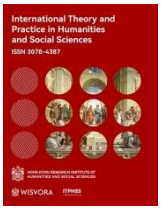
WISVORA

International Theory and Practice in Humanities and Social Sciences
2025 Volume2,Issue11 ISSN 3078-4387



Turquoise in Qijia Culture: A Nexus of Technology, Exchange, and Social Complexity in Northwest China

Qingqing Fan[1], Liping Yang[1*],Ziyi Wang[2],Weiming Liang[3]

[1]Gansu Provincial Institute of Cultural Relics and Archaeology, Lanzhou, China
[2]North China University of Water Resources and Electric Power, Zhengzhou, China
[3]Silk Road Information Port Co., Ltd, Lanzhou, China

Accepted

2025-11-29

Keywords

Qijia Culture; Turquoise objects; Resource Integration; Cultural Intermediaries; Production and Distribution Network; Northwest China

Corresponding Author

Liping Yang

https://doi.org/10.70693/itphss.v2i11.1717

Abstract

As a key Bronze-Age culture in Northwest China, the Qijia Culture is renowned for its jade artifacts and metallurgy, yet its numerous turquoise objects remain critically insufficiently explored. This study investigates turquoise artifacts through typological analysis and cross-cultural comparisons. It reveals that the Qijia communities not only preserved technical and stylistic elements from the Majiayao and Lower Changshan cultures but also transformed the social meaning of turquoise—from personal adornments into mortuary ritual objects. Furthermore, Qijia turquoise objects reflected mineral resource integration and indigenous technical traditions, positioning Qijia communities to serve as intermediaries between the Hexi Corridor and the Central Plains. The technical expertise and cultural legacy embodied in these turquoise objects underscore the frontier region's crucial role in advancing civilization through resource and technological integration, and reveal that Qijia communities played a dual role in the entire Bronze-Age turquoise production and distribution network in Northwest China.

1. Introduction

As a mineral distinct from jade yet culturally comparable, turquoise has been used in China for approximately 9000 years. Valued for its esthetic and cultural significance, this rare material serves as a sensitive indicator of trans-regional resource networks. Its diverse processing techniques, contextual application, and social functions offer a multidimensional perspective on power hierarchies, craft specialization, and ideological integration. Recent scholarship increasingly recognizes turquoise as a crucial material evidence for reconstructing complex processes in early China.

The examination of domestic archaeological findings reveals that the Central Plains region pioneered a tradition of utilizing turquoise, as evidenced by discoveries at the Jiahu Site (ca. 7000–5800 B.C.) in Henan Province. Turquoise was predominantly controlled by the elite class, and this tradition persisted for a long period until the rise of centralized empires, as indicated by

the presence of a turquoise processing workshop near the palace grounds at the Erlitou Site (Qin Xiaoli, 2022). During the Late Bronze Age, the production of turquoise objects declined (Liu Pan, 2023), with a shift toward more widespread civilian usage (Feng Shixiong, 2017). The influence of the Central Plains' turquoise culture also extended to neighboring regions, as evidenced by the analysis of turquoise artifacts unearthed in Xinjiang (ca. 1500–1000 B.C.), which suggests a potential influence from the Central Plains (Xian Yiheng, Fan Jingyi, et al., 2023). However, during the late Neolithic to early Bronze Age, turquoise utilization in the upper Yellow River Basin was exceptionally prevalent, becoming the region with the largest quantity of archaeological turquoise objects from the Majiayao to Qijia periods. This phenomenon can be attributed to the cultural radiation from the Central Plains, often referred to as the "East-to-West Jade Diffusion (Ye Shuxian & Tang Qicui, 2015) ", which facilitated the widespread adoption of turquoise in the upper Yellow River Basin and even influenced areas as far as Xinjiang mentioned above. Scholars have investigated the evolution and spread of turquoise processing techniques through morphological studies, noting that turquoise artifacts primarily consist of micro-sized items such as pendants, beads, and tesserae (Qin Xiaoli, 2016). Pang (2016) conducted a systematic typological analysis of Neolithic turquoise objects across mainland China, categorizing them into seven regional groups based on geographical distribution and cultural lineage. Turquoise objects from the prehistoric Northwest China were primarily concentrated in Gansu, Qinghai, and Ningxia. Although it was not the earliest region to utilize turquoise, the upper Yellow River Basin became the area with the most concentrated distribution of turquoise remains during the Late Neolithic Period.

Based on Pang's research, Cao (2022) demonstrates that jade and turquoise utilization remained at minimal levels from the Pre-Yangshao to the Majiayao periods in the upper Yellow River Basin. The jade and turquoise objects that were present primarily functioned as utilitarian tools or personal ornaments, lacking religious or social significance until the emergence of the Qijia Culture. The frequent deposition of jade and turquoise objects in Qijia cultural burials signals functions beyond mere decoration. Additionally, it is noteworthy that another significant aspect of the Qijia Culture is that it served as a pivotal conduit for the widespread utilization of turquoise and jade in Northwest China. Its geographical expanse encompassed the Jinghe and Weihe River Basin to the east, the Huangshui River Basin to the west, the Bailong River Basin to the south, and the Heishui River in the Inner Mongolia Autonomous Region to the north. Qijia communities facilitated significant cultural interchange between the East and West, as well as the North and South, during the late prehistoric era. Renowned for its abundant jade and turquoise artifacts, the Qijia Culture offers crucial archaeological insights into regional social complexity and intercultural interactions (Xie Xiaoyan, 2011).

Despite this prominence, scholarship on Qijia cultural turquoise objects remains largely subordinated to the broader research paradigm of jade studies. Turquoise has rarely been studied independently or systematically, including its typological characteristics, technical systems, and raw material sources. Additionally, its role as a trans-cultural medium in cultural exchanges remains underexplored.

Through a systematic analysis of existing scholarship and recent archaeological evidence, this study aims to shed light on the understanding of turquoise utilization in Northwest China. The research framework comprises three interconnected dimensions:

(1) Establish a typological inventory of Qijia Culture turquoise objects and delineate spatiotemporal distribution patterns.

(2) Elucidate region-specific technological trajectories.

(3) Investigate the relationship between turquoise raw material acquisition and social

organization by incorporating data from turquoise mining sites discovered in Northwest China.

2. Statistical Analysis of Turquoise Objects from the Qijia Culture

This section provides a systematic overview of turquoise objects associated with the Qijia Culture, as well as contemporaneous objects that exhibit Qijia cultural features. The analysis draws on archaeological discoveries from Gansu and Qinghai. These objects were excavated from sites across the Hexi Corridor, the upper Yellow River, and its primary tributaries—specifically the Huangshui and Taohe rivers—as shown in Figure 1. The presentation follows a spatial sequence, progressing from west to east and north to south, with detailed descriptions provided below.

