



Ancient DNA from the skeletons of Roopkund Lake reveals migrants of Mediterranean origin in South Asia



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Located 5000 meters above sea level, Roopkund Lake is home to several hundred human skeletons of unknown origin

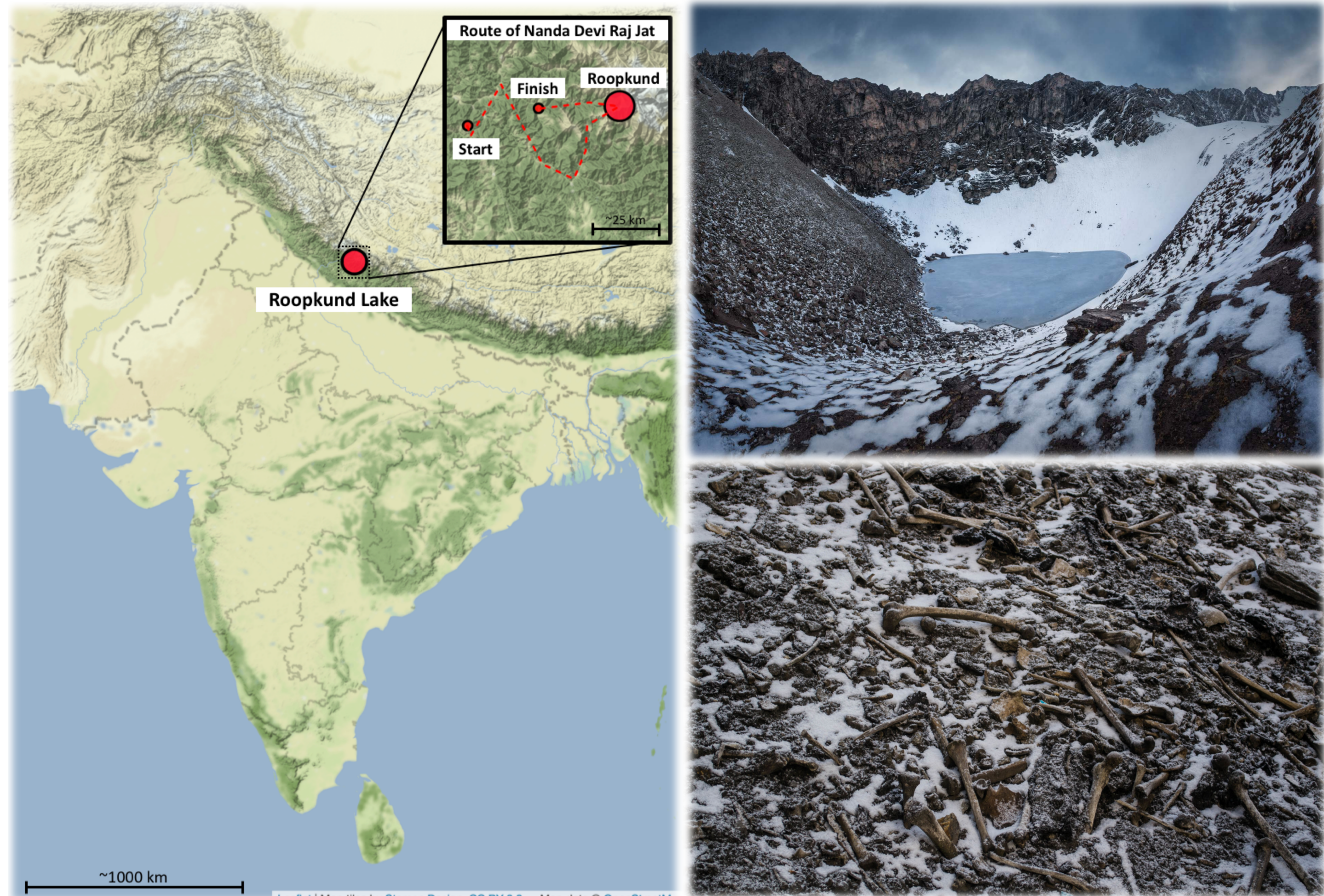
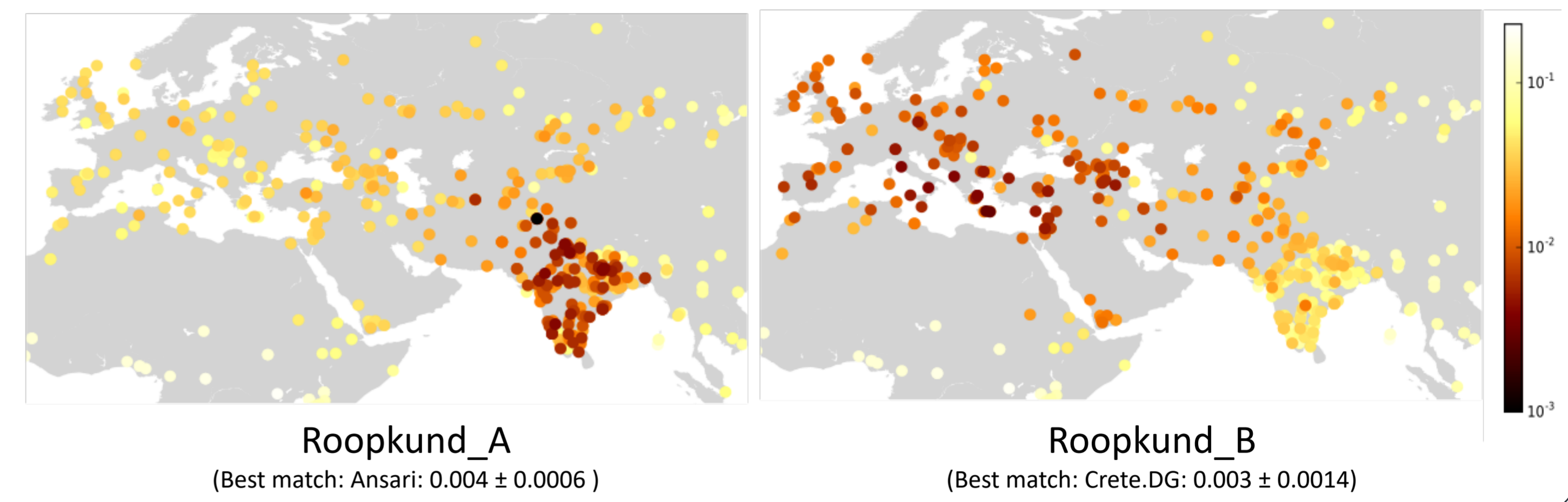
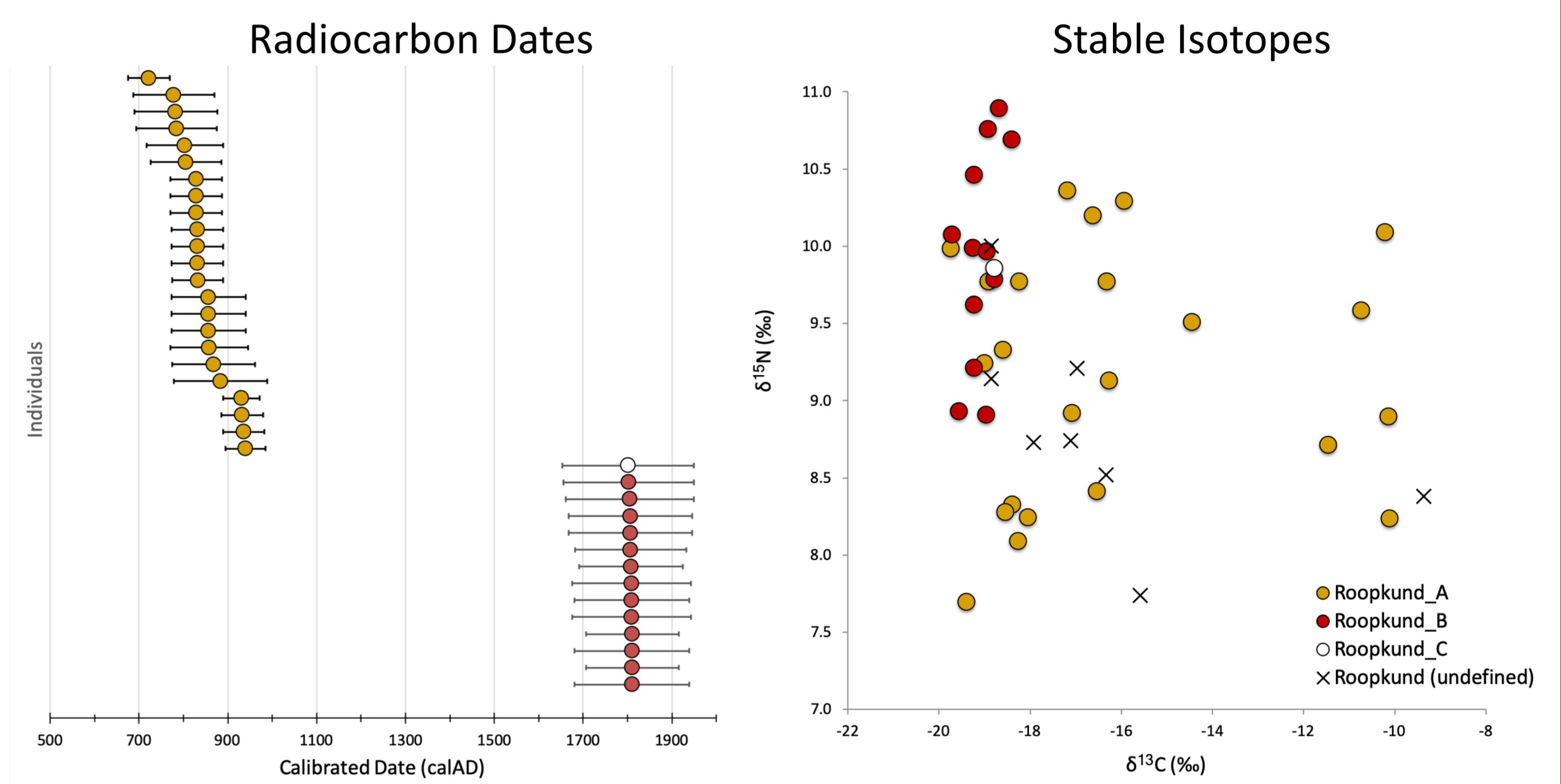


