Acoustical Society of America
The Journal of the Acoustical Society of America

Ultra-high-frequency hearing in seals and sea lions in the context of other secondarily aquatic mammals

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J. Acoust. Soc. Am. **140**, 3298 (2016); http://dx.doi.org/10.1121/1.4970487

The underwater hearing abilities of marine mammals near the upper frequency limit of hearing are poorly understood. While the maximum frequency of hearing is often identified following a sharp roll-off in sensitivity, it is apparent that many marine mammals can perceive high-amplitude tonal sounds above this frequency region. We recently measured underwater detection thresholds in quiet conditions in the 50-180 kHz range for one California sea lion, one spotted seal, and one harbor seal. Absolute sensitivity curves from these subjects exhibited two distinct slope regions at frequencies near the high-frequency hearing limit. The first region is characterized by an initial, rapid decrease in sensitivity with increasing frequency—*i.e.* a steep slope—while the second shows a much less rapid sensitivity decrease—*i.e.* a shallower slope. An additional masking study conducted with one of the seals suggested that the initial, rapid decrease in sensitivity is not due to cochlear constraints, as has been proposed, but rather due to constraints on the underlying bone-conduction mechanism. These results can be viewed in the context of the selective pressures influencing ultra-high-frequency hearing in other aquatic mammals, including those capable of specialized echolocation.