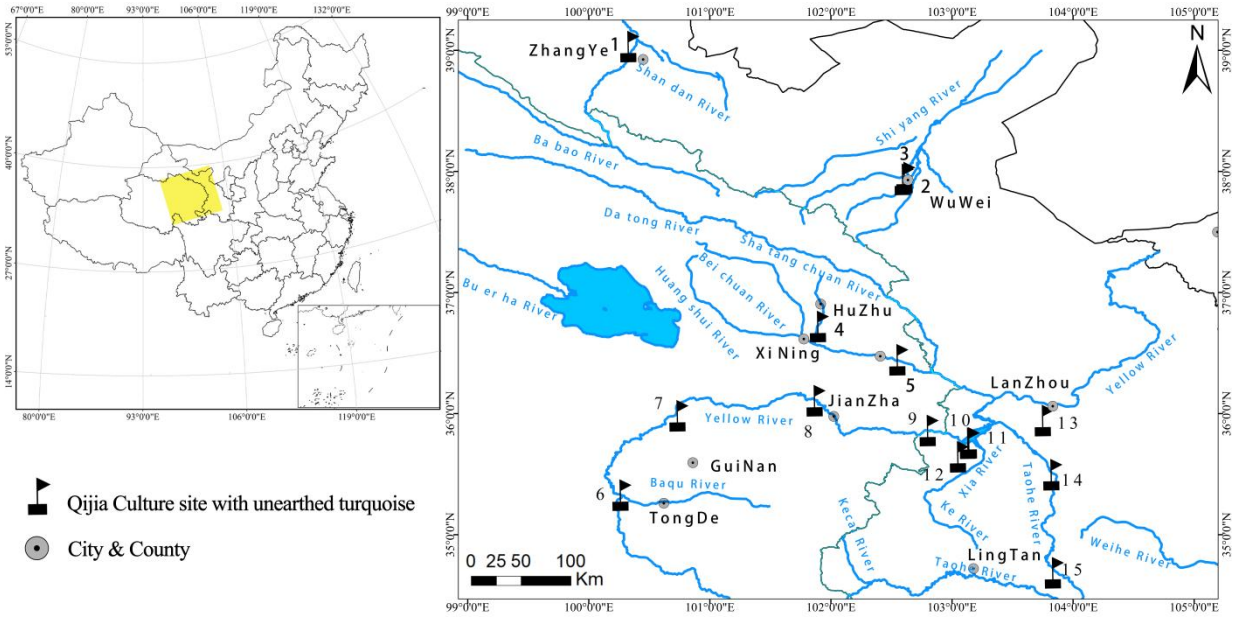


Figure 1: Distribution of sites with turquoise objects from the Qijia Culture
(1. Xichengyi Site; 2. Huangniangniangtai Site; 3. Haizang Site; 4. Zongzhai Site; 5. Liuwan Cemetery; 6. Zongri Site; 7. Gamatai Site; 8. Zhiganglaka Site; 9. Lajia Site; 10. Qinweijia Site; 11. Dahezhuang Site; 12. Xinzhuangping Site; 13. Qinggangcha Site; 14. Qijiaping Site; 15. Mogou Cemetery.)

Image source: This map is based on the standard map with drawing number GS (2024) 0650 downloaded from the standard map service website of the Ministry of Natural Resources of the People's Republic of China, and the boundary of the base map is not modified.

2.1 The Hexi Corridor

The Xichengyi Site in Zhangye City (Chen Guoke, Zhang Liangren, et al., 2015), located in the middle reaches of the Heihe River, yielded one bead near the individual's cervical vertebra in M11 ('M' is the abbreviation for *Muzang*, meaning burial. The same convention applies to subsequent notations.), though its precise morphology remains undetermined.

The Huangniangniangtai Site in Wuwei City (Guo Deyong, 1960; Wei Huaiheng, 1978), situated on the western bank of the middle reaches of the Shiyang River, yielded thirty-two beads from eight burials. These beads predominantly exhibit oblate and tubular morphologies. Their distribution across burials is as follows: M4 (two beads), M24 (three beads), M32 (one bead adjacent to cervical vertebrae), M38 (six beads), M42 (six beads), M54 (six beads), M51 (one bead), M71 (four beads, including one tubular specimen), and M88 (three beads).

The Haizang Site, situated 2km north of the Huangniangniangtai Site, served as a handicraft

production place for the latter (Gansu Provincial Institute of Cultural Relics and Archaeology, 2022). Nineteen turquoise objects were unearthed, nine of which came from four burials, including four beads and five tesserae: M3 (one barrel-shaped bead with biconical drilling, found near the remains of a young male), M6 (five square or rectangular tesserae), M9 (one barrel-shaped bead with biconical drilling, adjacent to toe bones), M12 (two columnar beads with biconical drilling, one with a lenticular cross-section and the other with a trapezoidal cross-section). The remaining ten objects from the Qijia Culture layers comprise three beads, one tessera, and six fragments. Unit T0205 ('T' is the abbreviation for *Tanfang*, meaning square excavation unit.) yielded one barrel-shaped bead with biconical drilling and four irregular fragments. T0303 yielded two columnar beads, including one octagonal prism with conical drilling and one quadrangular prism with tubular drilling. T0405 yielded three specimens, including one rectangular tessera with a polished surface and two irregular fragments.

Representative turquoise objects from the Huangniangniangtai and Haizang sites are depicted in Figure 2.

2.2 The Huangshui River Basin

The Zongzhai Site in Huzhu County (Xu Xinguo, 1986), located on the east bank of the Shatangchuan River (a tributary of the Huangshui River), yielded three beads from two burials. These specimens exhibit tubular and oblate morphologies with biconical drilling.

The Liuwan Cemetery in Ledu County (The Archaeological Team, CPAM of Qinghai Province, & Institute of Archaeology, Chinese Academy of Social Sciences, 1984), situated on the north bank of the Huangshui River, yielded thirty-four beads from the Qijia cultural burials. Representative turquoise objects are depicted in Figure 2. These beads were found both singly and in groups within burials, and primarily distributed in the cranial-cervical and perioral regions, with secondary concentrations near the femora. The classification is presented in Table 1. The excavators classified these beads into five morphological groups through typological analysis as follows.

Table 1: Typological statistics of turquoise beads from Qijia cultural burials at Liuwan

Period / Group	The Early Phase of Qijia Culture	The Middle Phase of Qijia Culture	The Late Phase of Qijia Culture
Group I (Disc beads)	M309 (1)	M972 (1)	M1138 (1) M1129 (1) M312 (1)
Group II (Tubular beads (L: 0.5–2.1 cm) featuring circular, elliptical, or rectangular cross-sections.)	M1337 (1) M1017 (2) M952 (1) M1061 (2) M265 (1)	M972 (4) M1156 (1)	M1129 (1)
Group III (Axe-shaped beads with a perforation at the narrow end.)	M265 (1) M1103 (1) M1151 (1)	M972 (1) M557 (1)	M312 (1) M776 (1) M292 (1)
Group IV (Irregular strip beads with a perforation at one end.)	M1051 (1)	M557 (1)	
Group V		M708 (2)	M270 (1)

(Irregular beads)	M697 (1)

2.3 The upper Yellow River Basin

The Zongri Site in Tongde County (Chen Honghai, 2002), located on the south bank of the upper reaches of the Yellow River, revealed a group of burials associated with the Qijia Culture. Among these, two burials (M80 and M130) yielded significant quantities of turquoise objects and raw materials, with M130 containing 202 tubular beads.

