

## SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): 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*. The short-finned pilot whale is distributed worldwide in tropical to warm temperate waters (Leatherwood and Reeves 1983). The northern extent of the range of this species within the USA Atlantic Exclusive Economic Zone (EEZ) is generally thought to be Cape Hatteras, North Carolina (Leatherwood and Reeves 1983). Sightings of these animals in USA Atlantic EEZ occur primarily within the Gulf Stream [Southeast Fisheries Science Center (SEFSC) unpublished data], and primarily along the continental shelf and continental slope in the northern Gulf of Mexico (Mullin *et al.* 1991; SEFSC unpublished data). There is no information on stock differentiation for the Atlantic population.

### POPULATION SIZE

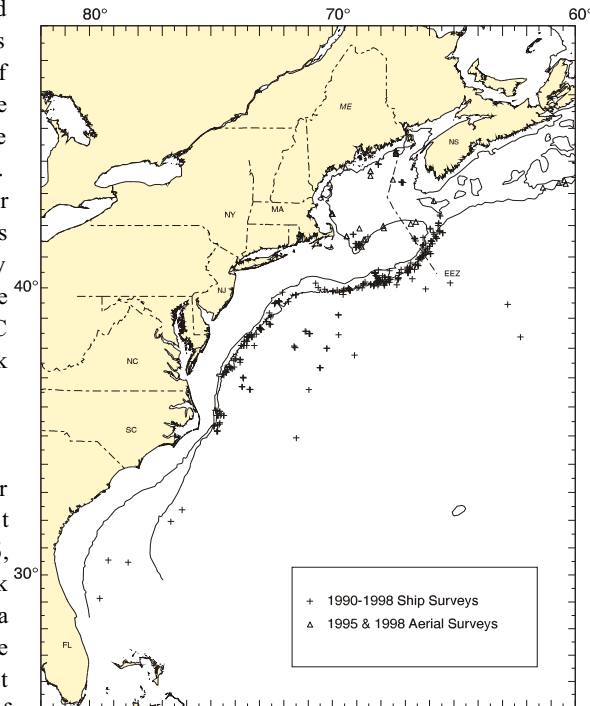
An abundance of 9,800 (CV=0.34) for *Globicephala* sp. was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Figure 1; Palka *et al.* in review). Shipboard data were 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 4,724 (CV=0.61) for *Globicephala* sp. 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 *Globicephala* sp. is the sum of the estimates from the two 1998 USA Atlantic surveys, 14,524 (CV=0.30), where the estimate from the northern USA Atlantic is 9,800 (CV=0.34) and from the southern USA Atlantic is 4,724 (CV=0.61). This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat.

### 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



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

as specified by Wade and Angliss (1997). The best estimate of abundance for *Globicephala* sp. is 14,524 (CV=0.30). The minimum population estimate for *Globicephala* sp. is 11,343.

#### **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 for *Globicephala* sp. is 11,343 (CV=0.30). 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 CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997), and because this stock is of unknown status. PBR for the western North Atlantic *Globicephala* sp. is 113.

#### **ANNUAL HUMAN-CAUSED MORTALITY**

Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the USA 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 this stock during 1994-1998 in the USA fisheries listed below was 137 (CV= 0.22) pilot whales (Table 2). The Canadian average annual mortality estimate for 1994 to 1996 from the Nova Scotia trawl fisheries is 9 long-finned pilot whales. It is not possible to estimate variance of the Canadian estimate. The total average annual mortality estimate for 1994 to 1998 from the USA and Nova Scotia trawl fisheries is 146 (Table 2).

#### **Fishery Information**

##### **USA**

The level of past or current, direct, human-caused mortality of short-finned pilot whales in the USA Atlantic EEZ is unknown. The short-finned pilot whale has been taken in the pelagic longline fishery in Atlantic waters off the southeastern USA (Lee *et al.* 1994; SEFSC unpublished data).

