Study and Analysis of the Settlement Pattern of Parthian Period in La'lvar River's Watershed, Markazi Province

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Abstract

La'lvar region of Markazi province, a part of the catchment basin of the great Qomrood River, is referred to a section that differs from the main bed of Qomrood in terms of topographical structure of the geographical environment and includes an inter-mountain plain and the high unevenness around it. This region has always been welcomed by humans due to its favorable environmental conditions, and hence settlement evidence of different periods can be observed in it. According to archaeological surveys conducted in La'lvar region during two periods in 2008 and 2014, one hundred and eighty-five archaeological sites from the fifth millennium BC to the contemporary era were identified. One of the most important settlement periods of this region is the Parthian period as evidenced by the existence of large and significant sites such as Khorheh, Shahriari, and Jam. Unfortunately, despite the high importance of this period, no comprehensive and independent studies so far have been conducted on it, and questions such as how has been the structure of settlement pattern in Parthian period and what have been the factors affecting Parthian sites are still remained unanswered.

Therefore, based on the data obtained from archaeological activities in the region, and preparation of GIS maps, the authors embarked on the study of these issue, and finally analyzed and reconstructed the landscape of La'lvar region in Parthian period as well as the environmental patterns of the settlements in this period. The results indicate that during the Parthian period, on the one hand, the region witnessed an increase in the number of settlements and population growth, and on the other hand, in this period significant and central large sites such as Khorheh and Jam monuments were formed. In this era, unlike the previous periods, most of the settlements were formed on the banks of the river and on flat land with fertile soil, in turn, indicating that more attention is paid to the necessary conditions for agriculture-based livelihoods.

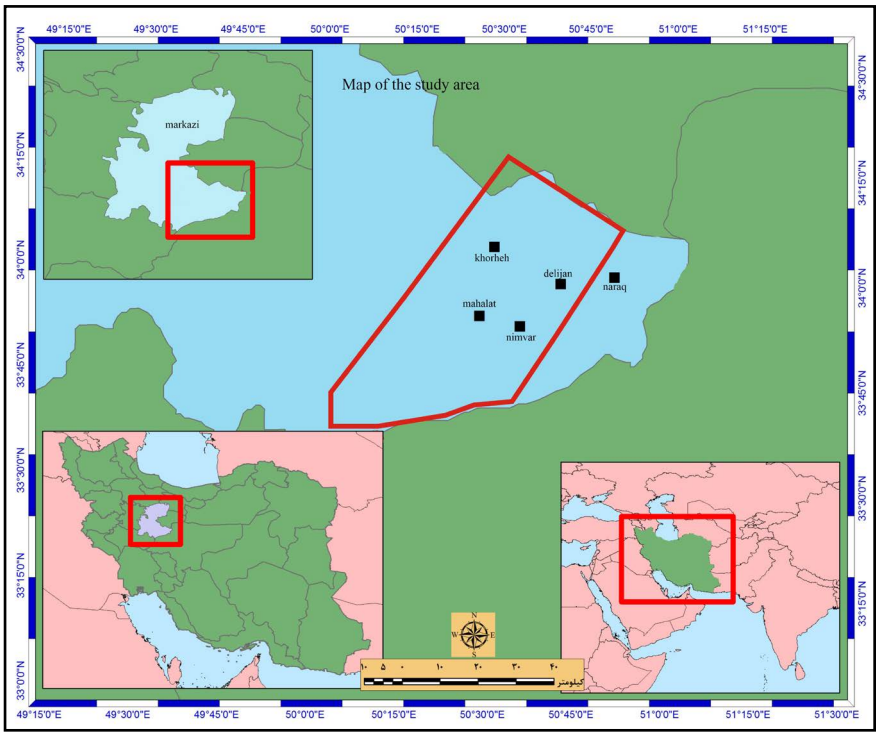
Keywords: La'lvar Watershed, Parthian Sites, Settlement Pattern, Environmental Factors, Archaeological Survey.

