

**SUMMARY OF MARINE MAMMAL OBSERVATIONS
DURING 2006 SURVEYS**

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SUMMARY OF MARINE MAMMAL OBSERVATIONS DURING 2006 SURVEYS

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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 (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 15 water quality surveys during 2006. Throughout the year, observers were present on all of the Nearfield water column surveys (n=12) to document the sightings of right whales in the Nearfield. Observers were present on three (WF061, WF062, and WF064) of the six Farfield water column surveys.

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). Within the last five years, 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 mid-April through November (CeTap 1982; 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

Marine mammal observations were performed during all daylight hours while transiting during Nearfield water column surveys (Figure 1), and while the vessel was on-station for sampling operations. Additionally, marine mammal observers were present during three winter/spring Farfield surveys (Figure 2) during the 2006 survey year. 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. Two survey vessels were used as observation platforms during the course of the year. The observer's eye-height above the sea surface was approximately 5 meters on the R/V *Tioga* 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*, F/V *Key Largo*, R/V *First Light*, F/V *Shanna Rose*, and the R/V *Nauset* observed marine mammals while on surveys. These vessels were used to conduct MWRA Boston Harbor surveys and the Fecal Coliform Surveys in the Nearfield and Farfield areas (Figure 3). Similar to the previous year, data from Boston Harbor 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.