The Gamatai Site in Guinan County (Qinghai Provincial Institute of Cultural Relics and Archaeology & School of Archaeology and Museology, Peking University, 2016), located on the south bank of the Longyangxia Reservoir, yielded 188 beads from its cemetery. These beads are primarily flattened rectangular prisms, with a minority exhibiting oblate morphology. All were perforated using biconical drilling and range in size from 0.6 to 2.4 cm. Excavation records document their distribution as follows: M2 (seven beads), M11 (two beads), M12 (twenty-four beads), M18 (one bead adjacent to the cervical vertebrae of only one of the two individuals), M21 (twelve beads), M23 (forty-one beads laterally dispersed around the skull), M24 (thirteen beads distributed around the carpal bones), M25 (16 beads adjacent to the cervical vertebrae), M26 (one bead), M27 (twenty-seven beads bilaterally distributed along the skull), M28 (one bead recovered from the backfill above the grave), M31 (nine beads), M35 (twenty-one beads adjacent to the cervical vertebrae, one incised with parallel linear motifs), M38 (seven beads dispersed superior to the clavicle), M39 (two beads), and M40 (four beads).

The Zhiganglaka Site in Jianzha County (Hu Xiaojun, 1996), situated 6 km east of the Lijiaxia Reservoir, yielded ten turquoise objects from Qijia Culture burials. Most of these objects are fragmented and morphologically indistinct, with only one exhibiting a definitive perforation and a trapezoidal cross-section.

The Lajia Site in Minhe County (Beijing Art Museum et al., 2015), located 26 km west of the Liujiaxia Reservoir, yielded 243 beads. Most of these beads exhibit either oblate-barrel or tubular morphologies, all uniformly perforated by biconical drilling. As excavation reports for this site remain unpublished, only photographs of five beads from two burials (four beads from M12 and one bead from M17) are documented. Specimen M12:6 (M12:6 refers to the sample number in the primary excavation records; the same convention applies to subsequent notations.) displays an irregular oblate-barrel morphology. M12:7 displays a bivalve-shaped morphology. M12:8 displays a rectangular prism morphology. An uncatalogued M12 specimen demonstrates an oblate fusiform morphology. The M17 specimen exhibits an oblate-barrel morphology.

The Qinweijia Site in Yongjing County (Xie Duanju, 1975), located on the north bank of the Liujiaxia Reservoir, yielded forty-seven beads. The excavators categorized these beads into two types. Type I (forty-six beads) exhibits spherical, oblate, or triangular morphologies and was recovered from ten burials: five adult burials (M23, M25, M81, M103, M135), two child burials (M36, M43), and three multiple interments containing adults and children (M30, M42, M134). Most beads were found adjacent to the cranio-cervical regions. H3 ('H' is the abbreviation for *Huikeng*, meaning ash pit.) yielded one single flattened rectangular prism bead, classified as Type II.

The Dahezhuang Site (Xie Duanju, 1974), located 0.5 km east of the Qinweijia Site, yielded 20 Qijia cultural beads from four burials. All beads exhibit elliptical cross-sections, and their typological classification provides a referential framework for the Qinweijia Site: Type II (five beads) came from M14 and M82, while Type I (fifteen beads) came from M6 and M69.

The Xinzhuangping Site in Jishishan County (Jia Jianwei, 1996), located on the east bank of the Yinchuan River (a tributary of the Yellow River), is approximately 10 km north of the

Qinweijia and Dahezhuang sites. Previous surveys documented 169 beads, primarily exhibiting irregular columnar forms, with a few oblate specimens.

The Qinggangcha Site in Lanzhou City (Guo Deyong, 1972), located in the Gaolan Mountain area 15 km south of the Yellow River, yielded four turquoise ornaments from a Qijia cultural burial numbered M3, though the excavation report provides no morphological details.

Representative turquoise objects from the Lajia, Qinweijia, and Dahezhuang sites are also depicted in Figure 2.

