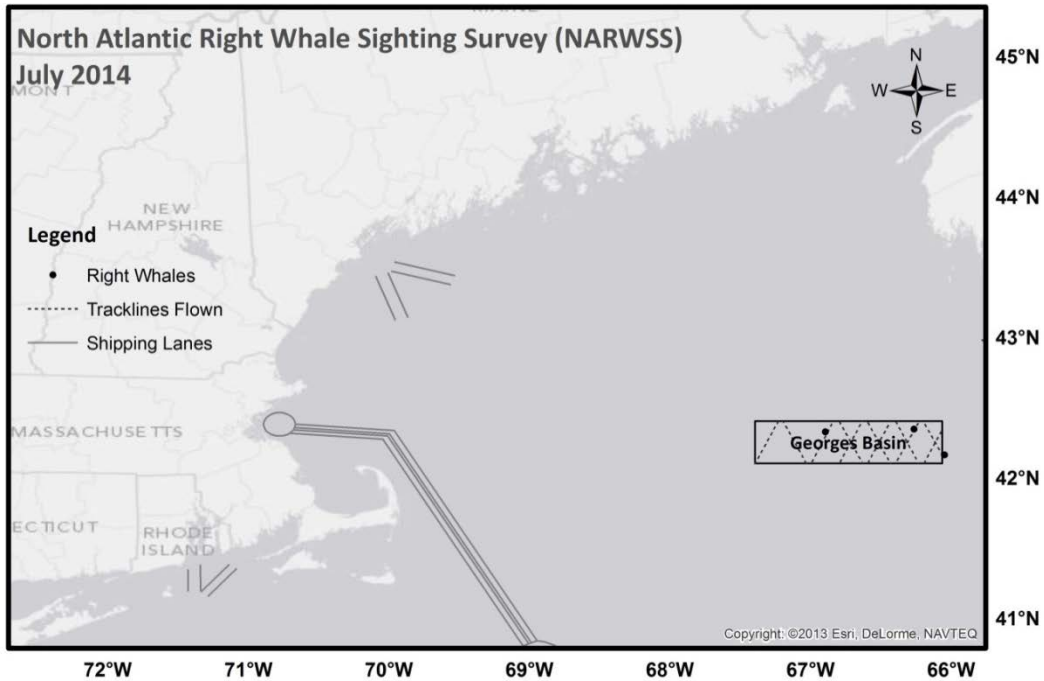


Figure 2c. North Atlantic Right Whale Sighting Survey (NARWSS) tracklines flown and right whale (*Eubalaena glacialis*) sightings from July 2014. This survey and others conducted over the Scotian Shelf in Canada during the remainder of July 2014 are detailed in a separate report (Cole and Henry 2015). No surveys were flown in August or September of 2014.

