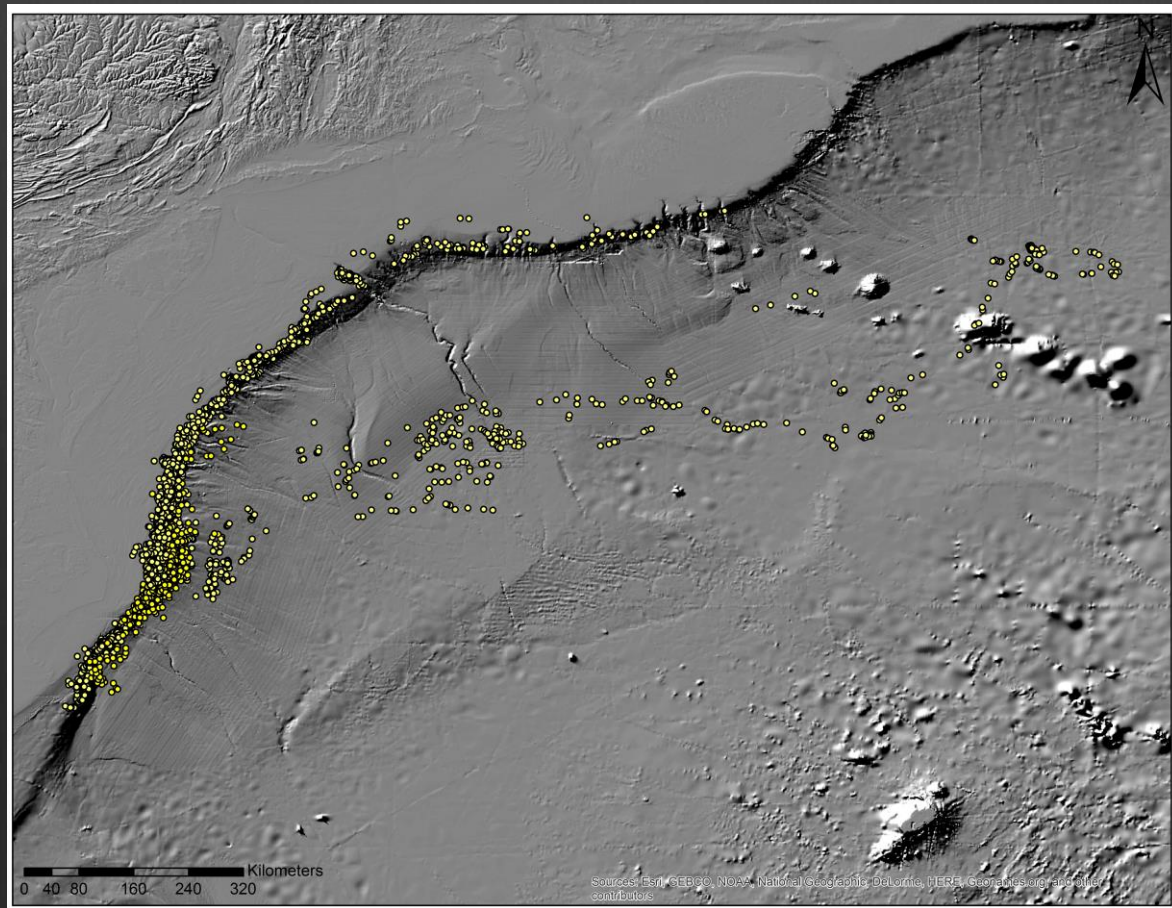


Movement and Residency Patterns of Satellite-tagged Odontocetes Offshore of Cape Hatteras, NC

“Living on the Edge”

Heather Foley, Zach Swaim, Danielle Waples,
Robin Baird, Daniel Webster, & Andy Read



OVERVIEW

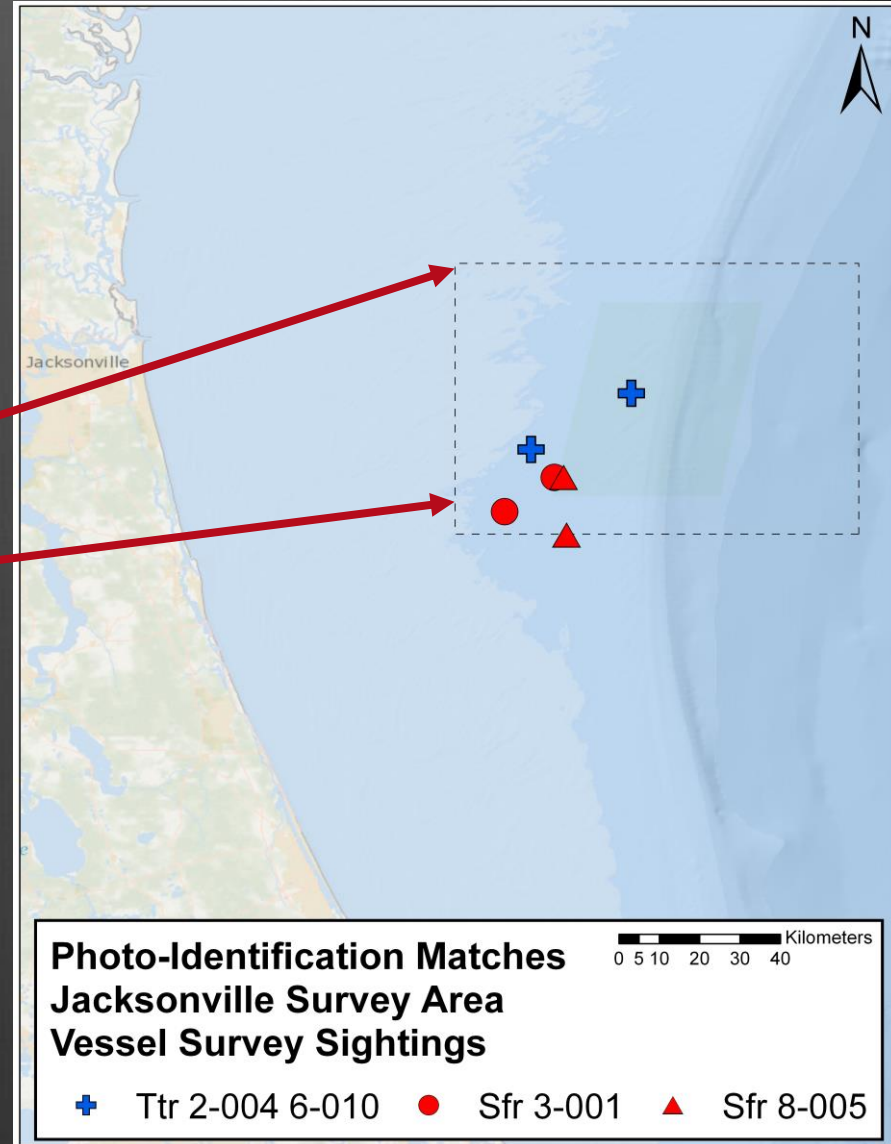
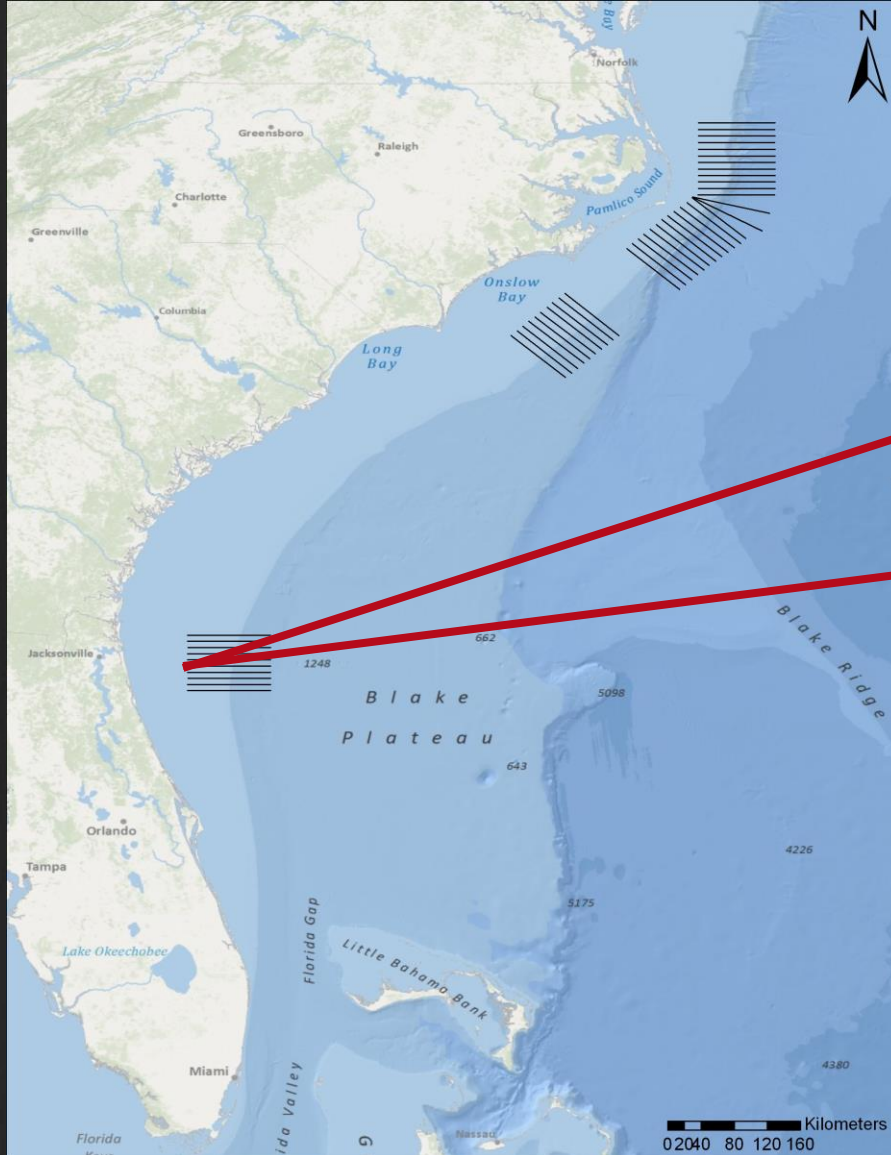