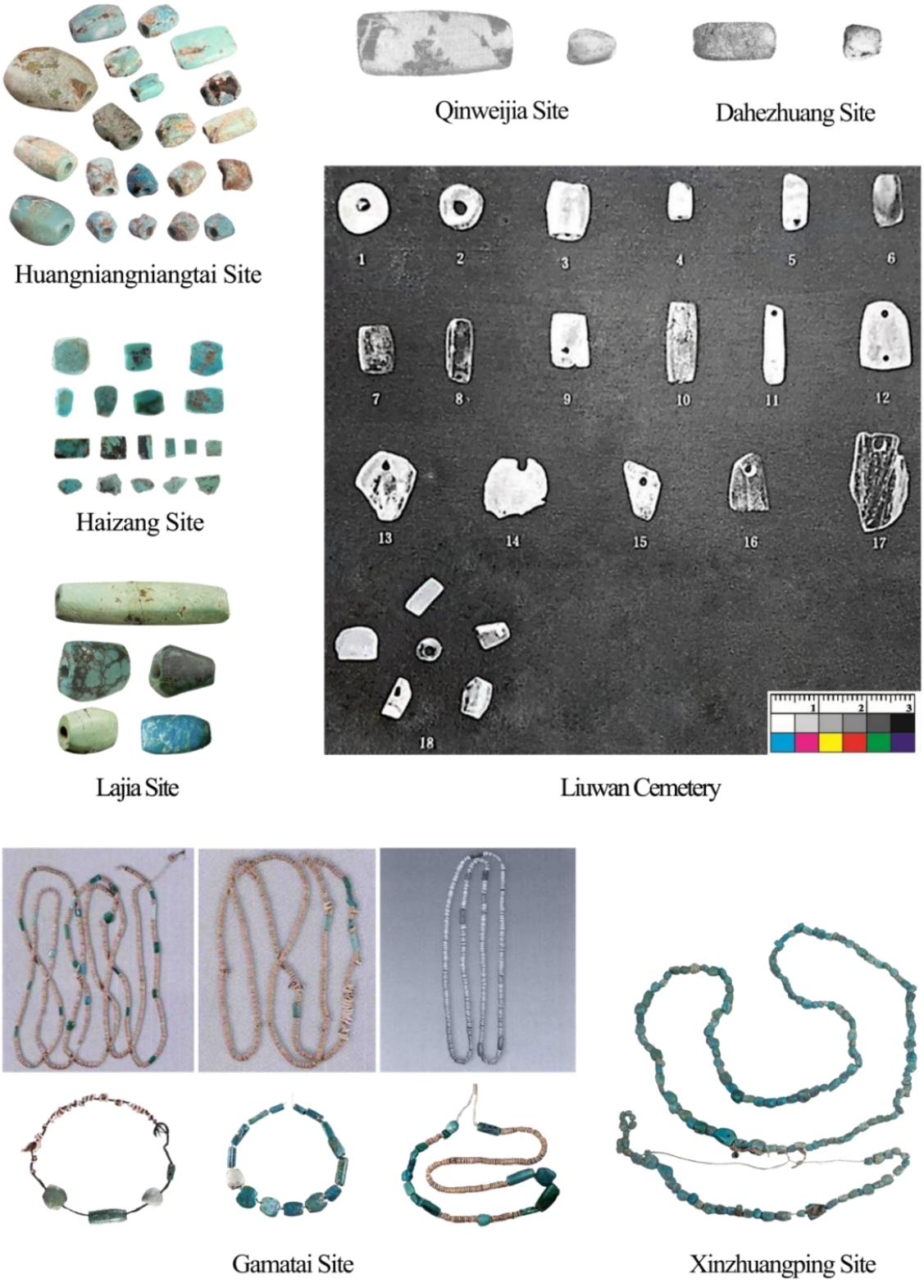


Figure 2: Turquoise objects from different Qijia cultural sites

Image source: Huangniangniangtai site: "Jade of Qijia Culture.", pp. (pages) 156–159. Haizang Site: "Haizang at Wuwei-Report on Excavation of Qijia Culture site.", pls. (plates) 30, 31,120, 133, 139, 144, and 151. Liuwan Cemetery: " Excavation of a Primitive Society Cemetery at Liuwan in Qinghai.", pl. 171. Lajia Site: "Jade of Qijia Culture. ", pp. 96–98; "The concept of jade-using in different stages of prehistoric times in Gan-Qing area". Gamatai Site: "Gamatai Site, Guinan.", pls. 10, 11, and 24. Qinweijia Site: "Excavation of a Chichia Culture Cemetery at Ch'inwei-Chia in Yung-Ching County, Kansu Province.", pl. 14. Dahezhuang Site: "Excavation of the Remains of Chichia Culture Atta-Ho-Chuang in Yung-Ching County, Kansu Province.", pl. 17. Xinzhuangping Site: "Jade of Qijia Culture.", p. 73.

2.4 The Taohe River Basin

The Qijiaping Site in Guanghe County (Gansu Provincial Institute of Cultural Relics and Archaeology & Department of Cultural Heritage and Museology, Fudan University, 2023), located on the west bank of the lower reaches of the Taohe River, is the type site of the Qijia Culture. Numerous turquoise objects were unearthed here, predominantly more than 1000 tesserae, with minor beads. Notably, black adhesive residue is preserved on the versos of the tesserae. Excavation records document their distribution as follows: M28 (a multiple burial) contained three cylindrical beads adjacent to Individual R4's cervical vertebrae; M42 (a multiple burial) contained two beads near Individual R7's mandible and 660 tesserae near Individual R8's right greater trochanter; M44 (a multiple burial) contained eight tesserae between Individual R1's femora; and M90 contained one tessera between the femora of the interred individual.

The Mogou Cemetery in Lintan County (Mao Ruilin et al., 2009; Qian Yaopeng et al., 2014), located on the west bank of the middle reaches of the Taohe River, yielded primarily tesserae with minor beads, paralleling the pattern at Qijiaping. During the first excavation, four beads were recovered as follows: M303 (a multiple burial) contained one bead each on Individual IV and V, exhibiting flattened rectangular prisms; M344 (a multiple burial) contained two beads. The following year's excavations recovered substantial quantities of tesserae.

3. Methods and Results

The research method mainly combines archaeological typology with comparative analysis. It involves consulting a large number of archaeological excavation reports, observing turquoise artifacts in museums such as the Linxia Hui Autonomous Prefecture Museum, the Gansu Provincial Museum, and the Qinghai Provincial Museum, and field investigations at ancient turquoise and jade mining sites in Hami and Dunhuang. Following the previous statistical analyzes, this section classifies turquoise objects based on morphological traits and decorative positioning. Through the analysis and investigation of unearthed turquoise artifacts, it has been found that Qijia communities, associated with turquoise artifacts, were not only users of these objects but also distributors of turquoise resources.

3.1 Morphological characteristics

Beads are categorized into a three-tiered system based on Beck's (1928) morphological classification criteria: primary classification by axis-to-diameter ratio (defining Classes A–C), sub-classification by axial section (Types a–c), and cross-sectional styles (Styles I–III), with specific classification parameters detailed in Figure 3. Table 2 shows the details of the classifications of the beads.

Table 2. Distribution of full typological codes in Qijia Culture turquoise beads

Region	Site	Class	Type	Style	Quantity	Notes
Hexi Corridor	Xichengyi Site				1	Undetermined morphology
	Haizang Site	B	c	I	1	Based on descriptions and visual documentation from the original excavation records, all seven specimens can be classified.
				III	3	
		C		II	1	
				III	2	
	Huangniangniangtai Site	B	b	II	1	The thirty-two beads documented in the original records are preliminarily classified into BcII and CcII (oblate morphologies), along with Bb, Bc, Cb, and Cc (tubular morphologies). Only twenty specimens have associated visual documentation, which enabled detailed typological analysis of these cases.
				III	1	
			c	II	1	
				III	1	
		C	b	II	4	
				III	2	
			c	I	1	
				II	4	
				III	5	
Huangshui River Basin	Zongzhai Site	B	c		1	Among the three documented specimens, two were visually classified into types Bc and Cc.
		C			1	
	Liuwan Cemetery	A	a	III	5	The original records classified thirty-four beads into five groups. Preliminarily reclassified according to the new typological criteria as follows: Group I→ A I and B I; Group II→ B I–III and C I–III; Groups III–V→ A I–III. Sixteen specimens with visual documentation can be detailed classified.
			c	I	1	
				II	1	
				III	3	
		B	b	I	1	
		C	b	I	1	
				III	1	
			c	II	1	
				III	2	
The Upper Yellow River Basin	Zongri Site	B	b		202	The count of the original artifacts is undocumented; 202 tubular beads from M130 can be preliminarily classified into Bb, Bc, Cb, and Cc.
			c			
		C	b			
			c			
	Gamatai Site	C	c	I	2	The originally recorded 188 beads are predominantly classified into Cb and Cc, with a minority classified into BcII and CcII. 5 specimens with visual documentation can be detailed classified.
				II	3	
	Zhiganglaka Site			III	1	Unidentifiable morphology
	Lajia Site	C	b	III	1	The originally recorded 243 beads are preliminarily classified into Bb, Bc, Cb, and Cc. Five specimens with visual documentation can be detailed classified.
			c	II	3	
				III	1	
	Qinweijia Site	C	c	II	1	The original records classified 447 beads into two types. Preliminarily reclassified according to the new typological criteria as follows: Type I→ Class B and C; Type II→ CbII. Two specimens with visual
			b	II	1	

						documentation can be detailed classified.
	Dahezhuang Site	C	c b	II II	1 1	Two specimens can be visually classified.
	Xinzhuangping Site	B C			169	The 169 documented beads are preliminarily classified into B and C.
	Qinggangcha Site				4	Undetermined morphology
Taohe Valley	Qijiapping Site	C		I	3	Among the five documented specimens, three were visually classified into C I.
	Mogou Cemetery	C	b		2	Among the four documented specimens, two were preliminarily classified into Cb.

