

LONG-FINNED PILOT WHALE (*Globicephala melas*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of pilot whales in the Western Atlantic — the Atlantic or long-finned pilot whale, *Globicephala melas*, and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to identify to the species level at sea; therefore, some of the descriptive material below refers to *Globicephala* sp., and is identified as such. The species boundary is considered to be in the New Jersey to Cape Hatteras area. Sightings north of this area are likely *G. melas*.

Pilot whales (*Globicephala* sp.) are distributed principally along the continental shelf edge in the winter and early spring off the northeast U.S. coast, (CETAP 1982; Payne and Heinemann 1993; Abend and Smith 1999). In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters, and remain in these areas through late autumn (CETAP 1982; Payne and Heinemann 1993). In general, pilot whales occupy areas of high relief or submerged banks. They are also associated with the Gulf Stream north wall and thermal fronts along the continental shelf edge (Waring *et al.* 1992; NMFS unpublished data).

The long-finned pilot whale is distributed from North Carolina to North Africa (and the Mediterranean) and north to Iceland, Greenland and the Barents Sea (Sergeant 1962; Leatherwood *et al.* 1976; Abend 1993; Buckland *et al.* 1993a; Abend and Smith 1999). The stock structure of the North Atlantic population is uncertain (Anonymous 1993; Fullard *et al.* 2000). Recent morphometrics (Bloch and Lastein 1993) and genetics (Siemann 1994; Fullard *et al.* 2000) studies have provided little support for stock structure across the Atlantic (Fullard *et al.* 2000). However, Fullard *et al.* (2000) have proposed a stock structure that is correlated to sea surface temperature: 1) a cold-water population west of the Labrador/North Atlantic current, and 2) a warm-water population that extends across the Atlantic in the Gulf Stream.

POPULATION SIZE

The total number of long-finned pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although several 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). Two estimates were derived from catch data and population models that estimated the abundance of the entire stock. Seasonal estimates are available from selected regions in U.S. waters during spring, summer and autumn 1978-1982, August 1990, June-July 1991, August-September 1991, June-July 1993, July-September 1995, July-August 1998, and June-August 2004. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* sp., both long-finned and short-finned pilot whales. One estimate is available from the Gulf of St. Lawrence.

Mitchell (1974) used cumulative catch data from the 1951-1961 drive fishery off Newfoundland to estimate the initial population size (ca. 50,000 animals).

Mercer (1975), used population models to estimate a population in the same region of between 43,000 and 96,000 long-finned pilot whales, with a range of 50,000-60,000 being considered the best estimate.

An abundance of 11,120 (CV=0.29) *Globicephala* sp. was estimated from an aerial survey program conducted from 1978 to 1982 in continental shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). An abundance of 3,636 (CV=0.36) *Globicephala* sp. was estimated from a June and July 1991 shipboard line transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). Abundances of 3,368 (CV=0.28) and 5,377 (CV=0.53) *Globicephala* sp. were

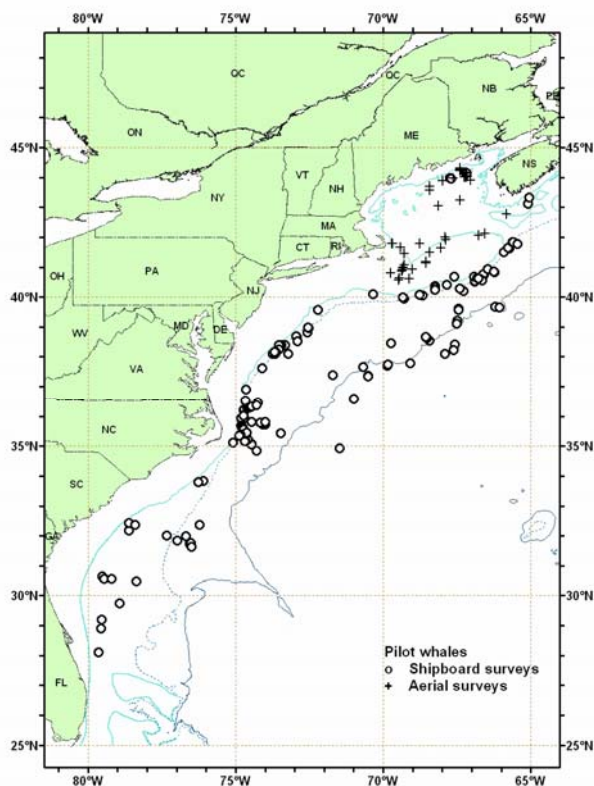


Figure 1. Distribution of pilot whale sightings from NEFSC and SEFSC vessel and aerial summer surveys during 1998 and 2004. Isobaths are at 100 m, 1,000 m and 4,000 m.

estimated from line transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11 aircrafts, respectively (NMFS 1991). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than 8 years are deemed unreliable, and 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.

