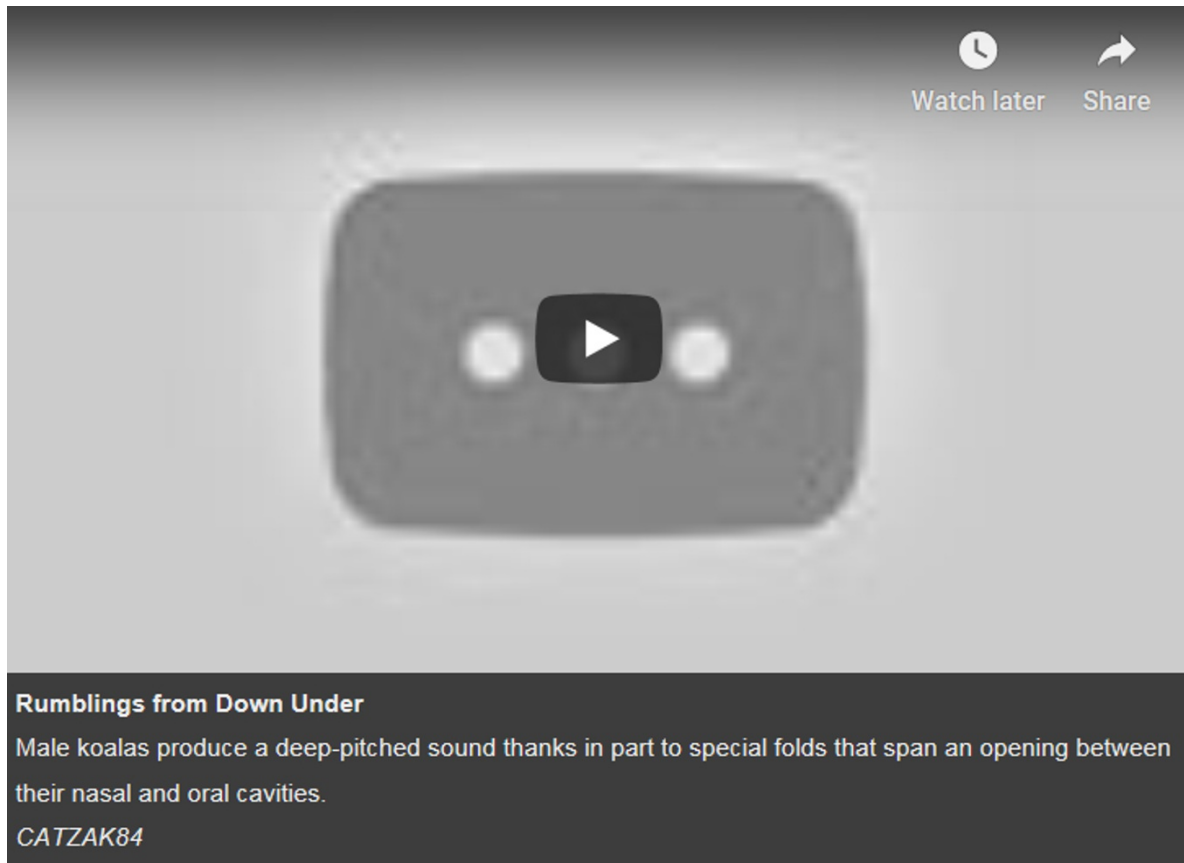


Discovery of organ explains koalas' super-bass notes

Throat structure explains why male mating calls are bizarrely deeper than expected for the animal's size.

Brian Owens

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For such diminutive animals, male koalas have an uncannily deep voice. The pitch of their bellowing mating call is 20 times lower than would be anticipated for their size, and more like something you would hear from an elephant, for instance.

Benjamin Charlton, a biologist at the University of Sussex in Brighton, UK, wanted to know what gave these marsupial Barry Whites their rumbling bass voice. “The first time I heard a koala bellow, I was genuinely amazed that an animal this small could produce such a sound,” he says.

In 2011, he was part of a team that discovered that koalas have a descended larynx (which holds the vocal cords) — something found only in humans and certain species of deer. This makes their vocal tract longer than expected and helps to produce unusually resonant calls¹. But the koala’s laryngeal vocal cords are too small to produce the extremely low fundamental frequencies of the mating bellows, so Charlton and his colleagues, together with Roland Frey at the Leibniz Institute for Zoo and Wildlife Research in Berlin, dissected ten male koalas (*Phascolarctos cinereus*) to take a closer look.

Focusing on the koala’s throat and soft palate, they found a set of much larger folds that had never been described before, spanning an opening between the nasal and oral cavities of the pharynx — the upper part of the throat behind the mouth and nose but above the larynx.

These ‘velar’ vocal folds are the right size to produce the low frequencies of koala bellows, and Charlton and his team were able to reproduce the sounds by using a pump to suck air through the pharynx and larynx of dead koalas — mimicking the bellows that live koalas make when they inhale.

Koala bellow

REF. 2

You may need a more recent browser or to install the latest version of the Adobe Flash Plugin.

