Marine Mammals of the Atlantic Region and the Gulf of Mexico

SEFSC/NMFS

Unit 23

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Photo above: Oceanic bottlenose dolphins in the Gulf of Mexico.

INTRODUCTION

The Atlantic region, including the Gulf of Mexico, has at least 94 stocks of 39 species of marine mammals. The U.S. Fish and Wildlife Service has management authority for two stocks of the endangered West Indian manatee, while the National Marine Fisheries Service (NMFS) has responsibility for management of the remaining cetacean and pinniped stocks.

According to criteria provided by the 1994 Amendments to the Marine Mammal Protection Act (MMPA), there are 53 strategic stocks in the Atlantic region, including several stocks classified as threatened or endangered under the Endangered Species Act (ESA; Table 23-1). In the western North Atlantic, the strategic[1] stocks include endangered right, humpback, fin, sei, blue, and sperm (two stocks) whales; endangered West Indian manatee (two stocks); western North Atlantic coastal bottlenose dolphin (depleted under the MMPA); stocks where estimated mortality exceeds their potential for biological removal (PBR): harbor porpoise;

[1]Under the Marine Mammal Protection Act, a strategic stock is defined as a marine mammal stock that 1) has a level of direct human-caused mortality exceeding the potential biological removal; 2) based on the best available scientific information is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; or 3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA.

Table 23-1

Status of marine mammal stocks in the Atlantic region, including the Gulf of Mexico.

Species/stock	Minimum population estimate (N_{min})[1]	Potential biological removal level (PBR)[2]	Annual fisheries-caused mortality[3]	Total annual human-caused mortality[4]	Strategic status[5]	MMPA/ ESA status[6]	Trend[7]
Seals and sea lions							
Grey seal (W. North Atlantic)	Unknown	Unknown	304	445	No		I
Harbor seal (W. North Atlantic)[8]	91,546	2,746	882	893	No		I
Harp seal (NW North Atlantic)[8]	Unknown	Unknown	73	447,442	No		I
Hooded seal (NW North Atlantic)	Unknown	Unknown	25	5,199	No		U
Whales and porpoises							
Atlantic spotted dolphin							
N. Gulf of Mexico	22,626	226	0	0	No		U
W. North Atlantic	36,235	362	6	6	No		U
Atlantic white-sided dolphin (W. North Atlantic)	50,883	509	357	357	No		U
Blainville's beaked whale (N. Gulf of Mexico)[9]	24	0.2	0	0	Yes		U
Blue whale (W. North Atlantic)	Unknown	Unknown	0	0.2	Yes	E	U
Bottlenose dolphin							
Gulf of Mexico bay, sound, and estuary[10]	Unknown	Unknown	Unknown	Unknown	Yes		U
N. Gulf of Mexico oceanic	2,641	26	Unknown	Unknown	No		U
N. Gulf of Mexico Continental Shelf	17,084	270	0	0	No		U
N. Gulf of Mexico coastal stocks[11]							
Eastern	Unknown	Unknown	Unknown	Unknown	Yes		U
Northern	Unknown	Unknown	Unknown	Unknown	Yes		U
Western	Unknown	Unknown	Unknown	Unknown	Yes		U
W. North Atlantic offshore	70,775	566	Unknown	Unknown	No		U
W. North Atlantic coastal	Unknown	Unknown	Unknown	Unknown	Yes	D	U
Brydes whale (N. Gulf of Mexico)	5	0.1	0	0	No		U
Clymene dolphin							
N. Gulf of Mexico	4,901	49	0	0	No		U
W. North Atlantic	Unknown	Unknown	0	0	No		U
Common dolphin (W. North Atlantic)	99,975	1,000	151	151	No		U
Cuvier's beaked whale							
N. Gulf of Mexico	39	0.4	0	0	Yes		U
W. North Atlantic[12]	2,154	17	1	1	Yes		U
Dwarf sperm whale[13]							
N. Gulf of Mexico	340	3.4	0	0	No		U
W. North Atlantic	285	2	0	0	No		U
False killer whale (N. Gulf of Mexico)	501	5	0	0	No		U
Fin whale (W. North Atlantic)	1,678	3.4	0.8	2.8	Yes	E	U
Fraser's dolphin							
N. Gulf of Mexico	Unknown	Unknown	0	0	No		U
W. North Atlantic	Unknown	Unknown	0	0	No		U
Gervais' beaked whale (N. Gulf of Mexico)[9]	24	0.2	0	0	Yes		U
Harbor porpoise (Gulf of Maine / Bay of Fundy)	60,970	610	652	734	Yes		U
Humpback whale (Gulf of Maine)	549	1.1	2.8	4.2	Yes	E	U
Killer whale							
N. Gulf of Mexico	28	0.3	0	0	No		U
W. North Atlantic	Unknown	Unknown	0	0	No		U
Long-finned pilot whale (W. North Atlantic)[14]	24,866	249	163	163	No		U
Melon-headed whale							
N. Gulf of Mexico	1,293	13	0	0	No		U
W. North Atlantic	Unknown	Unknown	0	0	No		U
Mesoplodont beaked whales (W. N. Atlantic)[12]	2,154	17	1	1	Yes		U
Minke whale (Canadian East Coast)	1,899	19	2.2	2.6	No		U
North Atlantic right whale (Western)	313	0	1.4	3.2	Yes	E	U
Northern bottlenose whale (W. North Atlantic)	Unknown	Unknown	0	0	No		U
Pantropical spotted dolphin							
N. Gulf of Mexico	29,311	293	0	0	No		U

Table 23-1

Continued from previous page.