An abundance of 668 (CV=0.55) *Globicephala* sp. 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 (NMFS 1993b). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE (Buckland *et al.* 1993b; Laake *et al.* 1993). Estimates include school-size bias, if applicable, but do not include corrections for $g(0)$, the probability of detecting a group on the track line, or for dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 8,176 (CV=0.65) *Globicephala* sp. 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 (Palka *et al.* Unpub. Ms.). 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 isobath. Data collection and analysis methods used were described in Palka (1996).

Kingsley and Reeves (1998) obtained an abundance estimate of 1,600 long-finned pilot whales (CV=0.65) from a late August and early September aerial survey of cetaceans in the Gulf of St. Lawrence in 1995. Based on an examination of long-finned pilot whale summer distribution patterns and information on stock structure, it was deemed appropriate to combine these estimates with NMFS 1995 summer survey data. The best 1995 abundance estimate for *Globicephala* sp. is 9,776 (CV=0.55), the sum of the estimates from the U.S. and Canadian surveys, where the estimate from the U.S. survey is 8,176 (CV=0.65) and from the Canadian 1,600 (CV=0.65).

An abundance of 9,800 (CV=0.34) *Globicephala* sp. was estimated from a line transect sighting survey conducted during 6 July to 6 September 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38°N) (Figure 1; Table 1; Palka *et al.* Unpub. Ms.). 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 5,109 (CV = 0.41) *Globicephala* sp. was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 54,163 km of track line in waters south of Maryland (38°N) (Figure 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 1993b; Laake *et al.* 1993) where school size bias and ship attraction were accounted for.

The best 1998 abundance estimate for *Globicephala* sp. is 14,909 (CV = 0.26), the sum of the estimates from the two U.S. Atlantic surveys, where the estimate from the northern U.S. Atlantic is 9,800 (CV=0.34) and from the southern U.S. Atlantic is 5,109 (CV =0.41). This estimate is a recalculation of the same data reported in previous SARs. This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

An abundance of 15,728 (CV=0.34) for *Globicephala* sp. was estimated from a line transect sighting survey conducted during 12 June to 4 August 2004 by a ship and plane that surveyed 10,761km of track line in waters north of Maryland (38°N) to the Bay of Fundy (45°N) (Figure 1; Palka unpubl.). 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 track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for $g(0)$ and biases due to school size and other potential covariates (Figure 1; Palka Unpubl.).

A shipboard survey of the U.S. Atlantic outer continental shelf and continental slope (water depths > 50m) between Florida and Maryland (27.5 and 38°N) was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x 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 there were 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 *Globicephala* sp. between Florida and Maryland was 15,411 (CV =0.43).

The best 2004 abundance estimate for *Globicephala* sp. is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 31,139 (CV =0.27), where the estimate from the northern U.S. Atlantic is 15,728 (CV =0.34), and from the southern U.S. Atlantic is 15,411 (CV =0.43). 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 <i>Globicephala</i> sp. by 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
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	9,800	0.34
Jul-Aug 1998	Florida to Maryland	5,109	0.41
Jul-Sep 1998	Florida to Gulf of St. Lawrence (COMBINED)	14,909	0.26
Jun-Aug 2004	Maryland to the Bay of Fundy	15,728	0.34
Jun-Aug 2004	Florida to Maryland	15,411	0.43
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	31,139	0.27

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 *Globicephala* sp. is 31,139 (CV = 0.27). The minimum population estimate for *Globicephala* sp. is 24,866.

Current Population Trend

There are insufficient data to determine the population trends for *Globicephala* sp.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include those from animals taken in the Newfoundland drive fishery: calving interval 3.3 years; lactation period about 21-22 months; gestation period 12 months; births mainly from June to November; length at birth is 177 cm; mean length at sexual maturity is 490 cm for males and 356 cm for females; age at sexual maturity is 12 years for males and 6 years for females; mean adult length is 557 cm for males and 448 cm for females; and maximum age was 40 for males and 50 for females (Sergeant 1962; Kasuya *et al.* 1988). Analysis of data recently collected from animals taken in the Faroe Islands drive fishery produced higher values for all parameters (Bloch *et al.* 1993; Desportes *et al.* 1993; Martin and Rothery 1993). These differences are likely related, at least in part, to larger sample sizes and newer analytical techniques.