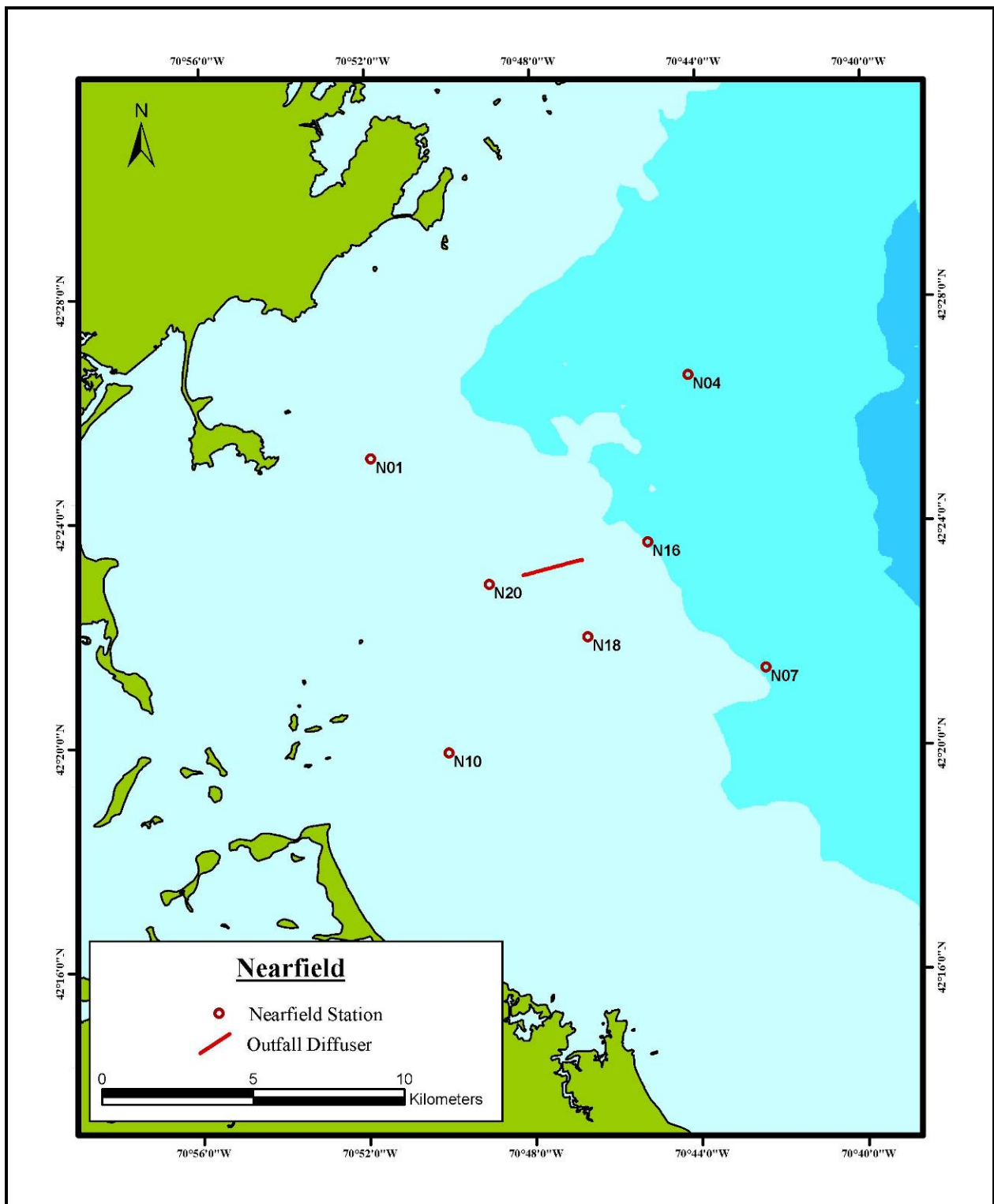


Figure 1. Location of Nearfield Stations

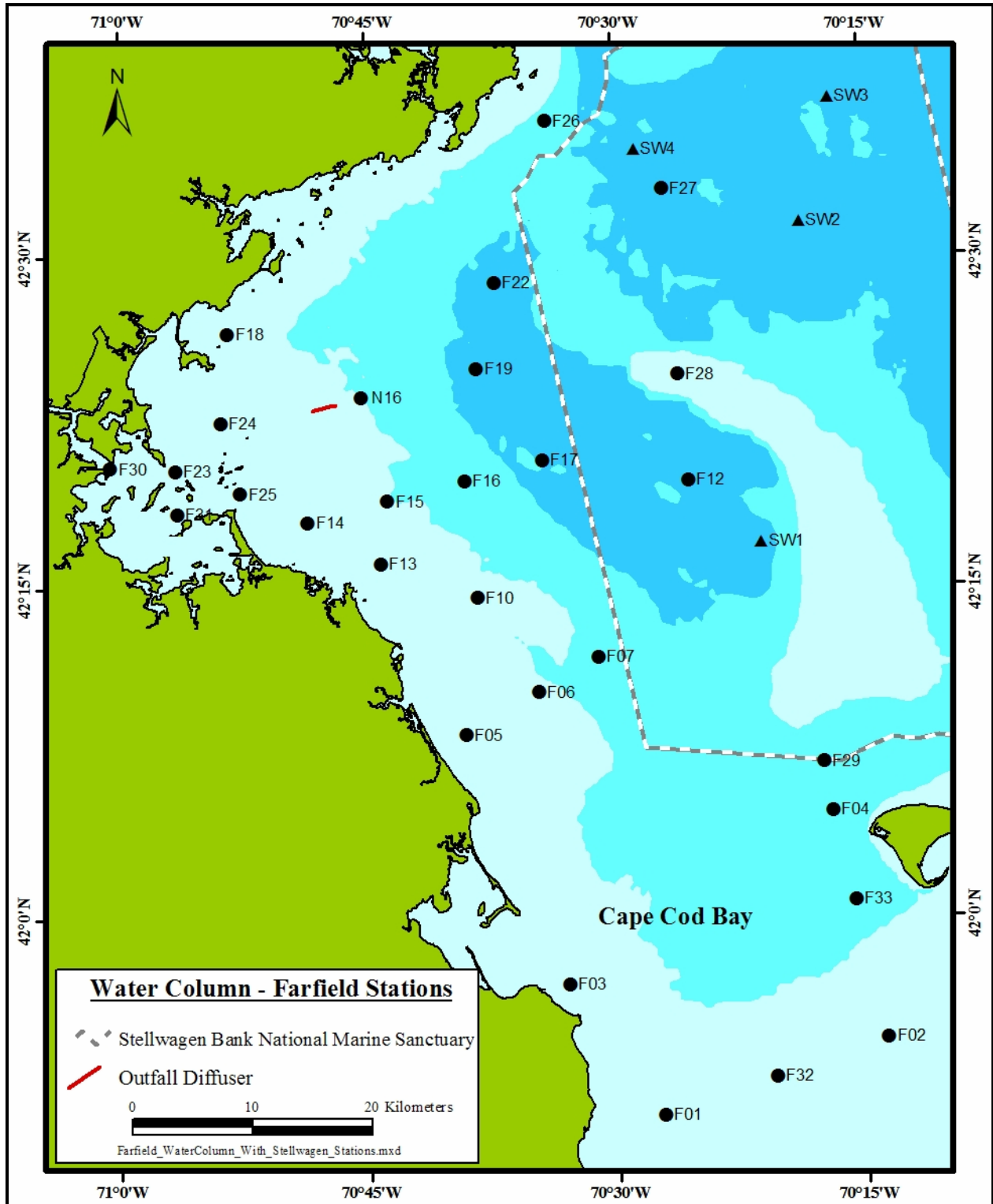


Figure 2. Location of Farfield Stations

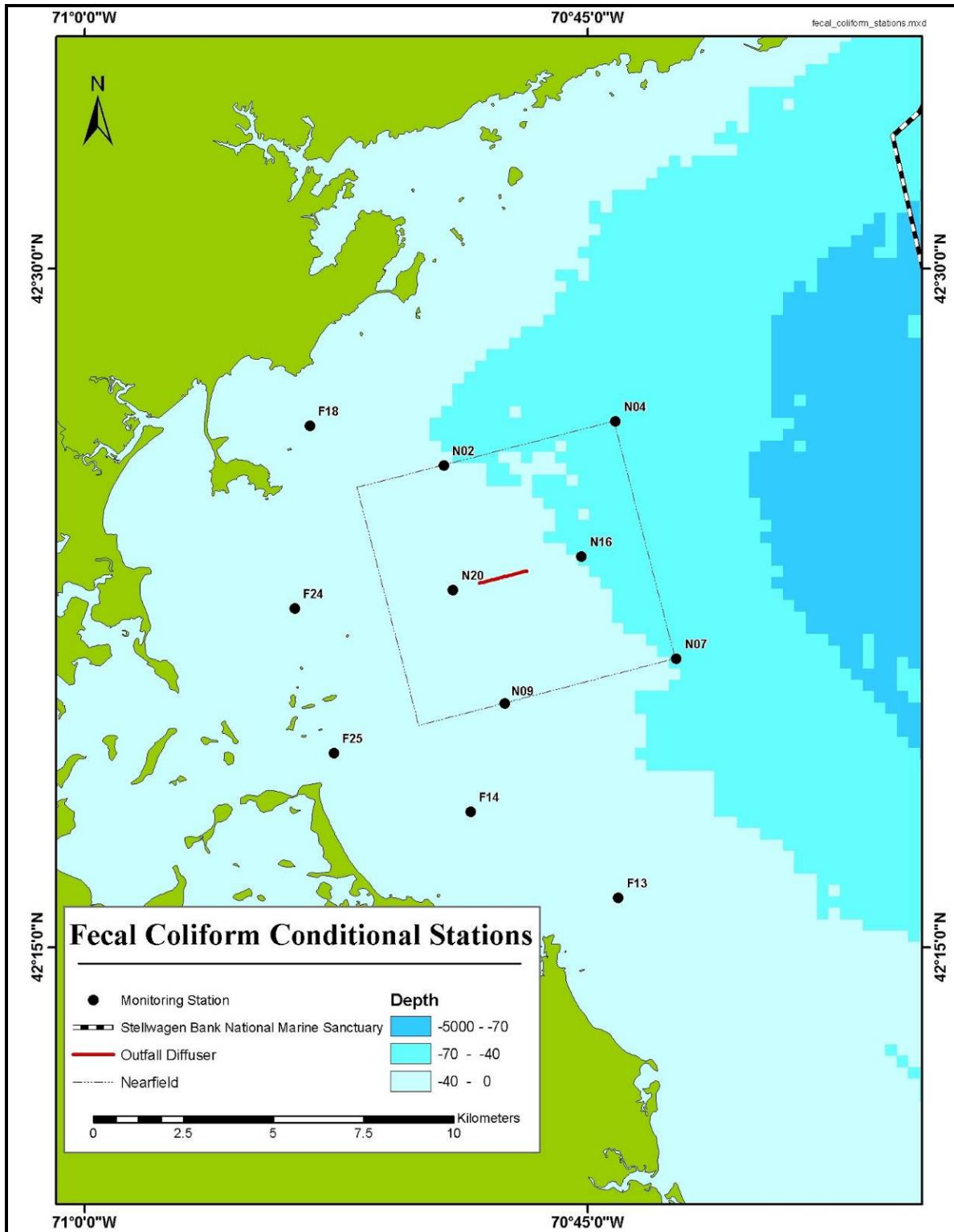


Figure 3. Location of Fecal Coliform/ Adverse Conditional Stations

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. Based on these factors, the ability to extrapolate from observation data to abundance estimates is severely limited and is not advisable. The utility of this data set is thus limited to documentation of the time, location and particulars for each individual occurrence of a sighting and provides useful qualitative information concerning seasonal patterns and relative abundance within the same study area.