USWTR/AFAST/AFTT Baseline Monitoring Cape Hatteras/Onslow Bay/Jacksonville

- vessel surveys
 - photo-id/biopsy
- aerial surveys
 - line-transect
- passive acoustics
 - HARPs/MARUs

Residency along the Continental Shelf

Jacksonville



Residency along the Continental Shelf

Onslow Bay

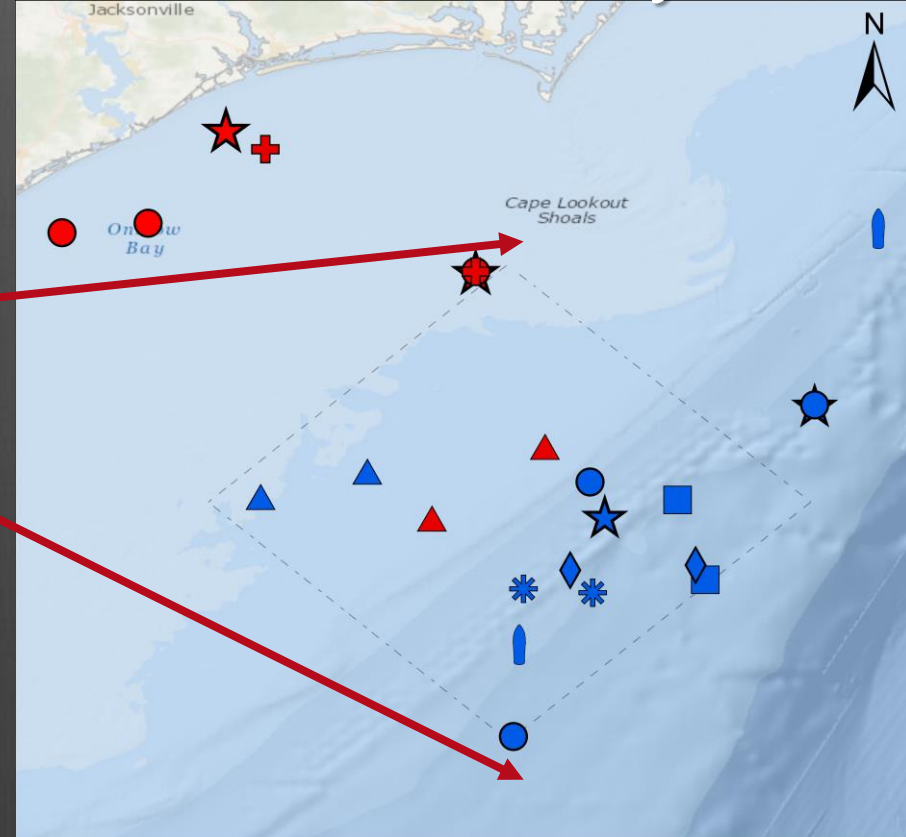
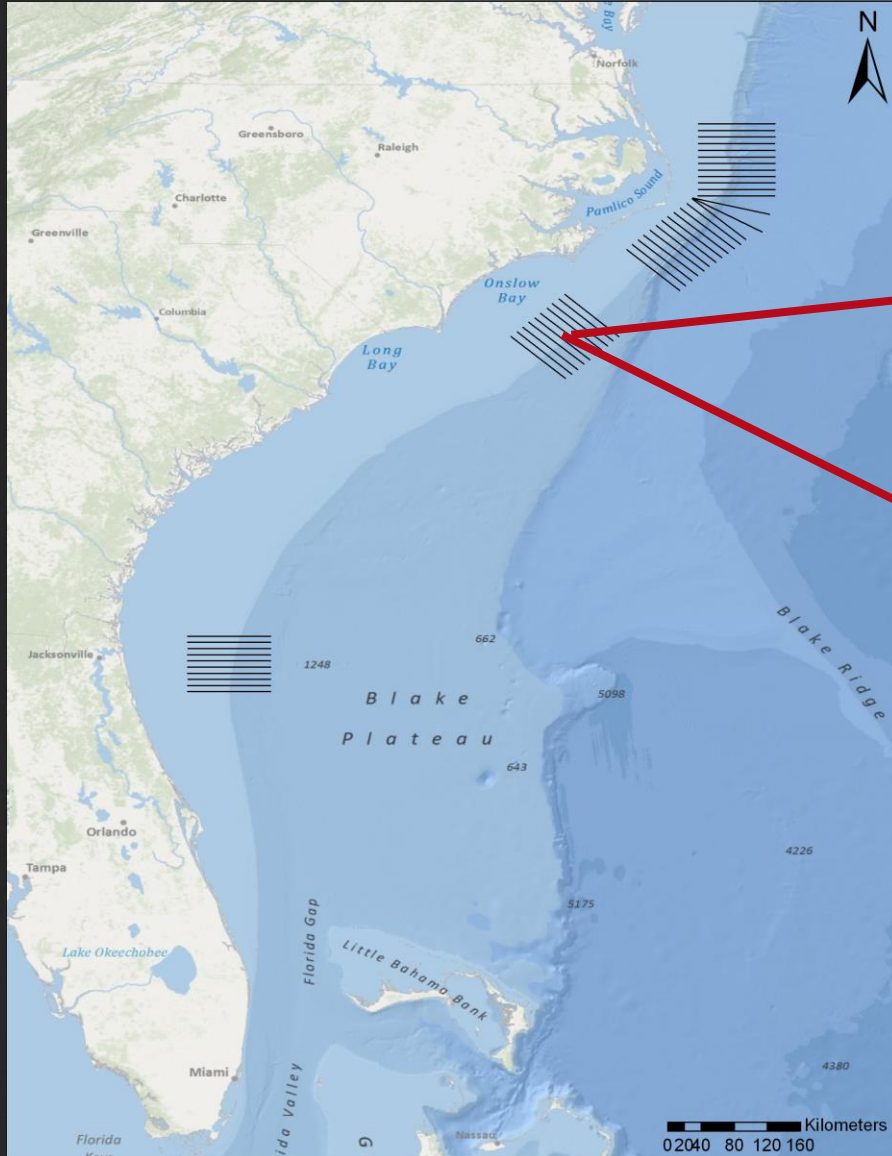


