THE DEVELOPMENT AND DECLINE OF SOCIAL COMPLEXITY IN NORTH CHINA: SOME ENVIRONMENTAL AND SOCIAL FACTORS

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ABSTRACT

This paper examines settlement patterns in the middle and lower Yellow River valley in the Longshan period (2600-2000 BC), when the Neolithic culture was transformed to a state-level social organisation. During this period a series of changes in climate, ecology, and geomorphology took place. This external pressure triggered large-scale population movements, realignment of social groups, and inter-polity conflict, all of which are demonstrated in the changing patterns of settlement distribution. During this unstable era, many societies declined in terms of degree of sociopolitical complexity, but some polities in the Central Plains (the Erlitou culture in Henan) became highly integrated with a nucleated settlement pattern and developed the first urbanism in China. Climatic fluctuation and environmental conditions are important variables in social change, but it was the differing human responses to external challenges and social interaction which ultimately determined the development or decline of complex societies and the emergence of civilisation in China.

In recent years there has been an increase in interdisciplinary studies of paleoenvironments and their role in social process, especially the development and decline of civilisations (e.g., Hole 1994; Crumley 1995; Rosen 1995). Severe ecological fluctuation can alter social conditions and stimulate new patterns of social adaptation. For instance, in southern Mesopotamia, ecological stresses may have triggered large scale social change by upsetting precarious balances among different social groups and systems of agro-pastoral production. This led to massive demographic realignments and ultimately to urbanisation (Hole 1994). Similarly, in the Iron Age of temperate Europe climatic change may have effected socio-economic transformations (Crumley 1995). Long-term climatic deterioration and failure to adapt to such change may have contributed to the collapse of the Early Bronze Age civilisation in the southern Levant (Rosen 1995). Notably, these discussions are not a simple revival of climatic determinism. It has been emphasised that social structure and human behavior can be modified in response to environmental impacts. This can be significant in explaining change.

This paper argues that during the third millennium BC (the Longshan period), the social transformation from early complex society to state-level social organization[1] in the Yellow River valley related to a series of changes in climate, ecology and geomorphology. Affected by both internal and external factors, the Shandong and southern Shanxi regions, although they witnessed the development of highly complex societies, did not evolve into states by their own internal dynamics. It was on the Central Plains that early states evolved from less complex social systems.

THE STUDY OF PALEOENVIRONMENT

Research on Holocene environmental change is a relatively new field in Chinese geology which has developed rapidly in recent years. A number of studies have outlined changes in climate, sea level, river courses and lakes during the Holocene (e.g., Shi and Kong 1992; Shi and Zhang 1996; S. Wang 1993; Xu and Shen 1990; X. Zhao 1984; Zou 1997). The results of these studies have greatly enriched our knowledge of the Holocene environment and have, in turn, been used by archaeologists in conjunction with archaeological data to reconstruct the relationship of environment to cultural sequences. Consequently, many

scholars have become increasingly interested in correlations observed between environmental changes and archaeological cultural transformations (e.g., Sun 1987; Man 1991; Wang 1991, 1993, 1996; Wang and Li 1992; Cao 1994; Gao 1996). It should be pointed out that the geological data presented are much less refined than the archaeological data, making them difficult to apply in archaeological interpretations. In addition, there are other problems not explicitly addressed in these studies, which are discussed below.

First, many geologists use archaeological evidence together with geological data to reconstruct paleoclimatic conditions. Geological chronologies, however, are primarily derived from uncalibrated radiocarbon dates (BP), while archaeological chronologies are based on calibrated dates (calibrated BP or BC). As uncalibrated dates underestimate calendar dates within the time span of this paper by as much as several hundred years, these two sets of data are not directly comparable without calibrating the geological BP dates. Second, paleoclimatic information is obtained largely from pollen profiles, which do not indicate with precision the time when climatic change took place. Since a lag time of up to 300 years exists between climatic change and vegetation response, this may reflect on pollen data (e.g., Bradley 1999; Wick *et al.* 1997). Third, it takes time for human societies to respond to environmental changes. It is likely, therefore, that there is also a lag time between environmental change and social transformation (if affected by new environmental conditions) and that this reflects on the archaeological record.

Taking all these factors into account, the paleo-environmental data presented by geologists should not be used in archaeological interpretations without being evaluated independently. This statement, however, does not suggest that the results of current environmental studies are irrelevant. Such data can still provide a general framework for the understanding of environmental conditions on a large scale, and this may be related to the development of human societies. While the geographic chronology may be later than calendrical chronology due to the errors in uncalibrated carbon dates, the archaeological change may reflect a gradual reaction of human society in response to environmental change. Therefore, the temporal correlation of the two sets of data from current geographical and archaeological records may in fact represent two related events. In the following discussion, I will summarise the paleoclimatic information and archaeological cultural sequence, examine settlement patterns in the middle and lower Yellow River valley (mainly Shandong, Henan and southern Shanxi) against both environmental and human factors and evaluate the possible relationships between the two sets of data.

ENVIRONMENTAL CONDITIONS AND CULTURAL DEVELOPMENT

The topographic patterns of the Middle and Lower Yellow River valley can be characterised as uplands with alluvial river basins in the west, great plains in the centre (the Central Plains) and a combination of highlands and riverine plains in the east. The Yellow River, rising in the mountainous west, flows eastward across a wide extent of the country. It is a dry-climate river plagued by excessive fluctuation and flooding and carrying a heavy load of silt. In its lower course, silt progressively chokes normal channels and leads directly to floods, frequently causing changes in the river course (Murphey 1972). The Yellow River switches back and forth between the north and the south of the Shandong Highlands in its course to the sea, and major changes of this kind have taken place at least since the late Pleistocene and throughout prehistoric and historic times (Wang 1993).

Recent studies of climatic changes in the Holocene indicate that the Megathermal (or climatic optimum) in North China began in a phase dated by calibrated C14 dates to approximately 10,000-7500 BP and ended during the last three millennia BC (Figure 1). During the period 7500-3500 BP, the climate in general was warmer and moister than the present.

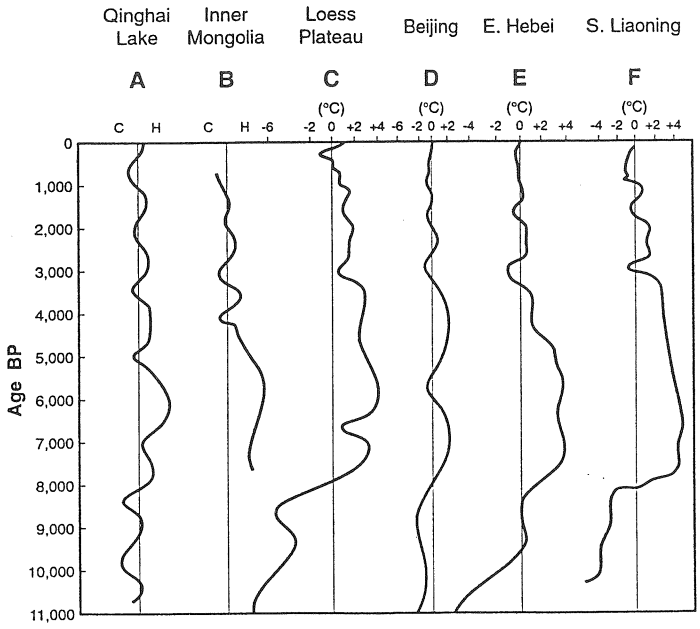

Figure 1: Holocene temperature changes in northern China (redrawn from Y. Shi et al. *1992).*

However, this climatic optimum was characterised by several cooling fluctuations, at different times in different places. In general, the period 7500-5500 BP witnessed the warmest temperature (up to 2-5°C higher than at present) and highest precipitation. A climatic fluctuation occurred around 4000 BP bringing lower temperature (1-1.5°C lower than at present) but high precipitation in many areas (Zhou *et al.* 1991:235). Following this incidence, a warm and wet climatic condition returned. The temperature between 3600 and 3300 BP was about 1-2°C higher than at present (Xu and Shen 1990:11; Zhou *et al.* 1991; Shi *et al.* 1992). These fluctuations and variations in temperature and precipitation correlate with changes in other ecological conditions of the region, including the following:

1. Shifts of the Yellow River's lower course (Figure 2). At least two major changes of river course occurred during the Neolithic period. During the early and middle Neolithic the Yellow River flowed through the Hebei Plains and emptied into the Bohai Sea. Around 4600 BP it moved south to the northern Jiangsu Plains and emptied into the Yellow Sea. Yet another change took place about 4000 BP, when the river course switched back to the Hebei Plains again (Wang 1993).
2. The fluctuations in precipitation affected the size of fresh water areas in the lowlands. Rivers, lakes, and ponds enlarged in size during wet climatic conditions and reduced in the dry in the Huang-Huai and western Shandong plains and the circum-Bohai region (Man 1991; Wang and Li 1992; Cao 1994).
3. Fluctuations in the level of the Eastern China Sea during the postglacial period. The highest sea level occurred during the period 6000-5000 BP (2-4 m higher than at present) and rose again during the periods 4600-4000 BP (1-2 m higher than at present) and 3800-3100 BP (1-3 m higher than at present) (Figure 3). As a result, marine transgression and movement of coastlines along Bohai Bay and in northern Jiangsu dramatically changed the landscapes of these regions (Zhao 1984:178; Wu 1990; Wang and Li 1992) (Figure 2, Table 1).