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the USA. 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). DWF effort in the Atlantic coast EEZ under MFCMA has been directed primarily towards Atlantic mackerel and squid. An average of 120 different foreign vessels per year (range 102-161) operated within the Atlantic coast EEZ during 1977 through 1982. In 1982, there were 112 different foreign vessels; 18 (16%) were Japanese tuna longline vessels operating along the USA Atlantic coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. The number of foreign vessels operating within the USA Atlantic EEZ each year between 1983 and 1991 averaged 33 and ranged from nine to 67. The number of Japanese longline vessels included among the DWF vessels averaged six and ranged from three to eight between 1983 and 1988. MFCMA observer coverage on DWF vessels was 25-35% during 1977-82, increased to 58%, 86%, 95%, and 98%, respectively, during 1983-86, and 100% observer coverage was maintained from 1987-91. 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 USA vessels involved in joint venture fishing operations in which USA 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 fishery and tuna longline fisheries (Waring *et al.* 1990).

The distribution of long-finned pilot whale, a northern species, overlaps with that of the short-finned pilot whale, a predominantly southern species, between 35°30'N to 38°00'N (Leatherwood *et al.* 1976). Although long-finned pilot whales are most likely taken in the waters north of Delaware Bay, many of the pilot whale takes are not identified to species and bycatch does occur in the overlap area. In this summary, therefore, long-finned pilot whales (*Globicephala melas*) and unidentified pilot whales (*Globicephala* sp.) are considered together.

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) Sea Sampling 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, pelagic longline, and pelagic pair trawl fisheries, but no mortalities or serious injuries have documented in the Northeast multispecies sink gillnet or mid-Atlantic coastal sink gillnet.

#### **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. Since 1994, between 10-13 vessels have participated in the fishery (Table 2). 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, 1997 (NA), 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, 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 resampling techniques. Between 1989 and 1998, eighty-seven 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 (.17), 1997 (NA), and 12 in 1998 (0); average annual mortality between 1994-1998 was 13 pilot whales (0.04) (Table 2). Table 3 summarizes the number of animals released alive and classified as injured or non-injured. It also includes the ratio of observed to estimated mortalities for this fishery. Because animals released alive may have subsequently died due to injuries received during entanglement, pilot whales that were released were included in the mortality estimates. 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-November. Takes occurred at the Oceanographer Canyon continental shelf break and along the continental shelf northeast of Cape Hatteras in October-November.

#### **Pelagic Pair Trawl**

Effort in the pelagic pair trawl fishery has 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 Atlantic tunas fishery. The fishery operated from August-November in 1991, from

June-November in 1992, from June-October in 1993, and from mid-summer to November in 1994 and 1995. Sea sampling 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 54%, respectively, of the sets were observed. Twelve vessels have operated in this fishery. The fishery extends from 35°N to 41°N, and from 69°W to 72°W. Approximately 50% of the total effort was within a one degree square at 39°N, 72°W, around Hudson Canyon. Examination of the 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). Five pilot whale (*Globicephala* sp.) mortalities were reported in the self-reported fisheries information in 1993. In 1994 and 1995 observers reported one and twelve mortalities, respectively. Since this fishery no longer exists, it has been excluded from Tables 2 and 3.