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 for *Globicephala* sp. is 24,866. 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 0.48 because the CV of the average mortality estimate is between 0.3 and 0.6 (Wade and Angliss 1997) and because this stock is of unknown status. PBR for the western North Atlantic *Globicephala* sp. is 239.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III.

Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the U.S. Atlantic EEZ because of the uncertainty in species identification by fishery observers. The Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Total annual estimated average fishery-related mortality or serious injury to *Globicephala* sp. during 1999-2003 in the U.S. fisheries listed below was 210 pilot whales (CV = 0.40) (Table 2).

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. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). Foreign fishing operations for squid ceased at the end of the 1986 fishing season and, for mackerel, at the end of the 1991 fishing season.

During 1977-1991, observers in this program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al.* 1990; Waring 1995). A total of 391 (90%) were taken in the mackerel fishery, and 41 (9%) occurred during *Loligo* and *Illex* squid-fishing operations. This total includes 48 documented takes by U.S. vessels involved in joint-venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters (Fairfield *et al.* 1993; Waring 1995); however, the majority of the takes occurred in late spring along the 100 m isobath. Two animals were also caught in both the hake and tuna longline fisheries (Waring *et al.* 1990).

Pelagic Drift Gillnet

Estimates of the total bycatch from 1989 to 1993 were obtained using the aggregated (pooled 1989-1993) catch rates, by stratum (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. Between 1989 and 1998, 87 mortalities were observed in the large pelagic drift gillnet fishery. The annual fishery-related mortality (CV in parentheses) was 77 in 1989 (0.24), 132 in 1990 (0.24), 30 in 1991 (0.26), 33 in 1992 (0.16), 31 in 1993 (0.19), 20 in 1994 (0.06), 9.1 in 1995 (0), 11 in 1996 (0.17), no fishery in 1997 and 12 in 1998 (0). 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). Since this fishery no longer exists it has been excluded from Table 2. Pilot whales were taken along the continental shelf edge, northeast of Cape Hatteras in January and February. Takes were recorded at the continental shelf edge east of Cape Charles, Virginia, in June. Pilot whales were taken from Hydrographer Canyon along the Great South Channel to Georges Bank from July to November. Takes occurred at the Oceanographer Canyon continental shelf break and along the continental shelf northeast of Cape Hatteras in October-November.

Atlantic Tuna Pelagic Pair Trawl

Five pilot whale (*Globicephala* sp.) mortalities were reported in the self-reported fisheries information in 1993. In 1994 and 1995 observers reported 1 and 12 mortalities, respectively. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic attributable to this fishery in 1994 was 2.0 (CV=0.49) and 22 (CV=0.33) in 1995. Since this fishery no longer exists, it has been excluded from Table 2.

Pelagic Longline

Total effort, excluding the Gulf of Mexico, for the pelagic longline fishery, based on mandatory self-reported fisheries information, from 1991 to 2000 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999; Yeung *et al.* 2000). In the 2001 Stock Assessment Report, the 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 1999) *et al.* 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. Most of the estimated marine mammal bycatch was from U.S. Atlantic EEZ waters between South Carolina and Cape Cod (Johnson *et al.* 1999). Pilot whales are frequently observed to feed on hooked fish, particularly big-eye tuna (NMFS unpublished data). Between 1992 and 2000, 62 pilot whales (including 2 identified as a short-finned pilot whales) were released alive, including 32 that were considered seriously injured (of which 1 was identified as a short-finned pilot whale), and 2 mortalities were observed. January-March bycatch was concentrated on the continental shelf edge northeast of Cape Hatteras. Bycatch was recorded in this area during April-June, and takes also occurred north of Hydrographer Canyon off the continental shelf in water over 1,000 fathoms during April-June. During the July-September period, takes occurred on the continental shelf edge east of Cape Charles, Virginia, and on Block Canyon slope in over 1,000 fathoms of water. October-December bycatch occurred between the 20 and 50 fathom contour lines between Barnegat Bay and Cape Hatteras. The estimated fishery-related mortality to pilot whales in the U.S. Atlantic (excluding the Gulf of Mexico) attributable to this fishery was: 127 in 1992 (CV=1.00), 93 in 1999 (CV=1.00), 24 in 2000 (CV=1.0), 20 (CV = 1.0) in 2001, 2 (CV =1.0) in 2002 and 0 in 2003. The estimated serious injuries were 40 (CV=0.71) in 1992, 19 (CV=1.00) in 1993, 232 (CV=0.53) in 1994, 345 (CV= 0.51) in 1995, (includes 37 estimated short-finned pilot whales in 1995 (CV=1.00), 0 from 1996 to 1998, 288 (CV=0.74) in 1999, 109 (CV=1.00) in 2000, 50 in 2001 (CV = 0.58), 52 in 2002

(CV = 0.48) , and 21 in 2003 (CV = 0.49). The average 'combined' annual mortality in 1999-2003 was 132 pilot whales (CV =0.49) (Table 2).

