

ROUGH-TOOTHED DOLPHIN (*Steno bredanensis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Rough-toothed dolphins (*Steno bredanensis*) are distributed worldwide in the Atlantic, Pacific and Indian Oceans, generally in warm temperate, subtropical, or tropical waters. They are commonly reported in a wide range of water depths, from shallow, nearshore waters to oceanic waters (West *et al.* 2011). Most shipboard sightings from the U.S. East Coast have occurred in oceanic waters at depths greater than 1,000 m (Figure 1). Sightings of rough-toothed dolphins along the East Coast of the U.S. are much less common than in the Gulf of Mexico (CETAP 1982; NMFS 1999; Mullin and Fulling 2003).

In the western North Atlantic, tracking of five rough-toothed dolphins that were rehabilitated and released following a mass stranding on the east coast of Florida in 2005, demonstrated a variety of ranging patterns (Wells *et al.* 2008). All tagged rough-toothed dolphins moved through a large range of water depths averaging greater than 100 m, though each of the five tagged dolphins transited through very shallow waters at some point. These five rough-toothed dolphins moved through waters ranging from 17° to 31°C, with temperatures averaging 21° to 30°C. Recorded dives were rarely deeper than 50 m, with the tagged dolphins staying fairly close to the surface. It is not known how representative of normal species patterns any of these movements are.

Analyses of worldwide genetic differentiation in *Steno* indicate animals in the western Atlantic Ocean are strongly differentiated from those in the Pacific and Indian Oceans (Albertson 2014; da Silva *et al.* 2015). Albertson (2014) illustrated that this species may exhibit fine-scale population structure and da Silva *et al.* (2015) provided evidence for multiple populations in the western South Atlantic. However, to date there has been no examination of stock structure for this species within the western North Atlantic or the Gulf of Mexico. For management purposes, rough-toothed dolphins observed off the eastern U.S. coast are considered a separate stock from those in the northern Gulf of Mexico. There are insufficient data to determine whether multiple demographically-independent stocks exist with the western North Atlantic Stock. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The best abundance estimate available for the western North Atlantic rough-toothed dolphin is 136 (CV=1.00). This estimate is an average from summer 2011 and summer 2016 shipboard surveys covering waters from central Florida to the lower Bay of Fundy.

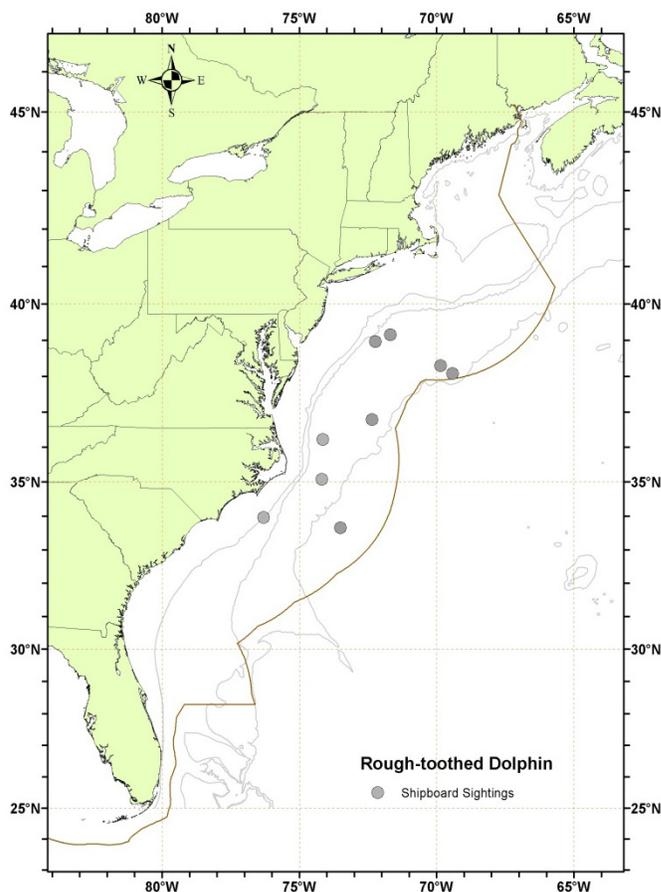


Figure 1. Distribution of rough-toothed dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, 2002, 2004, 2006, 2007, 2011 and 2016. Isobaths are the 100-m, 1000-m and 4000-m depth contours.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent surveys and abundance estimates

The Southeast and Northeast Fisheries Science Centers conducted shipboard surveys of continental shelf and slope waters along the U.S. East Coast from southeastern Florida to the lower Bay of Fundy, during the summers of 2011 and 2016 (Palka 2012; Garrison 2016). The NEFSC surveys covered waters deeper than 100-m while the SEFSC covered waters greater than 50-m depth, all within the U.S. EEZ. Sightings of rough-toothed dolphins were rare (2011: n=4; 2016: n=0 sightings) in waters between central Virginia and the lower Bay of Fundy and therefore no abundance estimate was made for this region.