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**

The pelagic longline fishery operates in the USA Atlantic (including Caribbean) and Gulf of Mexico EEZ (SEFSC unpublished data). Interactions between the pelagic longline fishery and pilot whales have been reported; however, a vessel may fish in more than one statistical reporting area and it is not possible to separate estimates of fishing effort other than to subtract Gulf of Mexico effort from Atlantic fishing effort, which includes the Caribbean Sea. 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, 9,869 sets in 1992, 9,862 sets in 1993, 9,481 sets in 1994, 10,129 sets in 1995, 9,885 sets in 1996, 8,023 sets in 1997, and 6,675 sets in 1998 (Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a). Since 1992, this fishery has been monitored with about 5% observer coverage, in terms of trips observed, within every statistical reporting area within the EEZ and beyond. Off the USA Atlantic coast, 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. The 1992-1997, estimated take was based on a revised analysis of the observed incidental take and self-reported incidental take and effort data, and replace previous estimates for the 1992-1993 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 bycatch estimates were from Yeung (1999a). Most of the estimated marine mammal bycatch was from 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 1990-1997 fifty-eight pilot whales (including two identified as a short-finned pilot whales) were released alive, and one mortality was observed. The condition codes that the observers assigned to the disentangled animals were: alive (41 animals); unknown (10 animals); and dead (5 animals). 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 along the 20 to 50 fathom contour lines between Barnegatt Bay and Cape Hatteras. The estimated fishery-related mortality to pilot whales in the USA Atlantic (excluding the Gulf of Mexico) attributable to this fishery was: 105 in 1992 (CV=1.00), 15 in 1993 (CV= 1.0), 137 in 1994 (CV=0.44), 258 (includes 58 estimated short-finned pilot whales) in 1995 (CV=0.29), and 0 in 1996-1998; average annual mortality between 1994 and 1998 was 79 pilot whales (CV=0.24) (Table 2). Seriously injured and released alive animals are included in the Table 2 mortality estimates. Table 3 summarizes the number of animals released alive and classified as injured or non-injured. It also includes the ratio of observed to estimated mortalities for this fishery.

#### **North Atlantic Bottom Trawl**

Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under the MMPA, were observed in order to meet fishery management needs, rather than marine mammal management needs. An average of 970 (CV= 0.04) vessels (full and part time) participated annually in the fishery during 1989-1993. The fishery is active in New England in all seasons. One mortality was documented in 1990, and one animal was released alive and uninjured in 1993. The estimated fishery-related mortality to pilot whales in the USA Atlantic attributable to this fishery was: 0 in

1994-1998; average annual mortality between 1994-1998 was 0 pilot whales (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

#### **Squid, Mackerel, Butterfish Trawl**

The mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The fishery occurs along the USA mid-Atlantic continental shelf region between New Brunswick, Canada, and Cape Hatteras year around. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was reclassified as a Category II fishery in 1995. In 1996, mackerel, squid, and butterfish trawl fisheries were combined into the Atlantic squid, mackerel, butterfish trawl fishery, and maintained a Category II classification. Three fishery-related mortality of pilot whales were reported in self-reported fisheries information from the mackerel trawl fishery between 1990-1992. One mortality was observed in the 1996 and 1998, and both occurred in the *Illex* squid fishery. The estimated fishery-related mortality to pilot whales in the USA Atlantic attributable to this fishery was: 45 in 1996, 0 in 1997, and 85 in 1998; average annual mortality between 1996-1998 was 43 pilot whales (CV=0.61) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

#### **Mid-Atlantic Coastal Gillnet**

Observer coverage of the USA Atlantic coastal gillnet fishery was initiated by the NEFSC Sea Sampling program in July, 1993; and from July to December 1993, 20 trips were observed. During 1994 and 1995 221 and 382 trips were observed, respectively. This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of fish species, some of which operate right off the beach. The number of vessels in this fishery is unknown, because records which are held by both state and federal agencies have not been centralized and standardized. Observer coverage, expressed as percent of tons of fish landed, was 5%, 4%, 3%, and 5% for 1995, 1996, 1997, and 1998 (Table 2).

No pilot whales were taken in observed trips during 1993-1997. One pilot whale was observed taken in 1998 (Table 2). Observed effort was concentrated off NJ and scattered between DE and NC 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 (1.1). Average annual estimated fishery-related mortality attributable to this fishery during 1995-1998 was 2 pilot whales (CV=1.1)

