COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Northern Gulf of Mexico Continental Shelf Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) Continental Shelf Stock of common bottlenose dolphins inhabits waters from 20 to 200 m deep in the northern Gulf from the U.S.-Mexican border to the Florida Keys (Figure 1). Genetically distinct "coastal" and "offshore" ecotypes of bottlenose dolphins (Hoelzel *et al.* 1998; Vollmer 2011) occur in the Gulf of Mexico, and the Continental Shelf Stock, while predominantly of the coastal ecotype, may also include dolphins of the offshore ecotype (Vollmer 2011). The Continental Shelf Stock range may extend into Mexican and Cuban territorial waters; for example, a stranded dolphin from the Florida Panhandle was rehabilitated and released over the shelf off western Florida and traveled into the Atlantic Ocean (Wells *et al.* 1999). However, there are no available estimates of either abundance or mortality from Mexico or Cuba to incorporate in this assessment.

This stock's boundaries abut other bottlenose dolphin stocks, namely the Oceanic Stock and the three coastal stocks. While individuals from different stocks may occasionally overlap, the degree of overlap is unknown and it is not thought that significant mixing or interbreeding occurs between them. Genetic studies have shown significant differentiation between inshore stocks and the adjacent coastal stock (Sellas *et al.* 2005) and among dolphins living in coastal and shelf waters (Vollmer 2011). These results suggest that if there is spatial overlap there may be mechanisms reducing interbreeding between the stocks. Overall, stock structure of bottlenose dolphins in the northern Gulf of Mexico is complex and has not been fully examined. Continued studies are necessary to examine the current stock boundaries delineated in coastal, shelf and oceanic waters. As research is completed, it may be necessary to revise stocks of bottlenose dolphins in the northern Gulf of Mexico.

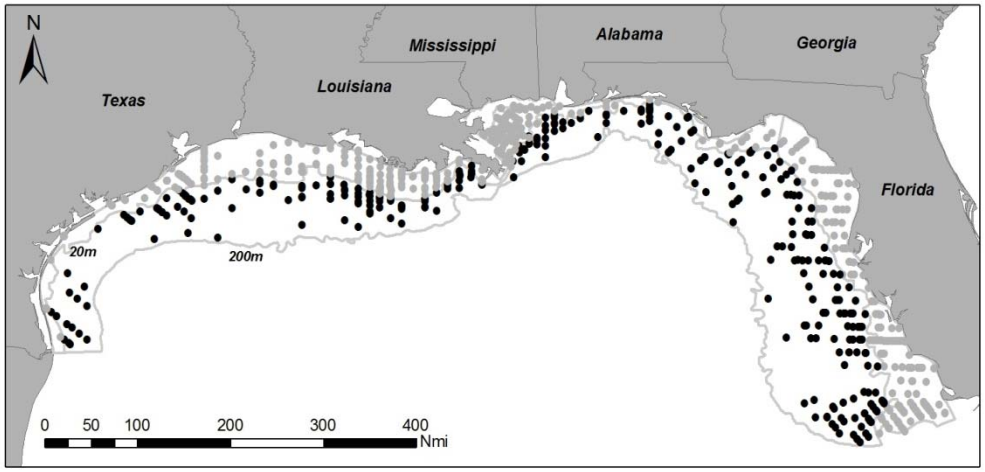

Figure 1. *Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Continental Shelf Stock. The 20-m and 200-m isobaths are shown.*

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Continental Shelf Stock of bottlenose dolphins is 51,192 (CV=0.10; Table 1). This estimate is from an inverse-variance weighted average of seasonal abundance estimates from aerial surveys conducted during spring 2011, summer 2011, fall 2011 and winter 2012.

Earlier abundance estimates

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

Recent survey and abundance estimate

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m

depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring (March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each of these surveys was conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (seas state, glare, water color, etc.) was developed using data across all four surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Continental Shelf Stock of bottlenose dolphins were based upon tracklines and sightings in waters from the 20-m to the 200-m isobaths and between the Texas-Mexico border and the Florida Keys. The seasonal abundance estimates for this stock were: spring – 45,171 (CV=0.22), summer – 64,583 (CV=0.16), fall – 34,181 (CV=0.20) and winter – 58,561 (CV=0.25). Due to the uncertainty in stock movements and apparent seasonal variability in the abundance of the stock, a weighted average of these seasonal estimates was taken where the weighting was the inverse of the CV. This approach weights estimates with higher precision more heavily in the final weighted mean. The resulting weighted mean and best estimate of abundance for the Western Coastal Stock of bottlenose dolphins was 51,192 (CV=0.10).