During the 2006 monitoring year, the marine mammal observers, Battelle survey team members, and MWRA survey team members counted 53-57+ individual whales, 22+ harbor porpoises, two unidentified porpoises, and 24-31 Atlantic white-sided dolphins. Included in the whale count were one right whale, 31-35+ humpback whales, nine finback whales, more than seven minke whales, and more than five instances of unidentifiable whales. Whale sightings in 2006 were concentrated mainly in Massachusetts Bay (Figure 2) and unlike previous years, no whales were sighted in the vicinity of the Nearfield area (Figure 1). The total number of whales (53-57+) sighted during 2006 was the greatest since 1999 (59 sightings); intervening year-counts were 2005 (32), 2004 (11), 2003 (15), 2002 (16-19), 2001 (20), and 2000 (53+). The sightings of 2006 were comparable to the sightings of 1999, which had 59 sightings (Short *et al.* 2006). It should also be noted that whales were observed on other types of surveys in addition to the water column surveys. Both the Benthic Farfield and Nearfield (BN/BF) survey and the Stellwagen Bank survey (SW), which was conducted for the Stellwagen Bank National Marine Sanctuary, are included in the observations in Table 1, as well as the Boston Harbor surveys conducted by MWRA. In addition to the whales, 136 harbor seals were also sighted during the year. All sightings recorded by a dedicated marine mammal observer or other survey personnel are summarized in Table 1. Whale sighting distribution is presented in Figure 4. The second column in Table 1 provides the figure location and corresponds to a symbol on Figure 4.

Table 1. Marine Mammal Observer Sightings During MWRA 2006 Water Quality Monitoring Program

Survey ID	Figure Location ¹	Date\Time	Count	Mammal	Location	Sighting Comments	Observer Present
BHWQM R/V <i>Merganser</i>		1/5/06	1	Harbor Seal	42°20.59'N/71°00.48'W		No
PC064 R/V <i>Merganser</i>		1/11/06		No sightings			No
CSO-RWM R/V <i>Merganser</i>		1/12/06 1145	1	Harbor Seal		Off CNY Shipyard Quarters Marina	No
BHWQM R/V <i>Merganser</i>		1/24/06 0924	1	Harbor Seal	42°21.59'N/71°02.82'W		No
		1/24/06 1021	1	Harbor Seal	42°18.61'N/71°59.36'W		No
CSO-RWM R/V <i>Merganser</i>		1/30/06 1145	1	Harbor Seal		Off CNY Shipyard Quarters Marina	No
		1/30/06 1300	1	Harbor Seal		Winthrop Yacht Club	No
PC065 R/V <i>Merganser</i>		2/9/06		No sightings			No
WF061/WN061 R/V <i>Tioga</i>		02/10/06 1350	4	Harbor seals	42°19.31'N/070°55.47'W		Yes
		02/10/06 1420	5	Harbor seals	42°19.23'N/070°55.10'W	4 seals were previously sighted, east side of George's Island	Yes
		02/10/06 1440	3	Harbor seals	42°18.73'N/070°55.17'W	Observed at Toddy Rock.	Yes
		02/11/06 1610	3	Harbor seals	42°19.34'N/070°56.03'W	Observed North side of George's Island.	Yes

Table 1. Marine Mammal Observer Sightings During MWRA 2006 Water Quality Monitoring Program

Survey ID	Figure Location ¹	Date\Time	Count	Mammal	Location	Sighting Comments	Observer Present
		02/11/06 1630	3	Harbor seals	42°16.21'N/070°55.95'W		Yes
		02/13/06		No sightings			Yes
BHWQM R/V <i>Merganser</i>		2/16/06 0845	1	Harbor Seal		Off CNY Shipyard Quarters Marina	No
WF062/WN062 R/V <i>Tioga</i>		02/28/06		No sightings			Yes
		03/01/06		No sightings			Yes
		03/02/06 0700	5	Harbor seals	42°18.79'N/070°55.19'W	Observed on Toddy Rock, North side of Hull	Yes
		03/02/06 0700	3	Harbor seals	42°18.79'N/070°55.19'W	Observed on South side of George's Island on rocks.	Yes
WN063 R/V <i>Aquamonitor</i>		03/22/06 0720	1	Harbor seal	42°16.44'N/070°55.98'W	Observed on North side of George's Island on rocks.	Yes
BHWQM R/V <i>Merganser</i>		3/23/06 0856	1	Harbor Seal		Off CNY Shipyard Quarters Marina	No
PC066 R/V <i>Merganser</i>		3/24/06		No sightings		Eiders & winter ducks	No
WN064/WF064 R/V <i>Aquamonitor</i>		04/10/06		No sightings			Yes
	1	04/11/06 1030	1	Unidentified Baleen whale	42°17.28'N/070°27.12'W	Observed by scientific crew.	Yes
	2	04/11/06 1102	1	Finback whale	42°20.52'N/070°25.45'W		Yes
		04/11/06 1130	15-20	Atlantic white-sided dolphins	42°24.60'N/070°25.99'W		Yes
	3	04/11/06 1135	1	Finback whale	42°24.66'N/070°26.02'W	Observed by vessel captain.	Yes
		04/11/06 1136	3-5	Atlantic white-sided dolphins	42°24.82'N/070°26.07'W	Gannets also observed.	Yes
	4	04/11/06 1140	1	Finback whale	42°25.39'N/070°26.14'W		Yes
		04/11/06 1255	1	Harbor seal	42°35.71'N/070°33.48'W		Yes
	5	04/11/06 1452	1	Minke whale	42°22.89'N/070°36.27'W		Yes
		04/11/06 1615	1	Harbor seal	42°19.98'N/070°44.05'W		Yes
		04/11/06 1722	6	Harbor seals	42°18.72'N/070°54.76'W		Yes
		04/12/06 0729	8	Harbor seals	42°18.85'N/070°54.23'W	Observed on rocks.	Yes
		04/12/06 1013	1	Harbor seal	42°23.60'N/070°45.24'W		Yes
		04/12/06 1016	1	Harbor seal	42°18.61'N/070°45.19'W		Yes
		04/12/06 1019	1	Harbor porpoise	42°23.63'N/070°45.20'W	Observed by Station N16.	Yes
		04/12/06 1600	5	Harbor seals	42°18.74'N/070°54.56'W	Hauled out on rocks.	Yes
		04/14/06* 0650	5	Harbor seals	42°16.41'N/070°55.80'W	Observed on rocks North side of Grape Island.	Yes
		04/14/06 0720	10	Harbor seals	42°18.81'N/070°54.31'W	Observed on rocks on South side of George's Island.	Yes
		04/14/06 0720	15	Harbor seals	42°18.81'N/070°54.31'W	Observed on Toddy Rock, North side of Hull.	Yes
		04/14/06 0950	2	Atlantic white-sided dolphins	42°08.00'N/070°20.20'W		Yes
	6	04/14/06 0950	1	Minke whale	42°08.00'N/070°20.20'W		Yes
	7	04/14/06 0950	2	Humpback whales	42°08.00'N/070°20.20'W	Cow/calf pair observed.	Yes
	8	04/14/06 1000	1	Minke whale	42°07.16'N/070°17.81'W	Observed at Station F29.	Yes
		04/14/06 1000	1	Harbor porpoise	42°07.16'N/070°17.81'W	Observed at Station F29.	Yes
	9	04/14/06 1000	4	Finback whales	42°07.16'N/070°17.81'W	Observed at Station F29.	Yes
	10	04/14/06 1010	1	Minke whale	42°07.00'N/070°17.39'W	Observed at Station F29.	Yes

