

RISSE'S DOLPHIN (*Grampus griseus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Risso's dolphins are distributed worldwide in tropical and temperate seas (Jefferson et al. 2008), and in the Northwest Atlantic occur from Florida to eastern Newfoundland (Leatherwood et al. 1976; Baird and Stacey 1991). Off the northeast U.S. coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during spring, summer, and autumn (CETAP 1982; Payne et al. 1984). In winter, the range is in the mid-Atlantic Bight and extends outward into oceanic waters (Payne et al. 1984). In general, the population occupies the mid-Atlantic continental shelf edge year round, and is rarely seen in the Gulf of Maine (Payne et al. 1984). During 1990, 1991 and 1993, spring/summer surveys conducted along the continental shelf edge and in deeper oceanic waters sighted Risso's dolphins associated with strong bathymetric features, Gulf Stream warm-core rings, and the Gulf Stream north wall (Waring et al. 1992, 1993; Hamazaki 2002). There is no information on stock structure of Risso's dolphin in the western North Atlantic, or to determine if separate stocks exist in the Gulf of Mexico and Atlantic. Therefore, it is plausible the stock could actually contain multiple demographically independent populations that should themselves be stocks, because the current stock spans multiple eco-regions (Longhurst 1998; Spalding et al. 2007). In 2006, a rehabilitated adult male Risso's dolphin stranded and released in the Gulf of Mexico off Florida was tracked via satellite to waters off Delaware (Wells et al. 2009). The Gulf of Mexico and Atlantic stocks are currently being treated as two separate stocks.

POPULATION SIZE

Nine abundance estimates are available for Risso's dolphins from selected regions for select time periods. Sightings were almost exclusively in continental shelf edge and continental slope areas (Figure 1). The best abundance estimate for Risso's dolphins is the result of the 2011 survey— 15,197 (CV=0.55).

Earlier abundance estimates

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

Recent surveys and abundance estimates

An abundance estimate of 15,054 (CV=0.78) Risso's dolphins was obtained from a line-transect sighting survey conducted during 12 June to 4 August 2004 by a ship and plane that surveyed 10,761 km of trackline in waters north of Maryland (38°N) to the Bay of Fundy (45°N) (Table 1; Palka 2006). Shipboard data were collected using the two-independent-team line-transect method and analyzed using the modified direct-duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and $g(0)$, the probability of detecting a group on the trackline. Aerial data were collected using the Hiby

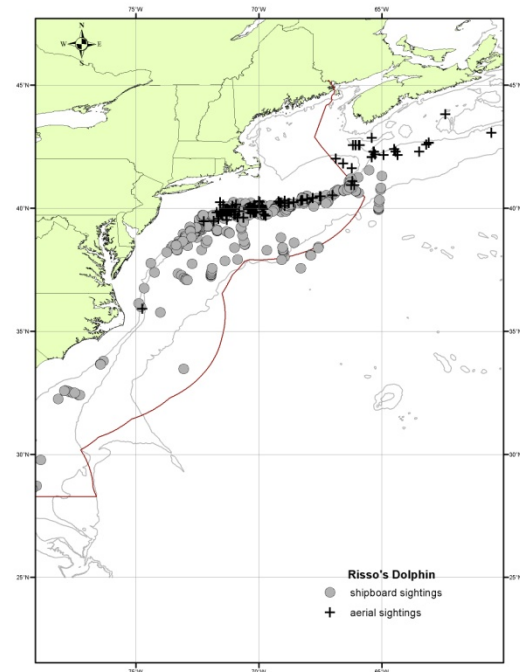


Figure 1. Distribution of Risso's dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010 and 2011. Isobaths are the 100-m, 1,000-m, and 4,000-m depth

circle-back line-transect method (Hiby 1999) and analyzed accounting for $g(0)$ and biases due to school size and other potential covariates (Palka 2005).

A shipboard survey of the U.S. Atlantic outer continental shelf and continental slope (water depths >50 m) between Florida and Maryland (27.5 and 38°N latitude) was conducted during June-August 2004. The survey employed two independent visual teams searching with 25x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and recorded a total of 473 cetacean sightings. Sightings were most frequent in waters north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias ($g(0)$) and group-size bias employing line-transect distance analysis and the direct-duplicate estimator (Palka 1995; Buckland et al. 2001). The resulting abundance estimate for Risso's dolphins between Florida and Maryland was 5,426 (CV =0.54).

