

PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata attenuata*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin (*Stenella frontalis*) and the pantropical spotted dolphin (*S. attenuata*) (Perrin *et al.* 1987). The Atlantic spotted dolphin occurs in two forms which may be distinct sub-species (Perrin *et al.* 1987, 1994; Rice 1998): the large, heavily spotted form which inhabits the continental shelf and is usually found inside or near the 200m isobath; and the smaller, less spotted island and offshore form which occurs in the Atlantic Ocean but is not known to occur in the Gulf of Mexico (Fulling *et al.* 2003; Mullin and Fulling 2003; Mullin and Fulling 2004). Where they co-occur, the offshore form of the Atlantic spotted dolphin and the pantropical spotted dolphin can be difficult to differentiate at sea.

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans (Perrin *et al.* 1987; Perrin and Hohn 1994). Sightings of this species occur in oceanic waters of the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Figure 1; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Pantropical spotted 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). Because there are many confirmed records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), pantropical spotted dolphins almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters only comprise about 40% of the entire Gulf of Mexico and 35% of the oceanic (i.e., >200 m) Gulf of Mexico.

Some of the Pacific Ocean populations have been divided into different geographic stocks based on morphological characteristics (Perrin *et al.* 1987; Perrin and Hohn 1994). The Gulf of Mexico population is being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic Ocean stock(s). 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 pantropical spotted dolphins is 50,880 (CV=0.27; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200m isobath to the seaward extent of the U.S. EEZ from Texas to Florida.

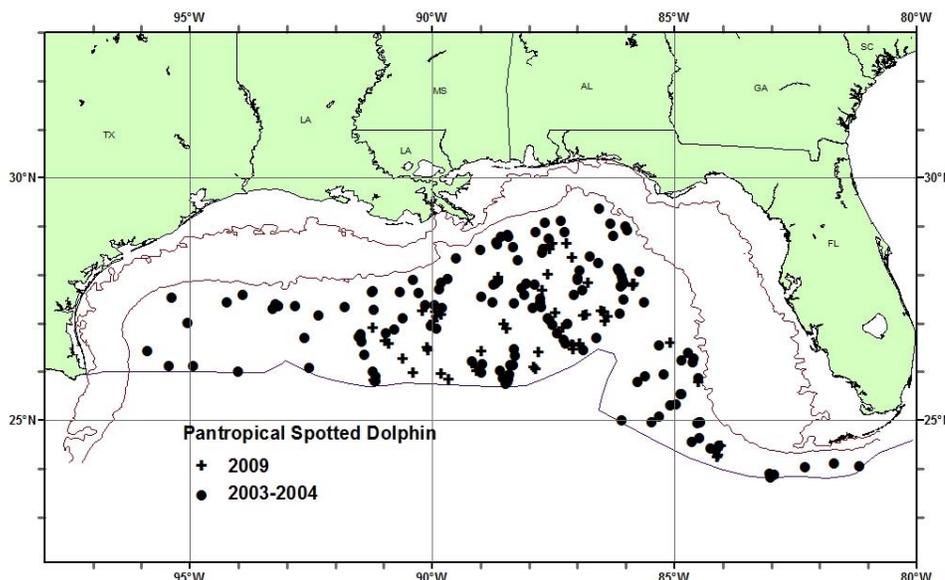


Figure 1. Distribution of pantropical spotted dolphin sightings from SEFSC vessel surveys during summer 2003 and spring 2004, and during summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 20 m and 200 m isobaths and the offshore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

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 pantropical spotted dolphins in oceanic waters during 2009 was 50,880 (CV=0.27; Table 1).

Month/Year	Area	N_{best}	CV
Jun-Aug 2009	Oceanic waters	50,880	0.27

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 pantropical spotted dolphins is 50,880 (CV=0.27). The minimum population estimate for the northern Gulf of Mexico is 40,699 pantropical spotted dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of pantropical spotted dolphin abundance have been made based on data from surveys covering 1991-2009. The estimates vary by a maximum factor of nearly three. 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. Nevertheless, differences in temporal abundance estimates will still be difficult to interpret without a Gulf of Mexico-wide understanding of pantropical spotted dolphin abundance. The oceanography of the Gulf of Mexico is quite dynamic, and the spatial scale of the Gulf is small relative to the ability of most cetacean species to travel. Studies based on abundance and distribution surveys restricted to U.S. waters are unable to detect temporal shifts in distribution beyond U.S. waters that might account for any changes in abundance.

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 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 net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 40,699. 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 northern Gulf of Mexico pantropical spotted dolphin stock is 407.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated annual average fishery-related mortality or serious injury for this stock during 2008-2012 is 3.4 pantropical spotted dolphins (CV=0.65; Table 2).