Photo-Identification Matches
Onslow Bay Survey Area
Vessel Survey Sightings

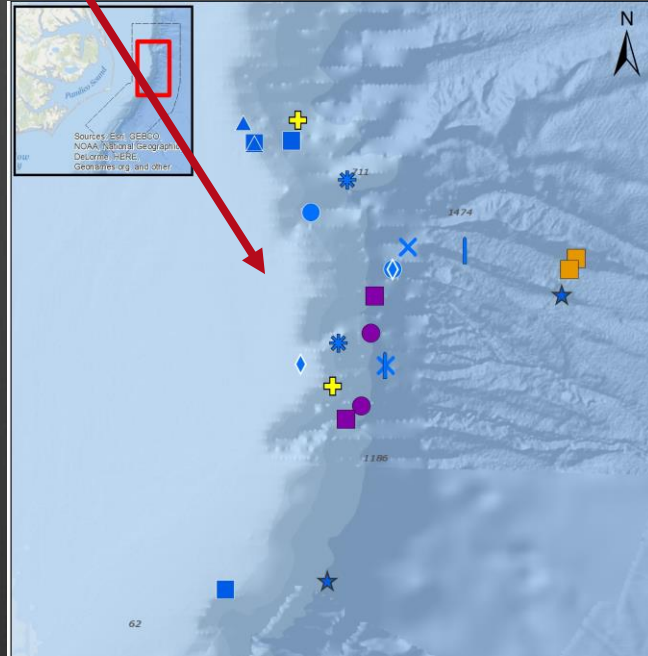
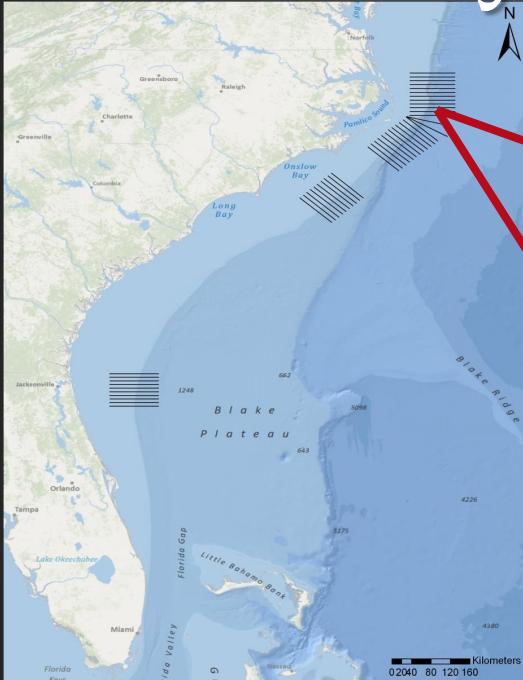
0 5 10 20 30 40 Kilometers

- | | | | |
|-------------|-------------------|-------------|-------------|
| ● Ttr 1-004 | ★ Ttr 6-010 | ◆ Ttr 9-016 | ▲ Sfr 9-013 |
| ┆ Ttr 2-001 | ✱ Ttr 6-018 | ★ Sfr 7-013 | ✚ Sfr 9-023 |
| ■ Ttr 4-002 | ▲ Ttr 7-015 8-009 | ● Sfr 8004 | |

Residency along the Continental Shelf

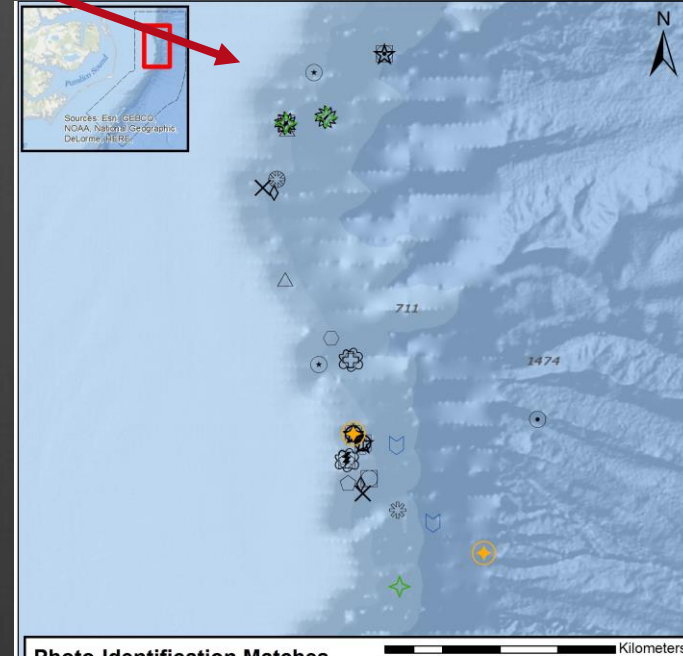
Cape Hatteras

25 pilot whale matches



**Photo-Identification Matches
Cape Hatteras Survey Area
Vessel Survey Sightings**

+	Dde 7-002	●	Zca-005r	●	Ttr 7-031		Ttr 9-016
■	Pma-004	■	Ttr 1-001	▲	Ttr 7-038	×	Ttr 9-027
■	Zca-003r	◆	Ttr 6-020	★	Ttr 7-058	★	Ttr 6-018 & Ttr 9-013



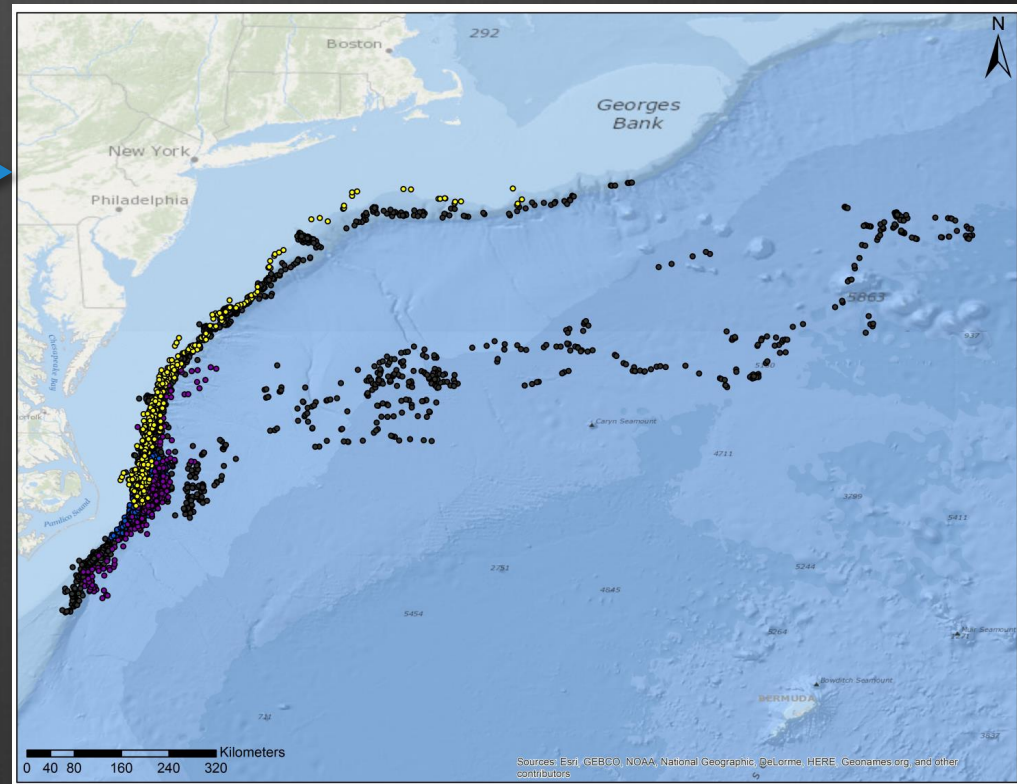
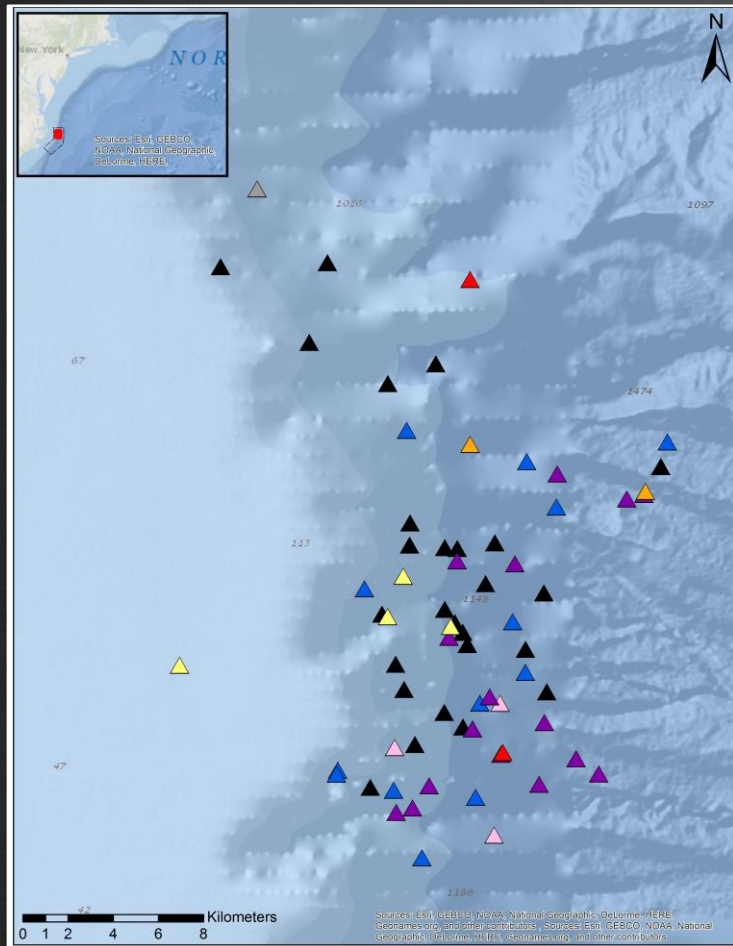
**Photo-Identification Matches
Cape Hatteras Survey Area
Vessel Survey Sightings**

