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Site Size Hierarchy and the Complex Chiefdoms in the Bampur Valley During the Chalcolithic Period (4500-3900 BCE)

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Abstract

Bampur Valley in southeastern Iran, in the central part of Iranian Baluchestan, has been a key area for understanding various cultural processes since the Chalcolithic period. To better comprehend these processes in the prehistoric era, the present article focuses on site size hierarchy, based on the data related to the Yahya VA/Aliabad Period, around 4500-3900 BCE, collected from 41 sites during a survey conducted in 2009. The surveyed area spans more than 300 square kilometers along the Bampur River. The area of each site was estimated using GPS mapping, and SPSS analysis helped us classify the site sizes. Consequently, a three-level classification proved more acceptable than others, which includes: 1) sites less than 3 hectares, comprising 31 sites; 2) sites between 3-7 hectares, consisting of 7 sites; and 3) sites larger than 7 hectares, which includes only one site named Chah Hosseini, covering more than 15 hectares. For a better understanding of the various aspects of complexity and site size hierarchy, the relationship between site size and the distance of each site from the others was analyzed using SPSS. Consequently, the correlation between them was calculated by Pearson R and regression tests. Ultimately, this analysis demonstrates that examining distances and sizes is meaningful.

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1. Introduction

Bampur Valley in southeastern Iran is located in the central region of Iranian Baluchestan, within Sistan and Baluchestan province, and lies in the eastern part of the Jazmurian Basin, 200 km north of the Oman Sea. Bampur Valley is bordered by the Bazman Mountains and the Lut desert to the north, the Nikshahr mountainous area to the south, and the Jazmurian marshlands to the west. The Jiroft Plain is located 350 kilometers northwest of Bampur and provides a natural route to Kech-Makran in Pakistan through Bampur Valley (Fig.1).

The Bampur River, one of the few permanent rivers in Baluchestan, flows from the northern mountains of Iranshahr and, after traversing more than 150 kilometers, finally reaches the Jazmurian Basins in the westernmost part of the Bampur valley. The Jazmurian Basin is situated between the Jiroft Plain to the north and the Bampur Valley to the east and has been regarded as the final destination of the Bampur River from the east and the Halil Rud River from the north.

The investigations and excavations conducted by Stein in the 1930s at sites related to the Chalcolithic Period and Bronze Age in Iranian Baluchestan represent the first archaeological

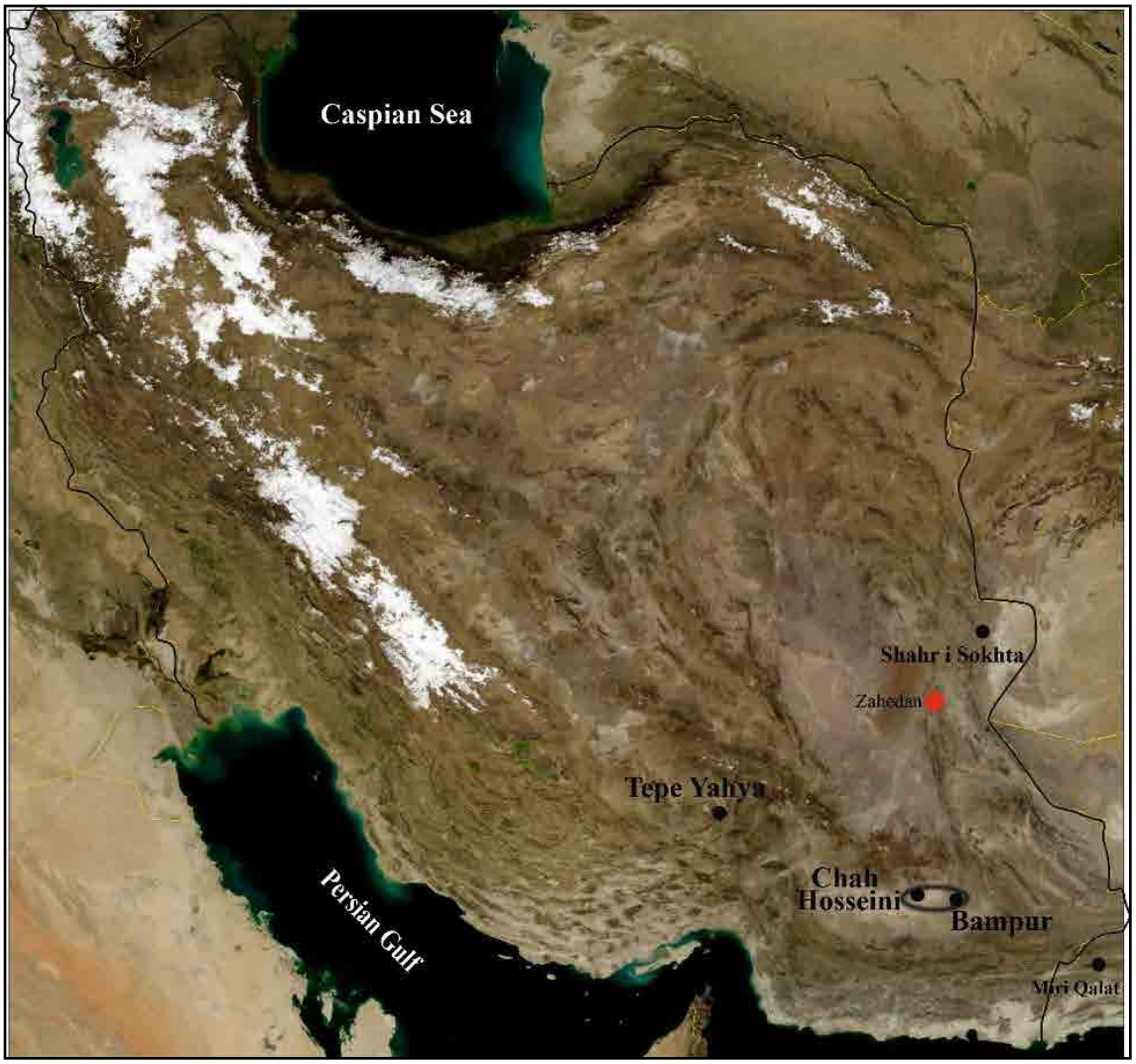


Fig. 1: The Survey area has been noted by an oval black line in the Bampur Valley (Author, 2024).

activities in the region. The Yahya VA and Aliabad wares (or Kerman-related wares) serve as tangible evidence within Stein's collection (Stein, 1937: XIX), which we now understand may date back to the mid-5th to mid-4th millennium BCE (Mutin et al. 2017: 3-4). Thirty years after Stein's explorations, B. De Cardi (1970) excavated at Tepe Bampur and categorized the cultural sequence of Bampur into six periods (I-VI), beginning in the early third millennium BCE, around 2900 BCE, and ended in Period VI around 1900 BCE

The latest fieldwork conducted in this area was carried out by the two authors (Moradi and Sarhaddi Dadian) in October 2011 as part of the archaeological survey project of the Bampur and Dalgan region. This marked the first comprehensive and systematic archaeological exploration in the Bampur Valley (Fig. 2). The survey began near Tepe Bampur and extended 30 kilometers westward into the Chah Hosseini area dated back to mid fifth to the 3rd millennium BCEE (Moradi, 2023: 44).

Further west lies the Jazmurian Basin, which shows no clear evidence of ancient settlements (Fig. 2). Scattered evidence of prehistoric settlements has only been found 30 km west of Chah Hosseini in the Chah Hashem area (Moradi, 2019: 242-3).