Table 1. Marine Mammal Observer Sightings During MWRA 2006 Water Quality Monitoring Program

Survey ID	Figure Location ¹	Date\Time	Count	Mammal	Location	Sighting Comments	Observer Present
	11	04/14/06 1030	1	Minke whale	42°07.02'N/070°17.37'W	Observed at Station F29.	Yes
	12	04/14/06 1045	1	Humpback whale	42°02.50'N/070°16.27'W	Observed between Wood End Light and Racepoint Light.	Yes
	13	04/14/06 1045	1	Right whale	42°02.50'N/070°16.27'W	Observed between Wood End Light and Racepoint Light.	Yes
		04/14/06 1050	4	Atlantic white-sided dolphins	42°02.29'N/070°15.93'W	Dolphins observed in all directions around vessel.	Yes
	14	04/14/06 1050	2	Humpback whales	42°02.29'N/070°15.93'W		Yes
	15	04/14/06 1050	2	Finback whales	42°02.29'N/070°15.93'W		Yes
	16	04/14/06 1050	1	Humpback whales	42°02.29'N/070°15.93'W		Yes
		04/14/06 1100	2	Harbor porpoise	42°00.84'N/070°15.58'W		Yes
		04/14/06 1100	8	Harbor porpoise	42°00.84'N/070°15.58'W		Yes
		04/14/06 1110	2	Harbor porpoise	41°59.32'N/070°15.06'W		Yes
	17	04/14/06 1110	1	Humpback whale	41°59.32'N/070°15.06'W		Yes
		04/14/06 1110	2	Harbor porpoises	41°59.32'N/070°15.06'W		Yes
		04/14/06 1110	1	Harbor seal	41°59.32'N/070°15.06'W		Yes
		04/14/06 1130	1	Harbor porpoise	41°56.46'N/070°14.22'W		Yes
PC067 R/V <i>Merganser</i>		4/14/06		No sightings			No
Spotted from land		4/26/06	2	Harbor porpoises		Off DI dock	No
PC068 R/V <i>First Light</i>		5/16/06		No sightings			No
WN066 R/V <i>Aquamonitor</i>		05/17/06		No sightings			Yes
PC069 R/V <i>Merganser</i>		6/6/06		No sightings			No
WF067/WN067 R/V <i>Aquamonitor</i>		06/19/06		No sightings			No
		06/20/06		No sightings			Yes
	18	06/21/06 1212	5-8	Humpback whales	42°24.60'N/070°26.00'W	Observed Northeast of Station F28.	No
	19	06/21/06 1212	1	Minke whale	42°24.60'N/070°26.00'W	Observed Northeast of Station F28.	No
PC070 R/V <i>Merganser</i>		7/12/06 1134	1	Harbor seal	42°22.90'N/70°49.03'W	Dying dogfish b/w N16 & N04	No
WN069 R/V <i>Aquamonitor</i>		07/19/06		No sightings			Yes
BF061/BN061 R/V <i>Aquamonitor</i>						Hundreds of birds feeding on the water surface: petrels and shearwaters. Observed while in transit from Station FF04 to Station FF05.	
	20	08/03/06 1105	1+	Humpback whales	42°17.30'N/070°25.50'W		No
		08/03/06 1105	1+	Harbor porpoises	42°17.30'N/070°25.50'W	Observed while in transit from Station FF04 to Station FF05.	No
	21	08/03/06 1130	1+	Minke whales	42°17.30'N/070°25.50'W	Observed bubble-net feeding. Observed while in transit from Station FF04 to Station FF05.	No
	22	08/03/06 1135	~4	Humpback whales	42°17.30'N/070°25.50'W	Observed while in transit from Station FF04 to Station FF05.	No
	23	08/03/06 1300	1+	Humpback whales	42°08.00'N/070°25.35'W	Observed while in transit from Station from FF05 to Station FF07.	No
PC071 R/V <i>Merganser</i>		8/9/06		No sightings			No