⊞	GmTag087	△	Gma_1-002	☆	Gma_7-003	⚡	Gma_7-017	○	Gma_7-071
◆	GmTag096	○	Gma_6-001	⊙	Gma_7-007	↑	Gma_7-018	⊞	Gma_7-084
⊙	GmTag097	⊞	Gma_6-006	⊙	Gma_7-009	⊞	Gma_7-026	✓	Gma_7-085
⊞	Gma_1-001	⊞	Gma_6-026	+	Gma_7-012	∞	Gma_7-027	↓	Gma_8-007
⊞	Gma_6-033	⊞	Gma_7-002	⊞	Gma_7-014	◇	Gma_7-055	×	Gma_8-016

9 bottlenose dolphin,
2 Cuvier's beaked
whale, 1 sperm whale,
1 common dolphin

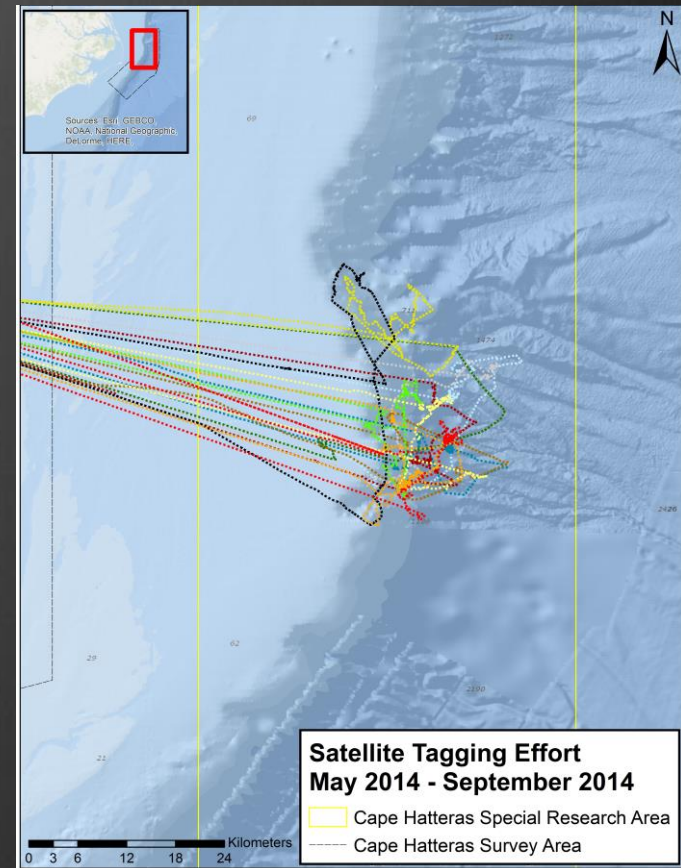
OBJECTIVE

Obtain medium-term movement and diving patterns of odontocetes to complement the existing information on long-term residency patterns from photo-id and short-term Dtag dive records



EFFORT

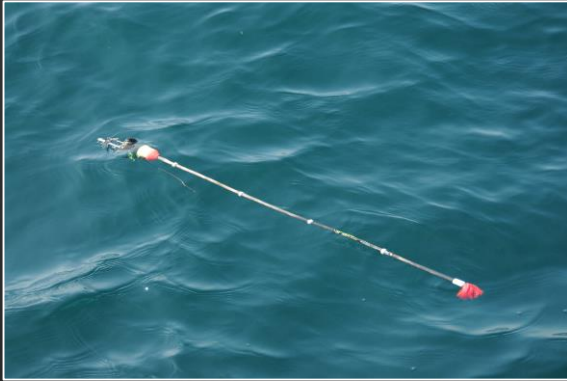
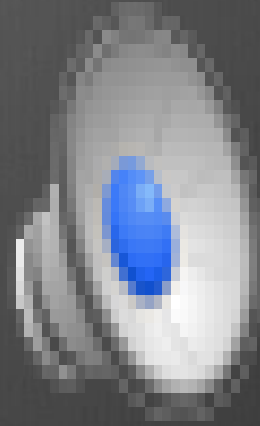
- May, June and September 2014
- 11 days with Cascadia Research Collective
- Wildlife Computers SPOT5 location-only and Mk-10 depth-transmitting tags



**Satellite Tagging Effort
May 2014 - September 2014**

— Cape Hatteras Special Research Area
- - - Cape Hatteras Survey Area

LIMPET – Low Impact Minimally Percutaneous External-electronics Transmitter

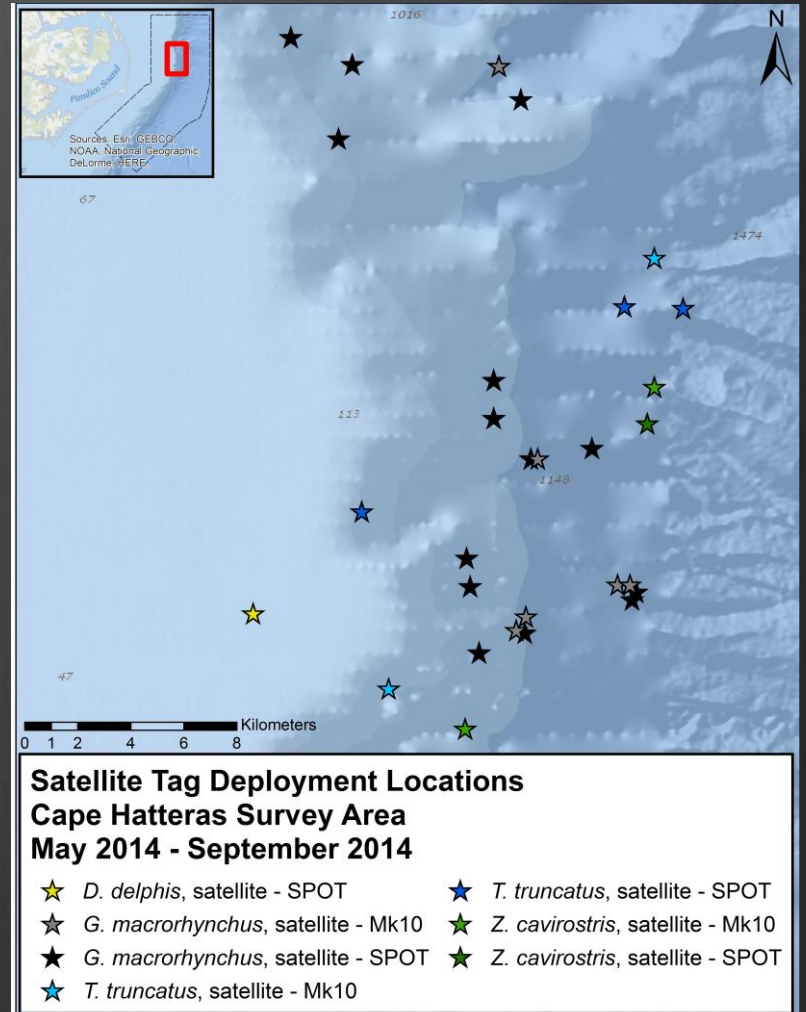


RESULTS

29 individuals tagged

- 20 short-finned pilot whales (14 SPOT, 6 Mk10)
- 5 bottlenose dolphins (3 SPOT, 2 Mk10)
- 3 Cuvier's beaked whales (1 SPOT, 2 Mk10)
- 1 short-beaked common dolphin (1 SPOT)

Deployment	Animal ID	Tag Type	ARGOS Id	Last Transmission
13-May-14	Zc029	Mk-10	102465	12-Jul-14
14-May-14	Gm084	SPOT	94808	15-May-14
14-May-14	Gm085	Mk-10	53644	21-Jun-14
14-May-14	Gm086	SPOT	94788	1-Aug-14
18-May-14	Gm087	SPOT	98362	28-Nov-14
18-May-14	Tt014	SPOT	53652	2-Jun-14
7-Jun-14	Gm088	SPOT	102471	24-Sep-14
8-Jun-14	Gm089	Mk-10	94810	Failed immediately
8-Jun-14	Gm090	SPOT	94796	2-Aug-14
8-Jun-14	Gm091	Mk-10	102464	Failed immediately
11-Jun-14	Gm092	SPOT	94817	30-Jul-14
11-Jun-14	Gm093	Mk-10	94805	29-Jun-14
11-Jun-14	Gm094	SPOT	94804	3-Sep-14
11-Jun-14	Gm095	SPOT	53651	3-Sep-14
11-Jun-14	Tt015	SPOT	109822	29-Jun-14
11-Jun-14	Tt016	Mk-10	72534	28-Jun-14
12-Jun-14	Dd001	SPOT	94806	22-Jul-14
11-Sep-14	Gm096	SPOT	94814	12-Sep-14
11-Sep-14	Gm097	SPOT	98369	13-Oct-14
11-Sep-14	Gm098	Mk-10	98358	9-Oct-14
11-Sep-14	Gm099	SPOT	102473	14-Nov-14
11-Sep-14	Gm100	Mk-10	53553	6-Oct-14
13-Sep-14	Gm101	SPOT	94794	15-Oct-14
13-Sep-14	Gm102	SPOT	102466	23-Sep-14
13-Sep-14	Gm103	SPOT	94793	5-Jan-15
13-Sep-14	Tt017	SPOT	98359	30-Sep-14
16-Sep-14	Tt018	Mk-10	94797	29-Sep-14
16-Sep-14	Zc030	Mk-10	77246	25-Oct-14
16-Sep-14	Zc031	SPOT	98368	19-Oct-14

