

Summary of Marine Mammal Observations During 2008 Surveys

Massachusetts Water Resources Authority
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TABLE OF CONTENTS

1.0	Introduction.....	1
2.0	Background.....	1
3.0	Methods.....	2
4.0	Results.....	4
5.0	Discussion.....	12
6.0	Summary of Whale Sightings 1998 through 2008.....	13
7.0	References.....	17

LIST OF TABLES

Table 1. Marine Mammal Observer Sightings on 2008 MWRA Boston Harbor and Shellfish Water Quality Surveys.....	6
Table 2. Marine Mammal Observer Sightings on 2008 Nearfield and Farfield Surveys.....	7
Table 3. Whale Sightings by Area, Species, and Year.....	14

LIST OF FIGURES

Figure 1. Location of Nearfield and Farfield Stations.....	3
Figure 2. Location of MWRA Surveys for Division of Marine Fisheries Shellfish Bed Monitoring.....	5
Figure 3. Approximate Locations of Whale Sightings during 2008 Surveys.....	11
Figure 4. Distribution of Sightings by Species and Area, 1998-2008.....	15
Figure 5. Total Sightings of Whales by Area, 1998-2008.....	15
Figure 6. Distribution of Whale Sightings by Species, 1998-2008.....	16

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1.0 Introduction

At least five endangered species of whales are known to visit or inhabit the Massachusetts and Cape Cod Bay area (Environmental Protection Agency [EPA] 1993): the right whale, humpback whale, finback whale, sei whale (rarely observed) and blue whale (rarely observed). Several non-endangered marine mammal species are also found: minke whales, harbor porpoise, several dolphin species, gray seals, and harbor seals.

Since 1995, Massachusetts Water Resources Authority (MWRA) has included marine mammal observers on monitoring surveys. The MWRA surveys are being conducted as part of the long-term Harbor and Outfall Monitoring Project designed to verify compliance with the discharge permit and to assess the potential environmental impact of treated sewage effluent discharge into Massachusetts Bay. These observers were included in response to a National Marine Fisheries Service (NMFS) request that MWRA provide observational data and set a positive example by using observers to minimize the chances of collision with a right whale. In addition to looking for right whales, observers conducted observations for other marine mammals. On surveys where observers were not present, the chief scientist and field crew documented any incidental sightings of marine mammals.

Marine mammal observers were present on all nearfield and farfield water quality surveys during 2008. Observers were not present on Boston Harbor surveys and bacteria surveys for shellfish water quality monitoring.

2.0 Background

A brief description of when marine mammals are expected to be found in Massachusetts and Cape Cod Bays is presented and discussed below.

The right whale (*Eubalaena glacialis*) is critically endangered. Based on historical sightings, right whales can be expected to visit Massachusetts and Cape Cod Bays throughout the year (Brown *et al.* 2002), with peak abundance in February, March and early April (Hamilton and Mayo 1990). Over the past four decades 72% of the catalogued population of right whales has visited Cape Cod Bay and Massachusetts Bay (Brown *et al.* 2002). For the period of 1978 through 1986, using photographed sightings of right whales collected from whale watch boats and research cruises, the total number of individually identified right whales in Cape Cod Bay ranged from a single animal in 1978 to 47 individuals in 1986 (Hamilton and Mayo 1990). The use of the eastern portion of Stellwagen Bank/Wildcat Knoll by right whales has been noted during extended surveys by the Center for Coastal Studies (Brown *et al.* 2002).

The humpback whale (*Megaptera novaeangliae*) is an endangered species of whale known to feed within the Gulf of Maine in the spring, summer and fall (Waring *et al.* 1999). Historic records indicate that humpbacks have been documented on Stellwagen Bank from April through December (CeTap 1982; Geraci *et al.* 1989; NMFS 1991). However, distribution appears to correlate with prey densities (Waring *et al.* 1999). The amount of humpback whale use of the Stellwagen area varies periodically most likely based on the availability of sand lance as prey (Payne *et al.* 1986; Payne *et al.* 1990; Weinrich *et al.* 1997).

The finback whale (*Balaenoptera physalus*) is considered to be an endangered species and is the most abundant and frequently sighted of the endangered whales that visit Massachusetts and Cape Cod Bays (EPA 1993). Finbacks are sighted year round in the Stellwagen Bank area with a peak abundance occurring between the spring and fall (Pett and McKay 1990).

The sei whale (*Balaenoptera borealis*) and blue whale (*Balaenoptera musculus*) are both endangered species (EPA 1993). The sei whale is uncommon but is regularly sighted (Schilling *et al.* 1992), while the blue whale is rarely sighted in Massachusetts and Cape Cod Bays (EPA 1993). Both blue and sei whales typically remain in deeper water (more than 100 meters) and further offshore (CeTap 1982). However, sightings of these species in coastal areas may correspond to changes in prey distribution (Payne *et al.* 1990, Wenzel *et al.* 1988).

The minke whale (*Balaenoptera acutorostrata*) is a non-endangered species typically seen in the Stellwagen Bank area during the spring, summer and fall (CeTap 1982; Pett and McKay 1990). During the winter, minke whale sightings in New England appear to decline dramatically (Waring *et al.* 1999).

The Atlantic white-sided dolphin (*Lagenorhynchus acutus*) is a species of dolphin found from central west Greenland to North Carolina (Waring *et al.* 1999). The Gulf of Maine stock of Atlantic white-sided dolphins is classified as strategic by the National Marine Fisheries Service (Waring *et al.* 1999). Sightings of these dolphins in the Stellwagen Bank and Cape Cod Bay areas are common in the spring, summer (Weinrich *et al.* 2001), and, to a lesser extent, the fall (Pett and McKay 1990).

The Atlantic pilot whale or long-finned pilot whale (*Globicephala melaena*) is the largest species of dolphin found in cool temperate waters off Labrador, Newfoundland, and in the St. Lawrence River with sporadic sightings as far south as Maryland and Virginia (Bulloch 1993). Pilot whales form schools of a few to many hundreds of individuals and are mainly found relatively close to shore. Pilot whale distribution and abundance appear to be linked to the topography of the sea floor and the abundance of their primary food source, squid (Harrison and Bryden 1989).

The gray seal (*Halichoerus grypus*) is a non-endangered species of pinniped found from Maine to Long Island Sound (Rough 1995). A small, year round breeding population is known to occur on outer Cape Cod and Nantucket Island (Waring *et al.* 1999). The majority of gray seal sightings in Cape Cod Bay and the Stellwagen Bank area occur during the winter and spring, although periodic sightings have been recorded in the summer (Center for Coastal studies unpublished data).

Harbor porpoises (*Phocoena phocoena*) of the Gulf of Maine/Bay of Fundy stock are classified as strategic by the National Marine Fisheries Service (Waring *et al.* 1999). Historic data indicate that harbor porpoises can be found in the Stellwagen Bank area and Cape Cod Bay from December through June (Pett and McKay 1990).

