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

STOCK DEFINITION AND GEOGRAPHIC RANGE

The coastal morphotype of common bottlenose dolphins is continuously distributed along the Atlantic coast south of Long Island, New York, to the Florida peninsula, including inshore waters of the bays, sounds and estuaries. 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coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data).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 southern Georgia contains an extensive estuarine tidal marsh system, punctuated with several river drainages. There is moderate development throughout the region, along with the larger industrialized area around Brunswick, Georgia, which includes 4 sites on the Environmental Protection Agency's National Priority List (NPL) of hazardous waste sites (EPA 2008).

Balmer *et al.* (2011) conducted photo-ID studies between 2004 and 2009 in two field sites in south-central Georgia, one in the Turtle/Brunswick River estuary (TBRE) and the second north of the Altamaha River/Sound including the Sapelo Island National Estuarine Research Reserve and extending north 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 in the TBRE exhibit contaminant burdens consistent with long-term fidelity to the TBRE (Pulster and Maruya 2008; Balmer *et al.* 2011; Kucklick *et al.* 2011).

Therefore, the Southern Georgia Estuarine System Stock (SGES) is bounded in the south by the Georgia/Florida border at the Cumberland River out through Cumberland Sound and in the north by the Altamaha River out through Altamaha Sound inclusive, and encompasses all estuarine waters in between, including but not limited to the Intracoastal Waterway, Hampton River, St. Andrew and Jekyll Sounds and their tributaries, St. Simons Sound and tributaries, and the TBRE system (Figure 1). Although the majority of photo-ID survey effort by Balmer *et al.* (2013) was conducted within the estuaries, opportunistic surveys extending along the coast and satellite-linked telemetry of three individuals suggested that animals within the SGES had ranging patterns that extended into the coastal waters of the TBRE. Thus, the nearshore (≤ 1km from shore) coastal waters from Altamaha Sound to Cumberland Sound were included in the SGES Stock boundaries. The southern boundary abuts the northern boundary of the Jacksonville Estuarine System Stock, previously defined based on photo-ID and genetic data (Caldwell 2001). The northern boundary is defined based on continuity of estuarine habitat, evidence for significantly lower contaminant levels in dolphins from the Sapleo Island area (Balmer *et al.* 2011) and a genetic discontinuity between dolphins sampled in southern Georgia and those sampled in Charleston, South Carolina (Rosel *et al.* 2009). These boundaries are subject to change upon further study of dolphin residency patterns in estuarine waters of central and northern Georgia.

Dolphins residing in the estuaries north of this stock between Altamaha Sound, Georgia, and Wassaw Sound, Georgia, are not currently covered in any stock assessment report. Based on photo-ID surveys and telemetry, Balmer *et al.* (2013) identified dolphins with high site-fidelity to the estuarine waters from Altamaha Sound north to and including Sapelo Sound. These animals did not have extended ranging patterns outside of this region, suggesting that they may represent a separate stock and should not be included in the SGES or Northern Georgia/Southern South Carolina Estuarine System (NGSSCES) Stocks. Future research focusing on the waters north of Sapelo Sound to the southern boundary of the NGSSCES (Ossabaw Sound) is necessary to identify the ranging patterns of

dolphins in this region and determine appropriate stock delineations. It should be noted, however, that in this intervening region during 2007-2011, 12 stranded dolphins were reported. It could not be determined if there was evidence of human interactions for 10 of these stranded animals, and for 1 animal no evidence of human interactions was detected. One animal was disentangled from commercial crab pot gear and released alive without serious injury (Maze-Foley and Garrison in prep.).

