**Sheep birth distribution in past herds: a review for prehistoric Europe (6th – 3rd millennia BC).**

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**Supplementary Table S1A:** Results from stable isotope analysis of enamel bioapatite from the sheep third molars (M3) at Borduşani-*Popină* (PBORD).

Each sample is located in tooth crown using the distance from the enamel–root junction.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PBORD Ovis68 M3** |  | **PBORD Ovis69 M3** |  | **PBORD Ovis33 M3** |  | **PBORD Ovis555 M3** |  | **PBORD Ovis449 M3** | **PBORD Ovis277 M3** |
| distance(mm) | δ18O (‰) |  | distance(mm) | δ18O (‰) |  | distance(mm) | δ18O (‰) |  | distance(mm) | δ18O (‰) |  | distance(mm) | δ18O (‰) | distance (mm) | δ18O (‰) |
| 25.8 | -5.26 |  | 28.3 | -9.30 |  | 30.2 | -5.93 |  | 25.1 | -7.21 |  | 27.7 | -6.14 | 24.7 | -7.09 |
| 24.3 | -5.62 |  | 26.9 | -9.22 |  | 28.8 | -6.42 |  | 23.8 | -7.43 |  | 26.4 | -7.16 | 23.7 | -7.60 |
| 22.2 | -6.06 |  | 25.7 | -9.29 |  | 27.5 | -7.35 |  | 22.4 | -6.95 |  | 25.0 | -7.52 | 22.7 | -7.50 |
| 21.6 | -6.51 |  | 24.4 | -9.17 |  | 26.3 | -7.50 |  | 21.0 | -6.56 |  | 23.6 | -8.53 | 21.4 | -6.87 |
| 20.5 | -6.64 |  | 22.9 | -8.07 |  | 25.1 | -7.79 |  | 19.7 | -5.90 |  | 22.5 | -8.56 | 20.1 | -6.16 |
| 19.1 | -6.69 |  | 21.6 | -7.07 |  | 23.8 | -7.54 |  | 18.4 | -5.44 |  | 21.0 | -8.45 | 18.9 | -5.78 |
| 17.7 | -6.26 |  | 20.4 | -5.76 |  | 22.5 | -7.83 |  | 17.0 | -4.96 |  | 19.6 | -8.12 | 17.5 | -4.77 |
| 16.6 | -5.99 |  | 19.0 | -5.19 |  | 21.1 | -7.13 |  | 15.6 | -4.39 |  | 18.2 | -7.42 | 16.2 | -4.31 |
| 15.4 | -5.44 |  | 17.6 | -4.70 |  | 19.9 | -6.93 |  | 14.3 | -4.09 |  | 16.8 | -6.74 | 15.1 | -3.68 |
| 13.9 | -4.44 |  | 16.4 | -4.31 |  | 18.7 | -6.32 |  | 13.0 | -3.81 |  | 15.5 | -5.74 | 13.8 | -3.63 |
| 12.7 | -3.85 |  | 15.2 | -3.90 |  | 17.3 | -6.22 |  | 11.7 | -3.57 |  | 14.2 | -4.74 | 12.5 | -3.15 |
| 11.3 | -2.99 |  | 14.0 | -3.48 |  | 16.0 | -5.77 |  | 10.5 | -3.37 |  | 12.9 | -3.65 | 11.3 | -3.50 |
| 9.9 | -2.09 |  | 12.7 | -3.45 |  | 14.6 | -5.21 |  | 9.2 | -3.43 |  | 11.4 | -2.92 | 9.7 | -3.76 |
| 8.7 | -1.94 |  | 11.4 | -3.51 |  | 13.4 | -4.75 |  | 7.9 | -3.27 |  | 9.9 | -2.18 | 8.5 | -4.71 |
| 7.3 | -1.99 |  | 10.2 | -3.78 |  | 12.2 | -4.96 |  | 6.6 | -3.91 |  | 8.6 | -2.26 | 7.4 | -5.94 |
| 6.1 | -2.15 |  | 9.0 | -4.01 |  | 10.9 | -4.76 |  | 5.1 | -4.91 |  | 7.3 | -2.51 | 6.1 | -7.15 |
| 4.5 | -2.80 |  | 7.7 | -4.82 |  | 9.8 | -4.99 |  | 3.6 | -6.39 |  | 6.1 | -3.10 |  |  |
| 3.1 | -4.56 |  | 6.6 | -5.52 |  | 8.4 | -4.87 |  | 2.5 | -7.35 |  | 4.6 | -4.56 |  |  |
|   |   |  | 5.4 | -6.83 |  | 7.2 | -5.34 |  |   |   |  | 3.1 | -5.33 |  |  |
|   |   |  | 4.0 | -7.80 |  | 5.9 | -5.72 |  |   |   |  | 1.8 | -6.50 |  |  |
|   |   |  |   |   |  | 4.6 | -6.97 |  |   |   |  |   |   |  |  |

**Supplementary Table S1B:** Results from stable isotope analysis of enamel bioapatite from the sheep third molars (M3) at Hârşova-tell(HVA).