The harbor seal (*Phoca vitulina*) is a non-endangered species of pinniped commonly found in the near shore waters around New England (Katona *et al.* 1993). Harbor seals are most frequently seen in the Stellwagen Bank and Cape Cod Bay areas in the winter and early spring with sightings beginning in late September (Pett and McKay 1990).

3.0 Methods

Figure 1 shows a map of MWRA sampling stations, nearfield and farfield. Marine mammal observations were performed during all daylight hours while transiting during nearfield water column surveys, and while the vessel was on-station for sampling operations. During vessel transits, the observer continuously scanned the sea surface from directly ahead to 90 degrees abeam on either side of the vessel. Initial sightings were made by eye with confirmation and identification aided by binoculars. While on-station, the observer scanned 360 degrees around the vessel. The observer was typically positioned at the highest and most secure vantage point of the survey vessel. Weather conditions, safety of the observer, and limiting interference with the operation of the vessel and sampling team were all factors that influenced the position of the observer on board the vessel. Three survey vessels were used as observation platforms during the course of the year.

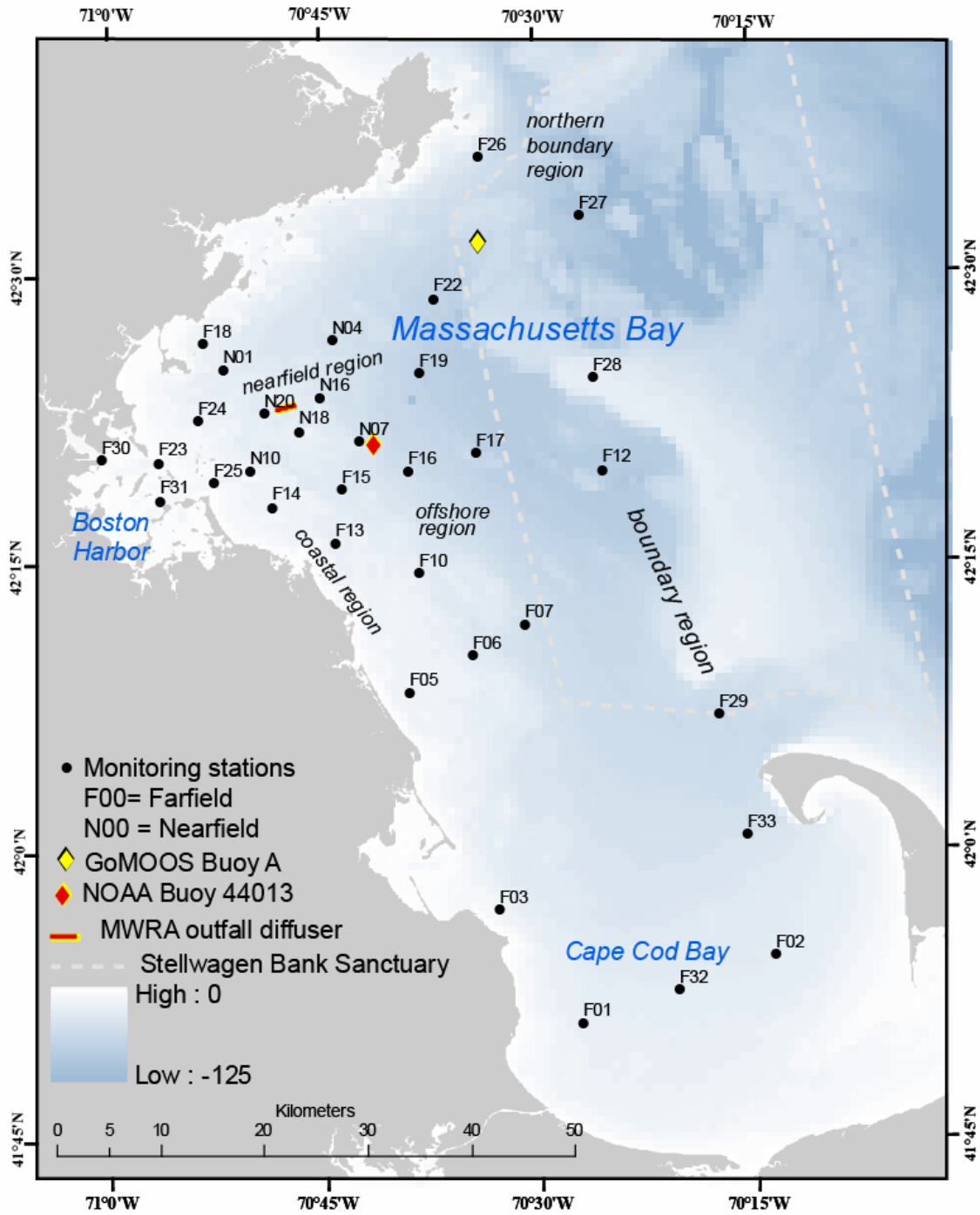


Figure 1. Location of Nearfield and Farfield Stations

The observer's eye-height above the sea surface was approximately 4 meters on the R/V *Tioga* and R/V *Andy Lynn VI* and 2.5 meters aboard the R/V *Aquamonitor*. Observations were conducted 40 minutes out of every hour and were suspended when visibility was reduced to zero or when darkness occurred.

Several other vessels were also used to conduct surveys where marine mammal observers were not present. The scientific crew on board the R/V *Merganser*, R/V *Key Largo*, F/V *First Light*, and the F/V *Windmere* observed marine mammals while on surveys. These vessels were used to conduct MWRA Boston Harbor surveys and bacteria surveys for shellfish water quality monitoring (Figure 2). Similar to the previous year, data from those surveys are included in this report.

Vessel track, station sequence, and number of stations varied among cruises, due to the constraints of weather, special survey requirements, or both.

4.0 Results

Observation of marine mammals on surveys designed and operated for the collection of water quality data places limitations and constraints on the method of observation and on the conclusions that may be drawn from the data. Standard line transect methodology is not possible on such surveys, and different vessels (which vary the characteristics of the survey platform) were used during the year. Therefore it is not appropriate to use these opportunistic sightings to estimate animal abundance. The data provide useful qualitative information concerning seasonal patterns and relative abundance within the same study area.

