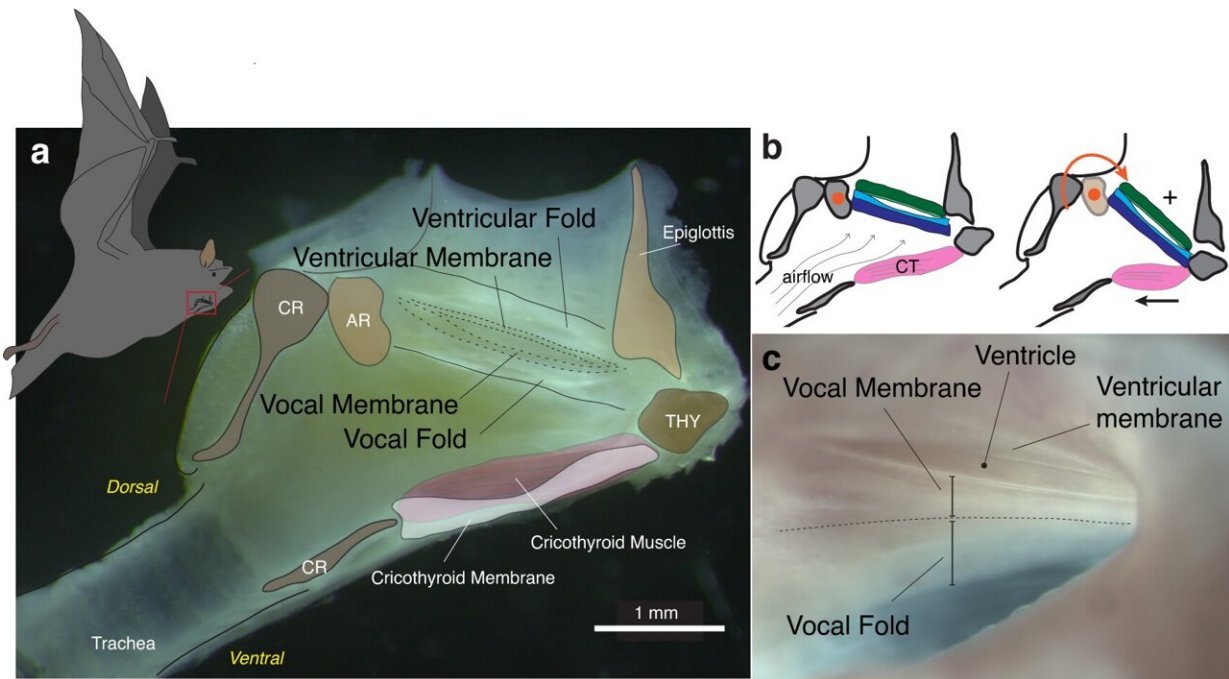


Bats growl like death metal singers and Mongolian throat singers

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Bat larynx inside. Credit: University of Southern Denmark

Many animals produce sound to communicate with each other, and bats are no exception. But bats are extreme when it comes to sound production.

Bats can produce a range of frequencies, also known as the [vocal range](#), that far exceeds vertebrates, including humans. Researchers do not yet

know the meaning of all their sounds and songs, but they are learning more and more about how all these sounds are made.

Now a new study in the journal *PLOS Biology* reports that for some sounds, [bats](#) use the same technique as human death metal singers and throat singing members of the Tuva people in Siberia and Mongolia. The study comes from a research team at University of Southern Denmark, led by Professor Coen Elemans, Department of Biology. The team has for the first time filmed what goes on in a bat's larynx when it produces sound.

Heavy vocal folds

"We identified for the first time what physical structures within the larynx oscillate to make their different vocalizations. For example, bats can make low [frequency](#) calls, using their so called 'false vocal folds,' like human death metal singers do," said Coen Elemans.

False vocal folds are called so because they look like vocal folds but they are not used in normal human speech and song. Only death metal growlers and throat singers from a few cultures around the world use their false vocal folds like the bats. Humans move the vocal folds down so that they oscillate together with the vocal folds.

"This makes the vocal folds heavy and therefore they vibrate at very low frequencies," explained postdoc Jonas Håkansson, first author of the study.

Annoyance in densely packed roosts

Growling sounds are often produced when bats fly in or out from a densely packed roost. The researchers do not know for sure, what a

growing bat intends to communicate, when it uses its false vocal folds to produce low sounds in the range of 1 to 5 kHz.

"Some seem aggressive, some may be an expression of annoyance, and some may have a very different function. We don't know yet," said biologist and bat expert Lasse Jakobsen from University of Southern Denmark, co-author on the study.

When bats hunt insects in complete darkness, they use echolocation. They send out very short, very high frequency calls, and listen for echoes reflected from objects in the surroundings to find and capture insects.

Filmed with 250,000 frames per second

"A bat can determine the shape, size and texture of echoing objects within milliseconds," said Lasse Jakobsen. The study also reveals for the first time how bats are able to make their extraordinarily high frequency echolocation calls. They do so by vibrating very thin vocal membranes—structures that humans also once had, but were lost in our evolution.

"We have directly filmed these vocal membranes for the first time. To show their vibrations we needed to film at extremely high rates, up to 250,000 frames per second. We see many adaptations in the larynx, that we think are responsible for the bat's ability to make very high frequency calls very fast, so that they can catch insects while flying," said Jonas Håkansson.

The voices of Mariah Carey and Prince

Together the normal vocal range for a bat spans 7 octaves, the research team reports.

"That is remarkable. Most mammals have a range of 3 to 4, and humans about 3. Some human singers can reach a range of 4 to 5, but they are only very few. Well-known examples are Mariah Carey, Axl Rose and Prince. It turns out that bats surpass this range by using different structures in their larynx," said Coen Elemans.

About the study

Five larynxes from Daubenton's bats were extracted, mounted and filmed while applying air flow to mimic natural breathing. The high-speed videos shows vocal membranes and false [vocal folds](#) vibrating at different frequencies.

More information: Bats expand their vocal range by recruiting different laryngeal structures for echolocation and social communication, *PLoS Biology* (2022). [DOI: 10.1371/journal.pbio.3001881](#)

Provided by University of Southern Denmark

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