

Science for Environment Policy

The first direct measures of how Cuvier's beaked whales respond to military sonar

Two tagged Cuvier's beaked whales have shown intense and lasting avoidance behaviours in response to military sonar. In the first study of this kind, the whales showed significant responses to sonar at volumes that are currently assumed in the US to have no effect on behaviour.

Unusual mass strandings of whales and dolphins have been linked with use of military mid-frequency active (MFA) sonar, developed to enable submarines to detect other vessels [underwater](#). It has been proposed that these underwater bursts of [sound](#) affect behaviour, leading to strandings.

The sensitivity of Cuvier's beaked whales to sonar is of particular concern, as this species makes up 69% of the strandings linked to MFA. For this research, the authors carried out controlled exposure experiments on two Cuvier's beaked whales off the coast of southern California, USA. This is the first study to directly measure the behavioural responses of this species to MFA.

The experiments consisted of attaching tags to the whales which recorded the level of sound reaching the whale, the noises produced by the whale and the movements of the animal. The whales were then exposed to MFA sonar for 30 minutes from a stationary source, between 3.4 and 9.5 km away.

During the course of the experiment the 'volume' of the sonar was increased from 160 dB re 1 μ Pa-m (a measure of acoustic pressure) to 210 dB re 1 μ Pa-m. These levels are currently considered in the US to be too low to affect whale behaviour.

By coincidence, the second whale was also exposed to MFA sonar from a naval vessel 118 km away. The tags on the whales showed that the levels of sound reaching them were 84–144 dB re 1 μ Pa (root-mean-square, or rms, sound pressure level) (from the research source) and 78–106 dB re 1 μ Pa (rms) (from the naval vessel).

To compare how the behaviour of the whales exposed to sonar differed from normal behavior, the researchers used data from 15 whales tagged in the same way which were not exposed.

The results demonstrated clear responses to the research sonar. Initially both whales reduced their movements, perhaps to better monitor the sound. As the volume increased the whales stopped producing any sounds themselves and began to swim quickly away from the source. Both whales sustained some form of avoidance response long after the sonar ended, over an hour and a half in both cases.

Surprisingly, the whale that was exposed to sonar from the naval vessel did not show any avoidance behaviours, even though volumes were comparable. The researchers speculate that this may mean that the distance from the source, as well as the volume itself, can affect whales' responses. This should be taken into account in further research.

The researchers conclude that these results can have serious implications. Rapid movements away from sonar might result in strandings. If whales cease making any noises themselves for sustained periods, as found in this study, it will prevent them from foraging, as these animals locate prey through echolocation.

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