Radiocarbon-dated archaeological record of early first millennium B.C. mounted pastoralists in the Kunlun Mountains, China

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Pastoral nomadism, as a successful economic and social system drawing on mobile herding, long-distance trade, and cavalry warfare, affected all polities of the Eurasian continent. The role that arid Inner Asia, particularly the areas of northwestern China, Kazakhstan, and Mongolia, played in the emergence of this phenomenon remains a fundamental and still challenging question in prehistoric archaeology of the Eurasian steppes. The cemetery of Liushiu (Xinjiang, China) reveals burial features, bronze bridle bits, weaponry, adornment, horse skulls, and sheep/goat bones, which, together with paleopathological changes in human skeletons, indicate the presence of mobile pastoralists and their flocks at summer pastures in the Kunlun Mountains, ∼2,850 m above sea level. Radiocarbon dates place the onset of the burial activity between 1108 and 893 B.C. (95% probability range) or most likely between 1017 and 926 B.C. (68%). These data from the Kunlun Mountains show a wider frontier within the diversity of mobile pastoral economies of Inner Asia and support the concept of multiregional transitions toward Iron Age complex pastoralism and mounted warfare.

Bronze Age | horse-riding | climate change | socioeconomic models

For decades, the first millennium B.C. was traditionally seen as a period of rapid growth of a powerful network of culturally similar tribes of mounted mobile pastoralists and warriors (among them, "Scythians" and "Saka") across the Eurasian steppes (discussion and references in 1–4). To attest to their prevalent nomadic lifestyle, archaeological data [mainly from monumental burial mounds (kurgans) of the wealthy aristocratic elite and distinguished warriors], ancient writings, and art objects were used (e.g., 4–7). Observed similarities in the characteristic weapon types, metal horse harnesses, and "animal style" decorations were further used to stress the cultural unity of the Eurasian steppes and to coin widely used terms, such as "Scythian world" and "Scythian triad" (discussion and references in 8).

However, a growing body of evidence obtained through multidisciplinary research projects carried out from Mongolia to the Black Sea (e.g., 9–13) has called into question the oversimplified 20th-century concepts of nomadism based on the cultural unity, long-distance movements, and purely pastoralist economy of these societies across Eurasia. Instead, more nuanced models are being put forward that account for more complex economies, including different types of herding, farming and foraging, and sociopolitical organization as well as the macro- and microregional diversity of social, economic, and environmental change during the late Bronze Age and early Iron Age (e.g., 14–18). Furthermore, studies on earlier forms of pastoralism in Eurasia from at least the late third millennium B.C. (10, 11) indicate a long developmental process leading to the complex subsistence strategies and political economies of the first millennium B.C.

In a recent review of the archaeology of the Eurasian steppes and Mongolia, the "significant role" that this study field "must come to play in developing more comprehensive understandings of world prehistory" was stressed (13). To reach this stage, however, a better knowledge of the driving forces and key variables (i.e., climate change, innovative technologies, new forms of social and political integration) behind the transition to the pastoral and mixed agropastoral economies of the late Bronze age and early Iron Age and solid case studies of this transition on the local to regional scale are required (2, 13, 19–21). Reliable age determinations of find complexes are crucial to provide a robust chronological framework for the interval spanning the second and early first millennium B.C. and to fill the spatial/temporal gap in our current knowledge (e.g., 4, 22).

This paper presents previously undescribed archaeological and radiocarbon data from Liushui, Xinjiang, China. The results are compared with available records from southern Siberia, Mongolia, China, and Kazakhstan and are further discussed in terms of a wider frontier within the diversity of mobile pastoral economies of Inner Asia and multiregional transitions toward Iron Age complex pastoralism and mounted warfare.

ANTHROPOLOGY

Results

Liushui cemetery (36° 14′ 41.9′′ north, 81° 43′ 23′′ east) occupies an area of ∼4,000 m^2 on a terrace of the upper Keriya River in the Kunlun Mountains, ∼2,850 m above sea level (a.s.l.) (Fig. 1). It was discovered in 2002 under a layer of aeolian loess several meters thick (23). During three summer campaigns, the entire graveyard with 52 earth pit tombs containing about 160 skeletons of men, women, and children has been excavated.

