May 2016

COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Central Georgia Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, to the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several inshore areas of the southeastern United States (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

Coastal central and northern Georgia contains an extensive estuarine tidal marsh system in which bottlenose dolphins are documented. The primary river drainages in this region are the Altamaha in central Georgia and the Savannah River at the Georgia-South Carolina border. Much of the coastal marsh and islands in the area have been privately owned since the early 19th century and have therefore experienced little development and the marshes and coastal region are therefore relatively undisturbed. The Sapelo Island National Estuarine Research Reserve, part of NOAA's Estuarine Reserve System, lies in this section of the Georgia coast and includes 4,000 acres of tidal salt marsh.

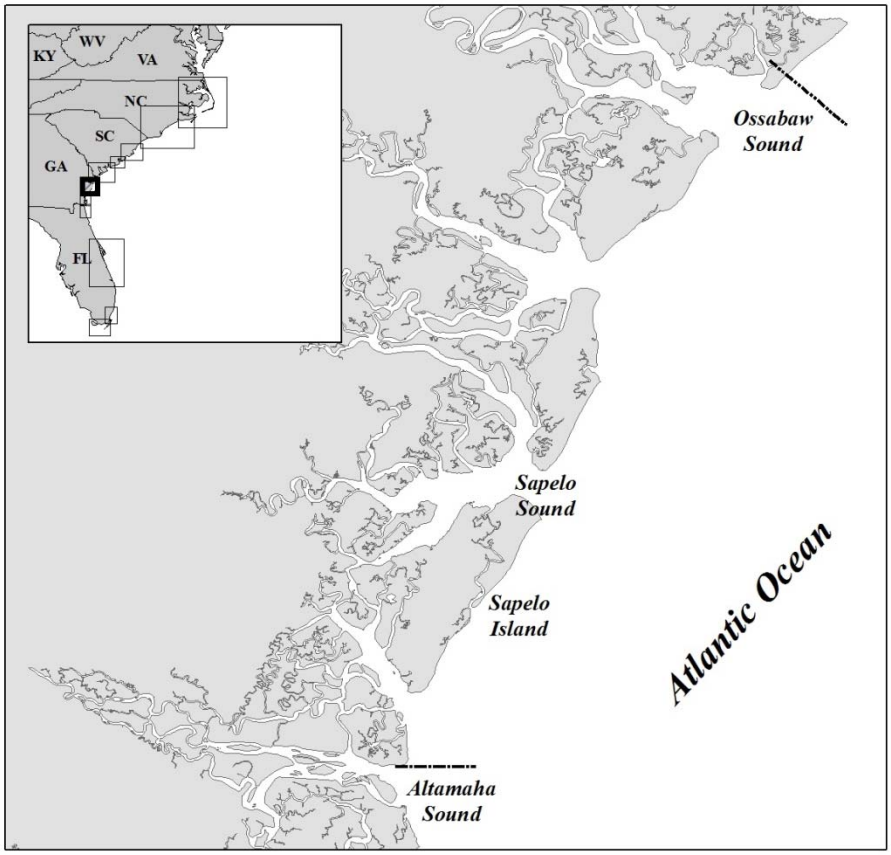

Figure 1. *Geographic extent of the Central Georgia Estuarine System (CGES) Stock. Dashed lines denote the boundaries.*

The Central Georgia Estuarine System Stock (CGES) is delineated in the estuarine waters of central Georgia (Figure 1). It extends from the northern extent of Ossabaw Sound, where it meets the border with the Northern Georgia/Southern South Carolina Estuarine System Stock, south to the Altamaha River, which provides the border between the CGES and the Southern Georgia Estuarine System Stock. Nearshore (≤ 1km from shore) coastal waters are also included in the CGES Stock boundaries.

The boundaries of this stock are supported by photo-ID and genetic data. Balmer *et al.* (2011) conducted photo-ID studies between 2004 and 2009 in the Turtle/Brunswick River estuary (TBRE) in southern Georgia and in estuarine habitats north of the Altamaha Sound to Sapelo Sound. Photo-ID data revealed strong site fidelity to the

two regions and supported Altamaha Sound as an appropriate boundary between the two sites as 85.4% of animals identified did not cross Altamaha Sound (Balmer *et al.* 2013). Just over half the animals that did range across Altamaha Sound had low site fidelity and were believed to be members of the South Carolina/Georgia Coastal Stock. Genetic analysis of mitochondrial DNA control region sequences and microsatellite markers of dolphins biopsied in southern Georgia showed significant genetic differentiation from animals biopsied in northern Georgia and southern South Carolina estuaries as well as from animals biopsied in coastal waters >1 km from shore at the same latitude (NMFS unpublished data). In addition, bottlenose dolphins sampled within the Sapelo Island area exhibited contaminant burdens significantly lower than those sampled to the south in the TBRE (Balmer *et al.* 2011; Kucklick *et al.* 2011) consistent with long-term fidelity to these separate areas.

POPULATION SIZE

During 2008-2009, seasonal, mark-recapture photo-ID surveys were conducted to estimate abundance in a portion of the CGES area from Altamaha Sound north to Sapelo Sound. Estimates from winter were chosen as the best representation of the resident estuarine stock in the area surveyed, and a Markovian emigration model was chosen as the best fit based on the lowest Akaike's Information Criterion value. The estimated average abundance, based on winter 2008 and winter 2009 surveys, was 192 (CV=0.04; Balmer *et al.* 2013). Estimates were adjusted to include the 'unmarked' (not distinctive) as well as 'marked' (distinctive) portion of the population for each winter survey. It is important to note this estimate covered approximately half of the entire range of the CGES Stock, and therefore, the abundance estimate is negatively biased.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). Though negatively biased, the best estimate for the CGES Stock is 192 (CV=0.04). The resulting minimum population estimate is 185.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. 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 the 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 of the CGES Stock of common bottlenose dolphins is 185. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for this stock of common bottlenose dolphins is 1.9.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the CGES Stock during 2009–2013 is unknown because this stock is known to interact with an unobserved fishery (see below). No mortality or serious injury was documented from human-caused actions during 2009–2013.