The present article has been prepared based on data collected from this survey, which covers an area of over 300 km². More than 121 sites were discovered, including those dating to the Chalcolithic Period, Bronze Age, and early historical periods. Among these, 41 sites are associated with various sequences of the Chalcolithic period, 38 sites from the Bronze Age, and the remaining sites are linked to the historical and Islamic eras (Moradi, 2017) (Fig. 2). The area was thoroughly explored on foot, and the sizes of the sites were measured using GPS Tracking Map. The sherds were also collected based on a non-probabilistic sampling method.

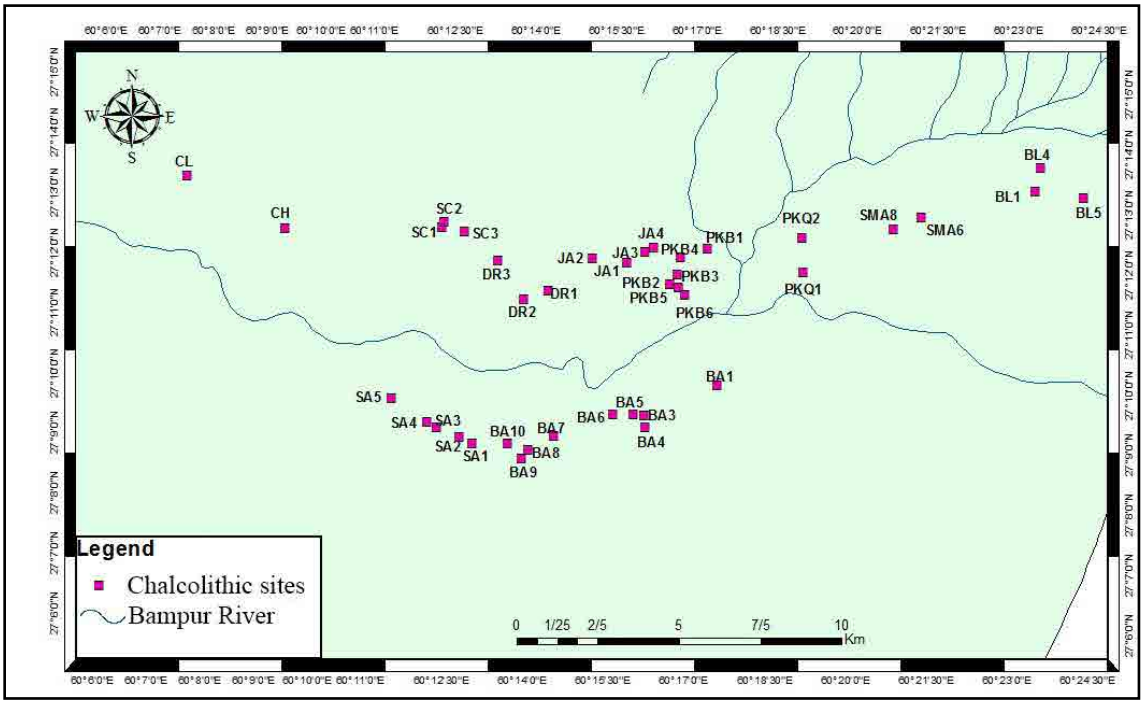


Fig. 2:The location of the Chalcolithic sites in the Bampur Valley shown by GIS (Author, 2024).

Whereas most Chalcolithic sites were found to the west along both the northern and southern banks of the river, the sites with Yahya VA pottery (4500-4200 BCE) were located on the northern part of the river, while those with Aliabad ware (4200-3900 BCE), in lesser quantity and limited area, were situated in the southern part of the Bampur River. The non-Chalcolithic settlements are primarily concentrated in the eastern part of the survey area within a 5-kilometer radius around Tepe Bampur.

Due to the absence of modern excavation in the Bampur valley, establishing an absolute date for this period is not feasible; thus, this date can only be referenced based on 14C dating conducted in Kerman and Kech-Makran in Pakistan (Fig. 3). Most of these sites are relatively small, half of them being less than 1 meter in height, while others range from 1.5 to 3.5 meters (Fig. 4). Only two sites stand out due to their significant height: 1) Chah Hosseini, covering more than 15 ha, is located at the western edge of the surveyed area, and 2) Tepe Balanch1, with an area of 1 ha and a height exceeding 4 meters, is situated at the eastern edge of the surveyed area. The largest site, Shams Abad no.15, spans over 20 ha and is mostly flat or scattered with sherds.

The sites related to the Chalcolithic period, dating from 4500 to 3900 BCE (Eskandari *et al.,* 2023; Moradi, 2025) (Fig. 3). We generally found three types of Chalcolithic pottery on the surface: Bampur, Kerman, and Miri wares (Mutin *et al.,* 2017). Kerman and Bampur pottery likely belong to an earlier part of the Chalcolithic period, around 4500 to 4200 BCE (Eskandari, 2017), contemporary with Yahya VA, while Aliabad/Miri wares are associated with the later Chalcolithic period, approximately 4200 to 3600 BCE (Eskandari *et al.,* 2023). However, the Aliabad ware dated between 4200-3600 BCE is divided into three phases (Eskandari et al. 2023), but the pottery from the latest phase was not collected from the Bampur valley, and the ware associated with the older phases appears alongside local wares that have also been seen with Yahya VA pottery at some other sites. Therefore, it would be difficult to suggest a date later than 3900 BCE in the surveyed area. It should be noted that Aliabad pottery also has Kerman/Jiroft origins, indicating the continuity of settlement in the area during this millennium (Fig. 5).

Date (B.C)	Bampur valley	Kerman/ Jiroft	Kech- Makran	Sistan
4500-4200	Chah Hosseini Horizone	Yahya VA/		
4200-3900	Chah Hosseini Horizone	Yahya VA Mahtutabad I	Miri I	
3900-3600	Chah Hosseini Horizone **?????????**	Mahtoutabad II Standard Ali Abad	Miri II	
3600-3300	Unknown	Mahtoutabad III Uruk / Late Aliabad	Miri IIIa	
3300-3100	Unknown	Tepe Yahya IVC2 Proto-Elamite/Varamin A	Miri IIIa	I
3100-2900	Unknown	Varamin B	Miri IIIa	I
2900-2500	Bampur I-IV	Yahya IVB Early Jiroft	Miri IIIb	II-III
2500-2000	Bampur V-VI	Tepe Yahya IVB6 Late Jiroft	Miri IIIc	IV

Fig. 3: Chronology of the southeast of Iran (after: Mutin 2013; Eskandari *et al.*, 2023; Moradi, 2025).