Each grave was covered with a stone-veneered earth mound or stone circle of 3–6.6 m in diameter (Fig. 2*J*). About half of the graves had an additional small stone circle on the eastern side in which ashes, pot sherds, and burned bones of sheep/goats were found. These finds indicate ritual feasting, which occurred some time after the funeral ceremony.

Beneath each stone cover, there was a single oval or rectangular grave pit of 30–220 cm depth (Fig. 2*B*). In only eight cases (∼15%) was a single person buried in a supine position with legs drawn up and head facing toward the east. One grave revealed 14 skeletons, but the majority of pits contained 2 to 6 skeletons found in layers separated by sand, gravel, and stones. This feature and the presence of disturbed and incomplete skeletons with displaced components probably indicate multiple burial events and the reopening of the grave pits for subsequent burials.

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Fig. 1. Physiographic map of Inner Asia showing sites and archaeological cultures mentioned in the text.

The goods with which the deceased were endowed are limited in type, quantity, and quality. Sheep/goat bones in or beside vessels are the remains of food gifts, whereas single horse skulls or mandibles with or without a bronze bit and cheek pieces placed next to the human body might represent highly valued riding horses. Altogether, 80 ceramic vessels, mainly round-bottom bowls, small pots, and beakers of portable size (Fig. 3), were found in 35 tombs; the others did not contain any pottery. In several cases, sets of one pot plus one bowl were observed. The predominating clay colors are variations of brick-red and gray. All vessels bear impressed, engraved, or incised surface decoration, notably zigzags, hatched triangles, and dotted lines in various layouts and combinations.

Altogether, 38 tombs contained bronze objects (Fig. 2 *B–E* and *G–I*), among which knives, buttons, and beads occur most frequently. Knives (i.e., 26 from 19 tombs) were mostly accompanied by whetstones, both found at the waist. Other bronze objects include arrowheads (found in 5 tombs) (Fig. 2 *D* and *E*), horse bridle bits (found in 4 tombs) (Fig. 2*C*), earrings (Fig. 2*A*) and bracelets (found in 2 tombs), and a mirror (found in 1 burial). A socketed bronze axe and lance point are singular finds from tomb M55, which also stands out for containing a higher quantity of goods (Fig. 2 *B* and *H*). In 4 tombs, iron fragments were found and assumed to be parts of knives, but the severe state of corrosion did not allow more exact determination.

Ornaments include very distinct gold and silver earrings with one biconical end, gold or silver beads, and a gold pectoral (Fig. 2*A*). Necklaces are usually made of white stone or shell beads; nephrite and agate beads are rare. Stone pegs accompanied by pieces of graphite appear similar to modern "eyebrow pencils," although their exact use is not known. Bone material has been implemented for arrowheads (Fig. 2*F*) and pins.

To date, macro- and microscopic analyses performed on 100 human skeletons in various (very good to poor) degrees of preservation (24, 25) provide rich demographic (Table 1) and paleopathological information (Table 2) about the ancient population. A great number of pathological changes (e.g., fractures of vertebral bodies, strain and trauma of the adductor muscles, stress fractures of foot bones, ligament strain of the ankle joint, stress fractures of the scapula) (Fig. 4) were documented and further used to reconstruct disorders of the musculoskeletal apparatus and to discuss the predominant lifestyle.

Archaeological objects and funerary features do not show obvious cultural diversity, suggesting that the cemetery represents a coherent cultural period. To establish an absolute chronology, 11 samples representing nine tombs were radiocarbon-dated. Dated material includes charcoal (twigs of *Populus* spp., and wood of Maloideae spp. within the rose family) from post-funeral fires and wood pieces preserved in the socketed arrowheads, lance, and axe as summarized in Table 3. The results (Table 3) allow us to conclude that the whole phase of activity started between 1108 and 893 B.C. (95% probability range) or most likely between 1017 and 926 B.C. (68%). The directly dated tombs span the interval between 149 and 414 y (95%) or most likely between 173 and 298 y (68%). The whole phase seems to have finished between 760 and 493 B.C. (95%) or most likely between 750 and 630 B.C. (68%).