Introduction

La'lvar River's Watershed is located south of Markazi province of Iran or south of the Central Plateau of Iran. This region encompasses the city of Mahallat and the northwestern part of Delijan and a small part of Khomein with an area of 2880 km2, which is hydrologically situated in La'lvar River's Watershed (map. 1). According to archaeological surveys carried out in La'lvar region, 185 archaeological sites were identified, of which 44 sites contain settlement evidence of the Parthian period, indicating that this region has been very important in the Parthian period. In the present research, using the information obtained from comprehensive archaeological survey and analysis of Geographical Information System (GIS), it has been attempted to analyze the collected data in terms of settlement patterns and influential factors as well as the process of settlement changes and developments. Therefore, two fundamental questions are brought up in this regard: 1- How has been the settlement period of La'lvar River's Watershed the Parthian period? 2- What were the factors affecting the settlement patterns and changes in La'lvar River's Watershed during the Parthian period and what effect did these factors have on the changes in settlement patterns during the Parthian period?

Research Hypotheses: The settlement pattern of La'lvar River's Watershed was formed llongitudinally during the Parthian period on the margins of the main rivers and waterways. The settlement patterns indicate a very strong environmental impact on the formation of settlements in this period and the most important factors in the

formation of settlements are the water resources and easy access to natural and environmental resources. La'lvar and Khorheh rivers have been among the most essential factors influencing the settlement changes and developments of the Parthian period, so that the majority of ancient sites of this period are formed on the margins or at close distances from the bed of these rivers.



◄ **Map 1. Location of the Study Area (Authors, 2018).**

Geographical Location and Environmental Features of the Study Area

La'lvar River is one of the most important tributaries of Qarachai River and is located in the southern part of the catchment basin of Markazi province. This river collects the waters of a large area of the country's central regions as well as Markazi and Isfahan provinces and reaches Qarachai River and then Namak Lake. The initial branches and the source of this river are located on the foothills of high mountains which are as high as 3906 meters, situated in Aligudarz city and Central Zagros (Afshin, 1994: 474). La'lvar River is resulted from the confluence of two rivers, Kharqab and Khomein, before entering the Qom basin. This river is known as Golpayegan River until it enters the city of Khomein. In the east of Khomein around Chehel Rase and in the border area between the cities of Mahallat and Khomein it enters this basin, and then Khorheh, Bazijan, Sefid Darreh, Siah Darreh, Darband Shoor and

Azna rivers join this water body in this region; afterwards, with a northeast path, it goes towards Qom from the west of Delijan and after passing through Qom city, another river called Qarasu joins it, and before entering Hoz-e Sultan Lake, it is known as Qomrood river (Figure 1) (Afazeli, 2008: 22). The water level of La'lvar River fluctuates throughout the year and sometimes floods. In wet and rainy years, the whole valley is filled with water. In cases of flooding, it causes severe damage to the villages located on the route (Figure 2) (Badiei, 1982: 169). Other sources that play an important role in water supply in the study area include deep and semi-deep wells, springs and aqueducts. There are a large number of these seasonal springs in the mountainous areas of Mahallat city. The rise of water

Fig. 1. Aerial Image of La'lvar Region (Authors, 2018). ▶

Fig. 2. La'lvar River (Alaei Moghadam and Banijamali, 2009). ▶

from these springs in mainly limited to some months of spring and summer. However, there are a number of permanent springs in this area, among which Shafa spring, Sarcheshmeh and the hot spring of Mahallat can be mentioned (Zendehdel, 2000: 43).

The most important natural features of this region are high mountains and intermountain plains as well as expensive and fertile valleys. The region is located on the eastern slopes of the Zagros Mountains, to the west of which are relatively high mountains. Overall, the southern and northeastern regions are in the form of plains and the central and western regions are in the form of mountains. The average altitude of this area is 1600 meters above sea level. Surakh-e Gav Mountain is located in the west of Khorheh village and in the south of Surakh Gav Mountain, there is a wall-like mountain range known as Khorzin Mountain. Khorheh River flows through these two mountains. Khorezin mountain range, as a wall, separates the village of Khorheh in the north and the village of Nineh in the south. Khorzin Mountains, Surakh-e Gav, Haftad Gholleh and Baraftab in the north and Harva, Yakhchal, Dareh Farakh and FiroozKooh mountains are located in the south in the form a circle, lacking any permanent flow of water (Movahedi, 1996: 14).