Photo credit: [top] Atish Waghvase [bottom] Himadri Sinha Roy

Pairwise F_{ST} indicates that the Roopkund_B skeletons are most closely related to populations from the Eastern Mediterranean

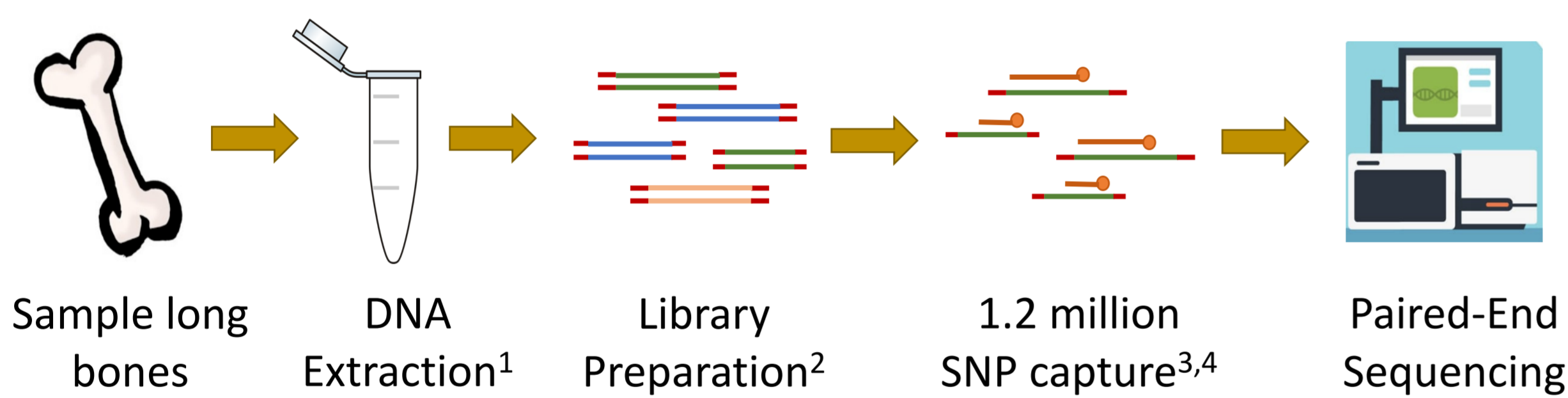


The Roopkund individuals died during at least two events, approximately one thousand years apart