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Survey ID	Figure Location ¹	Date\Time	Count	Mammal	Location	Sighting Comments	Observer Present
WF06B/WN06B/ SW061 R/V <i>Aquamonitor</i>		08/21/06		No sightings			No
		08/22/06 0710	1	Harbor Seal	42°17.49'N/070°55.65'W	Hauled out on Toddy Rock.	Yes
	24	08/23/06 1051	4	Humpback whales	42°20.35'N/070°26.55'W	Observed while in transit to Station F28.	No
	25	08/23/06 1108	2	Humpback whales	42°24.60'N/070°26.00'W	Observed south of Station F28.	No
	26	08/23/06 1120	1+	Unidentified whale	42°24.60'N/070°26.00'W	Whales bubble feeding Southeast of Station F28. Others observed west of Station F28.	No
	27	08/23/06 1129	2	Humpback whales	42°25.72'N/070°24.95'W	Observed while in transit to Station SW2.	No
	28	08/23/06 1140	3	Humpback whales	42°27.40'N/070°22.90'W		No
	29	08/24/06 1050	1	Unidentified whale	42°03.80'N/070°16.46'W		No
WN06C R/V <i>Aquamonitor</i>		09/05/06		No sightings			Yes
PC072 R/V <i>Merganser</i>		9/7/06		No sightings			No
WN06D R/V <i>Aquamonitor</i>		10/03/06		No sightings			Yes
PC073 R/V <i>Merganser</i>		10/4/06 0848	1	Harbor Seal	42°20.39'N/70°47.48'W	Salps visible throughout Mass Bay	No
		10/4/06 0947	1	Harbor porpoise	42°21.36'N/70°42.36'W	Salps visible throughout Mass Bay	No
		10/4/06 1009	1	Harbor porpoise		½ way b/w N07 & N16 Salps visible throughout Mass Bay	No
CSO-RWM R/V <i>Key Largo</i>		10/16/06 0950	1	Harbor Seal	42°23.06'N/71°02.55'W		No
CSO-RWM R/V <i>Merganser</i>		10/17/06 0830	1	Harbor Seal	42°20.74'N/71°01.21'W		No
WF06E/WN06E/ SW062 R/V <i>Aquamonitor</i>		10/23/06		No sightings			No
		10/24/06		No sightings			No
	30	10/27/06 1042	2-3	Humpback whales	42°36.12'N/070°33.90'W	Observed while on Station F26.	No
	31	10/27/06 1211	1	Unidentified whale	42°33.56'N/070°25.39'W	Observed while in transit to Station SW3.	No
	32	10/27/06 1420	1+	Unidentified whales	42°25.63'N/070°24.84'W	Observed while in transit to Station F28.	No
		10/31/06 0945	1	Unidentified odontocete	42°21.36'N/070°42.37'W	Observed while on Station N07.	Yes
		10/31/06 1105	1	Unidentified odontocete	42°21.31'N/070°46.74'W	Observed while on Station N18.	Yes
		10/31/06 1205	7	Harbor seals	42°19.34'N/070°55.46'W	Observed Southeast side of George's Island on rocks.	Yes
		10/31/06 1205	13	Harbor seals	42°19.34'N/070°55.46'W	Observed on Toddy Rock, North side of Hull.	Yes
		10/31/06 1222	1	Harbor seal	42°17.00'N/070°55.40'W	Observed in water.	Yes
BHWQM R/V <i>Merganser</i>		10/27/06 0831	1	Harbor Seal	42°22.12'N/71°02.81'W		No
CSO-RWM R/V <i>Merganser</i>		11/1/06 1215	1	Harbor Seal	42°20.73'N/71°00.68'W		No
CSO-RWM R/V <i>Merganser</i>		11/14/06 1208	1	Harbor Seal	42°21.28'N/71°02.72'W		No
CSO-RWM R/V <i>Merganser</i>		11/15/06 1230	1	Harbor Seal	42°18.35'N/71°02.43'W		No

Table 1. Marine Mammal Observer Sightings During MWRA 2006 Water Quality Monitoring Program

Survey ID	Figure Location ¹	Date\Time	Count	Mammal	Location	Sighting Comments	Observer Present
WN06F R/V <i>Aquamonitor</i>		11/18/06		No sightings			Yes
PC074 R/V <i>First Light</i>		11/27/06		No sightings			No
BHWQM R/V <i>Merganser</i>		11/29/06 0848	1	Harbor Seal	42°22.45'N/71°02.26'W		No
		11/29/06 0916	1	Harbor Seal	42°20.40'N/70°59.89'W		No
CSO-RWM R/V <i>Merganser</i>		12/5/06 0839	1	Harbor Seal	42°20.01'N/71°02.09'W		No
		12/5/06 1240	1	Harbor Seal	42°21.01'N/71°01.04'W		No
PC075 F/V <i>Shanna Rose</i>		12/11/06		No sightings			No
CSO-RWM R/V <i>Merganser</i>		12/12/06 0802	1	Harbor Seal	42°20.75'N/71°01.13'W		No
		12/12/06 0805	1	Harbor Seal	42°21.01'N/71°01.04'W	100 yards away from 1 st seal	No
		12/12/06 1213	1	Harbor Seal	42°20.27'N/70°59.61'W		No
CSO-RWM R/V <i>Merganser</i>		12/13/06 0939	1	Harbor Seal	42°16.56'N/71°02.73'W		No
PC076 R/V <i>Nauset</i>		12/18/06		No sightings			No
CSO-RWM R/V <i>Merganser</i>		12/19/06 0810	1	Harbor Seal	42°20.59'N/71°00.48'W		No
		12/19/06 0826	1	Harbor Seal	42°20.77'N/71°01.30'W		No
		12/19/06 0840	1	Harbor Seal	42°21.11'N/71°02.03'W		No
		12/19/06 0856	1	Harbor Seal	42°22.20'N/71°03.00'W		No
CSO-RWM R/V <i>Merganser</i>		12/20/06 0842	1	Harbor Seal	42°20.56'N/71°01.72'W		No
		12/20/06 0851					No
		12/20/06 0856	2	Harbor Seal	42°20.56'N/71°01.72'W		No
BHWQM R/V <i>Merganser</i>		12/22/06 0822	1	Harbor Seal	42°22.11'N/71°02.78'W		No

¹“Figure Location” refers to the numbers in Figure 4, which identify the location of where the whale(s) were observed.

²“No sightings” means that the marine mammal observer, Battelle survey team members, or MWRA survey team members did not see any animals on that day.

* It is important to note that individual identification of the animals on 4/14/06 was not possible and some sightings may represent duplicate sightings of the same individual.

