BRYDE'S WHALE (Balaenoptera edeni): Northern Gulf of MexicoStock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bryde's whales are distributed worldwide in tropical and sub-tropical waters, but the taxonomy and number of species and/or subspecies of Bryde's whales in the world is currently a topic of debate (Kato and Perrin 2009; Rosel and Wilcox 2014). In the western Atlantic Ocean, Bryde's whales are reported from the Gulf of Mexico and the southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves 1983) but which subspecies the whales belong to in these different areas is unknown.. Sighting records and acoustic detections of Bryde's whales in the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) occur almost exclusively in the northeastern Gulf in the De Soto canyon area, along the continental shelf break between 100 m and 400 m depth (Figure 1; Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling 2004; Maze-Foley and Mullin 2006; Rice *et al.* 2014; Rosel and Wilcox 2014; Širović *et al.* 2014; Rosel *et al*. 2016; Soldevilla *et al.* 2017). Bryde's whales have been sighted in all seasons within the De Soto Canyon area (Mullin and Hoggard 2000; Maze-Foley and Mullin 2006; Mullin 2007; DWH MMIQT 2015). Genetic analysis suggests that Bryde's whales from the northern Gulf of Mexico represent a unique evolutionary lineage distinct from other recognized Bryde's whale subspecies, including those found in the southern Caribbean and southwestern Atlantic off Brazil (Rosel and Wilcox 2014). The geographic distribution of this Bryde's whale form has not yet been fully identified. Two strandings from the southeastern U.S. Atlantic coast share the same genetic characteristics with those from the northern Gulf of Mexico (Rosel and Wilcox 2014), but it is unclear whether these are extralimital strays (Mead 1977) or they indicate the population extends from the northeastern Gulf of Mexico to the Atlantic coast of the southern U.S. (Rosel and Wilcox 2014). There have been no confirmed sightings of Bryde's whales along the U.S. east coast during NMFS cetacean surveys (Rosel *et al*. 2016)

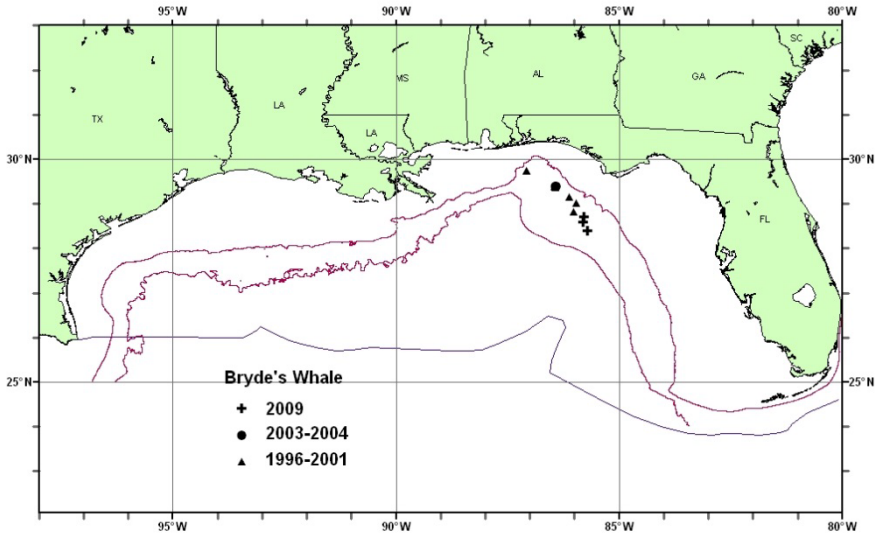

Figure 1. *Distribution of Bryde's whale sightings from SEFSC vessel surveys during spring 1996-2001, summer 2003 and spring 2004, and summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.*

Historical whaling records from the 1800s suggest Bryde's whales may have been more common in the U.S. waters of the north central Gulf of Mexico and in the southern Gulf of Mexico in the Bay of Campeche (Reeves *et al.* 2011). At the time this report was written, there had yet to be a confirmed sightings in the north central or western Gulf despite NMFS survey effort in the area dating back to the early 1990s (e.g., Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). A compilation of available records of cetacean sightings, strandings, and captures in Mexican waters of the southern Gulf of Mexico identified no Bryde's whales (Ortega-Ortiz 2002). There are insufficient data to determine whether it is plausible the stock contains multiple demographically independent populations that should be separate stocks.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico Bryde's whales is 33 (CV=1.07; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200-m isobath to the seaward extent of the U.S. EEZ.