Fig. 2. Archaeological finds from Liushui graveyard: gold earrings and a gold foil pectoral (*A*); opened oval grave pit M55 showing the original position of the human skeleton and associated funeral objects (*B*); bronze bit with bone cheek pieces (*C*); arrowheads made of bronze (*D* and *E*) and bone (*F*); bronze knives (*G* and *I*) and a socketed axe (*H*); and the stone circle covering the grave ground (*J*). The wooden shaft fragment from the arrowhead in *D* was removed and radiocarbon-dated (sample KIA29830; Table 3). Photographs by A.A. and X.W.

Discussion

Further discussion focuses on (*i*) comparison of the burial features and artifact inventory of Liushui with contemporary cultures of Inner Asia (locations of archaeological sites and cultures are provided in Fig. 1), (*ii*) reconstruction of the social status and subsistence strategies of the population buried at Liushui, (*iii*) a possible socioeconomic model for interpreting the Liushui site

Fig. 3. Characteristic pottery from Liushui with comb impressions and hatched triangles. Photographs by M.W.

in a regional context, and (*iv*) climate change and the trajectory of socioeconomic changes toward higher residential mobility.

To mark a tomb with a low stone mound or stone circle (Fig. 2*I*) was a widespread custom in central Eurasia during the late Bronze Age to early Iron Age (e.g., 4), and the interment of a horse's head or mandible accompanying human inhumation (Fig. 2*B*) has been archaeologically verified at a number of sites from Kazakhstan and Mongolia to northeastern China (4, 14, 29, 30).

The Liushui bronze weaponry, particularly the very distinctive rhombic arrowheads with one side spur, and horse harnesses (Fig. 2) show great similarity to finds from kurgans (e.g., Arzhan 1 and Berlik in Fig. 1), with the inventories representing different steppe and forest-steppe cultures, such as Bol'shaya Rechka, Krasnoozero, and late Irmen' in Siberia (4); Tasmola and Zebakino-Dongal in Kazakhstan (4); and Subeshi in Xinjiang (31). Except for the rhombic socketed arrowheads, all other bronze weapons, horse harnesses, and ornaments have been found across the northern Chinese steppes from Xinjiang to the Korean Peninsula (32, 33).

Some of the prestigious gold objects from Liushui have a comparably broad geographical distribution range. Similar crescent-shape gold foil pectorals were found at the Bystranskoe site of the Bol'shaya Rechka culture (7) and in the Yuhuangmiao burial site near Beijing (29). On the other hand, the gold and silver earrings of Liushui (Fig. 2*A*) do not have close analogs, except for the earrings with a truncated conical pendant from Bystranskoe (7) and from Chaiwopu near Turfan (31).

Intriguingly, the pottery of Liushui with its impressed decoration (Fig. 3) differs significantly from the contemporary widespread painted ceramic wares of Xinjiang (31) but shows a distinct similarity to the incised and impressed ceramics characteristic of the Krasnoozero, late Irmen', and Bol'shaya Rechka cultures of Siberia (4). In Xinjiang, unpainted gray to brick-red bowls and pots are only known from burial places like Xiabandi in the western Kunlun Mountains (34). Preliminary reports on finds from Djoumboulak Koum in the lower reaches of the Keriya River, in the center of Taklamakan (Fig. 1), include pictures of ceramic vessels (35) that also share details of form and decoration with some vessels from Liushui.

Table 1. Demographic data on skeletal remains of the ancient population buried in Liushui

	Sex (%)			
Age groups, y	Male	Female	Unknown	Total (%)
0–1	—	—	3	3
2–9	—	—	—	—
10–14	2	4	2	8
15–23	12	9	8	29
24–35	19	7	5	31
36–55	13	8	4	25
56–69	2	2	—	4
Total (%)	48	30	22	100

Percentages are calculated based on a total of 100 individuals analyzed.