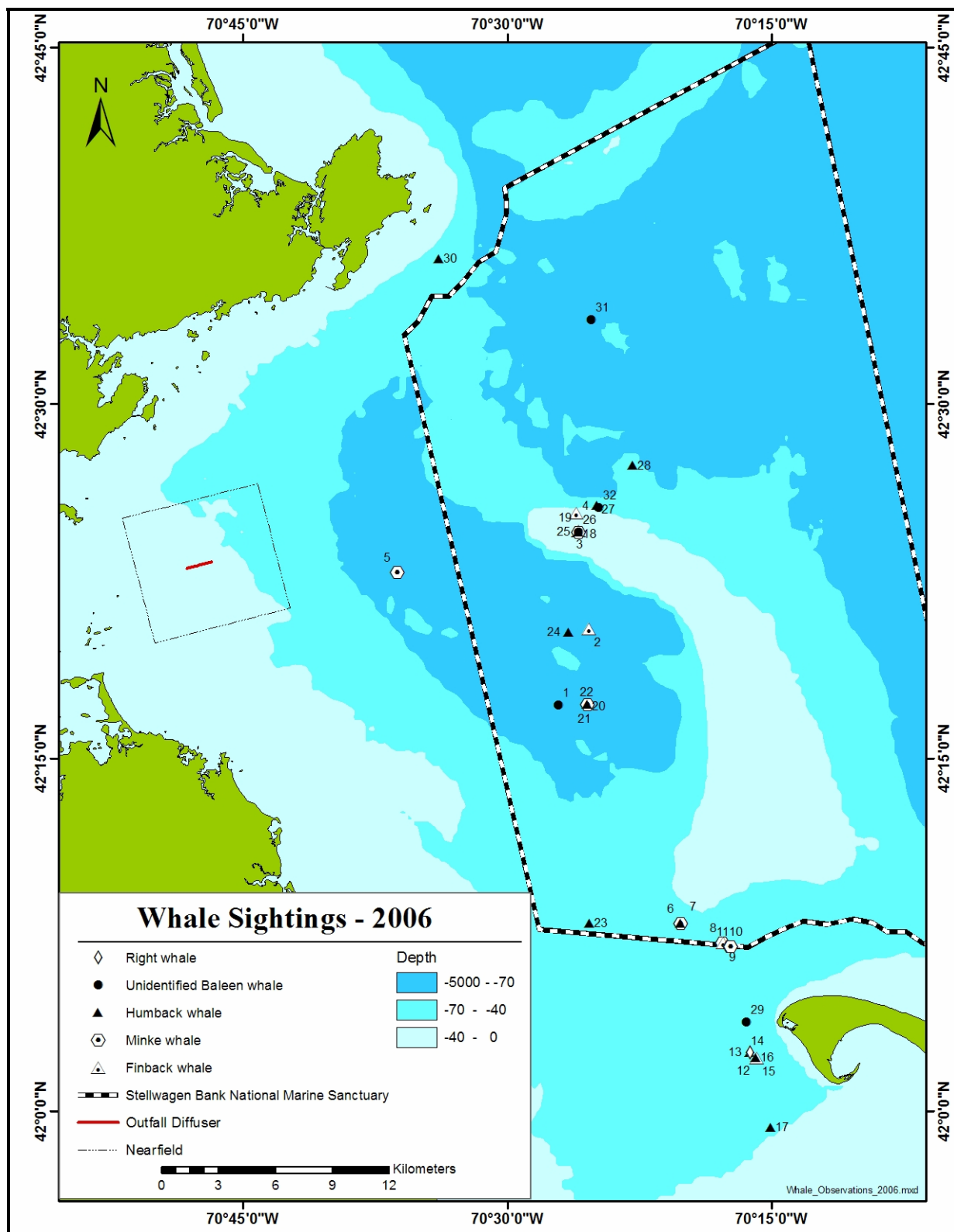


Figure 4. Approximate Locations of Whale Sightings during 2006 MWRA Water Quality Surveys

Note: The data displayed in this figure come from Table 1 of this report. Numbers in the Figure corresponds to “Figure Location” of Table 1.

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). However, some generalizations can be made.

Of the 53-57+ whales sighted on the surveys, 21 whales were sighted by a dedicated observer, which was substantially greater than in recent years 2005 (n=6), 2004 (n=7), 2003 (n=13), 2002 (n=6). Furthermore, the number of whales sighted in 2006 were similar to the number of whales sighted by a dedicated observer between 1998-2001 years (n = between 16 and 31) as well.

During 2006, more than 136 pinnipeds were sighted; an increase in number compared to sightings that occurred in 2005 when only 76 were observed. However, 136 pinnipeds is low compared to 2004 when 303 were observed. The 2006 pinniped counts were similar to 2003, 2002, and 2001 (105, 138, and 138, respectively). Furthermore, in years prior to 2001, only 20 to 60 pinniped sightings were made throughout the survey area. It should be noted that most observations of pinnipeds are when the vessel is transiting to and from the survey area, with the pinnipeds typically resting upon rocks.

About 24-31 dolphins were sighted in 2006, similar to 2004 (27+ dolphins) and 1998 (32 dolphins). However, 2006 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.

Whale Center of New England sighting records for the season show that whales observed in Massachusetts Bay and Stellwagen Bank increased notably from the past several years. Many adult humpback and fin whales were seen surface feeding on abundant sand lance (*Ammodytes* spp.) schools over the shallow waters of the Bank itself for much of the year. Humpback whale mother-calf pairs were also more abundant than they had been in the previous five years. North Atlantic right whales were present in unusual numbers, often surface feeding, both over the shallow waters of Stellwagen Bank and in the deeper waters of Massachusetts Bay at least for the second half of April and the first half of May, but were not seen with any consistency during summer (as had been the case from 2003-2005). As was the case for each year since 2001, humpback and fin whales were also numerous relatively close to shore west and northwest of Stellwagen during September and October. At times up to 25-30 humpbacks, and approximately an equal number of fin whales, were seen feeding (apparently on some kind of plankton), often within five miles of the end of the outfall tunnel. Unlike past years, this included a number of adult humpback whales, including mothers with calves, along with the juvenile whales that had been predominant during previous year's sightings. This represented a level of use equivalent to 2005, which had been higher than any other such fall plankton feeding aggregation documented. The Whale Center's sightings database comes from a variety of platforms, including whale watch boats operating out of Provincetown, Boston, and Gloucester, MA, and a dedicated research vessel operating out of Gloucester, MA. Their sightings are generally a result of dedicated searches with some survey effort as well (Whale Center of New England, unpublished data).

Over the last nine years, the Provincetown Center for Coastal Studies (PCCS) has conducted systematic surveys of Cape Cod Bay from January through mid-May. In 2006, right whales were present in the Cape Cod Bay Critical Habitat area for at least 91 days between January 29 and May 8, 2006 (Jaquet et al. 2006). A total of 305 right whale sightings were recorded from aerial surveys and research cruises in Cape Cod Bay and adjacent waters, of which 290 were photographed. The 290 photographed sightings represent a minimum of 99 individuals, at least 78 of which were sighted in Cape Cod Bay. This number is higher than the average number from 1998-2005, but the average residency time (period between first

and last sightings of an individual excluding gaps when not sighted during three or more surveys) in the bay was shorter than in those years. This shorter individual residency time was likely related to a relatively low zooplankton density (as measured by PCCS sampling) throughout the season. The number of right whales identified is a minimum estimate because a small portion of the sightings have not yet been matched to or confirmed to match an individual in the catalogue. In 2006, a large proportion of right whales were observed in the southwestern portion of the Bay and around Race Point to the northeast. This is in contrast to 2004 and 2005 when most sightings were to the east (Jaquet et al 2006). (Provincetown Center for Coastal Studies, January 2007).