Earlier abundance estimates

There are three previous estimates of abundance (Table 1). Please see Appendix IV for a summary of survey descriptions for earlier estimates.

Recent survey and abundance estimate

During summer 2009, a line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico (Garrison 2016). Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for Bryde's whales in oceanic waters during 2009 was 33 (CV=1.07; Table 1).

Table 1. Summary of abundance estimates for northern Gulf of Mexico Bryde's whales. 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
Apr-Jun 1991-1994	Oceanic waters	35	1.10
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	40	0.61
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	15	1.98
Jun-Aug 2009	Oceanic waters	33	1.07

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 distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Bryde's whales is 33 (CV=1.07). The minimum population estimate for the northern Gulf of Mexico is 16 Bryde's whales.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of Bryde's whale abundance have been made based on data from line-transect surveys covering 1991–2009 (Table 1). The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long intervals between surveys. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV>0.30) remains below 80% (alpha=0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007). While not a trend analysis, it should be noted that research studies conducted under the Natural Resource Damage Assessment (NRDA) estimated there was up to a 22% decline in population size resulting from the *Deepwater Horizon* oil spill (see Habitat Issues section).

All verified Bryde's whale sightings have occurred in a very restricted area of the northeastern Gulf (Figure 1) during surveys that uniformly sampled the entire oceanic northern Gulf. Because the population size is small, in order to effectively monitor trends in Bryde's whale abundance in the future, other methods need to be used.

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 likely do not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995). Between 1988 and 2015, there have been two documented strandings of calves (total length <700 cm) in the northern Gulf of Mexico (SEUS Historical Stranding Database unpublished data; NOAA

National Marine Mammal Health and Stranding Response Database unpublished data).

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; Wade 1998). The minimum population size is 16. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.1 because the stock is very small, exhibits very low genetic diversity, and appears to represent a unique and possibly endemic evolutionary lineage of Bryde's whale (Rosel and Wilcox 2014). PBR for the northern Gulf of Mexico Bryde's whale is 0.03, equivalent to one take every 33 years.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Gulf of Mexico Bryde's whale stock during 2011–2015 is unknown. There was no documented fishery-caused mortality or serious injury for this stock during 2011–2015. Mean annual mortality and serious injury during 2011–2015 due to other human-caused actions (the *Deepwater Horizon* oil spill) was 0.8. The minimum total mean annual human-caused mortality and serious injury for this stock during 2011–2015 was, therefore, 0.8. This is considered a minimum mortality estimate as some fisheries with which the stock could interact have limited observer coverage. In addition, the likelihood is low that a whale killed at sea due to a fishery interaction or ship-strike will be recovered (Williams *et al.* 2011).

Fisheries Information

The commercial fisheries that potentially could interact with this stock in the Gulf of Mexico are the Category I Atlantic Ocean, Caribbean, Gulf of Mexico large pelagics longline fishery, and two Category III fisheries, the Southeastern U.S. Atlantic, Gulf of Mexico shark bottom longline/hook-and-line fishery and the Southeastern U.S. Atlantic, Gulf of Mexico, and Caribbean snapper-grouper and other reef fish bottom longline/hook-and-line fishery. See Appendix III for detailed fishery information. All three of these fisheries have observer programs, however observer coverage is limited for the two Category III fisheries. Pelagic swordfish, tunas, and billfish are the targets of the large pelagics longline fishery operating in the northern Gulf of Mexico. There has been no reported fishing-related mortality or serious injury of a Bryde's whale by this fishery during 1998–2015 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2010; 2012a, b; 2013; 2014; 2016; 2017). For the two category III bottom longline/hook-and-line fisheries, the target species are large and small coastal sharks and reef fishes such as snapper, grouper, and tilefish. There has been no reported fishery-related mortality or serious injury of a Bryde's whale by either of these fisheries (e.g., Scott-Denton *et al.* 2011; Hale *et al.* 2012; Gulak *et al.* 2013; 2014; Enzenauer *et al.* 2015; 2016).