Species/stock	Minimum population estimate (N_{min})[1]	Potential biological removal level (PBR)[2]	Annual fisheries-caused mortality[3]	Total annual human-caused mortality[4]	Strategic status[5]	MMPA/ ESA status[6]	Trend[7]
Pantropical spotted dolphin (continued)							
W. North Atlantic	3,010	30	6	6	No		U
Pygmy killer whale							
N. Gulf of Mexico	203	2	0	0	No		U
W. North Atlantic	Unknown	Unknown	0	0	No		U
Pygmy sperm whale[13]							
N. Gulf of Mexico	340	3.4	0	0	No		U
W. North Atlantic	285	2	0	0	Yes		U
Risso's dolphin							
N. Gulf of Mexico	1.271	13	0	0	No		U
W. North Atlantic	12,920	129	40	40	No		U
Rough-toothed dolphin (N. Gulf of Mexico)	2,034	20	0	0	No		U
Sei whale (Nova Scotia)	128	0.3	0	0.4	Yes	E	U
Short-finned pilot whale							
N. Gulf of Mexico	542	5.4	0	0	No		U
W. North Atlantic[14]	24,866	249	163	163	No		U
Sperm whale							
N. Gulf of Mexico	1,409	2.8	0	0	Yes	E	U
North Atlantic	3,539	7.1	0	0.2	Yes	E	U
Spinner dolphin							
N. Gulf of Mexico	1,356	14	0	0	No		U
W. North Atlantic	Unknown	Unknown	0	0	No		U
Striped dolphin							
N. Gulf of Mexico	2,266	23	0	0	No		U
W. North Atlantic	68,558	686	0	0	No		U
White-beaked dolphin (W. North Atlantic)	1,023	10	0	0	No		U
Other marine mammals							
West Indian manatee[15]							
Florida	1,822	3.6	Unknown	> PBR	Yes	E	D
Antillean	86	0.172	Unknown	Unknown	Yes	E	D

[1] N_{min} is a conservative estimate of abundance used to estimate PBR; it provides reasonable assurance that the stock size is equal to or greater than the estimate.

[2] The maximum number of animals, not including natural mortalities, that may be removed from a stock while allowing that stock to reach or stay at its optimum sustainable population level (50–100% of its carrying capacity); it is calculated as the product of N_{min}, one-half of R_{max} (the maximum productivity rate), and F_r (the recovery factor).

[3] An estimate of the total number of annual mortalities and serious injuries (likely to result in death) caused by commercial fisheries.

[4] An estimate of the total number of annual mortalities and serious injuries (likely to result in death) caused by humans; it includes other sources of mortality, such as ship strikes, strandings, orphaned animals collected for public display, mortalities associated with research activities, takes by foreign countries, and mortalities associated with activities authorized through incidental take regulations.

[5] As defined in the Marine Mammal Protection Act (MMPA) Amendments of 1994, any marine mammal stock 1) for which the level of direct human-caused mortality exceeds the PBR level; 2) which is declining and likely to be listed as threatened under the Endangered Species Act (ESA); or 3) which is listed as threatened or endangered under the ESA or as depleted under the MMPA.

[6] As defined in the MMPA, any species that is listed as threatened or endangered under the ESA is also considered to be a depleted stock.

[7] Trends: I=increasing; S/I=stable/increasing; S=stable; D=decreasing; U=unknown.

[8] Annual mortality includes Canadian fishery bycatch data and NW Atlantic commercial hunt statistics.

[9] This is a combined abundance estimate for Blainville's beaked whale and Gervais' beaked whale.

[10] Represents at least 33 individually recognized stocks of bottlenose dolphin in U.S. Gulf of Mexico bays, sounds, and other estuaries. These stocks are combined in a single report in U.S. Atlantic Stock Assessment Reports (e.g. Waring et al., 2007).

[11] Represents three individually recognized stocks of bottlenose dolphin in U.S. Gulf of Mexico coastal waters. These stocks are combined in a single report in U.S. Atlantic Stock Assessment Reports.

[12] The abundance estimate may include both Cuvier's beaked whale and mesoplodont beaked whales.

[13] The abundance estimate may include both dwarf and pygmy sperm whales.

[14] The estimates may include both short-finned and long-finned pilot whales.

[15] This species is under the jurisdiction of the U.S. Fish and Wildlife Service, and is not included in the stock-status tables of the National Overview.

NEFSC Protected Species Branch

Pilot whale.

and stocks designated as strategic based on Atlantic Scientific Review Group recommendations: pygmy sperm whale in the western North Atlantic, bottlenose dolphins (33 bay, sound, and estuarine stocks and 3 coastal stocks) in the Gulf of Mexico, Blainville's beaked whale, Cuvier's beaked whale (2 stocks), Gervais' beaked whale, and mesoplodont beaked whales.

Recent assessments indicate that of the 94 Atlantic marine mammal stocks, 3 are increasing (gray, harbor, and harp seals), 2 are decreasing (Florida and Antillean stocks of West Indian manatee), and trends for the remaining 89 stocks are unknown (Table 23-1). The four marine mammal stocks highlighted in this unit are representative of the scientific and management issues for Atlantic and Gulf of Mexico regions.