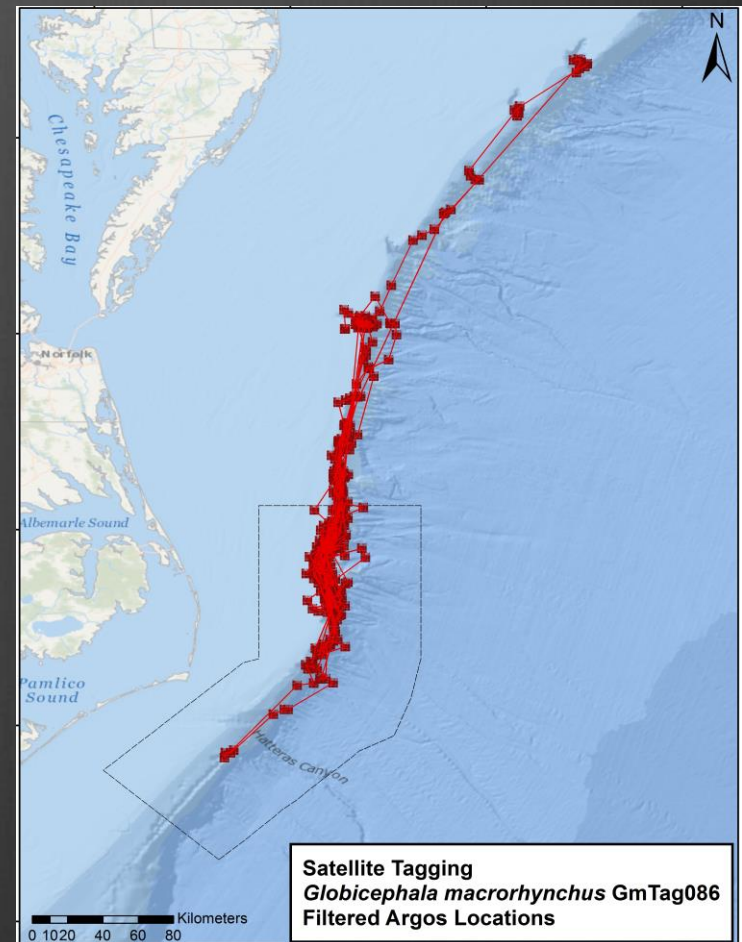
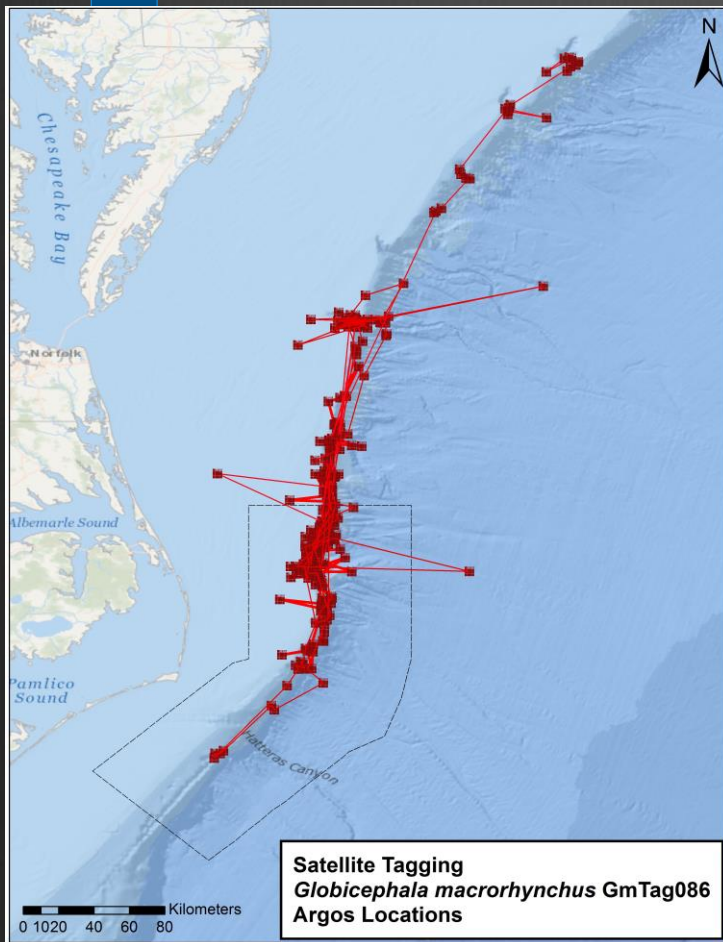


DATA FILTERING

811 Locations

Douglas Filter

516 Locations



FILTERED OUTPUT

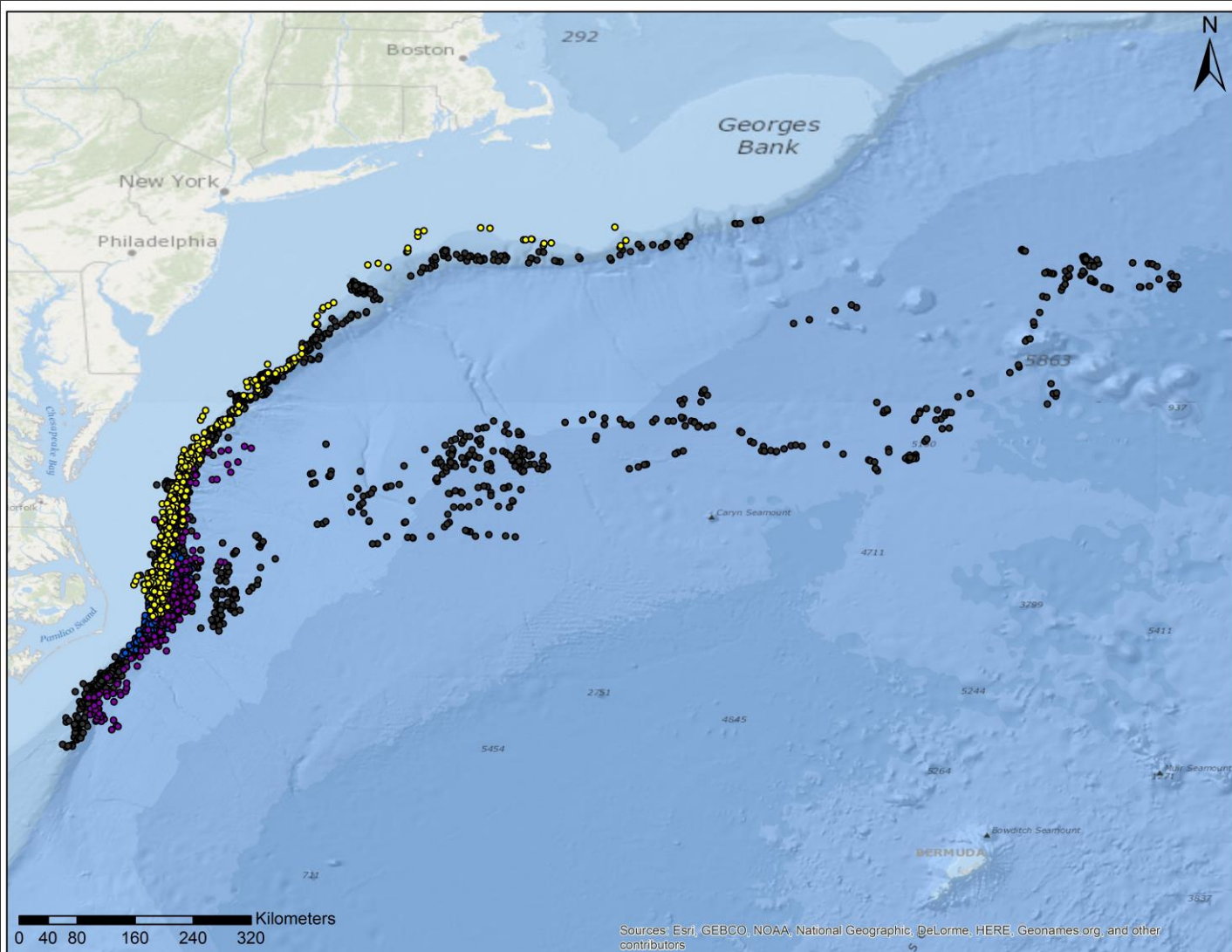
7549 locations (n =29)

