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

## STOCK DEFINITION AND GEOGRAPHIC RANGE

Risso's dolphins are distributed worldwide in tropical and temperate seas. They generally have an oceanic range, and occur along the Atlantic coast of North America from Florida to eastern Newfoundland (Leatherwood *et al*. 1976; Baird and Stacey 1990). Off the northeast USA coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during the spring, summer, and autumn (CETAP 1982; Payne *et al*. 1984). In winter, the range begins at the mid-Atlantic bight and extends further 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 in continental shelf edge and deeper oceanic waters had sightings of Risso's dolphins associated with strong bathymetric features, Gulf Stream warm-core rings, and the Gulf Stream north wall (Waring *et al*. 1992; Waring 1993). There is no information on stock differentiation of Risso's dolphin in the western North Atlantic.

## POPULATION SIZE

Total numbers of Risso’s dolphins off the USA or Canadian Atlantic coast are unknown, although eight estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Figure 1). An abundance of 4,980 Risso’s dolphins (CV=0.34) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 11,017 (CV=0.58) Risso’s dolphins was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). An abundance of 6,496 (CV=0.74) and 16,818 (CV=0.52) Risso’s dolphins was estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11, respectively (Anon. 1991). As recommended in the GAMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, therefore should not be used for PBR determinations. Further, due to changes in survey methodology these data should not be used to make comparisons to more current estimates.

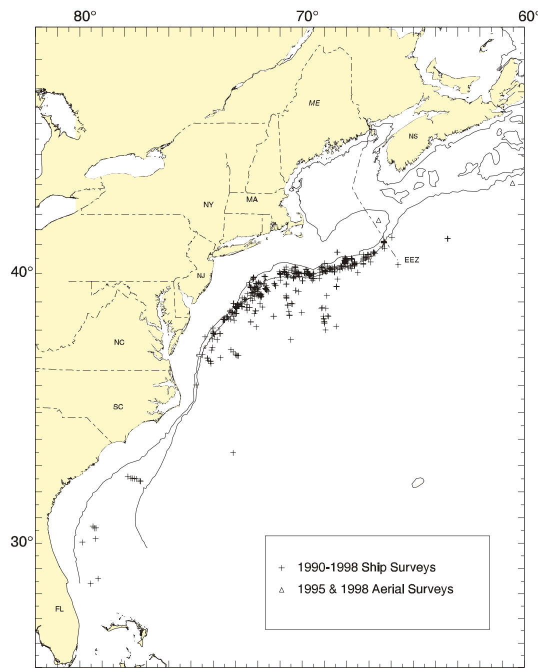


**Figure 1.** *Distribution of Risso’s dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1990-1998. Isobaths are at 100 m and 1,000 m.*

An abundance of 212 (CV=0.62) Risso’s dolphins was estimated from a June and July 1993 shipboard line transect sighting survey conducted principally between the 200 and 2,000m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Anon. 1993). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993). Estimates include school-size bias, if applicable, but do not include corrections for *g(0)* or dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 5,587 (CV=1.16) Risso’s dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.* in review). Total track line length was 32,600 km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 18,631 (CV=0.35) Risso's dolphins was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Figure 1; Palka *et al.* in review). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 10,479 (CV=0.51) Risso's dolphins was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 5,570 km of track line in waters south of Maryland (38°N) (Figure 1; Mullin in review). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993; Laake *et al.* 1993) where school size bias and ship attraction were accounted for.

The best available abundance estimate for Risso's dolphins, 29,110 (CV=0.29), is the sum of the estimates from the two 1998 USA Atlantic surveys where the estimate from the northern USA Atlantic is 18,631 (CV=0.35) and from the southern USA Atlantic is 10,479 (CV=0.51). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

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 |
|---|---|---|---|
| Jul-Sep 1995 | Virginia to Gulf of St. Lawrence | 5587 | 1.16 |
| Jul-Sep 1998 | Maryland to Gulf of St. Lawrence | 18,631 | 0.35 |
| Jul-Aug 1998 | Florida to Maryland | 10,479 | 0.51 |
| Jul-Sep 1998 | Gulf of St. Lawrence to Florida (COMBINED) | 29,110 | 0.29 |

### 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 29,110 (CV=0.29). The minimum population estimate for the western North Atlantic Risso's dolphin is 22,916 (CV=0.29).

### Current Population Trend

There are insufficient data to determine the 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 22,916 (CV=0.29). 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 Risso's dolphin is 220.