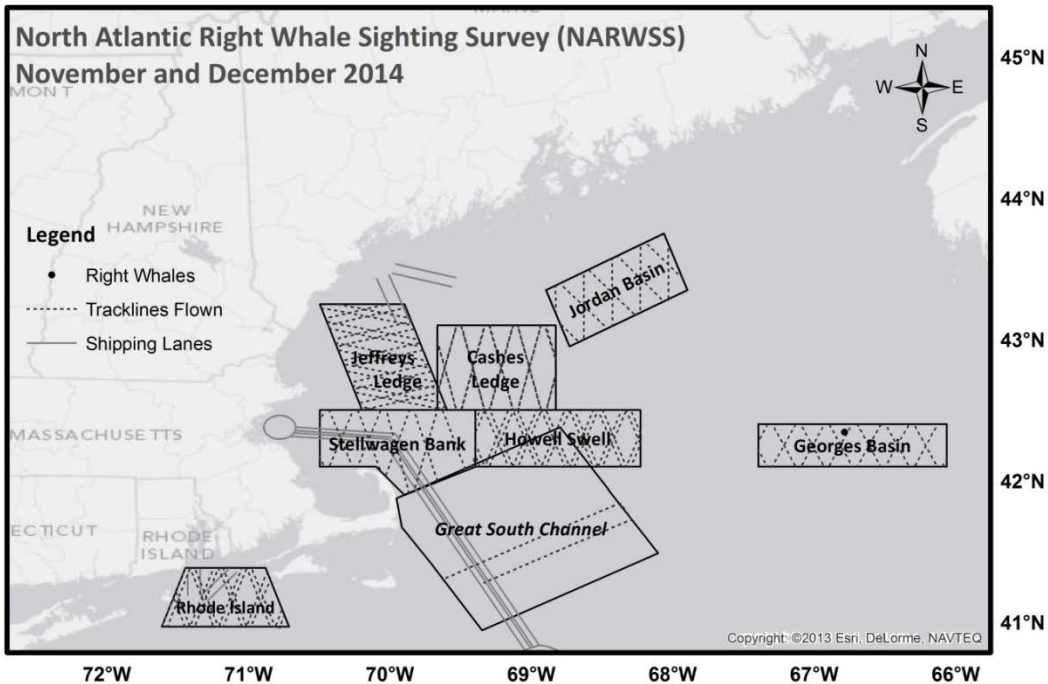


Figure 2d. North Atlantic Right Whale Sighting Survey (NARWSS) tracklines flown and right whale (*Eubalaena glacialis*) sightings from November and December of 2014. No surveys were flown in October of 2014.

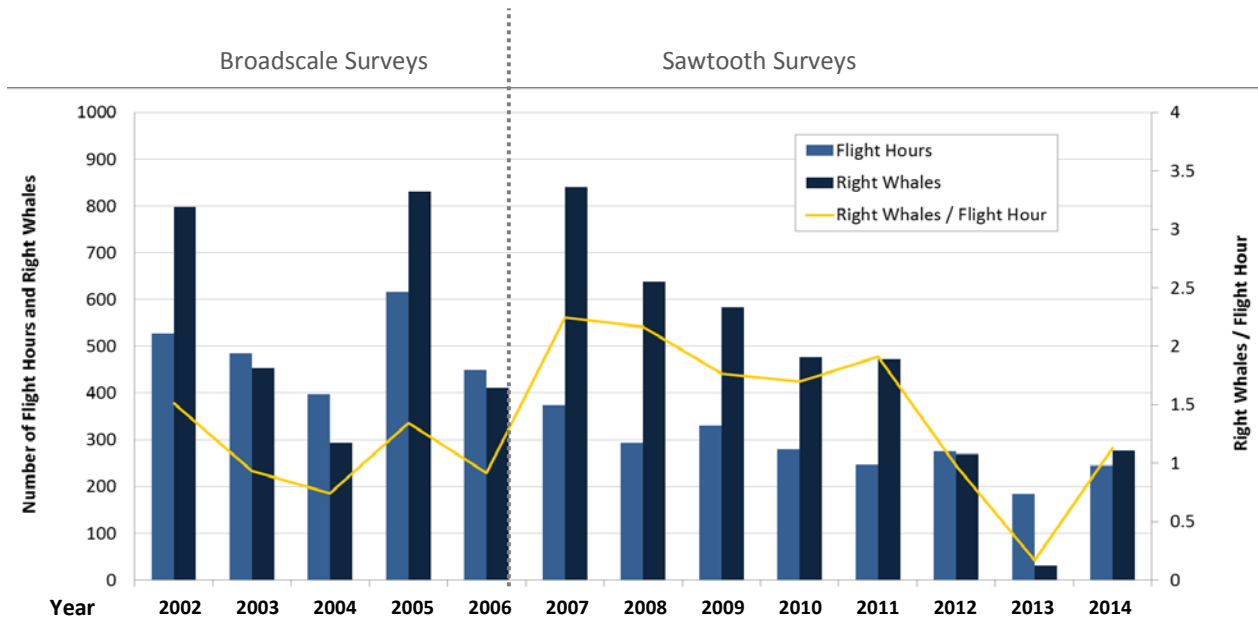


Figure 3. Comparison of North Atlantic Right Whale Sighting Survey (NARWSS) hours flown and right whale (*Eubalaena glacialis*) sightings from 2002 through 2014 with the number of right whales seen per flight hour overlaid. The number of flights includes randomized systematic, directed, and exploratory surveys. The number of flight hours includes time on transit, on survey, and circling to photograph whales. The number of whales includes duplicate individuals but not whales seen on transit. The number of right whales sighted per flight hour increased in 2007 when the sawtooth survey design replaced broadscale systematic surveys that covered the entire Gulf of Maine (Cole et al 2007). From 2002 - 2005 there were periods when 2 survey aircraft were used concurrently.

