

COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Choctawhatchee Bay Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: “Northern Gulf of Mexico Bay, Sound and Estuary Stocks”.

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the Gulf of Mexico (Mullin 1988). Long-term (year-round, multi-year) residency by at least some individuals has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico (e.g., Irvine and Wells 1972; Shane 1977; Gruber 1981; Irvine *et al.* 1981; Wells 1986a; Wells *et al.* 1987; Scott *et al.* 1990; Shane 1990; Wells 1991; Bräger 1993; Bräger *et al.* 1994; Fertl 1994; Wells *et al.* 1996a,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including

Choctawhatchee Bay, with the first stock assessment reports published in 1995.

More recently, genetic data also support the concept of relatively discrete BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, and Charlotte Harbor, Florida; Matagorda Bay, Texas; and the coastal Gulf of Mexico (1-12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant population

differentiation among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Additionally, photo-ID and genetic data from several

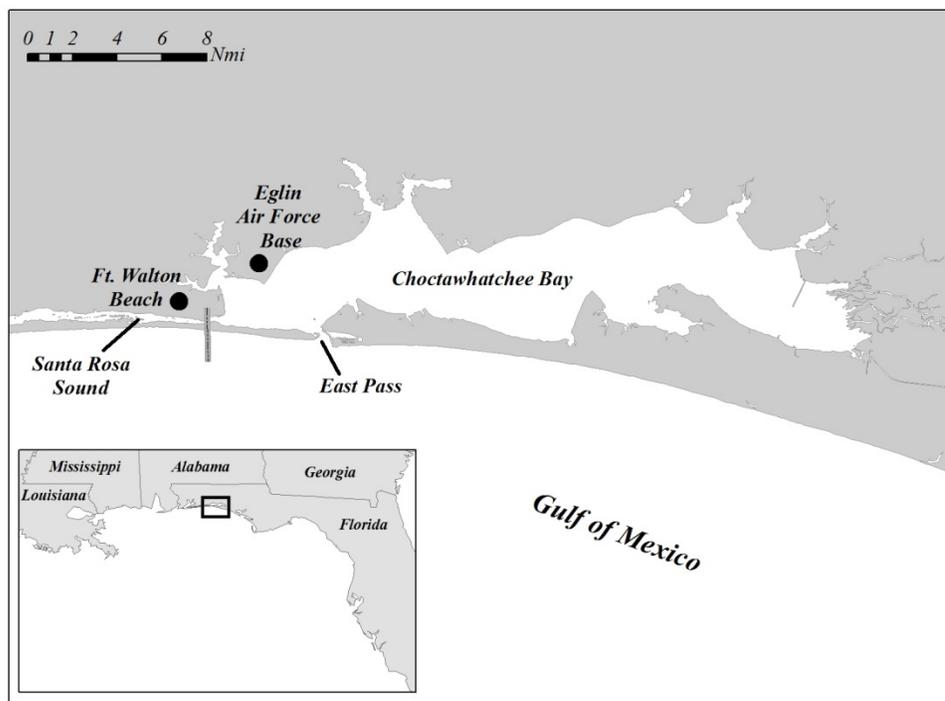


Figure 1. Geographic extent of the Choctawhatchee Bay Stock, located in the Florida panhandle. The western border (with Santa Rosa Sound) is denoted by a solid line.

inshore areas of the southeastern United States also support the existence of resident estuarine animals and a differentiation between animals biopsied along the Atlantic coast and those biopsied within estuarine systems at the same latitude (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz 2007; Rosel *et al.* 2009; NMFS unpublished).