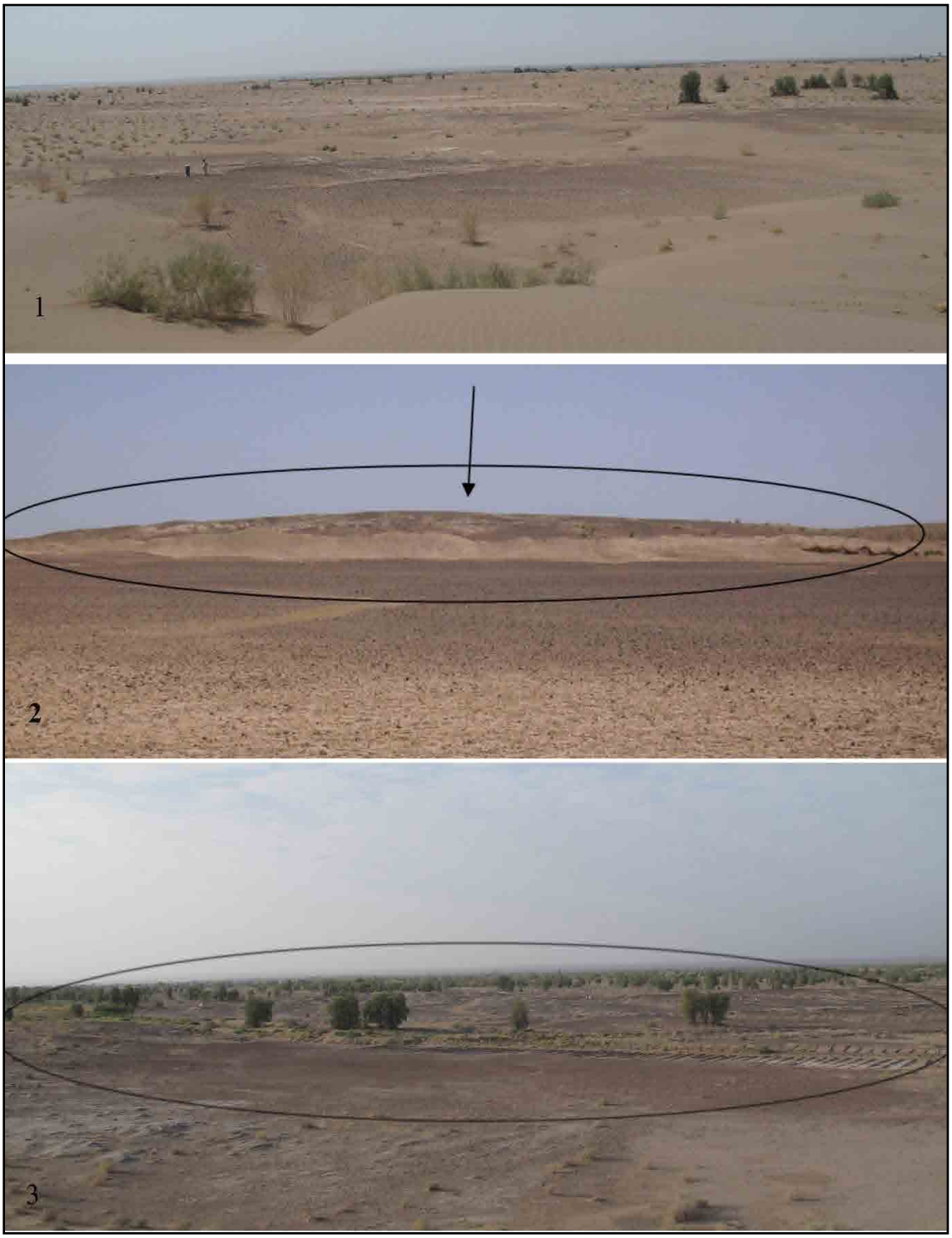


Fig. 4: Chalcolithic sites (1: Sorme Chesm, 2: Tepe Balanch 1 and 3: Chah Hosseini) (Author, 2024).

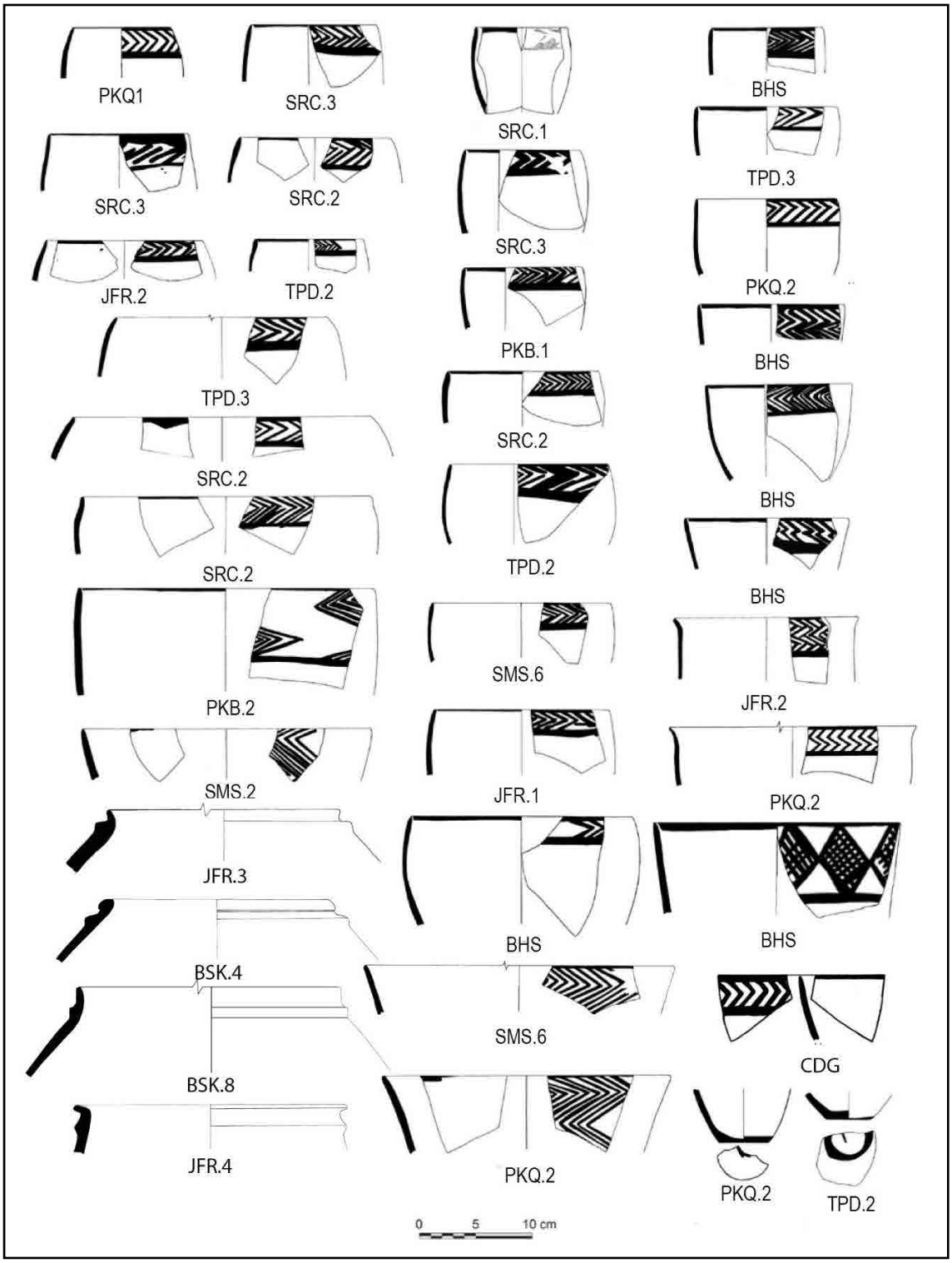


Fig. 5: Kerman-related wares in the Bampur Valley sites (after: Mutin *et al.*, 2017).

