



Project Gallery

The *Mogou Multidisciplinary Investigation Project*: insights into the kinship and social organisation of a Bronze Age population in north-west China

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Excavation at Mogou, a Bronze Age cemetery containing over 1700 burials and 6000 individuals, has revealed a diverse range of multiple burials. Building on this dataset, the *Mogou Multidisciplinary Investigation Project* aims to explore connections between kinship, burial space and social organisation in Bronze Age north-west China.

Keywords: North-west China, Mogou cemetery, Bronze Age, ancient DNA, kinship

Introduction

North-west China played an important role in trans-Eurasian cultural diffusion and population migration during the mid second millennium BC (Jaffe & Flad 2018) (Figure 1). Wheat and barley spread along the Hexi Corridor and regional metallurgical cultures were transformed. Little research, however, has been carried out on site-level social organisation and different political/economic strategies, and the mechanisms underlying cultural development and interactions across and beyond this vast region remain unclear.

Mogou (磨沟) is a Bronze Age cemetery situated in Lintan County, southern Gansu, along the terraces that line the Tao River (Figure 1). Covering over 30ha, Mogou is the largest and best-preserved Qijia Culture (1750–1400 BC) cemetery found to date (Qian *et al.* 2010) (Figure 2a). From 2008 to 2012, Mogou was among key excavations conducted by the Gansu Provincial Institute of Cultural Relics and Archaeology (GPI CRA) and the School of Cultural Heritage at Northwest University. Over 1700 burials were uncovered, containing more than 6000 individuals. Situated on the eastern perimeter of the Eurasian Steppe, apart from local and Central Plains influences, a handful of the tombs also contained Andronovo-style gold accessories, highlighting Mogou's integration within a wider exchange network.

Mogou society and the *Mogou Multidisciplinary Investigation Project*

Radiocarbon dating indicates that Mogou was occupied around 1750–1100 BC (Mao *et al.* 2009; Xie *et al.* 2009). Material culture remains can be assigned almost exclusively to the

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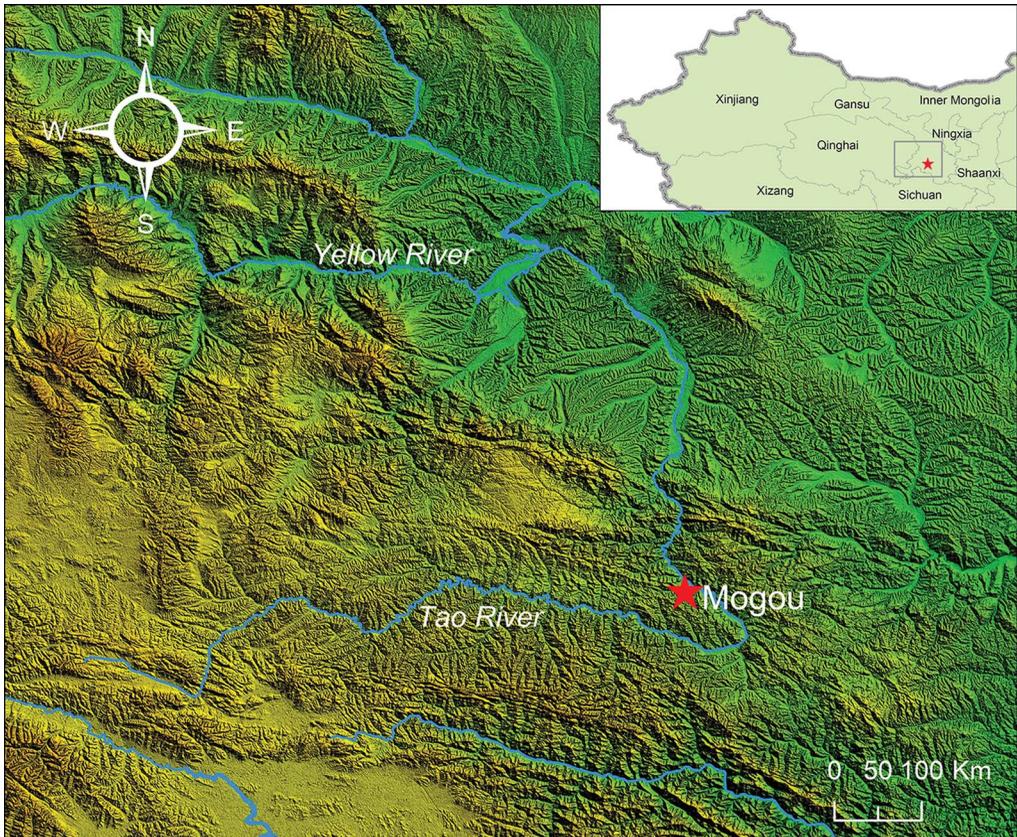