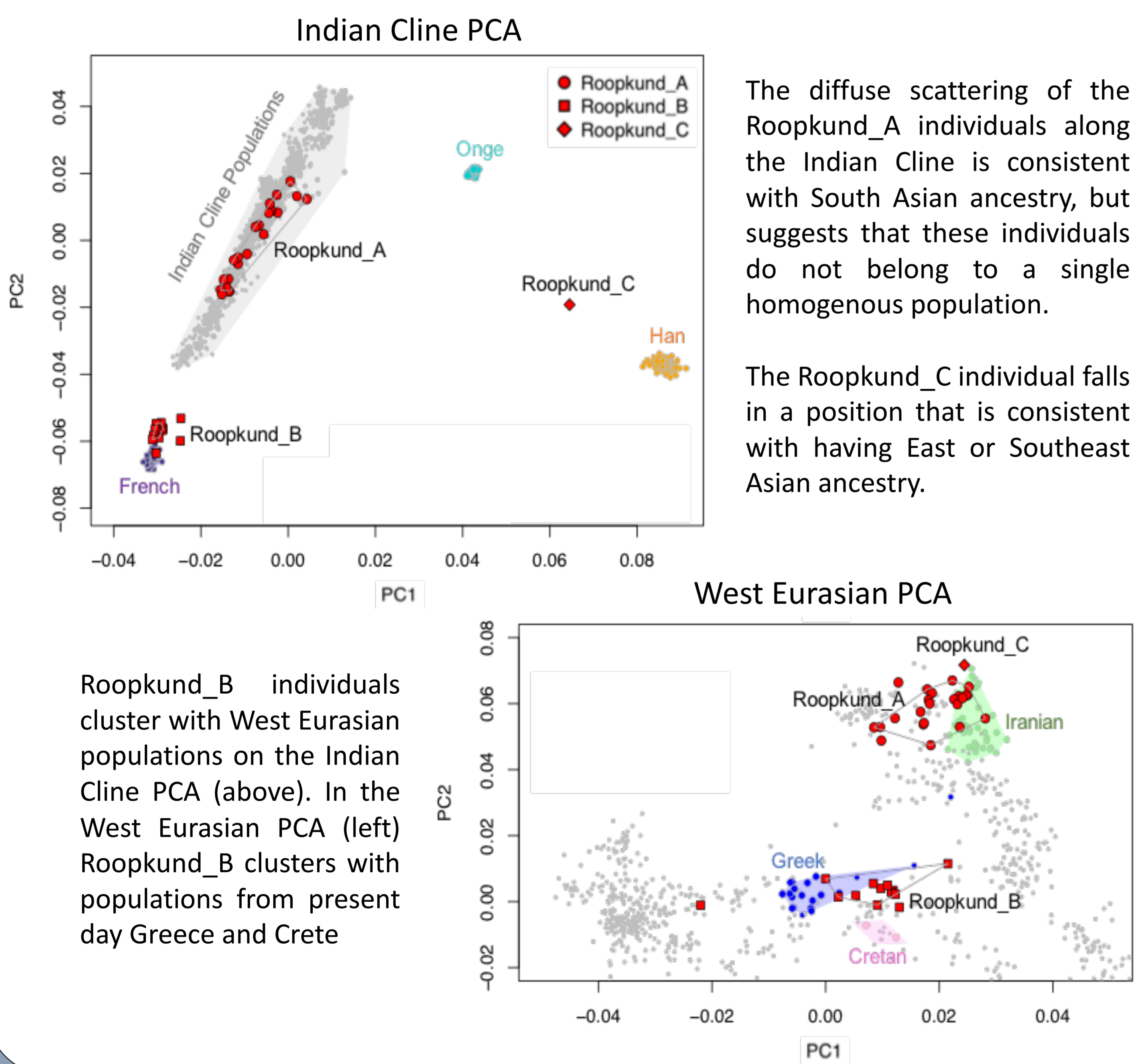


Radiocarbon dating (left) shows that Roopkund_A individuals date to around 800 calCE (although they may not have been deposited during a single event), while Roopkund_B and Roopkund_C individuals date to around 1800 calCE. Error bars indicate the 95.4% confidence interval. Stable isotope analysis (right) shows a correlation between dietary practices and genetic clustering.