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 that potentially could interact with this stock in the Gulf of Mexico are the Category I Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery and the Atlantic Highly Migratory Species (high seas longline) fishery (Appendix III). There is very little effort within the Gulf of Mexico by the high seas longline fishery, and no takes of pantropical spotted 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 longline fishery operating in the northern Gulf of Mexico. The average annual serious injury and mortality in the Gulf of Mexico pelagic longline fishery for the 5-year period from 2008 to 2012 is 3.4 (CV=0.65; Table 2). There were no reports of mortality or serious injury to pantropical spotted dolphins by this fishery during 1998-2008 (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). However, during 2009, 4 pantropical spotted dolphins were observed to be seriously injured (3 during quarter 2 and 1 during quarter 4) and 1 pantropical spotted dolphin was released alive with no presumed serious injury after entanglement interactions with the pelagic longline fishery (Garrison and Stokes 2010). During 2010, 2 pantropical spotted dolphins were released alive with no presumed serious injuries after entanglement interactions with the pelagic longline fishery (Garrison and Stokes 2012a). One of the entanglements occurred during experimental fishing to test the effectiveness of “weak” hooks as a potential bycatch mitigation tool. There was 100% observer coverage of all experimental sets. During 2011 there were no reports of mortality or serious injury to pantropical spotted dolphins (Garrison and Stokes 2012b). During 2012, 1 mortality of a pantropical spotted dolphin occurred during an experimental set (during quarter 2; Garrison and Stokes 2013).

Table 2. Summary of the incidental mortality and serious injury of northern Gulf of Mexico pantropical spotted 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	08-12	53, 47, 46, 42, 47	Obs. Data Logbook	.26, .22, .28, .18, .11	0,4,0,0,0	0,0,0,0,1	0,16,0,0,0,0	0,0,0,0,1,0	0,16,0,0,0,1.0	NA, .69, NA, NA, NA	3.4 (0.65)

^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

Ten pantropical spotted dolphins were reported stranded in the Gulf of Mexico during 2008-2012 (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 30 September 2013). Evidence of human interaction was detected for 3 strandings (mortalities), which were the result of incidental capture in a research trawling net. No evidence of human interactions was detected for 2 stranded animals, and for the remaining 5 animals, it could not be determined if there was evidence of human interactions. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of

entanglement or other fishery interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

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, no animals from this stock were considered to be part of the UME, but the 5 strandings during 2011 and 2012 were included in the UME.

Table 2. Pantropical spotted dolphin (*Stenella attenuata*) strandings along the northern Gulf of Mexico coast, 2008-2012.

STATE	2008	2009	2010	2011	2012	TOTAL
Alabama	0	1	0	0	0	1
Florida	1	1	0	0	2*	4
Louisiana	0	0	0	3* ^a	0	3
Mississippi	0	0	0	0	0	0
Texas	0	1	1	0	0	2
TOTAL	1	3	1	3	2	10

* These strandings are included in the Northern Gulf of Mexico UME.

^a These 3 strandings were incidental takes during a research trawl.

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 pantropical spotted dolphins, Risso’s dolphins, spinner dolphins, striped dolphins, bottlenose dolphins and sperm whales swimming in oil in offshore waters. 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

Pantropical spotted 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 likely less than 10% of PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of pantropical spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this stock.

REFERENCES CITED

- Andersen, M.S., K.A. Forney, T.V.N. Cole, T. Eagle, R. Angliss, K. Long, L. Barre, L. Van Atta, D. Borggaard, T. Rowles, B. Norberg, J. Whaley and L. Engleby 2008. Differentiating serious and non-serious injury of marine mammals: report of the serious injury technical workshop, 10-13 September 2007, Seattle, WA. NOAA Tech. Memo. NMFS-OPR-39, 94 pp.
- Angliss, R.P. and D.P. DeMaster 1998. Differentiating serious and non-serious injury of marine mammals taken incidental to commercial fishing operations: Report of the serious injury workshop, 1-2 April 1997, Silver Spring, MD. NOAA Tech. Memo. NMFS-OPR-13, 48 pp.
- 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.
- 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.
- Fulling, G. L., K.D. Mullin and C.W. Hubard. 2003. Abundance and distribution of cetaceans in outer continental shelf waters of the U.S. Gulf of Mexico. Fish. Bull. 101: 923-932.
- 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. 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. 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 2013. NOAA Tech. Memo. NMFS-SEFSC-655, 62 pp.
- Geraci, J.R. 1990. Physiologic and toxic effects on cetaceans. Pages 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.
- 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
- 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 G.L. Fulling. 2003. Abundance and distribution of cetaceans in the southern U.S. Atlantic Ocean during summer 1998. *Fish. Bull.* 101: 603-613.
- 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.
- 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 2000-003.* U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
- 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>
- NOAA. 2012. Federal Register 77:3233. National policy for distinguishing serious from non-serious injuries of marine mammals. Available from: <http://www.nmfs.noaa.gov/op/pds/documents/02/238/02-238-01.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.
- Perrin, W.F., E.D. Mitchell, J.G. Mead, D.K. Caldwell, M.C. Caldwell, P.J.H. van Bree and W.H. Dawbin. 1987. Revision of the spotted dolphins, *Stenella* spp. *Mar. Mamm. Sci.* 3(2): 99-170.
- Perrin, W.F. and A.A. Hohn. 1994. Pantropical spotted dolphin *Stenella attenuata* (Meyen, 1833). Pages 129-159 *in*: S. H. Ridgway and R. Harrison (eds.) *Handbook of marine mammals, Vol. 5: The first book of dolphins.* Academic Press, London. 416 pp.
- Perrin, W.F., D.K. Caldwell and M.C. Caldwell. 1994. Atlantic spotted dolphin. Pages 173-190 *in*: S. H. Ridgway and R. Harrison (eds.) *Handbook of marine mammals, Volume 5: The first book of dolphins.* Academic Press, London. 418 pp.
- Rice, D.W. 1998. Marine mammals of the world, systematics and distribution. Spec. Publ. No 4. The Society for Marine Mammalogy, Lawrence, KS. 231 pp.
- 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.
- 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.