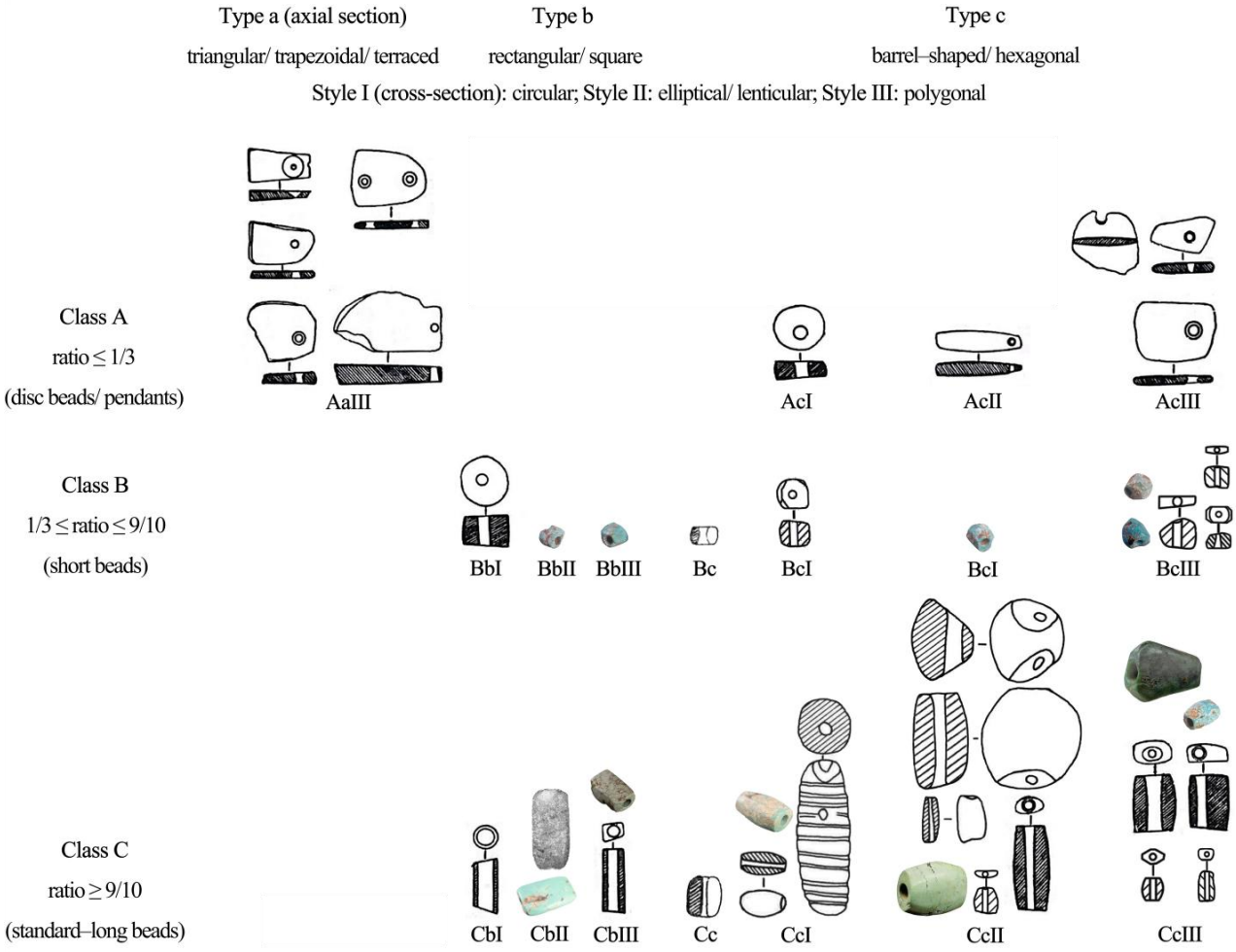


Figure 3: Illustration of various types of beads

(Liuwan Cemetery: Class A (all), BbI, CbI, CbIII (lower), Cc II (bottom-right), CcIII (center two); Huangniangniangtai Site: BbII, BbIII, BcI, BcIII (left two), CbII (lower), CcI (top-left), CcII (bottom-left), CcIII (top-right); Zongzhai Site: Bc, Cc; Haizang Site: BcI, BcIII (right three), CcII (bottom-center), CcIII (bottom two); Gamatai Site: CcI (bottom two), CcII (top three).)

Image source: same as Figure 2.

Tesserae, predominantly found in the Taohe Valley with limited distribution in the western sites of the Qijia Culture (five tesserae from the Haizang Site), are characterized by polished surfaces and regular rectangular or square shapes. Their dimensions range from 0.3–0.6 cm (length) × 0.2–0.6 cm (width) × 0.1 cm (thickness). At the Qijiaping Site, over 1000 larger

tesserae (2.8–2.9 cm × 0.8 cm × 0.1 cm) were recovered. A substantial quantity of similar tesserae was also excavated at the Mogou Cemetery.

3.2 Decorative position

Archaeological findings to date indicate that turquoise objects within the Qijia cultural context were predominantly used for personal adornment, with a few specimens exhibiting distinct mortuary ritual functions. These objects can be categorized into three typological groups according to their bodily location context, as shown in Figure 4. Table 3 shows the details of positions and demographic characteristics of the turquoise objects.

Group I objects, primarily distributed on skulls, cervical vertebrae, or clavicular regions, constitute the largest category. Functionally, they are interpreted as headgear, ear ornaments, or necklaces. These objects typically appear as either large individual beads or strings of clustered bead assemblages, occasionally combined with other materials such as bone or jade. Geographically, they are most concentrated within the core zone of the Hehuang Valley. Notably, these assemblages are more prevalent in male burials and less frequent in children's burials.

Group II objects, exclusively found in and around the oral cavities, represent the least common category. These objects are functionally interpreted as *Kouhan* (meaning funerary mouthpieces) and exhibit a similar geographic concentration to that of Group I. In contrast to Group I objects, they are evenly distributed across individuals of all ages and sexes.

Group III objects, typically found on the lower parts of the body, including the pelvic, humeral, carpal, femoral, and tarsal regions, functioned as wrist ornaments or waist pendants, and were primarily made from tesserae with subsidiary beads. Their distribution spans the Qijia cultural regions, with core concentrations in the upper Yellow River and the Taohe River Basin. Mortuary evidence indicates a higher prevalence in female burials.

Table 3. Positions and demographic characteristics of turquoise objects from Qijia cultural burials

Region	Site	Burial	Period		Position	Object
Hexi Corridor	Haizang Site	M3	Middle to Late Period	male	cervical vertebrae	beads
		M12		female	lateral aspect of the femur	
		M6			fill soil	tessrae
	Huangniangniangtai Site	M24		female	cervical vertebrae	beads
		M32		male	left Clavicle	
		M4		unknown		
		M38		male, female	oral cavity	
		M42		child		
Huangshui River Basin	Liuwan Cemetery	M952	Middle to Late Period	female	skull	beads
		M1061		male, female	oral cavity	
		M1337			cervical vertebrae	
		M972		male	skull lateral aspect of the right femur	
The Upper Yellow River Basin	Gamatai Site	M27	Late Period	male	skull	beads
		M23				
		M25		male	cervical vertebrae	
		M35				

		M38				
		M39				
		M18		female		
		M24		female	right carpal bones	
		M28			fill soil	
	Dahezhuang Site	M14	Early Period	adult	Unspecified	
		M6				
		M69		child		
		M82				
	Qinweijia Site	M23	Middle to Late Period			
		M25				
		M81		adult		
		M103				
		M135				
		M30		adult, child		
		M134		adult, child		
		M42		adult, child		
		M43		child		
		M36				
Taohe Valley	Qijiapping Site	M28	Late Period	male	skull	beads
		M42			lumbar vertebrae	tessrae
				child	cervical vertebrae	beads
		M44		female	between the femora	tessrae
		M90				
	Mogou Cemetery	M303		female male	cervical vertebrae pelvis	beads

