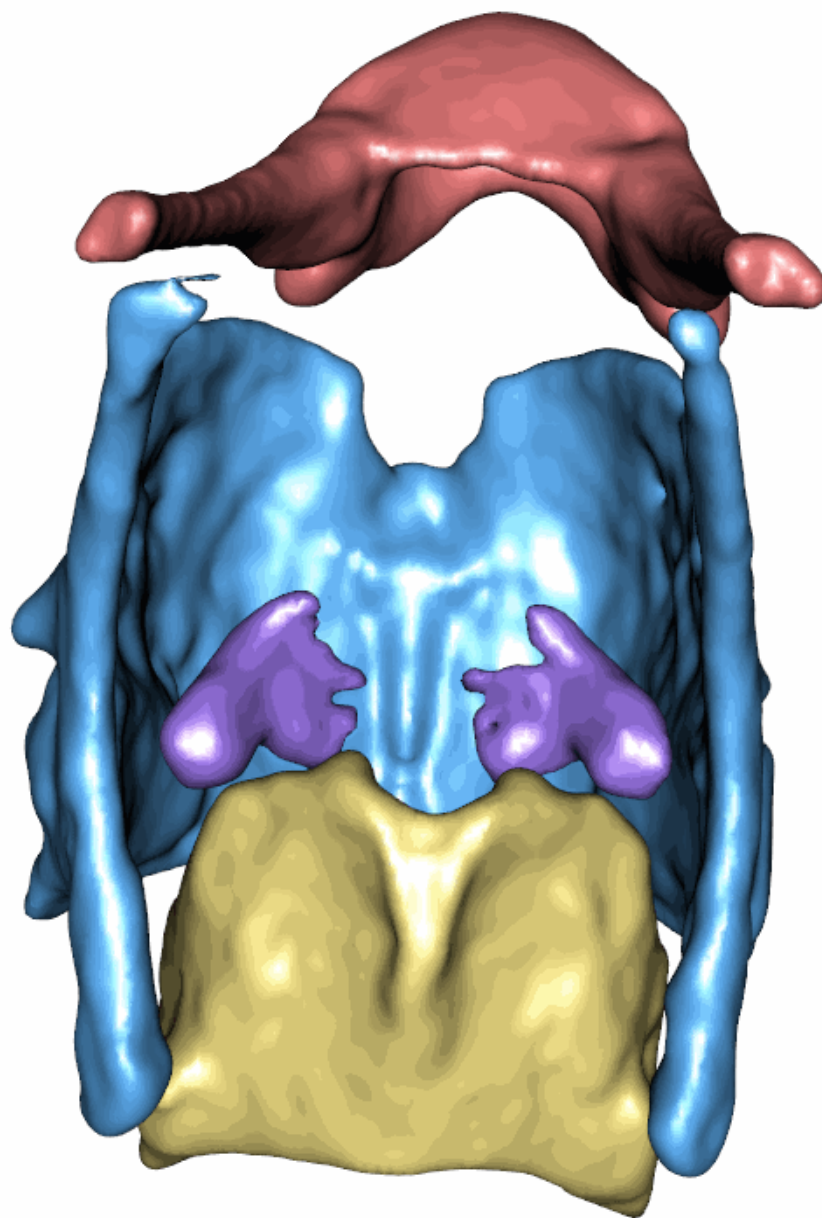


# Primate voice boxes are evolving at rapid pace

August 11 2020

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3D image of a gorilla larynx. Credit: Copyright Dr Jacob Dunn, Anglia Ruskin University (ARU)

Scientists have discovered that the larynx, or voice box, of primates is significantly larger relative to body size, has greater variation, and is under faster rates of evolution than in other mammals.

Published in the journal *PLOS Biology* and led by academics from Anglia Ruskin University (ARU), Stanford University, and the University of Vienna, the research is the first large-scale study into the [evolution](#) of the [larynx](#).

The larynx has three main functions: protecting the airway during feeding, regulating the supply of air to the lungs, and vocal communication. Because of its important role in facilitating social behaviour, through vocalisation, it has long been believed that the larynx is a key area of evolution, particularly in species with highly developed vocal communication systems.

The researchers made CT-scans of specimens from 55 different species, and produced 3-D computer models of their larynges. These were studied alongside detailed measurements, including body length and [body mass](#).

