Supplementary Materials

for

EVOLUTIONARY MORPHOLOGY OF THE RABBIT SKULL

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Supplementary Table 1 – List of all specimens used in this study. Abbreviation are AMNH = American Museum of Natural History; LACM = Los Angeles County Museum of Natural History; MCZ = Museum of Comparative Zoology; USNH = National Museum of Natural History; USNM = United States National Museum.

*Brachylagus idahoensis* AMNH 447, 33608, 33609, 33610, 33612, 33614, 33615, 33616, 33645, 92869, 140866, LACM 93771; *Bunolagus monticularis* AMNH 146662, 146663, MCZ 56904, 56905; *Caprolagus hispidus* AMNH 54852; *Lepus americanus* LACM 27289, 70391, 70392, 70393, 93733, 93737, 93743, 93745, 93747, 93748; *L. californicus* LACM 27289, 70391, 70392, 70393, 93733, 93737, 93743, 93745, 93747, 93748; *L. timidus* AMNH 18298, 18299, 18300, 18301, 18309, USNM 200636, 200637, 200640, 200648, 200649, 200641; *Nesolagus timinsi* AMNH 272419, 276142; *Oryctolagus cuniculus* LACM 5839, 30041, 30044, 59588, 59590, 59591, 59593, 67145, AMNH 166951, 146660, 146684, 146685, 169489, 169491; *Pentalagus furnessi* AMNH 42323, NMNS 42411, 42893, 42928, 42933, 42935, 42962, 42964, 42970, 42974; *Poelagus marjorita* LACM 14471, 14472, 55847, 55848, 55849, AMNH 51036, 51046, 51049, 51052, 51055, 118569, 118664, 118856, 165800; *Pronolagus randensis* MCZ 33980, 33981, 33982, 33983; *Pr. rupestris* 141515, USNM 342667, 342668, 342671; *Romerolagus diazi* AMNH 148172, 148174, 148178, 148180, 148181; *Sylvilagus aquaticus* USNM 132343, 246721, 246722, 246908, 247174, 247175, 247290, 564058, 564059; *S. audubonii* LACM 34345, 34346, 34347, 34366, 34369, 34371, 34372, 34376, 35055, 35062; *S. floridanus* USNM 567168, 567191, 567197, 567226, 567228, 567229, 567230, 567231, 567232, 567234; *S. palustris* AMNH 1409, 1410, 1412, 6226, 91136, 147446, 147447, 147449, 163975

Supplementary Table 2 – The 39 of 184 (21.2%) specimens with missing landmark data.

| Specimen       | missing landmarks | Specimen      | missing landmarks |
|----------------|-------------------|---------------|-------------------|
| Brachylagus 33608 | 41                | Pentalagus 42935 | 41, 42            |
| Brachylagus 33609 | 16               | Poelagus 118569 | 17, 20, 21        |
| Brachylagus 33614 | 4, 31             | Poelagus 14471 | 16                |
| Brachylagus 33616 | 16               | Poelagus 14472 | 25, 41            |
| Brachylagus 447   | 31                | Poelagus 51036 | 41, 42            |
| Bunolagus 146662  | 28                | Pr. rupestris 141515 | 31          |
| Bunolagus 146663  | 5, 25, 26, 31, 34 | Pr. rupestris 168887 | 1       |
| Bunolagus 56905   | 20                | Pr. rupestris 168890 | 28, 31        |
| Caprolagus 54852  | 28                | Pr. rupestris 168939 | 31, 41         |
| L. americanus 93733 | 28               | Pr. rupestris 342668 | 28           |
| L. capensis 187395 | 40               | Romerolagus 148174 | 42           |
| L. capensis 187421 | 16               | Romerolagus 148180 | 11, 41, 42     |
| L. capensis 187423 | 20, 34            | Romerolagus 148181 | 11           |
| L. saxatilis 56421 | 41, 42            | S. aquaticus 564059 | 31          |
| L. saxatilis 59649 | 20                | S. audubonii 34371 | 25, 31         |
| L. timidus 18299  | 16                | S. audubonii 35055 | 17           |
| L. timidus 18309  | 41, 42            | S. obscurus 567197 | 31          |
| Nesolagus 276142  | 20, 42            | S. obscurus 567230 | 20          |
| Oryctolagus 166951 | 16               | S. palustris 6226 | 31, 42         |
| Oryctolagus 67145  | 28                |                |                  |
Supplementary Figure 1 – The leporid cranial morphospace. Biplots of the first four PC axes, colored by genus. Refer to the legend to shapes and colors; for genera with more than 1 species, symbols are used to delineate different species. Symbols are reused, therefore color plus symbol represents a single species. Genus abbreviations in legend can be referred to full species names in Table 1.
**Supplementary Figure 2** – The mean rabbit skull shape warped to represent the minimum and maximum of the first four Principal Component axes. Warping was done by thin-plate spline method, implemented in R package *geomorph* (Adams, Collyer & Sherratt 2016, [http://cran.r-project.org/web/packages/geomorph/](http://cran.r-project.org/web/packages/geomorph/)). The skulls are interactive 3D models.

PC1 – 26.7%

PC2 – 18.8%

PC3 – 10.2%

PC4 – 8.6%
Supplementary Figure 3 – Animations of the shape changes from minimum to maximum of PC1 and PC2, in lateral and front-on views. Warping was done by thin-plate spline.

PC1 – 26.7% min to max

PC2 – 18.8% min to max
Supplementary Figure 4 – Phylomorphospace based on PC1, 2 and 3. Each sphere is a species mean, scaled to mean centroid size, and colored by genus. The phylogeny is from Matthee et al. (2004) and summarized below.
Supplementary Figure 5 – The Matthee et al. (2004) phylogeny plotted with box and whisker plots of facial tilt angle (°) by species. The dark line represents the median of the data, the lower and upper quartiles (25% and 75%) are shown as the box, and the whiskers provide the minimum and maximum values. Outliers are shown as open circles. This figure supplements Figure 5.
Supplementary Figure 6 – Facial tilt angle (°) by locomotor mode. The dark line represents the median of the data, the lower and upper quartiles (25% and 75%) are shown as the box, and the whiskers provide the minimum and maximum values. Outliers are shown as open circles. This figure supplements Figure 5.