The periodic climatic fluctuations often coincided with the development and decline of archaeological cultures (Table 1). First, the early Neolithic culture, Peiligang (6500-5000 BC), developed at the beginning of the Megathermal. About 70 Peiligang sites have been found, and most of them are distributed in the alluvial plains in central Henan. Second, during the maximum climatic optimum, the early and middle Yangshao culture (*c.*5000-3500 BC) flourished; about 800 Yangshao sites have been discovered in the Henan region. Due to the high precipitation and expansion of fresh water areas in the lowland regions, large areas of the Central Plains were probably covered by water. Yangshao sites in these areas are small and scattered, and tend to be located on relatively high ground (Cao 1994:64). In contrast, in the highlands in southern Shanxi and western Henan and the transitional regions between highlands and lowlands in central western Henan, the Yangshao culture flourished, as indicated by the dense distribution of sites (Liu 1996a). The climatic fluctuations from 5500 to 5000 BP brought cooler and drier conditions, diminishing agricultural productivity and leading to conflict over resources and consequent social instability. Archaeologically, the period 5500-5000 BP (the late Yangshao in the Central Plains and mid-Dawenkou culture in Shandong) witnessed population movement, indicated by the appearance of different Dawenkou and Qujialing material cultural assemblages commonly found in Shandong and Hubei,[2] and the construction of the earliest town walls in Henan and Shandong.

After 5000 BP a warm climate resumed, although it was in general cooler and drier than the early Yangshao period. The Central Plains lowlands may have become more inhabitable for the Neolithic settlers, due to the reduction of fresh water areas. During this period the Longshan culture (2800-2000 BC) developed the highest population density in the Neolithic. In the Henan region, about 1000 Longshan sites have been found and site numbers sharply increased in the lowland regions of central Henan (Figure 4). The climatic fluctuation around 2000 BC coincided with the decline of the Longshan culture; the lower temperature but higher precipitation may have caused flooding, damaging the fields of some Longshan communities but benefiting others, leading to disparities and enhancing social competition. Afterwards, a better climate returned, leading to the flourishing of the Erlitou culture. However, the number of communities dropped dramatically compared to the Longshan period, as no more than 130 Erlitou sites have been identified in Henan (Figure 4).

In the coastal areas of Shandong and northern Jiangsu during the maximum climatic optimum, the coastlines advanced to their westernmost extremes around 6000-5000 BP (Wang 1991; Wang and Li 1992) (Figure 2). Within a sample area of 29 counties/cities (Table 2), the Dawenkou (4100-2600 BC) settlements increased rapidly in number (209 sites), compared to the previous period of the Beixin culture (5300-4100 BC: 14 sites) (Figure 4). After a climatic fluctuation occurred shortly before 5000 BP, many environmental and demographic changes took place during the next 1000 years when the late Dawenkou and Longshan cultures developed. Temperature and precipitation increased and then decreased, while the sea level fell and then rose; the Yellow River shifted its lower course from the north in the Hebei Plains to the south in western Shandong and northern Jiangsu about 4600 BP.

As the coastline of Bohai Bay retreated towards the east, alluvial plains were rapidly formed in the delta region of the

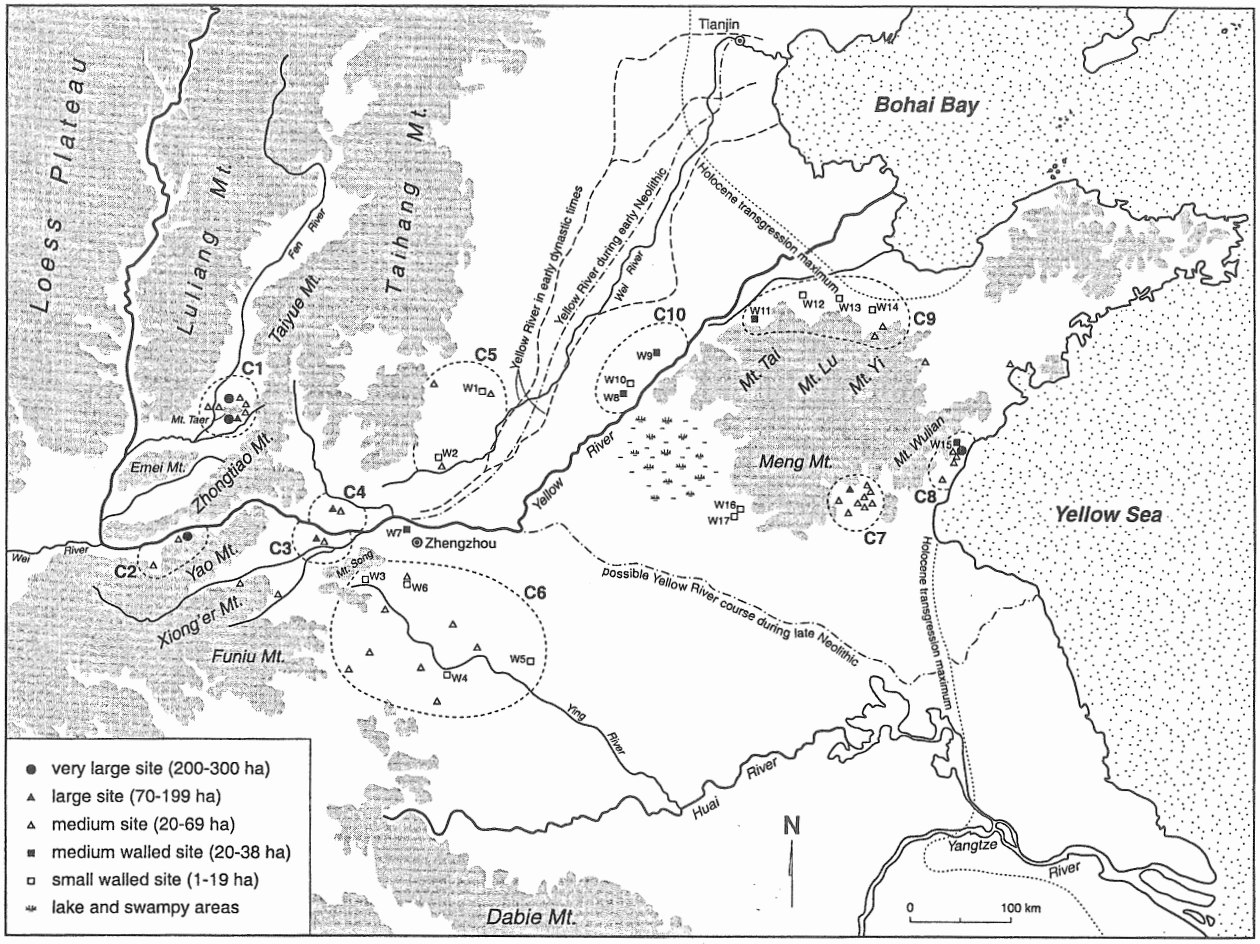

Figure 2: Map of the middle and lower Yellow River valley, showing major geographic configurations in Neolithic times – topography, swampy areas, changes of coastline (after Wang and Li 1992: Figure 1; Wu 1990: Figures 3, 4) and changes in the course of the Yellow River (after Wang 1993: figs 2, 3, 4). The map also shows the ten clusters, discussed in the text, of large sites and walled towns dating to the late Longshan culture.

Site clusters are as follows: C1: the Linfen Basin cluster; C2: the Western Henan cluster; C3: the Yi-Luo River valley cluster; C4: the Qin River valley cluster; C5: the northern Henan; C6: the central Henan cluster; C7: the Linyi cluster; C8: the Rizhao cluster; C9: the North Shandong cluster; C10: the West Shandong cluster.

Walled sites: W1: Hougang; W2: Mengzhuang; W3: Wangchenggang; W4: Haojiatai; W5: Pingliangtai; W6: Guchengzhai; W7: Xishan; W8: Jingyanggang; W9: Jiaochengpu; W10: Wangzhuang; W11: Chengziyai; W12: Dinggong; W13: Tonglin-Tianwang; W14: Bianxianwang; W15: Dantu; W16: Xuegucheng; W17: Xikangliu (W7 and W17 are pre-Longshan walled sites).

ancient Ji River (which flowed through the region where the lower course of the Yellow River is situated today). In this region, settlers took advantage of the newly exposed land to occupy even broader areas. The changing course of the Yellow River may have caused flooding and thus the population movement. The occupation of high grounds (called *gudui*, mounds) in swampy areas in western Shandong during the Longshan period suggests that people may have moved to higher locations from inundated lowlands due to Yellow River flooding (Zhi and Zhang 1987). Northern Jiangsu witnessed periodic population decrease during the marine transgression (Wu 1990) and movement of the Yellow River into the region (Wang 1991). As a result, some late Dawenkou settlers migrated westward to the Central Plains and the northern Huai River region (Du 1992; Gao 1996). The Shandong region witnessed the sharpest increase in the number of settlements during the Longshan period; archaeological surveys have yielded more than 700 sites in the sample area, which is 3.5 times that of the preceding Dawenkou culture in the same region (Figure 4).

Following another period of climatic calamity and environmental changes about 4000 BP the Longshan culture in the Yellow River valley diminished (Table 1). There was a rapid decrease of temperature (1-1.5°C lower than at present),

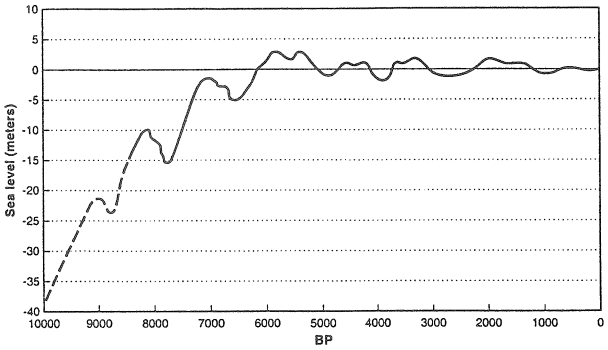

Figure 3: Holocene sea-level fluctuations along the east coast of China (after Zhao 1984: Figure 35).

accompanied by flooding in many river systems. Conditions may have been worsened due to the changing course of the Yellow River from south back to north, which probably caused drastic flooding in the inland region (Wang 1993, 1996). These floods may have been followed later by marine transgression in the coastal regions as the sea level rose around 3800 BP (Zhao 1984:178). Some large settlements in coastal areas, such as Liangcheng in Shandong, became depopulated (see below). However, as warm and wet climatic conditions returned some time after 4000 BP, the Yueshi culture in Shandong and northern Jiangsu flourished (Table 1), although the number of settlements apparently declined as only about 113 sites are dated to the Yueshi culture in the sample area, which is only 16% of the Longshan total (Figure 4).

