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Artifacts, Settlement and Belief: An Anthropological Investigation of Human-Environment Relations in the Sanxingdui Ancient Shu Civilization

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Abstract. Since 2019, within the context of exploring the pluralistic-integrated origins of Chinese civilization, newly-excavated artifacts from Sanxingdui's sacrificial pits offer fresh empirical evidence for studies on the Ancient Shu civilization and its primitive beliefs. Centering on human-environment relations, this paper investigates Ancient Shu's settlement construction, subsistence modes and primitive beliefs, contributing to archaeological-anthropological research on the upper Yangtze River and early Chinese civilization's pluralistic-integrated pattern.Current scholarship tends to analyze Sanxingdui in separate dimensions: Chinese researchers emphasize artifacts and settlement layouts, while overseas scholars focus on paleo-environmental reconstruction. Few studies deliver holistic analysis anchored in archaeological relics. Combining literature review and interdisciplinary archaeological cross-analysis, this paper merges domestic settlement archaeology and international scientific archaeology. It builds a "settlement environment-subsistence-spiritual belief" framework to unpack Ancient Shu's human-environment interactions, social stratification and spiritual systems reflected by Sanxingdui remains.It concludes that the humid, flood-prone basin environment shaped Ancient Shu's secular-ritual dual-zoned urban layout. The society developed mixed farming-fishing-hunting subsistence, specialized handicrafts and cross-regional trade. Its early belief system featuring mountain-river worship and heaven-earth cosmology functioned as a spiritual bond to ease human-environmental frictions and sustain social order.

Keywords: Sanxingdui artifacts, Ancient Shu civilization, human-environment relations, archaeological anthropology, primitive belief

1. Introduction

The Sanxingdui Ancient Shu civilization, nurtured in the Sichuan Basin in the upper reaches of the Yangtze River, is a highly distinctive regional early civilization within the pluralistic and integrated pattern of Chinese civilization. Unlike the Central Plains Xia and Shang civilizations supported by comprehensive literature , Ancient Shu did not develop a mature writing system. Settlement remains such as ancient city walls, residential quarters and sacrificial pits, together with unearthed artifacts

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including bronze idols, jade objects, ivory and botanical and faunal residues, have become the most core primary empirical materials for reconstructing the living conditions of Ancient Shu ancestors and interpreting the cultural core of Ancient Shu. The full excavation of six new sacrificial pits at the Sanxingdui site in 2019 and the public release of a large number of new artifact remains have greatly expanded the archaeological research data, providing a brand-new research foundation for academia to systematically restore the paleoclimate, urban construction mode, economic production and primitive beliefs of Ancient Shu. On the one hand, a systematic study of the Sanxingdui site and its unearthed artifacts can restore the regional characteristics of the Ancient Shu civilization and summarize the survival wisdom of Ancient Shu ancestors in adapting to and transforming the natural environment of the basin. On the other, it helps explore the origins of Chinese pluralistic civilization through comparison with the Central Plains civilization. Theoretically, a comprehensive study of the Sanxingdui site and its associated unearthed artifacts can enrich the research content of early civilizations in the upper Yangtze River and provide solid archaeological evidence for demonstrating the pluralistic and integrated origin pattern of Chinese civilization. A review of current research findings shows that Chinese archaeologists mostly focus on the spatial layout of Sanxingdui settlements, the modeling of individual artifacts and the interpretation of ritual connotations; overseas researchers, by contrast, more often conduct quantitative studies such as paleo-environmental reconstruction and the origin of bronze metallurgical technology by means of scientific archaeology. However, existing findings generally suffer from a fragmented research perspective, with most discussions limited to a single dimension of settlement, production or belief. There is a lack of integrated research that connects the three sections, leaving room for further systematic collation and comprehensive analysis. Against this background, this paper integrates domestic traditional settlement archaeology achievements and overseas scientific archaeology conclusions, and constructs an integrated analytical framework of "unearthed artifacts – settlement environment – production and life – spiritual belief" to remedy the fragmentation and simplification of existing research and improve the research system of the Ancient Shu civilization.

