

AUDITORY STUDIES WITH BEARDED SEALS: SOUND SENSITIVITY AND THE EFFECTS OF NOISE

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Bearded seals (*Erignathus barbatus*) have a circumpolar Arctic distribution and are closely associated with moving, broken ice. They spend nearly all of their lives in off-shore, remote habitats; as a result, their biology and behavior remain largely unknown. With respect to sensory biology, bearded seals—like other marine mammals—rely on acoustic cues to support a range of behaviors including orientation, communication, predator avoidance, and prey detection. However, the ability of bearded seals to perceive sound has never been investigated. In this study, a go/no-go behavioral paradigm was applied to determine auditory profiles for two young bearded seals trained to participate in hearing tests. Underwater detection thresholds were measured in quiet conditions for tonal sounds ranging from 0.10 - 61 kHz. The seals displayed sensitive underwater hearing, with peak sensitivity of 50 dB re 1 μ Pa and a broad range of best hearing from 0.35 - 45 kHz. To evaluate their ability to detect signals embedded within background noise, thresholds were then measured in the presence of octave-band masking noise. Like other phocinae seals, the bearded seals performed particularly well at this task compared to other mammals, with critical ratios ranging from 12 dB at 200 Hz to 30 dB at 25.6 kHz. Finally, one bearded seal completed additional testing to evaluate hearing before and immediately following voluntary exposure to single- and multiple-shot impulses from a seismic air gun. Collectively, these psychoacoustic studies describe the hearing capabilities of bearded seals in quiet conditions, in the presence of simultaneous noise, and following seismic noise exposure. Combined with recently reported data for spotted and ringed seals, they inform regulatory guidelines regarding best management practices for marine mammals in a rapidly changing Arctic environment.

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