Table 2. Summary of the incidental mortality 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 mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type <sup>1</sup>	Observed Serious Injury	Observer Coverage <sup>2</sup>	Observed Mortality	Estimated Mortality <sup>5</sup>	Estimated CVs	Mean Annual Mortality
Pelagic <sup>6</sup> Drift Gillnet	94-98	1994=12 <sup>3</sup> 1995=11 1996=10 1998=13	Obs. Data Logbook	0, 0, 0, 0, 0	.87, .99, .64, NA, .99	17, 9, 7, NA, 12	20, 9.1 <sup>4</sup> , 11, NA, 12	.06, 0, .17, NA, 0	13 <sup>6</sup> (0.04)
Atlantic <sup>8</sup> squid, mackerel, butterfish trawl	96-98	NA	Obs. Data Weighouts	0, 0, 0, 0, 0	.007, .008, .003	6, 0, 1	45, 0, 85	1.27, 0, .65	43 (0.61)
N. Atl. Otter Trawl	94-98	NA	Obs. Data Weighouts	0, 0, 0, 0, 0	.004, .011 <sup>7</sup> , .002, .002, .001	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0 (0)
Pelagic <sup>9</sup> Longline	94-98		Obs. Data Logbook	12, 11, 0, 0, 0	.05, .06, .03, .04, .03	0, 0, 0, 0, 0	137, 258, 0, 0, 0	0.44, 0.32, 0, 0, 0	79 (0.24)
Mid-Atlantic Coastal Sink Gillnet	94-98	NA	Obs. Data Weighout	0, 0, 0, 0, 0	.05, .04, .03, .05	0, 0, 0, 1	0, 0, 0, 7	0, 0, 0, 1.1	2 (1.1)
Nova Scotia trawl fisheries	94-96	NA	Obs. Data	0, 0, 0, 0, 0	NA, NA, NA	13, 9, 6	13, 9, 6	NA, NA, NA	9 (NA)
TOTAL									146 (0.22)

<sup>1</sup> Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook (Logbook) data are used to measure total effort for the pelagic drift gillnet and longline fishery, and these data are collected at the Southeast Fisheries Science Center (SEFSC).

<sup>2</sup> Observer coverage of the mid-Atlantic coastal sink gillnet fishery is measured in tons of fish landed.

Observer coverage for the pelagic drift gillnet, pair trawl and longline fishery are in terms of sets. The trawl fisheries are measured in trips.

<sup>3</sup> 1994, 1995 and 1996 shown, other years not available on an annual basis.

<sup>4</sup> One vessel was not observed and recorded 1 set in a 10 day trip in the SEFSC mandatory logbook. If you assume the vessel fished 1.4 sets per day as estimated from the 1995 SS data, the point estimate may increase by 0.84 animals. However, the SEFSC mandatory logbook data was taken at face value, and therefore it was assumed that 1 set was fished within this trip, and the point estimate would then increase by 0.06 animals.

<sup>5</sup> Annual mortality estimates include seriously injured and released alive animals.

<sup>6</sup> The fishery did not operate in 1997; the average annual mortality is based on the number of years (4; 1994, 1995, 1996, and 1998) that the fishery operated.

<sup>7</sup> Observer coverage for the Atlantic bottom trawl fishery in 1995 is based on only January to May data.

<sup>8</sup> In 1997 and 1998 the observed pilot whales were taken from the *Illlex* squid otter trawl subfishery.

<sup>9</sup> Mortality estimates were taken from Yeung (1999a,b) and exclude the Gulf of Mexico.

## 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). The Atlantic Canadian and Greenland salmon gillnet fishery is seasonal, with the peak from June to September, depending on location. In southern and eastern Newfoundland, and Labrador during 1989, 2,196 nets 91 m long were used. There are no effort data available for the Greenland fishery; however, the fishery was terminated in 1993 under an agreement between Canada and North Atlantic Salmon Fund (Read 1994).

There were 3,121 cod traps operating in Newfoundland and Labrador during 1979, and about 7,500 in 1980 (Read 1994). This fishery was closed at the end of 1993 due to collapse of Canadian groundfish resources.

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips, were observed in NAFO Fishing Area 3 (off the Grand Bank) (Lens 1997). A total of 47 incidental catches were recorded, which included one 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 25-40% of large Canadian vessels (greater than 100 ft), 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 1991-96 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, 13 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).