BOTTLENOSE DOLPHIN: NORTHERN GULF OF MEXICO OCEANIC STOCK

Stock Definition and Geographic Range

Based on research currently being conducted on bottlenose dolphins in the Gulf of Mexico and the western North Atlantic Ocean, stock structure is uncertain but appears to be complex. The multidisciplinary research programs conducted over the last three and a half decades (e.g. Wells, 1994) are beginning to shed light on stock structures of bottlenose dolphins, though additional analyses are needed before they can be elaborated on in the Gulf of Mexico. As additional research is completed, it may be necessary to revise the stock structure of bottlenose dolphins in the Gulf of Mexico.


SEFSC/NMFS

Gulf of Mexico oceanic bottlenose dolphin.

Thirty-eight stocks have been provisionally identified for Gulf of Mexico bottlenose dolphins (Waring et al., 2007). These stocks are comprised of both long-term resident and nonresident (e.g. migratory) stocks; the former are more susceptible to human impacts. Stock sizes are generally small, ranging from about 30 to 1,500 animals. Seasonal movements of dolphins provide opportunities for genetic exchange between individual stocks, complicating the identification of stocks, especially in coastal and inshore waters. Gulf of Mexico stock structure includes 33 bay, sound, and estuarine stocks located in inshore habitats; 3 Gulf of Mexico coastal stocks covering nearshore waters; a Continental Shelf stock; and an oceanic stock in waters from the 200 m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ).

Both coastal/nearshore and offshore ecotypes of bottlenose dolphins (Hersh and Duffield, 1990) occur in the Gulf of Mexico (LeDuc and Curry, 1997). The offshore and nearshore ecotypes are genetically distinct using both mitochondrial and nuclear markers (Hoelzel et al., 1998). In the northwestern Atlantic, Torres et al. (2003) found a statistically significant break in the distribution of the ecotypes at 34 km from shore. The offshore ecotype was found exclusively seaward of 34 km and in waters deeper than 34 m. Within 7.5 km of shore, all animals were of the coastal ecotype. If the distribution of ecotypes found by Torres et al. (2003) is similar in the northern Gulf of Mexico, the oceanic stock consists of the offshore ecotype.

Population Size and Current Trend

During summer 2003 and spring 2004, line-transect surveys dedicated to estimating the abundance of oceanic cetaceans were conducted in the northern Gulf of Mexico. During each year, a grid of uniformly-spaced transect lines from a random start were surveyed from the 200-m isobath to the seaward extent of the U.S. EEZ using NOAA Ship *Gordon Gunter* (Mullin, 2007). The estimate of abundance for bottlenose dolphins in oceanic waters, pooled from 2003 to 2004, was 3,708 (CV=0.42) (Mullin, 2007), which is the best available abundance estimate for this species in the northern Gulf of Mexico. However, population data are insufficient to determine trends for this stock.

Stock Status

The level of past or current, direct, human-caused mortality of bottlenose dolphins in the Gulf of Mexico is unknown; however, interactions between bottlenose dolphins and fisheries have been observed in the Gulf of Mexico. Pelagic swordfish, tunas, and billfish are the targets of the pelagic longline fishery operating in the U.S. Gulf of Mexico. There were no reports of mortality or serious injury to bottlenose dolphins in the Gulf of Mexico by this fishery during 1998–2006 (Yeung, 1999, 2001; Garrison, 2003, 2005; Garrison and Richards, 2004; Fairfield-Walsh and Garrison, 2006). However, fishery interactions have previously been reported to occur between bottlenose dolphins and the pelagic longline fishery in the Gulf of Mexico (NMFS, unpublished data[2]), with annual fishery-related mortality and serious injury to bottlenose dolphins estimated to be 2.8 per year (CV=0.74) during 1992–93 (Waring et al., 2007). This could include bottlenose dolphins from the Continental Shelf and oceanic stocks. One animal was hooked in the mouth and released by the pelagic longline fishery in 1998 (Yeung, 1999).

There have been no reports of incidental mortality or injury associated with the shrimp trawl fishery in this area. A trawl fishery for butterfish was monitored by NMFS observers for a short period in the 1980's, with no records of incidental take of marine mammals (Burn and Scott, 1988; NMFS unpublished data[2]), although an experimental set by NMFS resulted in the death of two bottlenose dolphins (Burn and Scott, 1988). There are no other data available with regard to this fishery.

The use of explosives to remove oil rigs in portions of the Continental Shelf in the western Gulf of Mexico has the potential to cause serious injury or mortality to marine mammals. These activities have been closely monitored by NMFS observers since 1987 (Gitschlag and Herczeg, 1994). There have been no reports of either serious injury or mortality to bottlenose dolphins in the oceanic Gulf of Mexico (NMFS unpublished data[2]).

The status of bottlenose dolphins, relative to the optimal sustainable population (OSP), in the U.S. Gulf of Mexico oceanic waters is unknown. Although the total fishery-related mortality and serious injury for this stock is unknown, it is assumed to be less than 10% of the calculated PBR and (from a population perspective) insignificant and approaching zero. Because bottlenose dolphins are not listed as threatened or endangered under the ESA and the annual fishery-related mortality and serious injury has not exceeded the PBR, this is not considered a strategic stock.