Tag Length Range

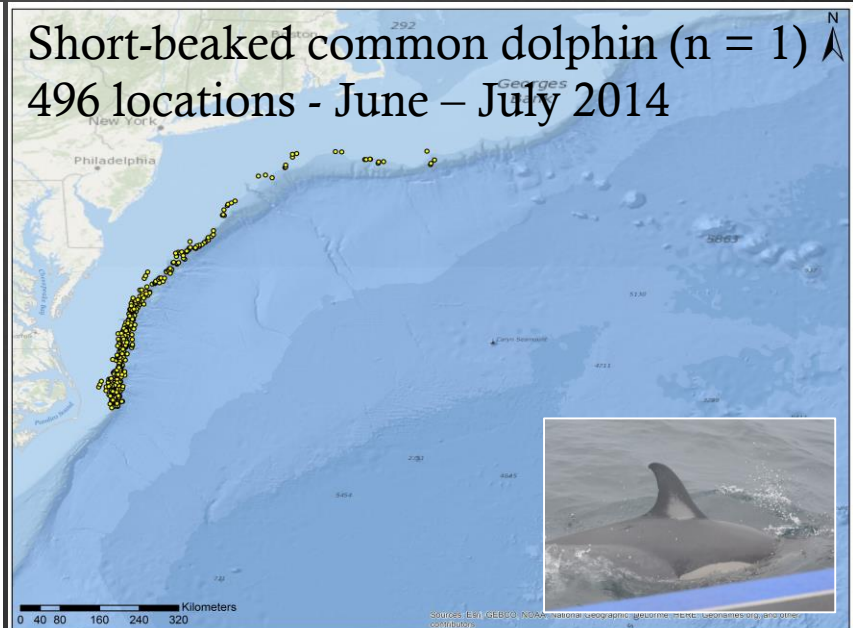
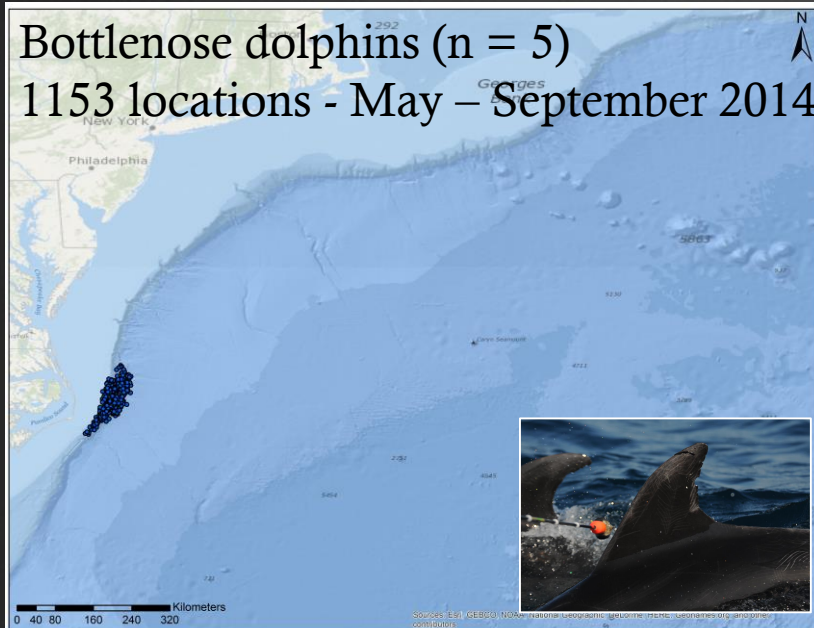
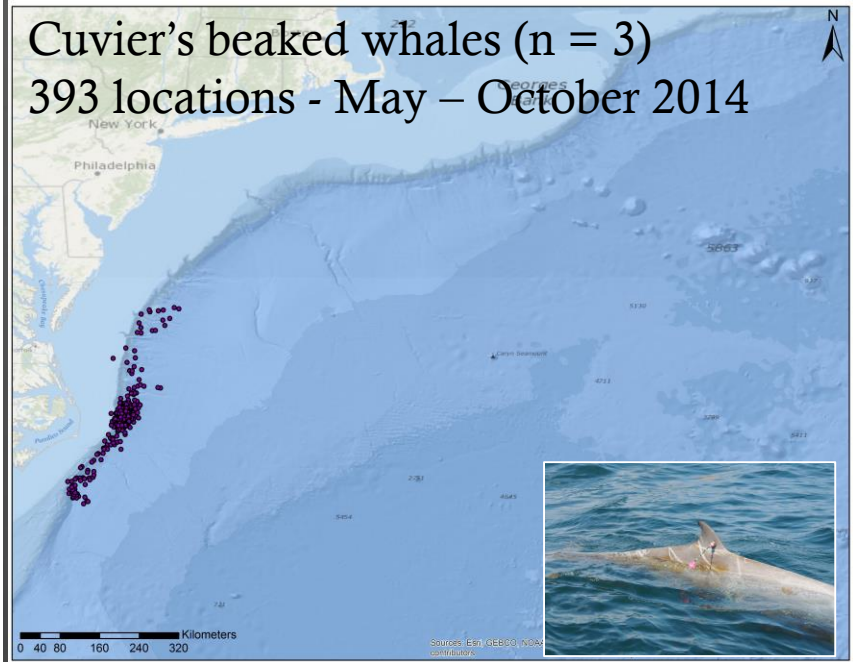
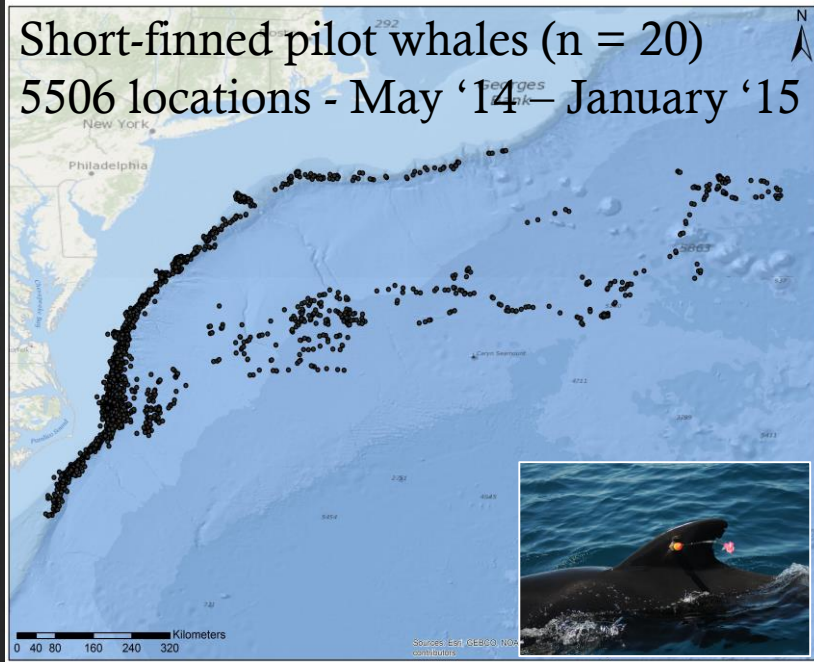
1 – 194 days