Genome-wide ancient DNA from 38 individuals

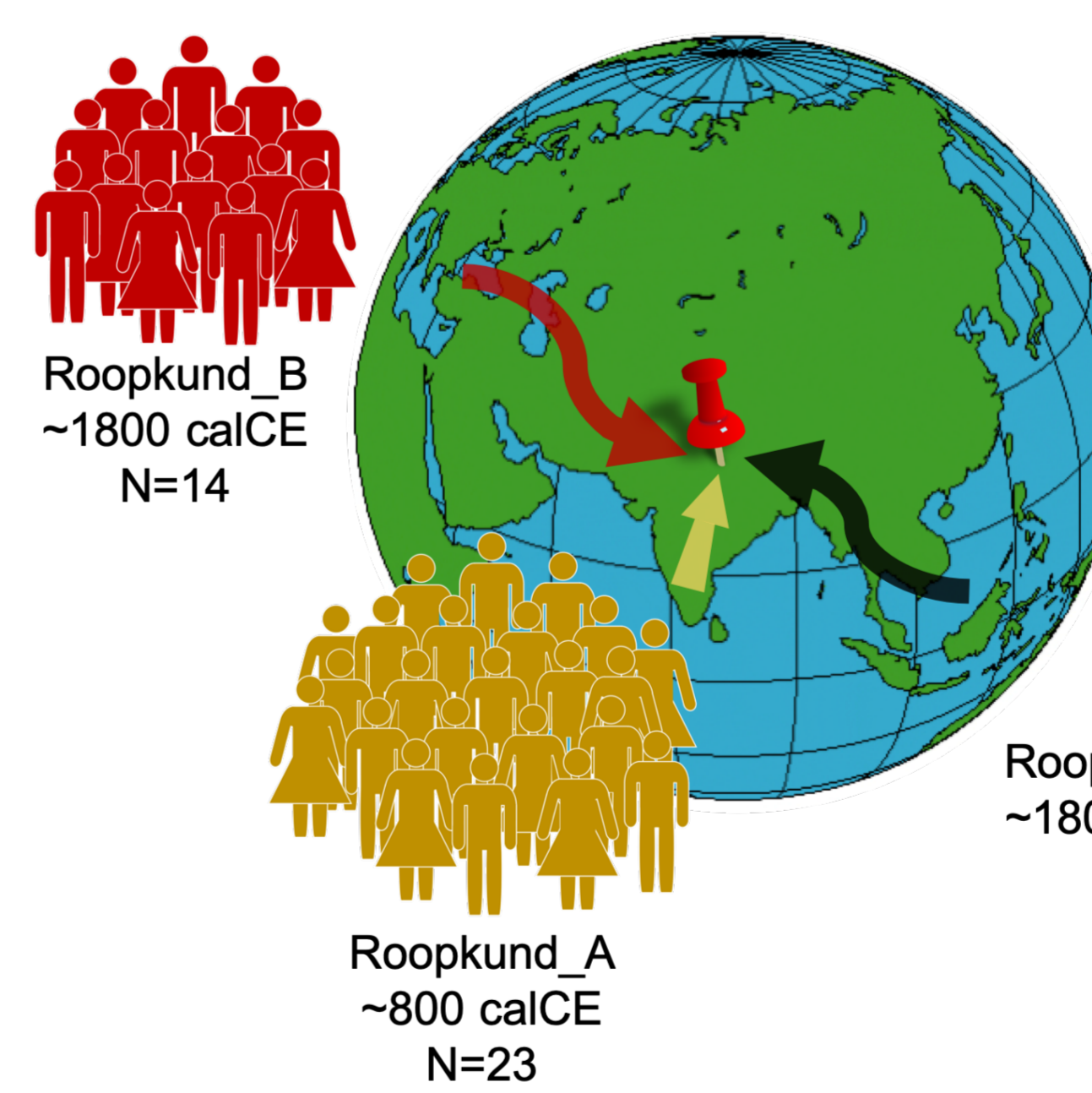


PCA reveals three distinct clusters



Conclusions

We identify multiple genetically and isotopically distinct groups, refuting previous suggestions that the skeletons of Roopkund Lake were deposited during a single, catastrophic event. The Roopkund_A group dates to around 800 CE and is of broadly South Asian ancestry, while the Roopkund_B and Roopkund_C groups date to around 1800 CE and are of Eastern Mediterranean and Southeast Asian ancestry, respectively.



Other observations

- Mitochondrial and Y-chromosome haplogroups (not shown) are consistent with these findings.
- Morphological analyses (not shown) are also consistent with the observation of multiple distinct groups
- We detected no genetically related individuals (3rd degree or closer)⁵, and find that the two main groups are composed of both genetically male and female individuals of a variety of ages

[1] Dabney et al. *PNAS* (2013) [2] Rohland et al. *Phil. Trans. R. Soc. B* (2015) [3] Fu et al. *Nature* (2015) [4] Haak et al. *Nature* (2015) [5] Kuhn et al. *BioRxiv* (2017)

ADMIXTURE highlights differing ancestry of Roopkund individuals

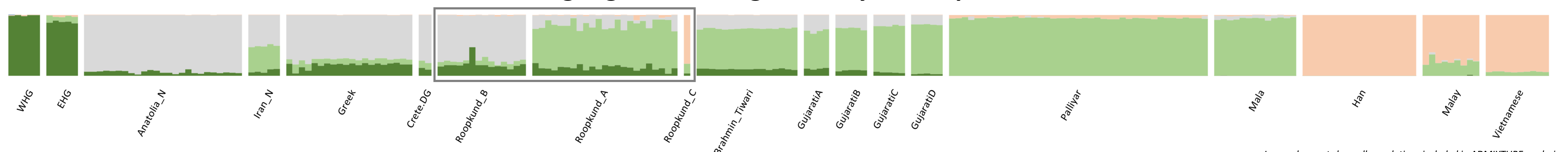


Image does not show all populations included in ADMIXTURE analysis