Table 1. Summary of recent abundance estimates for the northern Gulf of Mexico Continental Shelf Stock of bottlenose dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Season/Year	Area	N_{best}	CV
Spring, summer and fall 2011, winter 2012	Continental Shelf waters, 20-200 m	51,192	0.10

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 of abundance for bottlenose dolphins is 51,192 (CV=0.10). The minimum population estimate for the northern Gulf of Mexico is 46,926.

Current Population Trend

There are insufficient data to determine the population trends for this species because of methodological differences in the surveys over time.

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 history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 46,926. 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 the stock is of unknown status. PBR for the Gulf of Mexico Continental Shelf Stock of bottlenose dolphins is 469.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury within the Continental Shelf Stock during 2008-2012 is unknown. During 2008-2012, 1 mortality and 1 serious injury were observed in the Southeastern U.S. Atlantic, Gulf of Mexico, Caribbean snapper-grouper and other reef fish fishery, and 2 mortalities and 1 serious injury were observed in the Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl fishery. One mortality occurred

during 2010 incidental to oil rig platform removal operations when an animal became entangled in line and drowned. In addition, in 2010, 1 serious injury was observed that likely involved the Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) 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.

Fisheries Information

The commercial fisheries which potentially could interact with this stock in the Gulf of Mexico are: the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl fishery; and the Category III Southeastern U.S. Atlantic, Gulf of Mexico shark bottom longline/hook-and-line fishery; Southeastern U.S. Atlantic, Gulf of Mexico, Caribbean snapper-grouper and other reef fish fishery; Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery; and the Gulf of Mexico butterfish trawl fishery (Appendix III). The level of past or current, direct, human-caused mortality of bottlenose dolphins in the northern Gulf of Mexico is unknown; however, interactions between bottlenose dolphins and fisheries have been observed in the northern Gulf of Mexico.

Reef Fish Fishery

During 2008-2012, 1 mortality and 1 serious injury were observed in the snapper-grouper and other reef fish fishery. During 2012 a mortality occurred when a dolphin was entangled in the mainline of bottom longline gear. During 2010 a serious injury occurred in which a bottlenose dolphin was hooked in the rostrum and line was wrapped around the rostrum (Maze-Foley and Garrison in prep a). Both animals were likely from the Continental Shelf Stock, and both incidents occurred off Florida's west coast.

Shrimp and Butterfish Trawl Fisheries

During 2008-2012, 2 mortalities and 1 serious injury were observed in the shrimp trawl fishery that can be ascribed to this stock. A voluntary observer program for the shrimp trawl fishery began in 1992 and became mandatory in 2007. A total of 5 bottlenose dolphin mortalities were observed in the shrimp trawl fishery during 2003, 2007, 2008, 2010 and 2011, and 1 bottlenose dolphin was observed to be seriously injured during 2012. The 2008 and 2011 mortalities as well as the 2012 serious injury likely belonged to the Continental Shelf Stock. During 2009, 1 bottlenose dolphin was released alive presumably with no serious injury after becoming entangled in the lazy line of a shrimp trawl. This animal could have belonged to the Continental Shelf Stock or the Western Coastal Stock. During 1992-2007 the observer program recorded an additional 6 unidentified dolphins caught in a lazy line or turtle excluder device, and it is likely that 3-4 of the animals belonged to the Continental Shelf Stock or the Atlantic spotted dolphin (*Stenella frontalis*) stock. For 2 of these cases, the observer report indicated the animal may have already been decomposed, but this could not be confirmed because there was no necropsy in either case. In addition, in 2008 a dolphin carcass was caught on the tickler chain of a shrimp trawl; however, the animal's carcass was severely decomposed and may have been captured in this state. It is likely the unidentified carcass belonged to the bottlenose dolphin Continental Shelf Stock or the Atlantic spotted dolphin stock.