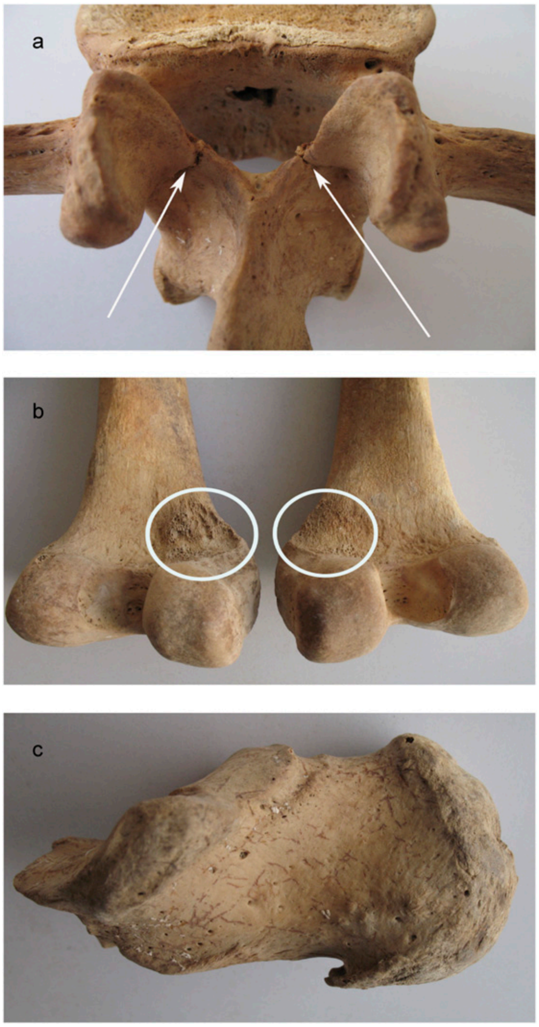

Fig. 4. Pathological changes in skeletons from Lishui. (*A*) Dorsal view of the second lumbar vertebra with stress fractures below the articular surfaces on both sides. (*B*) Dorsal view of both femur condyles. The medial part shows an irregular and porous surface where the attachment of the adductor muscles is located. (*C*) Lateral view of the right calcaneus. The plantar area is broadened and shows a spur at the attachment of the plantar aponeurosis. Photographs by J.G.

The typological parallels between the archaeological finds from Liushui and Taklamakan and those from Siberia, Kazakhstan, Mongolia, and northern China might suggest long-distant cultural/technological exchange, which existed in Inner Asia already during the Bronze Age. The recent results of genetic studies further support the existence of such interregional contacts (36). In particular, the mtDNA analysis carried out on the human remains from Xiaohe cemetery (37) provides evidence that the admixed population of both western and eastern origin lived in eastern Taklamakan (38). The latter publication considering the genetic haplotypes and particular archaeological data also suggests a close relationship between the Xiaohe people and the Bronze Age populations of southern Siberia (38).

More radiocarbon dates are urgently required for robust reconstructions of the spatial/temporal patterns and contacts of different cultures and regions of Inner Asia. Well-dated sites are mainly concentrated in southern Siberia, including the late ninth century B.C. Arzhan 1 royal tomb in Tuva (22) and the agropastoral Chicha settlement dating from approximately the 14th century to ninth century B.C. (4), which are frequently used as

Table 2. Pathological changes revealed by the study of skeletal remains of the ancient population buried in Liushui

Body parts analyzed	Pathological disorders included	Sex (%) Male	Female	Total (%)
Spine	Fractures of vertebral bodies	2.0	—	2.0
Lower extremities	Strain and trauma of muscles, bones, and ligaments of feet and legs	60.0	15.9	75.9
Upper extremities	Strain and trauma of muscles, bones, and ligaments of hands and arms	4.1	1.4	5.5
Shoulder girdle	Strain and trauma of muscles, bones, and ligaments of the shoulder girdle	10.4	4.1	14.5
Cranium	Arrow and/or blow wound	2.1	—	2.1
Total (%)		78.6	21.4	100

All percentages are calculated based on a total of 145 registered disorders taken as 100%.

the reference sites for typological correlations (e.g., 4). However, recently published radiocarbon dates from the relevant archaeological sites in Mongolia and China (e.g., 13, 14, 38, 39) allow substantial revision of the originally proposed typological dating toward older ages (4, 37, 40).