Organ music

This marks the first time that an organ specialized for sound production other than the larynx has been found in a terrestrial mammal, says Charlton. The only other similar example is in toothed whales, which have phonic lips that generate clicks used for echolocation.

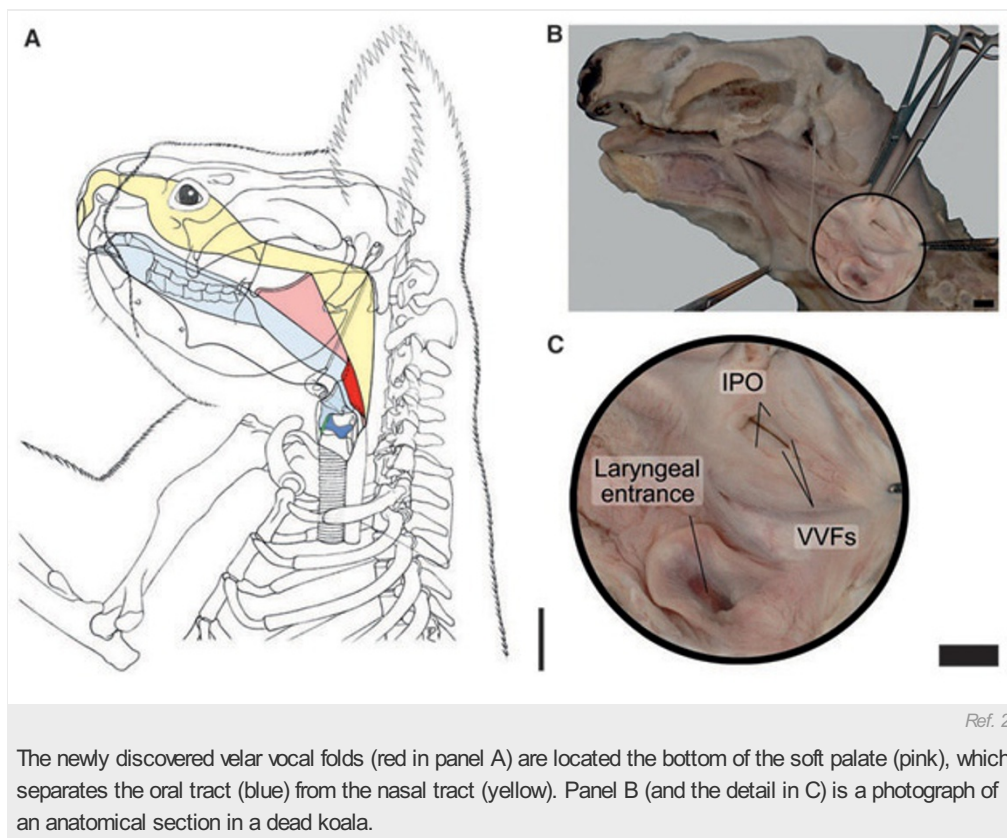
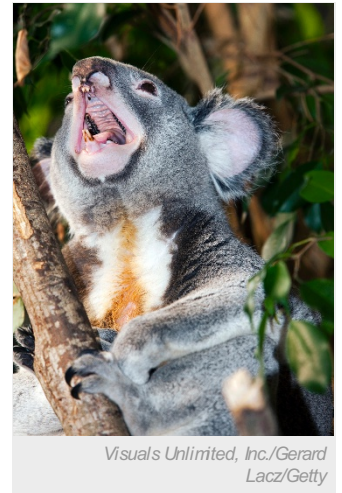
It may seem odd that the koala structure, described today in *Current Biology*², has only now been discovered, but Charlton thinks that previous investigators may simply not have considered its potential role in sound production in this species.

He now plans to examine female koalas, as well as other marsupials that produce disproportionately low bellows, to see whether the feature is unique to male koalas. Velar folds have not been documented in any other mammals, so could have been overlooked in the same way. But Charlton thinks that “it seems likely that this remarkable adaptation evolved independently in the koala.”

Karen Black, an evolutionary biologist at the University of New South Wales in Sydney, Australia, says that it is not surprising that koalas have a unique anatomy for sound production. The low-frequency bellows allow koalas to communicate over long distances in their open forest habitats, she says. She notes that they also have extremely large auditory bony structures called bullae in their middle ear, which could be an adaptation for picking up low-frequency sounds.

William Ellis, a wildlife ecologist at the University of Queensland in Brisbane, Australia, who collaborated to the 2011 study, thinks that the low-pitched bellow could be an evolutionary adaptation. Because the bellow is an accurate, if exaggerated, indicator of size, it may help smaller males to avoid fights with bigger rivals, he says.

But he is sure that there is more to learn about the behaviour. “For an animal that spends so much of its time resting, the bellow is perhaps the most interesting thing the koala regularly does,” he says. “Yet we are only just figuring it out.”



1. Charlton, B. D. *et al. J. Exp. Biol.* **214**, 3414–3422 (2011).
2. Charlton, B. D. *et al. Curr. Biol.* **23**, R1035–R1036 (2013).