Table. 1: Investigated sites with approximate areas and pottery types found on the surface (Author, 2024).

no	Site name	Approximate area (hc)	Class	Region	Type of pottery
1	Chah Hosseini	15	**1**	Northern region of the Bampur River	All
2	Balanch 1	4	**2**		Yahya VA
3	Balanch 2	0/35	**3**		Yahya VA
4	Balanch 5	0/25	**3**		Yahya VA
5	Shams Abad 6	1/7	**3**		Yahya VA
6	Shams Abad 8	2	**3**		Bampur ware
7	Posht Kor Qasem Abad 1	2/2	**3**		Yahya VA
8	Posht Kor Qasem Abad 2	5/25	**2**		Yahya VA
9	Posht Kor Pishk Abad 1	2/8	**3**		Yahya VA
10	Posht Kor Pishk Abad 2	2/6	**3**		Yahya VA
11	Posht Kor Pishk Abad 3	2/9	**2**		Yahya VA
12	Posht Kor Pishk Abad 4	3/6	**2**		Bampur ware
13	Posht Kor Pishk Abad 5	0/75	**3**		Aliabad ware
14	Posht Kor Pishk Abad 6	0/4	**3**		Aliabad ware
15	Jafar Abad 1	2/7	**3**		Yahya VA
16	Jafar Abad 2	0/17	**3**		Yahya VA
17	Jafar Abad 3	0/3	**3**		Aliabad ware
18	Jafar Abad 4	0/35	**3**		Aliabad ware
19	Darreh1	1	**3**		Yahya VA
20	Darreh2	3/7	**3**		Yahya VA
21	Darreh3	0/8	**2**		Yahya VA
22	Sorme Cheshm 1	1/8	**3**		Yahya VA
23	Sorme Cheshm 2	0/1	**3**		Yahya VA
24	Sorme Cheshm 3	0/35	**3**		Yahya VA
25	Chah Husseini	15	**1**		Yahya VA
26	Chil Dergi	0/75	**3**		Yahya VA
27	Pishk Abad 1	6/6	**2**	Southern region of the Bampur River	Bampur ware
28	Pishk Abad 2		**2**		Aliabad ware
29	Pishk Abad 3	0/4	**3**		Aliabad ware
30	Pishk Abad 4	1/3	**3**		Aliabad ware
31	Pishk Abad 5	2	**3**		Bampur ware
32	Pishk Abad 6	4/8	**2**		Bampur ware
33	Pishk Abad 7	0/65	**3**		Bampur ware
34	Pishk Abad 8	3/5	**2**		Aliabad ware
35	Pishk Abad 9	2/1	**3**		Aliabad ware
36	Pishk Abad 10	2/4	**3**		Yahya VA
37	Shekar Abad 1	2/2	**3**		Bampur ware
38	Shekar Abad 2	0/7	**3**		Bampur ware
39	Shekar Abad 3	0/8	**3**		Aliabad ware
40	Shekar Abad 4	2/7	**3**		Bampur ware
41	Shekar Abad 5	0/5	**3**		Bampur ware

The importance of this study lies in two aspects. First, archaeological research in Iranian Baluchestan has declined since the 1970s, limited to sporadic excavations. Secondly, our understanding of the prehistoric cultural processes in this region is largely restricted to typological comparisons of pottery from Tepe Bampur or findings from the surface of the sites. The need for comprehensive studies that go beyond typological pottery comparisons is quite evident. This will enhance our knowledge of various aspects of the lives of ancient societies inhabiting the Bampur Valley. Due to the lack of interdisciplinary archaeological studies, this research is significant as it aids in a better understanding of the social hierarchy during the Chalcolithic period of the Bampur Valley. Additionally, this research allows us to explore the complexities of Chalcolithic societies in southeastern Iran.

2. Archaeological background and chronological issue of the Bampur Valley in the Chalcolithic period (ca. 4500-3900 BCE)

Many sites in the southeast of Iran until the mid-fifth millennium BCE showed less interaction with other areas. In the second half of the fifth millennium BCE, the expansion of the Yahya VA culture in Kerman towards the eastern and southeastern regions significantly increased interactions between Kerman, Baluchestan, and Makran in later periods. Sistan joined this interaction only in the second half of the fourth millennium BCE

In the late fifth millennium BCE, among the Chalcolithic sites in the Bampur valley, the highest dispersion of nonlocal pottery includes Kerman-related wares (Yahya VA) (Fig. 5) and, to a lesser extent, Aliabad/Miri II wares (Mutin *et al.,* 2017: 118-119). However, the number of sites with Yahya VA pottery is greater than those with Aliabad/Miri II wares, concentrated on the northern side of the Bampur River.

At first glance, our data suggest that the latter half of the Chalcolithic period, or Yahya VA – Aliabad period (c. 4500-3900 BCE), represents an expansion phase in the Bampur region as well as Kerman (Fig. 3 and 5). To gain a better understanding of the various aspects of cultural processes in the Bampur Valley, it seems rational to focus on sites featuring these types of pottery as the primary surface finds (table 1). This pottery has also been documented 400 km to the north in Mir Javeh near Zahedan (Heydari, 2015: Fig. 4), and in Saravan, located 250 km east of Bampur (Moradi *et al.,* 2018: 35-36). The southeasternmost distribution of Aliabad wares is found in Kech-Makran, in the west of Pakistani Baluchistan, linked to Miri II-IIIa wares (Besenval, 2001: 5).

Kerman-related ceramics include Black-on-buff and Black-on-red wares. These two types are reported in large quantities in Kerman and at Chah Hosseini in Bampur Valley. The Black-on-buff wares are more prevalent during the Yahya VB period, while the Black-on-red wares, characterized by a red color paste, are more common in Period VA than in Period VB (Mutin et al., 2017: 5). Notably, in the Bampur valley, the most frequently found sherds are associated with Black-on-red wares, which appear to date between the mid-fifth and the first centuries of the fourth-millennium cal. BC, based on 14C dates obtained from recent excavations at Kerman sites (Eskandari, 2017; Fig. 6, 32; Shafiee *et al.,* 2019, Figs. 9A-F).

