

RE-DATING THE LOSS OF LARYNGEAL AIR SACS IN *HOMO SAPIENS*

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Laryngeal air sacs are a product of convergent evolution in many different species of primates, bats, and other mammals. Air sacs have been lost in *Homo sapiens*. This has been argued to have occurred before *Homo heidelbergensis*, due to a loss of the bulla in the hyoid bone from *Australopithecus afarensis* (Martinez, 2008), at a range of 500kya to 3.3mya. (de Boer, to appear). Possible reasons for the loss of laryngeal air sacs include infection, the ability to modify breathing patterns and reduce need for an anti-hyperventilating device (Hewitt et al, 2002), and the selection against air sacs as they are disadvantageous for subtle, timed, and distinct sounds. (de Boer, to appear). Further, it has been suggested that the loss goes against the significant correlation of air sac retention to evolutionary growth in body mass (Hewitt et al., 2002). I argue that the loss of air sacs may have occurred on the more recent side of the timeline, as the loss of the bulla in the hyoid does not exclude the possibility of air sacs, as air sacs can herniate around surrounding tissue (Frey et al., 2007), and as the diachronic connection between the bulla and the air sacs is opaque. Further, the weight measurements of living species as a justification for the loss of air sacs despite a gain in body mass I argue to be unfounded given archaeological evidence, which suggests that the laryngeal air sacs may possibly have been lost only after size reduction in *Homo sapiens* from *Homo heidelbergensis*. I will flesh out these arguments, first presented in Littauer (to appear). Finally, I suggest two further possible pressures on laryngeal air sacs in *Homo sapiens*. First, the linguistic niche of hunting would have been better suited to higher frequency, directional calls as opposed to lower frequency, multidirectional calls, especially in a savannah-like environment. It is worth noting that the influence of the savannah on the evolution of the larynx has been explored before (Hombert, 2010). I argue here that the loss of air sacs might have then been advantageous, as lower frequencies produced by air sac vocalisations over bare ground have been shown to favour multidirectional over targeted utterances (Frey and Gebler, 2003). Secondly, the reuse of air stored in air sacs could have possibly been disadvantageous toward sustained, regular heavy breathing. In short, it is possible the loss of air sacs occurred on a more recent scale than previously considered.

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