A trawl fishery for butterfish was monitored by NMFS observers for a short period in the 1980's with no records of incidental take of marine mammals (Burn and Scott 1988; NMFS unpublished data), although an experimental set by NMFS resulted in the death of 2 bottlenose dolphins (Burn and Scott 1988). There are no other data available.

Shark Bottom Longline Fishery

The shark bottom longline fishery has been observed since 1994. No interactions between bottlenose dolphins and this fishery were observed during 2004-2012 (Hale and Carlson 2007; Hale *et al.* 2007; Richards 2007; Hale *et al.* 2009; 2010; 2011; 2012; Gulak *et al.* 2013). The shark bottom longline fishery has been observed since 1994, and 3 interactions with bottlenose dolphins have been recorded, 2 of which likely involved the Continental Shelf Stock: 1 mortality (2003) and 1 hooked animal that escaped at the vessel (2002; Burgess and Morgan 2003). For the shark bottom longline fishery in the Gulf of Mexico, Richards (2007) estimated bottlenose dolphin mortalities of 58 (CV=0.99), 0 and 0 for 2003, 2004 and 2005, respectively.

Other Mortality

During 2008-2012, there was 1 at-sea observation in 2010 in the Continental Shelf Stock area of a bottlenose dolphin entangled in monofilament line and hooks, and this dolphin was considered seriously injured (Maze-Foley and Garrison in prep a,b).

The use of explosives to remove oil rigs in portions of the continental shelf in the western Gulf of Mexico has the potential to cause serious injury or mortality to marine mammals. These activities have been closely monitored by NMFS observers since 1987 (Gitschlag and Herczeg 1994). There had been no reports of either serious injury or mortality to bottlenose dolphins until 2010 (NMFS unpublished data). One mortality occurred during 2010 when a bottlenose dolphin became entangled in a diver's guide line during platform removal operations. A diver discovered the dolphin at a depth of 25.9m and reported it to be motionless and unresponsive with both tail flukes caught in poly guide line, which was being used to transfer equipment to the sea floor. No explosives were involved in this incident.

A total of 1,703 bottlenose dolphins were found stranded in the northern Gulf of Mexico from 2008 through 2012 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012 [for 2008-2011 data] and 15 April 2013 [for 2012 data]). Of these, 141 showed evidence of human interactions (e.g., gear entanglement, mutilation, gunshot wounds). Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Wells *et al.* 1998; Gorzelany 1998), and some are struck by vessels (Wells and Scott 1997). The vast majority of stranded bottlenose dolphins are assumed to come from stocks that live nearest to land, namely the bay, sound and estuary stocks and the three coastal stocks. Nevertheless, it is possible that some of the stranded bottlenose dolphins belonged to the Continental Shelf or Oceanic Stocks and that they were among those strandings with evidence of human interactions. (Strandings do occur for other cetacean species whose primary range in the Gulf of Mexico is outer continental shelf or oceanic waters.)

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of 2013, the event is still ongoing. It includes cetaceans that stranded prior to the Deepwater Horizon oil spill (see "Habitat Issues" below), during the spill, and after. During 2010, 221 bottlenose dolphins were considered to be part of the UME; during 2011, 320 bottlenose dolphins, and during 2012, 151 bottlenose dolphins. The vast majority of stranded bottlenose dolphins are assumed to belong to one of the coastal stocks or to bay, sound and estuary stocks. Nevertheless, it is possible that some of the stranded bottlenose dolphins considered part of the UME belonged to the Continental Shelf Stock.

HABITAT ISSUES

The Deepwater Horizon (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500m deep, exploded on 20 April 2010. The rig sank, and over 87 days ~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. 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).

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 and likely will continue for some time. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure of marine mammals and turtles relative to oil from DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Aerial surveys have observed Risso's dolphins, spinner dolphins, pantropical spotted dolphins, striped dolphins, bottlenose dolphins and sperm whales swimming in oil in offshore waters. Given the location of the well head and the trajectory of the surface oil during the spill, it is likely the Continental Shelf Stock of bottlenose dolphins was exposed to oil during the event. 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

Bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico Continental Shelf Stock is not considered strategic under the MMPA. Total U.S. fishery-related mortality and serious injury for this stock is not known, but is likely to be less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of bottlenose dolphins, relative to OSP, in the northern Gulf of Mexico continental shelf waters is unknown. There are insufficient data to determine population trends for this stock.

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