

Patterns of residency of odontocetes along the shelf break of the U.S. east coast

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Our understanding of the movements and patterns of residency of pelagic cetaceans is limited because it is difficult to obtain repeated samples from animals that live their entire lives far from shore. Surveys of such populations typically occur at broad spatial scales, interspersed by long time periods and often do not allow for identification of individual animals. We used dedicated photo-identification techniques as part of the U.S. Navy's Integrated Comprehensive Monitoring Program for marine species to identify patterns of residency of odontocetes at three sites along the shelf break of the U.S. east coast ranging from 50 to 150 km from shore. Our surveys began in Onslow Bay, NC in 2007, and Jacksonville, FL and Cape Hatteras, NC in 2009. In Onslow Bay, we have re-sighted 8 of 126 (6%) *Tursiops truncatus* and 4 of 78 (5%) *Stenella frontalis*. It is likely that these *T. truncatus* include both offshore and coastal ecotypes; we are currently analyzing biopsy samples obtained during these surveys to address this proposition. We have not matched any of the *T. truncatus* to other catalogs from coastal waters, but the *S. frontalis* appear to range widely over the shelf. For example, one *S. frontalis* photographed at the offshore site in September 2011 was observed in June 2001 and June 2002 in the near-shore waters of Onslow Bay. In Jacksonville, we have re-sighted 2 of 52 *T. truncatus* and 2 of 77 (3%) *S. frontalis*. We have identified 253 individual *Globicephala macrorhynchus* off Cape Hatteras and have matched 8 of 253 (3%) individuals. To date we have found no matches among the three sites. The re-sightings of these species within the three study areas occurred over multiple seasons and years, and suggest a surprising degree of residency by individual odontocetes in these offshore waters.

