I. INTRODUCTION

Passive acoustic surveys have become an effective means of monitoring both the natural and anthropogenic contributions to ambient noise levels in the world’s oceans. Autonomous and cabled hydrophones are now used widely to study the sounds generated by undersea earthquakes, ice noise, and marine animals. Research has also confirmed that low-frequency (〈1000 Hz) human sources of noise pollution have dramatically increased over the last 50 years (Andrew et al., 2002; McDonald et al., 2008). The primary sources of low-frequency anthropogenic noise are the sounds associated with shipping, military and research activities, and oil and gas exploration and development (Richardson et al., 1995; Croll et al., 2001; Hildebrand, 2009). Of growing concern is the effect these increasing levels of low-frequency noise have on protected species, such as baleen whales that are acoustically sensitive and use low-frequency sound for communication and possibly navigation or prey-finding (Richardson et al., 1995; Clark et al., 2009). In particular, the sounds from airgun surveys have been the focus of several recent marine mammal investigations (e.g., Di Iorio and Clark, 2010; Madsen et al., 2006; Weir, 2008a,b), and the potential and observed effects have been reviewed [e.g., National Research Council (NRC), 2003, 2005; Gordon et al., 2004; Bradley and Stern, 2008]. To assess the potential effects of airgun sounds on whales, the temporal and geographical occurrence of this sound and the distribution of species that are potentially impacted must be described.

In 1999, a consortium of U.S. investigators deployed an array of autonomous hydrophones (Fox et al., 2001) to monitor seismic activity along the Mid-Atlantic Ridge (Smith et al., 2002; Dziak et al., 2004). Although this experiment was designed to monitor the low-frequency signals of earthquakes, the instruments were also capable of recording the low-frequency calls of several species of baleen whales, as well as anthropogenic sounds such as ship noise and seismic airgun pulses. These instruments were located within potential migratory routes for fin (Balaenoptera physalus) and blue (B. musculus) whales and were in a remote region that rarely if ever is included in marine mammal surveys (Mellinger and Barlow, 2003).