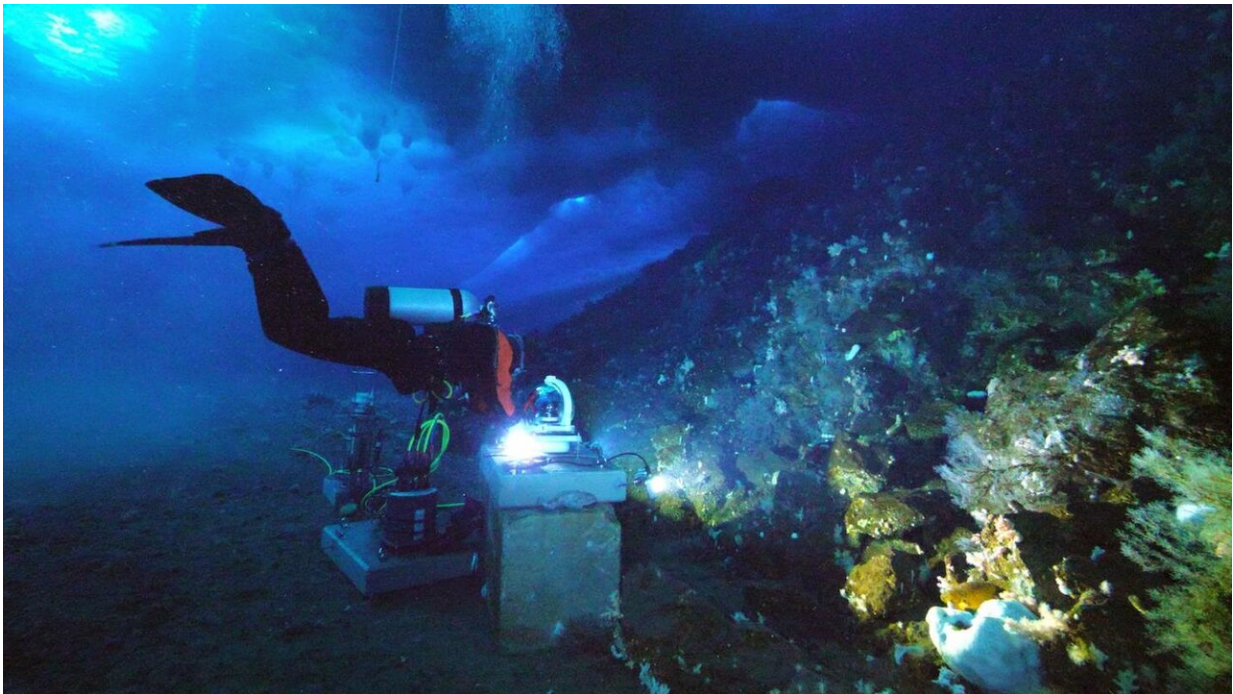


Under Antarctica's ice, Weddell seals produce ultrasonic vocalizations

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University of Oregon evolutionary biologist Paul Czikowski looks over the underwater camera during a dive at the National Science Foundation-funded McMurdo Oceanographic Observatory. The observatory, completed in 2017, is located 21 meters below the sea ice cover at McMurdo Sound, Antarctica, 850 miles from the South Pole. Credit: Henry Kaiser

Weddell seals are chirping, whistling and trilling under Antarctica's ice at sound frequencies that are inaudible to humans, according to a

research team led by University of Oregon biologists.

Two years of recordings at a live-streaming underwater observatory in McMurdo Sound have captured nine types of tonal ultrasonic seal vocalizations that reach to 50 kilohertz. Humans hear in the sonic range of 20 to 20,000 hertz, or 20 kilohertz.

The discovery is detailed in a paper published online Dec. 18 ahead of print the *Journal of the Acoustical Society of America*.

Weddell seals (*Leptonychotes weddellii*), the world's southernmost-ranging mammal, thrive under the continent's sea ice, using their large teeth to create air holes. They can dive to 600 meters in search of prey and remain submerged for 80 minutes. Researchers had first identified 34 seal call types at sonic frequencies in 1982, tying the sounds to social interactions.

The study's lead author Paul Czikó, a visiting research professor in the UO's Institute of Ecology and Evolution, began recording the seals' sonic-ranged vocalizations in 2017 after completing the installation of the McMurdo Oceanographic Observatory. Workers at McMurdo Station, he said, often fell asleep listening to broadcasts of the seals' sonic sounds coming from below.

"The Weddell seals' calls create an almost unbelievable, otherworldly soundscape under the ice," Czikó said. "It really sounds like you're in the middle of a space battle in 'Star Wars,' laser beams and all."

Over the next two years, the observatory's broadband digital hydrophone—more sensitive than equipment used in earlier recordings—picked up the higher-frequency vocalizations during passive monitoring of the seals.

"We kept coming across these ultrasonic call types in the data," said co-author Lisa Munger, a [marine biologist](#) who studies marine mammal acoustics and a career instructor in the UO's Clark Honors College. "Finally, it dawned on us that the seals were actually using them quite regularly."



Two Weddell seals relax atop the sea ice at McMurdo Sound, Antarctica. A University of Oregon-led research team has discovered that Weddell seals produce nine types of vocalizations at sound frequencies that are inaudible to humans. Credit: Elliott Devries

The nine new call types were composed of single or multiple vocal

elements having ultrasonic fundamental frequencies. Eleven elements, including chirps, whistles and trills, were above 20 kHz. Two exceeded 30 kHz and six were always above 21 kHz. One whistle reached 44.2 kHz and descending chirps in another call type began at about 49.8 kHz. Harmonics, or the overtones, of some vocalizations exceeded 200 kHz.

"It was really surprising that other researchers previously had, in effect, missed a part of the conversation," said Cziko, who earned a doctorate in evolutionary biology from the UO in 2014.

What the ultrasonic vocalizations mean in the Weddell seals' repertoire is unknown. The seals are among 33 species of fin-footed mammals grouped as pinnipeds. Until now, pinnipeds, which also include sea lions and walruses, were believed to vocalize only at sonic levels.

It could be, Cziko said, that the seals produce the sounds simply to "stand out over all the lower-frequency noise, like changing to a different channel for communicating."

Or, the researchers noted, the ultrasonic vocalizations may be used for echolocation, a biological sonar that dolphins, toothed whales and bats use to navigate in limited visibility to avoid obstacles and locate friends or prey.

"The possibility of seals using some kind of echolocation has really been discounted over the years," Cziko said. "We actually had a lot of somewhat heated discussions in our group about whether or how the seals use these ultrasonic sounds for echolocation-like behaviors."

It is not known how Weddell seals navigate and find prey during the months of near absolute darkness in the Antarctic winter. The study provides no evidence for echolocation.

"We'd like to know who is producing the ultrasonic calls—males, females, juveniles, or all of the above," Munger said. "And how are the seals using these sounds when they're out in deeper water, looking for fish? We need to record in more places to be able to correlate sounds with behaviors."

More information: Paul A. Cziko et al, Weddell seals produce ultrasonic vocalizations, *The Journal of the Acoustical Society of America* (2020). [DOI: 10.1121/10.0002867](https://doi.org/10.1121/10.0002867)

Provided by University of Oregon

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