SEFSC/NMFS

Gulf of Mexico oceanic bottlenose dolphin.

NORTH ATLANTIC RIGHT WHALE: NORTH ATLANTIC STOCKS

Stock Definition and Geographic Range

The right whale is a slow-swimming animal that frequents coastal and shelf habitats. It feeds in temperate or high latitudes in summer, and calves in warmer water in winter. The North Atlantic population is generally thought to consist of two relatively discrete stocks in the eastern and western portions of this ocean basin, although the eastern population is functionally extinct.

Historically, right whales were found in coastal waters throughout the North Atlantic in a range that extended from Florida (and perhaps further south) to Greenland in the west, and from western Africa to Norway in the east. However, intensive exploitation has greatly reduced the range of this animal. In the western North Atlantic, the remaining population is largely confined to U.S. and Canadian waters, spending summers feeding in the Gulf of Maine and on the Scotian Shelf. In winter, pregnant females migrate to give birth in the coastal waters of Georgia and Florida (Kraus et al., 1986; Winn et al., 1986); although other whales are also found there at this time, the whereabouts of a substantial portion of the population in winter remains unknown. The Bay of Fundy constitutes a major summer feeding area for the

[2]National Marine Fisheries Service, SEFSC, Mississippi Laboratory, 3209 Frederic St., Pascagoula, MS 39567.

North Atlantic right whales.

population, although recent genetic studies suggest the existence of a second, unidentified feeding area (Schaeff et al., 1993).

The western North Atlantic stock has been the subject of a long-term study since the 1970's, and much of its biology and behavior is reasonably well understood (see Kraus and Rolland, 2007). Most of the population has been biopsy sampled, and genetic analyses are ongoing (Schaeff et al., 1993, 1997; Brown et al., 1994; Rosenbaum et al., 1997, 2000; Frasier et al., 2007).

Population Size and Current Trend

No consistent, statistically based population estimates are available for the western North Atlantic population. However, considerable effort has been spent recording re-sighting histories of individual whales using photo-identification techniques[3] so that a reasonable and consistently calculable population index, minimum number alive (MNA), is available. In 1992, the western North Atlantic MNA was estimated to be 295 individuals (Knowlton et al., 1994), and an updated census yielded an MNA estimate of 291 animals in 1998 (Kraus et al., 2001). A review of the photo-ID recapture database on 30 June 2007 indicated that 325 individually recognized whales in the catalog were known to be alive during 2003. This index, while known to be biased low, can be used to track population trends more precisely than is possible for other large whale stocks. An International Whaling Commission (IWC) workshop on status and trends of western North Atlantic right whales (IWC, 2001) concluded that the population was in decline during the 1990's. However, over the 14-year period of 1990–2003, the MNA increased by a mean growth rate of 1.8%, despite losses exceeding gains during some years in the 1990's.

In the eastern North Atlantic stock, only a handful of individuals are assumed to exist. Rare sightings have been made of single individuals in European waters (Brown, 1986), but it is unclear whether these represent a tiny residual population or individuals who have wandered in from the western North Atlantic. However, in recent years, re-sightings of two photographically identified individuals have been made off Iceland and arctic Norway and in the old Cape Farewell whaling ground east of Greenland (Jacobsen et al., 2004; Frasier et al., 2007).

Stock Status

The North Atlantic right whale is critically endangered throughout its range (Brownell et al., 1986; Clapham et al., 1999). Given the various threats described below, this species is among the most threatened of all large whales and further conservation action is urgently required to avoid extinction.

Right whales suffer significant anthropogenic mortality. The principal anthropogenic factors preventing recovery and growth of the population are ship strikes and entanglements in fishing gear. From 2001 to 2005, the average reported mortality and serious injury to right whales was 3.2 animals per year (1.4 from fishery interactions and 1.8 from ship strikes). During this period, 7 of 16 records of mortality or serious injury (including records from both U.S. and Canadian waters) involved entanglements or fishery interactions. Sources of ship strikes are generally unknown, though many of the right whale's major habitats in the western

[3]Individual right whales can be identified from photographs using the pattern of callosities on the head and any prominent scarring (Kraus et al., 1986).

North Atlantic are adjacent to, or even straddle, major shipping lanes. Given the population's dependence upon nearshore habitat during much of its life cycle, intensive coastal development poses additional threats to recovery.

Awareness and mitigation programs for reducing right whale anthropogenic injury and mortality have been established in both the southeastern and northeastern United States. A Recovery Plan was implemented in 1991, and a revised plan was published in 2004. Additionally, a Mandatory Ship Reporting System was implemented in 1999 covering right whale critical habitat areas in the southeastern United States and in the Great South Channel/Cape Cod Bay/Massachusetts Bay areas. This system requires vessels over 300 tons to report information on their identity, location, course, and speed. In return, the vessels receive information on right whale occurrence and on measures to avoid collisions with the whales. Research is ongoing to test compliance with suggested speed restrictions in areas where right whales have been reported.