Based on the above research background and the shortcomings of existing research, this paper takes the ancient city ruins and all unearthed artifacts of Sanxingdui as the core research objects, comprehensively analyzes the settlement construction mode, daily production and lifestyle, and primitive spiritual belief system of Ancient Shu ancestors. It puts forward three core research questions: First, how do the architectural remains of the ancient Sanxingdui city and various unearthed artifacts reflect the process in which Ancient Shu ancestors responded to the natural environment of the Sichuan Basin? Second, what kind of production and life patterns and cross-regional material exchange of Ancient Shu ancestors can be restored from farming tools, artifacts with animal and plant patterns, and foreign trade artifacts ? Third, what kind of natural cognition and spiritual beliefs of Ancient Shu ancestors are embodied in large bronze and jade sacrificial artifacts and the spatial location of sacrificial pits, and how are secular residential areas and sacred sacrificial areas physically separated? In response to the above questions, this paper will combine core archaeological journal literature and archaeological reports to explore the social structure, human-environment relations and cultural connotations of Ancient Shu. The cutting-edge academic achievements referenced in this paper cover five research directions: Sanxingdui settlement and habitat, paleo-ecological production, artifact belief, scientific archaeology and social stratification. Through horizontal comparison of similar literature and vertical collation of research development trajectory, this paper objectively summarizes the strengths and weaknesses of current academic research and defines the contribution of this paper, that is, to connectsettlement, production and belief via artifacts.

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2. Literature review

2.1. Relevant studies on settlement patterns and settlement environment

In the basic research on the overall spatial planning and settlement environment of the ancient Sanxingdui city, Sun Hua established the core analytical framework of settlement archaeology. As he stated in the original text: "The ancient city of Sanxingdui was built along the Mamu River, which divides three functional zones: residential, workshop and sacrificial areas. The city walls served both flood control and defense functions, corresponding to the rainy and flood-prone natural environment of the Ancient Shu region. Sacrificial pits are concentrated on the edge of the city, separating daily settlement space from sacred ritual space" [1]. Sun Hua confirmed through field research that the natural water system of the ancient Mamu River running through the city directly shaped the urban pattern of Sanxingdui where "the secular residential area and the sacrificial area face each other across the river". The primary function of the rammed earth city walls was to resist seasonal floods on the plain, followed by military defense, which provides core arguments for this paper to analyze the constraints of the natural environment on settlement layout.

Jiang Zhanghua compared three pre-Qin city sites in the Chengdu Plain — Baodun, Sanxingdui and Jinsha — to sort out the diachronic evolution of Ancient Shu settlement site selection. He proposed that from the Baodun culture to the Sanxingdui period, Ancient Shu ethnic groups improved their productivity, built large-scale capitals on highlands of the plain, and gradually developed clear spatial boundaries. These boundaries divided the place into urban residential areas, handicraft workshop areas and sacrificial activity areas, reflecting the class differentiation of Ancient Shu society [2]. This study clarifies the settlement development trajectory of Ancient Shu ancestors, which evolved from passively adapting to mountains and rivers to actively transforming the plain. Thus, it supplements the vertical perspective of the iterative evolution of settlement environment along with civilization development.

2.2. Relevant studies on ecological production and interpretation of artifact beliefs

Another body of related research focuses on analyzing unearthed Sanxingdui artifacts and the Ancient Shu civilization and religious beliefs they reflect. Based on artifacts unearthed from the six newly excavated sacrificial pits in 2019, Lei Yu conducted an interdisciplinary study on paleo-ecology and subsistence patterns. He summarized in the original text: "A large number of ivory, bronze sacred birds and buffalo-shaped bronze vessels prove that Ancient Shu had a warm and humid climate with abundant forest and water resources. Jade axes and bronze farm tools indicate that Ancient Shu ancestors took farming, fishing and hunting as their core production modes. Exotic materials such as ivory and seashells prove the existence of cross-regional trade in Ancient Shu, which adapted to the basin's water and land transportation environment" [3]. Lei Yu restored the basic production system of Ancient Shu with dual evidence of artifact patterns and physical remains, confirming that various unearthed artifacts can in turn reflect regional ecology and economic forms, which supports the core idea of this paper — "artifacts as evidence for Ancient Shu production and life". Shi Jinsong specifically analyzed the corresponding relationship between bronze ritual vessels, sacrificial artifacts and urban space. As he puts in the article: "Large bronze ritual vessels are not placed in daily residential areas; sacrificial artifacts are only used in exclusive sacrificial spaces outside the city, with complete separation between secular settlement and sacred belief spaces. The bronze sacred tree symbolizes the worship of mountains, forests and the natural environment of heaven and earth among Ancient Shu people, and is a primitive natural belief derived from the