The Liushui cemetery is located in the upper Keriya River valley, only ∼10–20 km away from the climatic snow line and ∼80–100 km away from the riparian oases located along the Kunlun Mountains on the edge of the Taklamakan Desert. The area experiences a semiarid continental climate with cold winters (below −11 °C in January), warm summers (∼18 °C in July), and annual precipitation of ∼270 mm/y (41). Location, climate, and mountain grass-shrub vegetation characterize the area as very suitable for summer pasture. In contrast, the middle and lower reaches of Keriya River (∼1,000–1,450 m a.s.l.) experience extremely hot and dry summers when pastureland and fresh water become very limited. However, relatively mild winters make those locations more suitable for use during the cold season.

The Liushui burial features and artifacts, particularly the small tomb structures, low quantity of luxury items, and portable pottery size, are suggestive of a commoner group of mobile pastoralists. Although tombs M16 and M55 reveal a slightly richer quantity and quality of goods, which point to a higher social status of the mature males buried there, they are not comparable with kurgans of aristocratic elite (e.g., 4, 6, 7). The relatively large number of tombs and individuals and the custom of subsequent burials point to the cemetery being in use over a relatively long period (up to several centuries). This is also corroborated by the radiocarbon-based chronology (Table 3). Long use of the cemetery and anthropological evidence of a family relationship among the individuals buried in one grave (24) may moreover suggest that it was used by one or several kinship groups possessing the rights to the valley and pastures there, which would require some kind of habitation stability.

Age and sex determination of the buried population (Table 1) shows the presence of all age groups of both sexes, except for the very vulnerable age group of 1- to 9-y-old children. This feature allows at least two interpretations. Either the infants, except for newborns, who had to be nursed, were not taken to summer pasture but stayed in the settlement with the part of the family engaged, for example, in farming, or the infants who had not passed through an initiation ritual were buried separately. Both interpretations have parallels in archaeological and ethnographic records but need to be archaeologically proved in the study area.

The lack of caries and the relatively low abrasion of the chewing surfaces of the teeth, together with the frequent traces of gingival infections, suggest that the people buried in Liushui were frequent meat eaters rather than farmers relying on plant food (24). Strain and trauma of muscles, bones, and ligaments of the feet and legs were most common in the Liushui population (76% of the total number of pathological disorders), followed by traumatic changes in the shoulder girdle (14.5%), as can be expected from active mobile life in mountainous terrain (Table 2). Traumatic disorders in male skeletons are recorded much more frequently (78.6%) than in female skeletons (21.4%). Despite weapons being found in the Liushui burials, direct evidence of involvement in combat is rare (Table 2). Arrow and/or blow wounds have been observed only on two male skeletons (24). The interpretation of Liushui as a burial ground located close to summer pastures and used by people involved in vertical mobile pastoralism is supported by archaeological and paleopathological evidence, which, altogether, indicates extensive horse