During the 2008 monitoring year, the marine mammal observers, Battelle survey team members, and MWRA survey team members counted between 44-45 individual whales, one Atlantic white-sided dolphin, four harbor porpoises, and four unidentified porpoises. Included in the whale count were 13 right whales, ten humpback whales, five finback whales, four minke whales, and between 12-13 unidentified whales. Whale sightings in 2008 were split almost equally between the Stellwagen Bank National Marine Sanctuary and Cape Cod Bay. Between 17-18 whales were spotted in the Stellwagen Bank Sanctuary, and 18 were sighted in Cape Cod Bay. Seven whales were spotted in the vicinity of the nearfield and two in the farfield (Figure 3). The total number of whales (44-45) sighted during 2008 was the most since 2006 (53-57+ sightings). Tables 1 and 2 summarize all the sightings of whales by survey staff in 2008. Additionally, all other sighting of marine mammals such as pinnipeds and dolphins are also included in those tables. In addition to the whales, approximately 142 harbor seals, a single grey seal, one dolphin, and eight porpoises were also sighted during the year. The geographic distribution of whale sightings is presented in Figure 3.

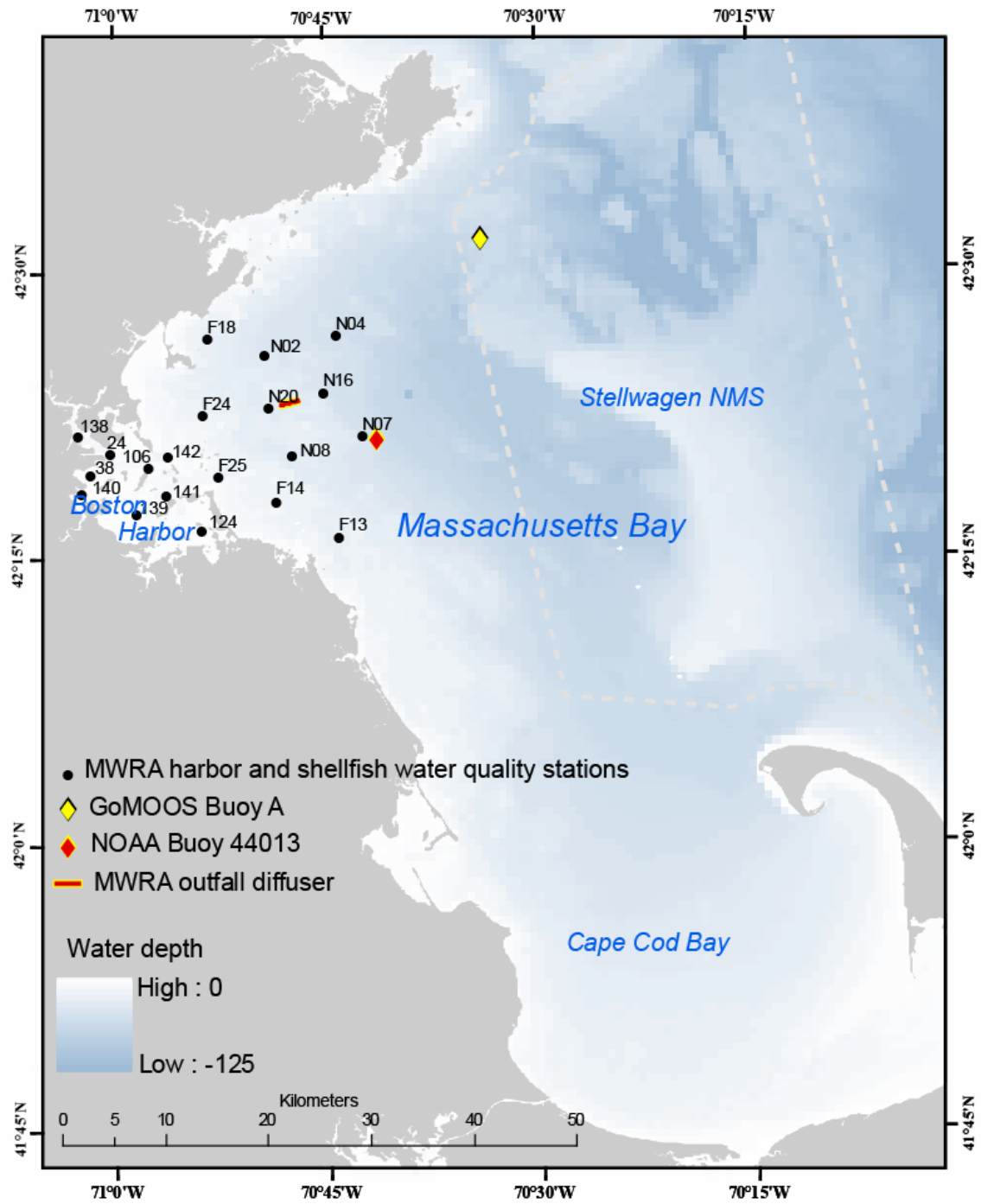


Figure 2. Location of MWRA Surveys for Division of Marine Fisheries Shellfish Bed Monitoring

Table 1. Marine Mammal Observer Sightings on 2008 MWRA Boston Harbor and Shellfish Water Quality Surveys.

Survey ID	Date/Time	Number	Mammal	Location	Sighting Comments	Observer Present
PC081 R/V <i>Merganser</i>	01/24/08	0	--	--	No sightings	No
WQM2008 R/V <i>Merganser</i>	01/08/08 0850	1	Harbor Seal	42°21.68 N 71°02.73 W	Upper Inner Harbor, BHWQM harbor survey	No
PC082 F/V <i>First Light</i>	02/25/08 0815	4	Harbor Seals	42°19.27 N 70°55.38 W	Sighted off George's Island	No
WQM2008 R/V <i>Merganser</i>	02/29/08 0954	1	Porpoise	42°21.62 N 71°01.70 W	Inner Harbor mouth	No
PC083 F/V <i>First Light</i>	03/11/08	0	--	--	No sightings	No
WQM2008 R/V <i>Merganser</i>	03/13/08 1107	1	Harbor Seal	42°19.44 N 70°59.78 W	Off Thompson Island	No
WQM2008 R/V <i>Merganser</i>	04/04/08 0911	1	Harbor Seal	42°20.59 N 71°00.48 W	Inner Harbor mouth	No
	04/04/08 0918	1	Harbor Seal	42°20.59 N 71°00.48 W	Inner Harbor mouth	
PC084 R/V <i>Merganser</i>	04/22/08 0830	1	Porpoise	42°17.77 N 70°47.74 W	En route from F25 to F14	No
WQM2008 R/V <i>Merganser</i>	04/25/08 0845	2	Porpoises	42°22.65 N 71°02.74 W	Upper Inner Harbor, BHWQM harbor survey	No
PC085 F/V <i>Windemere</i>	05/22/08 1215	1	Finback Whale	42°22.44 N 70°53.52 W	En route from F18 & F24	No
PC086 R/V <i>Key Largo</i>	06/10/08	0	--	--	No sightings	No
PC087 R/V <i>Merganser</i>	07/1/08 1019	2	Finback Whales	42°24.84 N 70°41.65 W	Site N16	No
PC088 R/V <i>Merganser</i>	08/04/08	0	--	--	No sightings.	No
PC089 R/V <i>Merganser</i>	09/04/08 1020	1	Finback Whale	42°42.75 N 70°82.18 W	300m West of N02	No
WQM2008 R/V <i>Merganser</i>	10/06/08	1	Harbor Seal	42°18.22 N 71°02.26 W	Site 140	No
PC08A R/V <i>Merganser</i>	10/08/08 1215	1	Harbor Seal	42°24.42 N 70°52.51 W	En route from F18 to F24, off Nahant.	No
CSO2008 R/V <i>Key Largo</i>	10/23/08	1	Harbor Seal	42°22.14 N 71°03.42 W	Mouth of Charles River	No
	10/23/08	1	Harbor Seal	42°21.66 N 71°02.28 W	Inner Harbor off Pier 3	
WQM2008 R/V <i>Merganser</i>	10/27/08 0940	1	Harbor Seal	42°23.13 N 71°02.93 W	Tobin Bridge	No
	10/27/08 1030	1	Harbor Seal	42°20.40 N 71°00.33 W	Site 024	
	10/27/08 1110	1	Harbor Seal	42°18.22 N 71°02.26 W	Site 140	
	10/27/08 1050	1	Harbor Seal	42°19.00 N 70°59.38 W	South of Thompson Island	
CSO2008 R/V <i>Key Largo</i>	10/28/08 1105	1	Harbor Seal	42°23.10 N 71°02.94 W	Tobin Bridge	No
PC08B R/V <i>Merganser</i>	11/03/08 1046	2	Minke Whales	42°23.06 N 70°48.36 W	Site N07	No