POPULATION SIZE

The Georgia Dolphin Project conducted quarterly boat-based surveys from 1992 to 2003 to photograph and count dolphins, but no abundance estimate has been published from this work. During 2008-2009, seasonal, mark-recapture, photo-ID surveys were conducted to estimate abundance in a portion of the SGES including St. Simons Sound north to and inclusive of Altamaha Sound. Estimates from winter were chosen as the best representation of the portion of resident estuarine stock in the area surveyed, and a random emigration model was chosen as the best fit based on the lowest Akaike's Information Criterion value. The estimated average abundance estimate, based on winter 2008 and winter 2009 surveys, was 194 (CV=0.05; Balmer *et al.*, 2013). It is important to note this estimate covered less than half of the entire range of the SGES 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 SGES Stock is 194 (CV=0.05). The resulting minimum population estimate is 185.

Current Population Trend

There are insufficient data to determine the population trends for this stock.

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 SGES Stock of bottlenose dolphins is 185. 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 this stock of bottlenose dolphins is 1.9.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury within the SGES Stock of bottlenose dolphins during 2007-2011 is unknown. No interactions with crab pot gear were documented; however, it is not possible to estimate the total number of interactions or mortalities associated with crab pots since there is no systematic observer program.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fishery Information

There is a potential for the SGES Stock to interact with the Category II Atlantic blue crab trap/pot fishery (Appendix III).

Crab Pots

During 2007-2011 there were no documented interactions with crab pots in the SGES area. However, 3 earlier interactions involving live animals observed entangled in crab pot gear were documented during 2001, 2004 and 2005. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab pots.

Other Mortality

From 2003 to 2007, 15 additional bottlenose dolphins were reported stranded within the SGES From 2007 to 2011, 24 bottlenose dolphins were reported stranded within the SGES (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012). It was not possible to make any determination of possible human interaction for 23 of these strandings. For the remaining dolphin, no evidence of human interactions was detected. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals that die or are seriously injured in fishery interactions are discovered, reported or investigated, nor will all of those that are found necessarily show signs of entanglement or other fishery interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

A portion of the stock's range is highly industrialized, and the Environmental Protection Agency has included 4 sites within the Brunswick area on its National Priority List (NPL) of hazardous waste sites (EPA 2008). Specifically, the LCP Chemicals Site contaminated soils, groundwater and adjacent marsh with mercury and polychlorinated biphenyls (PCBs). Mean total polychlorinated biphenyl (PCB) concentrations from dolphins biopsied in the TBRE (Pulster and Maruya 2008; Sanger *et al.* 2008) were significantly higher than dolphins sampled in other areas of the world including other inshore estuarine waters along the Southeast coast of the United States, including the Gulf of Mexico (Schwacke *et al.* 2002; Hansen *et al.* 2004; Litz 2007; Balmer *et al.* 2011; Kucklick *et al.* 2011). PCB congeners measured in tissues of dolphins biopsied in the TBRE system were enriched in highly chlorinated homologs consistent with Aroclor 1268 (Pulster and Maruya 2008; Sanger *et al.* 2008,Balmer *et al.* 2011; Kucklick *et al.* 2011). The TBRE area is known to be contaminated with this specific PCB mixture 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).

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 TBRE 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. Overall, the results plainly showed that bottlenose dolphins are susceptible to PCB-related health effects (Schwacke *et al.* 2012).

Thus, the high levels of PCBs recorded in dolphins from this stock, along with demonstrated PCB-related health effects, raise concern for the long-term health and viability of the stock. However, there are no estimates of indirect human-caused mortality from pollution or habitat degradation. Studies of the distribution and health of bottlenose dolphins in this area are ongoing (Sanger *et al.* 2008; Schwacke, pers. comm.).

STATUS OF STOCK

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 SGES 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 so the zero mortality rate goal, 10% of PBR, is 0.2. There have been no documented human-caused mortalities to this stock during 2007 – 2011. Entanglements in both commercial and recreational crab pot fisheries have been documented in prior years, and 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. Detrimental impacts of high pollutant burdens may be a significant issue for this stock due to the high mean total polychlorinated biphenyl (PCB) concentrations

found in the blubber of animals in this region. 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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