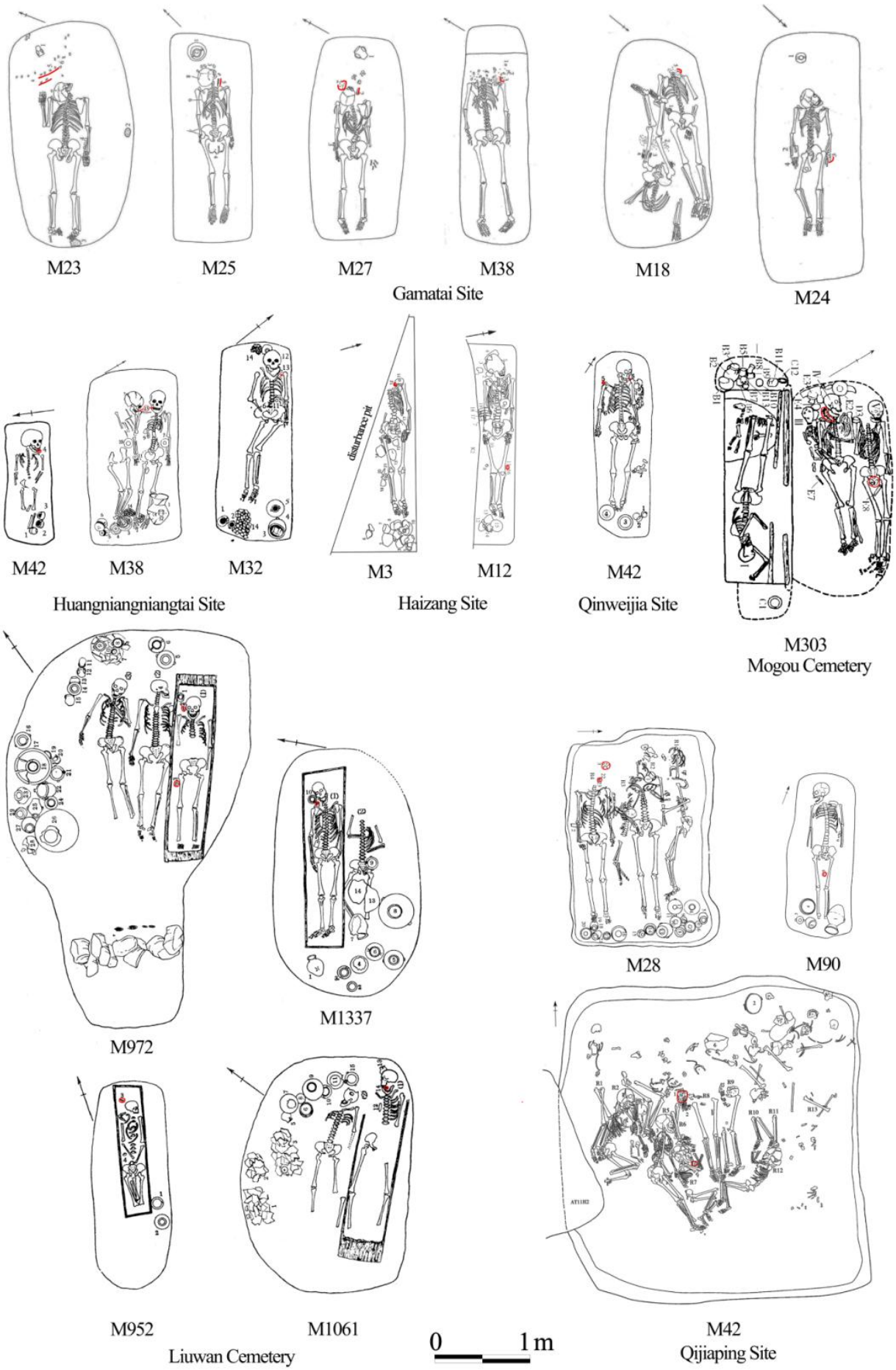


Figure 4: Diagram of decorative position from different burials (as indicated by the red line)

Image source: same as Figure 2.

3.3. Spatio-temporal Distribution Characteristics

In terms of morphology and spatial distribution, Class A beads are predominantly concentrated in the Huangshui River Basin, with the Liuwan Cemetery serving as a representative example. Axe-shaped pendants (A–III beads) represent the dominant type in this region. These pendants are mostly associated with male burials and are typically placed on the heads or necks. In contrast, the distribution patterns of Class B and C beads cover a wider area than those of Class A. Although these beads remain more prevalent in male burials, they are also found in female and child burials. Taken together, the prevalent and central positioning of males in burials reflects the patriarchal nature of the Qijia Culture's social structure. Tesserae, primarily rectangular or square in shape, are exemplified by findings from the Qijiaping Site and Mogou Cemetery in the Taohe River Basin. Features such as standardized dimensions, mass production, and the application of colloidal adhesive collectively indicate a high degree of technical standardization, further evidencing the diversified utilization of turquoise by the eastern Qijia communities.

From the perspective of temporal evolution, the morphologies and functions of turquoise objects exhibit distinct phases. In the early phase, turquoise objects were relatively scarce and morphologically simple. For example, beads from the Dahezhuang Site feature oblate forms and were predominantly worn at the ear or neck as singular adornments. In the middle phase, beads displayed typological diversification, with axe-shaped and long tubular beads becoming prevalent. This period also saw the emergence of distinct uses, such as Kouhan, indicating complex spiritual beliefs and systematic funeral rituals. During the late phase, the use of diverse bead types continued, while inlay technology advanced toward maturity. A universal trend emerged: turquoise objects were intricately combined with bone and talc materials to create increasingly complex adornments. This is exemplified by composite bead strings from the Gamatai Site and composite tessera assemblages from the Qijiaping Site and Mogou Cemetery. The contrast between the status symbolism emphasized in western regions and the technological specialization evident in eastern regions of turquoise objects highlights regional differences within the late period of the Qijia Culture.

4. Results and Discussion

4.1. Turquoise Craftsmanship of the Qijia Culture: Transmission Systems and Technological Diffusion

Although turquoise emerged relatively late in Gansu and Qinghai, it quickly gained prominence due to its distinctive qualities. During the late Neolithic period, the Majiayao communities pioneered turquoise production in this region, a practice that was directly inherited by the Qijia Culture. This continuity is archaeologically evidenced by seventeen pre-Qijia burials containing turquoise at the Zongri Site, more than 240 Majiayao turquoise objects from the Liuwan Cemetery, including forty of the Banshan type and 204 of the Machang type, one turquoise ornament recovered from a Banshan type burial at the Zhiganglaka Site, and another Banshan type object from the Qinggangcha Site. Compared with Majiayao's predominantly oblate pendants, which feature relatively fewer beads, Qijia cultural turquoise objects demonstrate marked advancements in technology and quantity. The standardized mass production of beads, particularly tubular specimens, signifies the refinement and proliferation of biconical drilling. It should be noted that turquoise, as a typical hydrothermal alteration mineral, primarily occurs as lenticular orebodies or thin-layered veins within interlayer shear zones (Xian Yiheng, Liang Yun, et al., 2023). This primary mineral occurrence state fundamentally constrains the morphological

characteristics of the final products, which directly explains the prevalence of miniature beads and tesserae in archaeological finds. It is reasonable to infer that during the initial development of turquoise drilling technology, the properties of the material likely constrained early artisans' technical expression, confining them to creating shallow perforations on relatively large surfaces. As technical capabilities advanced, the artisans progressively mastered biconical drilling techniques, enabling the production of numerous long beads. This technological progression is evident in the distribution of beads within the Qijia Culture. In later sites such as Gamatai, Lajia, and Qijiaping, there is a higher proportion of Class C beads. This technological advance established critical foundations for the diffusion of turquoise craftsmanship across neighboring cultural regions.