Due to the shortage of rainfall in this region, there is no forest cover, and the vegetation only includes desert bushes and rarely tamarisk branches and sometimes trees such as mountain fig trees. The most important rangeland and mountainous plants in this region are Artemisia, Rosa persica, milk vetch, various types of wheat family, and other plants from different species of iris, borage, sorrel, wild leek (Allium ampeloprasum), Peganum harmala, Descurainia sophia, Echinops, etc. (Lal Bar et al., 2015: 59).

The main fauna of this region live in Haftad Qala conversation area, which is located between Markazi province and Moteh of Isfahan province. This area is one of the most important centers and habitats of wildlife and one of the habitats of wild goats, goats, rams, ewes and deer. Hunting grounds in this region have always been of interest to rulers, kings, khans and those interested in hunting and fishing (Rahimpour, 2005: 121-125). Other animals in the area include jackals, wolves, foxes, rabbits, hyenas, sables, boars, see-see partridges, snakes, and fish (Saeidian, 2009: 2471).

Background of Archaeological Studies in La'lvar River Basin

Major archaeological activities in the study area included seven excavation seasons and three archaeological surveys. The first

unscientific excavation in Khorheh was carried out in 1859 under the order of Nasser al-Din Qajar with the aim of finding old artifacts no written sources of which is available and only two photos with short inscriptions are remained of it; although due to the lack of significant artifacts discovered, the royal excavation was stopped (Mohammadifar 2008: 111), the memory of this work in 1270 AH, that is, 32 years later, motivated the Qajar king to re-excavate the area. In this excavation, Dr. February and Etemad Al-Saltanah accompanied the king (Etemad Al-Saltanah 1966: 922).

The first archeological excavation was carried out in 1956 in Khorheh under the supervision of Ali Hakemi and directed by Andre Godard (Hakemi, 1990: 11-44). The second scientific excavation in Mahallat was the continuation of excavations in Khorheh region under the supervision of Mahdi Rahbar in 1976. This excavation continued in 1996, 2000 and 2003 (Rahbar, 2003). Meanwhile, in 2000, Mr. Mahdi Rahbar carried out the first excavation season in Atashkouh Fire Temple in Nimvar of Mahallat (Rahbar, 2000).

Another activity done in this region was the boring operation conducted to provide a stratigraphy in the area of Yekeh Chah cave in 2006 by Mohsen Javeri. Although this activity was mostly done in the form of a geological project, based on its stratigraphy, 11 settlement layers, extending from the Bronze Age to the Islamic period, were identified (Javari, 2011: 72-74).) In the fall of 2014, a boring project was set up to determine the arena and limits of the large site of Jam (Cham) which was implemented by the authors (Banijamali and Alaei Moghadam: 2014).

The first survey and identification of Mahallat, as the main part of La'lvar basin, was carried out in 1995 by Khosrow Pourbakhshhandeh. In this study, more than 60 works were identified (Pourbakhshhandeh, 1995). The second archaeological survey in this region was carried out in 2008, during which all archeological works were identified (Alaei Moghadam and Banijamali, 2009). While performing the excavation in the site of Jam mound, the remaining area of La'lvar region and some points, which had been previously identified, were re-examined, and the obtained data led to the completion of the 2008 survey.

The Importance of the Study Area in Written Sources and Texts

The early geographers have divided the Median territory into two regions: the Great Mede, which included Hamedan, Rey, and Isfahan, and the Lesser Mede that encompasses part of Azerbaijan