Atlantic Tuna Purse Seine

Two interactions with pilot whales were observed in 1996. In one interaction, the net was actually pursed around one pilot whale, the rings were released and the animal escaped alive, condition unknown. This set occurred east of the Great South Channel and just north of the Cultivator Shoals region on Georges Bank. In a second interaction, 5 pilot whales were encircled in a set. The net was opened prior to pursuing to let the whales swim free, apparently uninjured. This set occurred on the Cultivator Shoals region on Georges Bank. No trips were observed during 1997 through 1999. Four trips were observed in September 2001. No marine mammals were observed taken during these trips.

Atlantic Squid, Mackerel, Butterfish Trawl Fisheries

Illux Squid

Since 1996, 45% of all pilot whale takes observed were caught incidental to *Illux* squid fishing operations; 1 in 1996, 1 in 1998 and 2 in 2000. Annual observer coverage of this fishery has varied widely and reflects only the months when the fishery is active. The estimated fishery-related mortality of pilot whales attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 0 in 1999, 34 in 2000 (CV=0.65), unk in 2001-2002 due to no observer coverage, and 0 in 2003. The average annual mortality between 1999-2003 was 11 pilot whales (CV=0.65) (Table 2).

Loligo Squid

Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97) and 0 between 2000 and 2003. The average annual mortality between 1999-2003 was 10 pilot whales (CV=0.97) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Atlantic Mackerel

No incidental takes of pilot whales have been observed in the domestic mackerel fishery.

A U.S. joint venture (JV) fishery was conducted in the Mid-Atlantic region from February to May 1998. NMFS maintained 100% observer coverage of the foreign joint venture vessels where 152 transfers from the U.S. vessels were observed. No incidental takes of pilot whales have been observed in the mackerel fishery. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998). There have been no observed incidental takes of pilot whales reported for the Gulf of Maine fishery.

Mid-Atlantic Mixed Species Trawl Fisheries

There was one observed take in this fishery reported in 1999. The estimated fishery-related mortality for pilot whales attributable to this fishery was: 0 in 1996-1998, 228 in 1999 and 0 in 2000-2003. The average annual mortality between 1999-2003 was 46 pilot whales (CV=1.03) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Northeast Atlantic (Gulf of Maine/Georges Bank) Herring Fishery

There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during 1999-2003.

A U.S. joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August - December 2001. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations. Three pilot whales were incidentally captured in a single mid-water trawl during foreign fishing operations (TALFF) (Table 2). The total mortality attributed to the Atlantic herring mid-water trawl fishery from 1999-2003 was 11 animals (Table 2).

Mid-Atlantic Coastal Gillnet

No pilot whales were taken in observed trips during 1993-1997. One pilot whale was observed taken in 1998, 0 during 1999-2003. Observed effort was scattered between New York and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 7 in 1998 (1.10). Average annual estimated fishery-related mortality attributable to this fishery between 1999-2003 was zero pilot whales.

CANADA

An unknown number of pilot whales have also been taken in Newfoundland and Labrador, and Bay of Fundy groundfish gillnets, Atlantic Canada and Greenland salmon gillnets, and Atlantic Canada cod traps (Read 1994).

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches were recorded, which included 1 long-finned pilot whale. The incidental mortality rate for pilot whales was 0.007/set.

In Canada, the fisheries observer program places observers on all foreign fishing vessels, on between 25% and 40% of large Canadian vessels (greater than 100ft), and on approximately 5% of small vessels (Hooker *et al.* 1997). Fishery observer effort off the coast of Nova Scotia during 1991-1996 varied on a seasonal and annual basis, reflecting changes in fishing effort (see Figure 3, Hooker *et al.* 1997). During the 1991-1996 period, long-finned pilot whales were bycaught (number of animals in parentheses) in bottom trawl (65); midwater trawl (6); and longline (1) gear. Recorded bycatches by year were: 16 in 1991, 21 in 1992, 14 in 1993, 3 in 1994, 9 in 1995 and 6 in 1996. Pilot whale bycatches occurred in all months except January-March and September (Hooker *et al.* 1997).

