

## Underwater Vocal Behavior in Male Spotted Seals (*Phoca largha*)

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The acoustic ecology of spotted seals (*Phoca largha*) remains largely unknown, due to their association with unstable pack ice during the breeding season, their presumed aquatic breeding habits, and their sympatric distribution in sub-arctic regions with closely related harbor seals (*Phoca vitulina*). As a result, distance sampling tools that rely on acoustics cannot yet be applied with spotted seals. Captive studies can support passive acoustic monitoring efforts by describing fundamental features of species-typical vocalizations emitted by known individuals. These features include acoustic parameters as well as developmental, seasonal, and sex-based patterns in vocal behavior. In this study, we observed two male spotted seals in captivity from age 3 months through adulthood (8 years). We scored vocal behavior daily and opportunistically recorded spontaneous calls emitted by these individuals at known distances with calibrated receivers. The production of underwater calls emerged during sexual maturation, at age 4. To evaluate vocal repertoire and fine-scale temporal patterns of sound production in adult seals, an underwater acoustic recorder was continuously deployed with these seals at age 7-8 years. The spotted seals produced at least eight distinctive underwater call types with dominant energy below 1 kHz. For the most common call type, source level was ~140 dB re 1  $\mu$ Pa (sound pressure level at 1m). There was a marked annual peak in vocal activity in spring, prior to the yearly molt. This period coincided with increased aggressive behavior and musky odor indicative of heightened reproductive status. Our results from developing male spotted seals reared in captivity, obtained in the absence of conspecific females, confirm the production of recognizable, stereotypic underwater calls associated with the breeding season. These findings can be used to inform the use of autonomous acoustic recorders to track the presence and movements of free-ranging seals in remote habitats. [Supported by OGP JIP on Sound and Marine Life, NOAA NA16NMF4390027].