VARIABILITY IN LONGSHAN SETTLEMENT PATTERNS AND GEOGRAPHIC CONFIGURATIONS

The settlement data used in this study are derived from surveys carried out in southern Shanxi and Henan (Liu 1996a), and in a large part of Shandong including 29 cities/ counties (Table 2).[3] Nearly 1480 Longshan sites found in these regions are examined here.

Longshan sites tend to group into four classes: 1) very large sites, 300-200 ha; 2) large sites, 199-70 ha; 3) medium sites, 69-20 ha; and 4) small sites, <20 ha (Figure 2). Among the four very large sites, two (Taosi and Liangchengzhen) have been excavated. The material remains from the excavations indicate the existence of individuals with high status in a stratified society. Therefore, the large sites may have been regional centres. Nineteen walled sites, five in Henan and fourteen in Shandong,[4] with a size range from 1 to 38 ha, have been identified. Some of these, especially the ones which are relatively large in size, may have functioned as important sociopolitical centres in these regions.

By plotting all the large and medium sized and walled sites, Longshan settlement patterns reveal ten clusters of large settlements or walled town sites, each with several medium and small settlements (see Figure 2 and Table 3).[5] Among the ten settlement clusters, there appear to be some geographic patterns. Some clusters, located near the mountainous regions in southern Shanxi, western Henan, and Shandong, are either completely (Clusters 1, 2) or partially (Clusters 3, 4, 7-10) surrounded by natural barriers such as mountains and large rivers. Other clusters in central and northern Henan are situated on the Central Plains with few geographic barriers. Adapting Carneiro's concept of environmental circumscription (Carneiro 1970), the ten clusters can be divided into two geographic types: more circumscribed settlement clusters (Clusters 1-4, 7-10) and less circumscribed settlement clusters (Clusters 5, 6) (Figure 2).

VARIABILITY IN LONGSHAN SETTLEMENT PATTERNS AND SOCIAL ORGANISATION

The ten clusters exhibit two patterns of settlement distribution. The first is the mono-centred system: in each cluster (or sub-cluster in the case of Cluster 1) one very large or large centre is closely surrounded by a number of medium and small sites and the major centre is not walled (Clusters 1-4, 7, 8). The second pattern is the multi-centred system: in each cluster there are multiple centres of medium/small sized sites with or without walls, and all the centres are found spread out evenly over the landscape (Clusters 5, 6, 9, 10). Taking into consideration such factors as settlement hierarchy, demographic parameters, spatial distribution of regional centres and rank-size variations,[6] the first pattern can be further divided into two categories: centripetal and centrifugal systems. The second pattern can be characterised as two types: scattered multi-centred and linear multi-centred competing systems.

Mono-centred Centripetal Regional Systems

A three- or four-tier settlement hierarchy coexisting with very large- and large-size regional centres is observed in Clusters 1, 2, 7 and 8 in the environmentally circumscribed regions (Figure 2). Minor centres were clustered around the major centres and, in turn, were closely surrounded by a lower level of settlements. So far as we know, defensive facilities such as town walls were absent in the major centres. Rank-size distributions express primate or log-normal curves, suggesting the existence of highly integrated social systems. These four clusters seem to represent the most integrated social systems in the region in question.

Socio-political integration paralleled rapid demographic growth, which was partially attributable to human migration

Table 1. Comparison of Environmental Change and Archaeological Cultural Development in the Middle and Lower Yellow River Valley*

Time (BP)	Archaeological cultures: Henan, S. Shanxi	Archaeological cultures: Shandong	Climatic condition	Yellow R. Course	Sea level	Populn. move. & site numbers in Henan	Settlement features & socl. development: Henan	Settlement features & socl. development: S. Shanxi; Shandong
			Optimum began	North	Low			
8500								
7500	Peiligang	Houli	Fluctuation			70		
7000			Maximum of climatic optimum					
6000	E. Yangshao	Beixin				800		
5500	M. Yangshao	E. Dawenkou			Highest + 2-4 m			
5000	Late Yangshao	M. Dawenkou	Fluctuation			Dawenkou & Qujialing cult. to Henan	One walled site No large burials No long-distance exch. of elite goods	Two walled sites Large burials Long-distance exch. of elite goods
	Early Longshan	L. Dawenkou	Improvement		Low			
4500	Late Longshan	Longshan		Change South	High + 1-2 m	1000	More than 5 walled sites No large burials No long-distance exch. of elite goods	More than 12 walled sites Large burials Long-distance exch. of elite goods
4000			Fluctuation	Change				
	Erlitou: Xinzhai, Phase I, Phase II, Phase III, Phase IV	Yueshi	Improvement	North	Low	130	State-level society poli. Centralization cultural expansion	Cultural constraint
3600					High + 1-3 m			
3050	Shang dynasty					680	Cultural expansion, continuous development of early states	

* This table does not illustrate the time gaps, discussed in the paper, between uncalibrated BP dates which are used by geologists to indicate paleoenvironmental conditions and calibrated BP dates used in archaeology. Readers should note that the time frames for environmental change may be slightly earlier than social change and archaeological chronology indicated here.

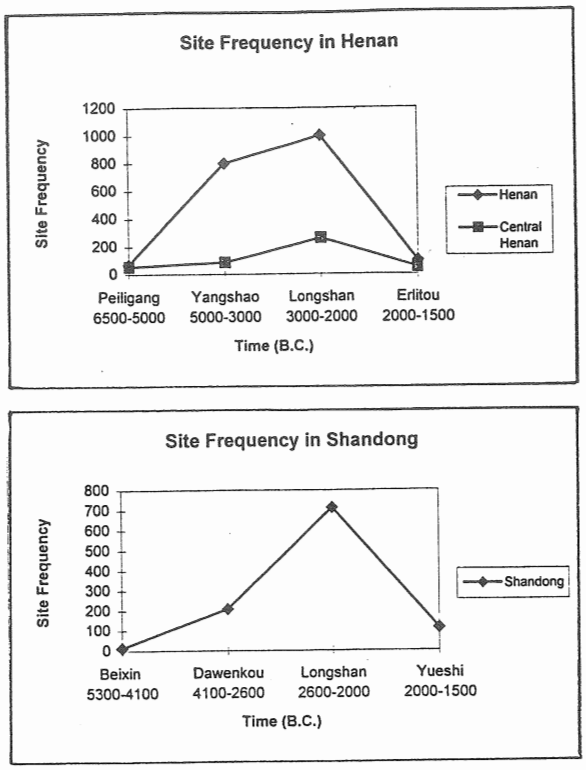

Figure 4: Demographic changes from Early Neolithic to Early Bronze Age in Henan and Shandong, based on site frequencies.

from other areas. In the southern Shanxi and western Henan cases, it was perhaps caused by a population push from north or west to the already well populated and environmentally circumscribed regions (Liu 1996a:248, 269). In the southeastern Shandong cases, it was probably the population movement from northern Jiangsu, where ecological conditions deteriorated as the result of the marine transgression and the change of the Yellow River course from north to south. The arrival of new migrants probably reinforced and accelerated the development of the existing power structure and social hierarchy.

In Cluster 8 (Rizhao), for example, a group of sites is distributed around the major centre, Liangchengzhen (Figure 5) (Sino-American Archaeology Team 1997; Underhill *et al.* 1998). A four-level settlement hierarchy (Figure 6A) and a log-normal to primate rank-size curve can be observed (Figure 7A).[7] The settlement nucleation happened rather suddenly since Liangchengzhen and its surrounding areas were barely populated prior to the Longshan period. Due to the lack of excavation at the site it is unclear exactly how Liangchengzhen developed into a large regional centre. The population migration from northern Jiangsu may have partially contributed to such a rapid demographic change. Probably also because of its optimum location for marine transportation, raw materials such as jade were imported into manufacturing centres while final products were exported to other regions (Liu 1996b:9). In addition, lithic sources for making stone tools have been identified in Mount Baishi near Liangchengzhen (Sino-American Archaeology Team 1997:4), and semi-finished stone tools have also been found at the site (Underhill *et al.* 1998: 464). The Liangchengzhen site, therefore, may have functioned not only as a political center, but also as a regional centre for craft production and distribution of certain types of élite items and utilitarian goods, which stimulated the rapid growth of population as well as the hierarchical settlement system there.

These centripetal settlement patterns, characterised by population moving into an environmentally circumscribed area, represent the most complex social systems in the region. However, they did not directly lead to the formation of early states.

Mono-centred Centrifugal Regional Systems

A three-tier settlement hierarchy (Figure 6B), accompanied by large regional centres, is revealed in Clusters 3 and 4. The settlement patterns are rather similar to those of the centripetal systems, but with lower degrees of social integration as indicated by smaller regional centres and near log-normal rank-size curves (Figure 7B). This situation is probably related to the semi-circumscribed environment which facilitated the move of population out to neighbouring regions, where more desirable agricultural lands became available as a result of ecological change at the beginning of the Longshan period (Liu 1996a:254, 268). These two clusters, characterised as "centrifugal regional systems," also indicate complex social systems in the region, although they may not be as integrated as the ones in the centripetal systems.