## ANNUAL HUMAN-CAUSED MORTALITY

Total annual estimated average fishery-related mortality or serious injury to this stock during 1996-2000 was 51 Risso's dolphins (CV=0.52; Table 2).

### Fishery Information

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA) in that year, an observer program was established which has recorded fishery data and information of incidental bycatch of marine mammals. DWF effort in the USA Atlantic Exclusive Economic Zone (EEZ) under MFCMA has been directed primarily towards Atlantic mackerel and squid. From 1977 through 1982, an average of 120 different foreign vessels per year (range 102-161) operated within the US Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese tuna longline vessels operating along the USA east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within US Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13, and 9, respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8, and 8, respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-82, and increased to 58%, 86%, 95%, and 98%, respectively, in 1983-86. From 1987-91, 100% observer coverage was maintained. Foreign fishing operations for squid and mackerel ceased at the end of the 1986 and 1991 fishing seasons, respectively. NMFS foreign-fishery observers have 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). Three animals were taken by squid trawlers and a single animal was killed in longline fishing operations.

Data on current incidental takes in USA fisheries are available from several sources. In 1986, NMFS established a mandatory self-reported fisheries information system for large pelagic fisheries. Data files are maintained at the Southeast Fisheries Science Center (SEFSC). The Northeast Fisheries Science Center (NEFSC) Fisheries Observer Observer Program was initiated in 1989, and since that year several fisheries have been covered by the program. In late 1992 and in 1993, the SEFSC provided observer coverage of pelagic longline vessels fishing off the Grand Banks (Tail of the Banks) and provides observer coverage of vessels fishing south of Cape Hatteras.

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet fishery, pelagic pair trawl fishery, and pelagic longline fishery, but no mortalities or serious injuries have been documented in the Northeast multispecies sink gillnet, mid-Atlantic coastal gillnet, or North Atlantic bottom trawl observed fisheries.

**Pelagic Drift Gillnet**

The estimated total number of hauls in the pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls in 1991, 1992, 1993, 1994, 1995,1996, and 1998 were 233, 243, 232, 197, 164,149, and 113 respectively. In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. Further, in January 1999 NMFS issued a Final Rule to prohibit the use of driftnets (*i.e.*, permanent closure) in the North Atlantic swordfish fishery (50 CFR Part 630). Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. From 1994-1998, between 10 and 13 vessels have participated in the fishery. Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, and 99% in 1998. Effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras. Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the pelagic drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch, for each year from 1989 to 1993, were obtained using the aggregated (pooled 1989-1993) catch rates, by strata (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques. Fifty-one 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, 9 in 1998 (0). Since this fishery no longer exists, it has been excluded from Table 2.

**Pelagic Pair Trawl**

Effort in the pelagic pair trawl fishery increased during the period 1989 to 1993, from zero hauls in 1989 and 1990, to an estimated 171 hauls in 1991, and then to an estimated 536 hauls in 1992, 586 in 1993, 407 in 1994, and 440 in 1995, respectively. This fishery ceased operations in 1996, when NMFS rejected a petition to consider pair trawl gear as an authorized gear type in the Atlantic tuna fishery. The fishery operated from August-November in 1991, from June-November in 1992, from June-October in 1993 (Northridge 1996), and from mid-summer to November in 1994 and 1995. Fisheries Observer began in October 1992 (Gerrior *et al*. 1994), and 48 sets (9% of the total) were sampled in that season, 102 hauls (17% of the total) were sampled in 1993. In 1994 and 1995, 52% and 55%, respectively, of the sets were observed. Nineteen vessels have operated in this fishery. The fishery extends from 35ºN to 41ºN, and from 69°W to 72°W. Approximately 50% of the total effort was within a one degree square at 39ºN, 72ºW, around Hudson Canyon. Examination of the 1991-1993 locations and species composition of the bycatch, showed little seasonal change for the six months of operation and did not warrant any seasonal or areal stratification of this fishery (Northridge 1996). One mortality was observed in 1992. Estimated annual fishery-related mortality (CV in parentheses) 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). Since this fishery no longer exists, it has been excluded from Table 2.

During the 1994 and 1995 experimental fishing seasons, fishing gear experiments were conducted to collect data on environmental parameters, gear behavior, and gear handling practices to evaluate factors affecting catch and bycatch (Goudey 1995, 1996). Results of these studies were inconclusive in identifying factors responsible for marine mammal bycatch.