Two other commercial fisheries that overlap to a small degree with the primary Bryde's whale habitat in the northeastern Gulf of Mexico are the Category III Gulf of Mexico butterfish trawl fishery and Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl fishery (Rosel *et al.* 2016). No interactions have been documented for either of these fisheries.

Other Mortality

There were two reported strandings of Bryde's whales in the Gulf of Mexico during 2011–2015 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 18 May 2016). During 2012, two Bryde's whale strandings occurred in Louisiana. It could not be determined if there was evidence of human interaction for these strandings. Both whales were in a state of advanced decomposition when observed. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as Bryde's whales, because not all of the whales 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 for cetaceans in the northern Gulf of Mexico beginning 1 March 2010 and ending 31 July 2014 (Litz *et al.* 2014; http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico.htm, accessed 1 June 2016). It includes cetaceans that stranded prior to the *Deepwater Horizon* (DWH) oil spill (see "Habitat Issues" below), during the spill, and after. The two Bryde's whale strandings in 2012 are considered to be part of this UME.

A population model was developed to estimate the injury and time to recovery for stocks affected by the DWH oil spill, taking into account long-term effects resulting from mortality, reproductive failure, reduced survival rates,

and the proportion of the stock exposed to DWH oil (DWH MMIQT 2015). Based on the population model, it was projected that 3.8 Bryde's whales died during 2011–2015 due to elevated mortality associated with oil exposure and that the stock experienced a 22% maximum reduction in population size due to the oil spill (DWH MMIQT 2015). The DWH Marine Mammal Injury Quantification Team cautioned that the capability of Bryde's whales to recover from the DWH oil spill is unknown because the population models do not account for stochastic processes and genetic effects (DWH MMIQT 2015), to which small populations are highly susceptible (Shaffer 1981; Rosel and Reeves 2000). The population model used to predict Bryde's whale mortality due to the DWH event has a number of sources of uncertainty. Model parameters (e.g., survival rates, reproductive rates, and life-history parameters) were derived from literature sources for Bryde's whales occupying waters outside of the Gulf of Mexico. In addition, proxy values for the effects of DWH oil exposure on both survival rates and reproductive success were applied based upon estimated values for common bottlenose dolphins in Barataria Bay. Finally, there was no estimation of uncertainty in model parameters or outputs.

Ship strikes may pose a threat to this stock. In 2009, a Bryde's whale was found floating in the Port of Tampa, Tampa Bay, Florida. The whale had evidence of pre-mortem and post-mortem blunt trauma, and was determined to have been struck by a ship, draped across the bow, and carried into port.

HABITAT ISSUES

The *Deepwater Horizon* MC252 drilling platform, located approximately 80 km 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 ~3.2 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (DWH NRDAT 2016). Shortly after the oil spill, the NRDA process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies were conducted to determine potential impacts of the spill on marine mammals. These studies estimated that 48% of the Bryde's whale stock was exposed to oil, that 22% (95% CI: 10–31) of females suffered from reproductive failure, and 18% (95% CI: 7–28) of the population suffered adverse health effects (DWH MMIQT 2015). A population model estimated the stock experienced a maximum 22% reduction in population size (see Other Mortality section above).

STATUS OF STOCK

The Bryde's whale is not listed as threatened or endangered under the Endangered Species Act, but the northern Gulf of Mexico stock is considered strategic under the MMPA because minimum total mean annual human-caused mortality and serious injury exceeds PBR. In addition, the stock is very small and exhibits very low genetic diversity, which place the stock at great risk of demographic stochasticity. The restricted range places it at risk of environmental stochasticity. The DWH oil spill is estimated to have resulted in a 22% maximum decline in population size for this stock. In April 2015, NMFS made a positive 90-day finding on a petition to list the Gulf of Mexico Bryde's whale as endangered under the ESA (NMFS 2015) and a proposed rule to list was published in December 2016 (NMFS 2016). The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

REFERENCES CITED

Barlow, J., S.L. Swartz, T.C. Eagle and P.R. Wade. 1995. U.S. marine mammal stock assessments: Guidelines for preparation, background, and a summary of the 1995 assessments. NOAA Tech. Memo. NMFS-OPR-6, 73 pp.

