

## **Skull Evolution in Leporids (rabbits and hares)**

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The lagomorph (rabbits, hares, and pikas) skull exhibits a unique set of characteristics that easily distinguish it from most other mammalian orders. Among lagomorphs, leporids (hares and rabbits) are recognized for their exceptional hopping ability, while some species show a level of cursoriality that is unmatched for animals of their size. Previous workers have suggested some aspects of their skull morphology are related their mode of locomotion, but a thorough test of these hypotheses has not been conducted. We explored the relationship between skull shape and ecology by using a 2D morphometric data set that included 144 skulls from 17 living leporids (rabbits and hares). Our analyses showed strong correlation between skull shape and whether these species lived in burrows. We also found that the degree to which leporids tilt their face ventrally relative to their basicranium was strongly associated with whether they moved in a generalized scampering fashion (more flat skulls), or whether they hopped (more tilted skulls). Our 2D data showed that diastema length was more strongly correlated with overall skull length than the basioccipital length was to skull length, suggesting that the basicranium and facial regions were differentially influencing overall skull shape. To explore this further we have utilized the RV coefficient to analyze an additional set of leporid skulls using 3D geometric morphometric data taken from surface renders from CT scans. These analyses suggest a distinct pattern of modularity between the facial and basioccipital regions in the lagomorph skull, and further confirm conclusions from our 2D data set. The most recent ancestors of lagomorphs, the mimotonids (ca 55Ma), exhibit a facial region that is remarkably similar to that of living lagomorphs. Their basicranium, however, is much more typically mammalian. It wasn't until tens of millions of years later that the basicranium of fossil lagomorphs showed features that were consistent with those of the highly tilted skulls of living lagomorphs.