

Cetacean species diversity during four years of survey effort in Onslow Bay, NC, USA

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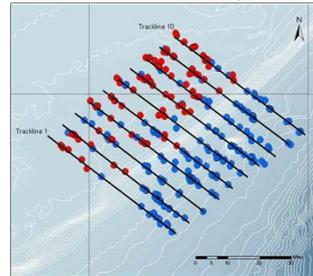


Abstract

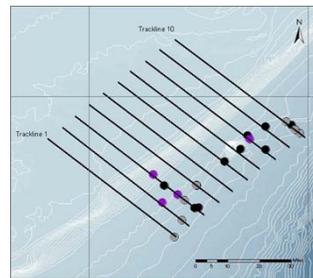
From June 2007 to April 2011, dedicated aerial and vessel surveys were conducted in a 1,713 km² area in Onslow Bay, NC, identified as an alternative site for a US Naval sonar training range. The site straddles the shelf-break and incorporates shallow, shelf and deeper, pelagic waters. The surveys were designed to investigate occurrence, density, and distribution of protected marine species. Sixty-seven complete aerial surveys covering 48,674 km, and 67 single track-line vessel surveys covering 5,642 km, were conducted. *Tursiops truncatus*, the most frequently encountered species, was recorded during every calendar month and observed throughout the range. This species displayed two distinct color patterns; dolphins east of the continental shelf break exhibited a white peduncle and were sighted in larger groups, while animals on the shelf were more uniform in color and were sighted in smaller groups. *Stenella frontalis*, the second most commonly encountered species, was sighted in 10 of 12 calendar months, and had a distribution restricted to inshore, continental shelf waters. *Globicephala macrorhynchus*, *Grampus griseus* and *Steno bredanensis* occurred less frequently and were commonly encountered in summer months. Only these five species were recorded during the first 33 months of effort. In the subsequent 14 months four additional species, *Delphinus delphis*, *Balaenoptera physalus*, *Balaenoptera acutorostrata* and *Megaptera novaeangliae* were observed in winter and spring months. The appearance of two "colder" water species, *D. delphis* and *B. physalus*, on the same day raises questions about oceanographic features that influence conditions inside the survey area. Variation in Gulf Stream position, and the presence of warm and/or cold core eddies, likely influences cetacean presence at this site in winter months. On-going efforts will be aimed at establishing the relationship between cetacean occurrence and local oceanographic conditions within this site.

Aerial and Vessel Observations

June 2007 – February 2010

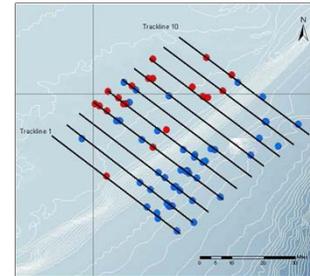


	Sightings	Individuals
<i>Tursiops truncatus</i>	158	2150
<i>Stenella frontalis</i>	88	1957

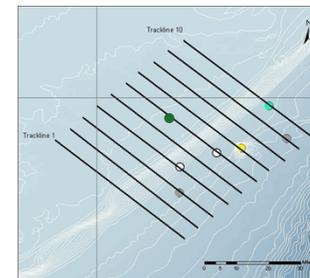


	Sightings	Individuals
<i>Globicephala macrorhynchus</i>	9	231
<i>Grampus griseus</i>	8	130
<i>Steno bredanensis</i>	4	67

March 2010 – April 2011



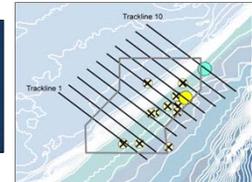
	Sightings	Individuals
<i>Tursiops truncatus</i>	47	1055
<i>Stenella frontalis</i>	20	538



	Sightings	Individuals
<i>Grampus griseus</i>	2	12
<i>Balaenoptera acutorostrata</i>	2	3
<i>Balaenoptera physalus</i>	1	1
<i>Megaptera novaeangliae</i>	1	2
<i>Delphinus delphis</i>	1	20