Survey ID	Date/Time	Number	Mammal	Location	Sighting Comments	Observer Present
WQM2008 R/V <i>Merganser</i>	11/04/08	1	Harbor Seal	42°21.99 N 71°02.67 W	Off site 138	No
	11/04/08	1	Harbor Seal	42°20.21 N 70°57.79 W	Off Deer Island	
CSO2008 R/V <i>Merganser</i>	11/05/08	1	Harbor Seal	42°17.17 N 70°58.71 W	Quincy Bay, off site 139	No
	11/05/08 1251	1	Harbor Seal	42°20.06 N 70°58.55 W	Site 065	
CSO2008 R/V <i>Merganser</i>	11/13/08 0800	1	Harbor Seal	42°20.38 N 70°58.97 W	Between Deer Island and Logan	No
	11/13/08 0805	1	Harbor Seal	42°20.46 N 70°59.73 W	Off Logan Airport	
CSO2008 R/V <i>Merganser</i>	11/14/08 0900	1	Harbor Seal	42°20.69 N 71°00.55 W	Off Logan Airport at mouth of Inner Harbor	No
CSO2008 R/V <i>Merganser</i>	11/18/08 0815	1	Harbor Seal	42°20.60 N 71°01.01 W	Off Reserve Channel	No
	11/18/08 1000	1	Harbor Seal	42°23.13 N 71°02.49 W	Outside Chelsea River	
CSO2008 R/V <i>Merganser</i>	11/26/08 0725	1	Harbor Seal	42°22.40 N 71°02.73 W	Inner Harbor off Naval Shipyard	No
	11/26/08 0732	2	Harbor Seals	42°23.18 N 71°03.33 W	At mouth of Island End River	
CSO2008 R/V <i>Merganser</i>	12/01/08 0835	1	Harbor Seal	42°21.97 N 70°58.50 W	Winthrop Marina	No
PC08C R/V <i>Merganser</i>	12/03/08 0815	2	Harbor Seals	42°20.36 N 70°53.59 W	Off of Calf Island	No
	12/03/08 0820	12	Harbor Seals	42°20.36 N 70°53.59 W	Outer Brewster Island	
CSO2008 R/V <i>Merganser</i>	12/12/08 0903	1	Harbor Seal	42°23.20 N 71°03.45 W	Mystic River upstream of Tobin Bridge	No

Table 2. Marine Mammal Observer Sightings on 2008 Nearfield and Farfield Surveys.

Survey ID	Date/Time	Number	Mammal	Location	Sighting Comments	Observer Present
WF081 WN081 R/V <i>Andy Lynn VI</i>	2/12/08	0	--	--	No sightings	Yes
	2/17/08	0	--	--	No sightings	
	2/21/08 1705	4	Harbor Seals	42°18.82 N 70°55.05 W	S side of George's Island	
	2/22/08 0625	1	Harbor Seal	42°15.22 N 70°55.37 W	N side of Grape Island	
	2/22/08 0640	10	Harbor Seals	42°18.84 N 70°54.96 W	S side of George's Island	
	2/22/08 0640	9	Harbor Seals	42°18.84 N 70°54.96 W	N side of Hull on Toddy Rocks	
	2/25/08 0730	10	Harbor Seals	42°18.88 N 70°54.86 W	In transit to N10	
	2/25/08 0730	2	Harbor Seals	42°18.88 N 70°54.86 W	In transit to N10	

Survey ID	Date/Time	Number	Mammal	Location	Sighting Comments	Observer Present
WF082 WN082 R/V <i>Tioga</i>	3/3/08 0955	1	North Atlantic Right Whale	41°56.97 N 70°14.17 W	0.25 miles from location	Yes
	3/3/08 1015	1	North Atlantic Right Whale	41°57.62 N 70°14.68 W	0.75 miles from location	
	3/3/08 1025	1	Unidentified Baleen Whale	41°59.79 N 70°15.37 W	Either finback or sei whale; 0.25 from location	
	3/3/08 1125	1	Unidentified Baleen Whale	42°11.01 N 70°19.66 W	0.75 miles from location	
	3/4/08 1625	6	Harbor Seals	42°18.78 N 70°54.85 W	N side of Hull on Toddy Rocks	
	3/6/08	0	--	--	No sightings	
WN083 R/V <i>Aquamonitor</i>	3/25/08 0725	5	Harbor Seals	42°18.55 N 70°55.13 W	Hauled out on Toddy Rocks	Yes
WF084 WN084 R/V <i>Aquamonitor</i>	4/9/08 0740	4	Harbor Seals	42°16.46 N 70°55.86 W	190° and 0.25 miles from location	Yes
	4/9/08 0810	7	Harbor Seals	42°18.57 N 70°55.49 W	030° and 0.5 miles from location	
	4/9/08 0930	1	Harbor Seal	42°13.41 N 70°42.26 W	090° and 0.25 miles from location	
	4/9/08 0950	1	Harbor Porpoise	42°09.74 N 70°39.81 W	270° and 0.1 miles from location	
	4/9/08 1100	1	Harbor Seal	41°57.41 N 70°33.07 W	090° and 0.1 miles from location	
	4/9/08 1110	8	Harbor Seals	41°55.47 N 70°31.38 W	On rocks at Stage Point, Manomet	
	4/9/08 1120	1	Harbor Seal	41°54.97 N 70°30.94 W	090° and 0.1 miles from location	
	4/9/08 1125	1	Harbor Seal	41°54.99 N 70°25.96 W	270° and 0.1 miles from location	
	4/9/08 1130	1	North Atlantic Right Whale	41°53.10 N 70°28.89 W	000° and 0.25 miles from location	
	4/9/08 1135	1	North Atlantic Right Whale	41°52.38 N 70°28.24 W	000° and 1.5 miles from location	
	4/9/08 1145	1	North Atlantic Right Whale	41°51.23 N 70°27.37 W	270° and 0.25 miles from location	
	4/9/08 1150	1	North Atlantic Right Whale	41°51.06 N 70°27.03 W	Station F01	
	4/9/08 1210	2	North Atlantic Right Whales	41°52.00 N 70°23.45 W	020° and 1.5 miles from location	
	4/9/08 1210	2	North Atlantic Right Whales	41°52.00 N 70°23.45 W	010° and 2.9 miles from location	
	4/9/08 1215	1	Harbor Seals	41°52.41 N 70°21.73 W	270° and 0.1 miles from location	
	4/9/08 1230	1	North Atlantic Right Whale	41°52.76 N 70°20.40 W	Station F32	
4/9/08 1250	1	North Atlantic Right Whale	41°54.04 N 70°15.11 W	180° and 1.0 miles from location		