Studies showing relatively low genetic diversity in the western North Atlantic population (Schaeff et al., 1993, 1997) suggest that inbreeding may be inhibiting recovery. This topic has been investigated using DNA extracted from historic baleen and bone samples (Rosenbaum et al., 1997, 2000). Findings suggest that the eastern and western North Atlantic populations were not genetically distinct (Rosenbaum et al., 2000), but the virtual extirpation of the eastern stock and its lack of recovery in the last hundred years strongly suggests population subdivision over a protracted (but not evolutionary) time scale. Genetic studies concluded that the principal loss of genetic diversity occurred prior to the 18th century (Waldick et al., 2002). However, revised conclusions of species composition in North American Basque whaling archaeological sites (Rastogi et al., 2004) contradict the previously held belief that Basque whaling during the 16th and 17th centuries was principally responsible for the loss of genetic diversity.

This is a strategic stock because the average annual fishery-related mortality and serious injury exceeds PBR and because the North Atlantic right whale is an endangered species (Waring et al., 2007). PBR is usually calculated using the minimum population size, maximum net productivity rate, and a recovery factor. However, given the decline of estimated survival rates for this stock (Caswell et al., 1999; IWC, 2001), the PBR has been set to zero and no mortality or serious injury can be considered insignificant.

NEFSC Protected Species Branch

Pilot whales.

LONG-FINNED PILOT WHALE: WESTERN NORTH ATLANTIC STOCK

Stock Definition and Geographic Range

There are two species of pilot whales in the Western Atlantic—the long-finned and the short-finned pilot whale. The distribution of long-finned pilot whales, a northern species, overlaps with that of the short-finned pilot whales, a predominantly southern species, between 35°30′ N and 38°00′ N (Leatherwood et al., 1976). Most of the pilot whale takes in fishery bycatch are not identified to species, and bycatch does occur in the overlap area. In this summary, therefore, long-finned pilot whales and unidentified pilot whales are considered together.

The long-finned pilot whale is distributed in the northern hemisphere from North Carolina east to North Africa and the Mediterranean and north to Iceland, Greenland, and the Barents Sea (Sergeant, 1962; Leatherwood et al., 1976; Abend,

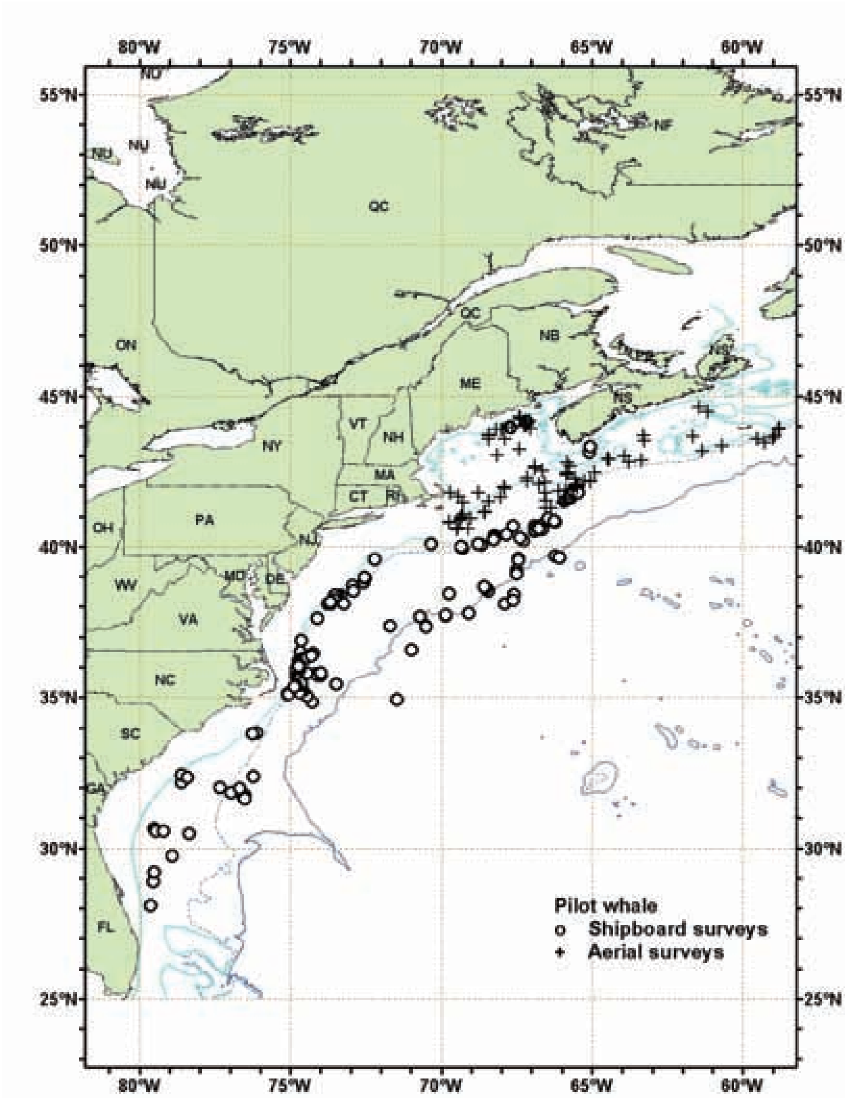

Figure 23-1
Distribution of pilot whale sightings from Northeast Fisheries Science Center and Southeast Fisheries Science Center shipboard and aerial surveys during the summer in 1998–2006. Isobaths are at 100 m and 1,000 m.