Scattered Multi-centred Competing Regional Systems

The coexistence of multiple medium/small-sized centres and walled towns is seen in Clusters 5 and 6 in the less circumscribed regions of northern and central Henan. The centres are distributed in a scattered fashion, and the distances between centres are regular (43 km in northern Henan and 42.6 km in the northwestern part of central Henan) (Figure 8). This is a phenomenon indicating inter-group political competition and independence (Earle 1991: 93), as well as territorial administration controlled by the local élites (Renfrew 1975:14; Johnson 1982:415). In Cluster 6, for example, among some 20 sub-clusters, most them express a two-tier settlement hierarchy (Figure 6C) and the rank-size distribution is convex (Figure 7C). These suggest a low level of integration and competing relationships among centres.

Table 2: Information on Neolithic and Yueshi sites discovered in twentynine counties/cities in Shandong

(BC)	Beixin 5300-4100	Dawenkou 4100-2600	Longshan 2600-2000	Yueshi 1900-1500	Reference
North Shandong					
Zouping	1	2	17	3	KG 89.6:505-23
Changle	0	22	60	7	KG 87.7:577-85
Zhangqui	3	10	42	30	Zhang 93:21
Zibo	2	3	13	0	HDKG89:6-23
Shouguang	0	14	62	6	HDKG89:29-60
Linqu	0	5	36	6	HDKG89:202-16
Qingzhou	1	20	76	9	HDKG89:124-40
Subtotal	7	76	306	61	Sum: 450
East Shandong					
Haiyang	0	8	11	2	KG 85.12:1057-67
Haiyang, Laiyang, Laixi and Huang Xian	0	2	5	1	KG 83.3:193-216
Subtotal	0	10	16	3	Sum: 29
Southwest Shandong					
Tengxian	2	25	32	0	KG 80.1:32-44
Zaozhuang	0	13	18	3	KG 84.4:289-301
Zoouxian	0	11	13	0	KGXJK 83:98-108
Sishui and Yanzhou	3	7	14	0	KG 65.1:6-12
Qufu	2	6	19	0	KG 65.12:599-613
Weishan	0	3	2	0	KG 95.4:313-18
Jining	0	7	6	0	KG 83.6:489-95
Juye, Chengwu, Heze, Danxian, Caoxian and Dingtao	0	6	70	20	Zhang 1996
Subtotal	7	78	174	23	Sum: 282
Southeast Shandong					
Liancheng	0	1	33	0	KG 97.4:1-15
Zhucheng	0	5	23	5	HDKG 89:225-36
Linyi	0	19	113	10	KG 92.2:87-93
Tancheng	0	6	11	0	KG 95.8:678-85
Feixian	0	7	5	2	KG.11:966-76
Subtotal	0	38	185	17	Sum: 240
West Shandong					
Liaocheng	0	7*	32	6	KGXJK 91:1-22
Subtotal	0	7	32	6	Sum: 45
Total	14	209	713	113	SUM: 1046

* Including Dawenkou and Yangshao sites. Code: KG = *Kaogu*; HDKG = *Haidai kaogu*; KGXJK = *Kaoguxue jikan.*

This suggestion is strongly supported by the evidence of inter-group conflict as several centres were constructed with town walls and human sacrifices were practiced in some walled centres.

In the southern part of central Henan the distances between centres (including medium and small centres and walled sites) are rather short, and the distribution of the centres is irregular, especially in the area near the Haojiatai site. This pattern may have been partially caused by the irregular distribution of river channels. They may also indicate, however, a situation in which the political centres were replaced frequently.

The emergence of walled sites is preceded by population movement from neighbouring regions, such as the Dawenkou culture in the east and the Qujialing culture in the south. The rapid population expansion is also related to environmental changes in this region. With the arrival of a cooler and drier climate and a smaller area under water, new

Table 3: The ten clusters of Longshan settlements identified by site surveys in southern Shanxi, Henan and Shandong

Cluster	Location	Tiers of settlement hierarchy	the largest centre and size (in hectares)	Settlement system
1.1	North of Mt. Taer Southern Shanxi	3	Taosi, 300	Mono-centred centripetal
1.2	South of Mt. Taer Southern Shanxi	3	Fangcheng, 230	Mono-centred Centripetal
2	Western Henan	3	Xiaojiaokou, 240	Mono-centred Centripetal
3	Yi-Luo valley	3	Poluoyao, 75	Mono-centred Centrifugal
4	Qin valley	3	Miaojie, 80	Mono-centred Centrifugal
5	Northern Henan	2-3, mostly 2 tiers	6 centres, up to 48 ha. incl. 2 walled. Mengzhuang, 25	Scattered Multi-centred
6	Central Henan	2-3, mostly 2 tiers	About 20 centres, up to 50 ha. incl. 4 walled. Wangchenggang, 1 Haojiatai, 3.3 Pingliangtai, 3.4 Guchengzhai, 16	Multi-centred Scattered
7	Linyi, Shandong	3	Zhangjiazhaili, 75	Mono-centred Centripetal
8	Rizhao, Shandong	4	Liangchengzhen, 246	Mono-centred Centripetal
9	Northern Shandong	2	4 centres, walled. Chengziyai, 20 Dinggong, 11 Tonglin-Tianwang, 15 Bianxianwang, 5.7	Multi-centred Linear
10	Western Shandong	3	2 centres, walled Jiangyanggang, 35 Jiaochangpu, 33	Multi-centred Linear

land became available for agricultural production and attracted population from surrounding areas (Liu 1996a:267).

The four town walls found in central Henan were all built at the beginning of the late Longshan period. Some were functional for a relatively brief time although inter-group conflict may have continued in a later period (e.g., evidence from Haojiatai). In some sub-clusters, political centres changed locations within the settlement system during the Longshan period (e.g., the Huan River valley and Wuhumiao sub-clusters). In other areas, regional centres may have relocated among polities (e.g., areas near Haojiatai) (Liu 1996a:260). These phenomena continue to suggest inter-group conflict and constant power shifts among political centres.

While social groups in the northern and central Henan regions were newly established and deeply involved in inter-group conflict, social complexity was not as developed as in other clusters during the Longshan period, indicated by smaller sizes of centres and decentralised settlement systems. Therefore, clusters 5 and 6, categorised as scattered

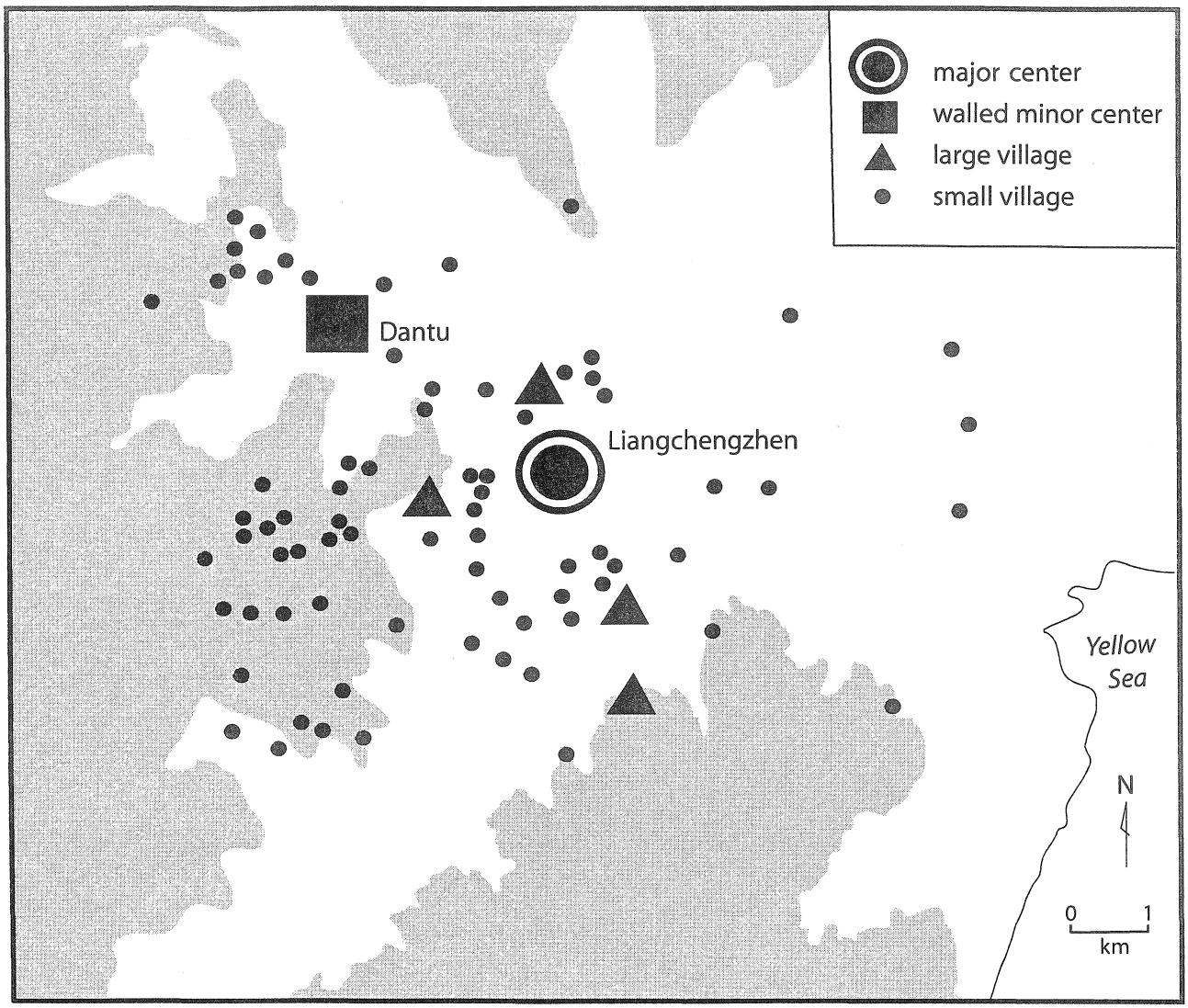

Figure 5: An example of a mono-centred settlement system; site distribution in the Rizhao cluster, Shandong (after Underhill et al. *1998: Figure 4).*

multi-centred competing regional systems, represent the least integrated social systems in the region.