Each sample is located in tooth crown using the distance from the enamel–root junction.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **HVA Ovis95 M3** |  | **HVA Ovis87 M3** |  | **HVA Ovis98 M3** |  | **HVA Ovis85 M3** |
| distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |
| 28.9 | -5.09 |  | 29.0 | -2.34 |  | 23.4 | -5.36 |  | 32.4 | -2.21 |
| 27.3 | -5.91 |  | 27.9 | -2.12 |  | 22.0 | -5.84 |  | 31.0 | -2.11 |
| 25.9 | -6.61 |  | 26.5 | -2.02 |  | 20.6 | -6.34 |  | 29.6 | -2.38 |
| 24.5 | -6.92 |  | 25.4 | -2.17 |  | 19.2 | -6.65 |  | 28.1 | -2.77 |
| 23.0 | -6.55 |  | 23.8 | -2.37 |  | 17.8 | -6.94 |  | 26.5 | -3.60 |
| 21.8 | -6.58 |  | 22.6 | -3.00 |  | 16.6 | -7.10 |  | 25.4 | -4.81 |
| 20.1 | -6.01 |  | 21.6 | -3.48 |  | 15.4 | -6.94 |  | 24.2 | -5.63 |
| 18.7 | -5.33 |  | 20.5 | -3.88 |  | 13.8 | -6.52 |  | 22.8 | -7.04 |
| 17.1 | -4.16 |  | 19.4 | -4.53 |  | 12.6 | -5.70 |  | 21.5 | -7.25 |
| 15.6 | -3.06 |  | 18.2 | -5.42 |  | 11.0 | -5.73 |  | 20.3 | -8.22 |
| 14.3 | -1.87 |  | 17.1 | -5.76 |  | 9.8 | -4.45 |  | 19.2 | -8.66 |
| 12.9 | -1.13 |  | 15.8 | -6.93 |  | 8.1 | -4.25 |  | 17.9 | -9.02 |
| 11.8 | -0.91 |  | 14.5 | -7.10 |  | 7.0 | -3.93 |  | 16.9 | -8.54 |
| 10.3 | -0.90 |  | 13.4 | -7.54 |  | 5.6 | -4.33 |  | 15.7 | -8.50 |
| 9.0 | -1.05 |  | 12.0 | -7.21 |  | 4.1 | -4.34 |  | 14.6 | -8.93 |
| 7.7 | -1.24 |  | 10.6 | -7.23 |  | 2.3 | -5.51 |  | 13.5 | -8.09 |
| 6.3 | -1.64 |  | 9.4 | -6.54 |  |  |  |  | 12.2 | -7.04 |
| 5.0 | -2.87 |  | 8.2 | -6.09 |  |  |  |  | 10.9 | -6.20 |
| 3.5 | -3.75 |  | 6.7 | -4.87 |  |  |  |  | 9.7 | -5.14 |
|  |  |  | 5.9 | -3.97 |  |  |  |  | 8.5 | -3.90 |
|  |  |  | 4.3 | -3.48 |  |  |  |  | 7.2 | -2.80 |
|  |  |  | 3.0 | -3.58 |  |  |  |  | 6.0 | -2.81 |
|  |  |  |  |  |  |  |  |  | 4.9 | -2.64 |
|  |  |  |  |  |  |  |  |  | 3.4 | -2.26 |

**Supplementary Table S1C:** Results from stable isotope analysis of enamel bioapatite from the sheep third molars (M3) at Alsónyék-Bátaszék (ALS).