An abundance estimate of 14,408 (CV=0.38) Risso's dolphins was obtained from an aerial survey conducted in August 2006 which covered 10,676 km of trackline in the region from the 2,000-m depth contour on the southern edge of Georges Bank to the upper Bay of Fundy and to the entrance of the Gulf of St. Lawrence (Table 1; Palka, pers. comm.). The value of $g(0)$ used for this estimation was derived from the pooled 2002, 2004 and 2006 aerial survey data.

An abundance estimate of 17,734 (CV= 0.42) Risso's dolphins was generated from a shipboard and aerial survey conducted during June-August 2011(Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey and shallower than the 100-m depth contour, through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of North Carolina to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a two-simultaneous team data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers, 2004). Shipboard data were inspected to determine if there was significant responsive movement to the ship (Palka and Hammond 2001). Because there was evidence of responsive movement of this species to the ship estimation of the abundance was based on Palka and Hammond (2001) and the independent observer approach assuming full independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling (MRDS) option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). An abundance survey was conducted concurrently in the southern U.S. waters (from North Carolina to Florida). The abundance estimates from this southern survey are being calculated and are not available at this time.

Table 1. Summary of abundance estimates for the western North Atlantic Risso's dolphin. Month, year, and area covered during each abundance survey, resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	Area	N_{best}	CV
Jun-Aug 2004	Maryland to Bay of Fundy	15,053	0.78
Jun-Aug 2004	Florida to Maryland	5,426	0.54
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	20,479	0.59
Aug 2006	S. Gulf of Maine to upper Bay of Fundy to Gulf of St. Lawrence	14,408	0.38
Jun-Aug 2011	North Carolina to lower Bay of Fundy	15,197	0.55

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 distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Risso's dolphins is 15,197(CV=0.55), obtained from the 2011 surveys. The minimum population estimate for the western North Atlantic Risso's dolphin is 9,857.

Current Population Trend

There are insufficient data to determine population trends for this species.

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 minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 9,857. The maximum productivity rate is 0.04, the default value for cetaceans (Barlow *et al.* 1995). 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 0.48 because the CV of the average mortality estimate is between 0.3 and 0.6 (Wade and Angliss 1997). PBR for the western North Atlantic stock of Risso's dolphin is 95.

ANNUAL HUMAN-CAUSED MORTALITY

Total annual estimated average fishery-related mortality or serious injury to this stock during 2006-2010 was 17 Risso's dolphins (CV=0.51; Table 2).

Fishery Information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the U.S. With implementation of the Fisheries Conservation and Management Act in that year, an observer program was established which recorded fishery data and information on incidental bycatch of marine mammals. NMFS foreign-fishery observers reported four deaths of Risso's dolphins incidental to squid and mackerel fishing activities in the continental shelf and continental slope waters between March 1977 and December 1991 (Waring et al. 1990; NMFS unpublished data).

In the pelagic drift gillnet fishery 51 Risso's dolphin mortalities were observed between 1989 and 1998. One animal was entangled and released alive. Bycatch occurred during July, September and October along continental shelf edge canyons off the southern New England coast. Estimated annual mortality and serious injury (CV in parentheses) attributable to the drift gillnet fishery was 87 in 1989 (0.52), 144 in 1990 (0.46), 21 in 1991 (0.55), 31 in 1992 (0.27), 14 in 1993 (0.42), 1.5 in 1994 (0.16), 6 in 1995 (0), 0 in 1996, no fishery in 1997, and 9 in 1998 (0). This fishery was closed effective in 1999.

In the pelagic pair trawl fishery, one mortality was observed in 1992. Estimated annual fishery-related mortality (CV in parentheses) attributable to the pelagic pair trawl fishery was 0.6 dolphins in 1991 (1.0), 4.3 in 1992 (0.76), 3.2 in 1993 (1.0), 0 in 1994 and 3.7 in 1995 (0.45). This fishery ended as of 1996.