Survey ID	Date/Time	Number	Mammal	Location	Sighting Comments	Observer Present
WF084 (cont.) WN084 R/V <i>Aquamonitor</i>	4/9/08 1400	1	Unidentified Baleen Whale	42°02.71 N 70°16.46 W	090° and 1.5 miles from location	Yes
	4/9/08 1400	1	Unidentified Baleen Whale	42°02.71 N 70°16.46 W	070° and 1.5 miles from location	
	4/9/08 1410	1	Humpback Whale	42°04.50 N 70°16.71 W	030° and 0.75 miles from location	
	4/9/08 1410	1	Unidentified Baleen Whale	42°04.50 N 70°16.71 W	230° and 0.25 miles from location. Possible minke whale	
	4/9/08 1520	1	North Atlantic Right Whale	42°09.93 N 70°25.96 W	180° and 0.75 miles from location. Was slapping tail.	
	4/9/08 1530	1	Finback Whale	42°11.07 N 70°29.14 W	000° and 0.25 miles from location	
	4/9/08 1830	1	Harbor Seal	41°18.60 N 70°54.92 W	270° and 0.25 miles from location	
	4/10/08 0810	6	Harbor Seals	42°20.64 N 70°55.29 W	090° and 0.25 miles from location	
	4/10/08 1330	1	Humpback Whale	42°25.35 N 70°25.83 W	300° and 1.0 miles from location	
	4/10/08 1350	2	Harbor Porpoises	42°23.12 N 70°25.89 W	090° and 0.1 miles from location	
	4/11/08 0955	1	Harbor Porpoise	42°23.46 N 70°45.80 W	000° and 0.1 miles from location	
	4/11/08 1235	1	Harbor Seal	42°21.28 N 70°51.46 W	030° and 0.1 miles from location	
AF081 R/V <i>Aquamonitor</i>	5/16/08	0	--	--	No sightings	No
WN086 R/V <i>Aquamonitor</i>	5/21/08	0	--	--	No sightings	Yes
AF082 R/V <i>Aquamonitor</i>	5/28/08	0	--	--	No sightings	No
AF083 R/V <i>Aquamonitor</i>	6/3/08 1040	1	Harbor Seal	42°32.92 N 70°33.42 W	1.3 km NW of Station AF8	No
WF087 WN087 R/V <i>Aquamonitor</i> R/V <i>Andy Lynn VI</i>	6/9/08 1315	1	Humpback Whale	42°07.00 N 70°17.24 W	3.5 km SSE of Station F29	Yes
	6/9/08 1330	1	Grey Seal	42°07.00 N 70°17.24 W	100 meters NW of Station F29	
	6/9/08 1350	1	Unidentified Baleen Whale	42°07.00 N 70°17.24 W	2 km NW of Station F29. Possible humpback whale	
	6/13/08 1047	1	Harbor Seals	42°17.87 N 70°55.23 W	Hauled out on Toddy Rocks	
	6/16/08 0901	1	Unidentified Baleen Whale	42°23.38 N 70°45.11 W	325 meters W of Station N16. Possible minke whale	
	6/16/08 1329	3-4	Unidentified Baleen Whale	42°24.35 N 70°25.59 W	1.2 km N of Station F28	

Survey ID	Date/Time	Number	Mammal	Location	Sighting Comments	Observer Present
AF084 R/V Aquamonitor	6/24/08 0905	1	Minke Whale	42°23.67 N 70°45.39 W	250 meters W of Station N16	No
	6/24/08 1018	1	Minke Whale	42°33.65 N 70°39.63 W	In transit to Station AF9	
	6/24/08 1210	1	Unidentified Baleen Whale	42°25.39 N 70°31.82 W	Near Station AF6	
WN089 R/V Aquamonitor	7/22/08	0	--	--	No sightings	Yes
WF08B WN08B R/V Aquamonitor	8/18/08	0	--	--	No sightings	Yes
	8/19/08 1018	2	Humpback Whales	42°20.22 N 70°25.55 W	Slightly NW of Station F12. Likely mother and calf	
	8/19/08 1040	4	Humpback Whales	42°25.22 N 70°26.02 W	Slightly SE of Station F28. One whale observed was first seen in 1976	
	8/20/08	0	--	--	No sightings	
WN08C R/V Aquamonitor	9/2/08	0	--	--	No sightings	Yes
WN08D R/V Aquamonitor	9/29/08	0	--	--	No sightings	Yes
WF08E WN08E R/V Aquamonitor	10/24/08	1	Unidentified Baleen Whale	42°07.58 N 70°19.08 W	--	Yes
	10/27/08	1	Harbor Seal	42°20.21 N 70°55.54 W	Next to #13 can in North Channel	
	10/31/08	1	Atlantic White Sided Dolphin	42°23.37 N 70°25.91 W	--	
WN08F R/V Aquamonitor	11/21/08 1250	12	Harbor Seals	42°18.75 N 70°54.69 W	Toddy Rocks N of Hull	Yes
	11/21/08 1250	3	Harbor Seals	42°18.75 N 70°54.69 W	SE side of George's Island	