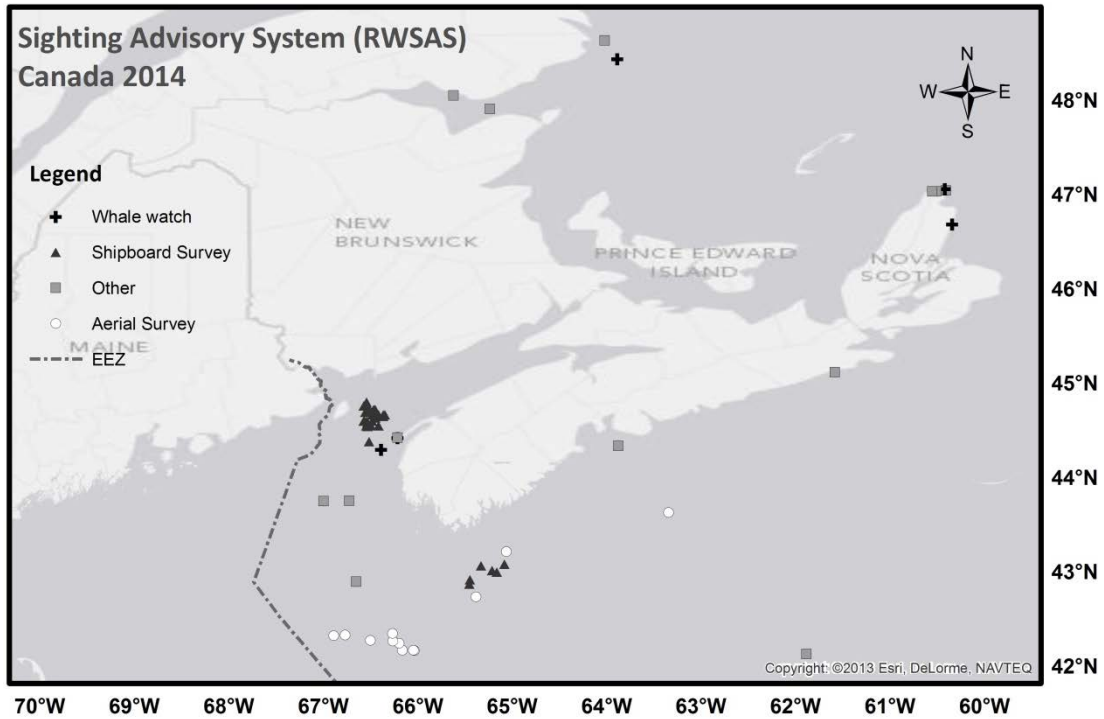


Figure 4a. Locations of all right whales (*Eubalaena glacialis*) reported to the Right Whale Sighting Advisory System (RWSAS) within Canadian waters in 2014, shown by reporting source. The category “Other” includes reports made by the general public, commercial ships, and fishing vessels. Unconfirmed reports were excluded.