Figure 1. Map showing north-west China and the location of the Mogou site (map by Xiaoying Ren).

Qijia Culture, alongside more than 100 Siwa Culture burials. Tombs were arranged in rows and rarely intersected, suggesting an intentional cemetery layout (Figure 2b). The cemetery featured two burial types—tombs with a side chamber (Figure 3a–b) and shaft graves (Figure 3c)—with no clear spatial patterning for either. Most Mogou graves were multiple burials containing anywhere between two and upwards of 20 individuals of either sex, and including all ages. Graves were often left partially unfilled following the first burial; covered with large stones or a wooden board, they were reopened whenever renewed interment was necessary.

Mogou is therefore a significant site that can offer insights into burial practices, social organisation and kinship structure in second-millennium BC north-west China. Work over the last decade has shown that the combination of ancient DNA, strontium isotope analysis and radiocarbon dating can provide a local perspective, shedding light on inheritance rules, marriage practices and questions such as whether social status was related to a specific paternal/maternal lineage or a specific genetic structure, leading to a composite window onto socioeconomic processes and human behaviour (Mittnik *et al.* 2019; Racimo *et al.* 2020). The *Mogou Multidisciplinary Investigation Project*, a collaboration between the Institute of Archaeological Science at Fudan University and GPICRA, aims to follow this lead and use these methods to analyse possible kinship ties, alongside the political and economic structures



Figure 2. a) Panoramic view of the Mogou site (blue area) and the Tao River; b) east section of Mogou cemetery (photographs by Ruilin Mao).

of the Mogou population. We are currently working on two key questions: how does utilisation of individual burial spaces/burial groups connect across the cemetery overall, and how does kinship influence political and economic strategy at Mogou?

We conducted a systematic survey of the archaeological materials and selected three areas within the cemetery for analysis. Our sample collection includes joint burials and individual burials containing different styles of artefacts, tombs with and without grave goods, and two different forms of Qijia and Siwa burial. The project will highlight the possibility of applying a multidisciplinary approach to Chinese archaeology from an anthropological perspective.



Figure 3. Chamber (a) and path (b) of side chamber grave M230, which contained three adults and one child; c) shaft grave M216, which contained two adults (photographs by Ruilin Mao).

Preliminary findings

We focus here on M80, a Qijia Culture tomb with double niche-chambers (Figure 4b). Given the quantity of accumulated human remains and rich grave goods, it was presumably in use for a considerable period. Twelve individuals were interred within M80, falling into four spatial groupings. The first of these is represented by a single surviving skull (individual 1) placed at the entrance of the tomb passage. The second consists of individuals 2–5, buried deep in the centre of the tomb passage (Zone A). The third group, located in the upper side chamber (Zone B), contains individual 6. Finally, the fourth group is represented by the lower side chamber (Zone C) and features individuals 7–12 (Table 1). Radiocarbon dating of individuals 5 and 8 provided dates of 3456–3364 cal BP and 3569–3411 cal BP (both at 95.4% confidence), confirming the Qijia periodisation.