Linear Multi-centred Competing Regional Systems

Clusters 9 and 10 in northern and western Shandong are characterised by the distribution of several walled centres with a linear pattern in the semi-circumscribed regions (Figure 2). Each subregional settlement system exhibits two or three levels of settlement hierarchy; for example, the walled site of Chengziyai (20 ha) is surrounded by about 40 sites no larger than 6 ha (Figure 9). Most centres were built with town walls, indicating competitive relationships between polities. There is also a regular spacing between centres. The average distance between the four centres in northern Shandong is 41.6 km and the distance between the two centres in western Shandong is about 43 km. The rank-size analysis of the northern Shandong cluster shows a convex curve (Figure 7D). This pattern is consistent with corresponding data from lowlands of the Central Plains.

A rapid rate of settlement proliferation is also observable in the northern and western Shandong clusters. Settlements increased in number and also expanded to areas which became newly habitable because of changes in climate and landscape. These conditions include a cooler and drier climate, retreat of the coastline, expansion of delta area, reduction in size of lakes and ponds in the circum-Bohai

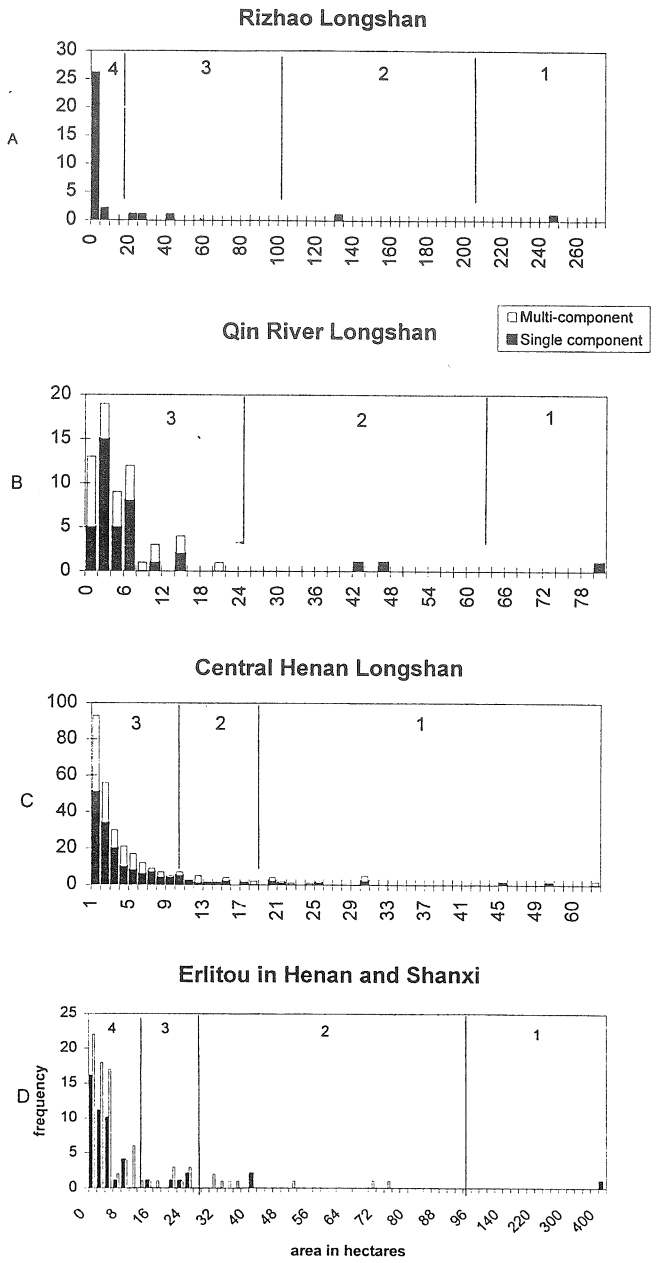

Figure 6: A: Settlement hierarchy of the Rizhao cluster in Shandong, showing four levels.
B: Settlement hierarchy of the Qin River valley cluster in Henan, showing 3 levels.
C: Settlement hierarchy of the Central Henan cluster, showing 2-3 levels of site hierarchy (many of the level 2 sites are sub-regional centres, see Figure 8).
D: Settlement hierarchy of the Erlitou culture, showing four levels.

region, and the Yellow River's changed course from north to south (Wang and Li 1992; Wang 1993).

These two clusters, categorised as linear multi-centred competing regional patterns, in many respects resemble the competing systems of the northern and central Henan clusters in the Central Plains. In both situations the emergence of walled sites is related to population expansion in a region where new land had become available for agricultural production because of environmental changes.

The four patterns of site distribution roughly correlate with the two types of geographic configuration in the region: all the mono-centred systems and two linear multi-centred systems are located in more circumscribed regions, while only the two scattered multi-centred systems in northern and central Henan are positioned in the less circumscribed regions. Interestingly, it is the latter variation of settlement patterns which gave rise to early states.

VARIABILITY IN LONGSHAN SETTLEMENT PATTERNS AND ECONOMIC SYSTEMS

Why did early states emerge from the competing social systems in the Central Plains, which were less complex in settlement hierarchy, rather than from the mono-centred systems with their highly developed settlement hierarchies? A comparison of socioeconomic and political systems from different regions may provide some clues.

Political Economic Systems

Political economic systems in complex societies have been classified into two basic types: those dependent upon wealth finance (although this concept may not be applicable to prestate societies in northern China), and those dependent upon staple finance (D'Altroy and Earle 1985:188; Earle 1987:294; Gilman 1987:22). In the former, valuables were manufactured and procured by the élites, exchanged for staples, then redistributed as symbols of rank on a regional level. The functions of such economic systems were to cement alliances between the leaders of different groups and to attract and establish personal client relationships with headmen of smaller groups (e.g., Hirth 1992:28). In the latter case, it is surplus staples, such as grain, that are mobilised to support the élite.

The evidence for the production, redistribution, and exchange of prestige goods (e.g., drums made of wood and alligator skin, jade objects, and elaborate ceramics) on a regular basis in the Shandong and southern Shanxi regions (Liu 1996b) suggests that the economic strategy was focused on production and manipulation of prestige goods. It may have facilitated a steady expansion of political influence in the two regions. On the contrary, in the Henan region there

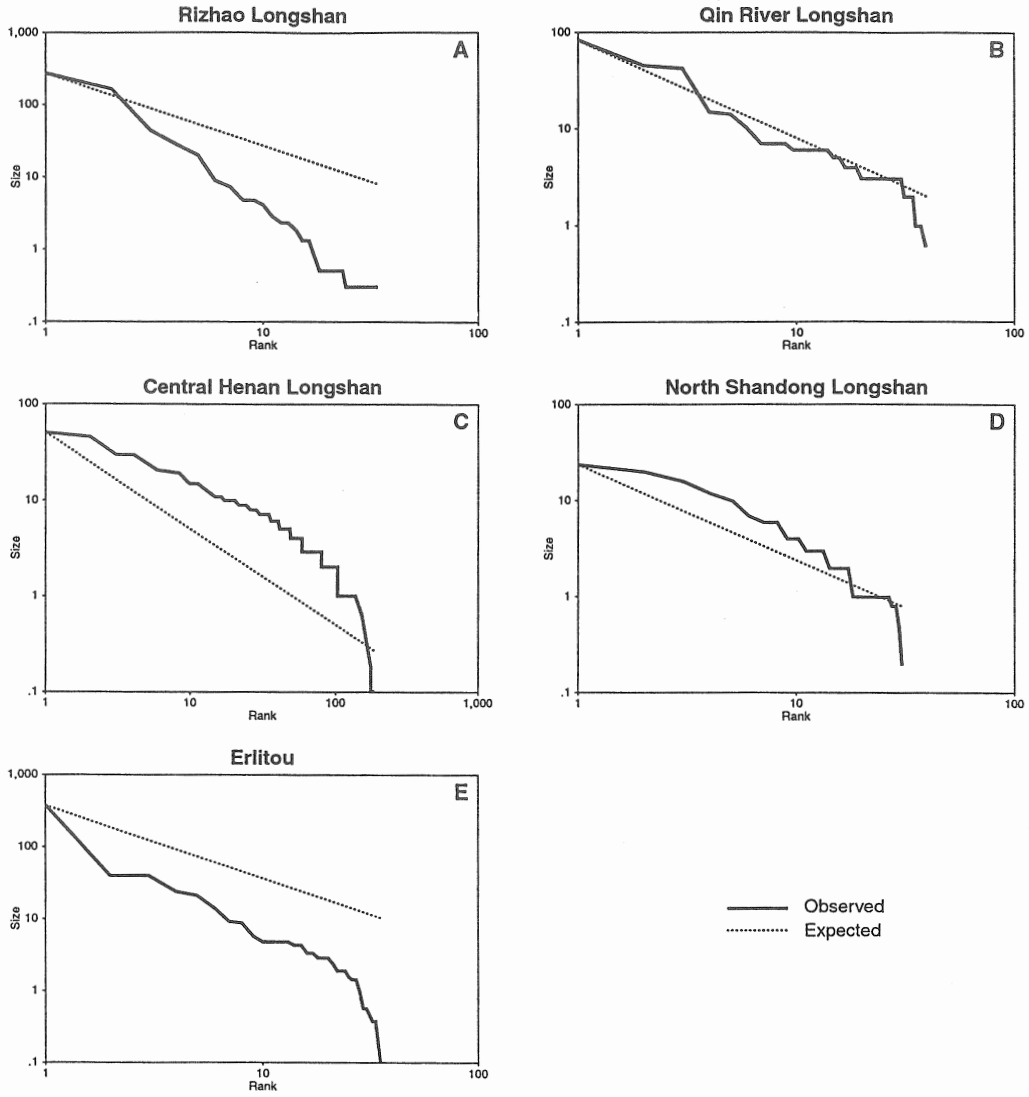

Figure 7: A: Rank-size distribution from the Rizhao cluster, showing nearly a log-normal curve.
B: Rank-size distribution from the Qin River valley cluster, showing nearly a log-normal curve.
C: Rank-size distribution from the Central Henan cluster, showing a convex curve.
D: Rank-size distribution from the North Shandong cluster, showing a convex curve.
E: Rank-size distribution from the Erlitou culture, showing a strong primate curve.

is no evidence that prestige goods were produced and circulated regularly by local élites. This suggests that the prestige goods economy was not practiced; although no evidence for the presence of staple finance has been observed either. This region is characterised by intensive military conflict between polities and frequent replacement of one political centre by another, indicating that military competition was a major force contributing to the socio-political systems.