Byrd, B.L., A.A. Hohn, G.N. Lovewell, K.M. Altman, S.G. Barco, A. Friedlaender, C.A. Harms, W.A. McLellan, K.T. Moore, P.E. Rosel and V.G. Thayer. 2014. Strandings illustrate marine mammal biodiversity and human impacts off the coast of North Carolina, USA. Fish. Bull. 112:1-23.

DWH MMIQT. 2015. Models and analyses for the quantification of injury to Gulf of Mexico cetaceans from the *Deepwater Horizon* Oil Spill. Available at https://www.fws.gov/doiddata/dwh-ar-documents/876/DWH-AR0105866.pdf

DWH NRDAT (*Deepwater Horizon* Natural Resource Damage Assessment Trustees). 2016. *Deepwater Horizon* oil spill: Final programmatic damage assessment and restoration plan and final programmatic environmental impact statement. Available from: http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan.

Enzenauer, M.P., B.M. Deacy and J.K. Carlson. 2015. Characterization of the shark bottom longline fishery, 2014. NOAA Tech. Memo. NMFS-SEFSC-677, 24 pp.

Enzenauer, M.P., B.M. Deacy and J.K. Carlson. 2016. Characterization of the shark bottom longline fishery, 2015. NOAA Tech. Memo. NMFS-SEFSC-689, 23 pp.

Fairfield Walsh, C. and L.P. Garrison. 2006. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2005. NOAA Tech. Memo. NMFS-SEFSC-539, 52 pp.
Fairfield-Walsh, C. and L.P. Garrison. 2007. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2006. NOAA Tech. Memo. NMFS-SEFSC-560, 54 pp.
Fairfield, C.P. and L.P. Garrison. 2008. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2007. NOAA Tech. Memo. NMFS-SEFSC-572, 62 pp.
Garrison, L.P. 2003. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2001-2002. NOAA Tech. Memo. NMFS-SEFSC-515, 52 pp.
Garrison, L.P. 2005. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2004. NOAA Tech. Memo. NMFS-SEFSC-531, 57 pp.
Garrison, L.P. 2016. Abundance of marine mammals in waters of the U.S. Gulf of Mexico during summer 2009. NOAA Southeast Fisheries Science Center, Protected Resources and Biodiversity Division, 75 Virginia Beach Drive, Miami, FL 33140. PRBD Contribution #PRBD-2016-09, 18 pp.
Garrison, L.P. and P. M. Richards. 2004. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2003. NOAA Tech. Memo. NMFS-SEFSC-527, 57 pp.
Garrison, L.P., L. Stokes and C. Fairfield. 2009. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2008. NOAA Tech. Memo. NMFS-SEFSC-591, 63 pp.
Garrison, L.P. and L. Stokes. 2010. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2009. NOAA Tech. Memo. NMFS-SEFSC-607, 64 pp.
Garrison, L.P. and L. Stokes. 2012a. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2010. NOAA Tech. Memo. NMFS-SEFSC-624, 59 pp.