In waters between central Virginia and central Florida, sightings of rough-toothed dolphins were also rare (2011: n=1; 2016: n=0 sightings). An abundance estimate of 271 (CV=1.00) rough-toothed dolphins was generated from the summer 2011 shipboard survey (Garrison 2016). It should be noted this estimate was based on a single sighting and therefore the abundance estimate is highly uncertain. Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). Uncertainties in the abundance estimate arise primarily from the low number of sightings, variance in encounter rates, and uncertainty in estimation of detection probability. In addition, this estimate likely does not cover the full range of the stock in the western North Atlantic.

The best abundance estimate available for the western North Atlantic rough-toothed dolphin is the average of the 2011 and 2016 abundance estimates, and is 136 (CV=1.00).

Table 1. Summary of abundance estimates for the western North Atlantic rough-toothed dolphin, *Steno bredanensis*, by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jun-Aug 2011	central Virginia to lower Bay of Fundy	0	-
Jun-Aug 2011	central Florida to central Virginia	271	1.00
Jun-Aug 2011	central Florida to lower Bay of Fundy (COMBINED)	271	1.00
Jun-Aug 2016	central Virginia to lower Bay of Fundy	0	-
Jun-Aug 2016	central Florida to central Virginia	0	-
Jun-Aug 2016	central Florida to lower Bay of Fundy (COMBINED)	0	-

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best abundance estimate is 136 (CV=1.00). The minimum population estimate is 67.

Current Population Trend

A trend analysis cannot be conducted for this stock due to the small number of sightings in any single year.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum

population size is 67. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic stock of rough-toothed dolphins is 0.7.

ANNUAL HUMAN-CAUSED MORTALITY

Total annual estimated fishery-related mortality and serious injury to this stock between 2012 and 2016 was zero, as there were no reports of mortalities or serious injuries to rough-toothed dolphins.

Fishery Information

There are currently no U.S. fisheries in the western North Atlantic with evidence of interactions that result in incidental mortality or serious injury of rough-toothed dolphins. There has been documented mortality and serious injury of rough-toothed dolphins by the Hawaii shallow-set longline fishery and the American Samoa pelagic longline fishery in the U.S. Pacific (Carretta *et al.* 2017; Carretta *et al.* 2018). Rough-toothed dolphins have been taken incidentally in the tuna purse seine nets in the eastern tropical Pacific, and in gillnets off Sri Lanka, Brazil and the offshore North Pacific (Jefferson 2002). A small number of this species are taken in directed fisheries in the Caribbean countries of St. Vincent and the Lesser Antilles, as well as in countries in the Pacific and off Ghana in the eastern north Atlantic Ocean (Northridge 1984; Argones 2001; Jefferson 2002; Reeves *et al.* 2003).

Other Mortality

Although there have been several mass strandings of rough-toothed dolphins along the U.S. east coast in the past, from 2012 to 2016 no rough-toothed dolphins were reported stranded between Maine and Florida (Northeast Regional Marine Mammal Stranding Network; Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 5 May 2017 (NER) and 28 April 2017 (SER)).

HABITAT ISSUES

Persistent organic pollutants (POPs) are a potential source of human-caused mortality. These contaminants were analyzed in 15 stranded rough-toothed dolphins from the Gulf of Mexico (Struntz *et al.* 2004). Although these dolphins exhibited lower concentrations of polychlorinated biphenyls (PCBs) than those observed in other species of dolphins including Risso’s, striped and bottlenose dolphins sampled in Japan, the Mediterranean and the Gulf coast of Texas, respectively, the concentrations were above the toxic threshold for marine mammal blubber suggested by Kannan *et al.* (2000). Struntz *et al.* (2004) concluded it was “likely that PCBs pose a health risk for the population represented by this limited sample group.” Plastic debris may also pose a threat to this, and other, species, as evidenced by plastic bags found in the stomachs of two stranded rough-toothed dolphins – one which stranded in 2004 in St. Lucie County Florida, and one in northeastern Brazil (de Meirelles and Barros 2007), and a plastic bottle cap found in one of the dolphins which stranded in St. Lucie County, Florida in 2004.

STATUS OF STOCK

Rough-toothed dolphins are not listed as threatened or endangered under the Endangered Species Act, and the Western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The status of rough-toothed dolphins in the U.S. EEZ relative to OSP is unknown. No fishery-related mortality or serious injury has been observed between 2012 and 2016; therefore, total fishery-related mortality and serious injury can be considered insignificant and approaching the zero mortality and serious injury rate. Given the limited number of sightings of rough-toothed dolphins over the years, the abundance estimate for this stock is highly uncertain and there are insufficient data to determine population trends for this stock. Although there are currently no known habitat issues or other factors causing a decline or impeding recovery, potential sources of human-caused mortality for this stock are poorly understood.

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