Table 2. Summary of the incidental mortality and serious injury of pilot whales (*Globicephala sp.*) 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 ^d	Data Type ^a	Observer Coverage ^b	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
SNE/Mid-Atlantic Illex Squid Trawl	99-03	73 ^e	Obs. Data Dealer	.028, .111, .00, .00, tbd	0, 0, unk, unk, 0	0, 2, unk, unk, 0	0, 0, unk, unk, 0	0, 34, unk, unk, 0	0, 34, unk, unk, 0	0, 0.65, unk, unk, 0	11 (.65)
SNE/Mid-Atlantic Loligo Squid Trawl (offshore)	99-03	384 ^e	Obs. Data Dealer	.009, .011, .012, .005, tbd	0, 0, 0, 0, 0	1, 0, 0, 0, 0	0, 0, 0, 0, 0	49, 0, 0, 0, 0	49, 0, 0, 0, 0	0.97, 0, 0, 0, 0	10 (0.97)
SNE/ Mid-Atlantic Bottom Trawl	99-03	NA	Obs. Data Dealer	.003, .003, .004, .005, tbd	0, 0, 0, 0, 0	1 ^f , 0, 0, 0, 0	0, 0, 0, 0, 0	228, 0, 0, 0, 0	228, 0, 0, 0, 0	1.03, 0, 0, 0, 0	46 (1.03)
GOM/GB Herring Mid-Water Trawl JV and TALFF ⁱ	2001	10 ^h	Obs. Data	1.0 ^g	0	11	0	11	11	NA	11 (NA)
Pelagic Longline (excluding NED-E) ^{c, j}	99-03	205, 193, 70, 54, 21	Obs. Data Logbook	.04, .04, .02, .04, .02	4, 4, 4, 4, 2	1, 1, 1, 0, 0	288, 109, 50, 52, 21	93, 24, 20, 2, 0	381, 133, 70, 54, 21	.79, .88, .50, .46, .77	132 (0.49)
Pelagic Longline - NED-E area only ^j	2001-2003	180 sets, 482, 535	Obs. Data Logbook	1, 1, 1	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0, 0, 0	0	0
TOTAL											210 (0.40)

- a 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).
- b Observer coverage of the Mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery are in terms of sets. The trawl fisheries are measured in trips.
- c 1999-2000 mortality estimates were taken from Table 10 in Yeung 2001 (NOAA Tech. Memo. NMFS-SEFSC-467).
- d Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.
- e These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR 65937).
- f The incidental take was observed on a trip than landed silver hake as the primary species.
- g During joint venture fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.
- h Three foreign vessels and seven American vessels.
- i NA=No joint venture or TALFF fishing effort for Atlantic herring.
- j An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on marine turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery was conducted from June 1, 2001-December 31, 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline EXCLUDING the NED-E area in one row and for ONLY the NED in the second row. No mortalities nor serious injuries were observed for pilot whales in the NED-E, though 1 pilot whale was caught alive and released without injury (Garrison, 2003; Garrison and Richards, 2004).

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. Between 2 and 120 pilot whales have stranded annually, either individually or in groups, in NMFS Northeast Region (NMFS 1993b) since 1980. From 1999-2003 126 pilot whales (*Globicephala sp.*) have been reported stranded between Maine and Florida (Table 3), including 11 and 57 animals that mass stranded in 2000 and 2002, respectively along the Massachusetts coast (NMFS unpublished data). Two juvenile animals that live stranded in Chatham, Massachusetts in 1999 were rehabilitated, satellite tagged and released (Nawojchik *et al.* 2003). Both animals were released off eastern Long Island, NY and tracked for four months in the Gulf of Maine. Four of 6 animals from one live stranding event in Massachusetts in 2000 were rehabilitated and released. In addition, 11 pilot whales that live stranded on Nantucket were returned to the water. However, certain studies have shown that frequently, animals that are returned to the water swim away and strand someplace else (Fehring and Wells 1976; Irvine *et al.* 1979; Odell *et al.* 1980)

Short-finned pilot whales (*Globicephala macrorhynchus*) have been reported stranded as far north as Block Island, Rhode Island (2001) and long-finned pilot whales (*Globicephala melas*) as far south as South Carolina. Rarely is there a distinction made between these two species within the U.S. east coast regional stranding records.

In eastern Canada, 37 strandings of long-finned pilot whales (173 individuals) were reported on Sable Island, Nova Scotia from 1970 to 1998 (Lucas and Hooker 1997; Lucas and Hooker 2000). This included 130 animals that mass stranded in December 1976, and 2 smaller groups (<10 each) in autumn 1979 and summer 1992. Fourteen strandings were also recorded along Nova Scotia in 1991-1996 (Hooker *et al.* 1997).