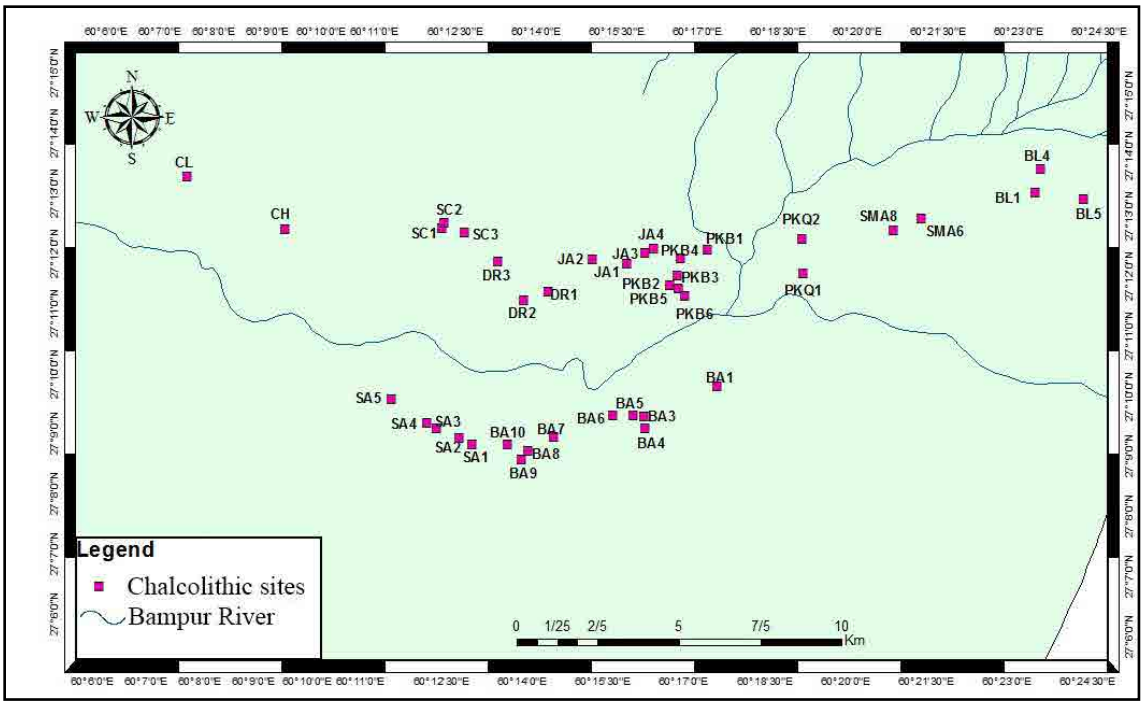


Fig. 6: GIS map of Chalcolithic Sites in the Bampur Valley in 3 level classification (Author, 2024).

Table. 2: Numeric classification of sites size based on six level division (Author, 2024).

no	Area	Frequency	Percent	Valid Percent	Cumulative Percent
1	Less than 1 ha	17	43.6	43.6	43.6
2	1-2 ha	5	12.8	12.8	56.4
3	2-3 ha	9	23.1	23.1	79.5
4	3-4 ha	4	10.3	10.3	89.7
5	4-7 ha	3	7.7	7.7	97.4
6	More than 7 ha	1	2.6	2.6	100.0
Total		39	100.0	100.0	

As noted by Lamberg-Karlovsky and Schmandt-Besserat, Chah Hosseini's monochrome and polychrome wares are at least wholly or partially contemporaneous with the Kerman-related ceramics (Lamberg-Karlovsky & Schmandt-Besserat, 1977). The survey included numerous bowls featuring interior painted decorations that are technologically similar to the Black on Red Kerman-related ceramics, leading us to assume they date to approximately the same period, between c. 4500 and 3900 BC. Bowls with interior painted decorations have been reported from 14 sites along the northern bank of the Bampur River, which also contain Kerman-related ceramics.

Aliabad wares are two types of ceramics that emerged on the southeastern Iranian plateau, primarily after the Black-on-buff and Black-on-red ware. However, it consists of early, Standard, and late phase between 4200-3600 BCE Miri ware consists of fine, monochrome-painted ceramics and is characteristic of period II at Miri Qalat and Shahi-Tump in Kech-Makran, a period dating

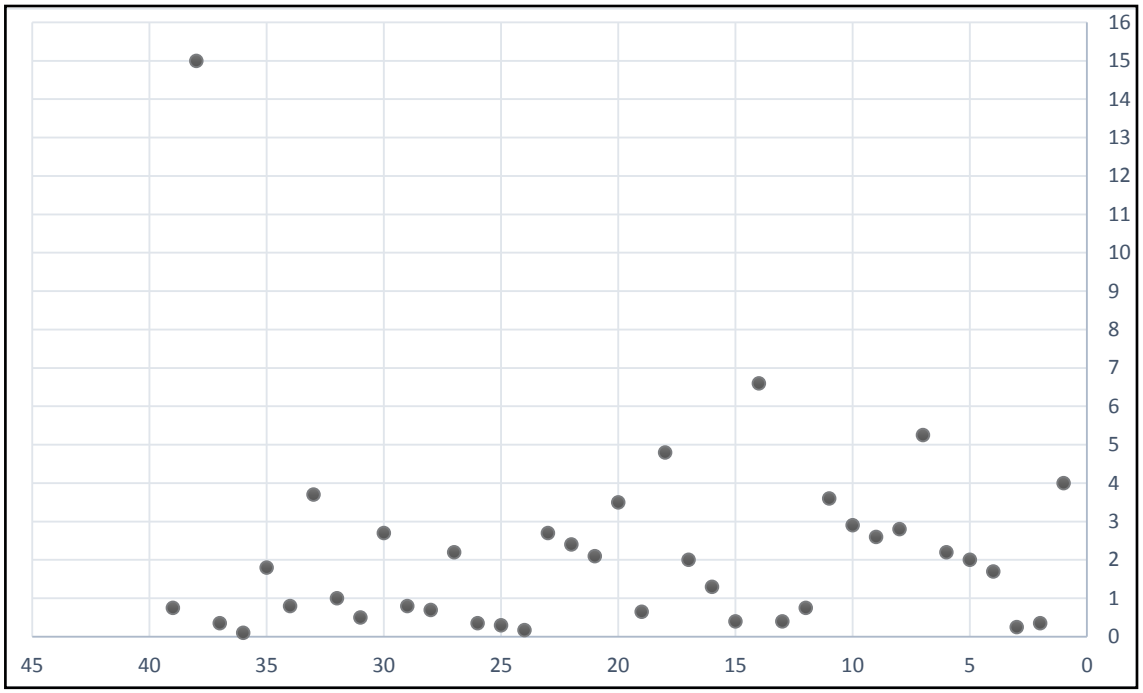


Fig. 7: Size chart of Chalcolithic sites in the Bampur valley. In this chart, there are three size categories which divided based on concentration in some parts of this chart (Author, 2024).

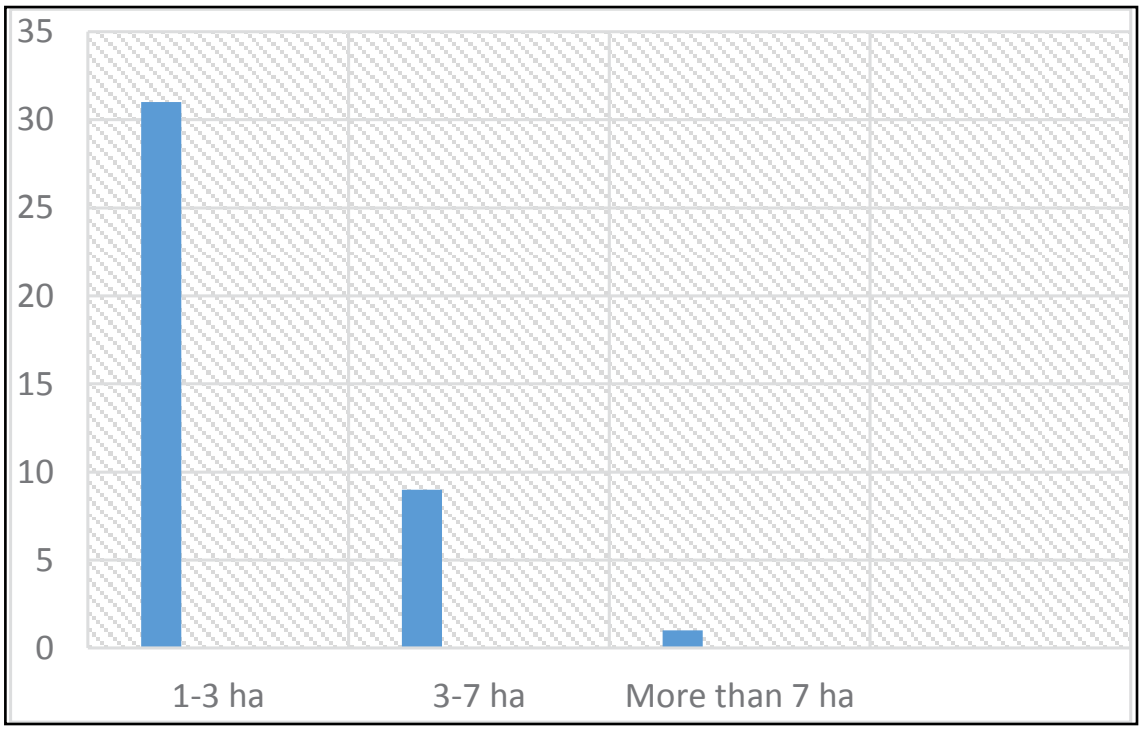


Fig. 8: Classification of sites size based on three level division (Author, 2024).