### Other Mortality

There were 220 short-finned pilot whale strandings documented during 1987- 1998 along the USA Atlantic coast between Cape Hatteras, North Carolina, and Miami, Florida; five of these were classified as likely caused by fishery interactions. From 1992-1995, eight short-finned pilot whales stranded along beaches north of Cape Hatteras (Virginia to New Jersey) (NMFS unpublished data).

## STATUS OF STOCK

The status of the short-finned pilot whale relative to OSP in USA Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock. They are 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 a strategic stock because the 1994-1998 estimated average annual fishery-related mortality to pilot whales, excluding Nova Scotia bycatches to pilot whales, *Globicephala* sp., exceeds PBR.

## REFERENCES

- 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.
- Buckland, S. T., D. R. Anderson, K. P. Burnham and J. L. Laake. 1993. Distance Sampling: estimating abundance of biological populations. *Chapman & Hall*, London, 446 pp.
- Cramer J. 1994. Large pelagic logbook newsletter - 1993. NOAA Tech. Mem. NMFS-SEFSC-352, 19 pp.
- 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.
- Gerrior, P., A. S. Williams and D. J. Christensen. 1994. Observations of the 1992 U.S. pelagic pair trawl fishery in the Northwest Atlantic. *Mar. Fish. Rev.* 56(3): 24-27.
- Goudey, C.A. 1995. The 1994 experimental pair trawl fishery for tuna in the northwest Atlantic, Massachusetts Institute of Technology, Sea Grant, MITSG 95-6, Cambridge, MA. 10 pp.
- Goudey, C.A. 1996. The 1995 experimental pair trawl fishery for tuna in the northwest Atlantic, Massachusetts Institute of Technology, Sea Grant, MITSG 95-6, Cambridge, MA. 13 pp.
- 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.

- Johnson, D. R., C. Yeung and C. A. Brown,. 1999. Estimates of marine mammal and marine turtle catch by the U.S. Atlantic pelagic longline fleet in 1992-1997. NOAA Tech. Mem. NMFS-SEFSC-418. 70 pp.
- Laake, J. L., S. T. Buckland, D. R. Anderson and K. P. Burnham. 1993. DISTANCE user's guide, V2.0. Colorado Cooperative Fish & Wildlife Research Unit, Colorado State University, Ft. Collins, Colorado, 72 pp.
- Leatherwood, S. and R. R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco, 302 pp.
- Lee, D. W., C. J. Brown, A. J. Catalano, J. R. Grubich, T. W. Greig, R. J. Miller and M. T. Judge. 1994. SEFSC pelagic longline observer program data summary for 1992-1993. NOAA Tech. Mem. NMFS-SEFSC-347. 19 pp.
- Lens, S. 1997. Interactions between marine mammals and deep water trawlers in the NAFO regulatory area. *ICES CM* 1997/Q:8. 10 pp.
- Mullin, K. D. (in review). Abundance and distribution of cetaceans in the southern U.S. Atlantic Ocean during summer 1998. *Fish. Bull.*
- Mullin, K., W. Hoggard, C. Roden, R. Lohofener, C. Rogers and B. Taggart. 1991. Cetaceans on the upper continental slope in the north-central Gulf of Mexico. OCS Study/MMS 91-0027. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Regional Office, New Orleans, Louisiana, 108 pp.
- 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., G. Waring and D. Potter. (in review). Abundances of cetaceans and sea turtles in the northwest Atlantic during summer 1995 and 1998. *Fish. Bull., U.S.*
- Read, A. J. 1994. Interactions between cetaceans and gillnet and trap fisheries in the north west 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.
- 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., 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. 1995. Fishery and ecological interactions for selected cetaceans off the northeast USA. Ph.D. dissertation, University of Massachusetts, Amherst, 260 pp.
- Yeung, C. 1999a. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1998. NOAA Technical Memorandum NMFS-SEFSC-430, 26 pp.
- Yeung, C. 1999b. Revised Mortality Estimates of Marine Mammal Bycatch in 1992-1997 based on Serious Injury Guidelines. NOAA Technical Memorandum NMFS-SEFSC-429, 23 pp.