Table 3. Pilot Whale (<i>Globicephala sp.</i>) strandings along the U.S. Atlantic coast 1999-2003. No distinction has been made between short-finned (<i>Globicephala macrorhynchus</i>) and long-finned pilot whale (<i>G. melas</i>).						
State	1999	2000	2001	2002	2003	TOTALS
Maine	0	0	5	2	1	8
New Hampshire	0	0	0	0	0	0
Massachusetts ^a	6	13	3	67	5	94
Rhode Island	0	0	1	1	0	2
Connecticut	0	0	0	0	0	0
New York	1	1	1	0	0	3
New Jersey	1	0	0	0	6	7
Delaware	0	0	0	0	0	0
Maryland	1	0	0	0	0	1
Virginia	2	0	0	0	0	2
North Carolina	2	0	2	0	0	4
South Carolina	0	0	1	0	1 ^b	2
Georgia	0	1	0	0	0	1
Florida	2	0	0	0	0	2
TOTALS	15	15	13	70	13	126
^a Massachusetts mass stranding (11 long-finned pilot whales, July 2000; 57 - animals, July 2002)						
^b Only moderate confidence on species identification						

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same stranding group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Islands drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

STATUS OF STOCK

The status of long-finned pilot whales relative to OSP in U.S. Atlantic EEZ is unknown, but stock abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel and squid stocks. There are insufficient data to determine the population trends for this species. The species is not listed under the Endangered Species Act. The 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. This is not a strategic stock because the 1999-2003 estimated average annual fishery-related mortality, excluding Nova Scotia bycatches of pilot whales, *Globicephala* sp., does not exceed PBR. The status has gone back and forth, because mortality has been close to PBR. In the last seven editions of this stock assessment report, it has been designated as non-strategic in 1998 and 1999 and this year.

REFERENCES

- Abend, A. 1993. Long-finned pilot whale distribution and diet as determined from stable carbon and nitrogen ratio isotope tracers. M.S. Thesis, University of Massachusetts, Amherst, MA.
- Abend, A. and T.D. Smith. 1999. Review of the distribution of the long-finned pilot whale (*Globicephala melas*) in the North Atlantic and Mediterranean. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-NE-117, 22 pp.
- Anonymous. 1993. Report of the study group on long-finned pilot whales. ICES C.M. 1993/N: 5 29 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. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-6, 73 pp.
- Bloch, D. and L. Lastein. 1993. Morphometric segregation of long-finned pilot whales in eastern and western North Atlantic. *Ophelia* 38: 55-68.
- Bloch, D., M. Zachariassen and P. Zachariassen. 1993. Some external characters of the long-finned pilot whale off Faroe Island and a comparison with the short-finned pilot whale. *Rep. Int. Whal. Commn., Special Issue 14*: 117-135.
- Buckland, S. T., D. R. Anderson, K. P. Burnham, and S. L. Laake. 1993b. Distance sampling: estimating abundance of biological populations. Chapman and Hall, New York, NY, 446 pp.
- Buckland, S. T., D. Bloch, K. L. Cattanach, Th. Gunnlaugsson, K. Hoydal, S. Lens, and J. Sigurjónsson. 1993a. Distribution and abundance of long-finned pilot whales in the North Atlantic, estimated from NASS-87 and NASS-89 data. *Rep. Int. Whal. Commn., Special Issue 14*: 33-49.
- Buckland, S. T., D.R. Andersen, K.P. Burnham, J.L. Laake, D.L. Borchers, and L. Thomas. 2001. Introduction to Distance Sampling estimating abundance of biological populations. Oxford University Press, New York, 432 pp.
- CETAP. 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report, Contract AA51-C78-48, Bureau of Land Management, Washington, DC, 538 pp.
- Cramer J. 1994. Large pelagic logbook newsletter - 1993. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-352, NMFS, Southeast Fisheries Science Center, Miami, FL. 19 pp.
- Dam, M. and D. Bloch. 2000. Screening of mercury and persistent organochlorine pollutants in long-finned pilot whale (*Globicephala melas*) in the Faroe Islands. *Mar. Pollut. Bull.* 40: 1090-1099.
- Desportes, G., M. Saboureaux and A. Lacroix. 1993. Reproductive maturity and seasonality of male pilot long-finned whales off the Faroe Islands. *Rep. Int. Whal. Commn., Special Issue 14*: 233-262.
- Fairfield, C. P., G. T. Waring, and M. H. Sano. 1993. Pilot whales incidentally taken during the distant water fleet Atlantic mackerel fishery in the Mid-Atlantic Bight, 1984-88. *Rep. Int. Whal. Commn., Special Issue 14*: 107-116.
- Fehring, W. K. and R. S. Wellsw. 1976. A series of strandings by a single heard of pilot whales on the west coast of Florida. *J. Mamm.* 57(1): 191-194.
- Fullard, K. J., G. Early, M. P. Heide-Jørgensen, D. Bloch, A. Rosing-Asvid, and W. Amos. 2000. Population structure of long-finned pilot whales in the North Atlantic: a correlation with sea surface temperature? *Molecular Ecol.* 9: 949-958.
- 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. NMFS, Southeast Fisheries Science Center, Miami, FL.
- 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. NMFS, Southeast Fisheries Science Center, Miami, FL.
- Hiby, L. 1999. The objective identification of duplicate sightings in aerial survey for porpoise. Pages 179-189 *in*: G.W. Garner, S.C. Amstrup, J.L. Laake, B.F.J. Manly, L.L. McDonald, and D.G. Robertson (eds.). *Marine Mammal Survey and Assessment Methods*. Balkema, Rotterdam.