Table. 3: Relation between distance and size of sites in each region (SPSS) (Author, 2024).

Correlations				
Site name gg			**distance**	**area**
Southern region	Classification of distance	Pearson Correlation	1	.440
		Sig. (2-tailed)		.115
		Sum of Squares and Cross-products	11.429	2.286
		Covariance	.879	.176
		N	14	14
	Classification of size	Pearson Correlation	.440	1
		Sig. (2-tailed)	.115	
		Sum of Squares and Cross-products	2.286	2.357
		Covariance	.176	.181
		N	14	14
Northern region	Classification of distance	Pearson Correlation	1	.373
		Sig. (2-tailed)		.066
		Sum of Squares and Cross-products	31.040	5.320
		Covariance	1.293	.222
		N	25	25
	Classification of size	Pearson Correlation	.373	1
		Sig. (2-tailed)	.066	
		Sum of Squares and Cross-products	5.320	6.560
		Covariance	.222	.273
		N	25	25

Table. 4: Correlation between sites measured by Pearson R- and Regression tests (Author, 2024).

Correlations				
Control Variables			**Area**	**Distance**
Site name	Classification of size	Correlation	1.000	.391
		Significance (2-tailed)	.	.015
		df	0	36
	Classification of distance	Correlation	.391	1.000
		Significance (2-tailed)	.015	.
		df	36	0

Table. 5: Result of the relation between the area and their distance (Author, 2024).

Region	index	index	Correlation	Regression & R-pearson
Northern region	Area	Distance	Relatively strong correlation	373.
Southern region	Area	Distance	Relatively strong correlation	440.

to the first half of the fourth millennium BC. Aliabad ware includes plain ceramics as well as monochrome and polychrome-painted ceramics, believed to have appeared in the second quarter of the fourth millennium BC and continued into the latter half of this millennium, although some radiocarbon dates suggest a timeframe between the mid-fifth and early fourth millennium BC (Eskandari *et al.,* 2023: Tab. 3).

However, the chronological relationships between these ceramics are generally based on the belief that Black-on-Red Ware followed Black-on-Buff Ware and that these two styles were produced before Aliabad and Miri wares. Important issues remain regarding the exact dating of these ceramic styles from the Chalcolithic period in southeastern Iran.

Chronologically, Prickett established the Yahya VA between 4200-3900 cal. BCE based on radiocarbon and stratigraphic evidence (Prickett, 1986: 410 tab. 3.1; 413 tab. 3.2). Additional radiocarbon dates, including on Chalcolithic samples from Tepe Dehno near Shahdad, Tepe Vakilabad in the Orzouyeh Plain and recently Tepe Varamin in Jiroft near Konar Sandal south have been presented by the archaeologists (Eskandari *et al.,* 2017; 2023; Shafiee *et al.,* 2019).

Based on these new radiocarbon analyses, the Yahya VC-VB is placed between 5350-4700 BCE and Yahya VA between 4700-4200 calBCE at Tepe Dehno (Eskandari *et al.,* 2018: Tab. 2). In Tepe Vakilabad, Yahya VC-VB set between 5300-4800 cal. BCE and Yahya VA between 4800-4200 cal. BCE (Shafiee *et al.,* 2019, 92 tab. 1). Other scholars have recently proposed Yahya VC (Early Black-on-Buff Ware) between 5000-4800 cal. BCE, Yahya VB (Black-on-Buff Ware) between 4800-4500 cal. BCE and Yahya VA (Black-on-Red Ware): 4500-4000 cal. BCE (Pfälzner & Soleimani, 2017: 118 Fig. 13).

No 14C dates from the Bampur Valley have been presented yet but by considering the presence of such pottery at more than 41 sites, we can establish the chronology of the Chalcolithic sites with Kerman-related wares to be between 4500-3900 BCE The typical Yahya VA pottery has been found alongside standard Aliabad wares. Despite this long duration covering more than one millennium, we must concentrate only on the sites with Yahya VA / Aliabad wares that date between 4500-3900 BCE, as is the case in the Kerman area (Table 1).

3. Methods

Our primary reason for selecting these sites was the presence of at least one shard associated with the Kerman Chalcolithic period. When estimating the size of the sites during this extensive period, it is important to note that the Aliabad ware, following Yahya VA pottery, likely represents a part of the cultural continuity of the Kerman Chalcolithic period in the Bampur plain. The pottery has been found in small sites measuring less than 3 hectares, thus placing them in the lowest tier of our three-level classification of site sizes, which does not affect our interpretation of site size in the Bampur Valley. Furthermore, most sites with Aliabad ware are situated in the southern part of the river, while those with Yahya VA pottery are concentrated to the north of the riverbed. In any case, this extensive period and the diversity of pottery do not disrupt our three-level classification of site sizes in this region.

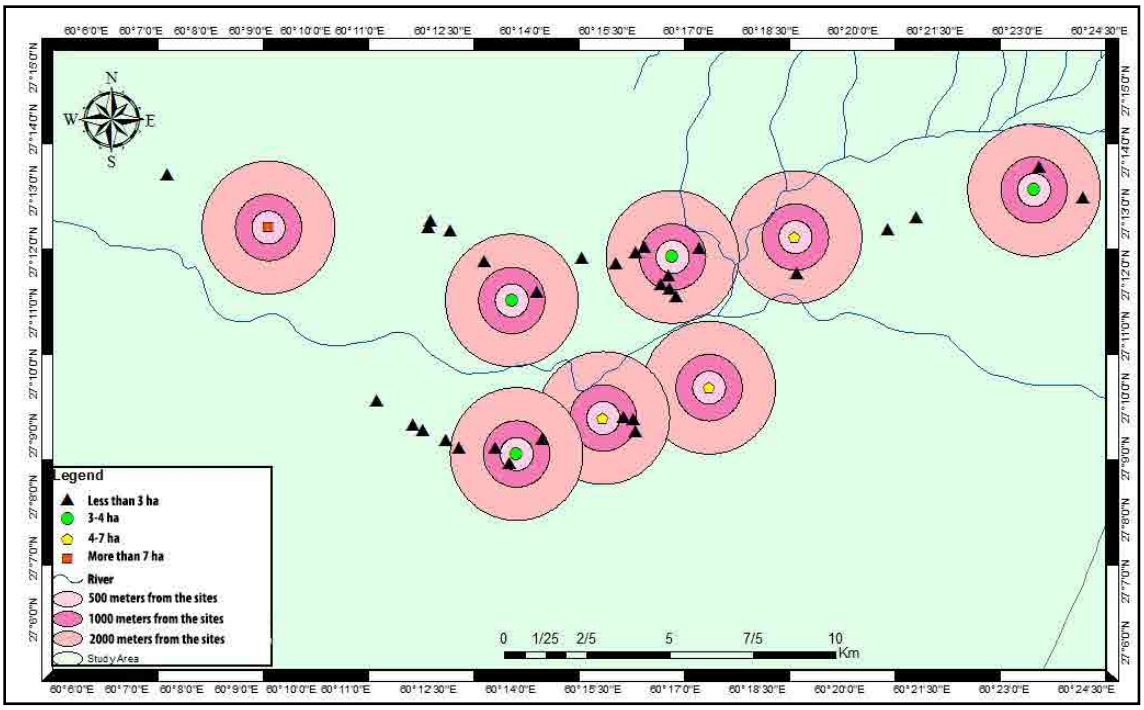


Fig. 9: General view of relation between site size and distance (Author, 2024).

