

Water temperature thresholds of bottlenose dolphins in Roanoke Sound, North Carolina

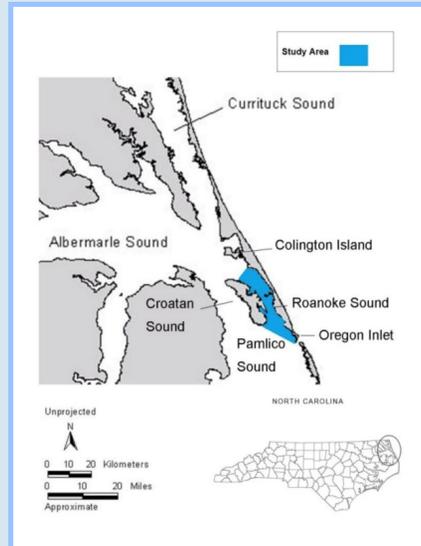


Claire E. Johnson¹ and Jessica S. Taylor²

Background

–Bottlenose dolphins (*Tursiops truncatus*) use Roanoke Sound, North Carolina as a seasonal habitat from roughly April to October each year. The Sound also serves as a nursery for calves and their mothers.

–The dolphins that use Roanoke Sound mostly come from the Northern North Carolina Estuarine System (NNCES) stock, which range from Chesapeake Bay, Virginia to Beaufort, North Carolina.



McKeowen and Taylor (2015)

–The NNCES stock is considered a coastal population because they primarily use estuarine waters and usually stay within three kilometers of shore during seasonal migration.

–Average sound water depths range from 1 to 1.3 meters, consequently water temperatures can get quite cold in the fall and very warm in the summer.

–Low surface water temperatures in the fall may trigger southern migration while high surface water temperatures in the summer may make a typically favorable habitat unfavorable.

Research Question

Are there upper and/or lower surface water temperature thresholds beyond which dolphin abundance significantly declines?

¹University of North Carolina at Chapel Hill

²Outer Banks Center for Dolphin Research

Methods

–Data comes from dedicated surveys and opportunistic sightings conducted by the Outer Banks Center for Dolphin Research (OBXCDR).

–Study Area

–Roanoke Sound, North Carolina, approximately 41 mi²

–Dedicated Surveys

–non-random transect surveys from 2008 to 2011

–standardized transect route from 2011-present

–Opportunistic Sightings

–conducted aboard the Nags Head Dolphin Watch, which operates from May to October each year

–tour routes are not standardized, but take place within portions of the standardized route used for dedicated surveys

–greatest effort occurs during the summer months (June, July, and August)

–Data Collection

–minimum and maximum group sizes are recorded along with best estimate of group size and number of calves

–best estimates were used as a measure for group size in this study

–temperature is measured for each sighting (°F) by pulling a bucket of surface water aboard and dropping in a thermometer

–various other environmental parameters are measured as well (see Sighting Data Sheet)

–Dataset

–comprised of 1,513 dedicated surveys and opportunistic sightings combined

–entries range from June 2008-October 2015

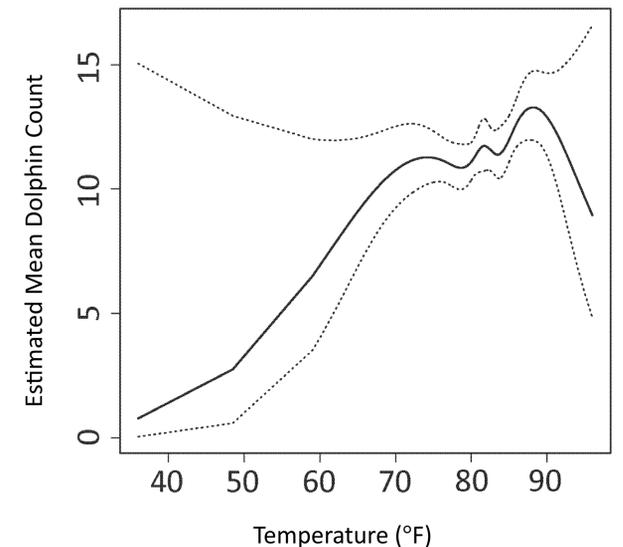
–temperatures range from 36°F to 96°F

Acknowledgments

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Results

Effect of water temperature on dolphin abundance



Poisson regression of dolphin group size (best estimate) per sighting and respective surface water temperature with a variable for season; n=1,513. Surface water temperature was proven to be significant ($P \leq 0.05$). Thus far, statistical analysis appears to support the hypothesis that temperature thresholds exist for bottlenose dolphins in Roanoke Sound.

Discussion

–Provides new insight into how bottlenose dolphins respond to their environment and helps us better design studies to address why.

–Rising estuarine water temperatures due to climate change may make parts of Roanoke Sound seasonally uninhabitable in the future.

–Future studies should investigate the mechanisms behind the temperature threshold phenomenon, for example:

–temperature effect on prey availability

–physiological responses to high and low water temperatures, especially metabolic responses

–effect of water temperature on calves and/or young of the year