DNA analysis of individuals 1 and 6 failed due to poor sample quality, although 10 valid mitochondrial genome sequences were obtained. Eight different mtDNA haplogroups were

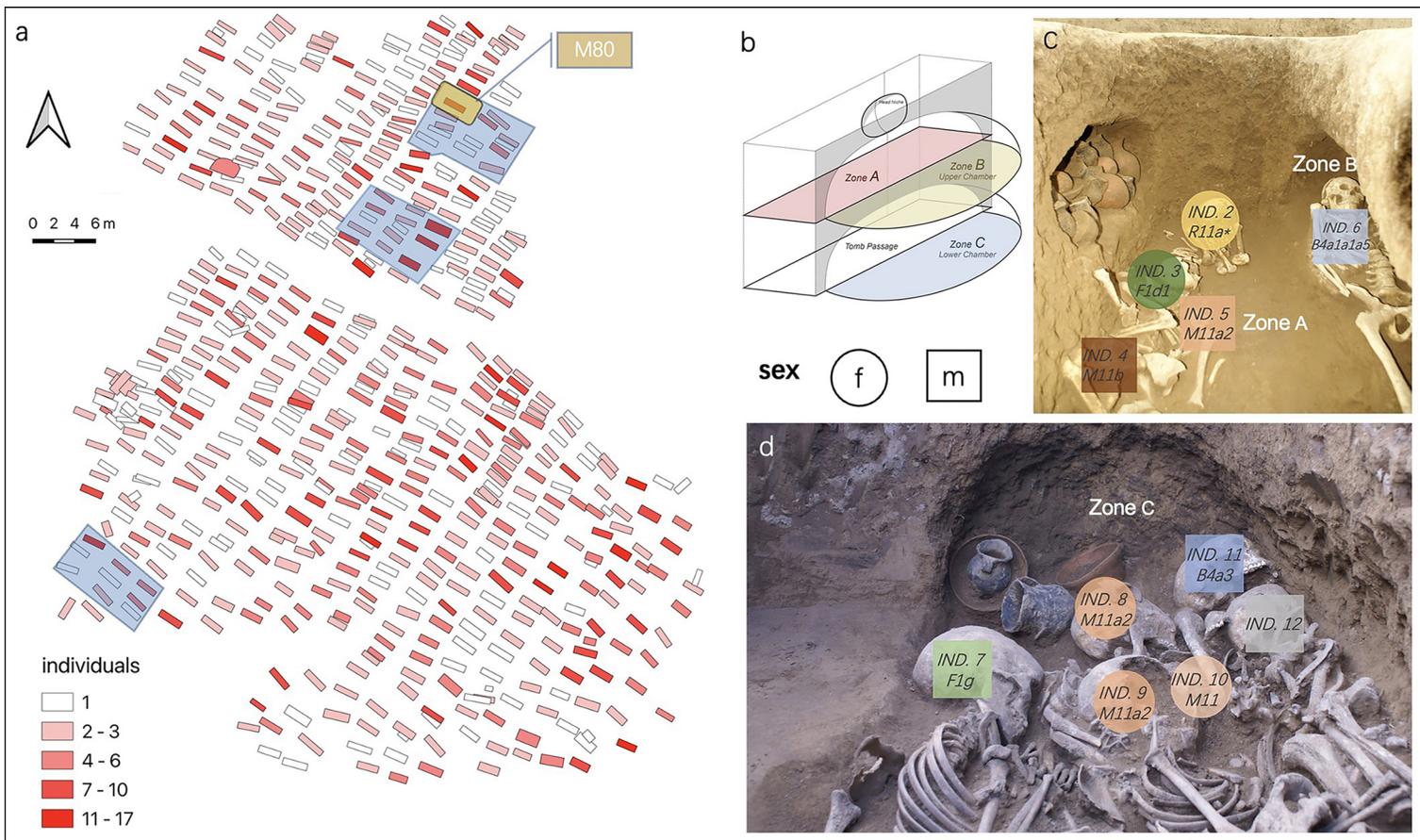


Figure 4. a) Plan of the Mogou cemetery (excavated in 2008 and 2009) and the three sample areas; b) schematic diagram of spatial structure of M80; c) middle of the tomb passage (Zone A) and upper chamber (Zone B) of M80; d) lower chamber (Zone C) of M80 (figure by Xiaoying Ren and Yao Yu).

Table 1. Sequencing results for individuals from burial M80. Dates calibrated using the IntCal20 curve (Reimer *et al.* 2020) in OxCal v4.4.2 (Bronk Ramsey 2009) and are presented in calibrated calendar years BP.