In the northeast sink gillnet fishery, Risso's dolphin interactions were observed in 2000, 2005 and 2006. Estimated annual mortalities (CV in parentheses) from this fishery are: 0 in 1999, 15 (1.06) in 2000, 0 in 2001-2004, 15 in 2005 (0.93), and 0 in 2006 through 2010.

Pelagic Longline

Pelagic longline bycatch estimates of Risso's dolphins in 1998, 1999, and 2000 were obtained from Yeung (1999), Yeung *et al.* (2000), and Yeung (2001), respectively. Bycatch estimates for 2001 - 2009 were obtained from Garrison (2003), Garrison and Richards (2004), Garrison (2005), Fairfield *et al.* (2006, 2007), Fairfield and Garrison (2008), Garrison *et al.* (2009), (Garrison and Stokes (2010), and Garrison and Stokes (2012). Most of the estimated marine mammal bycatch was from U.S. Atlantic EEZ waters between South Carolina and Cape Cod. Excluding the Gulf of Mexico, from 1992 to 2000 one mortality was observed in both 1994 and 2000, and 0 in other years. The observed numbers of seriously-injured but released alive individuals from 1992 to 2010 were, respectively, 2, 0, 6, 4, 1, 0, 1, 1, 1, 6, 4, 2, 2, 0, 0, 1, 2, 2 and 0. Estimated annual fishery-related mortality (CV in parentheses) was 17 animals in 1994 (1.0), 41 in 2000 (1.0), 24 in 2001(1.0), 20 in 2002 (0.86), and 0 in 2003 to

2008 (Table 2). Seriously injured and released alive animals were estimated to be 54 dolphins (0.7) in 1992, 0 in 1993, 120 (0.57) in 1994, 103 (0.68) in 1995, 99 (1.0) in 1996, 0 in 1997, 57 (1.0) in 1998, 22 (1.0) in 1999, 23 (1.0) in 2000, 45 (0.7) in 2001, 8 (1.0) in 2002, 40 (0.63) in 2003 28(0.72) in 2004, 3(1.0), 0 in 2005, 0 in 2006, 9 in 2007, 17 in 2008, 11 (0.71) in 2009, and 0 in 2010. There is a high likelihood that dolphins released alive with ingested gear or gear wrapped around appendages will not survive (Wells *et al.* 2008). The annual average combined mortality and serious injury for 2006-2010 is 7.4 Risso's dolphins (CV =0.71; Table 2).

Mid-Atlantic Bottom Trawl

Fifteen Risso's dolphins were observed taken in mid-Atlantic bottom trawl fisheries in 2010 (Table 2). This is the first time this species was observed taken in this fishery. The estimated annual fishery-related mortality and serious injury attributable to the Mid-Atlantic bottom trawl fishery (CV in parentheses) are 0 in 2006, 0 in 2007, 0 in 2008, and 0 in 2009. The 2010 estimate is currently not available. Until this bycatch estimate can be developed, the 2006-2010 average annual mortality attributed to the mid-Atlantic bottom trawl is calculated as 3 animals (15 animals/5 years).

Mid-Atlantic Gillnet

A Risso's dolphin mortality was observed in this fishery for the first time in 2007. The resulting estimated annual mortality for 2007 was 34 (CV=0.73). The 2006-2010 average mortality in this fishery is 6.4 Risso's dolphins (CV=0.73).

Mid-Atlantic Midwater Trawl

A Risso's dolphin mortality was observed in this fishery for the first time in 2008, and not again since. No bycatch estimate has been generated. Until this bycatch estimate can be developed, the 2006-2010 average annual mortality attributed to the mid-Atlantic midwater trawl is calculated as 0.2 animals (1 animal/5 years).