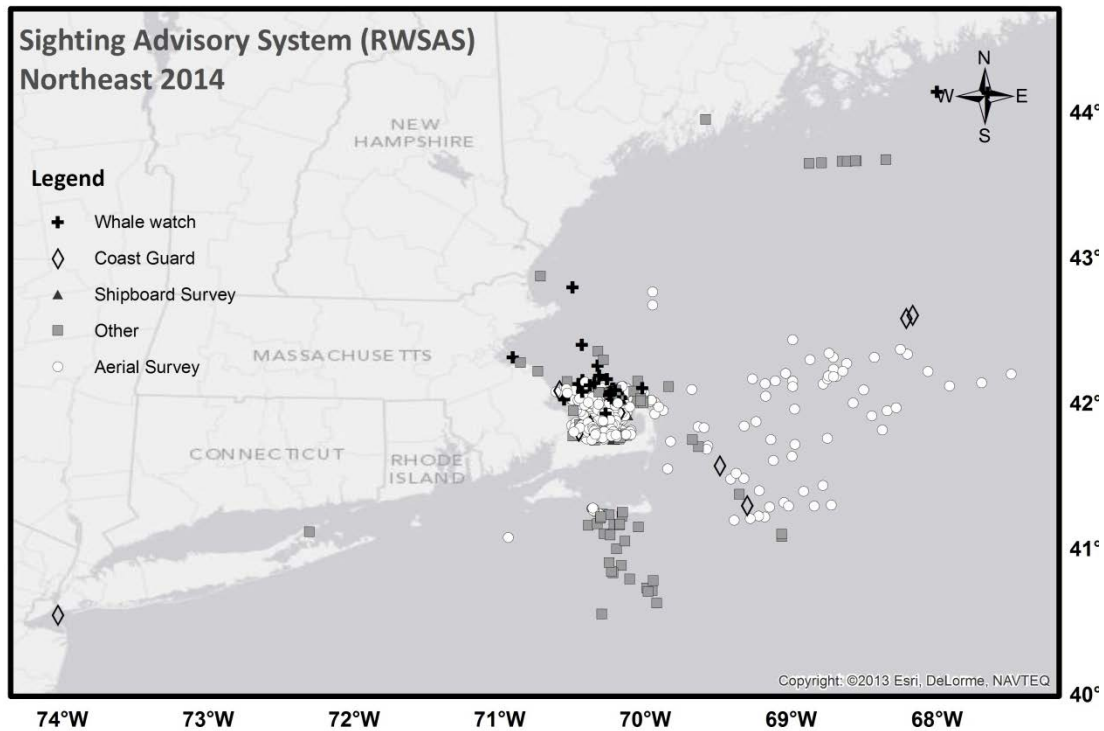


Figure 4b. Locations of all right whales (*Eubalaena glacialis*) reported to the Right Whale Sighting Advisory System (RWSAS) within the Northeast region (New York to Maine) in 2014, shown by reporting source. The category “Other” includes reports made by the general public, commercial ships, and fishing vessels. Unconfirmed reports were excluded.