Number of Filtered Locations from Each Tag

17-608



RESULTS



Short-beaked common dolphin

40 day duration

496 locations

n = 1

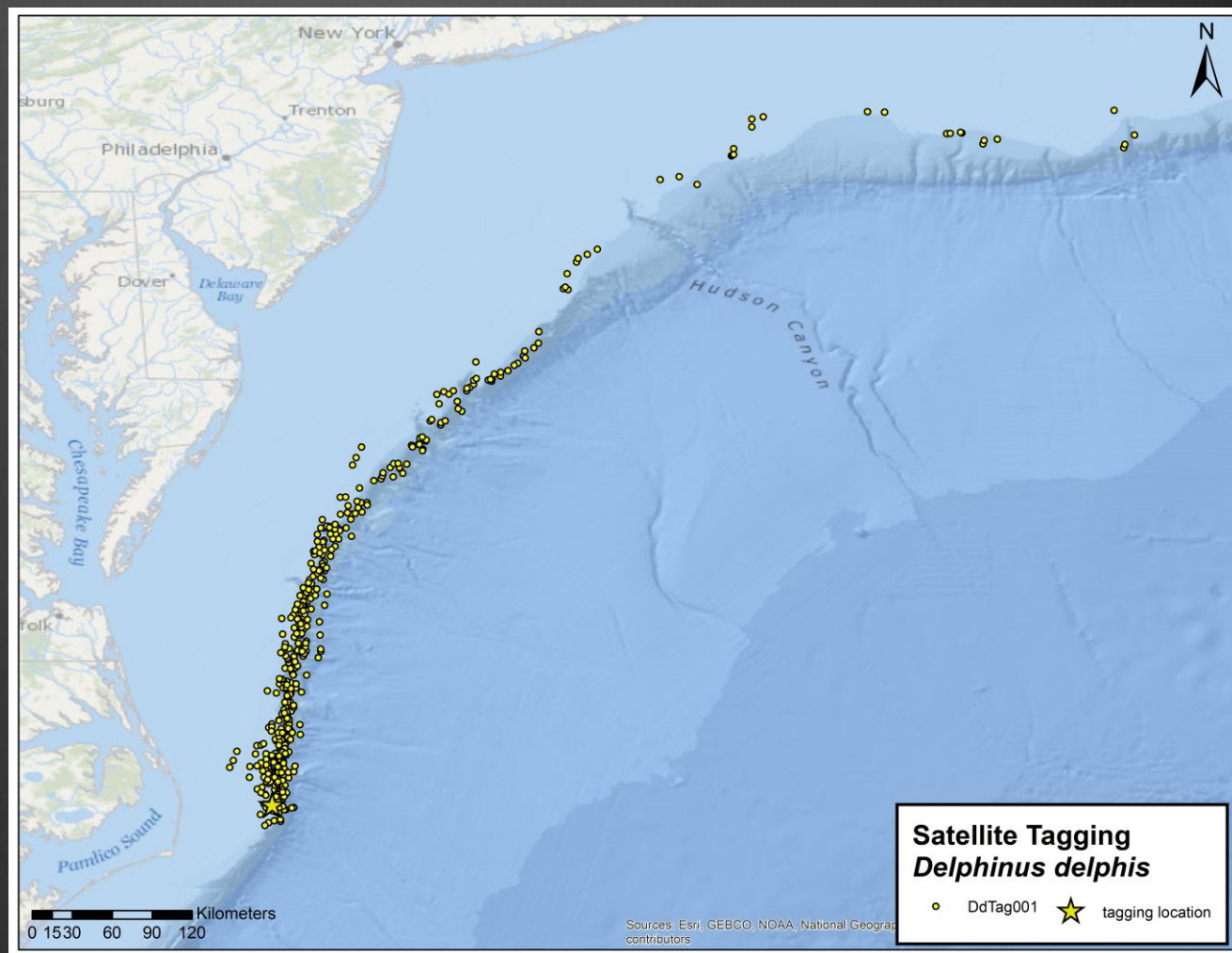
1 SPOT

Cumulative distance
traveled
4436 km

Mean/Maximum
distance from tagging
location
146 km/721 km

Median/Maximum
distance from shelf break
4 km/35 km

Median/Maximum depth
at locations
297 m/1626 m



Habitat: shallow, shelf waters

Bottlenose dolphin

6-18 day durations

214-293 locations

n = 5

3 SPOT - 2 Mk10

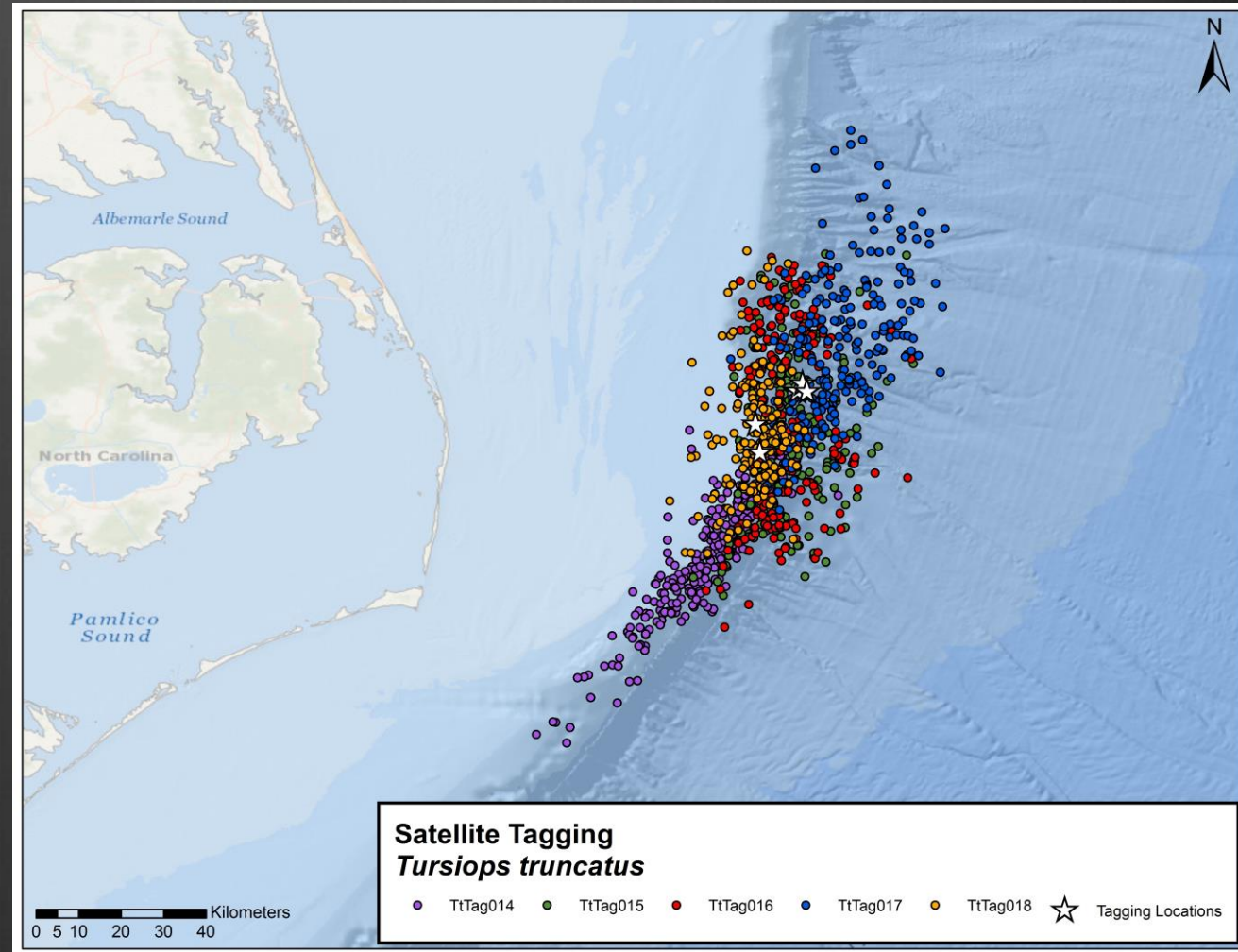
Cumulative distance traveled
1196 - 1481 km