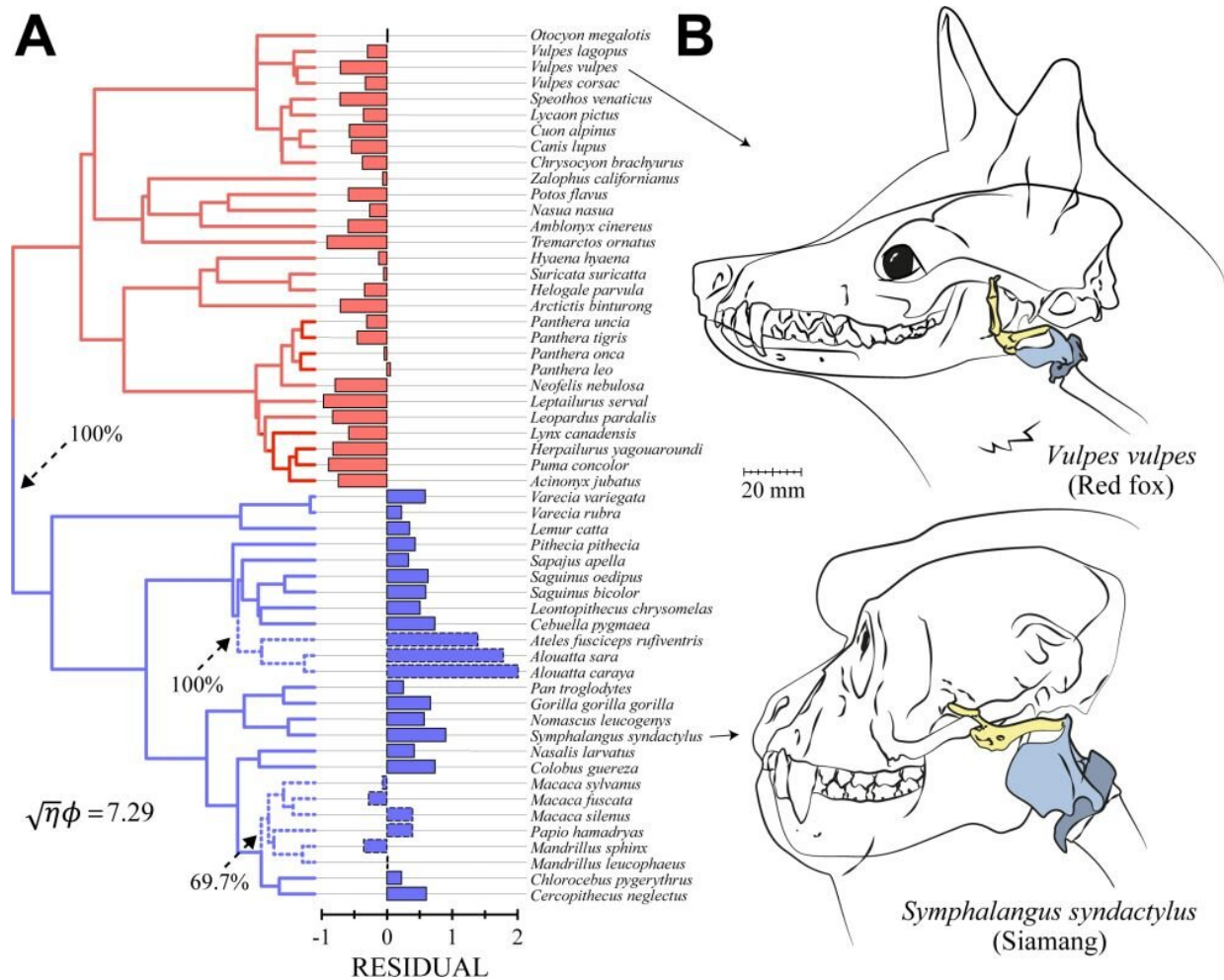
The [primates](#) ranged in size from a pygmy marmoset (*Cebuella pygmaea*) weighing just 110g, to a Western gorilla (*Gorilla gorilla*) weighing approximately 120kg. The carnivorans spanned from a 280g common dwarf mongoose (*Helogale parvula*) to a 180kg tiger (*Panthera tigris*).

The study found that, for a given [body length](#), primate larynges are on average 38% larger than those of carnivorans, and that the rate of larynx evolution is faster in these species.

There is also more variation in larynx size relative to body size among primates, indicating that primates have greater flexibility to evolve in

different ways. Carnivorans follow more of a fixed larynx-size to body-size ratio.

Larynx size was also found to be a good predictor of the call frequency of a species, which demonstrates the relevance for vocal communication of the observed size variations.