and of Kurdistan. According to the early Islamic texts, the study area (Khomein, Mahallat and delijan) has been a part of Isfahan region in historical times as Hassan Qomi has written in his book, quoting Hamzeh Isfahani's book, that the four Rastaqs of Isfahan included Komeidan, Anacbar, Vareh, and Saveh (Qomi, 1982: 57). During the Parthian period, this region was considered part of the ruler-occupied section of the Greater Mede. Regarding the conquest of this region during the Parthian period, it is stated that in 148 BC Mehrdad I conquered the Mede region, which was ruled by Timar Khosus, and added it to the Parthian territory and appointed a person called Bakazis as the ruler of this place (wolski, 2004: 94). There is very limited information about this region in Parthian sources, and most of the available information is mostly based on historical sources related to the early Islam, as it is stated in History of Qom about this region, "Khorhed established this district as wished by Alexander and this district has four columns made of round and equal stones in which there is no holes, openings, defects, and excessive parts, as if that those columns were cupolas fallen from stone and rocks and this district had long pools"(Qomi, 1982: 69). Elsewhere, he writes, "Khorhabad was built by Khor bin Arvand. This is a place, called Salamvar, which is located on a high mountain and it is said that it was a fortress that wa later destroyed by Alexander, and opposite of this mountain there is spring that has hot water... "(Ibid: 67). However, Girshman has stated about Khorheh that the Seleucids built many cities, one of which was a city constructed in Korheh near Arak (Girshman, 2000: 262). As mentioned above, most researchers consider Khorheh monument to belong to the Seleucid period (Godar, 1998: 205-206; Wandenberg, 1966: 124; Prada, 2007: 257), but during five seasons of excavations carried out by Mahdi Rahbar in Khorheh, he suggests a date between the first century BC and the first century AD for the construction of Khorheh, which survived until the end of the Parthian period (Rahbar, 2003: 133).

Archaeological Survey and the Parthian Sites Identified

The latest archaeological study in the area has identified 185 ancient sites, each with one or more settlement periods (Table 1). Relying on the relative dating based on the typological comparison of pottery types, evidence of Parthian settlement was identified in 44 sites (Table 2).

Parthian Pottery of the Sites in Laalvar River Basin

During the archaeological excavations in La'lvar River's

Table 1. Settlement periods of the sites identified during the survey of La'lvar River's Watershed (Authors, 2018). ▶

Row	Settlement period	No. of places with the intended evidence
1	Pre-Bronze Age	6
2	Bronze Age	5
3	Iron Age	1
4	Achaemenid	0
5	Seleucid	6
6	Parthian	44
7	Sassanid	37
8	Islamic	131

Watershed, 44 sites, dating back to the Parthian period, were identified. Chronology of the mentioned sites based on typology and comparative study of pottery collected from the identified sites with other Parthian sites such as Yazdgerd Castle (Keall & Keall, 1981), Bistoun (Kleiss, 1970), Laodicea of Nahavand (Rahbar and Alibeigi, 2011), Mah Neshan of Zanjan (Khosrozadeh and Aali, 2004), Tap-e Kelar of Kelardasht (Mousavi Koohpar and Amir Azadi, 2010), Tihaleh of Khorramabad (Khosravi, 2006), Kahur Langar chini (Khosrozadeh et al., 2006), Qorveh of Kurdistan (Mafi et al., 2009), Qomes (Hansman and Stronach, 1974), Sang-e Shir Cemetery of Hamadan (Afshari and Naghshineh, 2014) and the sites of the Central Zagros region (Mohammadifar, 2005) (Tables 3 and 4).

Parthian Potteris of this region are divided into three groups: typical, Clinky and painted. The Typical pottery is one of the most common pottery in this region. The paste and clay cover of this pottery group are buff, red, lateritious red, greenish buff, orange and brown (Figures 3 and 4).

Classification of the Parthian Sites by their Area

As mentioned above, a total of 44 ancient sites from the Parthian period were identified in this region that in terms of physical appearance include mounds (such as Qala-e-Gabri and Mohammadabad mounds), extensive sites (such as Shahriari and Jam sites) and monuments (such as Khorheh and Qala-e-Oghab) (Map 2). In terms of area, these sites are divided into 10 general categories listed in Table 5 (Diagram. 1).

As shown in Table 2 (Diagram 1), it is clear that three sites are larger than 20 hectares in area, including Jam site (with an initial area of more than 100 hectares), the site of Ham Raz castle (the area of the historical part is 22 hectares) on the margin of the main branch of Laalvar and Khorhe site (with an approximate area of 50 hectares) which is located on the margin of the sub-branch of the main Laalvar river (Figures 5 and 6). In addition, two sites, i.e. Mouhour Siaha

Table 2. General features of the Parthian sites of Laalvar river basin (Alaei Moghadam and Banijamali, 2009). ▼