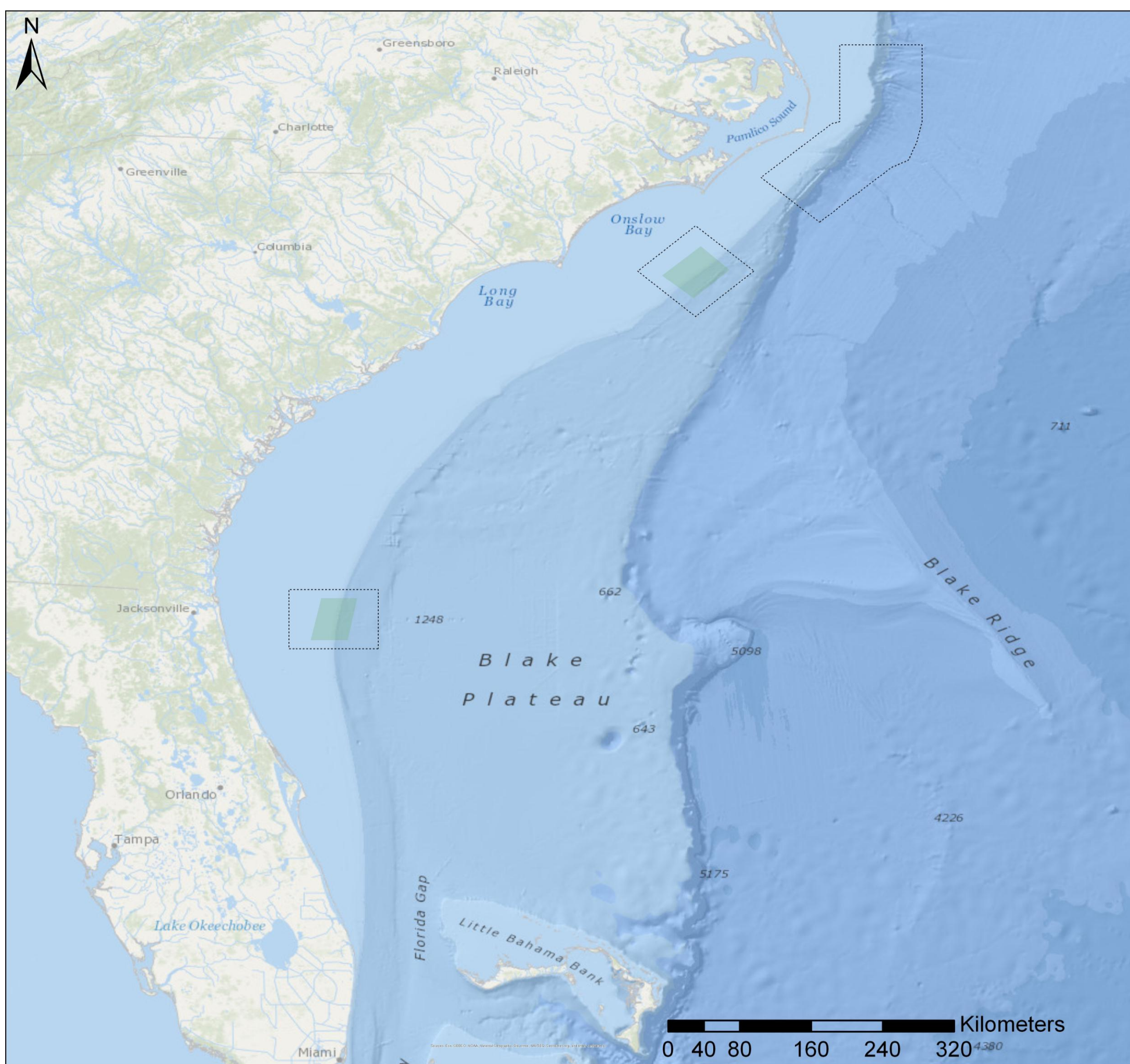


Figure 1. Survey sites including Cape Hatteras, NC, Onslow Bay, NC and Jacksonville, FL.

Methods

Vessel surveys were conducted in three Navy operating areas off Cape Hatteras, NC (2009-present), Onslow Bay, NC (2007-present), and Jacksonville, FL (2009-present) as part of an ongoing monitoring program designed to improve understanding of the occurrence, distribution and density of marine mammals at these sites (Figure 1). Photo-identification images were taken for species identification and to examine the residency and movement patterns of the species encountered. We used standard photo-identification methods and images of newly identified individuals were added to existing photo-identification catalogs.

Photo-identification analysis is complete for all images taken in Onslow Bay, NC and Jacksonville, FL through November 2013. In Cape Hatteras, NC, photo-identification analysis is complete for all species encountered through 2012 except for pilot whales which is ongoing. We have compared the bottlenose and Atlantic spotted dolphin catalogs between all three sites, but no matches were found. Remote biopsy sampling methods were used to collect small skin and blubber samples using a variety of 27 cm – 68 kg pull crossbows with a specialized 2.5 cm biopsy tip and bolt. Biopsy samples were collected from bottlenose dolphins off Cape Hatteras (n=30), Onslow Bay (n=9) and Jacksonville, FL (n=16) between May 2011 and July 2013.