6.0 Summary of Whale Sightings 1998 through 2006

For the past 12 years, MWRA has collected and reported on the yearly sightings of whales made during program surveys. The same methods have been used to collect whale sighting data over the years, but other factors such as platforms 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 nine years (1998 through 2006). 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. Observations were made in Boston Harbor by MWRA. However, the data for Boston Harbor was not available prior to 2005 and 2006; therefore, the data are not included in the comparison. One interesting note is that in 2005 one humpback whale was observed in Boston Harbor.

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

- Nearfield (NF; all nearfield stations),
- Stellwagen Bank National Marine Sanctuary (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 2006, at least 70 survey days were spent in Massachusetts and Cape Cod Bays. The Nearfield area was visited at least 12 times during 2006 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). In previous years, the Nearfield area was visited at least 17 times with 21 stations sampled during the survey. The remaining areas are visited during six or more surveys covering 1 to 3 days in an area, depending on the vessel track and weather. There is variability in the number of survey days from year to year, however this is not a major factor in the difference of sighting numbers per year.

During these MWRA surveys, 285-295+ whales of at least four identified species and unidentified species were seen over the past eight years (Table 2). In 2006, 53-57+ whales were observed, which is the second highest number of whales observed in a single year, partly due to the high number (24-27+) of humpback whales being observed on Stellwagen Bank. The highest number of whales (59) was sighted in 1999, due in part to 27 finback whales being observed on Stellwagen Bank. In the following year (2000), more than 29 humpback whales were noted on Stellwagen Bank bringing the total number of whales sighted in the year to more than 53. The lowest number of whales (11) was sighted in 2004.

Table 2. Sightings by Area, Species, and Year

Area	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total Sightings
Right Whale Observations										
SBNMS	2	1			2					5
FF	1									1
CCB	1	1		7			3		1	13
NF										
Totals	4	2		7	2		3		1	19
Humpback Whale Observations										
SBNMS	4	12	29+	1	2-5			1	24-27+	73-79+
FF				3	4			3	2-3	12-13
CCB					1	2			5	8
NF	1									1
Totals	5	12	29+	4	7-10	2		4	31-35+	94-101+
Finback Whale Observations										
SBNMS		27	4		1			1	7	40
FF					1		2			3
CCB							1		2	3
NF					1	1				2
Totals		27	4		3	1	3	1	9	48
Minke Whale Observations										
SBNMS	3		1					1	6+	11+
FF	1	3		3		1			1	9
CCB			1					15		16
NF	2	1	1	1	1	5	2	1		14
Totals	6	4	3	4	1	6	2	17	7+	50+
Unidentified Whale Observations										
SBNMS	5	7	5-6	1	1	2	1	4-6	4+	30-33+
FF	1	2	1	1	2			1		8
CCB	1	4	11	3		2		1	1	23
NF	5+	1				2	2	3		13+
Totals	12+	14	17-18	5	3	6	3	9-11	5+	74-77+
Year Totals	27+	59	53-54+	20	16-19	15	11	31-33	53-57+	285-295+

Note: Blank cell denotes no whales observed.

Half of the overall sightings (57% of the 285-295+) were made within the boundary of Stellwagen Bank (Figures 5 and 6). The area with the second highest whale sightings from 1998 to 2006 was Cape Cod Bay (22% of the 285-295+). Cape Cod Bay had the highest number of right whale sightings (13 out of 19), with the highest concentration of sightings occurring in April 2001 when seven were noted. An additional 11% of whales were sighted just outside Stellwagen Bank western boundary (listed as Farfield).