Sample ID	Grave ID	Location of tomb	Date (cal BP)	Sample	Age (Osteological)	Sex (Genetic)	Contamination	Mt_Depth ¹	mtDNA Haplogroup ²	Y Chromosome Haplogroup ³
F90901	3	Zone A		Temporal bone	18–25	Female	0.01	200.6954	F1d1	–
F90902	10	Zone C		Temporal bone	12	Female	–	0.5	M11	–
F90903	8	Zone C	3456–3364	Temporal bone	13–17	Female	0.01	153.9141	M11a2	–
F90904	11	Zone C		Tooth	35–39	Male	0.01	15.6263	B4a3	–
F90905	12	Zone C	3569–3411	Temporal bone	Infant	Female	–	0.46	–	–
F90906	9	Zone C		Tooth	26–35	Female	0.01	90.9119	M11a2	–
F90909	5	Zone A		Temporal bone	Infant	Male	0.01	88.9394	M11a2	O2a2b1a1a1-F8
F90910	6	Zone B		Temporal bone	26–35	–	–	2.03	B4a1a1a5	–
F90911	7	Zone C		Temporal bone	14–16	Male	0.01	30.1056	F1g	O2a2b1a1a1-F8
F90912	1	The entrance to the tomb passage		Temporal bone	NA	–	–	0.25	–	–
F90914	2	Zone A		Temporal bone	NA	Female	0.01	17.7265	R11a*	–
F90915	4	Zone A		Temporal bone	18–25	Male	0.01	61.0969	M11b	O2a2b1a1a1-F8

¹ Mt_Depth refers to the ratio of the aligned mtDNA bases to the total number of reference mtDNA bases.

² We used HaploGrep 2 (Weissensteiner *et al.* 2016) to assign the mtDNA haplogroups.

³ Y chromosome haplogroups were examined by aligning a set of positions in the ISOGG (International Society of Genetic Genealogy: <http://isogg.org/>).

identified for the remaining 10 individuals, indicating high maternal diversity among tomb occupants (Table 1). M80 is characterised predominantly by the presence of the most typical eastern Eurasian mtDNA haplogroups (B4, R9 and M11). The Y-chromosome haplogroup of individuals 4, 5 and 7 was identified as O-F8 (a sub-haplogroup of O-F5, both downstream markers of O α -M117). O α -M117, thought to derive from Yellow River Basin Neolithic farmers, represents a major founder paternal lineage of present-day Han Chinese, with over 16 per cent exhibiting the O α haplogroup (Yan *et al.* 2014).

In terms of the spatial distribution of mtDNA haplogroups, female individuals 8 and 9, who share haplogroup M11a2, were buried together in the lower chamber next to female individual 10, who possibly also shares M11a2. Male infant individual 5, buried in the tomb passage, shared haplogroups with individuals 8 and 9 (Figure 4c–d), with identical mitochondrial mutation loci indicating a probable maternal relation. The similarity in mtDNA haplogroup, combined with the spatial distribution of grave goods in the tomb passage and chamber, supports the supposition that the tomb passage was probably considered a legitimate burial space during the final period of the tomb's use. In addition, a type consistent with the mtDNA haplogroup and mutation loci of individual 11 was found in adjacent burial M90, indicating a maternal relationship between individuals in these two tombs. Y-chromosome and mtDNA haplotypes contain only information regarding the paternal or maternal lineage. The results suggest the possibility of paternal/maternal ties between individuals in these burials that impacted the arrangement of space within them and the location chosen for interment. Our initial results will be extended by complex kinship analysis at the genome-wide level.

Future prospects

The *Mogou Multidisciplinary Investigation Project* will enhance our ability to test interpretative models on rules of inheritance and mobility at Mogou and ultimately improve our understanding of Bronze Age political and economic strategies in north-west China. Our explicit spatiotemporal and microregional framework will help us recognise that ancient individuals do not always fall cleanly within culturally or genetically defined groupings. Furthermore, we believe that the project's integrated approach will help train the next generation of interdisciplinary researchers and establish a demonstrably sustainable model of collaboration between archaeologists and geneticists.

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