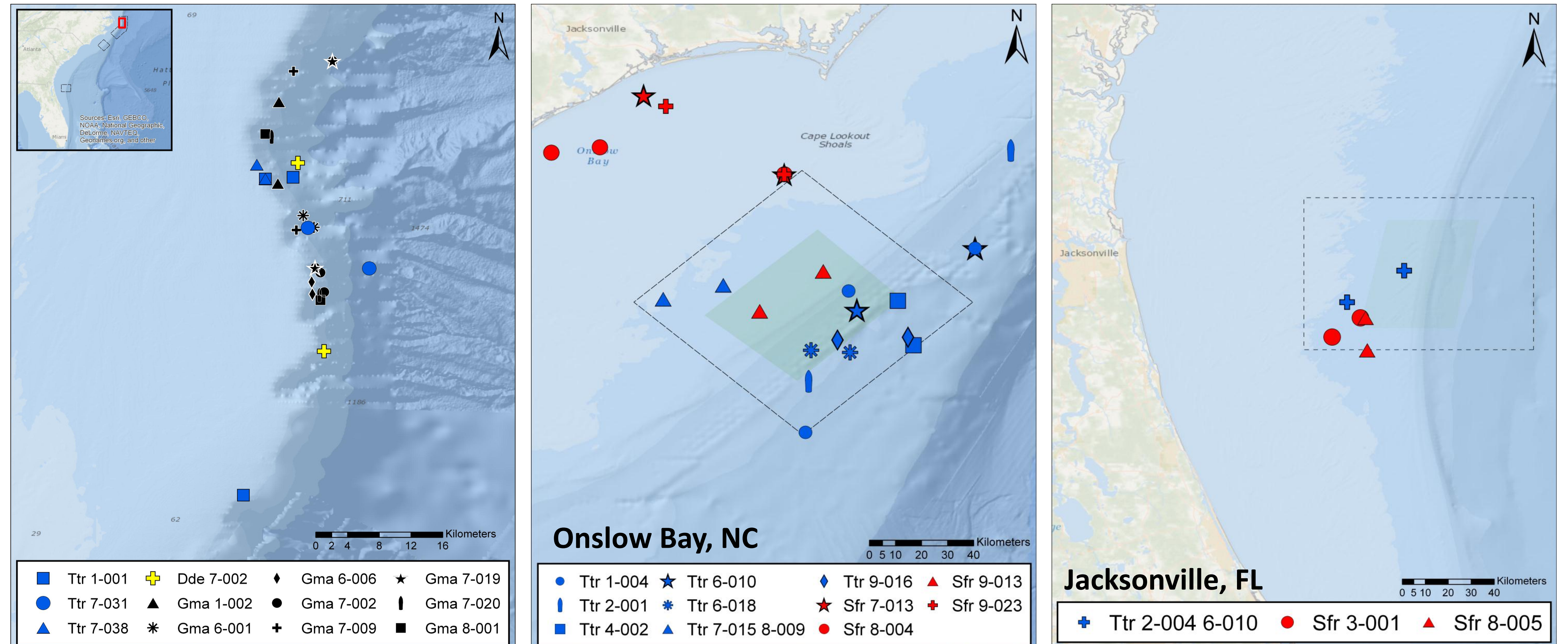


Figure 2. Photo identification matches of species observed in Cape Hatteras, NC, Onslow Bay, NC and Jacksonville, FL.



Table 1. Re-sightings of species in Cape Hatteras, NC, Onslow Bay, NC and Jacksonville, FL. No matches were found between bottlenose and Atlantic spotted dolphin catalogs in the three sites.

ID	2001	2002	2006	2007	2008	2009	2010	2011	2012	2013
Cape Hatteras, NC										
Ttr 1-001						X		X*		
Ttr 7-031, 7-038								X*		
Dde 7-002				X					X	
Gma 1-002, 6-001, 7-009					X			X	X	
Gma 6-006					X				X	
Gma 7-002			X		X				X	
Gma 7-019			X						X	
Gma 7-020				X*						
Gma 8-001				X			X			
Onslow Bay, NC										
Ttr 1-004						X	X		X	
Ttr 2-001				X						X
Ttr 4-002						X*				
Ttr 6-010				X					X	
Ttr 6-018, 7-015 [^] , 8-009 [^]						X	X			
Ttr 9-016					X	X				
Sfr 7-013								X		X
Sfr 8-004	X	X						X		
Sfr 9-013						X*				
Sfr 9-023								X*		
Jacksonville, FL										
Ttr 2-004 [^] , 6-010 [^]									X	X
Sfr 3-001							X	X		
Sfr 8-005								X*		

*Resighted within same year, [^]Observed together in multiple sightings

Table 2. Number of matched IDs and species-specific catalog sizes for Cape Hatteras, NC, Onslow Bay, NC and Jacksonville, FL.

Species	Cape Hatteras, NC		Onslow Bay, NC		Jacksonville, FL	
	Matched IDs	Catalog Size	Matched IDs	Catalog Size	Matched IDs	Catalog Size
<i>Tursiops truncatus</i>	3	107	8	126	2	52
<i>Stenella frontalis</i>	0	13	4	78	2	77
<i>Delphinus delphis</i>	1	20	---	---	---	---
<i>Globicephala macrorhynchus</i>	8	253	0	23	0	12
<i>Grampus griseus</i>	0	3	0	22	0	7
<i>Steno bredanensis</i>	---	---	0	12	---	---

Conclusions

- A number of species have been re-sighted over multiple years and across seasons, supporting the existence of fine-scale population structure among some pelagic odontocetes along the U.S. east coast (Fig. 2, Tables 1 & 2).
- There were no matches of bottlenose or Atlantic spotted dolphins observed among the three survey areas, which further supports a latitudinal boundary of these species.
- Genetic analysis of extracted DNA from 55 bottlenose dolphin biopsy samples collected at these three sites since 2011 confirms that all of the sampled dolphins were of the offshore ecotype, suggesting that there is limited overlap between coastal and offshore populations.
- We will continue to collect photo-identification images and genetic samples from the species we encounter on these surveys. Matched genetic and photo-identification data will be particularly useful for elucidating population structure and site fidelity of odontocetes in these three Navy operating areas.

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