**Supplementary Material**

**1 Site information**

**1.1 Jiahu**

The Jiahu site is located in the upper reaches of the Huai River, the southwest edge of the Huanghuaihai Plain, Wuyang County, Henan Province. It was first discovered in 1962 but its significance was not fully appreciated until other sites related to the Peiligang culture had been excavated (Zhang et al., 1999). Radiocarbon dates and cultural features dated the Jiahu to 7000 BCE-5500 BCE, corresponding to the Early Neolithic.

The total area is about 5.5 hectare (ha), but only 4.4% have been excavated, including 45 house foundations, 370 pits, 349 burials, 9 kilns, more than 300 graves, and thousands of artifacts made of bone, pottery, stone and other materials have been found. Some incised marks were found on the fragments of tortoise shell, bone and pottery, which were regarded as pictographic characters of early Chinese writing (Li et al., 2003). Archaeological evidence from macrobotanical remains found that carbonized rice grains and it has demonstrate that the rice was domesticated, while other plants remains (e.g. wild rice and beans) suggest that ancient people were mainly relied on wild plants at that time (Chen and Jiang, 1997; Liu and Chen, 2012). Skeletal remains of animals, including domesticated pig, dog, sheep, cattle, deer, roe deer, hare, aquatic species, indicate that hunting and domestication of animals also played important roles in their subsistence strategies.

Overall, Jiahu is likely characterized by low-level food production, consisting of foraging for wild resources and domesticating animals (pig and dog) and plants (millet and rice). The settlements were scattered distributed in the major river valleys in small scale (Liu and Chen, 2012).

**1.2 Qingliangsi**

The Qingliang site is located in the northeast of the Ruicheng County, Shanxi Province, near the southern foot of the Zhongtiao Mountains and the north side of the Yellow River. From 2003 to 2005, the Shanxi Provincial Institute of Archaeology carried out rescue excavations of the Qingliangsi for three years, revealing the site in area of nearly 0.3 ha and 355 tombs which can be divided into four phrases (Xue and Yang, 2011).

The first-phase tombs (4050-3770 BCE) belong to the late period of the Zaoyuan culture and all of them are small tombs without mortuary goods. The second-phase tombs (2400-2150 BCE) corresponded to the second-phase culture of Miaodigou, and there were a total of 189 tombs accompanied with abundant mortuary goods, including jade, a few pottery, animal remains and human sacrifice in some tombs. The third-phase (2150-2000 BCE) tombs, corresponding to the Longshan culture, included 105 tombs in total and the jade craft was more refined. During this phase, the phenomenon of human sacrifice is very common, and its scale is relatively larger when compared to the other Neolithic tombs with human sacrifice in China, which probably represents the extreme class division and contradiction in the process of being a state society. The fourth-period (2000-1900 BCE) belongs to the Longshan period, and a total of 44 tombs were found. During this period, the number of mortuary goods and the phenomenon of human sacrifice decreased or even disappeared, reflecting the decline of the Qingliangsi (Wu, 2018).

**1.3 Lajia**

The Lajia site is located in the Guanting Basin, Minhe County, Qinghai Province, northwestern China. Large-scale excavations were carried out continuously between 2000 and 2001, revealing the site more than 0.15 ha exposed. The dating results showed that the Lajia site was existed at about 3800-4000 BP (Xia et al., 2003), corresponding to the late period of the Qijia culture which was existed during the late Neolithic Age to the early Bronze Age in the Hexi Corridor (Gao et al., 2007).

The excavations of the Laijia revealed many house foundations, wide ditches, a small-sized square, some ash pits, a number of mortuary items (e.g. pottery, jade), animal and human sacrifices and victims, and the revelation of vestiges of the disasters caused by an earthquake and flood in 4000 BP.

**1.4 Jiaojia**

Jiaojia is located 20 km northeast of Zhangqiu distinct, Jinan city, Shandong Province. It was discovered in 1987 and was firstly excavated in 1992 by the archaeological team of Zhangqiu Museum. During the 2016-2017, the systematic excavation was carried out by the Shandong University (Lu et al., 2018). The total area is about 100 ha, but only 0. 2 hahave been excavated, revealing a rammed-earth wall, a ditch around it, many high-ranking burials, 116 house foundations and 974 pits. According to the radiocarbon dates, the Jiaojia appeared before 2900 BCE, corresponding to the middle and late Dawenkou Culture.

A total of 215 burials were found in northern and southern regions, including small normal burials and large noble burials. Within all the burials in the northern region, there were one coffin and some artifacts such as jades and different kinds of pottery (e.g. painted pottery and white pottery). A few burials in the southern regions have two coffins and more exquisite mortuary goods, probably representing the burials of the nobles. Taken together, the Jiaojia may reflect a strong hierarchical differentiation in the late period of the Dawenkou culture. Faunal remains, such as pigs, dogs, various aquatic species, eagle, and deer, were found in the site. Particularly, ancient people mainly used pigs and dogs for sacrifice and domesticated pigs and deer as the main sources of meat. Pathological studies show that the inhabitants of the Jiaojia during this period had shifted from an early hunter-gatherer economy to a mixed economy with the agricultural economy as the mainstay and livestock breeding as the supplement. Plant remains and isotopic evidence show that the diets of Jiaojia people were mainly dependent on C4-based millet and domesticated pigs (Wang et al., 2019).