Table 2. Summary of the incidental mortality of Risso's dolphin (<i>Grampus griseus</i>) by commercial fishery including the years sampled (Years), 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	Data Type ^a	Observer Coverage	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Pelagic Longline ^b	06-10	Obs. Data Logbook	, .07, .07, .07, .14, .08	0, 1, 2, 2, 0	0, 0, 0, 0, 0	0, 9, 17, 11, 0	0, 0, 0, 0, 0	0, 9, 17, 11, 0	0, .65, .73, .71, 0	7.4 (0.71)
Mid-Atlantic Gillnet	06-10	Obs. Data, Trip Logbook, Allocated Dealer Data	.04, .04, .03, .03	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 0, 0, 0, 0	0, 34, 0, 0, 0	0, 33, 0, 0, 0	0, .73, 0, 0, 0	6.6 (0.73)
Mid-Atlantic Bottom Trawl ^c	06-10	Obs. Data Dealer	.02, .03, .03, .05, .06	0, 0, 0, 0, 0	0, 0, 0, 0, 15	0, 0, 0, 0, 0	0, 0, 0, 0, na	0, 0, 0, 0, na	0, 0, 0, 0, na	3 (na)
Mid-Atlantic Midwater Trawl - Including Pair Trawl ^c	06-10	Obs. Data Weighout Trip Logbook	.089, .039, .133, .132, .25	0,0,0,0,0	0,0,1,0,0	na	na	na	na	0.2 (na)
TOTAL										17.2 (0.51)

^a Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Observer Program. The Observer Program collects landings data (Weighout), and total landings are used as a measure of total effort for the coastal gillnet fishery. Total observer coverage reported for gillnet and bottom trawl gear in the year 2010 includes samples collected from traditional fisheries observers in addition to fishery at-sea monitors through the Northeast Fisheries Observer Program (NEFOP). For 2010 only the NEFOP observed data were reported in this table, since the at-sea monitoring program just started in May 2010. In the Northeast region 437 and 658 trawl trips were sampled by observers and monitors, respectively. In the mid-Atlantic region, 661 and 75 trawl trips were sampled by observers and monitors, respectively.

^b Estimates can include data pooled across years, so years without observed SI or Mortality may still have an estimated value.

^c Estimates have not been generated for bottom trawl or midwater trawl. Unexpanded values are provisionally provided.

Other mortality

From 2006-2010, 43 Risso's dolphin strandings were recorded along the U.S. Atlantic coast (NMFS unpublished data). Seven animals during this time period had indications of human interaction, three of which were fishery interactions. Indications of human interaction are not necessarily the cause of death (Table 3). In eastern Canada, one Risso's dolphin stranding was reported on Sable Island, Nova Scotia from 1970 to 1998 (Lucas and Hooker 2000).

A Virginia Coastal Small Cetacean Unusual Mortality Event (UME) occurred along the coast of Virginia from 1 May to 31 July 2004, when 66 small cetaceans, including one Risso's dolphin, stranded mostly along the outer (eastern) coast of Virginia's barrier islands.

A Mid-Atlantic Offshore Small Cetacean UME was declared when 33 small cetaceans stranded from Maryland to Georgia between July and September 2004. The species involved are generally found offshore and are not expected to strand along the coast. Three Risso's dolphins were involved in this UME.

STATE	2006	2007	2008	2009	2010	TOTALS
Maine	1	0	1	0	0	2
Massachusetts ^{a,d}	1	3	8	4	0	16
New York	1	0	0	0	0	1
New Jersey	0	2	0	1	0	3
Delaware	0	1	0	0	0	1
Maryland	1	0	1	0	1	3
Virginia ^b	1	1	0	2	4	8
North Carolina ^c	1	0	1	3	2	7
Georgia	0	0	0	1	0	1
Florida	0	1	0	0	0	1
TOTAL	6	8	11	11	7	43

a. One of the 2009 animals had propeller wounds.

b. One of the 2009 animals showed signs of human interaction.

c. One animal in 2006 and 2 in 2009 showed signs of fishery interaction. One animal in 2008 and one in 2010 were classified as human interaction.

d. 2008 includes 4 animals mass stranded in Massachusetts, 3 of which were released alive.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, 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 interaction.

STATUS OF STOCK

The 2006-2010 average annual human-related mortality does not exceed PBR; therefore, this is not a strategic stock. The total U.S. fishery 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 a zero mortality and serious injury rate. The status of Risso's dolphins relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine population trends for this species. The species is not listed as threatened or endangered under the Endangered Species Act.

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