Furthermore, the development of tesserae production techniques in the eastern region of the late Qijia Culture underscores the Qijia communities' role as a key inheritor and a hub of turquoise craftsmanship during the early Bronze Age in Northwest China. The earliest archaeological evidence of turquoise tesserae in the Gansu-Qinghai-Ningxia region originates from Phase I at the Zongri Site (M322, Majiayao Culture), where a bone wristlet inlaid with over 200 turquoise tesserae was discovered. Similar techniques are found in the Lower Changshan Culture: at the Dianhe Site in Guyuan County (Zhong Kan, 1987), seventeen irregular turquoise tesserae are affixed to a pottery pendant, while at the Qiedaoba Cemetery in Haiyuan County (Ningxia Institute of Cultural Relics and Archaeology & The Archaeology Department Of China Historical Museum, 2003), eight polygonal turquoise tesserae are adhered to a black discoid adhesive matrix. Given the Lower Changshan Culture's formative influence on Qijia Culture (Jiang Hui & Zhong Yi, 2022), this inlay technology attests to a likely unbroken lineage of turquoise craftsmanship in the upper Yellow River Basin, spanning from the Majiayao to the Qijia period. Parallel developments are observed in the Siba Culture (ca. 2000–1500 B.C.), which interacted with the Qijia Culture in the Hexi Corridor, where a double-ear pottery jar with turquoise tesserae on the belly was recovered from Burial M115 in Huoshaogou Cemetery. Findings from other contemporary cultures confirm the local continuity and wide distribution of inlay technology across Northwestern China during this period. Similar technical characteristics are observed in tesserae objects from the Taosi Site and Xiajin Cemetery in the middle reaches of the Yellow River, where turquoise tesserae are affixed to a planar organic substrate (Yan Hongxian & Chen Honghai, 2024). Importantly, these sites postdate the Majiayao Culture while partially overlapping chronologically with the Qijia Culture. While independent invention cannot be entirely ruled out, this chronological and technical relationship raises the possibility of an eastward dissemination of such inlay techniques from a Northwestern center, possibly via cultural intermediaries like the Qijia. In summary, the discovery of these turquoise artifacts indicates that the production and use of tesserae originated from the Majiayao Culture. During the subsequent period, particularly contemporaneous with the Qijia Culture, this craft was not only inherited but also expanded across the Hexi Corridor and Taohe River Basin, and potentially reached the middle Yellow River Basin.

4.2. New Perspectives on the Turquoise Resource Network of Qijia Culture: Evidence from Ancient Mines

It should be emphasized that the availability of raw materials plays a crucial role in the evolution of turquoise processing technologies. Recent research on the material provenance of ancient Chinese turquoise objects has increasingly utilized scientific techniques such as isotope tracing, trace element analysis, and phase-structure characterization. These multi-disciplinary

approaches have been instrumental in uncovering resource circulation systems and technology diffusion patterns in early societies.

The Hubei-Henan-Shaanxi border region is a key turquoise production hub in China, characterized by two distinct mining belts. The northern belt is exemplified by the ancient Laziya turquoise mine site (Xian Yiheng, 2016), where turquoise exhibited lead-strontium isotopes matching some artifacts from the Xiajin Cemetery (Zhang Dengyi, Li Yanxiang, et al., 2022) and Qijiaping Site (Li Yanxiang et al., 2021). The southern belt, represented by the turquoise from Zhushan and Yungaisi (Shiyan, Hubei), yielded turquoise with lead-strontium isotopes consistent with some artifacts from Xiajin Cemetery (Zhang Dengyi, Li Yanxiang, et al., 2022). Additionally, infrared spectra patterns of artifacts from the Erlitou Site specifically match those from Yungaisi mine (Ren Jia et al., 2015). Collectively, these analytical results indicate that mining activities in this region date back to the Late Neolithic period, with turquoise supplied to settlements across the middle and the upper Yellow River Basin. The recent discovery of several ancient turquoise mining sites (Li Yanxiang et al., 2020; Cao Jian'en et al., 2021; Li Yanxiang et al., 2022) in Northwest China further confirms significant prehistoric mining activities within the border region spanning Gansu, Xinjiang, and Inner Mongolia. Lead-strontium isotopic analysis of artifacts from the Southern Yigediwo Site (Xichengyi Cultural Site) in Jinta County reveals a high degree of similarity to those of ancient turquoise sources in Hami (Zhang Dengyi, Li Yanxiang, & Xi Guanglan, 2022). This pattern suggests a circulation network that transported turquoise from territories north of the Hexi Corridor to its core zones during the Late Neolithic to Early Bronze Age. The establishment of these extensive procurement networks ensured a stable supply of raw materials, which was a fundamental prerequisite for the refinement, standardization, and widespread adoption of turquoise processing technologies across these early societies.

Early turquoise exploitation in Northwest China during the Qijia Culture period exhibited a complex, multi-sourced pattern. Lead-strontium isotopes identify the Laziya mine as one of the origins of Qijiaping turquoise tesserae, suggesting a potential exchange route connecting the Hubei-Henan-Shaanxi border region with the upper reaches of the Yellow River, likely following the Weihe and Taohe River (Zhang Dengyi, 2016). Meanwhile, artifacts from the Mogou Cemetery show a correspondence to Hami (Xinjiang) provenance, indicating southward mineral transportation through the Hexi Corridor. While direct evidence linking the Qijia communities to turquoise mining activities remains elusive, insights from the excavation of the Dunhuang Hanxia nephrite mining site provide valuable clues about their resource exploitation practices (Chen Guoke et al., 2021). Excavations uncovered ancient pits, primary processing areas, slag piles, lithic mining tools, and houses dating to the Xichengyi/Qijia cultural coexistence period. Material evidence includes numerous pottery sherds displaying cultural attributes of both groups, highlighting the symbiotic coexistence between Qijia and northwest mining communities. This suggests that turquoise, a rare gemstone resource like nephrite in Northwest China, was likely integrated into the Qijia Culture's resource management system. The turquoise circulation network of the Qijia Culture functioned through dual mechanisms of trans-regional resource allocation and technological inheritance. This dual system coincided with the dissemination of metallurgical technology (Chen Guoke, 2017). The standardized lithic mining tools from the Hanxia nephrite mine and the Hami turquoise mine suggest that Qijia communities were involved in consolidating mining operations in the Hexi Corridor. Meanwhile, the coexistence of turquoise with jade, pottery, bone objects, and discarded slag at sites such as Haizang and Zongri indicates an integrated production chain within settlements. This integrated chain involved the collaborative acquisition of raw materials, local processing, and product distribution. Within this

system, Qijia communities oversaw strategic resource nodes (e.g., Hanxia nephrite mine), consolidated technological processes at secondary hubs (e.g., Haizang Site), and distributed processed turquoise through interregional networks—as shown in Figure 5. This strategy reinforced their pivotal role within the prehistoric rare resource circulation network.