Political Structures

The regional differentiation in economic system between the Shandong-southern Shanxi and Henan Longshan cultures is closely related to the polarity in political structure of complex societies: individual oriented *versus* group oriented. The former type of society emphasises the identification of élites both by special housing and burial structures and by status-defining items of wealth, especially prestigious objects obtained through long-distance

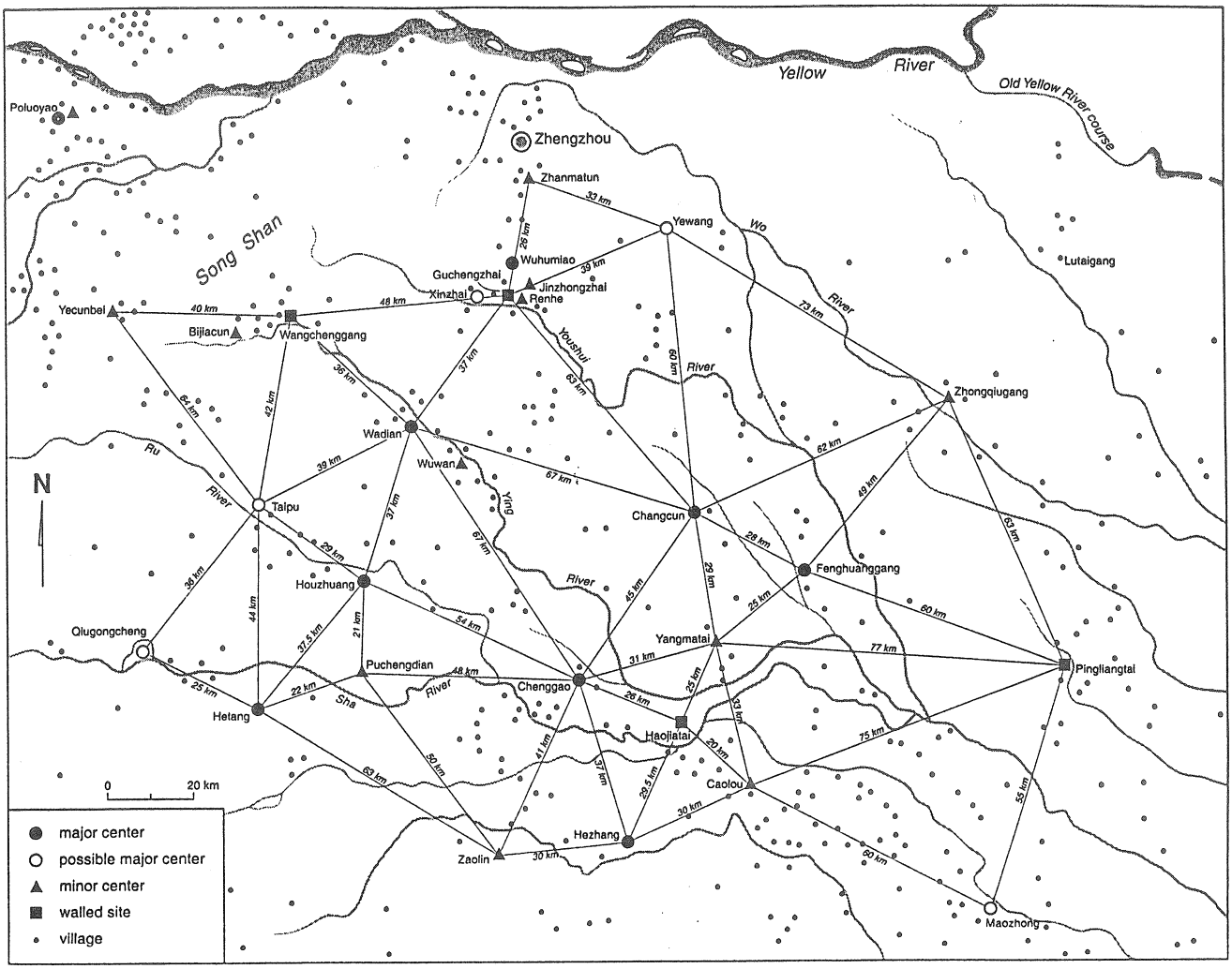

Figure 8: An example of a less circumscribed multi-centred settlement systems - site distribution in Central Henan.

exchange. In the latter type of society the interests of a population group were accentuated over the status of élite individuals, the importance of group definition was emphasised through investment in corporate labour constructions, and intra-group differentiation was minimum (Renfrew 1974:74).

Valuable objects, rich burials and large architectural remains have been found at sites in Shandong and southern Shanxi, which may thus be identified as those of individualising chiefdoms. On the contrary, the sites in central and north Henan have so far yielded no evidence for rich tombs, special housing or exotic prestigious objects, but some have town walls constructed for the protection of the whole community by corporate labour. These settlement systems, therefore, can be characterised as group-oriented chiefdoms. It was the group-oriented type of social system, involved in intensive military conflict by relying on local resources to maintain internal solidarity against outsiders, that gave rise to the early states in north China.

THE DEVELOPMENT AND DECLINE OF SOCIAL COMPLEXITY IN NORTH CHINA

The Longshan culture was succeeded by the Erlitou culture in a large part of Henan and southern Shanxi and by the Yueshi culture in Shandong. The Erlitou site (400 ha; *c.* 1900-1500 BC), which witnessed the development of the earliest urbanism in China, is regarded as a capital city of the late Xia dynasty by many Chinese archaeologists today (e.g., Zhao 1995; Fang 1996; Gao *et al.* 1998).

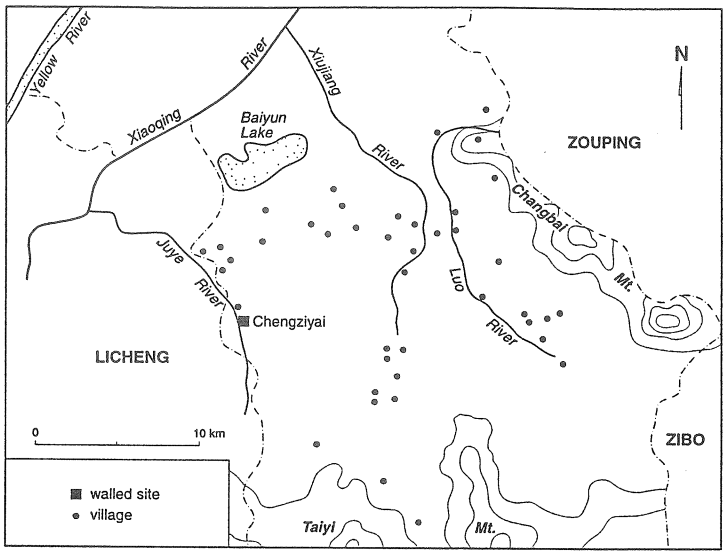

Figure 9: A sub-cluster within the circumscribed multi-centred settlement system in north Shandong. More than forty sites are centred on the Chengziyai walled town, revealing two levels of settlement hierarchy.

The Erlitou Culture

The Erlitou culture is divided into four phases. At the Erlitou site itself material remains dating to Phase I are rather modest, including mainly pottery and small house foundations. Large palatial foundations began to occur in Phase II. During Phase III, the Erlitou site reached its largest size with palatial foundations, elaborate tombs, bronze workshops and bronze ritual vessels. The site witnessed a decline in Phase IV, during which palatial structures were abandoned (IACASS 1999). These data clearly suggest that Erlitou gradually developed into a major political, ceremonial, and craft production centre, then finally collapsed.

The Erlitou culture is distributed mainly in southern Shanxi and in western and central Henan. More than 170 sites have been defined as belonging to it (Chen *et al.* 1999; Zou 1980:134; Zhao 1987; SWTIACASS 1985, 1989; NBCR 1991), and sites seem to be most densely distributed in the core area of 50 km radius from the Erlitou site (Figure 10). The histogram of Erlitou site sizes shows a four-tier settlement hierarchy, centred on the Erlitou site (Figure 6D). The rank-size distribution illustrates a strong primate curve (Figure 7E), indicating a highly integrated and centralised sociopolitical system.