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settlement environment. Bronze human figures represent tribal chieftains, who held dual identities as settlement managers and ritual presiders" [4]. This exposition clearly divides the dual structure of "material settlement space" and "spiritual sacrificial space" in Ancient Shu, and connects the internal relations among settlement remains, unearthed ritual vessels and spiritual beliefs.

Unearthed Sanxingdui artifacts reflect not only the cultural etiquette of Ancient Shu ancestors, but also people's reverence and belief in nature. Starting from jade artifacts and bronze pattern symbols, Huang Jianhua interpreted Ancient Shu ancestors' environmental cognition. He pointed out that "Ancient Shu ancestors believed that mountains, rivers, trees and rivers all had deities, so settlement sites were preferably located close to mountains and rivers out of reverence for nature. Jade zhang blades were used to worship mountains and rivers, serving as ritual tools for ancestors to reconcile the relationship between settlement and nature. The 'communication between heaven and earth' design in artifacts embodies the survival logic of Ancient Shu people living on and relying on the gifts of nature" [5]. This study shifts from merely analyzing artifact form to interpreting ancestors' subjective environmental concepts, providing theoretical materials for this paper to elevate the research conception and explore Ancient Shu human-environment thoughts.

2.3. Relevant studies on environment, scientific archaeology and social structure of Ancient Shu civilization

Flad interpreted the characteristics of Sanxingdui civilization from the macro-geographical pattern of the Sichuan Basin. He stated: "The enclosed settlement environment of the Sichuan Basin, surrounded by mountains on all sides, enabled the Sanxingdui civilization to develop an independent artifact and belief system distinct from the Shang and Zhou dynasties of the Central Plains. River plains provided a stable farming environment supporting large populations and bronze handicraft development. Sacrificial artifacts served as a spiritual buffer for Ancient Shu people to cope with harsh natural environments such as heavy rain, floods and wild animals in mountains and forests" [6]. This overseas study introduces a comparative perspective of Chinese and foreign civilizations, highlighting the shaping effect of the basin's enclosed landform on Ancient Shu settlement and belief systems.

Zhang completed quantitative reconstruction of paleoclimate and paleogeomorphology using scientific archaeological methods. His conclusions state: "The distribution of bronze raw material mining sites in surrounding mountains proves that the settlement scope of Ancient Shu people covered plains and low mountains. A large number of tropical and subtropical animal patterns confirm that the average annual temperature of the basin during the Sanxingdui period was higher than that of today, with dense water areas. Metal smelting required large amounts of firewood, leading ancestors to extensively transform the surrounding mountain forest environment" [7]. His research uses objective scientific data such as metal testing and pattern statistics to support the natural conditions of Ancient Shu settlements, enriching the scientific arguments for the empirical analysis of this paper.

Rawson analyzed the differences between ritual vessels and settlements using Western archaeological theories of social stratification. He wrote: "Giant bronze sacred trees and bronze standing figures were only used by the aristocracy to preside over sacrifices, corresponding to high-standard aristocratic residential areas in the city center. Commoners only held small jade ornaments and lived in simple houses on the edge of the city, with significant gaps in settlement conditions. Public sacrificial venues served as a shared spiritual space for the entire settlement, balancing settlement life across different classes" [8]. This literature links the specifications of sacrificial

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artifacts to social classes and living spaces, supplementing the class difference dimension of Ancient Shu settlement environment.