Each sample is located in tooth crown using the distance from the enamel–root junction.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **ALS Ovis 1 M3** |  | **ALS Ovis2 M3** |  | **ALS Ovis3 M3** |  | **ALS Ovis4 M3** |  | **ALS Ovis5 M3** |  | **ALS Ovis6 M3** |  | **ALS Ovis8 M3** |  | **ALS Ovis9 M3** |
| distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |
| 28.1 | -6.21 |  | 37.4 | -3.19 |  | 35.3 | -0.61 |  | 33.5 | -3.06 |  | 32.4 | -0.78 |  | 34.0 | -1.40 |  | 22.4 | -5.99 |  | 35.4 | -2.54 |
| 26.8 | -7.26 |  | 36.1 | -2.58 |  | 33.9 | -1.45 |  | 32.2 | -3.08 |  | 31.1 | -1.95 |  | 32.6 | -1.50 |  | 21.1 | -6.98 |  | 34.1 | -2.15 |
| 25.5 | -7.54 |  | 34.6 | -2.36 |  | 31.7 | -2.54 |  | 30.8 | -2.41 |  | 29.8 | -1.65 |  | 31.3 | -1.42 |  | 19.9 | -7.68 |  | 32.7 | -1.78 |
| 24.1 | -7.76 |  | 33.3 | -2.58 |  | 30.2 | -3.14 |  | 29.5 | -2.71 |  | 28.2 | -2.82 |  | 30.4 | -1.59 |  | 18.8 | -8.52 |  | 31.5 | -1.91 |
| 22.7 | -7.39 |  | 32.1 | -2.55 |  | 28.5 | -4.38 |  | 28.1 | -2.63 |  | 27.0 | -3.87 |  | 28.4 | -1.62 |  | 17.5 | -8.91 |  | 30.2 | -1.71 |
| 21.5 | -7.41 |  | 30.8 | -3.11 |  | 27.2 | -5.17 |  | 26.9 | -2.83 |  | 25.7 | -4.84 |  | 27.1 | -2.35 |  | 16.2 | -8.93 |  | 29.0 | -1.84 |
| 20.0 | -6.36 |  | 29.6 | -3.47 |  | 26.1 | -5.99 |  | 25.6 | -3.31 |  | 24.4 | -5.53 |  | 25.6 | -2.62 |  | 15.0 | -8.48 |  | 27.6 | -1.77 |
| 18.9 | -5.84 |  | 28.4 | -4.24 |  | 24.9 | -6.82 |  | 24.3 | -3.56 |  | 22.9 | -6.66 |  | 24.2 | -4.16 |  | 13.5 | -8.08 |  | 26.3 | -1.92 |
| 17.4 | -4.92 |  | 27.1 | -4.90 |  | 23.4 | -7.21 |  | 23.1 | -4.04 |  | 22.0 | -6.77 |  | 22.9 | -4.90 |  | 12.3 | -7.02 |  | 24.9 | -2.68 |
| 16.2 | -4.16 |  | 25.8 | -5.67 |  | 22.2 | -8.30 |  | 21.5 | -4.65 |  | 20.6 | -7.26 |  | 21.6 | -6.18 |  | 11.0 | -6.41 |  | 23.9 | -3.29 |
| 14.8 | -3.34 |  | 24.5 | -6.64 |  | 20.7 | -8.36 |  | 20.2 | -4.97 |  | 19.3 | -6.98 |  | 20.3 | -6.53 |  | 10.1 | -4.96 |  | 22.7 | -3.94 |
| 13.7 | -2.86 |  | 23.3 | -7.55 |  | 19.2 | -8.35 |  | 18.9 | -5.57 |  | 18.1 | -7.46 |  | 19.0 | -7.18 |  | 8.6 | -3.92 |  | 21.4 | -4.87 |
| 12.3 | -3.05 |  | 22.2 | -8.35 |  | 18.0 | -7.65 |  | 17.5 | -6.05 |  | 16.6 | -6.89 |  | 17.8 | -7.54 |  | 7.3 | -3.53 |  | 20.2 | -5.75 |
| 11.0 | -3.15 |  | 20.7 | -8.99 |  | 16.6 | -6.92 |  | 16.1 | -6.47 |  | 15.3 | -6.53 |  | 16.3 | -7.60 |  | 6.2 | -3.62 |  | 18.9 | -6.45 |