Based on the differentiation in ceramic styles, the Erlitou sites found in Henan are classified as the Erlitou type, while the sites in southern Shanxi are categorised as the Dongxiafeng type. The ceramic data suggest that the Erlitou type developed locally from the Longshan culture, mainly in central Henan, through an intermediate period called the Xinzhai phase. Xinzhai cultural assemblages have been identified at 8 sites (Zhao 1986), probably dated to 2000-1900 BC (Zhao 1999) (Figure 10). On the contrary, there is little indication of a ceramic continuity from the Longshan culture to the Erlitou culture in southern Shanxi (SWTIACASS 1980; Gao and Li 1987). The earliest ceramic remains of the Erlitou culture in southern Shanxi and the Qin River valley of northern Henan date to Phase II of the Erlitou period, representing an expansion of the Erlitou culture from central and western Henan to the northwestern regions (Li 1989:284; Yang 1997). Therefore, areas in western and central Henan, especially central Henan which seems to be the core area of the Xinzhai phase (Figure 10), should be the focus of a search for the rise of the Xia state.

Central Henan is the region where Cluster 6 is defined, representing multi-centred competing regional settlement patterns, characterised by extensive cultural interaction, especially inter-group conflict, and frequent power shifting among polities. Given the scarcity of settlement and absence of large sites, the early phases of the Erlitou culture in this region may have had a social structure no more complex than the late Longshan period, representing a multi-centred and decentralised chiefdom system. It is not until Phase II of the Erlitou culture that the sign of a state-level social organisation can be observed in the construction of palatial structures and in expansion of territory. The latter may have been a result of intensive military competition with the neighbouring Xiaqiyuan culture in northern Henan (Figure 10). Phase III reached a peak of cultural development as the capital city enlarged in size with state-controlled bronze production, and society became highly stratified (Liu 1996a:274).

Several changes in settlement pattern and material culture took place when the Longshan culture developed into the Erlitou:

1. Settlements decreased dramatically in number from about 700 to 170 in the same region (mainly southern Shanxi and the Henan region south of the Qin and Yellow Rivers), while the settlement hierarchy in western and central Henan changed from two- or three-tiered systems to a four-tiered system.
2. The political structure changed from the coexistence of multiple competing polities of medium sized centres (>75 ha) to one in which a very large single centre (400 ha) dominated many smaller centres (40 ha or less) and villages over a very broad region.
3. Rank-size distribution changed from convex to primate.

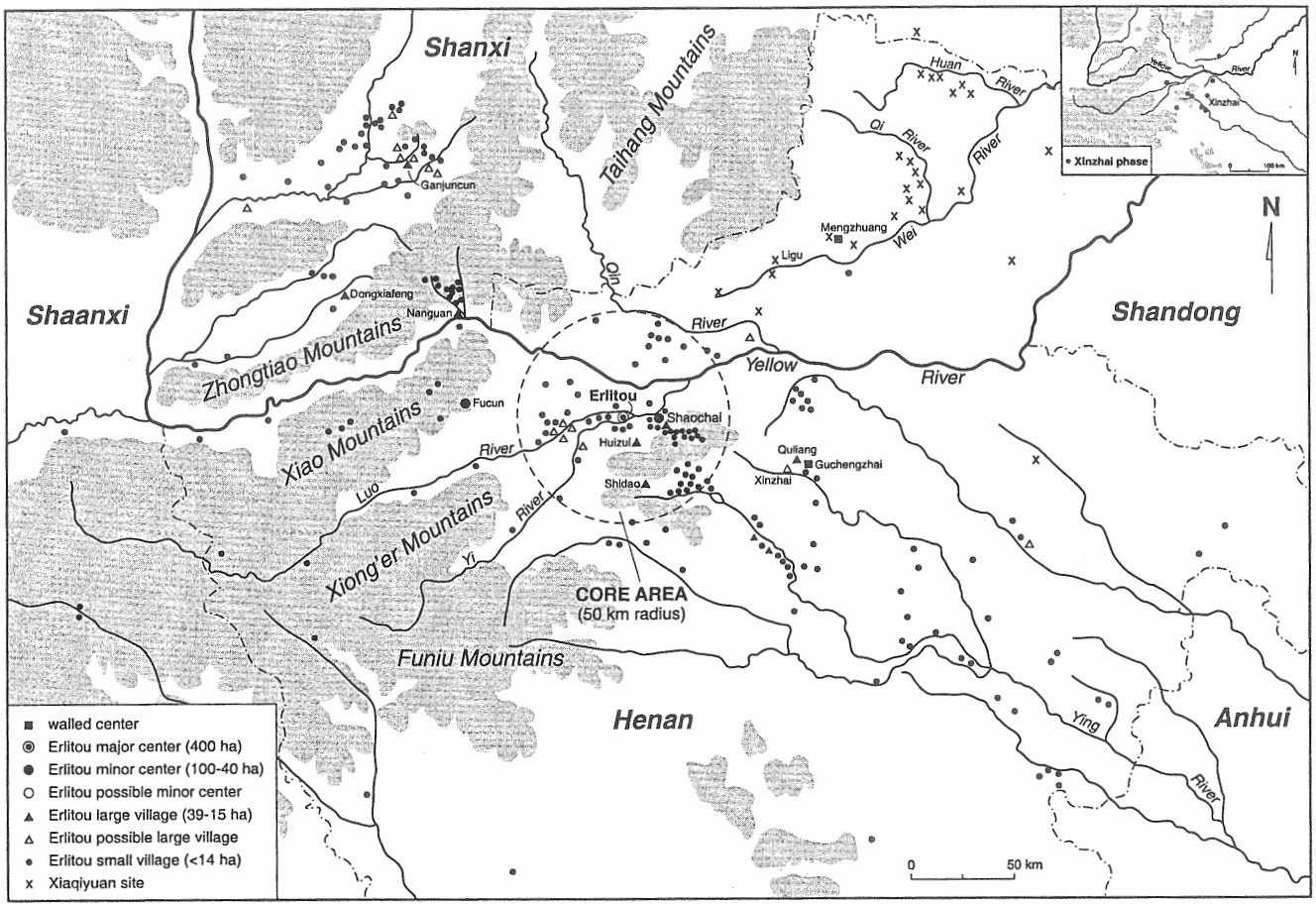

Figure 10: Distributions of the Erlitou and Xiaqiyuan sites and locations of Xinzhai sites.

4. Ceramic styles decreased from six types in the Longshan culture to two types in the Erlitou culture. This may suggest an increase in craft specialisation and standardisation of production relating to the development of political centralization (Longacre 1999; Rice 1981, 1996).
5. In addition to jade objects (which were the traditional means for representing high social ranking in the Neolithic), bronze objects (mainly weapons and ritual vessels) became, for the first time, status symbols, and bronze production became a state-controlled enterprise which ensured state monopoly of the military and ritual usage of bronze products.
6. Long-distance exchange of precious goods developed to a greater extent – some artefacts with characteristics of Central Asian cultures appeared in the Erlitou site (Fitzgerald-Huber 1995).

The sharp reduction of site numbers from Longshan to Erlitou indicates, to some extent, a population decline during the transitional period (Figure 4):[8] the early Erlitou culture may have experienced a period of instability. As mentioned above, there was a climatic fluctuation around 4000 BP with low temperature but high precipitation, accompanied by the Yellow River changing its lower course from south to north. This date nearly coincides with that referred to in legends as the time of "Yu the Great", the first king of the Xia dynasty, who regulated the floodwaters and gained political power. If these events did indeed happen, a natural catastrophe may be one of the major factors responsible for the population decrease from Longshan to Erlitou. Furthermore, the flood may have served as an opportunity for charismatic individuals to become politically influential, and to lead pre-state polities, such as the Xia, which politically dominated other groups. However, archaeological data cannot prove that late Longshan and early Erlitou (presumably the early Xia dynasty) represent a state-level society as argued by many Chinese archaeologists (e.g., An 1996). Even if Yu the Great was a real historical figure, he and his successors over many generations were probably only the heads of chiefdoms that coexisted with a number of similar polities.

The Yueshi Culture

While the competing social systems of the Longshan culture developed into a state level organization in the Central Plains, those in Shandong did not. The Yueshi culture (*c.*1900-1500 BC), which succeeded the Shandong Longshan culture, shows a rather different cultural style. On the one hand, increasing numbers of small bronze objects have been found in Yueshi sites (Cai 1993; Luan 1993) and a writing system may have been employed in the late Yueshi period (CRBZC 1997).[9] On the other hand, a clear change in ceramic quality is manifest: the finely made Longshan eggshell pottery completely disappeared and Yueshi ceramics appear to be cruder than those of Longshan. No luxury items of long-distance exchange such as jade objects, or elaborate burials have been found. It is also notable that settlements reduced significantly in number in the Shandong region (Figure 4), which may indicate a population decline. However, in some areas town walls continued to be rebuilt (Chengziyai, Tonglin-Tianwang, and Jiaochangpu). Therefore, the Yueshi culture may have had a similar socio-political organisation to that of the Longshan period in some areas, but lost political complexity in others.

Development and Decline

Why did the Longshan culture in northern and western Shandong, which manifested a similar degree of social complexity to its counterpart in the Central Plains, not develop into a state? Explanations may be found in multiple factors, both social and environmental. Socially, a comparison of the political and economic structure in these two regions may facilitate understanding the different trajectories of cultural development.

Six walled towns serving as subregional centres in northern and western Shandong were built successively over a long period of time from the early to middle Shandong Longshan culture (*c.*2600-2300 BC); these centres were spaced out over regular distances, and some of them were used during a long period of time throughout the Longshan culture. These phenomena indicate the existence of a steady expansion of a complex social system and a well-defined and long-established territory for each polity.

As discussed above, in the Shandong region the exchange and accumulation of prestige goods reinforced the status of individual chiefs. The redistribution of eggshell pottery among élites on a regular basis in Shandong Longshan may have served as a medium for expending political power and maintaining stability in this region, and controlling production and exchange of élite goods may have been the priority of élites.