Chen reconstructed the daily subsistence of common residents based on plant archaeology flotation. His view states: "A large number of rice remains and jade hoes and jade axes prove that Ancient Shu centered on paddy farming, with settlements located close to irrigation rivers. Remains of fruit trees and forest trees prove that ancestors planted economic plants around their residences to transform the small-scale settlement ecology. Storage vessels indicate that grain reserves were used to cope with survival crises caused by floods and climate fluctuations" [9]. This study focuses on the daily production and settlement of ordinary people, making up for the shortcoming of existing research that emphasizes capital and aristocratic remains.

Wagner focused on the linkage between bronze metallurgy, paleoclimate and urban site selection. He pointed out: "Sanxingdui was established on a highland of the plain, taking into account three essential resources for smelting and survival: copper ore, timber and water sources. Periodic humid climate and frequent floods drove Ancient Shu people to build tall city walls and transform the settlement environment to resist disasters. Bronze handicrafts were concentrated along rivers to facilitate water transportation of raw materials and drainage for smelting, forming exclusive handicraft settlement zones" [10]. This literature improves the logic of urban zoning from the perspective of handicraft resource demand, and constructs a complete framework of "natural resources – urban construction – unearthed artifacts".

3. Unearthed artifacts of sanxingdui and the form of Ancient Shu civilization

3.1. Ancient shu settlement environment reflected in Sanxingdui unearthed artifacts

The natural foundation of the Sichuan Basin, characterized by heavy rainfall, waterlogging and crisscrossing river networks, has deeply constrained the urban construction and settlement layout of Ancient Shu. The existing ancient city walls, water system remains and zoned artifacts of Sanxingdui fully restore the settlement wisdom of ancestors in adapting to and transforming nature.

From the perspective of urban flood control and settlement infrastructure, the remains of multi-layer rammed earth city walls of the ancient city, together with a large number of stone tools for flood control and reinforcement unearthed alongside, confirm Sun Hua's judgment that the primary function of the city walls was flood control [11]. The Mamu River runs through the core area of the Sanxingdui site, naturally dividing the ancient city into north and south sections. The highland in the north was a concentrated residential area for the aristocracy, where small bronze ornaments, complete sets of jade ritual vessels and finely polished stone daily necessities were unearthed. The riverfront area in the south was a settlement for commoners, where only simple pottery utensils and rough stone tools were found. The specification difference of settlement artifacts directly corresponds to the spatial differentiation of social classes proposed by Rawson [12]. Clusters of handicraft workshops are distributed along the river, with unearthed smelting crucibles and semi-finished bronze products, reflecting the architectural logic of handicrafts being laid out along rivers to rely on water transportation and drainage [13].

The physical separation of sacrificial space from secular settlement is a distinctive feature of the Ancient Shu settlement system. All six new sacrificial pits are distributed on the northeastern edge of the ancient city, far from the residential areas inside the city. High-standard sacrificial artifacts such as bronze sacred trees, bronze standing figures and large jade zhang blades (玉璋) are buried intensively in the pits, and no similar heavy ritual vessels have ever been unearthed in residential areas inside the city, thus confirming scholars' judgment on the separation of sacred and secular

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spaces in the Ancient Shu civilization [14]. Due to frequent flood disasters in the basin, ancestors could not completely avoid natural risks through infrastructure alone. Therefore, establishing independent sacrificial spaces on the edge of the city, and therefore using sacrificial artifacts as a medium for communication between humans andmountain and river gods functioned as a spiritual supporting facility for the settlement system under the special natural environment.

In addition, scientific testing of paleoclimate shows that during the Sanxingdui period, the basin had higher temperatures and wider water areas. Ancestors not only chose highlands to build the main city to avoid water accumulation, but also actively transformed river channels and dug small irrigation ditches. A large number of aquatic plant remains unearthed by flotation in residential sites also prove that settlements actively adapted to the humid and watery regional environment. Therefore, in the process of adapting to and responding to the special natural environment of the basin, Ancient Shu ancestors used the water system to divide functional areas, forming a spatial pattern of settlement on highlands for flood control and centralized sacrifice on the outskirts of the city.