Table 3. List of the radiocarbon dates presented in this study

Grave	Lab no.	Material/context	Date (^{14}C B.P.)	Error, y	Calibrated dates (cal B.C.) 68% From	68% To	95% From	95% To	Modeled dates (B.C.) 68% From	68% To	95% From	95% To
M16	KIA29825	Wood/bronze tube	2790	25	976	906	1008	849	967	897	994	843
M55	KIA29826	Wood/bronze lance	2715	25	896	829	908	813				
M55	KIA29826A	Tar pitch/bronze lance	2635	35	824	793	895	770				
M55	KIA29827	Wood/bronze axe	2770	25	972	850	997	840				
M55	Combined								892	829	898	820
M41	KIA29828	Wood/bronze arrowhead	2705	25	895	816	902	810	890	814	901	805
M9	KIA29829	Wood/bronze arrowhead	2485	30	758	541	772	417	768	685	784	590
M7	KIA29830	Wood/bronze arrowhead	2765	25	970	847	994	835	926	843	971	831
M12	Bln-5723	Charcoal	2826	39	1022	919	1120	897	984	887	1035	775
M15	Bln-5724	Charcoal	2497	24	761	549	772	524	768	679	780	585
M17	Bln-5725	Charcoal	2749	35	919	839	978	816	916	821	974	739
M26	Bln-5726	Charcoal	2803	32	997	918	1045	849	977	882	1010	774

All wood samples were from short-lived wood material. The calibrations were performed using the IntCal09 calibration curve (26) and are shown as calibrated years B.C. (cal B.C.). The modeled ages (27, 28) are provided as years B.C. (B.C.).

riding, walking and jumping with heavy loads, and archery practice from a very young age (25). The latter allows us to conclude that hunting was an important part of the subsistence economy.

A better understanding of the socioeconomic context and character of Liushui and its population requires a closer look at the contemporary archaeological records from the surrounding regions of China, Kazakhstan, and Mongolia. The process of the development of mobile pastoralism in northwestern China has not been studied systematically yet. It is generally agreed that domesticated cattle and sheep/goats were introduced to this region in ~2500 B.C. and that domesticated horse appeared only 12 centuries later (42). Traces of millet and wheat farming and herding of cattle and sheep/goats found along the river valleys in eastern Taklamakan are dated to approximately the 17th to 15th century B.C. (37) or even earlier (38). Burials of late Bronze Age agropastoralists have been excavated at Yanghai in Turfan and dated to approximately the 12th to 10th century B.C. (39), and thus are contemporaneous with the Liushui graveyard and with Kayue culture sites in the eastern Kunlun Mountains (43). The traditional image of Kayue culture as purely nomadic based on cattle, horse, and sheep/goat herding has been altered as a result of the excavation of a multilayered dwelling site at Fengtai (Fig. 1). The site, located at the rim of a large fertile valley ~2,500 m a.s.l., consists of early-phase (~1190–920 B.C.) wooden houses and late-phase (~980–750 B.C.) mud brick constructions (44). Permanent houses and the remains of barley found at Fengtai (44) suggest that a mixed agropastoral economy was well established in the Kunlun Mountains, as it also was in the riparian oases of Taklamakan, during the late Bronze Age.

At the same time, complex subsistence strategies (e.g., hunting, fishing, cattle and horse breeding), including seasonal movements of whole families and herds between highland and lowland pastures, were used in the neighboring regions of Inner Asia, as reflected by Tsagaan Salaa and Bayan Oigor (TS/BO in Fig. 1) petroglyphs in the Mongolian Altai (17); large ritual stone monuments (khirigsuurs) with immense horse sacrifices, such as Urt Bulagyn, in central Mongolia (13, 14); and the archaeological records of pastoral groups engaged in vertical herding of sheep/goats and cattle in southeastern and eastern Kazakhstan as early as ~2450 B.C. (15, 16, 45).

Rich archaeological records from the Talgar region (Fig. 1) located in the Tian Shan Mountains of southeastern Kazakhstan were used to construct a model of the mobility and social hierarchy of the first millennium B.C. population (15). The Talgar model reflects highly flexible subsistence strategies based on dry and wet farming and vertical pastoralism as well as a complex societal organization, including local communities of commoners, aristocratic elite, and warriors. The commoners, representing local multiresource kinship groups (both sedentary and mobile), formed the economic backbone of a regional chiefdom or even an incipient state, whereas the aristocratic elite and warriors (cultivating a mobile lifestyle) regulated all political affairs (both domestic and external), provided protection, and fought the battles for defense and raiding (15).

