

Review of underwater noise and its effects on marine animals

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This talk reviews the issues and research concerning marine anthropogenic noise and its effects on animals. A 1994 low frequency tomography experiment (ATOC) aroused public concern about the possible effects of acoustic exposure on whales. Alarmist environmental predictions, based on gaps in scientific knowledge, triggered the formation of expert panels which listed the needed research, some of which has recently been completed. Over time public concern shifted to low frequency naval sonar, pile driving, and mid-frequency sonar, and from marine mammals to fish. New research shows that auditory injury in mammals may occur within about 500 m of the most intense acoustic sources. TTS onset in dolphins occurs at about 195 dB re 1 $\mu\text{Pa}^2\cdot\text{sec}$ (SEL), the dynamic ranges of their ears are 20 dB greater than in humans, and PTS onset (scant evidence) occurs between 40 and 60 dB of TTS. It is still uncertain whether fish experience PTS because damaged hair cells may regenerate. Fish somatic tissue injury has been well quantified for barotrauma but not for acoustic exposure per se. The behavioral effects of acoustic exposure on any marine animals are poorly known. Noise exposure criteria for marine mammals are now available, and similar criteria for fish and turtles are being written. Scientifically the key question is whether animal reproduction and survival rates will decrease from masking effects as ambient noise levels increase? More data on long-term trends in marine ambient noise are needed.