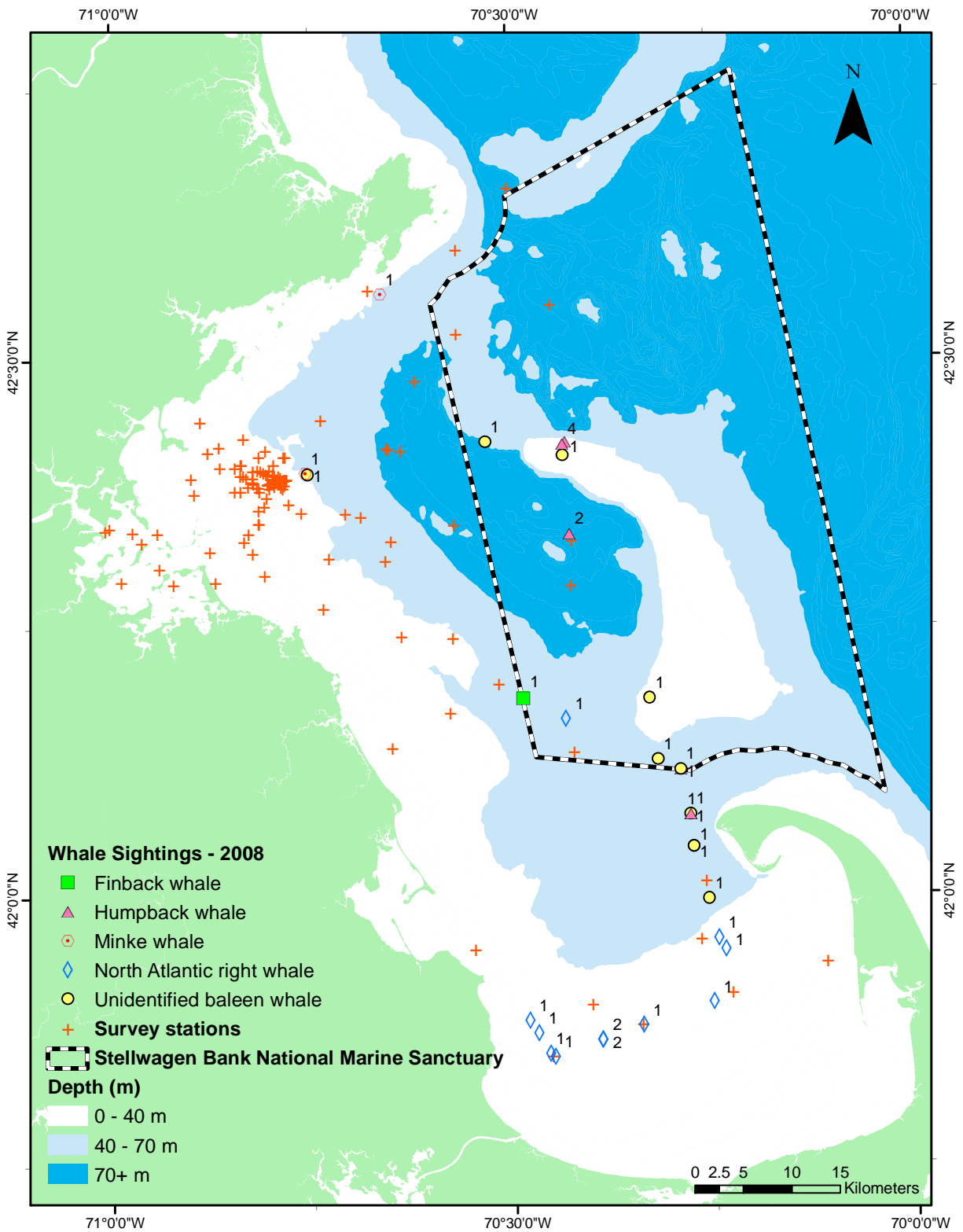


Figure 3. Approximate Locations of Whale Sightings during 2008 Surveys

Note: The data displayed in this figure come from Tables 1 and 2 of this report.

5.0 Discussion

Unlike statistically-based programs or programs that are specifically designed to search for whales, the MWRA sightings are opportunistic and do not follow dedicated and systematic line transect methodology (as mentioned in Section 4.0), therefore, observations are descriptive, not a statistically robust population census.

During 2008, about 143 pinnipeds were sighted. 142 of these were harbor seals and one was a grey seal. These sightings were an increase from 2007 when 96 pinnipeds were reported, and comparable with 2006 when 136 pinnipeds were seen. For comparison, the numbers for 2005 to 2001 were 76, 303, 105, 138, and 138, respectively. Furthermore, in years prior to 2001, only 20 to 60 pinniped sightings were made throughout the survey area. Most observations of pinnipeds are when the vessel is transiting to and from the survey area; the pinnipeds typically resting upon rocks.

Only one Atlantic white sided dolphin was seen in 2008. Also, surveys spotted four harbor porpoise and four additional unidentified porpoise in 2008. To put these numbers into a historical context, about 19-26 dolphins were sighted in 2007, similar to 2006 (24-31 dolphins), 2004 (27+ dolphins), and 1998 (32 dolphins). However, 2007 had an increase in dolphin sightings compared to both 2005, when a small pod was observed, and 2002 when 10-13 dolphins were sighted. For the years 1999, 2000, 2001, and 2003, dolphin sightings averaged between 50 and 112+, with 2003 recording the highest number of dolphins ever sighted for these surveys.

Since 1998, the Provincetown Center for Coastal Studies (PCCS) has conducted systematic surveys of Cape Cod Bay from January through mid-May. In 2008, aerial surveys by PCCS observed right whales in the Cape Cod Bay area for 125 days. According to PCCS, this was considerably longer than in the past four years (92, 100, 97, and 90 days for 2007, 2006, 2005, and 2004 respectively). Additionally, through photographic identification, 148 different right whales were confirmed, along with a number of so far unidentified whales. This number is approximately comparable with the 161 unique individuals sighted in 2007. However, the numbers from 2008 and 2007 are twice the annual average of identified individuals between 1998 and 2006. 47 right whales previously unseen in the Cape Cod Bay area were spotted in 2008. These observations suggest that the Cape Cod Bay area is becoming more attractive to right whales (Leeney *et al.*, 2008).

6.0 Summary of Whale Sightings 1998 through 2008

For the past 14 years, MWRA has collected and reported on the yearly sightings of marine mammals made during program surveys. The same methods have been used to collect whale sighting data over the years, but other factors such as vessels used, areas surveyed and time at each site prevent the data from being used for quantitative statements regarding whale populations in Massachusetts and Cape Cod Bays. The most consistent aspect of the program is that stations were surveyed around the same time of the year for approximately the same number of days. The following text provides a summary and comparison of the MWRA whale sighting data over the last ten years (1998 through 2008). Data prior to 1998 have not been included in this report due to possible differences in data collection methods, changes in survey teams, and variations in time spent in each area. Data for Boston Harbor collected by MWRA was not available prior to 2005; therefore, the data are not included in this comparison.