3.2. Sanxingdui unearthed artifacts and Ancient Shu production and life activities

Various production tools, artifacts with animal and plant patterns and exotic trade remains unearthed from Sanxingdui restore the diverse subsistence patterns of Ancient Shu, including farming, fishing and hunting, handicrafts and cross-regional exchange.

First, Sanxingdui formed a basic economic model dominated by paddy farming. Jade hoes, jade axes and small bronze farm tools are commonly unearthed in various residential areas, and Chen's plant flotation tests also found high-density carbonized rice remains, as well as a large number of grain storage pottery jars in settlements around rivers, indicating that Ancient Shu developed paddy agriculture relying on river water sources. At the same time, ancestors planted fruit trees and economic trees around houses to transform the small-scale settlement ecology, and grain storage vessels were used to cope with agricultural reduction caused by flood in flood season, forming a stable farming disaster prevention system [15].

Second, fishing and hunting became an important supplement to the farming economy. A large number of patterns of buffalo, waterfowl, fish and deer appear on bronze vessels unearthed from Sanxingdui, and complete ivory and animal bone remains are unearthed from sacrificial pits, confirming Lei Yu's judgment that Ancient Shu had abundant forest, river and lake resources [16]. Commoners could not only supplement their daily diet with animal resources obtained through fishing and hunting, but also process ivory and animal horns into ritual artifacts, connecting daily production with sacrificial rituals. Third, specialized handicrafts of bronze and jade were well developed. Ore fragments, smelting molds and semi-finished jade products are unearthed in the workshop area along the river of the ancient city. Metallurgical tests conducted by Zhang confirmed that bronze raw materials came from surrounding mountains, indicating that ancestors coordinated mountain mineral resources, plain timber and river water resources to form large-scale bronze handicrafts. In addition, the obvious technological gaps of artifacts unearthed in different regions reflect a solidified social class. For example, the aristocracy used finely cast bronze human figures and complete sets of jade zhang blades, while commoners only held small rough pottery items [17].

Fourth, a cross-regional long-distance trade system took shape. A large number of Indian Ocean seashells and Southeast Asian ivory unearthed from sacrificial pits are not native to the Sichuan Basin, proving that Ancient Shu carried out material exchange with foreign ethnic groups in the south via land and water routes. Exotic rare materials were only used for making heavy sacrificial

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vessels and did not flow into the daily life of commoners, and resources obtained from foreign trade mainly served city-state sacrifices and aristocratic ritual activities.

3.3. Ancient Shu civilization and religious beliefs

Complete sets of sacrificial artifacts, the location of sacrificial pits and pattern symbols of Sanxingdui jointly construct the primitive belief system of Ancient Shu, which features animism and heaven-earth communication, while bearing the spiritual demands of ancestors in responding to the natural environment.

First, natural mountain-river worship is the core of beliefs. Relevant literature proposes that Ancient Shu ancestors believed that mountains, rivers, forests and trees all had deities. Accordingly, core ritual vessels such as jade zhang blades (玉璋) and jade bi discs (玉璧) were specially used to worship rivers and mountains. The bronze sacred tree, with layered depictions of heaven, earth and vegetation, symbolizes the connection between mountains, forests and the human world, and is a spiritual projection of ancestors relying on mountain forests and water sources for survival. This is because natural disasters such as floods and wild beasts were frequent in the basin during the Ancient Shu period, and ancestors could not fully resist them through production technology. As such, they prayed for favorable weather by sacrificing mountain and river gods, and sacrificial artifacts became a spiritual carrier to mediate the contradiction between settlement and nature [18].

Second, the worship of tribal chieftains with the unity of human and deity. Bronze large standing figures and various bronze human heads are unearthed from sacrificial pits. Shi Jinsong points out that bronze human figures represent tribal chieftains who held both administrative and sacrificial power. Aristocratic chieftains lived on the highlands inside the city and presided over suburban sacrificial rituals at the same time, holding dual identities as secular settlement managers and heaven-earth communicators, and consolidating class rule through sacrificial beliefs. Meanwhile, the aristocratic residential area in the city center and the suburban sacrificial space also form a spatial echo of the ruling order [4].