- Hooker, S. K., R. W. Baird and M. A. Showell. 1997. Cetacean Strandings and bycatches in Nova Scotia, Eastern Canada, 1991-1996. Paper SC/49/05 presented to the IWC Scientific Committee, September 1997. 11 pp.
- Irvine, A. B., M. D. Scott, R. S. Wells, and J. G. Mead. 1979. Stranding of the pilot whale, *Globicephala macrorhynchus*, in Florida and South Carolina. Fish. Bull., U.S. 77 (2): 511-513.
- Johnson, D. R., C. A. Brown and C. Yeung. 1999. Estimates of marine mammal and marine turtle catch by the U.S. Atlantic pelagic longline fleet in 1992-1997. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-418. 70 pp. NMFS, Southeast Fisheries Science Center, Miami, FL.
- Kasuya, T., D. E. Sergeant and K. Tanaka. 1988. Re-examination of life history parameters of long-finned pilot whales in the Newfoundland waters. Sci. Rep. Whales Res. Inst. No. 39: 103-119.
- Kingsley, M.C.S. and R.R. Reeves. 1998. Aerial surveys of cetaceans in the Gulf of St. Lawrence in 1995 and 1996. Can. J. Zool. 76: 1529-1550.
- Laake, J. L., S. T. Buckland, D. R. Anderson, and K. P. Burnham. 1993. DISTANCE user's guide, V2.0. Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Ft. Collins, CO. 72 pp.
- Leatherwood, S., D. K. Caldwell and H. E. Winn. 1976. Whales, dolphins, and porpoises of the western North Atlantic. A guide to their identification. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 396, 176 pp.
- Lens, S. 1997. Interactions between marine mammals and deep water trawlers in the NAFO regulatory area. ICES CM 1997/Q:8. 10 pp.
- Lucas, Z. N. and S. K. Hooker. 1997. Cetacean strandings on Sable Island, Nova Scotia, 1990-1996. Paper SC/49/06 presented to the IWC Scientific Committee, September 1997. 10 pp.
- Lucas, Z. N. and S. K. Hooker. 2000. Cetacean strandings on Sable Island, Nova Scotia, 1970-1998. Can. Field- Nat. 114: 45-61.
- Martin, A. R. and P. Rothery. 1993. Reproductive parameters of female long-finned pilot whales (*Globicephala melas*) around the Faroe Islands. Rep. Int. Whal. Commn., Special Issue 14: 263-304.
- Mercer, M. C. 1975. Modified Leslie-DeLury population models of the long-finned pilot whale (*Globicephala melaena*) and annual production of the short-finned squid (*Illex illecebrosus*) based upon their interactions at Newfoundland. J. Fish. Res. Bd. Can. 32(7): 1145-54.
- Mitchell, E. 1974. Present status of northwest Atlantic fin and other whale stocks. In: W. E. Schevill, editor, The whale problem: A status report. Harvard University Press, Cambridge, Massachusetts. p.108-169.
- Muir, D. C. G., R. Wagermann, N. P. Grift, R. J. Norstrom, M. Simon, and J. Lien. 1988. Organochlorine chemical and heavy metal contaminants in white-beaked dolphins (*Lagenorhynchus albirostris*) and pilot whales (*Globicephala melaena*) from the coast of Newfoundland. Canada. Arch. Environ. Contam. Toxicol. 17: 613-629.
- Mullin, K. D. and G. L. Fulling. 2003. Abundance of cetaceans in the southern U.S. North Atlantic Ocean during summer 1998. Fish. Bull., U.S. 101:603-613.
- NMFS [National Marine Fisheries Service]. 1991. Northeast cetacean aerial survey and interplatform study. NOAA-NMFS-SEFSC and NEFSC. 4 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.
- NMFS [National Marine Fisheries Service]. 1993. Cruise results, NOAA ship DELAWARE II, Cruise No. DEL 93-06, Marine mammal Survey. 5 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.
- Odell, D. K., E. D. Asper, J. Baucom, and L. H. Cornell. 1980. A recurrent mass stranding of the false killer whale, *Pseudorca crassidens*, in Florida. Fish. Bull., U.S. 78(1): 171-177.
- Nawojchik, R., D. J. St. Aubin, and A. Johnson. 2003. Movements and dive behavior of two stranded, rehabilitated long-finned pilot whales (*Globicephala melas*) in the northwest Atlantic. Mar. Mamm. Sci. 19(1):232-239.
- Nielsen, J. B., F. Nielsen, P-J. Jørgensen, and P. Grandjean. 2000. Toxic metals and selenium in blood from pilot whales (*Globicephala melas*) and sperm whales (*Physeter catodon*). Mar. Pollut. Bull. 40:348-351.
- Northridge, S. 1996. Estimation of cetacean mortality in the U.S. Atlantic swordfish and tuna drift gillnet and pair trawl fisheries. Final report to the Northeast Fisheries Science Center, Contract No. 40ENNF500160.
- Palka, D. 1995. Abundance estimate of the Gulf of Maine harbor porpoise. Rep. Int. Whal. Commn., Special Issue 16: 27-50.
- Palka, D. 1996. Update on abundance of Gulf of Maine/Bay of Fundy harbor porpoises. NOAA-NMFS-NEFSC. Ref. Doc. 96-04; 37 pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543.
- Palka, D. and P.S. Hammond. 2001. Accounting for responsive movement in line transect estimates of abundance. Can. J. Fish. Aquat. Sci. 58: 777-787.
- Payne, P. M. and D. W. Heinemann. 1993. The distribution of pilot whales (*Globicephala* sp.) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988. Rep. Int. Whal. Commn., Special Issue 14: 51-68.