| 9.8 | -3.26 |  | 19.5 | -9.64 |  | 15.4 | -6.03 |  | 14.8 | -6.75 |  | 14.1 | -5.34 |  | 15.1 | -7.30 |  | 5.0 | -3.79 |  | 17.7 | -6.96 |
| 8.5 | -3.67 |  | 18.3 | -9.46 |  | 13.8 | -4.68 |  | 13.4 | -6.44 |  | 12.9 | -4.76 |  | 13.9 | -7.12 |  | 3.5 | -4.55 |  | 16.5 | -7.50 |
| 7.2 | -5.06 |  | 17.1 | -8.69 |  | 12.6 | -3.94 |  | 12.1 | -5.66 |  | 11.7 | -3.47 |  | 12.6 | -5.81 |  |  |  |  | 15.1 | -7.62 |
| 6.0 | -5.67 |  | 15.8 | -8.45 |  | 11.3 | -2.61 |  | 10.5 | -5.29 |  | 10.5 | -3.22 |  | 11.4 | -4.90 |  |  |  |  | 13.8 | -7.65 |
| 4.8 | -6.21 |  | 14.7 | -7.51 |  | 9.9 | -1.77 |  | 9.2 | -4.55 |  | 9.1 | -2.38 |  | 10.1 | -3.87 |  |  |  |  | 12.7 | -7.20 |
| 3.7 | -7.50 |  | 13.4 | -6.81 |  | 8.7 | -2.52 |  | 7.7 | -4.04 |  | 7.7 | -2.38 |  | 8.9 | -3.16 |  |  |  |  | 11.3 | -5.75 |
|  |  |  | 12.1 | -5.37 |  | 7.6 | -2.71 |  | 6.7 | -2.73 |  | 6.4 | -2.35 |  | 7.6 | -1.90 |  |  |  |  | 10.1 | -5.49 |
|  |  |  | 10.8 | -4.63 |  | 6.1 | -3.78 |  | 5.3 | -2.06 |  | 5.2 | -3.74 |  | 6.3 | -1.69 |  |  |  |  | 8.7 | -4.59 |
|  |  |  | 9.6 | -4.10 |  | 5.1 | -4.96 |  |  |  |  | 3.7 | -4.43 |  |  |  |  |  |  |  | 7.3 | -2.76 |
|  |  |  | 8.3 | -3.24 |  |  |  |  |  |  |  | 2.6 | -5.82 |  |  |  |  |  |  |  | 6.0 | -1.86 |
|  |  |  | 7.0 | -3.83 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 5.7 | -4.89 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Supplementary Table S1D:** Results from stable isotope analysis of enamel bioapatite from the sheep second (M2) and third molars (M3) at Skara Brae (SKB).

Each sample is located in tooth crown using the distance from the enamel–root junction.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SKB Ovis1 M3** |  | **SKB Ovis2 M3** |  | **SKB Ovis3 M2** |  | **SKB Ovis3 M3** |  | **SKB Ovis4 M3** |  | **SKB Ovis5 M3** |  | **SKB Ovis6 M3** |  | **SKB Ovis7 M3** |
| distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |
| 19.7 | -3.53 |  | 24.5 | -4.39 |  | 25.2 | -6.68 |  | 27.6 | -4.64 |  | 19.4 | -4.61 |  | 24.7 | -4.19 |  | 27.4 | -4.92 |  | 29.5 | -3.86 |
| 18.5 | -2.61 |  | 23.3 | -4.51 |  | 23.8 | -6.77 |  | 25.9 | -5.06 |  | 17.9 | -4.83 |  | 23.3 | -4.54 |  | 25.9 | -5.41 |  | 27.9 | -4.16 |
| 17.2 | -2.28 |  | 22.4 | -4.16 |  | 22.5 | -6.98 |  | 24.5 | -5.15 |  | 16.6 | -4.49 |  | 22.2 | -4.47 |  | 24.5 | -5.41 |  | 26.4 | -4.06 |
