

Blue whales align the pitch of their songs with extreme accuracy, study finds

August 2 2010



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Blue whales are able to synchronize the pitch of their calls with an extremely high level of accuracy, and a very slim margin of error from call to call, according to a new study of the blue whale population in the eastern North Pacific. Results were published in the *Journal of the Acoustical Society of America*. The authors suggest that the uniform pitch used by blue whale populations could allow individual whales to locate potential mates by swimming toward them or away from them.

"Blue whales in a given population have been observed to align their [pitch](#) to a common value, but we have now been able to determine just how accurately they are able to do so," said Roger Bland, professor of physics at San Francisco State University.

Bland and colleagues analyzed recordings of 4,378 blue whale songs, off the California coast, and focused on the whales' B calls -- the long, sad moan that typically forms the second half of the blue whale song that is specific to the eastern North Pacific population. They found that the whales all produce the B call at the same pitch, at a frequency of 16.02 Hz, exactly four octaves below middle C.

"We found that blue whales are capable of very fine control over the pitch of their call -- both in reproducing their call at the same pitch every time and in synchronizing their pitch with others," Bland said.

The study found a remarkably small variation in pitch from call to call. In musical terms, the half-tone change of pitch between the notes C and C Sharp is a 6 percent increase in pitch, whereas the variation observed between the blue whale's B calls was a 0.5 percent change in pitch.

The authors suggest that there may be an adaptive advantage to the whales tuning into a common pitch. "If whales are so super accurate in always calling at the exact same pitch, then it's possible that they could be able to detect tiny shifts in other whales' calls caused by the Doppler shift," Bland said. The [Doppler shift](#) is the apparent increase or decrease in pitch that is heard when the source of sound is moving toward or away from an individual, for example the change in pitch heard when a vehicle with a siren passes by.

Previous research has suggested that the [blue whale](#) song is produced only by males, and appears to be sung when the whales are traveling. "Given that blue whales can travel up to 5 meters per second, it's feasible that females could locate calling males by listening for the changes in the male's pitch," Bland said.

Underwater recordings were captured at the Pioneer Seamount Underwater Observatory, 50 miles off the California coast, over a three-

month period in 2001.

The study's results are consistent with recent research suggesting that blue whales across the world have decreased their pitch over the last few decades. "We found the frequency of the B call to be 16 Hz in 2001, which fits well with the downward trending curve that has been observed in previous research."

More information: "Frequency synchronization of blue whale calls near Pioneer Seamount" was published in the July 2010 issue of the Journal of the Acoustical Society of America. The paper is available online at: [bayacoustics.sfsu.edu/rtcpier/ ... /JASMAN1281490_1.pdf](http://bayacoustics.sfsu.edu/rtcpier/.../JASMAN1281490_1.pdf)

Provided by San Francisco State University

Citation: Blue whales align the pitch of their songs with extreme accuracy, study finds (2010, August 2) retrieved 22 September 2024 from <https://phys.org/news/2010-08-blue-whales-align-pitch-songs.html>

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