Site code	Site name	Area (m^2)	Settlement period	Site code	Site name	Area (m^2)	Settlement period
L1	Gabr-e Koli site	8000	Parthian-Sassanid	L23	Ghalavar site	-	Parthian-Sassanid
L2	Gavabad2 site	160000	Parthian	L24	Mian Doqala site	625	Seleucid- Parthian-Sassanid
L3	Qala Kohneh site	28000	Parthian-Sassanid-Islamic	L25	Jamil Tower	25	Parthian-Sassanid
L4	Zardeh Kamar	4000	Parthian-Sassanid	L26	Sarkamar Tower	-	Parthian-Sassanid-Islamic
L5	Farijan farm hill	7370	Parthian-Sassanid	L 27	Makhroube castle	50400	Parthian-Sassanid-Islamic
L6	Gabri Castle	11475	Parthian-Sassanid-Islamic	L28	Janabad Castle	4200	Parthian-Sassanid-Islamic
L7	Hajiabad 2 site	19360	Parthian	L29	Mahallat mound 1	6400	Parthian-Sassanid-Islamic
L8	Hajiabad site	2400	Seleucid-Parthian	L30	Jam mound	300000	5th millennium-Parthian-Sassanid
L9	Khorheh Castle	200000	Parthian-Sassanid	L31	Mohour Siaha mound	112350	Parthian-Sassanid-Islamic
L10	Shariari mound	102600	2nd millennium-Parthian-Sassanid	L32	Ham raz castle	257500	Parthian-Sassanid-Islamic
L11	Kopolou Reza mound	12100	Parthian-Sassanid-Islamic	L33	Jamalabad old cemetery	10000	Parthian-Sassanid
L12	Mohour Hoz Sultan	13000	Parthian-Sassanid	L34	Gol Cheshmeh Kohneh	15000	Parthian-Sassanid
L13	Dihgah mound	2610	Parthian-Sassanid-Islamic	L35	Mahour Kharabeh	17500	Parthian-Sassanid
L14	Imam Zadeh Zakaria mound	9000	Parthian-Sassanid	L36	Chah Farrokh 2 site	8500	Parthian-Sassanid
L15	Qala	10400	Parthian-Sassanid	L37	Chah Farrokh 1 site	33000	Parthian-Sassanid-Islamic
L16	Shah Bolbol caves	-	Parthian-Sassanid-Islamic	L38	Northern mound 2	2600	Parthian
L17	Shah Bolbol cemetery	22100	Parthian-Sassanid-Islamic	L39	Khougan mound 1	24300	Parthian
L18	Masoum mound 1	26000	Parthian-Sassanid-Islamic	L40	Bazijan site 2	9000	Seleucid-Parthian
L19	Masoum mound 2	19500	Parthian	L411	Northern mound of Saadat Abad	12000	Parthian
L20	Qala Gabri mound	5400	5th millennium BC-Parthian	L42	Bazijan site 2	9000	Seleucid-Parthian
L21	Mohammad Abad mound 2	1250	5th millennium BC-Parthian	L43	Khodarsi Castle	20000	Parthian-Sassanid
L22	Mohammad Abad mound	1300	Parthian-Sassanid	L44	Shahneshin Caste	-	Parthian-Sassanid-Islamic

(12 hectares) and the Gavabad 2 (16 hectares) are located on the banks of the main La'lvar River (Figures 5 and 6). According the variable of area, two sites of Jam and Khorheh can be described as central places that are formed in a strategic position. Jam site, that

Table 3. Comparative study and technical features of the Parthian pottery of La'lvar region (Alaei Moghadam and Banijamali, 2009). ▼