In this map there are three buffer zones with the range of 500, 1000 and 2000 meters. The red one is the largest one, (Chah Hosseini with 15 ha) that has no site in 2000 meters radius or more. The yellow pentagons are the sites between 4 -7 ha, with no other site at a radius of 500 meters and in radius of 1000 meters there is just one site. But in sites between 3 to 4 hectares marked with a green circle, they have some little sites (less than 3 ha) in radius of 1000 meters or in one case a little site in radius of 500 meters. Although some exceptions can be seen in Bampur valley, the analysis of distances and sizes in SPSS is significant.

Since all sites are located in a flat area, some ineffective variables for the research, such as elevation and slope, were removed from the list of variables. Also, the environmental factors were removed from the list of variables because all sites are located in a limited zone with the same conditions. In the first step, the site size, the map of the site's placement, and the distances between these 41 Chalcolithic sites were documented by GIS, and then the connection between these variables (site size and distance) was studied by using different tests of SPSS. When both variables were numerical, the Linear Regression and Pearson R tests were used to assess the relationship between them. The Pearson correlation test and linear regression are sophisticated statistical techniques for data that are typically at the interval level of measurement. Regression analysis is used when we want to predict the values of one variable from the other variables. So, the area of the sites is considered the independent variable, and the size and the distance between them are regarded as the dependent variables.

In this case, a simple linear regression test has been applied and the output of these tests is tables that evaluate the strength of the relationship. In fact, the strength of the relationship depends on the significance level of the independent and dependent variables, and one way to determine the significance level is through the "sig" output. When it is closer to zero, the significance would be greater, indicating a relationship between the two variables, which in this case indicates a direct



Fig. 10: Stamp seal from Tepe Jafar Abad, a Chalcolithic site in the Bampur valley (Author, 2024).

relationship between size and distance. In addition, a cluster diagram is provided to understand these relationships.

4. Discussion

Site-size hierarchy is an archaeological pattern commonly used to identify regional political hierarchies in stateless middle-range societies and state-level societies (Duffy, 2015). Flannery declared the concept of decision-making and hierarchical organization (1972: 412). Henry Wright and Gregory Johnson developed an approach defined by Flannery: that a state is "a society with specialized administrative activities" (1975: 267). Their model of decision-making hierarchies in early states finds its main archaeological application in the analysis of site-size hierarchies. The most widely used measure in their model was the number of size levels (normally in hectares) in a settlement hierarchy. Wright (1977) defined the states of Mesoamerica as having large centers dominating three or more levels of a settlement hierarchy and proposed the existence of up to five levels in the settlement hierarchies of Mesopotamia, southwestern Iran, and the central Andes (1986a) and Johnson (1982) also made a terminological distinction between the hierarchies present in these stratified societies and those that existed in the interpersonal relations of non-stratified societies.

The use of the site-size hierarchy model in southeastern Iran goes back to the archaeological investigation in the Rud-i Gushk area, located 80 km north of Tepe Yahya. This was the only region in southeastern Iran that was investigated and surveyed with a focus on the size of the sites (Pricket, 1986). However, the focus of this fieldwork was not on the hierarchy levels; Pricket classified the site sizes only for chronology. It is interesting to mention that during the Yahya VA period, the total number of settlements increased to 55 sites, with over 39 ha of site area and 72 ha of sherds scatters (Pricket, 1986: 591-93). Yahya VA tended to increase site numbers and the total area of occupation. This period had a substantial increase in the number of dune sites. Within Yahya VA, there were 53 measured dune sites with major or minor occupation components (Prickett, 1986: 770).

Although the middle of the Chalcolithic period (or the Chah Hosseini Horizon in the Bampur Valley) is the expansion phase in the region, for testing the model on the Bampur Valley, we focused on the period between 4500-3900 BCE, where Yahya VA pottery and contemporary sherds were collected at the sites. Measuring the settlement size without any excavation is difficult, but when the sites include different wares that date back to the Yahya VA/early Aliabad Periods, we could consider the present size of the site as the measuring factor.

Our basis was the presence of Kerman-related pottery (Yahya VA/Aliabad wares) that appeared alongside local pottery, all dated back to the middle to the early decades of the Late Chalcolithic periods. This means that we included all sites where any kind of Kerman-related pottery was found, and these sites were nominated for estimating size and distance from other sites. Since, according to archaeological research, this period is very long, it has been assumed that the area from which this type of pottery was collected corresponds to the area of the site during the specified period.

However, the concentration of sites was on the northern side of the Bampur River, and the study was focused on the northern section of the river with Yahya VA pottery (Fig. 2). But the southern side was also taken into consideration for a better understanding of the hierarchy. It is worth noting that all sites on the southern side of the river have Aliabad wares (ca. 4200-3900 BCE), and all of them were placed in the third level of size classification (less than 3 hectares).

By studying the surface finds, three pottery types have been classified in this area, including Kerman ware, Aliabad pottery, and local types (Mutin *et al.,* 2017: 3-15). A common element at many sites is Yahya VA/Aliabad ware, which is black on red with geometric designs and previously has been collected in large quantities in Kerman (Fig. 5). For greater accuracy, we removed the scattered sherds with multiple chronological sequences from our data, and finally, we only considered 41 sites for statistical analysis (Table 1). The area of each site was estimated using a GPS plan, and the distances were also estimated using a GPS route map.

In the first step, a numeric classification of site size based on a six-level division is prepared, and the table is presented using SPSS analysis (Table 2). If we count the sites with less than a 2-hectare area in one category, we can see a hierarchical arrangement of sites based on the estimated area for each one. But it has only a numerical value, and in the same way, we can also provide smaller or bigger classifications by playing with the numbers. So, as is obvious in Figures 7 and 8, it seems that the three-level classification is more acceptable than the others.

Therefore, by attending to Figures 7 and 8, there are three size categories divided based on concentration in different parts of Figure 7. In the lowest part of Figure 7, there are 31 sites with an area of less than 3 hectares. Statistically, most sites are located in this part, and the area difference among them is less. The sites between 3-7 hectares are located in the middle of the chart, and the area difference between them is less than 3 hectares, whereas the number of them decreased to 7 sites. In the upper part, we have only one site. Chah Hosseini is the most famous and largest Chalcolithic site in Baluchestan, with an area of about 15 hectares (Fig. 7). An exception exists here since Balanch no. 1, with an area of 1 ha, was assumed to be the other large site on the eastern edge of the surveyed area. Despite its smaller size, it has the greatest height among all sites in the

Bampur Valley, but it is separated from the concentration area of the other Chalcolithic sites. As a result, regarding the different choices for site size classification and by statistically analyzing the sizes, it is acceptable to divide them into three levels. 1) Less than 3 ha, 2) between 3-7 ha, and 3) one site more than 7 ha.