Choctawhatchee Bay is located in the Florida panhandle and connected to the Gulf of Mexico by a single pass, East Pass (Figure 1). The bay is approximately 348km² in surface area, 43km in length and 2-10km in width (Florida Department of Environmental Protection 2010; Conn *et al.* 2011). The bay is relatively shallow with steep slopes. Water depth averages 8m in western portions and 3m in eastern portions, with an overall mean depth of 3.8m. Fresh water flows into Choctawhatchee Bay from the Choctawhatchee River primarily (90% of freshwater input), and from numerous small creeks and bayous as well. Salinity varies from 0 to 34ppt on an east to west basis from the river delta in the east to East Pass in the west. Choctawhatchee Bay is bordered by forested wetlands and marshes (Florida Department of Environmental Protection 2010). To the north and east, development is limited, partly due to the presence of Eglin Air Force Base. To the south and west are well-developed tourist areas (Conn *et al.* 2011). Both commercial and recreational fishing, as well as oyster harvesting, occur in Choctawhatchee Bay. Environmental concerns for this area include eutrophication and its associated problems (e.g., harmful algal blooms, hypoxia) and loss of seagrass beds and tidal marshes (Florida Department of Environmental Protection 2010).

Bottlenose dolphins utilizing Choctawhatchee Bay are of particular concern due to the potential impacts of recent Unusual Mortality Events (UMEs) on the population (Conn *et al.* 2011; see 'Other Mortality' section). Partly as a result of elevated stranding levels in recent years, Choctawhatchee Bay was chosen by NMFS as the first in a series of north-central Gulf of Mexico BSE stocks to produce abundance estimates for bottlenose dolphins. Photo-ID surveys were conducted during July-August 2007 and mark-recapture models were used to generate abundance estimates for residents and for residents plus transients (Conn *et al.* 2011).

The boundaries of this stock include waters of Choctawhatchee Bay from Point Washington and Jolly Bay in the east to Fort Walton Beach in the west as this is the area surveyed during the most recent mark-recapture photo-ID abundance surveys. The boundaries are likely to change as additional research is conducted. Some animals sighted multiple times in Choctawhatchee Bay have also been sighted in Santa Rosa Sound and/or Pensacola Bay to the west (Shippee 2010), suggesting the geographic area encompassing this stock may have to be expanded westward to include some or all of these areas as well. Further research is needed to fully determine the degree of overlap between dolphins inhabiting primarily Choctawhatchee Bay and those inhabiting primarily Pensacola Bay and waters in between, and the degree of genetic exchange between dolphins in these areas. Dolphins have been observed leaving Choctawhatchee Bay through the pass and entering nearshore coastal waters (Shippee 2010). Further information is needed to determine how often this stock utilizes these waters. Information on the use of nearshore waters will be important when considering exposure to coastal fisheries as estuarine animals that make use of nearshore coastal waters would be at risk of entanglement in fishing gear while moving along the coast.

POPULATION SIZE

In order to estimate abundance of residents and of residents plus transients, photo-ID mark-recapture surveys were conducted during July-August 2007 in Choctawhatchee Bay using "racetrack" (sampling the perimeter of the bay, taking about 3 days to complete) and "zigzag" (sampling open waters and sections of the racetrack, taking about 4 days to complete) tracklines (Conn *et al.* 2011). Each survey was conducted in Beaufort Sea State 3 or less, in good weather, at a survey speed of 12-14kts. Twenty-one percent of dolphins photographed had non-distinctive dorsal fins, and 188 individuals were identified overall. Conn *et al.* (2011), averaging over all fitted models, estimated resident abundance as 179 (CV=0.04) and resident plus transient abundance as 232 (CV=0.06). Therefore, the best available abundance estimate of the resident Choctawhatchee Bay Stock is 179 (CV=0.04). Because this estimate does not account for the proportion of the population with unmarked fins, it is negatively biased. A reanalysis of the data using a method that accounts for unmarked fins is required for a less negatively biased estimate.

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). The best estimate for the Choctawhatchee Bay Stock is 179 (CV=0.04). The resulting minimum population estimate is 173.

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 Choctawhatchee Bay Stock of common bottlenose dolphins is 173. 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 1.7.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury of the Choctawhatchee Bay Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock may interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007–2011 and mortality rates were calculated at the state level (see Shrimp Trawl section below). The mean annual fishery-related mortality and serious injury during 2009–2013 is unknown. Additional mean annual mortality and serious injury during 2009–2013 due to other human-caused actions (fishery research) was 0.4. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.4. This does not include an estimate for the commercial shrimp trawl fishery.

