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To understand how ocean noise can effect marine animals, we must first try and imagine what it is like to mainly sense your environment through sound, as most marine animals do, instead of primarily through sight, like we do. This is because sound is transmitted so efficiently through water, carrying sometimes thousands of kilometers underwater, whereas vision is only useful for distances of a few meters underwater. So, marine creatures often need to listen to the faint sounds of their prey or predators, they may use sound to orient or select suitable habitat (as has been recently shown for some reef fish larvae), they may produce sounds for mating, and they may communicate with their group members using sound. All this in a marine environment that is becoming progressively noisier through shipping, seismic air guns used by the oil and gas industry, and high-intensity naval sonars, to name the top three noise sources. So, these animals are attempting to cope with an ever more opaque "acoustic smog" that is enveloping them, where silence is becoming an increasingly precious commodity.

Given how dependent most marine animals are on sound, do we really expect this significant change to their environment to have no serious impact? Bear in mind that noise from just a single seismic survey flooded through a region of almost 300,000 sq. km. Noise levels increased by two orders of magnitude and stayed that way nearly continuously for days at a time (IWC 2004). So we are talking about being assaulted by noise around the clock. Seismic noise from around Nova Scotia measured 3,000 km away in the middle of the Atlantic, formed the predominant part of the background noise. Moreover, throughout the summer, this noise was heard over 80% of the time. Whale calls seemed to sometimes be obscured or masked by the seismic air gun noise (Nieukirk et al. 2004). This effect could easily cause negative impacts on whale populations, since it is thought that some species of whale find mates by long-range calls.

International scientific bodies like the International Whaling Commission's Scientific Committee are recognizing the problem. In their 2004 report, the Committee noted: "The potential impact of seismic surveys on certain whale species within a critical habitat is deemed very high." They also noted that: "…repeated and persistent acoustic insults [over] a large area…should be considered enough to cause population level impacts". That means that the health of certain whale populations could be threatened. Whales have also been displaced from their feeding grounds, deflected from their migration paths, and have changed their calls due to noise.

Whales have even suffered lethal effects in the form of strandings (Balcomb and Claridge 2001; Frantzis 1998). Injuries seen recently in stranded whales were not typical of other mass strandings. Whales showed hemorrhaging around their brain and ears and in other structures to do with hearing (Jepson et al. 2003; NOAA and U.S. Navy 2001). These whale strandings were often linked with U.S. Navy ships using a powerful type of sonar. This sonar has been around since the early 1960s, which just happens to be when a certain species of whale started to mass strand. Not only have such strandings been tied to intense naval sonars, but seismic air gun noise has been implicated in whale strandings as well (Engel et al. 2004; Taylor et al. 2004).

Even more amazingly, several giant squid have apparently mass stranded in response to seismic air guns. When examined, they all had internal injuries, some of them massive, as in disintegrated muscles and unrecognizable organs. All the squid had badly damaged ears (MacKenzie 2004).. This, from a species that was unknown to even hear, not too long ago. Invertebrate marine species such as giant squid were always considered to be less sensitive to noise effects than fish, but they have surprised us in the severity of their reactions. Another invertebrate marine species, the snow crab, when exposed to seismic noise displayed bruised organs, abnormal ovaries along with hemorrhaging, stress, delayed embryo development, smaller larvae, greater leg loss, and so on (DFO 2004).

And of course several studies on fish also point toward cause for concern. Seismic air guns have been shown to severely damage fish ears permanently at distances of from 500 m to several kilometers (McCauley et al. 2003). Reduced catch rates of 50-80% and decreased abundances in species such as cod, haddock, rockfish, herring, and blue whiting have been reported with exposure to seismic air guns (Dalen

and Knutsen 1987; Engas et al. 1996; Lokkeborg 1991; Skalski et al. 1992; Slotte et al. 2004). These effects can last up to 5 days after exposure and at distances of 30 kms or so from a seismic survey. Increases in stress (Santulli et al. 1999) and strong behavioral reactions have been observed in fish as a reaction to noise. Day-to-night movements of fish were changed during long-term exposure to air guns (Wardle et al. 2001). Fish sometimes also showed reactions like dropping to deeper depths, becoming motionless, increasing their activity, or forming a compact school (Chapman and Hawkins 1969; Dalen and Knutsen 1987; McCauley et al. 2000; Pearson et al. 1992; Santulli et al. 1999; Skalski et al. 1992; Slotte et al. 2004). All these reactions could translate into impacts on the population in ways we cannot really predict.

Noise may interfere with mating (Rowe and Hutchings 2003) such that fish populations have a harder time recovering, impaired hearing in fish will almost certainly compromise their survival, and larval fish may not be able to orient back to their natal reef (Simpson et al. 2005). We recognize that the marine environment is under enormous pressure as it is—we do not want noise to sound the death knell.

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