Distribution and Abundances

Across the entire survey period, *Stenella frontalis* and *Tursiops truncatus* were the most commonly sighted species. *Stenella frontalis* sightings were all inshore of the continental shelf break; *Tursiops truncatus* were distributed across the entire survey area. In the first 33 months of effort, only three other cetacean species were observed, each with distribution patterns that include the South Atlantic Bight. In the last 14 months, four species new to the survey were sighted. *Delphinus delphis* had been observed during aerial surveys conducted in this area in 1998-99, but the sighting in March 2011 was the first and only in 47 months of survey effort. This sighting, which occurred on the same day as that of the *Balaenoptera physalus*, suggests that oceanographic conditions influenced the movement of these more northern temperate species into the survey area.



Common dolphins sightings from 1998-99 effort overlaid on current survey area. Images collected of common dolphins and fin whale sightings in March 2010.

Historical and current sightings of "cold" water species in the Onslow Bay survey area
 ● *Balaenoptera physalus* × 98-99 *Delphinus delphis*
 ● *Delphinus delphis* — 98-99 Survey area

In February 2011, three *Balaenoptera acutorostrata* (a single individual and a mom-calf pair) were sighted offshore of the continental shelf break. The following month a pair of *Megaptera novaeangliae* was observed on the continental shelf.

Objectives

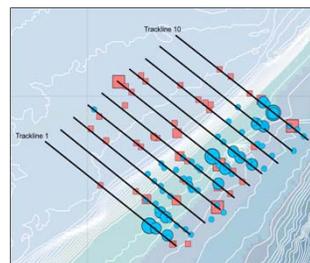
To describe spatial and temporal patterns of cetacean species occurrence using a multi-year data set with special emphasis on:

- distribution of two most abundant species (*Stenella frontalis* and *Tursiops truncatus*)
- distribution of groups of *Tursiops truncatus* with distinctive pigmentation patterns
- novel appearance of northern temperate species in the survey area in 2010-2011



Location of survey area within the US South Atlantic Bight. Located 70 km offshore of the North Carolina coast in Onslow Bay.

Tursiops truncatus Pigmentation Patterns



Tursiops truncatus Peduncle Color and Group Size	
● Present, Group size 1-25	● Absent, Group size 1-15
● Present, Group size 26-55	● Absent, Group size 16-35
● Present, Group size 56-80	● Absent, Group size 36-50

A review of all aerial images of *Tursiops truncatus* sighted over the entire survey period (July 2007 to April 2011) resulted in the identification of two distinct pigmentation patterns. On the dorsal surface of the peduncle of pelagic dolphins (including calves and larger individuals), there was an obvious white pigmentation pattern extending from just caudal of the dorsal fin to near the fluke. The peduncles of other dolphins were more uniform gray. We analyzed the distribution of dolphins that displayed the white peduncle patterns, by both group size and distance from shore. Dolphins that displayed a white peduncle occurred offshore of the continental shelf break and resided in larger groups, while animals on the shelf were more uniform in color and resided in smaller groups.

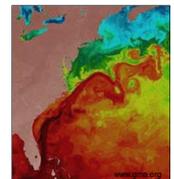


	# of sightings
White peduncle coloration	75
Uniform peduncle coloration	27
Could not be determined	20
	132

Conclusions

This survey area encompasses a natural bathymetric gradient including continental shelf and slope waters, and it is located in an area where the Gulf Stream can affect local currents and water temperatures. The Gulf Stream is a dynamic system, which displays considerable spatial variation over short and long geographical and temporal scales.

Variation in current position, and the presence of warm and/or cold core eddies, likely influence fine scale cetacean presence at this site.



The observed variation in species diversity across 47 months of effort highlights the importance of long term datasets in assessing potential impacts to marine mammal populations.