Fishery Information

This stock interacts with the Category II Atlantic blue crab trap/pot fishery (Appendix III).

Atlantic Blue Crab Trap/Pot

During 2009–2013 there were 2 documented interactions with commercial blue crab trap/pot gear in the CGES area. The interactions occurred during 2011 and 2013, and both involved an animal that was disentangled and released alive without serious injury (Maze-Foley and Garrison in prep a,b,c). These animals were included in the stranding database and in the totals in Table 1 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Since there is no systematic observer program, it is not possible

to estimate the total number of interactions or mortalities associated with crab trap/pot gear.

Other Mortality

From 2009 to 2013, 24 common bottlenose dolphins were reported stranded within the CGES (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, 11 June 2014). It could not be determined if there was evidence of human interaction for 20 of these strandings due to most (79%) were in a state of moderate or advanced decomposition when first observed. For 2 dolphins, no evidence of human interactions was detected. The remaining 2 strandings were fishery interactions with commercial crab trap/pot gear, described above. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 1. Common bottlenose dolphin strandings occurring in the Central Georgia Estuarine System Stock area during 2009 to 2013, as well as number of strandings for which evidence of human interactions (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interactions. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Central Georgia Estuarine System Stock	Total Stranded	1	1	6	5	11	24
	Human Interaction						
	---Yes	0	0	1[a]	0	1[b]	2
	---No	0	0	0	1	1	2
	---CBD	1	1	5	4	9	20

[a] This includes 1 fisheries interaction (FI) in which a dolphin was disentangled from commercial blue crab trap/pot gear and released alive without serious injury.
[b] This includes 1 FI in which a dolphin was disentangled from commercial blue crab trap/pot gear and released alive without serious injury.

HABITAT ISSUES

This stock is found in relatively pristine estuarine waters of central Georgia. Much of the area has had been privately owned since the end of the 19th century and not been developed leaving the marshes relatively undisturbed. This stock's area includes the Sapelo Island National Estuarine Research Reserve (SINERR), which is part of NOAA's National Estuarine Research Reserve system (NERR) and several National Wildlife Refuges. Just to the south of this stock's range, however, the estuarine environment around Brunswick, Georgia is highly industrialized and the Environmental Protection Agency has included 4 sites within the Brunswick area as Superfund hazardous waste sites. This region is known to be contaminated with a specific PCB mixture, Aroclor 1268, in soil and sediments, and the transport of these contaminants into the food web through invertebrate and vertebrate fauna has been documented (Kannan *et al.* 1997; Kannan *et al.* 1998; Maruya and Lee 1998). Balmer *et al.* (2013) measured PCB concentrations in dolphins sampled near Sapelo Island and found concentrations, including detection of Aroclor 1268, lower than those found in dolphins from the Brunswick, Georgia area, but still high when compared to other bottlenose dolphin stocks along the eastern seaboard. Given little evidence for movement of dolphins between these two areas (Balmer *et al.* 2011, 2013), the dolphins near Sapelo, Island in the

CGES Stock may be obtaining the high contaminant loads through eating contaminated prey (Balmer *et al.* 2011). Further work is necessary to examine contaminant and movement patterns of dolphin prey species in this region.

Studies have suggested an increased risk of detrimental effects on reproduction and endocrine and immune system function for marine mammals in relation to tissue concentrations of PCBs (De Swart *et al.* 1996; Kannan *et al.* 2000; Schwacke *et al.* 2002). PCB-related health effects on bottlenose dolphins along the Georgia coast were examined through a capture-release health assessment conducted during 2009 in the Brunswick area and in waters near Sapelo Island (Schwacke *et al.* 2012). Results from hematology and serum chemistry indicated abnormalities, most notably that 26% of sampled dolphins were anemic. Also, dolphins showed low levels of thryoid hormone, and thyroid hormones negatively correlated with PCB concentration measured in blubber. In addition, a reduction in innate and acquired immune response was found. T-lymphocyte proliferation and indices of innate immunity decreased with PCB concentration measured in blubber, indicating increased vulnerability to infectious disease. The high levels of PCBs recorded in dolphins from this stock, despite their relatively pristine environment, along with demonstrated PCB-related health effects, raise concern for the long-term health and viability of the stock. Studies of the distribution and health of bottlenose dolphins in this area are ongoing (Sanger *et al.* 2008; Schwacke, pers. comm.).

Illegal feeding or provisioning of wild bottlenose dolphins has been documented in Georgia, particularly near Brunswick and Savannah (Kovacs and Cox 2014; Perrtree *et al.* 2014; Wu 2013). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter the natural behavior and increase the risk of injury or death to wild dolphins.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the CGES Stock is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the Marine Mammal Protection Act. PBR for this stock is 1.9, and the zero mortality rate goal, 10% of PBR, is 0.2. There were no documented human-caused mortalities or serious injuries to this stock during 2009 – 2013. However, 2 recent entanglements (non-serious injuries) and entanglements in prior years in both commercial and recreational crab trap/pot fisheries have been documented. While the impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, it has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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