For this comparison, the whale sightings were grouped into four areas:

- Nearfield (NF; all nearfield stations),
- Stellwagen Bank National Marine Sanctuary (SBNMS; SW1, SW2, SW3, and SW4; stations F12, F27, F28, and F29),
- Cape Cod Bay (CCB; F01, F02, F03, F32, and F33), and
- Farfield (FF; F05, F06, F07, F10, F13, F14, F15, F16, F17, F18, F19, F22, F23, F24, F25, F30, and F31).

During 2008, approximately 29 survey days were spent in Massachusetts and Cape Cod Bays. The Nearfield area was visited at least 12 times during 2008 with a total of seven stations sampled on each survey. Each survey was for one day with vessel time about eight hours per day (approximately 96 hours/year).

During the MWRA surveys from 1998 to 2008, 346-357+ whales of at least four identified species and unidentified species were seen over the past eleven years (Table 2). The highest number of whales (59) was sighted in 1999, due in part to 24-27 finback whales being observed on Stellwagen Bank.

Table 3. Whale Sightings by Area, Species, and Year.

Area	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Total Sightings
Right Whale Observations												
SBNMS	2	1			2					1	1	7
FF	1											1
CCB	1	1		7			3		1		12	25
NF												
Totals	4	2		7	2		3		1	1	13	33
Humpback Whale Observations												
SBNMS	4	12	29+	1	2-5			1	24-27	6	8	87-93+
FF				3	4			3	2-3	1		13-14
CCB					1	2			5		2	10
NF	1											1
Totals	5	12	29+	4	7-10	2		4	31-35	7	10	111-118+
Finback Whale Observations												
SBNMS		27	4		1			1	7		1	41
FF					1		2			1	1	5
CCB							1		2			3
NF					1	1					3	5
Totals		27	4		3	1	3	1	9	1	5	54
Minke Whale Observations												
SBNMS	3		1					1	6+	3		14+
FF	1	3		3		1			1		1	10
CCB			1					15				16
NF	2	1	1	1	1	5	2	1		1	3	18
Totals	6	4	3	4	1	6	2	17	7+	4	4	58+
Unidentified Whale Observations												
SBNMS	5	7	5-6	1	1	2	1	4-6	4+	1	7-8	38-42+
FF	1	2	1	1	2			1		2		10
CCB	1	4	11	3		2		1	1	1	4	28
NF	5+	1				2	2	3			1	14+
Totals	12+	14	17-18	5	3	6	3	9-11	5+	4	12-13	90-94+
Year Totals	27+	59	53-54+	20	16-19	15	11	31-33	53-57+	17	44-45	346-357+

Note: Blank cell denotes no whales observed.

Over half of the overall sightings (54% of the 346-357+) were made within the boundary of Stellwagen Bank (Figures 4 and 5). The area with the second highest whale sightings from 1998 to 2008 was Cape Cod Bay (24% of the 346-357+). Cape Cod Bay had the highest number of right whale sightings (25 out of 33), with the highest concentration of sightings occurring in April 2008 when ten were noted. An additional 11% of whales were sighted just outside Stellwagen Bank western boundary (listed as Farfield). The Nearfield area, which lies over and around the outfall, had just over 11% of the total whale sightings, with minke whales being the dominant species, followed closely by unidentified whale species.

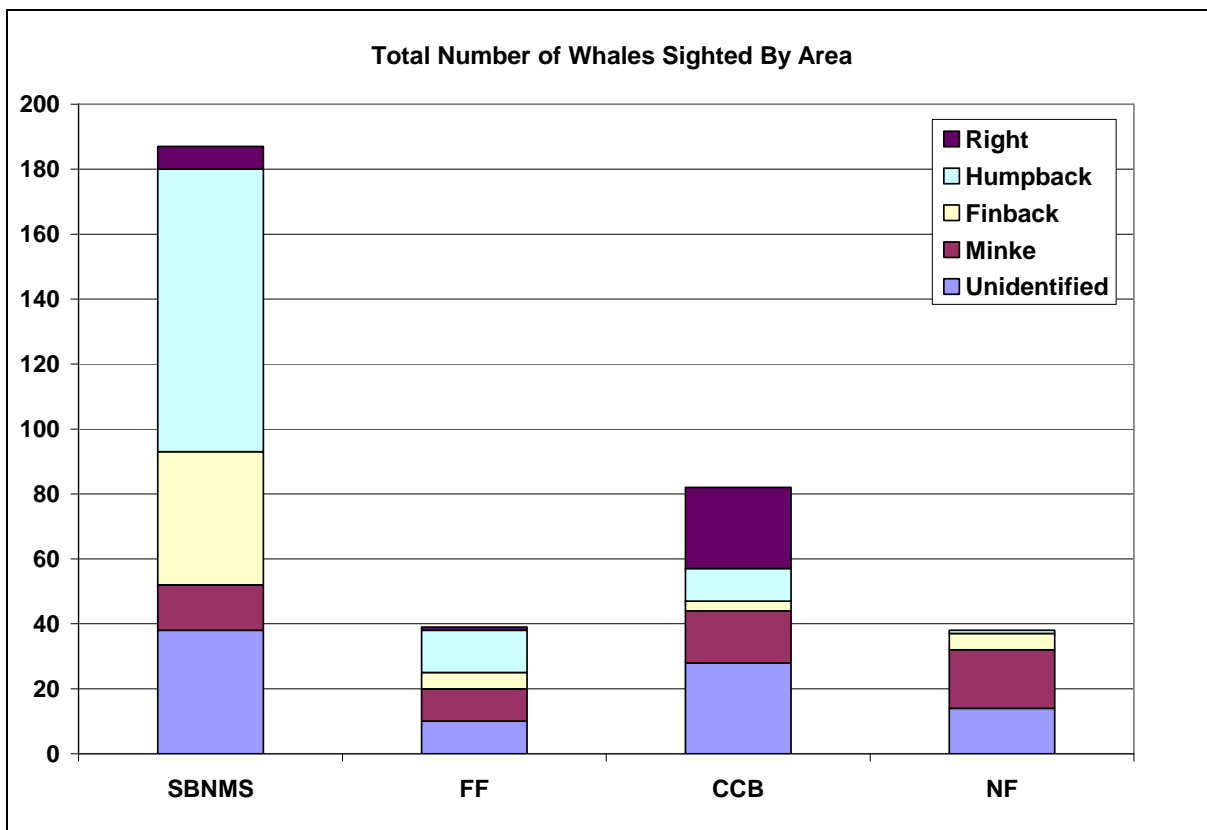


Figure 4. Distribution of Sightings by Species and Area, 1998-2008.