Garrison, L.P. and L. Stokes. 2012b. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2011. NOAA Tech. Memo. NMFS-SEFSC-632, 61 pp.
Garrison, L.P. and L. Stokes. 2013. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2012. NOAA Tech. Memo. NMFS-SEFSC-655, 62 pp.
Garrison, L.P. and L. Stokes. 2014. Estimated bycatch of marine mammals and sea turtles in the U.S. Atlantic pelagic longline fleet during 2013. NOAA Tech. Memo. NMFS-SEFSC-667, 61 pp.
Garrison, L.P. and L. Stokes. 2016. Estimated bycatch of marine mammals and sea turtles in the U.S. Atlantic pelagic longline fleet during 2014. NOAA Tech. Memo. NMFS-SEFSC-696, 62 pp.
Garrison, L.P. and L. Stokes. 2017. Estimated bycatch of marine mammals and sea turtles in the U.S. Atlantic pelagic longline fleet during 2015. NOAA Tech. Memo. NMFS-SEFSC-709, 61 pp.
Gulak, S.J.B., M.P. Enzenauer and J.K. Carlson. 2013. Characterization of the shark and reef fish bottom longline fisheries: 2012. NOAA Tech. Memo. NMFS-SEFSC-652, 42 pp.
Gulak, S.J.B., M.P. Enzenauer and J.K. Carlson. 2014. Characterization of the shark and reef fish bottom longline fisheries: 2013. NOAA Tech. Memo. NMFS-SEFSC-658, 22 pp.
Hale, L.F., S.J.B. Gulak, A.N. Mathers and J.K. Carlson. 2012. Characterization of the shark bottom longline fishery, 2011. NOAA Tech. Memo. NMFS-SEFSC-634, 27 pp.
Hansen, L.J., K.D. Mullin, T.A. Jefferson and G.P. Scott. 1996. Visual surveys aboard ships and aircraft. pp. 55-132. *In:* R. W. Davis and G. S. Fargion (eds.) Distribution and abundance of marine mammals in the north-central and western Gulf of Mexico: Final report. Volume II: Technical report. OCS Study MMS 96- 0027. Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
Jefferson, T.A. and A.J. Schiro. 1997. Distribution of cetaceans in the offshore Gulf of Mexico. Mammal Rev. 27(1):27-50.
Jefferson, T.A., M.A. Webber and R.L. Pitman. 2008. Marine mammals of the world. Academic Press, London. 573 pp.
Kato, H. and W.F. Perrin. 2008. Bryde's whales *Balaenoptera edeni/brydei*. pp. 158-163 *In:* W. F. Perrin, B. Würsig and J. G.M. Thewissen (eds.) Encyclopedia of Marine Mammals, Second Edition. Academic Press, San Diego. 1352 pp.
Leatherwood, S. and R.R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco. 302 pp.
Litz, J.A., M.A. Baran, S.R. Bowen-Stevens, R.H. Carmichael, K.M. Colegrove, L.P. Garrison, S.E. Fire, E.M. Fougeres, R. Hardy, S. Holmes, W. Jones, B.E. Mase-Guthrie, D.K. Odell, P.E. Rosel, J.T. Saliki, D.K. Shannon, S.F. Shippee, S.M. Smith, E.M. Stratton, M.C. Tumlin, H.R. Whitehead, G.A.J. Worthy and T.K. Rowles. 2014. Review of historical unusual mortality events (UMEs) in the Gulf of Mexico (1990–2009):