**1.5 Taosi**

The Taosi is located within the Linfen Basin, the lower reaches of the Yellow River Basin. The Institute of Archaeology of Chinese Academy of Social Science excavated it from 1978 to 1985. The area of the site is about 300 ha. It is a large center of the late Longshan period which is surrounded by many small sites and formed a three-story settlement hierarchy (He, 2018). The occupation can be divided into early (2300–2100 BCE), middle (2100–2000 BCE), and late phases (2000–1900 BCE). During the excavations, more than 1000 burials were excavated and were divided into three ranks, and hundreds of mortuary goods, such as jade, stone artifacts, pottery and other ritual goods were unearthed in the large-sized tombs which probably reflected social stratification. Animal remains in the site were mostly pigs, sheep and cattle.

**1.6 Shimao**

The Shimao is located in the town Gaojiabao, about 40 km to the southwest of Shenmu in the Yulin district, Shaanxi Province. The site has been known since the 1970s due to its association with jades. In last 40 years, it has been investigated and excavated by the Xi’an Banpo Museum and Shaanxi Provincial Institute of Archaeology for several times, revealing the area of over 400 ha. In order to protect the site and better understand its historical significance, the Shaanxi Provincial Institute of Archaeology has conducted the systematic surveys and excavations at Shimao and its surrounding areas since 2011.

The Shimao is regarded as the largest Neolithic walled settlement in China, dated to 2300–1800 BC. The settlement is mainly comprised by three parts: a pyramid palace centre, an inner enclosure and an outer rampart. The Houyangwan site where the animals collected in this study is located in the northeast of the central palace (Zhao et al., 2016).

During the excavations, large amounts of artifacts were unearthed, including jades, ceramics, tools, stone sculptures, animal (e.g. pigs, cattle and sheep) and human sacrifice. For the jade items, it is said that about three to four thousand kept in museums and private collections around the world are probably from the Shimao (Sun et al., 2018).

**1.7 Erlitou**

The Erlitou site is located on the southern bank of the Luo River. It was discovered in the 1950s, revealing a complex spatial layout, including magnificent architectural complexes, tombs, residential areas, and workshops for making bronzes, turquoise, pottery, and bone products (Liu and Xu, 2007). The discovery of these remains, as well as a number of elaborate bronze, ceramic artifacts, and jade, indicate a highly developed civilization. The Erlitou is considered as one of the most important sites in the early China because it is a prime site for the investigation of early cities and states in ancient China.

Zooarchaeological study show that there are at least 45 species of faunal remains. Five species are domesticated animals, including dogs, pigs, sheep, goats, and cattle, which occupy very high proportion of the total number of identifiable animals. According to the archaeological evidence, the animal remains of the Erlitou site belong to seven cultural and cultural phases, from the Erlitou Phase I-IV, the early and late of the Erlitang and Han Dynasty. The animals analyzed in this study were all from the Erlitou phase (Zhao et al., 2018). The radiocarbon results suggest that the site was about 1900-1500 BC (Liu and Chen, 2012).

**1.8 Wangjinglou**

The Wangjinglou site is located in Songshan, Zhengzhou. The site was discovered in the 1960s-1970s, and was extensively excavated by the Henan Provincial Institute of Archaeology during 1996-2007. During 2010-2011, the Zhengzhou Institute of Archaeology conducted systematic excavations, revealing walls, moats, large-scale architectural remains and ancient roads, house foundations, and burials. The total area of the site exposed 37 ha. It is an important regional central settlement which provides the important information for the establishment of the city in the early Xia and Shang Dynasties (Feng, 2019). In addition, a large amount of animal bones were unearthed during the excavation dating to the Erlitou-Erligang periods.

**1.9 Yinxu**

The Yinxu site was located on the south bank of the Huai River in Anyang, Henan Province. It was first excavated by the first generation of Chinese archaeologists in 1928 (Liu and Chen, 2012). The extensive excavations were carried out in later periods, revealing the total area of 24 ha and uncovering over 80 rammed-earth foundation sites including palaces, shrines, tombs and workshops. The whole excavations exposed the Palace-Temple complex at Xiaotun, the Royal Cemetery at Xibeigang and the rest of the ancient city was filled with small clusters of residential buildings. The dating results show that it is corresponding to the Late Shang Period.

Yinxu is regarded as the ancient city of Yin, the last capital of China's Shang Dynasty. It is very important because it exposed oracle bones and oracle bone script which is the earliest and robust evidence for writing in China (Bagley, 1999). These inscriptions recorded divinations, reflecting the life of Shang King and the economic and political activities of the Shang Dynasty. In addition to the discovery of a writing system, numerous objects made of bronze, jade/stone, ivory, ceramics, and bone were found, as well as some humans and animals in sacrificial pits were excavated.

**1.10 Zaoshugounao**

The Zaoshugounao site is located within the Guanzhong Basin in the southern Loess Plateau. The site is about 2000 m from north to south and 1500 m from east to west, covering a total area of 300 ha. The site was first discovered in 2005 by the department of Archaeology of the Northwest University and the Shaanxi Provincial Institute of Archaeology, and later was systematically excavated for several times (Wang et al., 2007). A large number of remains belonging to the Neolithic to the Sui-Tang Dynasties were excavated, including ash pits of different periods, burials, house foundations, potteries, and stone and bone artifacts. The potteries include many types such as gray pottery and red pottery. Hundreds of animals with different species and human skeletons were excavated in the site, and animal samples in this study were dating to the Predynastic Zhou-Western Zhou.

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