How is that whale listening?

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Researchers from San Diego State University and the University of California have been using computer models to mimic the effects of underwater noise on an unusual whale species and have discovered a new pathway for sound entering the head and ears.

Advances in Finite Element Modeling (FEM), Computed tomography (CT) scanning, and computer processing have made it possible to simulate the environment and anatomy of a Cuvier's beaked whale when a sonar signal is sent out or received by the whale.

The research paper, published today, Monday, February 4, 2008, in the Institute of Physics' Journal, *Bioinspiration & Biomimetics*, is a catalyst for future research that could end years of speculation about the effects of underwater sound on marine mammals.

FEM is a technique borrowed from engineering used, for example, to simulate the effect of an earthquake on a building. By inputting the exact geometry and physical properties of a building the effect of forces such as an earthquake, or in this case noise vibrations, can be accurately predicted.

Dr Cranford of San Diego State University triggered the research into Cuvier's beaked whales almost ten years ago when he undertook the first ever CT scan of a large whale, which provided researchers with the very complex anatomic geometry of a sperm whale's head.

Dr Cranford said, "I think that the methods developed for this research

have the potential to revolutionize our understanding of the impact of noise on marine organisms."

Since 1968, it has been believed that noise vibrations travel through the thin bony walls of toothed whales' lower jaw and onto the fat body attached to the ear complex. This research shows however that the thin bony walls do not transmit the vibrations. In fact they enter through the throat and then pass to the bony ear complex via a unique fatty channel.

Despite the Cuvier's beaked whale being a rare and little-known specie, Dr Cranford and his team started the work on it because over recent years there have been instances when this type of whale has stranded after exposure to intense sound, making them an ideal starting point for research into underwater communication.

Source: Institute of Physics