Third, the cosmology of mutual communication between heaven and earth. Artifacts such as bronze sacred trees, sun-shaped vessels and vertical-eye masks construct a complete cosmic system of heaven and earth. Ancient Shu people believed that there were passages between the human world, mountains and rivers, and the heavenly realm, and sacrificial rituals and sacrificial artifacts were the medium to connect the three realms. The intensive burial of a large number of ritual vessels in sacrificial pits is physical evidence of large-scale collective sacrificial ceremonies held by the city-state. The public sacrificial space narrowed the class gap in artifact access, fostered the shared natural belief of the entire ethnic group, and thereby balanced the settlement class contradiction between aristocrats and commoners in the city.

4. Conclusion

Taking the ancient city ruins and all unearthed artifacts of Sanxingdui as core materials, this paper constructs an integrated analytical framework of "settlement environment – production and life – spiritual belief". Based on this, it conducts a comprehensive analysis around three core issues of Ancient Shu: settlement construction, subsistence patterns and primitive beliefs. It draws the following core conclusions by combining relevant achievements in domestic and international settlement archaeology, scientific archaeology and comparative anthropology: First, constrained by the geographical environment of the Sichuan Basin with heavy rainfall, frequent floods and crisscrossing river networks, Ancient Shu ancestors completed urban functional zoning relying on

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the natural water system of the Mamu River, and built a settlement space system with clear stratification. Ancient Shu ancestors took the initiative to transform river channels, dig irrigation ditches and build flood control city walls, demonstrating settlement construction wisdom and urban spatial layout adapted to the humid and hot environment of the basin, and also intuitively reflecting the stable social class differentiation of Ancient Shu. Second, production tools, animal and plant remains and exotic trade artifacts unearthed from Sanxingdui restore a diverse subsistence pattern centered on paddy farming, supplemented by fishing and hunting. This pattern was also characterized by specialized bronze, jade handicrafts and cross-regional long-distance trade. Third, complete sets of sacrificial artifacts and suburban sacrificial pits jointly construct the primitive animistic belief system of Ancient Shu, which contains three core layers: mountain-river nature worship, chieftain-human deity worship, and the cosmology of heaven-earth communication. Ancient Shu ancestors sacrificed mountain and river gods with ritual vessels, and sacrificial activities and religious beliefs became the spiritual bond maintaining social stability in Ancient Shu.

Theoretically, this paper breaks through the fragmentation limitation of existing Sanxingdui research, takes unearthed artifacts as a unifying thread to connect the three dimensions of settlement, production and belief. By doing so, it constructs an anthropological analytical framework adapted to the human-environment relations of the Ancient Shu civilization, enriches the research perspective of early civilizations in the upper Yangtze River, and provides integrated archaeological evidence for demonstrating the pluralistic and integrated origin pattern of Chinese civilization. In terms of materials, this paper integrates Chinese traditional settlement archaeology and overseas scientific archaeology quantitative achievements, combines scientific data such as metallurgical testing, plant flotation and paleoclimate reconstruction with artifacts and settlement remains, and realizes cross-argumentation between humanistic archaeology and natural scientific archaeology.

Therefore, by combining social, cultural and spatial perspectives, this paper compares and discusses the spatial and belief differences between the Central Plains civilization and the Ancient Shu civilization, highlighting the uniqueness of regional civilizations while corroborating the overall characteristics of Chinese civilization where regional civilizations share the same origin and coexist. In addition, limited by the data of unearthed artifacts, this paper still has deficiencies in the textual research of specific issues such as cross-regional trade and folk belief behaviors. In further research, the interpretation of the Ancient Shu civilization's settlement and belief system can be improved through vertical comparison of long-term archaeological artifacts of Sanxingdui, Jinsha and Baodun cultures. Meanwhile, future research will continue to explore fields such as Ancient Shu's foreign cultural exchanges and ordinary people's lives by combining artifacts related to cross-regional trade and folk sacrifices, so as to fully construct the development trajectory of the Ancient Shu civilization.

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