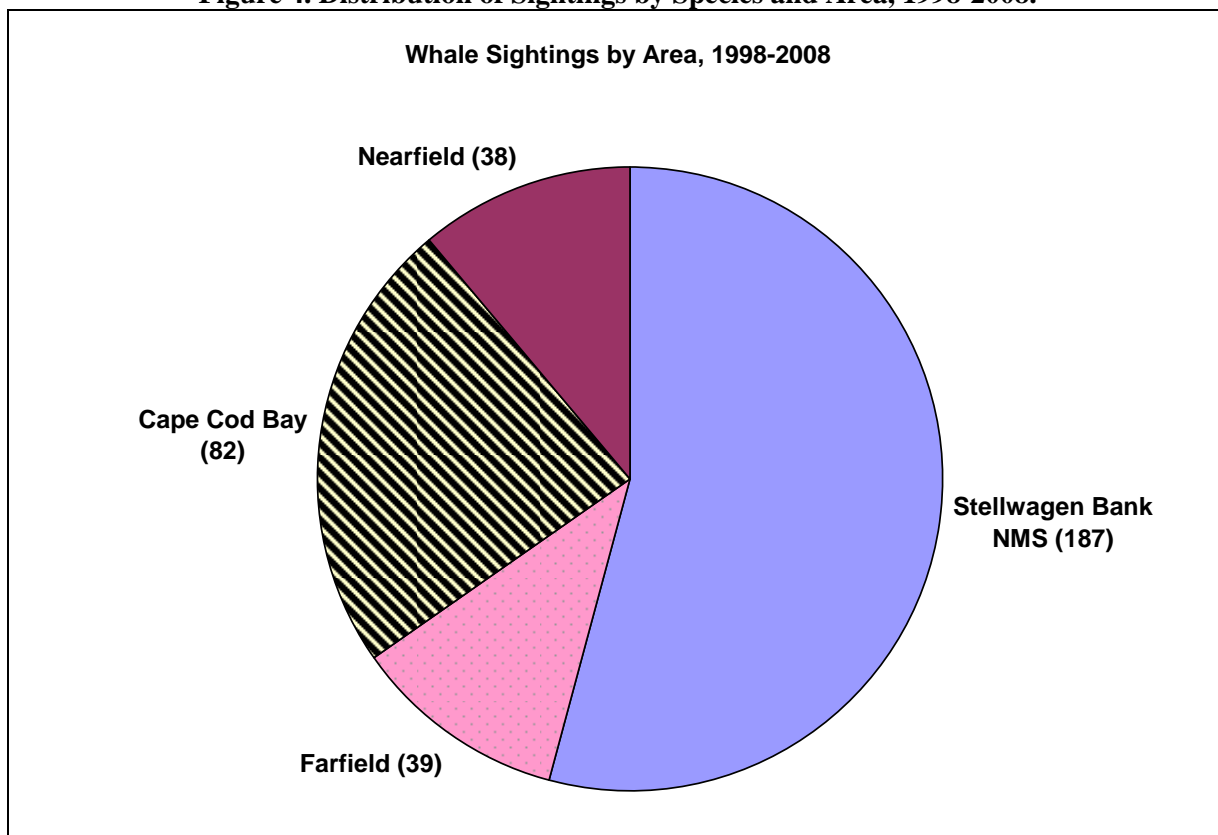


Figure 5. Total Sightings of Whales by Area, 1998-2008.

The most abundant identified whale species noted during the surveys was the humpback whale (111) (Figure 6). The total number of humpback whales represents 32% of the sightings of all whales throughout all of the areas over the years. Furthermore, 78% of humpback whale sightings occurred in the area of Stellwagen Bank. The second most abundant identified whales were the minke and the finback whales, with 17% and 16% of the total sightings, respectively. It should be noted that 26% of the whales sighted from 1998 to 2008 were of unidentified species.

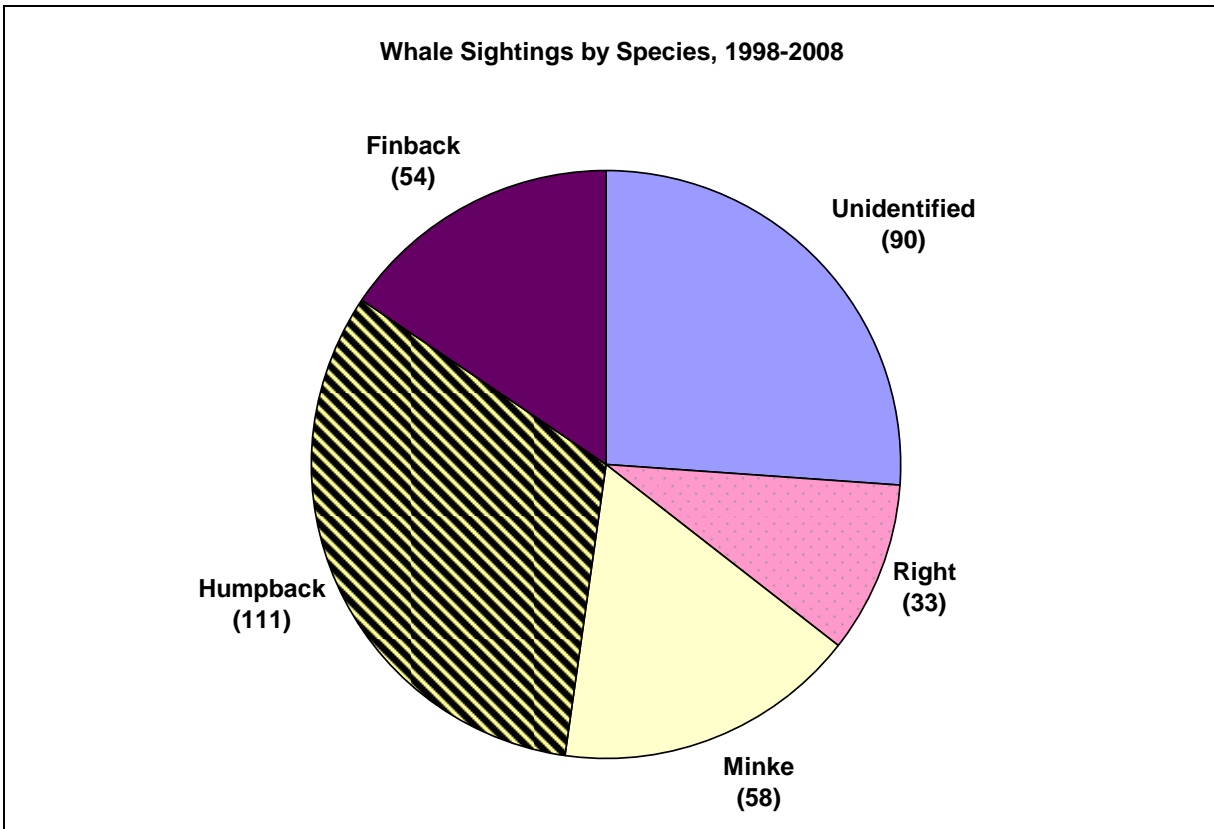


Figure 6. Distribution of Whale Sightings by Species, 1998-2008.

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