**Pelagic Longline**

Total effort, excluding the Gulf of Mexico, for the pelagic longline fishery, based on mandatory self-reported fisheries information, was 11,279 sets in 1991, 10,311 sets in 1992, 10,444 sets in 1993, 11,082 sets in 1994, 11,493 sets in 1995, 9,864 sets in 1996, 9,499 sets in 1997, 7,589 sets in 1998, 6,786 sets in 1999, and 6,582 sets in 2000 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al*. 2000; Yeung 2001). This annual effort has been recalculated to include those sets targeting other species in conjunction with tuna/swordfish, instead of just effort that exclusively targeted tuna/swordfish as in previous reports (Johnson *et al.* 1999; Yeung 1999a). The result is an average increase in self-reported effort of roughly 10% on the average (Yeung *et al.* 2000). The fishery has been observed from January to March off Cape Hatteras, in May and June in the entire mid-Atlantic, and in July through December in the mid-Atlantic Bight and off Nova Scotia. This fishery has been monitored with 3-6% observer coverage, in terms of sets observed, since 1992. The 1993-1997 estimated take was based on a revised analysis of the observed incidental take and self-reported incidental take and effort data, and replaces previous estimates for the 1990-1993 and 1994-1995 periods (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999). Further, Yeung (1999b), revised the 1992-1997 fishery mortality estimates in Johnson *et al.* (1999) to include seriously injured animals. The 1998, 1999, and 2000 bycatch estimates were from Yeung (1999a), Yeung *et al*. (2000), and Yeung (2001), respectively. Most of the estimated marine mammal bycatch was from US Atlantic EEZ waters between South Carolina and Cape Cod. Excluding the Gulf of Mexico, from 1992-2000 one mortality was observed in both 1994 and 2000, and 0 in other years. The observed number of seriously-injured but released alive individuals from 1992- 2000 was respectively 2, 0, 6, 4, 1, 0, 1, 1, and 1 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al*. 2000; Yeung 2001) ) (Table 2). Estimated annual fishery-related mortality (CV in parentheses) was 17 in 1994 (1.0), 41 in 2000 (1.0), and 0 in other years (Table 2). Seriously injured and released alive animals were estimated to be 54 (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, and 23 (1.0) in 2000 (Table 2).

Table 2. Summary of the incidental mortality of Risso's dolphin (*Grampus griseus*) by 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[3] | Data Type [1] | Observer Coverage | Observed Serious Injury | Observed Mortality | Estimated Serious Injury | Estimated Mortality | Estimated Combined Mortality | Estimated CVs | Mean Annual Mortality |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pelagic Longline[2] | 96-00 | 253, 245, 205, 193,186 | Obs. Data Logbook | .03, .03, .03, .04, .04 | 1, 0, 1, 1, 1 | 0, 0, 0, 0, 1 | 99, 0, 57, 22, 23 | 0, 0, 0, 0, 41 | 99, 0, 57, 22, 64 | 1.0, 0, 1.0, 1.0, 1.0 | 48 (.55) |
| Northeast Multispecies Sink Gillnet | 96-00 | 1993=349 1998=301 | Obs. Data Weighout Trip Logbook | .04, .06, .05, .06, .06 | | 0, 0, 0, 0, 1 | | 0, 0, 0, 0, 15 | | 0, 0, 0, 0, 1.06 | 3 (1.06) |
| TOTAL | | | | | | | | | | | 51 (.52) |

1 Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Science Center (NEFSC) Fisheries Observer Program. NEFSC collects landings data (Weighout), and total landings are used as a measure of total effort for the coastal gillnet fishery.

2 1996-1999 mortality estimates were taken from Table 9 in Yeung *et al.* (NMFS Miami Laboratory PRD 99/00-13), and exclude the Gulf of Mexico. 2000 mortality estimates were taken from Table 10 in Yeung (2001).

3 Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.

**Other mortality**

From 1995-2000, thirteen Risso's dolphin strandings were recorded along the USA Atlantic coast (NMFS unpublished data). In eastern Canada, one Risso's dolphin stranding was reported on Sable Island, Nova Scotia from 1970-1998 (Lucas and Hooker 2000).

**STATUS OF STOCK**

The status of Risso's dolphins relative to OSP in the US Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. The total fishery mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, can not be considered to be insignificant and approaching a zero mortality and serious injury rate. The 1996-2000 average annual fishery-related mortality does not exceed PBR; therefore, this is not a strategic stock.

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