- Read, A. J. 1994. Interactions between cetaceans and gillnet and trap fisheries in the northwest Atlantic. Rep. Int. Whal. Commn., Special Issue 15: 133-147.
- Scott, G. P. and C. A. Brown. 1997. Estimates of marine mammal and marine turtle catch by the U.S. Atlantic pelagic longline fleet in 1994-1995. Miami Laboratory Contribution MIA-96/97-28.
- Sergeant D. E. 1962. The biology of the pilot or pothead whale (*Globicephala melaena* (Traill) in Newfoundland waters. Bull. Fish. Res. Bd. Can. 132: 1-84.
- Siemann, L. 1994. Mitochondrial DNA sequence variation in North Atlantic long-finned pilot whales, *Globicephala melas*. Ph.D. Thesis, Massachusetts Institute of Technology/ Woods Hole Oceanographic Institution.
- Taruski, A. G., C. E. Olney and H. E. Winn. 1975. Chlorinated hydrocarbons in cetaceans. J. Fish. Res. Bd. Can. 32(11): 2205-9.
- 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. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
- Waring, G. T. 1995. Fishery and ecological interactions for selected cetaceans off the northeast USA. Ph.D. dissertation, University of Massachusetts, Amherst, MA 260 pp.
- Waring, G. T. 1998. Results of the summer 1991 R/V Chapman marine mammal sighting survey. NOAA-NMFS-NEFSC Lab. Ref. Doc. No. 98-09, 21pp. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543.
- Waring, G. T., P. Gerrior, P. M. Payne, B. L. Parry, and J. R. Nicolas. 1990. Incidental take of marine mammals in foreign fishery activities off the northeast United States, 1977-1988. Fish. Bull., U.S. 88(2): 347-360.
- Waring, G. T., C. P. Fairfield, C. M. Ruhsam, and M. Sano. 1992. Cetaceans associated with Gulf Stream features off the northeastern USA shelf. ICES Marine Mammals Comm. CM 1992/N:12, 29 pp.
- Weisbrod, A. V., D. Shea, M. J. Moore, and J. J. Stegeman. 2000. Bioaccumulation patterns of polychlorinated biphenyls and chlorinated pesticides in northwest Atlantic pilot whales. Environ. Toxicol. Chem. 19:667-677.
- Yeung, C. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1998. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-430, 26 pp. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL, 33149.
- Yeung, C., S. Epperly, and C. A. Brown. 2000. Preliminary revised estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet, 1992-1999. NMFS, Miami Lab. PRD Contribution Number 99/00-13, 58 pp. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL, 33149.
- Yeung, C. 2001. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1999-2000. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-467, 43 pp. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL, 33149.