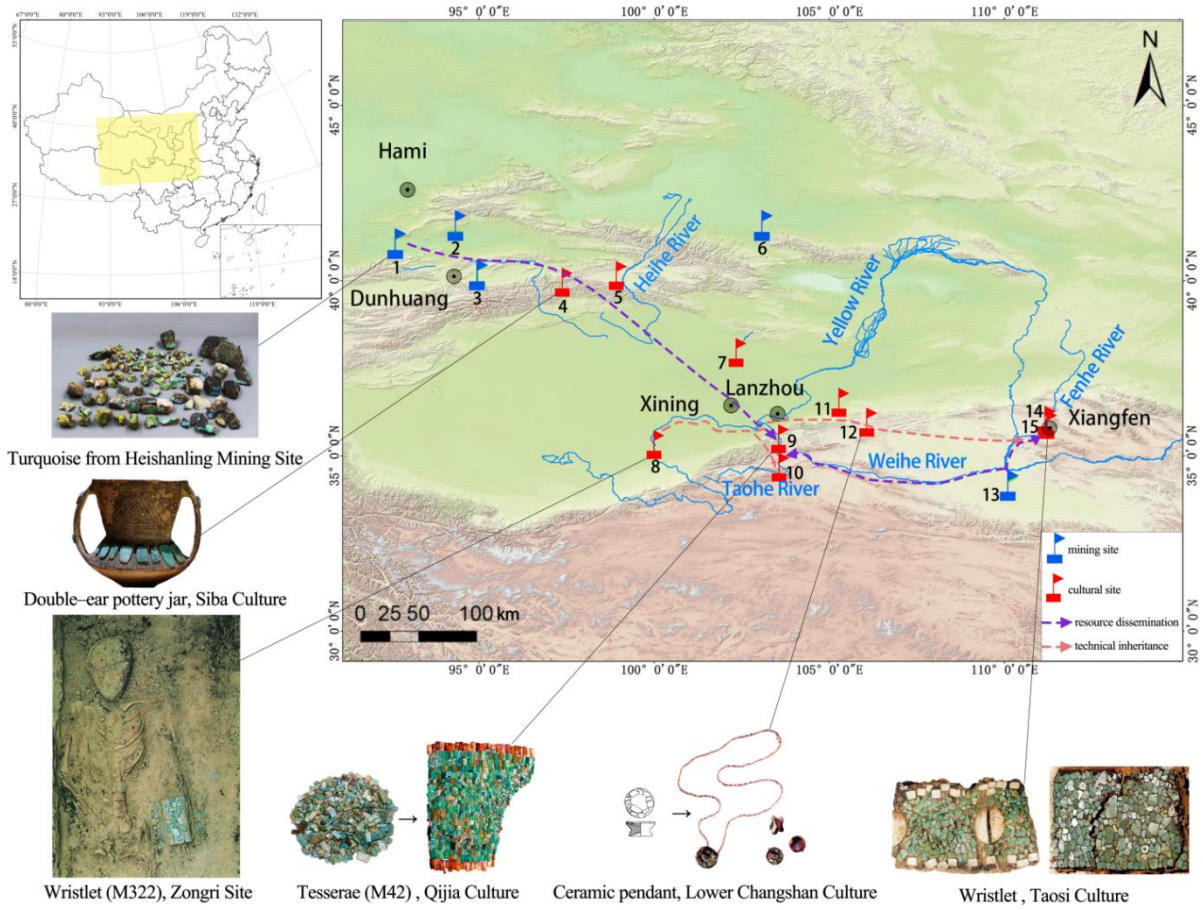


Figure 5: The Dissemination Routes of Turquoise Materials and Inlay Technology in Qijia Culture (1. Heishanling Turquoise Mining Site; 2. Tianhudong Turquoise Mining Site; 3. Hanxia Jade Mining Site; 4. Huoshaogou Cemetery; 5. Haizang Site; 6. Haobeiru Turquoise Mining Site; 7. Southern Yigediwo Site; 8. Zongri Site; 9. Qijiaping Site; 10. Mogou Cemetery; 11. Dianhe Site; 12. Qiedaoba Cemetery; 13. Taosi Site; 14. Xiajin Cemetery; 15. Laziya Turquoise Mining Site.)

5. Conclusion

The development of turquoise objects in the Qijia Culture provides a unique framework for understanding the evolution of prehistoric handicraft technology and social complexity in Northwest China. The analysis of the turquoise objects reveals three key developments. First, building on the turquoise-processing traditions of the Majiayao and Lower Changshan Cultures, Qijia artisans significantly increased the quantity of turquoise objects in Northwest China, surpassing those in other regions during the late Neolithic to Early Bronze Age. This achievement was made possible by refining drilling techniques, employing tesserae techniques, mass-producing turquoise items in various shapes, and transforming turquoise ornaments into ritual objects. Second, within the context of rare resource integration, Qijia communities incorporated mineral resources from the Hexi Corridor and the Hubei-Henan-Shaanxi border region into their resource networks, acting as pivotal intermediaries between northwest mining communities and Central Plains societies. Third, the long-distance exchange of turquoise further

catalyzed the formation of labor division structures through the standardization of mining tools at Hami, specialization in secondary processing at the Haizang Site, and diversification of mass production at the Qijiaping and Mogou sites. All archaeological evidence collectively points to the existence of systematic resource control mechanisms during early social complexity, establishing the material foundation for political entities in the upper Yellow River region.

From the Hexi Corridor to the Central Plains, the synergy between technological traditions and the resource systems elevated Qijia turquoise objects beyond material production. These objects served as transcultural symbols in regional politics. To understand why the Qijia Culture witnessed the final flourishing of jade industries from the late Neolithic to the early Bronze Age, we must examine how fluctuations in turquoise objects were linked to broader subsistence transitions. During the technological maturation of bronze metallurgy, inhabitants of the upper Yellow River systematically exploited raw materials and innovatively reconfigured traditional craftsmanship to achieve mass production, widespread use, and cross-regional distribution of craft products made from rare mineral resources (turquoise, nephrite, and copper). This production not only established the material foundations for early state formation but also embedded the spiritual significance of turquoise and jade cultures into early China's ritual systems.

Building on this foundation, future research should refine the reconstruction of turquoise circulation networks by employing these integrated methodologies, including applying geochemical sourcing techniques to additional artifacts and incorporating spatial parameters such as ore provenance, site clustering, topography, hydrology, and transportation hubs. This analytical framework provides a transferable model for investigating turquoise circulation networks across diverse Neolithic regions.

Acknowledgments

The authors thank Yizhuo Yang for assistance with archaeological materials, Yuxi Chen and Yunfei Liu for guidance in writing.

Conflict of Interest

The authors declare no competing interests.

Funding

No funding.

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