| 16.1 | -2.10 |  | 21.1 | -3.83 |  | 21.2 | -6.79 |  | 23.8 | -5.02 |  | 15.1 | -4.26 |  | 20.6 | -3.90 |  | 23.2 | -5.56 |  | 25.0 | -3.98 |
| 14.8 | -2.26 |  | 19.9 | -3.28 |  | 19.9 | -6.89 |  | 22.0 | -5.28 |  | 14.0 | -4.00 |  | 18.8 | -3.51 |  | 21.9 | -5.55 |  | 23.7 | -3.95 |
| 13.7 | -1.89 |  | 18.7 | -2.87 |  | 18.6 | -6.30 |  | 20.8 | -5.64 |  | 12.8 | -3.59 |  | 17.7 | -2.65 |  | 20.5 | -5.27 |  | 22.5 | -3.84 |
| 12.4 | -2.52 |  | 17.6 | -2.47 |  | 17.2 | -6.01 |  | 19.4 | -5.64 |  | 11.6 | -3.12 |  | 16.1 | -2.14 |  | 19.4 | -4.98 |  | 21.1 | -3.66 |
| 10.9 | -2.84 |  | 16.4 | -2.31 |  | 15.9 | -5.59 |  | 18.5 | -5.41 |  | 10.6 | -2.91 |  | 14.7 | -1.90 |  | 18.0 | -4.72 |  | 19.8 | -3.56 |
| 9.8 | -3.54 |  | 15.3 | -2.59 |  | 14.6 | -4.87 |  | 17.1 | -5.52 |  | 9.3 | -2.44 |  | 13.4 | -1.64 |  | 16.8 | -4.80 |  | 18.5 | -3.17 |
| 8.6 | -4.48 |  | 14.0 | -2.65 |  | 13.4 | -4.44 |  | 15.7 | -5.01 |  | 7.7 | -2.50 |  | 11.9 | -2.01 |  | 15.2 | -4.52 |  | 17.3 | -3.15 |
| 7.5 | -4.69 |  | 12.7 | -3.12 |  | 12.2 | -3.52 |  | 14.8 | -4.92 |  | 6.3 | -2.80 |  | 10.5 | -2.19 |  | 13.8 | -4.09 |  | 16.1 | -2.98 |
| 6.3 | -5.74 |  | 11.5 | -3.31 |  | 11.1 | -3.67 |  | 13.5 | -4.26 |  | 5.2 | -4.21 |  | 9.1 | -2.86 |  | 12.5 | -4.01 |  | 14.8 | -3.01 |
| 5.1 | -5.48 |  | 10.3 | -3.81 |  | 9.8 | -3.13 |  | 12.2 | -2.92 |  | 3.6 | -4.41 |  | 7.7 | -3.13 |  | 11.3 | -3.39 |  | 13.5 | -2.98 |
| 3.9 | -6.14 |  | 9.0 | -4.16 |  | 8.8 | -3.32 |  | 10.8 | -2.40 |  | 2.5 | -4.57 |  | 6.5 | -3.88 |  | 10.2 | -3.27 |  | 12.1 | -3.28 |
| 3.0 | -6.16 |  | 7.8 | -4.75 |  | 7.5 | -3.33 |  | 9.5 | -2.18 |  |  |  |  | 4.8 | -3.99 |  | 8.7 | -3.53 |  | 10.9 | -3.31 |
| 2.0 | -3.87 |  | 6.6 | -4.58 |  | 6.3 | -3.81 |  | 8.2 | -2.28 |  |  |  |  |  |  |  | 7.3 | -3.73 |  | 9.6 | -3.45 |
| 0.8 | -3.33 |  | 5.4 | -5.21 |  | 5.0 | -4.37 |  | 7.0 | -2.89 |  |  |  |  |  |  |  | 6.1 | -4.05 |  | 8.3 | -3.80 |
|  |  |  | 4.1 | -4.79 |  | 3.7 | -5.04 |  | 5.3 | -4.13 |  |  |  |  |  |  |  | 4.9 | -4.72 |  | 6.9 | -4.24 |
|  |  |  | 2.7 | -4.16 |  |  |  |  | 4.2 | -4.61 |  |  |  |  |  |  |  | 3.6 | -5.16 |  | 5.6 | -4.13 |
|  |  |  |  |  |  |  |  |  | 3.0 | -4.89 |  |  |  |  |  |  |  |  |  |  | 4.3 | -4.23 |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |  |  |  | 3.1 | -4.18 |

**Supplementary Table S1D (continued):** Results from stable isotope analysis of enamel bioapatite from the sheep third molars (M3) at Skara Brae (SKB).