1993; Buckland et al., 1993; Abend and Smith, 1999). The stock structure of the North Atlantic population is uncertain (ICES, 1993; Fullard et al., 2000). Morphometric (Bloch and Lastein, 1993) and genetic (Siemann, 1994; Fullard et al., 2000) studies have provided little support for stock structure across the Atlantic. However, Fullard et al. (2000) have proposed a stock structure that is correlated to sea surface temperature: a cold-water population west of the Labrador/North Atlantic current, and a warm-water population that extends across the Atlantic in the Gulf Stream.

In the western North Atlantic, pilot whales are found in winter and early spring principally along the Continental Shelf edge of the northeastern United States (CETAP, 1982; Payne and Heinemann, 1993; Abend and Smith, 1999). In the late spring, they move onto Georges Bank, the Gulf of Maine, and more northern waters, and remain in these areas through late autumn. In general, pilot whales occupy areas of high relief or submerged banks, but are also associated with the Gulf Stream north wall and thermal fronts along the Continental Shelf edge (Waring et al., 1992; NMFS, Unpublished data[4]).

Population Size and Current Trend

The total number of long-finned pilot whales in the Atlantic off the eastern United States and Canadian coasts is unknown. The initial population size was estimated to be between 50,000 and 60,000 individuals in this region (Mitchell, 1974; Mercer, 1975), but no current reliable estimates exist due to the difficulty of distinguishing long- and short-finned pilot whales at sea. The current best estimate for pilot whales (both species combined) in the western North Atlantic is 31,139 (CV = 0.27). This estimate is the result of two line-transect sighting surveys conducted in 2004 (Figure 23-1): one in waters north of Maryland (15,728 animals, CV = 0.34), and one south of Maryland (15,411 animals, CV = 0.43; Mullin and Fulling, 2003). The minimum population size of pilot whales is estimated to be 24,866. Due to changes in survey methodology, earlier abundance estimates should not be used to make comparisons to more current estimates, and no population trends are currently available for this species.

Stock Status

The status of long-finned pilot whales relative to the OSP in the U.S. Atlantic EEZ is unknown, but the stock's abundance may have been affected by reduction in foreign fishing, curtailment of drive fisheries[5] for pilot whales in the western North Atlantic, and increased abundance of pilot whale prey items (Atlantic herring, Atlantic mackerel, and squid). The current and maximum net productivity rates for long-finned pilot whales are also

[4]NMFS, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543.

[5]Targeted fisheries on whales where groups of whales are herded by motorized boats toward shore for slaughter.

unknown. To calculate PBR, the default value for cetaceans (0.04, based on reproductive life history constraints) was used for the maximum productivity rate. The PBR for western North Atlantic pilot whales is 249 animals per year.

As with the abundance estimates, the total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the U.S. Atlantic. The estimated average fishery-related mortality or serious injury of pilot whales during the period 2001–05 was 163 animals per year (CV = 0.09; Table 23-2). Pilot whales have frequently been observed to feed on hooked fish (NMFS, unpublished data[4]), and pelagic longline fisheries accounted for more than half of the estimated annual mortality and serious injury of pilot whales in the western North Atlantic (87 whales per year, including one seriously injured pilot whale in a 2005 experimental fishery; CV = 0.16). Bycatch of pilot whales also occurs in Mid-Atlantic bottom trawls (38 whales per year, CV = 0.15) and northeast bottom trawls (19 whales per year, CV = 0.12), Mid-Atlantic midwater trawls (7 whales per year, CV = 0.34), northeast midwater trawls (1 whale per year, CV = 0.35), and herring midwater trawls (11 whales in 2001). Although no data are available on bycatch of pilot whales in the bluefin tuna purse seine fishery (which has not been observed since 1996), previous interactions have been observed and may continue to be an issue. An unknown number of western North Atlantic pilot whales have also been taken in fisheries operating in the Canadian EEZ (Read, 1994; Hooker et al., 1997).

Another potential human-caused source of mortality is pollution. Bioaccumulation of polychlorinated biphenyls (PCB's) and chlorinated pesticides (DDT, DDE, dieldrin, and others) in whale blubber has been recorded by a number of researchers (Taruski et al., 1975; Muir et al., 1988; Dam and Bloch, 2000; Weisbrod et al., 2000). Elevated levels of toxic metals (mercury, lead, and cadmium) and selenium have also been measured in pilot whales (Nielsen et al., 2000). The population effects of observed tissue contaminant levels remain unknown.

Additionally, strandings (including mass strandings) of pilot whales are another source of mortality, although the role of human activity in such events is unknown (Table 23-3). Two hundred and twenty-one pilot whales were reported stranded between Maine and Florida during 2001–05, including two mass strandings in Massachusetts (57 whales in 2002 and 18 whales in 2005), one in Florida in 2003 (28 whales), and one in North Carolina in 2005 (33 whales; NMFS, unpublished data[4]). Although some of these animals were returned to the water, some studies have indicated that animals returned to the water frequently swim away and strand someplace else (Fehring and Wells, 1976; Irvine et al., 1979; Odell et al., 1980).

The species is not listed as threatened or endangered under the ESA, nor is it classified as depleted under the MMPA. This stock is not a strategic stock because the estimated average human-related mortality is below the PBR for pilot whales. The total U.S. fishery-related mortality and serious injury is not less than 10% of the PBR and therefore cannot be considered to be approaching zero mortality and serious injury rate.

Wayne Hoggard, SEFSC

Biopsy sample being collected by NMFS scientists aboard the NOAA Ship *Gordon Gunter*.

