

RISSO'S DOLPHIN (*Grampus griseus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Risso's dolphins are distributed worldwide in tropical to warm temperate waters (Leatherwood and Reeves 1983). Risso's dolphins in the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) occur throughout oceanic waters but are concentrated in continental slope waters (Figure 1; Baumgartner 1997; Maze-Foley and Mullin 2006). Risso's dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000).

Although there are only a few records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), Risso's dolphins almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), including waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters comprise about 40% of the entire Gulf of Mexico and 35% of the oceanic (i.e., >200 m) Gulf of Mexico.

The Gulf of Mexico population is being considered a separate stock for management purposes, although there is currently little

information to differentiate this stock from the Atlantic Ocean stock.

In 2006, a Risso's dolphin that stranded on the Florida Gulf Coast was rehabilitated, tagged with a satellite-linked transmitter and released into the Gulf southwest of Tampa Bay. Over a 23-day period the Risso's dolphin moved from the Gulf release site into the Atlantic Ocean and north to just off of Delaware (Wells *et al.* 2009).

During September 2007 – January 2008, tracking of an adult female Risso's dolphin that had been

rehabilitated and released by Mote Marine Laboratory after stranding on the southwest coast of Florida documented movements throughout the northern Gulf of Mexico. The dolphin, released with its young calf, traveled as far as Bahia de Campeche, Mexico, and waters off Texas and Louisiana before returning to the shelf edge southwest of its stranding site off Florida (Wells *et al.* 2008). As Wells *et al.* (2009) note, it is difficult to determine the effects of stranding and rehabilitation on post-release behavior, so it is unknown whether these movements were representative of Risso's dolphin ranging patterns in either the Gulf of Mexico or Atlantic Ocean. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico Risso's dolphins is 2,442 (CV=0.57; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200-m isobath to the seaward

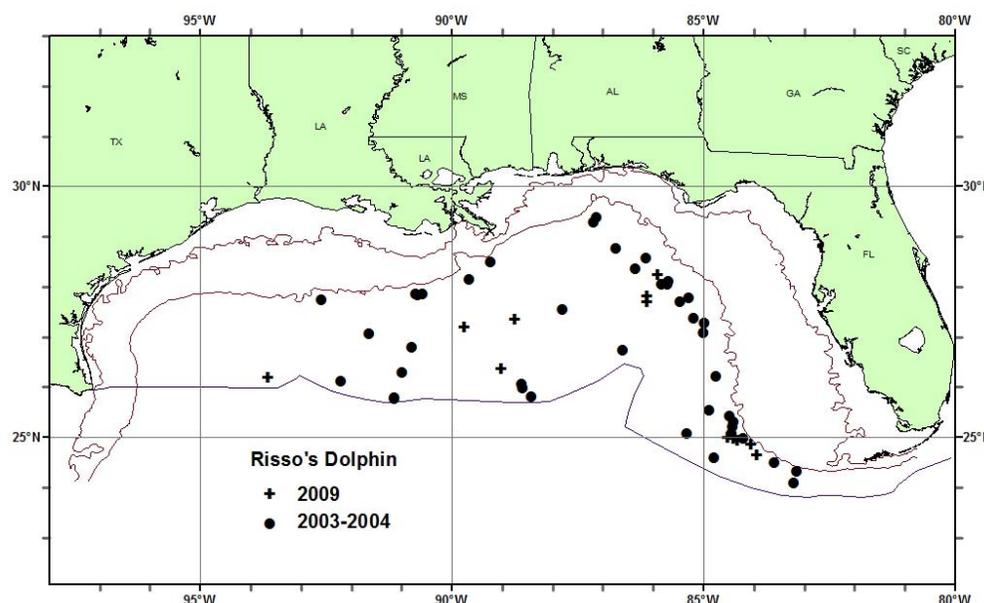


Figure 1. Distribution of Risso's dolphin sightings from SEFSC vessel surveys during summer 2003 and spring 2004, and during summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 20-m and 200-m isobaths and the offshore extent of the U.S. EEZ.

extent of the U.S. EEZ.

Earlier abundance estimates

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

Recent survey and abundance estimate

During summer 2009, a vessel-based line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for Risso's dolphins in oceanic waters during 2009 was 2,442 (CV=0.57; Table 1).

Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	2,749	0.27
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	2,169	0.32
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	1,589	0.27
Jun-Aug 2009	Oceanic waters	2,442	0.57

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 Risso's dolphins is 2,442 (CV=0.57). The minimum population estimate for the northern Gulf of Mexico is 1,563 Risso's dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of Risso's dolphin abundance have been made based on data from surveys covering 1991-2009 (Table 1). The estimates vary by a maximum factor of nearly two. To determine whether changes in abundance have occurred over this period, an analysis of all the survey data needs to be conducted which incorporates covariates (e.g., survey conditions, season) that could potentially affect estimates. It should be noted that since this is a transboundary stock and the abundance estimates are for U.S. waters only, it will be difficult to interpret any detected trends.

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 1,563. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Risso's dolphin is 16.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury for this stock during 2009–2013 was 7.9 Risso's dolphins (CV=0.85; Table 2) due to interactions with the pelagic longline fishery.

Fisheries Information

The commercial fisheries that interact, or that could potentially interact, with this stock in the Gulf of Mexico are the Category I Atlantic Highly Migratory Species (high seas longline) fishery and the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery (Appendix III). There is very little effort within the Gulf of Mexico by

the high seas longline fishery, and no takes of Risso's dolphins within high seas waters of the Gulf of Mexico have been observed or reported thus far. Pelagic swordfish, tunas and billfish are the targets of the large pelagic longline fishery operating in the northern Gulf of Mexico. During the second quarters (15 April – 15 June) of 2009–2013, observer coverage in the Gulf of Mexico pelagic longline fishery was greatly enhanced (approaching 55%) to collect more robust information on the interactions between pelagic longline vessels and spawning bluefin tuna. Therefore, the high annual observer coverage rates during 2009–2013 (Table 2) primarily reflects high coverage rates during the second quarter of each year. During the second quarter, this elevated coverage results in an increased probability that relatively rare interactions will be detected. Species within the oceanic Gulf of Mexico are presumed to be resident year-round; however, it is unknown if the bycatch rate observed during the second quarter is representative of that which occurs throughout the year.

For the 5-year period 2009–2013, the estimated annual combined serious injury and mortality attributable to the pelagic longline fishery in the northern Gulf of Mexico was 7.9 (CV=0.85) Risso's dolphins. During 2009–2013, 3 serious injuries of Risso's dolphins were observed during interactions with the pelagic longline fishery. These interactions occurred during the second quarter of 2011, during the fourth quarter of 2012 and during the third quarter of 2013 (Table 2; Garrison and Stokes 2010; 2012a,b; 2013; 2014). In addition, in the second quarter of 2011, 1 Risso's dolphin was observed entangled and released alive without serious injury in the northern Gulf of Mexico (Garrison and Stokes 2012b).

Prior to 2009, 1 mortality and 2 serious injuries were observed in 2008, and in 2005 a Risso's dolphin was observed entangled and released alive without serious injury in the northern Gulf of Mexico (Fairfield Walsh and Garrison 2006; Garrison *et al.* 2009).

Table 2. Summary of the incidental mortality and serious injury of northern Gulf of Mexico Risso's dolphins in the pelagic longline commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels ^a	Data Type ^b	Observer Coverage ^c	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	09-13	47, 46, 42, 47, 47	Obs. Data Logbook	.22, .28, .18, .11, .25	0, 0, 1, 1, 1	0, 0, 0, 0, 0	0, 0, 1.5, 29.8, 15.2	0, 0, 0, 0, 0	0, 0, 1.5, 29.8, 15.2	NA, NA, 1.0, 1.0, 1.0	7.9 (0.85)

^a Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.

^b Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC). Observer coverage in the GOM is dominated by very high coverage rates during April-June associated with efforts to improve estimates of bluefin tuna bycatch.

^c Proportion of sets observed.

Other Mortality

There were 7 reported strandings of Risso's dolphins in the Gulf of Mexico during 2009–2013 (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). This includes one mass stranding of 2 animals in Florida during January 2009. No evidence of human interactions was detected for 2 of the stranded animals, and it could not be determined if there was evidence of human interactions for the remaining 5 stranded animals. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as Risso's dolphins, 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.

Since 1990, there have been 13 common bottlenose dolphin or cetacean die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 2 of these included a Risso's dolphin. Between August 1999 and May

2000, 152 common bottlenose dolphins died coincident with *Karenia brevis* blooms and fish kills in the Florida Panhandle. Additional strandings included 3 Atlantic spotted dolphins, *Stenella frontalis*, 1 Risso's dolphin, 2 Blainville's beaked whales, *Mesoplodon densirostris*, and 4 unidentified dolphins. 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, 2011, and 2013, no animals from this stock were considered to be part of the UME, but during 2012, 1 stranded Risso's dolphin was included in the UME.