Each sample is located in tooth crown using the distance from the enamel–root junction.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SKB Ovis8 M3** |  | **SKB Ovis9 M3** |  | **SKB Ovis10 M3** |  | **SKB Ovis11 M3** |  | **SKB Ovis12 M3** |  | **SKB Ovis14 M3** |  | **SKB Ovis15 M3** |  | **SKB Ovis16 M3** |
| distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |
| 22.6 | -3.65 |  | 26.3 | -4.96 |  | 30.0 | -5.32 |  | 19.8 | -3.66 |  | 25.4 | -6.83 |  | 30.8 | -3.80 |  | 29.0 | -4.41 |  | 23.19 | -5.31 |
| 21.0 | -3.24 |  | 24.7 | -5.17 |  | 28.9 | -5.01 |  | 18.6 | -3.58 |  | 24.2 | -6.80 |  | 29.5 | -4.14 |  | 27.5 | -4.94 |  | 21.95 | -5.51 |
| 19.5 | -3.19 |  | 23.5 | -4.85 |  | 27.3 | -5.30 |  | 17.4 | -3.56 |  | 22.6 | -7.18 |  | 28.1 | -4.55 |  | 26.2 | -4.94 |  | 20.93 | -5.77 |
| 18.1 | -2.88 |  | 22.2 | -4.90 |  | 26.2 | -5.26 |  | 16.1 | -3.47 |  | 21.3 | -7.08 |  | 26.6 | -4.92 |  | 24.7 | -5.37 |  | 19.47 | -5.61 |
| 16.6 | -2.33 |  | 21.1 | -4.35 |  | 24.8 | -5.22 |  | 14.9 | -3.49 |  | 20.2 | -6.73 |  | 25.4 | -5.36 |  | 23.3 | -5.36 |  | 18.29 | -5.62 |
| 15.1 | -2.01 |  | 19.8 | -4.28 |  | 23.5 | -5.02 |  | 13.6 | -3.66 |  | 18.8 | -6.51 |  | 23.9 | -5.75 |  | 22.0 | -5.58 |  | 16.83 | -5.13 |
| 14.0 | -1.62 |  | 18.6 | -4.14 |  | 22.4 | -4.77 |  | 12.3 | -3.93 |  | 17.5 | -6.23 |  | 22.7 | -5.94 |  | 20.5 | -5.69 |  | 15.60 | -4.88 |
| 12.6 | -1.63 |  | 17.3 | -3.74 |  | 21.1 | -4.44 |  | 11.2 | -4.30 |  | 16.3 | -5.65 |  | 21.4 | -6.33 |  | 19.0 | -5.81 |  | 14.35 | -4.89 |
| 11.2 | -1.60 |  | 16.3 | -3.36 |  | 20.0 | -4.26 |  | 9.9 | -4.48 |  | 14.8 | -4.63 |  | 20.1 | -6.63 |  | 17.7 | -5.74 |  | 12.91 | -4.14 |
| 9.8 | -1.84 |  | 15.0 | -3.36 |  | 18.6 | -4.08 |  | 8.8 | -4.97 |  | 13.5 | -4.18 |  | 18.9 | -6.73 |  | 16.3 | -5.60 |  | 11.53 | -3.97 |
| 8.4 | -2.49 |  | 13.8 | -2.91 |  | 17.3 | -3.91 |  | 7.6 | -4.95 |  | 12.3 | -3.71 |  | 17.5 | -6.75 |  | 15.0 | -5.53 |  | 10.17 | -3.63 |
| 7.1 | -3.00 |  | 12.5 | -3.01 |  | 16.4 | -3.52 |  | 6.3 | -5.41 |  | 11.0 | -3.45 |  | 16.1 | -6.54 |  | 13.7 | -5.38 |  | 8.81 | -3.82 |
| 5.8 | -3.57 |  | 11.3 | -2.87 |  | 15.2 | -3.34 |  | 5.1 | -5.24 |  | 9.7 | -3.89 |  | 14.7 | -6.13 |  | 12.3 | -5.01 |  | 7.53 | -4.39 |
| 4.6 | -3.98 |  | 10.2 | -3.04 |  | 13.8 | -3.20 |  | 3.9 | -4.77 |  | 8.5 | -4.40 |  | 13.4 | -5.69 |  | 10.9 | -4.52 |  | 6.17 | -5.12 |
| 3.1 | -3.82 |  | 8.9 | -3.51 |  | 12.7 | -3.17 |  |  |  |  | 7.3 | -5.52 |  | 12.1 | -5.12 |  | 9.4 | -4.30 |  | 4.88 | -5.33 |
|  |  |  | 7.6 | -3.94 |  | 11.5 | -3.17 |  |  |  |  | 6.0 | -6.41 |  | 10.8 | -4.29 |  | 8.1 | -3.70 |  | 3.52 | -5.85 |
|  |  |  | 6.5 | -4.40 |  | 10.1 | -3.23 |  |  |  |  | 4.9 | -7.45 |  | 9.6 | -3.77 |  | 6.7 | -4.00 |  |  |  |
|  |  |  | 5.3 | -4.87 |  | 8.8 | -3.78 |  |  |  |  | 3.5 | -7.67 |  | 8.2 | -3.53 |  | 5.3 | -4.40 |  |  |  |
|  |  |  | 4.0 | -5.08 |  | 7.6 | -4.07 |  |  |  |  |  |  |  | 6.7 | -3.46 |  | 4.0 | -5.10 |  |  |  |
|  |  |  | 2.8 | -5.39 |  | 6.2 | -4.47 |  |  |  |  |  |  |  | 5.3 | -4.00 |  | 2.5 | -5.55 |  |  |  |
|  |  |  |  |  |  | 4.7 | -4.90 |  |  |  |  |  |  |  | 3.8 | -5.14 |  |  |  |  |  |  |
|  |  |  |  |  |  | 3.5 | -5.61 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Supplementary Table S1E:** Results from stable isotope analysis of enamel bioapatite from the sheep second (M2) and third molars (M3) at Kemenez (KMZ).