HARBOR SEAL: WESTERN NORTH ATLANTIC STOCK

Stock Definition and Geographic Range

Harbor seals are the most abundant seal species found in U.S. Atlantic waters and the most commonly seen marine mammal in New England coastal waters. In the western North Atlantic, har-

Table 23-2

Summary of the incidental mortality of pilot whales (*Globicephala* spp.) in commercial fisheries.

Fishery	Data type[1]	Year	No. Vessels[2]	Observer coverage[3]	Obs. serious injury[4]	Obs. mortality[4]	Est. serious injury	Est. mortality	Est. combined mortality[5]	Est. CV[6]	Mean annual mortality[7]
		2001		0.01	0	0	0	39	39	0.31	
		2002		0.01	0	0	0	38	38	0.36	
Mid-Atlantic bottom trawl	Observer, dealer	2003	Unk.	0.01	0	0	0	31	31	0.31	38 (0.15)
		2004		0.03	0	0	0	35	35	0.33	
		2005		0.03	0	4	0	31	31	0.31	
		2001		0.01	0	0	0	21	21	0.27	
		2002		0.03	0	0	0	22	22	0.26	
Northeast bottom trawl	Observer, dealer	2003	Unk.	0.04	0	0	0	20	20	0.26	19 (0.12)
		2004		0.05	0	2	0	15	15	0.29	
		2005		0.12	0	4	0	15	15	0.30	
		2001	23	0	0	0	0	Unk.	Unk.	Unk.	
Mid-Atlantic mid-water trawl	Observer, dealer, VTR	2002	20	0.003	0	0	0	Unk.	Unk.	Unk.	
		2003	23	0.018	0	0	0	3.9	3.9	0.46	7 (0.34)
		2004	25	0.064	0	0	0	8.1	8.1	0.38	
		2005	31	0.084	0	0	0	7.5	7.5	0.76	
		2001	24	0.001	0	0	0	Unk.	Unk.	Unk.	
Northeast mid-water trawl	Observer, dealer, VTR	2002	27	0	0	0	0	Unk.	Unk.	Unk.	
		2003	28	0.031	0	0	0	1.9	1.9	0.56	1 (0.35)
		2004	22	0.126	0	1	0	1.4	1.4	0.58	
		2005	25	0.199	0	0	0	1.1	1.1	0.68	
Gulf of Maine / Georges Bank herring mid-water trawl[8]	Observer	2001	10	1	0	11	0	11	11	NA	11 (NA)
		2001	98	0.04	4	1	50	20	70	0.5	
Pelagic longline (excluding NED-E)[9]	Observer, logbook	2002	87	0.05	4	0	52	2	54	0.46	
		2003	63	0.09	2	0	21	0	21	0.77	86 (0.16)
		2004	60	0.09	6	0	74	0	74	0.42	
		2005	60	0.06	9	0	212	0	212	0.21	
		2001	9	1	0	0	0	0	0	0	
Pelagic longline (NED-E area only)[9]	Observer	2002	14	1	0	0	0	0	0	0	0
		2003	11	1	0	0	0	0	0	0	
Pelagic longline experimental fishery[10]	Observer	2005	6	1	1	0	1	0	1	NA	1 (NA)
Total											163 (0.9)

[1]Observer data are used to measure bycatch rates, and are collected within the Northeast Fisheries Science Center Fisheries Observer Program. Logbook data are mandatory, collected by the Southeast Fisheries Science Center, and used to measure total effort for the longline fishery. Dealer data are mandatory, collected by the Northeast Fisheries Science Center, and used to estimate effort.

[2]The number of vessels in the fishery. For the squid trawl fisheries, numbers are based on 2002 permit holders; many trawl vessels participate in multiple fisheries, so numbers are not additive across fisheries. For the herring mid-water trawl fishery, three foreign and seven American vessels participate. For the pelagic longline fishery, numbers are based on vessels reporting effort to the pelagic longline logbook.

[3]Coverage for the trawl fisheries is measured as the number of trips; coverage for the longline fishery is measured as the number of sets.

[4]Recorded by on-board observers.

[5]Includes estimates of mortality and serious injury.

[6]Coefficient of variation for the combined mortality estimates.

[7]The mean of the estimated combined mortality for the years shown, with the coefficient of variation in parentheses.

[8]Includes joint venture (JV) and total allowable level of foreign fishing (TALFF) fishing. During JV operations, nets that are transferred from the domestic vessel to a foreign vessel for processing are observed on board the foreign vessel; nets that are fished by a domestic vessel but not transferred to a foreign vessel are not observed. During TALFF operations, all nets fished by the foreign vessel are observed.

[9]An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on sea turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery conducted from 1 June 2001 to 31 December 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline excluding the NED-E in one row and for only the NED-E in a 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).

[10]A cooperative research program to test effects of gear characteristics and fishing practices.

NEFSC Protected Species Branch

Pilot whale and calf.

State	2001	2002	2003	2004	2005	State total
Maine	6	2	1	4	2	15
New Hampshire	0	0	0	0	0	0
Massachusetts	3	65	5	1	22	96
Rhode Island	1	1	1	1	0	4
Connecticut	0	0	0	0	0	0
New York	1	0	0	3	1	5
New Jersey	0	0	6	0	2	8
Delaware	0	0	0	0	0	0
Maryland	0	0	0	0	4	4
Virginia	0	0	3	1	4	8
North Carolina	2	0	3	3	38	46
South Carolina[1]	1	0	1	0	0	2
Georgia	0	0	0	0	0	0
Florida	0	0	29	4	0	33
Annual total	14	68	49	17	73	221

[1]Only moderate confidence on species identification for 2003.