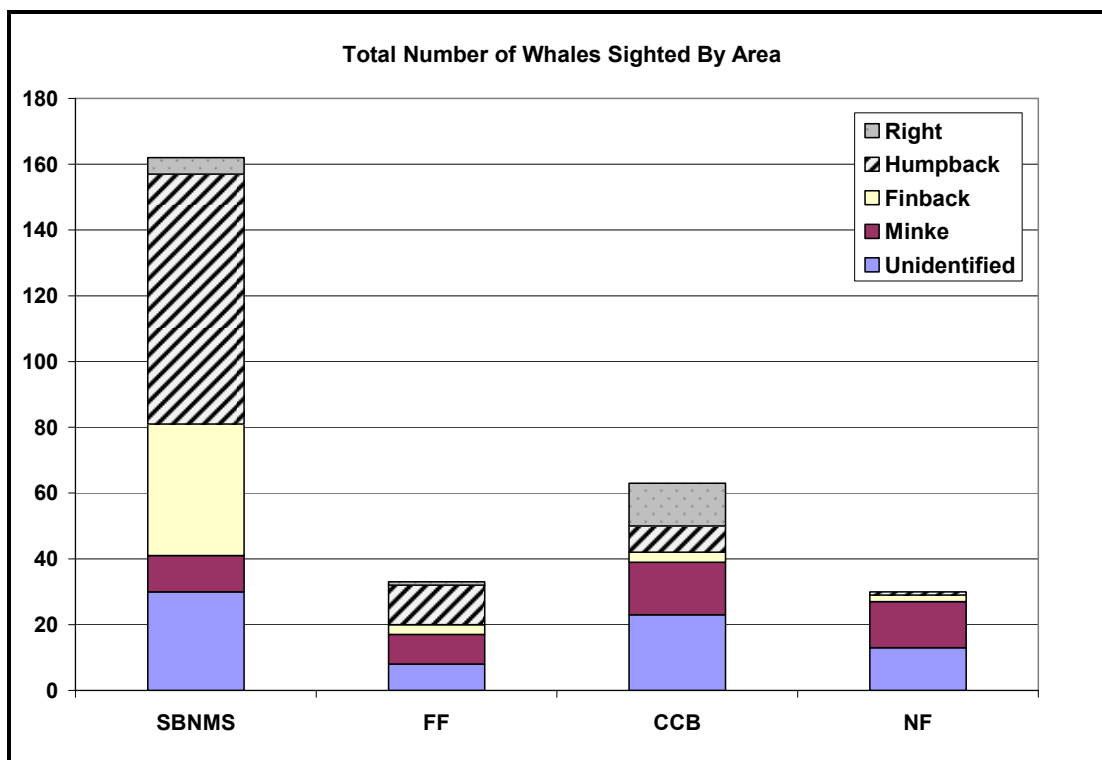


Figure 5. Distribution of Sightings by Species and Area, 1998-2006

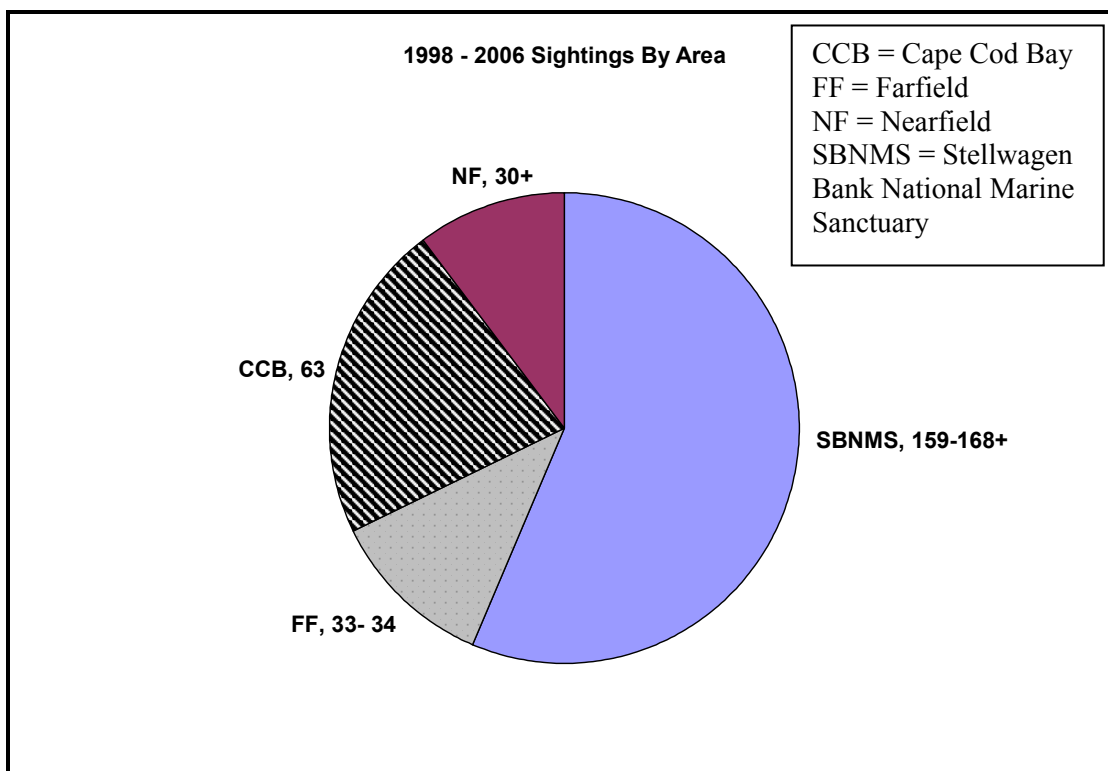


Figure 6. Total Sightings of Whales by Area, 1998-2006

The Nearfield area, which lies over and around the outfall, had 10% of the total whale sightings, with minke whales being the dominant species. It should be noted that no whales were observed in the Nearfield area during the 2006 surveys. An interesting caveat of the Nearfield sightings is that this area receives the most concentrated effort towards observations of whales relative to the other 3 areas.

The most abundant identified whale species noted during the surveys was the humpback whale (94-101+) (Figure 7). The total number of humpback whales represents 33% of the sightings of all whales throughout all of the areas over the years. Furthermore, most of these sightings occurred in the area of Stellwagen Bank. The total number of humpback whale sightings (73-79) on Stellwagen Bank represents 77% of the sightings for this whale. The second most abundant identified whales were the minke and the finback whales, each with 17% of the sightings. It should be noted that over the years a large number (74-77+) of unidentified whales have been observed and recorded.

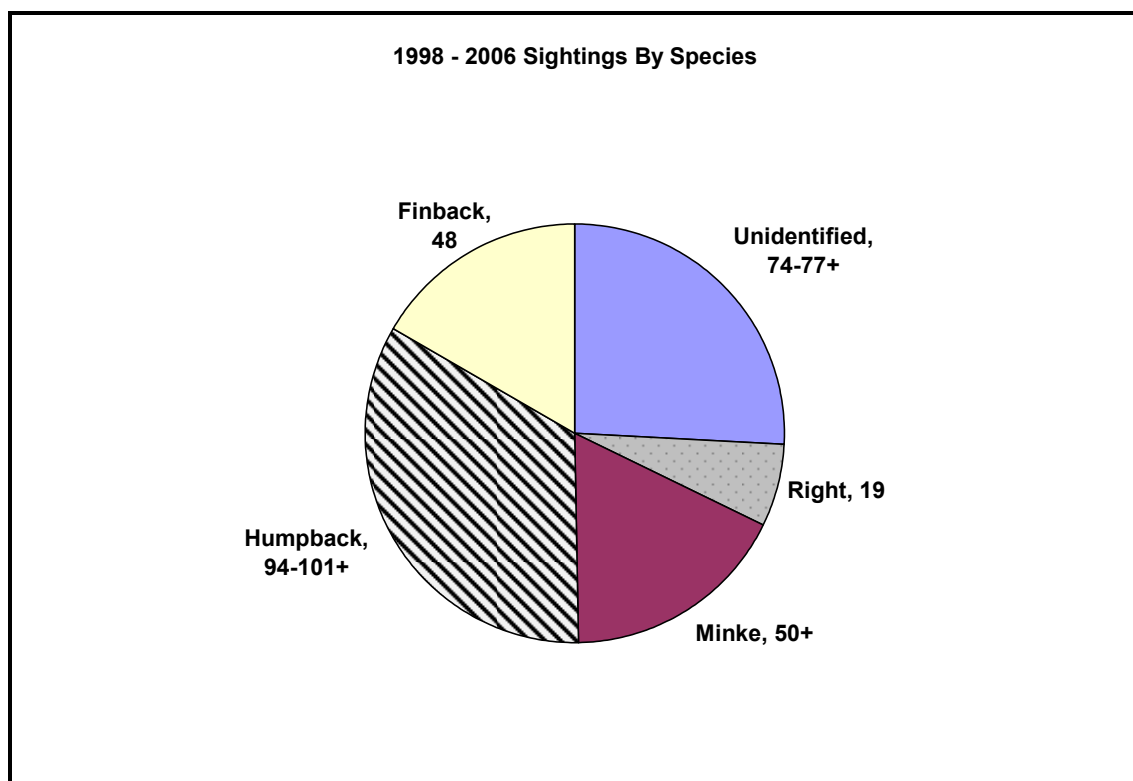


Figure 7. Distribution of Sightings within the Four Identified and Unidentified Species Categories

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