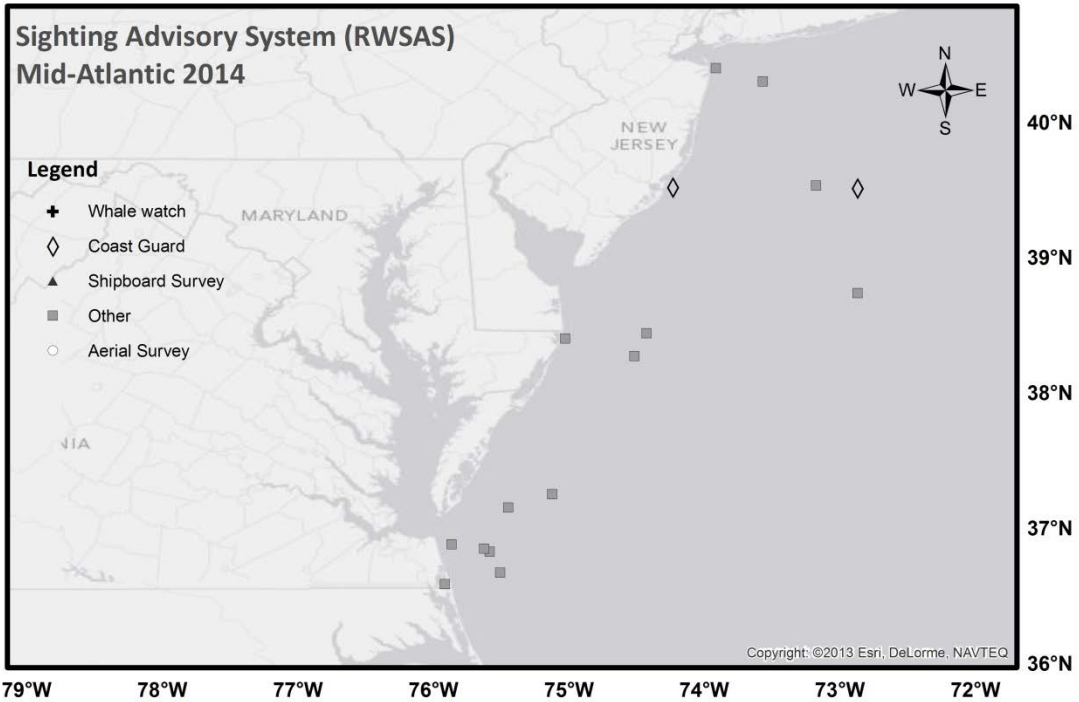


Figure 4c. Locations of all right whale (*Eubalaena glacialis*) sightings reported to the Right Whale Sighting Advisory System (RWSAS) within the Mid-Atlantic region in 2014, shown by reporting source. The category “Other” includes reports made by the general public, commercial ships, and fishing vessels. Unconfirmed reports were excluded.

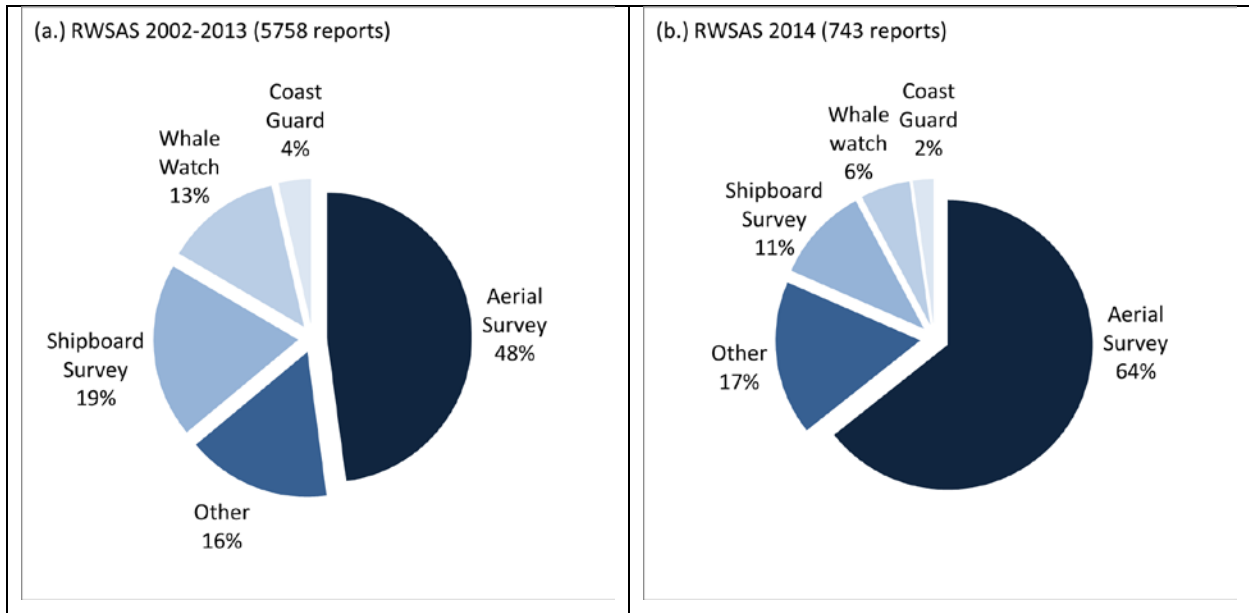


Figure 5. Right Whale Sighting Advisory System (RWSAS) reports by category from (a.) all years prior to 2014 (2002-2013) and (b.) 2014.

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