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

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Gulf of Mexico menhaden purse seine; and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III). There have been no documented mortalities of Choctawhatchee Bay common bottlenose dolphins in crab trap/pot fisheries. There is no systematic observer coverage of crab trap/pot fisheries; therefore, it is not possible to quantify total mortality. There are no recent observer program data for the Gulf of Mexico menhaden purse seine fishery. The menhaden fishery in this area is very limited. During 2010, there was only 1 fishing trip for Walton County, Florida, and none for Okaloosa County, Florida. During 2009 and 2011–2013, there were no fishing trips for either county (Florida Fish and Wildlife Conservation Commission 2013). There were no documented interactions with hook and line fisheries in Choctawhatchee Bay during 2009–2013. There is no observer coverage of hook and line fisheries.

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS’s Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual

mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimate for Florida BSE stocks (from Perdido Bay east and south to the Florida Keys) was 3.4 (CV=0.99). This estimate does not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Other Mortality

During 2009–2013, 2 dolphin mortalities occurred due to entanglement in a research gillnet in Choctawhatchee Bay. The mortalities occurred during 2011, and were included in the stranding database.

From 2009 to 2013, 13 common bottlenose dolphins were reported stranded within the Choctawhatchee Bay Stock area (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 10 of these strandings. For 1 dolphin, no evidence of human interaction was detected. For the remaining 2 dolphins, evidence of human interactions was found (both animals were entangled in research gillnet gear as mentioned 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.

Choctawhatchee Bay has been affected by 4 recent unusual mortality events (UMEs). First, between August 1999 and May 2000, 150 bottlenose dolphins died coincident with *Karenia brevis* blooms and fish kills in the Florida Panhandle. This UME started in St. Joseph Bay, Florida, and was concurrent spatially and temporally with a *K. brevis* bloom that spread east to west. There were 62 bottlenose dolphin strandings within Choctawhatchee Bay during this event, which accounted for about 41% of the total bottlenose dolphin strandings associated with this UME. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). Second, in March and April 2004, in another Florida Panhandle UME attributed to *K. brevis* blooms, 105 bottlenose dolphins and 2 unidentified dolphins stranded dead (Litz *et al.* 2014). This event also started in St. Joseph Bay, and the majority (76%) of animals stranded in the St. Joseph Bay Stock area with only 2 strandings within Choctawhatchee Bay. Although there was no indication of a *K. brevis* bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al.* 2005; Twiner *et al.* 2012). Third, a separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a *K. brevis* bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of most of the stranded dolphins. Between September 2005 and April 2006 when the event was officially declared over, a total of 88 bottlenose dolphin strandings occurred (plus strandings of 5 unidentified dolphins), with 44 (50%) occurring within Choctawhatchee Bay. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). Finally, a UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see “Habitat Issues” below), during the spill, and after. During 2010-2013, all 12 stranded animals from this stock were considered to be part of the UME.

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear. To date there are no records of depredation or provisioning for this stock area however.

Table 1. Common bottlenose dolphin strandings occurring in the Choctawhatchee Bay Stock area from 2009 to 2013, as well as number of strandings for which evidence of human interaction was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction. 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
Choctawhatchee Bay Stock	Total Stranded	1	2 ^a	4 ^a	2 ^a	4 ^a	13
	Human Interaction						
	---Yes	0	0	2 ^b	0	0	2
	---No	1	0	0	0	0	1
	---CBD	0	2	2	2	4	10

^a All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
^b Two entanglement interactions with research gillnet gear (mortalities).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Given the trajectory of the surface oil during the spill and the documented oiling of shoreline (Michel *et al.* 2013), it is likely the Choctawhatchee Bay Stock of common bottlenose dolphins was exposed to oil during the event. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi barrier islands, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana (OSAT-2 2011). A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands.

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including the Choctawhatchee Bay Stock, and because the high number of bottlenose dolphin deaths associated with UMEs in the Florida panhandle since 1999 suggests that this stock may be stressed, finds cause for concern about this stock. The total human-caused mortality and serious injury for this stock is unknown and there is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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