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**Title:**
Underwater hearing and communication in the endangered Hawaiian monk seal (Neomonachus schauinslandi)

**Abstract:**

Monk seals are among the most endangered marine mammals, and the most primitive phocid seals. We lack substantive bioacoustic information for monk seals, with no formal descriptions of underwater vocalizations and limited data concerning their ability to hear underwater sounds. The auditory biology of monk seals is compelling from behavioral, conservation, and evolutionary perspectives. These seals have been isolated for more than 10 million years, and have auditory structures that differ from those of other living species. Unlike other aquatically mating phocids, monk seals breed asynchronously and are not known to produce social calls in water. To address knowledge gaps, we thoroughly evaluated a single captive individual. A mature male Hawaiian monk seal was trained to perform a psychophysical task while submerged. Sound detection thresholds were measured for narrowband tones across the frequency range of hearing. Additionally, an acoustic recorder was placed in the seal's living enclosure, enabling characterization of spontaneous vocalizations and seasonal trends in calling. We found this individual to have best hearing from 1 to 25 kHz, with reduced high-frequency hearing relative to other species. In contrast to an early report, this seal could readily detect low-frequency sounds, however hearing at all frequencies was less sensitive than in other true seals. Despite the absence of conspecifics, the seal regularly produced at least six different underwater calls with spectral energy below 1 kHz. Seasonal calling patterns reflected a period of reproductive activity lasting more than seven months, coincident with elevated testosterone levels and increased production of all call types. This study presents the first examination of underwater vocalizations in Hawaiian monk seals, provides insight into the perceptual abilities of this species and the evolution of underwater hearing within the phocid lineage, and enables improved assessments of noise effects on these vulnerable seals. [Supported by US Navy's LMR Program].