Table 23-3
Pilot whale strandings, by state, along the U.S. Atlantic Coast during the years 2001–05. No distinction has been made between short-finned and long-finned pilot whales.

bor seals are common from Labrador to southern New England and New Jersey, and occasionally to the Carolinas (Boulva and McLaren, 1979; Katona et al., 1993; Gilbert and Guldager, 1998). Although the stock structure is unknown, the northwest Atlantic subspecies, *Phoca vitulina concolor*, is believed to represent a single breeding population. Breeding and pupping normally occurs in waters north of the New Hampshire/Maine border, although breeding occurred as far south as Cape Cod in the early part of the twentieth century (Temte et al., 1991; Katona et al., 1993).

Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine (Katona et al., 1993), and are found seasonally along the southern New England and New York coasts from September through late May (Schneider and Payne, 1983; Barlas, 1999). A general southward movement from the Bay of Fundy to southern New England waters occurs in autumn and early winter (Rosenfeld et al., 1988; Whitman and Payne, 1990; Jacobs and Terhune, 2000). A northward movement from southern New England to Maine and eastern Canada occurs prior to the pupping season, which takes place from mid May through June (Richardson, 1976; Kenney, 1994; deHart, 2002). The overall geographic range throughout U.S. Atlantic coast waters has not changed greatly during the last century.

Population Size and Current Trend

Harbor seals, like gray seals, were bounty-hunted in New England waters until the late 1960's. This hunt may have caused the demise of the harbor seal stock in U.S. waters (Katona et al., 1993). However, the number of seals along the New England coast has increased nearly five-fold since the passage of the MMPA in 1972. A 2001 coast-wide aerial summer survey produced a count of 99,340 seals (CV = 0.097; Gilbert et al., 2005). Although this number has been corrected for animals in the water or outside of the survey area, the count is considered to be a minimum population estimate. This number is substantially higher than the last survey count in 1997; the number of pups in 2001 was also much higher than the 1997 count (Gilbert and Guldager, 1998; Gilbert et al., 2005). Increased abundance of seals in the Northeast Region has also been documented during aerial and boat surveys of overwintering haulout sites (Payne and Selzer, 1989; Rough, 1995; Barlas, 1999).

The average increase in uncorrected counts over the 1981–2001 survey period (i.e. 1981, 1982, 1986, 1993, 1997, and 2001 surveys) has been 6.6% (Gilbert et al., 2005). Possible factors contributing to harbor seal population increase include MMPA protection, fishery management regulations designed to rebuild groundfish stocks

NEFSC Protected Species Branch

Aerial view of harbor seals hauled out on a beach.

(e.g. closed areas and fishing effort reduction), and habitat protection of important haulout sites (e.g. National Park Service and National Wildlife Refuge lands).

Stock Status

Researchers and fishery observers have documented incidental mortality of harbor seals in several fisheries in recent years, particularly within the Gulf of Maine sink gillnet fishery (Waring et al., 2007). Bycatch in several Atlantic Canada and Greenland fisheries was summarized in Read (1994). Estimated average annual fishery-related mortality and serious injury to this stock in U.S. waters during 2001–05 was 882 harbor seals (CV = 0.16).

Shark predation has become an important source of pup mortality at Sable Island, Nova Scotia. Lucas and Stobo (2000) suggest that shark-inflicted mortality in pups, as a proportion of total production, was less than 10% in 1980–93, approximately 25% in 1994–95, and increased to 45% in 1996. Also, shark predation on adults was selective towards mature females. They suggest that predation mortality is likely impacting population growth, and may be contributing to the observed population decline in that area.

Other sources of mortality include human interactions (boat strikes, fishing gear, and deliberate shooting), storms, abandonment of pups by the mother, and disease (Katona et al., 1993; NMFS, unpublished data[4]). Canada's Department of Fisheries and Oceans reports small numbers of harbor seals taken annually in a subsistence hunt (numbers in the 2002–05 period range from 16 in 2004 to 334 in 2002 [DFO, 2006]). Annually, small numbers of harbor seals regularly strand during the winter period in southern New England and Mid-Atlantic regions (NMFS, unpublished data[4]). Reported strandings from 2001 through 2005 were 177 in 2001, 262 in 2002, 377 in 2003, 560 in 2004, and 341 in 2005. Sixty-eight (4.0%) of the seals stranded during this 5-year period showed signs of human interactions. Further, many live stranded animals are euthanized due to poor condition of the animals, although some sick and injured seals are transported to rehabilitation facilities. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all animals that die or are seriously injured are washed ashore, and not all animals washed ashore show obvious signs of entanglement or other fishery interactions.

The western North Atlantic harbor seal stock is increasing and is not listed as threatened or endangered under the ESA. The stock is not a strategic stock since the estimated annual level of fishery-related mortality and serious injury in U.S. waters (882 seals) does not exceed PBR (2,746 animals). However, because human-induced mortality and serious injury is greater than 10% of PBR, these losses cannot be considered to be approaching a zero mortality and serious injury rate.

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