



## F Temporary threshold shift not found in ice seals exposed to single airgun impulses

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We measured low-frequency (100 Hz) hearing thresholds in trained spotted seals (*Phoca largha*) and ringed seals (*Pusa hispida*) before and immediately after controlled exposures to impulsive noise from a small (10 in<sup>3</sup>) seismic airgun. Threshold shifts were determined from psychoacoustic data, and behavioral responses to the impulse noise were scored from video recordings. Four incremental exposure conditions were established by manipulating both the distance and the operating pressure of the airgun, with received sound levels ranging from 190 to 207 dB re 1  $\mu$ Pa peak SPL and 165–181 dB re 1  $\mu$ Pa<sup>2</sup>-s SEL. We found no evidence of temporary threshold shift (TTS,  $\geq 6$  dB) in four subjects tested up to eight times each per exposure condition, including at levels previously predicted to cause TTS. Relatively low-magnitude behavioral responses were observed during noise exposure and indicate that individuals can learn to tolerate loud, impulsive sounds, but this does not necessarily imply that similar sounds would not elicit stronger behavioral responses in wild seals. The maximum exposure values used here can improve precautionary estimates for TTS onset from impulse noise in pinnipeds. However, additional studies using multiple impulses and/or higher exposures are needed to identify the actual noise conditions that induce changes in hearing sensitivity.