The very similar topography, environment, and climate of the two regions and some parallels in the archaeological records suggest that the Talgar scenario might also be applicable to the Kunlun region, which includes alpine pastures around Liushui and the Keriya valley connecting it with the mountain foothill grasslands and densely populated settlements surrounded by irrigated fields (e.g., Djoumboulak Koum situated ~270 km north of Liushui) in the riparian oases of Taklamakan, now covered by desert sands (46). If so, the Liushui burial site should be viewed as representing a commoner community moving with herds and flocks between low-elevation winter pastures with seasonal or year-round settlements and high-elevation summer pastures and forming part of a more complex economical-political unit. Verifying this scenario remains a challenge for future archaeological research in the region.

Environmental and climatic changes, together with social, economic, and political factors, are often mentioned when discussing the transition toward increased mobility and the emergence of mounted warfare (discussion and references in 1–4, 13, 17, 47) in the first millennium B.C. Both proxy-based climate reconstructions (48, 49) and climate modeling experiments (50) demonstrate that the eastern part of Inner Asia, including western and northern China, became particularly dry during the first millennium B.C. The environmental factors, such as a gradual decrease in atmospheric precipitation and river discharge attributable to the mid- to late-Holocene weakening of the summer monsoon and the progressing deglaciation of the Tian Shan and Kunlun mountains, led to a shortage of arable land and irrigation water. This ultimately caused intense desertification and the abandonment of the settlements in Taklamakan (35, 46, 47). Considering how such landscape transformation affected pastoral or mixed pastoral-agricultural communities of Xinjiang, we see at least two possible directions. On one hand, limited resources would cause tensions among the neighboring tribes and stimulate further mastering of military skills and warfare. On the other hand, increased aridity would favor a reliance on mobile herding, a subsistence strategy better suited to the altered environment. Published archaeological data and regional archaeological models (14–18, 51, 52) suggest that human societies of the first millennium B.C. could successfully deal with these problems, both economically (through better use of scattered resources and mastering mobile forms of pastoralism) and sociopolitically (through the development of state-like confederacies and a stratum of aristocratic elite and warriors preventing struggle for resources among the local communities and regulating relationships with the neighboring states). The trajectory of socioeconomic changes toward higher residential mobility in this part of Inner Asia since the late second millennium B.C. was doubtless related to adaptation strategies responding to a decrease in water supply.

Materials and Methods

Standard methods applied in archaeological and paleopathological studies and described elsewhere (3–5, 7, 19) were used at the site (23–25). Resulting radiocarbon dates were converted to calendar ages (Table 3) using IntCal09 (26) and analyzed using a Bayesian modeling approach (27). The Bayesian model is based on a single phase of activity (27). For the charcoal, we used a standard charcoal outlier model (28), where the age of each piece is assumed to be drawn from an exponential distribution with an unknown time constant anywhere between 1 and 1,000 y. The effect of this is to assume that the charcoal is, on average, 28 y older than the context. We have to bear in mind that there is also a possibility that the charcoal could be intrusive; in such a case, the dates for the contexts are really the dates for the intrusion event rather than for the tomb (relevant for tombs M12, M15, M17, and M26), but this would make the dates later rather than earlier. All wood is assumed to be short-lived but still older than the tomb context. The outlier model used is similar to that for charcoal, except that each piece of wood has an age drawn from an exponential distribution with an unknown time constant between 1 and 10 y. The effect of this is to assume that each piece of wood is, on average, 4 y older than the context. In the case of tomb M55, we assume that the different pieces of wood all have slightly different ages at burial. The Bayesian model is used to estimate the start and end of the use of the cemetery, including the graves that remain undated.

All the dates, except those for tombs M5 and M9 (Table 3), are old enough to be clearly earlier than the radiocarbon plateau of the first millennium B.C. This means that the chronological precision of this dataset is good and, from the point of view of the onset of activity, is certainly not affected by this feature of radiocarbon calibration. The calibration curve from 1000 to 800 B.C. is very steep and provides good precision for calibration. Although the end date for the group suffers from uncertainty because of the plateau from 800 B.C. (onward), this fact does not affect the conclusions of this paper.

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