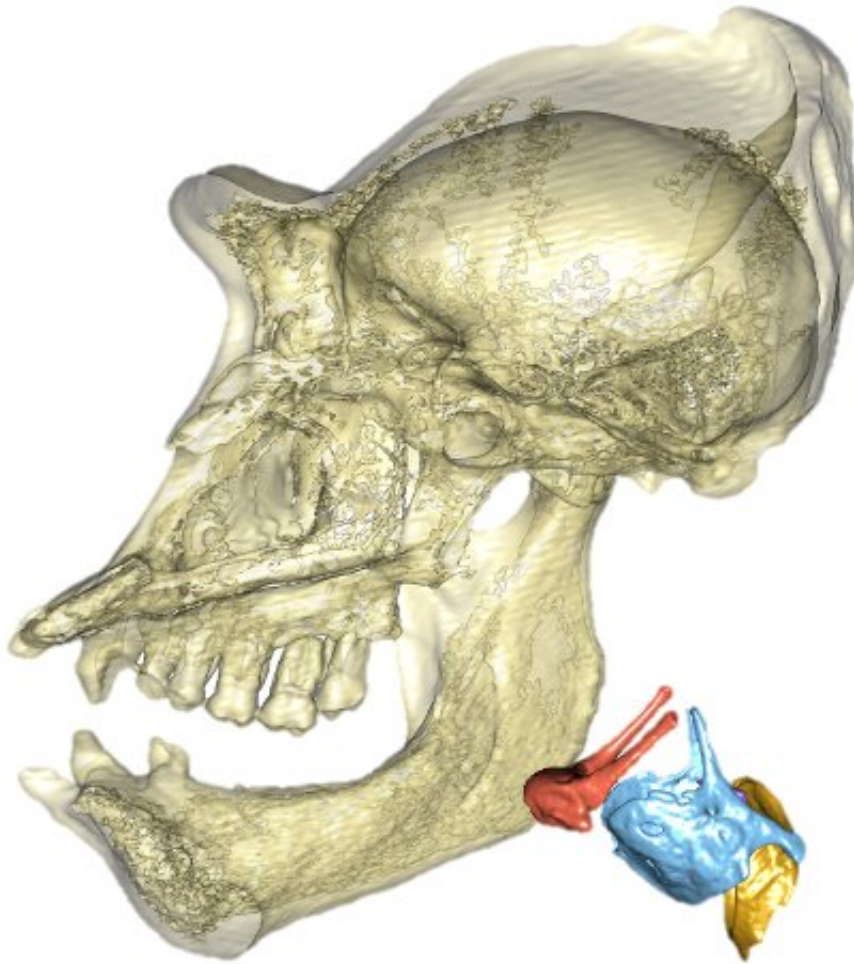


Ornstein-Uhlenbeck model results. (A) Phylogenetic tree and residuals from a pGLS regression of larynx size to log body-length. Carnivorans (red) exhibited smaller larynges than expected based on body size, whereas primates (blue) exhibited larger larynges. Among primates, atelids exhibited exceptionally large larynges (upper set of dashed lines), and papionines exhibited exceptionally

small larynges (lower dashed lines). Arrows indicate where grade shifts in mean larynx size are estimated to have arisen; percentages indicate support for these estimations from a bootstrap analysis (see Methods). (B) Computer larynx models derived from CT scans depicted in situ for two species with comparable body lengths (71.4 cm for the red fox and 68.5 cm for the siamang), showing the larger relative size of the primate larynx. The data used to create this figure are located in S1 Data, sheet B, columns B and C. CT, computed tomography; pGLS, phylogenetic generalized least squares. Credit: Bowling et al, 2020

Co-lead author Dr. Jacob Dunn, Reader in Evolutionary Biology at Anglia Ruskin University (ARU), said: "This study demonstrates clear differences in the evolution of the larynx between groups of mammals.

"Specifically, we have shown for the first time that the primate larynx is larger, less closely linked to [body](#) size, and under faster rates of evolution than the carnivoran larynx, which is a well-matched comparison group, indicating fundamental differences in the evolution of the vocal organ across species."



Gorilla skull and larynx. Credit: Copyright Dr Jacob Dunn, Anglia Ruskin University (ARU)

Co-lead author Dr. Daniel Bowling, Instructor in Psychiatry and Behavioral Sciences at Stanford University, added: "Our study also shows that differences in larynx size predict changes in voice pitch, highlighting the larynx's crucial role in vocal communication. This is demonstrated by the rich and varied calls produced by many primate [species](#)."

"The results imply fundamental differences between primates and carnivorans in the forces constraining larynx size, as well as highlighting an evolutionary flexibility in primates that may help explain why they have developed complex and diverse uses of the vocal organ for communication. This provides an exciting avenue for future studies examining variation among other mammalian groups."

**More information:** *PLOS Biology* (2020). [DOI: 10.1371/journal.pbio.3000764](https://doi.org/10.1371/journal.pbio.3000764)

Provided by Anglia Ruskin University

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