STATE	2009	2010	2011	2012	2013	TOTAL
Alabama	0	0	0	0	0	0
Florida	2 ^a	0	1	1 ^b	1	5
Louisiana	0	0	0	0	0	0
Mississippi	0	1	0	0	0	1
Texas	1	0	0	0	0	1
TOTAL	3	1	1	1	1	7

^a Includes Florida mass stranding of 2 animals in January 2009.
^b This stranding is included in the Northern Gulf of Mexico UME.

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).

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. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the 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-linked tags on sperm and Bryde's whales.

Vessel and aerial surveys documented Risso's dolphins, bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in offshore waters of the northern Gulf of Mexico following the DWH oil spill. 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

Risso's dolphins are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico stock is not considered strategic under the MMPA. Total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and therefore cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The mean annual fishery-related mortality and serious injury does not exceed PBR. The status of Risso's dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this species.

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.
- Baumgartner, M.F. 1997. The distribution of Risso's dolphin (*Grampus griseus*) with respect to physiography in the northern Gulf of Mexico. Mar. Mamm. Sci. 13: 614-638.
- Buist, I., J. McCourt, S. Potter, S. Ross and K. Trudel. 1999. In situ burning. Pure. Appl. Chem. 71(1): 43-65.
- 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.
- 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. NOAA NMFS-SEFSC-539, 52 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.
- Geraci, J.R. 1990. Physiologic and toxic effects on cetaceans. pp. 167-197 in: J. R. Geraci and D. J. St. Aubin (eds.) Sea mammals and oil: Confronting the risks. Academic Press, New York. 259 pp.
- Hansen, L.J., K.D. Mullin, T.A. Jefferson and G.P. Scott. 1996. Visual surveys aboard ships and aircraft. Pages 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.
- Leatherwood, S. and R.R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco. 302 pp.
- Lehr, B., S. Bristol and A. Possolo, eds. 2010. Oil budget calculator: Deepwater Horizon. Technical documentation. Prepared by the Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team for the National Incident Command. Available from: http://www.restorethegulf.gov/sites/default/files/documents/pdf/OilBudgetCalc_Full_HQ-Print_111110.pdf
- Litz, J.A., M.A. Baran, S.R. Bowen-Stevens, R.H. Carmichael, K.M. Colegrove, L.P. Garrison, S.E. Fire, E.M. Fougères, 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.

- McNutt, M.K., R. Camilli, T.J. Crone, G.D. Guthrie, P.A. Hsieh, T.B. Ryerson, O. Savas and F. Shaffer. 2012. Review of flow rate estimates of the *Deepwater Horizon* oil spill. *P. Natl. Acad. Sci. USA* 109 (50): 20260-20267.
- Mullin, K.D. and W. Hoggard. 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships. Pages 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.* Minerals Management Service, Gulf of Mexico OCS Region, New Orleans. OCS Study MMS 96-0027.
- NOAA. 2011. Public scoping for preparation of a programmatic environmental impact statement for the Deepwater Horizon BP Oil Spill. Available from: <http://www.gulfspillrestoration.noaa.gov/wp-content/uploads/2011/04/Public-DWH-PEIS-Scoping-Review-Document1.pdf>
- Operational Science Advisory Team (OSAT). 2010. Summary report for sub-sea and sub-surface oil and dispersant detection: Sampling and monitoring. Prepared for P. F. Zukunft, RADM, U.S. Coast Guard, Federal On-Scene Coordinator, Deepwater Horizon MC252, December 17, 2010. Available from: http://www.restorethegulf.gov/sites/default/files/documents/pdf/OSAT_Report_FINAL_17DEC.pdf
- Ortega Ortiz, J.G. 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.
- Wade, P.R. and R.P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
- Wells, R.S., C.A. Manire and J. Whaley. 2008. Travels with Betty: A Risso's dolphin tour of the Gulf of Mexico. Strandings: Newsletter of the Southeast United States Marine Mammal Health and Stranding Network. National Marine Fisheries Service Southeast Regional Office and Southeast Fisheries Science Center. Winter, Spring, Summer, Fall 2007: 1-4.
- Wells, R.S., C.A. Manire, L. Byrd, D.R. Smith, J.G. Gannon, D. Fauquier and K.D. Mullin. 2009. Movements and dive patterns of a rehabilitated Risso's dolphin, *Grampus griseus*, in the Gulf of Mexico and Atlantic Ocean. *Mar. Mamm. Sci.* 25(2): 420-429.
- 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.