In the Farukh Phase in Dehloran (4600-4300 BCE) and the Susa Phase in the Susiana Plain (4300-4000 BCE) in southwestern Iran, there were central settlements often larger than neighboring settlements. During the Farukh Phase, two settlement centers grew with obvious distance between them, which may have allowed them to control the smaller sites with designated distances. Similarly, in the Susiana Plain, two "primate" settlement centers developed during the Chalcolithic period. Chogha Mish in the east flourished with an area of 11 ha, and Susa in the west was the other (Wright, 1986b: 53-55). It is also interesting to know that in the Rud-i Gushk area, north of Tepe Yahya in Kerman, there are different sites that can be divided into three categories (Prickett, 1986).

In the second step for a better understanding of the concept of site hierarchy, the relationship between site size and distance of sites was studied using statistical methods. First, the distance between each site and the nearest site was measured using a GPS route map. Then, in SPSS software, the correlation between them was calculated using Pearson's R and regression tests (Tables 3-4).

In Table 5, the site size categories are shown based on the distance between them. The small sites (category no. 1) have more varied distances, but all are less than half a kilometer. In contrast, sites with 3-7 hectares (category no. 2) have more distance from other sites, with the nearest distance being half to one kilometer only for one site (Tables nos. 3-4).

In Figure 9, there are three buffer zones with ranges of half, one, and two kilometers. The red one is the largest (Chah Hosseini) and has no site within a 2-kilometer radius or more. The yellow pentagons are the sites between 3 - 7 ha; no site is located within a radius of half a kilometer, and within a radius of 1 kilometer, there is only one site. However, in these sites, there are some smaller sites (less than 3 ha) within a radius of 1 kilometer. Although some exceptions can be seen in the Bampur Valley, which could be referred to as the multi-chronological situation of the excepted sites, the analysis of distances and sizes in SPSS is meaningful. Based on these tests, there is a significant relation between the area and their distances (Table 5). In this way, when the area of the site has increased, its distance from the smaller sites has increased. Based on the results, the relation between the site size (or the area of each site) and distance is 39 percent, and their significance (sig) is less than 5 percent, and even in some cases is under 1 percent or reaches zero, which means that the results are valuable (Table 5).

5. Conclusion

Based on the site size charts and statistical analysis, a three-level classification is proposed for the middle Chalcolithic sites of the Bampur Valley, and it seems to be more acceptable than other classifications. Our classification consists of: 1) small villages (less than 3 ha; a total of 31 sites), 2) the large village (between 3 to 7 ha; consisting of 7 sites), and a big center (15 ha). It should

be interesting that we encounter the same situation in the southwest of Iran. Hence, our division is more similar to southwest Iran in the Dehloran and Susiana Plains. The same situation can be seen in the Rud-i Gushk area near Tepe Yahya in Kerman. Sabaz area in south east Bampur river seems to have a similar situation in the chalcolithic period but needs to more focus on the sites in the future (Sarhadi Dadian, 2024)

For greater accuracy, the relationship between site distance and site size is examined using Pearson's R and regression tests, which indicate a significant correlation between area and distance. As the area of a site increases, the distance from smaller sites also increases.

By acknowledging that simple chiefdoms possess only one level of control hierarchy above the local community, while complex chiefdoms have one or two levels of control hierarchy above the community (Wright, 1984: 42-43), we can categorize the Chalcolithic sites of the Bampur Valley as a complex chiefdom that exerted a two-level control over 31 small villages. It appears that during this period, middle-range societies existed in the Bampur Valley, where complex chiefdoms could have multiple levels of decision-makers above the primary producers (Fig. 10).

The question that arises here is why, unlike on the Susiana Plain, the settlements in the Bampur Valley did not evolve into state or pre-state societies in later periods. Although our knowledge is very limited due to a lack of archaeological excavations, perhaps the answer can be explored through the context of the Middle and Late Chalcolithic sites in southwestern Iran. As we have observed in southwestern Iran, during this period, two large centers dominated several smaller sites in the Susiana Plains. The presence of these two large centers may have heightened competition between them for resources or dominance. Such a situation is not evident in the Bampur Valley or Dehloran Plains, where only one significant center is found in each of these areas. Additionally, a number of other factors may influence the cultural processes in these sites in the southwest of Iran. The presence of Mesopotamia as an influential factor in the southwest of Iran, along with the complex experiences in the exchange and management of goods, may have led these settlements to achieve a level of complexity that pushed them toward statehood. Finally, in the absence of excavations in the Bampur Valley, it will be difficult to say more about the cultural processes in the southeast of Iran.

Author's Contributions

Dr. Hossein Moradi (corresponding author) and Dr. Hossein Sarhadi Dadian directed the fieldwork. Dr. Moradi formed a framework for analyzing the data and Dr. Zahra Rajabiuon by using SPSS, designed the statistical charts and tables.

Author Contributions

The contribution of all authors to the writing of the article has been equal.

Conflict of Interest

Authors declared no Conflict of Interest.

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چکیده

دشت بمپور در قسمت مرکزی بلوچستان ایران، در جنوب‌شرقی ایران به‌عنوان یک منطقهٔ کلیدی برای درک فرآیندهای مختلف فرهنگی از دوران مس‌وسنگ به‌بعد، مطرح بوده است. داده‌های پژوهش حاضر از بررسی حدود ۴۸ محوطهٔ مس‌وسنگ از بخش بمپور از شهرستان ایرانشهر در استان سیستان‌وبلوچستان جمع‌آوری شده است. این مطالعه با تمرکز بر سلسله‌مراتب اندازهٔ محوطه‌ها تلاش دارد تا با استفاده از روش‌های آماری با استفاده از برنامهٔ SPSS، سلسله‌مراتب هر محوطه را در کل منطقهٔ مورد بررسی، مورد ارزیابی قرار دهد تا از این راه میزان پیچیدگی اجتماعی در این دوره در دشت بمپور را مورد مطالعه قرار گیرد. طبقه‌بندی اندازهٔ محوطه‌ها با استفاده از SPSS انجام شدو نهایتاً با استفاده از آزمون‌های R-Pearson و Regression، طبقه‌بندی سه سطحی مقبول‌تر از سایر طبقه‌بندی‌ها فرض شد که شامل موارد زیر است: ۱) محوطه‌های کمتر از ۳ هکتار شامل ۳۱ محوطه؛ ۲) بین ۳ تا ۷ هکتار شامل ۷ محوطه؛ و ۳) محوطه‌های بیشتر از ۷ هکتار می‌باشد. برای درک بهتر جنبه‌های مختلف پیچیدگی و سلسله‌مراتب اندازهٔ محوطه‌ها، رابطهٔ بین اندازهٔ محوطه و فاصلهٔ هر محوطه با سایر محوطه ها توسط SPSS مورد مطالعه قرار گرفت. درنهایت این پژوهش نشان می‌دهد که تحلیل فواصل و اندازه‌ها معنادار است. در جایی‌که جوامع خان‌سالار ساده از الگوی دو سطحی در سلسله‌مراتب اندازهٔ محوطه‌ها برخوردار بوده‌اند، بررسی‌های به‌عمل آمده نشان می‌دهد که الگوی سه سطحی مختص به جوامع خان‌سالار پیچیده می‌باشد درد شت بمپور دیده می‌شود که پیش‌تر در جلگهٔ شوش و فاز فرخ در دهلران و درهٔ صوغان در کرمان نیز دیده شده است.

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