

The Controlled Exposure Experiment – Development of an Experimental Methodology for Assessing the Impact of Noise on Marine Mammals

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ABSTRACT

While there is concern about the potential effects of noise from human activities on marine mammals, it is very difficult to determine whether a particular noise exposure has an effect, and if it does, to assess the long term consequences. So many variables affect the behaviour of marine mammals in relation to the use of sound that it is difficult to distinguish behavioural reactions in response to a particular noise exposure from unrelated behaviour. A lot is known about the sounds produced by marine mammals, but much less is known about how these are used, particularly for baleen whales. This paper describes the methodology and some results of “Controlled Exposure Experiments” developed by the Humpback Whale Acoustic Research Collaboration (HARC), a multinational project studying the effects of noise on humpback whales migrating along the Queensland coast. It combines the different methods of experimental control used in the physical sciences with those of the biological sciences. Part of the methodology is to minimise the effects of as many variables as possible by choice of the conditions of experiment, and to allow for the effects of other variables by establishing baseline knowledge of their effects on normal acoustic behaviour and then to measure these variables during noise exposure. This involves a wide range of multidisciplinary and multiplatform measurements and observations, including the behaviour at and below the surface of subject animals, the movements and vocal behaviour of all other conspecifics in the area, as well as the environmental acoustic conditions (propagation, ambient noise) affecting the use and reception of sound.