Mean/Maximum distance from tagging location
19 km/84 km

Median/Maximum distance from shelf break
4 km/38 km

Median/Maximum depth at locations
1643 m/2794 m

Maximum dive depth/duration
944 m*/13.8 min



Habitat: edge & slope of continental shelf with high site fidelity

Cuvier's beaked whale

36-60 day durations

80-189 locations

n = 3

1 SPOT - 2 Mk10

Cumulative distance traveled

852 - 2058 km

Mean/Maximum distance from tagging location

44 km/241 km

Median/Maximum distance from shelf break

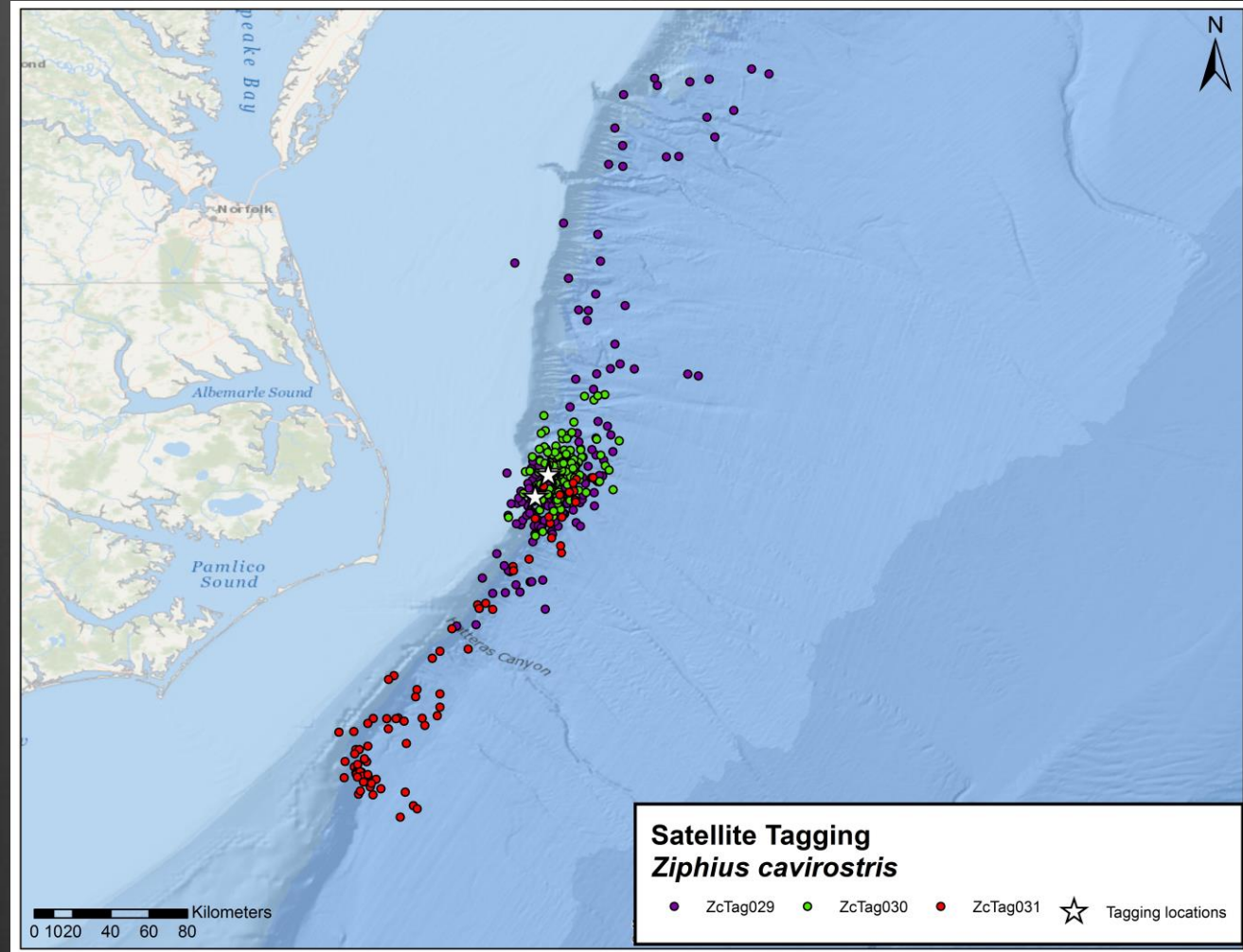
11 km/72 km

Median/Maximum depth at locations

1748 m/3015 m

Maximum dive depth/duration

2800 m/98 min



Habitat: continental slope

Short-finned pilot whale

1-194 day durations

17-608 locations

n = 20

14 SPOT - 6 Mk10

Cumulative distance traveled

56 - 7564 km

Mean/Maximum distance from tagging location

69 km/1192 km

Median/Maximum distance from shelf break

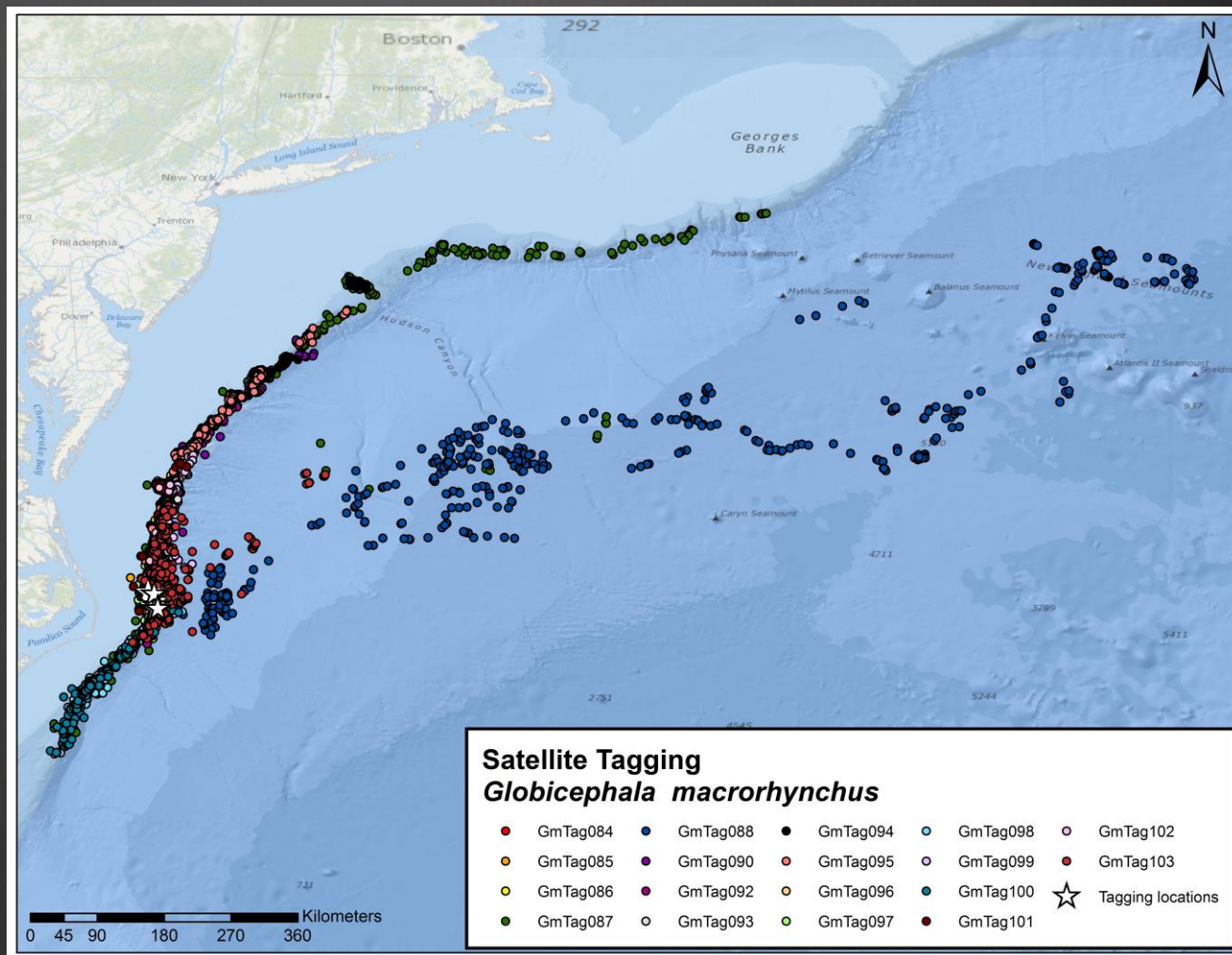
3 km/395 km

Median/Maximum depth at locations

1260 m/5147 m

Maximum dive depth/duration

1104 m/26 min



Habitat: continental slope, canyons

Species Comparison

	Short-beaked Common Dolphin	Bottlenose Dolphin	Cuvier's beaked whale	Short-finned pilot whale
Distance traveled	4436 km	1196-1481 km	852-2058 km	56-7564 km
Mean distance from tagging location	146 km	19 km	44 km	69 km
Maximum distance from tagging location	721 km	84 km	241 km	1192 km
Median distance from shelf break	4 km	4 km	11 km	3 km
Maximum distance from shelf break	35 km	38 km	72 km	395 km
Median depth of locations	297 m	1643 m	1748 m	1260 m
Maximum depth of locations	1626 m	2794 m	3015 m	5147 m
Maximum dive depth	n/a	944 m	2800 m	1104 m
Maximum dive duration	n/a	14 min	98 min	26 min

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Maximum dive duration	n/a	14 min	98 min	26 min

GmTag087

18 May 2014 – 28 November 2014

194 day deployment – 543 locations – 7563 km traveled



Photo-Id



+ GmTag096 - 5/4/2012
+ GmTag096 - 6/20/2012



Photo-Identification Matches of Satellite-Tagged Animals Cape Hatteras Survey Area Vessel Survey Sightings

▲ GmTag087 + GmTag096 ● GmTag097 ◆ TtTag015 ■ ZcTag029



+ GmTag096 - 5/4/2012
 + GmTag096 - 6/20/2012



Photo-Id



Photo-Identification Matches of Satellite-Tagged Animals Cape Hatteras Survey Area Vessel Survey Sightings

▲ GmTag087 + GmTag096 ● GmTag097 ◆ TtTag015 ■ ZcTag029

Future Work

- Additional Years (May, June 2015)
- Additional Sites (JAX - 2015)
- Comparison of species across sites
- Sex/Age Class differences
- Habitat Models
 - MaxEntropy
 - State Space



Questions?