Each sample is located in tooth crown using the distance from the enamel–root junction.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **KMZ Ovis 1 M2** |  | **KMZ Ovis10013 M2** |  | **KMZ Ovis00018 M2** |  | **KMZ Ovis00018 M3** |
| distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |  | distance (mm) | δ18O (‰) |
| 30.1 | -2.30 |  | 27.5 | -2.39 |  | 20.6 | -4.16 |  | 25.3 | -1.67 |
| 28.7 | -2.09 |  | 26.2 | -2.74 |  | 19.3 | -4.05 |  | 24.0 | -2.09 |
| 27.5 | -2.82 |  | 25.0 | -3.05 |  | 17.9 | -4.20 |  | 22.8 | -2.46 |
| 26.1 | -2.68 |  | 23.8 | -3.06 |  | 16.6 | -3.90 |  | 21.4 | -2.87 |
| 24.9 | -3.22 |  | 22.5 | -3.56 |  | 15.4 | -3.76 |  | 20.5 | -3.11 |
| 23.5 | -3.13 |  | 21.2 | -3.50 |  | 14.2 | -3.45 |  | 19.3 | -3.60 |
| 22.1 | -3.79 |  | 20.2 | -3.71 |  | 11.7 | -2.69 |  | 18.3 | -4.04 |
| 20.7 | -3.44 |  | 18.9 | -4.09 |  | 10.4 | -2.22 |  | 17.0 | -4.49 |
| 19.4 | -3.81 |  | 17.9 | -4.44 |  | 9.1 | -2.12 |  | 15.8 | -4.43 |
| 18.3 | -3.21 |  | 16.3 | -4.17 |  | 7.6 | -1.96 |  | 14.7 | -4.81 |
| 16.9 | -3.63 |  | 15.1 | -4.28 |  | 6.5 | -1.79 |  | 13.4 | -4.53 |
| 15.6 | -2.89 |  | 13.8 | -4.17 |  | 5.3 | -1.75 |  | 12.3 | -4.55 |
| 14.3 | -3.03 |  | 12.3 | -4.12 |  | 4.1 | -1.70 |  | 10.9 | -4.03 |
| 12.9 | -2.20 |  | 10.9 | -3.71 |  | 2.9 | -1.89 |  | 9.6 | -3.68 |
| 11.7 | -2.18 |  | 9.5 | -3.61 |  |  |  |  | 8.3 | -3.14 |
| 10.6 | -1.16 |  | 8.2 | -3.05 |  |  |  |  | 7.2 | -2.47 |
| 9.1 | -0.95 |  | 6.9 | -2.99 |  |  |  |  | 5.9 | -1.77 |
| 7.8 | -0.40 |  | 5.7 | -2.88 |  |  |  |  | 4.6 | -1.44 |
| 6.6 | -0.43 |  | 4.3 | -3.00 |  |  |  |  | 3.3 | -1.74 |
| 5.7 | -0.52 |  | 2.8 | -3.10 |  |  |  |  |  |  |
| 4.4 | -1.17 |  |  |  |  |  |  |  |  |  |
| 2.9 | -1.41 |   |   |   |   |   |   |   |   |   |