Providing context for the complex and long-lasting northern Gulf of Mexico cetacean UME. Dis. Aquat. Organ. 112:161-175.
Maze-Foley, K. and K.D. Mullin. 2006. Cetaceans of the oceanic northern Gulf of Mexico: Distributions, group sizes and interspecific associations. J. Cetacean Res. Manage. 8(2):203-213.
Mead, J.G. 1977. Records of Sei and Bryde's whales from the Atlantic Coast of the United States, the Gulf of Mexico, and the Caribbean. Rep. Int. Whal. Comm. (Special Issue) 1:113–116.
Mullin, K.D. 2007. Abundance of cetaceans in the oceanic northern Gulf of Mexico from 2003 and 2004 ship surveys. NOAA Southeast Fisheries Science Center, 3209 Frederic Street, Pascagoula, MS 39567. PRBD Contribution #PRBD-2016-03, 27 pp.
Mullin, K.D. and W. Hoggard. 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships. pp. 111-172. *In:* R. W. Davis, W. E. Evans and B. Würsig (eds.) Cetaceans, sea turtles and seabirds in the northern Gulf of Mexico: Distribution, abundance and habitat associations. Volume II: Technical report. OCS Study MMS 96-0027. Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
Mullin, K.D. and G. L. Fulling. 2004. Abundance of cetaceans in the oceanic northern Gulf of Mexico. Mar. Mamm. Sci. 20(4):787-807.
NMFS. 2015. Endangered and threatened wildlife; 90-day finding on a petition to list the Gulf of Mexico Bryde's whale as threatened or endangered under the Endangered Species Act. Federal Register 80:18343–18346. Available at: http://sero.nmfs.noaa.gov/protected_resources/brydes_whale/documents/80fr18343.pdf
NMFS. 2016. Endangered and threatened wildlife and plants: Notice of 12-month finding on a petition to list the Gulf of Mexico Bryde's whale as endangered under the Endangered Species Act (ESA). Federal Register 80:88639–88656. Available at: https://www.gpo.gov/fdsys/pkg/FR-2016-12-08/pdf/2016-29412.pdf
Ortega-Ortiz, J. 2002. Multiscale analysis of cetacean distribution in the Gulf of Mexico. Ph.D. dissertation. Texas A&M University, College Station. 170 pp.
Peltier, H., W. Dabin, P. Daniel, O. Van Canneyt, G. Dorémus, M. Huon and V. Ridoux. 2012. The significance of stranding data as indicators of cetacean populations at sea: modelling the drift of cetacean carcasses. Ecol. Indicators 18:278–290.
Reeves, R.R., J.N. Lund, T.D. Smith and E.A. Josephson. 2011. Insights from whaling logbooks on whales, dolphins, and whaling in the Gulf of Mexico. G. Mex. Sci. 29(1):41–67.
Rice, A.N., J.T. Tielens, K.J. Palmer, A. Muirhead and C.W. Clark. 2014. Potential Bryde's whale calls (*Balaenoptera edeni*) recorded in the northern Gulf of Mexico. J. Acoust. Soc. Amer. 135:3066-3076.
Rosel, P.E. and R.R. Reeves. 2000. Genetic and demographic considerations for the conservation of Asian river cetaceans. pp. 144–152. *In:* R.R. Reeves, B.D. Smith and T. Kasuya (eds) Biology and conservation of freshwater cetaceans in Asia. IUCN, Gland, Switzerland and Cambridge, UK.
Rosel, P.E. and L.A. Wilcox. 2014. Genetic evidence reveals a unique lineage of Bryde's whales in the northern Gulf of Mexico. Endang. Species Res. 25:19-34.
Rosel, P.E., P. Corkeron, L. Engleby, D. Epperson, K.D. Mullin, M.S. Soldevilla and B.L. Taylor. 2016. Status review of Bryde's whales (*Balaenoptera edeni*) in the Gulf of Mexico under the Endangered Species Act. NOAA Tech. Memo. NMFS-SEFSC-692.
Scott-Denton, E., P.F. Cryer, J.P. Gocke, M.R. Harrelson, D.L. Kinsella, J.R. Pulver, R.C. Smith and J.A. Williams. 2011. Descriptions of the U.S. Gulf of Mexico reef fish bottom longline and vertical line fisheries based on observer data. Mar. Fish. Rev. 73(2):1–26.
Shaffer, M.L. 1981. Minimum population sizes for species conservation. BioScience 31:131–134.
Širović, A., H.R. Bassett, S.C. Johnson, S.M. Wiggins and J.A. Hildebrand. 2014. Bryde's whale calls recorded in the Gulf of Mexico. Mar. Mamm. Sci. 30(1):399–409.
Soldevilla, M.S., J.A. Hildebrand, K.E. Frasier, L.A. Dias, A. Martinez, K.D. Mullin, P.E. Rosel and L.P. Garrison. 2017. Spatial distribution and dive behavior of Gulf of Mexico Bryde's whales: Potential risk of vessel strikes and fisheries interactions. Endang. Species Res. 32:533–550.Wade, P.R. 1998. Calculating limits to the allowable human-caused mortality of cetaceans and pinnipeds. Mar. Mamm. Sci. 14(1):1–37.
Wade, P.R. and R.P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, WA. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
Wells, R.S., J.B. Allen, G. Lovewell, J. Gorzelany, R.E. Delynn, D.A. Fauquier and N.B. Barros. 2015. Carcass-recovery rates for resident bottlenose dolphins in Sarasota Bay, Florida. Mar. Mamm. Sci. 31(1):355-368.
Williams, R., S. Gero, L. Bejder, J. Calambokidis, S.D. Kraus, D. Lusseau, A.J. Read and J. Robbins. 2011. Underestimating the damage: Interpreting cetacean carcass recoveries in the context of the *Deepwater Horizon*/BP incident. Conserv. Lett. 4:228–233.

Würsig, B., T.A. Jefferson and D.J. Schmidly. 2000. The marine mammals of the Gulf of Mexico. Texas A&M University Press, College Station.
Yeung, C. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1998. NOAA Tech. Memo. NMFS-SEFSC-430, 26 pp.
Yeung, C. 2001. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1999-2000. NOAA Tech. Memo. NMFS-SEFSC-467, 43 pp.