Although the production and distribution of prestige goods can facilitate a rapid expansion of political influence by establishing new channels for exchange, it suffers from high risks and instability. Chiefdoms that mainly rely on this type of economic strategy are vulnerable to any kind of disruption in the exchange networks that provide the prestige goods needed to sustain the élite. As a result, some societies may cycle between periods of expansion and collapse (Earle 1987; Gilman 1987). This general tendency may explain the decline of the Longshan cultures in Shandong and southern Shanxi, as the societies failed to make adjustments to the changing social and natural environment.

A series of environmental changes occurred around 4000 BP. Lower temperatures higher precipitation caused river flooding and the Yellow River to change its course. This also provides some explanation for the cultural disruption at the end of the Shandong Longshan culture (Wang and Li 1992; Wang 1993, 1996). However, there are signs of gradual cultural decline already occurring toward the end of the Longshan period, when the quality of finely made pottery had deteriorated and eggshell pottery was disappearing (Luan 1993). It is likely that the social change, which did not happen suddenly, was the consequence of both environmental change and human activities. The weakness in the political and economic system (individual oriented political structure and wealth finance) may have contributed to the decline of social complexity there.

On the other hand, all the six town walls found in Henan were built around the beginning of the late Henan Longshan culture (*c.*2600 BC), which coincided with the change of the Yellow River's course. The simultaneous construction of walled enclosures at several locales on floodplains implies their initial function for protecting communities from floods in this densely populated region occupied by groups with different ethnic origins. The fact that some of the walled enclosures were partially destroyed by floods and then rebuilt in prehistoric and historic times (Wangchenggang and Guchengzhai; see Dong 1988; Cai Quanfa of Henan Institute of Archaeology, personal communication 1999) supports the hypothesis of their hydraulic function. Although most of the town walls shortly ceased to function, inter-group conflict evidently continued into the later period.

These phenomena imply that the military conflict between polities was probably more intense than in Shandong, so that replacement of one political centre by another was more frequent in this region. This may have been a consequence of the intensive use of military force by local élites seeking to obtain regional domination. In the Henan region, we do not find evidence that prestige goods, such as eggshell pottery goblets or jade, were circulated regularly among local élites, suggesting that a prestige goods economy is unlikely to have been practiced. The absence of well-furnished élite burials and the presence of town walls

suggest the existence of a group-oriented chiefdom in which the interests of a population group were emphasised over the status of élite individuals, and intra-group differentiation was minimal. Given the fact that conflict between different ethnic or local groups was intensive, communities may have been forced to rely on local resources to maintain internal solidarity against outsiders. Different methods may have been employed to constitute stable alliances among chiefdoms, or an intention to maintain regional stability may have been absent. Military competition, therefore, seems to have been the dominant characteristic of inter-polity relationships in the Henan region. Such societies may have had better resources to cope with social or environmental impacts. These situations perhaps were the major forces contributing to the emergence of the state in Henan rather than in Shandong.

Furthermore, social change tends to take place most rapidly at focal points in any region where settlement groups are able to interact with many neighbouring centres in less circumscribed topographic conditions (Clark and Blake 1994:20). Such an environmental situation was one of the major external factors responsible for the emergence of states in the Central Plains. On the contrary, the rather circumscribed geographic configuration in all other regions may have limited the opportunities for further political integration.

In conclusion, the Neolithic cultural transformations in the middle and lower Yellow River valley were closely related to environmental conditions and climatic fluctuations. Population movement, triggered by ecological changes, played an important role in both development and decline of social complexity in these regions. The interactions between communities in the entire region formed a large system of positive mutual enhancement, in which all the regional Longshan cultures developed in social complexity. However, the development was uneven among social groups, being affected by internal and external factors.

Three models are generated here based on the analysis of settlement patterns. The first is the mono-centred settlement system in circumscribed environment (Figure 11A), characterised by the accumulation and display of prestige goods and individual-oriented chiefdoms. The second is the multi-centred linear settlement system in a circumscribed environment (Figure 11B), characterised by military competition but rather stable inter-group relationships, with some degree of a prestige goods economy and individual-oriented social structure. The third is the multi-centred scattered settlement system in a less circumscribed environment (Figure 11C), characterised by intensive military competition, frequent replacement of political centres, a lower level of development in intra-social stratification, an absence of long-distance exchange of élite goods, and an emphasis on group solidarity. While the Neolithic cultures at the end of the Longshan period showed signs of stagnation or decline in social complexity in the first two types of settlement systems, a higher level of social organisation – the state – emerged from the third type of system at the focal point of the Central Plains.

Environmental conditions were crucial variables, but not the sole causal factors, in determining social transformation. Both development and decline of social complexity happened in different regions where similar environmental changes occurred (e.g., climatic fluctuation and flooding). It is clear that different sociopolitical and economic systems, as well as various human actions in response to external impacts contributed to the differing trajectories of social change.

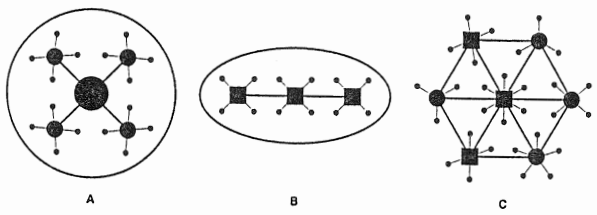

Figure 11: Three major types of settlement system in relation to geographic configurations:
A. Mono-centred settlement system in a circumscribed environment;
B. Multi-centred linear settlement system in a circumscribed environment;
C. Multi-centred scattered settlement system in a less circumscribed environment.

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NOTES

1. In this article a state is defined, following Marcus and Feinman (1998:4), as a society "with (minimally) two class-endogamous strata (a professional ruling class and a commoner class) and a government that was both highly centralized and internally specialized." The earliest example of such a social formation in China has been revealed in Erlitou in Henan, the first urban site (see discussion).

2. Ceramic vessels belonging to the Dawenkou cutlure in Shangdong and the Qujialing culture in Hubei have been found at many late Yangshao and early Longshan sites in the Henan region. Some burials, which contain pottery and skeletons with distinctive physical characteristics such as tooth-extraction resembling those from the Dawenkou culture in the east (Du 1992; NBCR 1991:38), suggest a population movement rather than a diffusion of material cultures.

3.Three types of survey information are used here: (1) Archaeological survey reports published in major archaeological journals in China. (2) Survey information published in *Zhongguo wenwu dituji:Henan fence* (An Atlas of Chinese cultural relics: the Henan volume [NBCR 1991]) which is the result of a nationwide archaeological survey project, conducted mainly for the purpose of cultural preservation during the 1980s. (3) Results of full-coverage regional surveys carried out by Sino-foreign archaeological expeditions in recent years. The bulk of the data is derived from the first two types of information, which are the results of unsystematic surveys. A very large number of sites have been recorded over an immense area, broad phases of occupation have been recognized, and total site areas measured; nevertheless, geological and cultural landscape destruction are not well studied, the different occupational areas of sites in different phases are not well measured, and small sites have been better recorded in some areas than others. Despite the imperfection of these survey results, however, the data still have great potential for settlement archaeology.

4. Although some 17 walled sites have been reported from Shandong (Zhang 1996), the identification of many of them is still a matter of debate among Chinese archaeologists. Those sites with ambiguous data (e.g., six small ones in western Shandong), therefore, are not marked on the map (Figure 2).

5. Guchengzhai is a newly discovered Longshan walled site (Wang and Li 1998). The excavation is still in progress and a report has not been published. For details regarding clusters 1-6, see Liu 1996a.

6. Derived from the "Rank-Size Rule" of economic geographers (Haggett 1971; Stewart 1958), analysis of rank-size distribution has been used in archaeological studies of regional settlement patterns (e.g., Adams and Jones 1981; Blanton *et al.* 1982; Johnson 1977, 1980, 1981, 1987; Kowalewski 1982; Wright 1986). Different rank-size distributions (e.g., log-normal, convex, or primate) have been seen as reflections of different systems of social integration. For instance, the rank-size distribution of highly integrated settlement systems is expected to approach log-normality. Accordingly, systems with a relatively low degree of integration should exhibit very convex rank-size distributions, although central place distributions are also convex. Furthermore, primate distributions may have been characteristic of systems in which economic competition is minimized and/or system boundary maintenance is the primary function of the primate center (Johnson 1981, 1987:108); they also may suggest the existence of high order sacred ceremonialism, macro-regional élite exchange, foreign diplomacy and war focussing on chiefly centers (Kowalewski 1982).

7. The data of site size were reported differently in the two survey reports (Sino-American Archaeology Team 1997; Underhill *et al.* 1998). The sizes of two large sites (Liangchengzhen and Dantu) used in this study are based on the later report (Underhill *et al.* 1998), which however did not provide detailed information on smaller sites. Therefore, the site sizes of third and fourth level of sites analysed here are derived from the earlier report (Sino-American Archaeology Team 1997).

8. The Longshan sites discussed here are dated 2600-2000 BC, while Erlitou sites are dated to 1900-1500 BC. However, not until Phase II of the Erlitou culture (*c.*1800-1700 BC) did the Erlitou site grow in size and Erlitou settlements expand over a large region. There are only a few small- and medium-sized sites dating to the Xinzhai phase (*c.*2000-1900 BC; see Zhao 1999 for estimated date). This phenomenon suggests an even more dramatic decrease in site numbers than shown in Figure 4, and probably reflects a decline in population density during the transitional period between Longshan and Erlitou.

9. Two inscribed oracle bones along with more than 350 items (tools, ornaments, and pottery vessels), all dated to the late Yueshi culture (contemporary with early Shang), were discovered in a sacrificial pit at the Shijia site in Huantai county. The inscriptions include the characters *liu* (six) and *pu* (divination) (CRBZC 1997) and are similar in structure to the oracle-bone inscriptions of the late Shang.

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