Row	Pottery catalogue (physical appearance and technical features)	Sites compared	Sources compared
1	lateritious, mineral, wheel-made, enough firing, lateritious clay coating on both surfaces	Yazdegerd Castle, Bistun, Mianab of Shoushtar	Keall&Keall, 1981, F. 19, No.17/41 Kleiss, 1970, Abb. 25, No. 1 Moghadam, 2006, Fig. 28. Drawing 3
2	Lateritious red, mineral wheel-made, enough firing, lateritious red clay coating on both surfaces	Shiman, Mahneshan of Zanjan, Zahak castle, Laodicea of Nahavand	Herring, 1997, Fig. 24, drawing 9, Khosrowzadeh, and Ali, 2004; drawing 3, Fig. 1, Kleiss, 1973, Abb.22 No. 26; Rahbar and Alibeigi, 2011, Fig. 4, drawing 11
3	Red lateritious, mineral wheel-made, enough firing, lateritious red clay coating on both surfaces	Selukieh, Kelar Mound of Kelardasht, Tourang Tap-e Kangavar	Debevoise, 1934, F.11-19, No.12; Mousavid Kouhpar and Amir Azodi, 2010; Fig. 2, drawing 8; Herring, 1997, Fig. 35, drawing 3; Mohammadifar, 2005, tablet 12, drawing 17
4	Brown, mineral wheel-made, enough firing, brown clay coating on the internal surface and dark buff of the outer surface	Qala Sam, Qala Koulak mound of Sistan, Kok-e Kohzad, Mount Khawjeh, Bistoun	Herring, 1997, Fig. 36, drawing 7; Alaei Moghadam 2014, Fig. 5-8, drawing 50; Banijamali and Alaei Moghadam, 2011, Fig. 1, Drawing 3; Kleiss 1970, Abb. 26, No. 33
5	Gray, mineral wheel-made, enough firing, lateritious red clay coating on both surfaces	Ghomes, Qala Sam,	Herring, 1997, Fig. 29, Drawing 6; Herring 1997, Fig. 36, drawing 6
6	Gray, mineral wheel-made, enough firing, orange clay coating on both surfaces	Bistoun, Laodicea of Nahavand, Sang-e Shir of Hamadan	Kleiss, 1970, Abb. 2, No. 4; Rahbar and Alibeigi, 2011, Fi. 4, drawings 21 and 23; Afshari and Naghshineh, 2014, drawing 8, fig. 2
7	Red lateritious, mineral wheel-made, enough firing, lateritious red clay coating on both surfaces	Ghomes, Kahuar Langa rchini	Handman and Stronach, 1974, F. 4, No. 4; Khowsrozade et al. 2006, fig. 7, drawing 5.
8	Orange, mineral wheel-made, enough firing, brown clay coating inside and orange clay coating outside	Bistoun, Mahneshan of Zanjan	Kleiss, 1970, Abb. 26, No. 47; Khosrowzadeh and Ali, 2004; Drawing 8, fig. 6
9	Lateritious red, mineral wheel-made, enough firing, buff clay coating on both surfaces with carved decoration (groove) on outer surface	Yazdegerd Castle, Bistoun	Keall&Keall, 1981, F.11, No.11/31 Kleiss, 1970, Abb. 28, No. 7
10	lateritious, mineral, wheel-made, enough firing, buff clay coating on both surfaces	Tihale of Khoramabad, Qorveh of Kurdistan, Selukieh, Bistoun, Toyserkan	Khosravi, 2006, fig. 3, drawing 4; Mafi et al. 2009, tablet 14, drawing 1. Debevoise, 1934, F.100-109, No.105 Kleiss, 1970, Abb. 26, No. 51; Mohamamdifar, 2005, tablet 5, drawing 12.

unfortunately the major part of it has currently been destroyed and disturbed by the 50-year activity of the brick kilns is located in part of La'lvar river, where on the one hand, the river has the greatest width, and on the other hand, a turn along the river path allowed for an easier exploitation of the water. On the other side, there are two

Table 4. Typological comparison and technical features of the Parthian pottery of La'lvar region (Alaei Moghadam and Banijamali, 2009). ▼

Row	Pottery catalogue (physical appearance and technical features)	Sites compared	Sources compared
11	Red, mineral wheel-made, enough firing, red clay coating on both surfaces	Mah neshan of Zanjan, Kelar mound of Kelardasht, Masjed Soleyman	Khosrowzade and Ali, 2004, drawing 11, fig. 6; Mousavi Kouhpar and Amir Azodi, 2010, fig. 2, drawing 4; Herrin
12	lateritious, mineral, wheel-made, enough firing, lateritious clay coating on both surfaces	Bistoun	Kleiss, 1970, Abb. 26, No. 50
13	lateritious, mineral, wheel-made, enough firing, lateritious clay coating on both surfaces, with carved decorations (wavy) on the outer surface	Gheshlagh Mah castle, Mahneshan of Zanjan, Kelar Mound of Kelardasht	Khosrowzadeh and Ali, 2004, drawing 6, fig. 6; Khosrowzadeh, 2010, drawing 4, fig. 4; Mafi et al. 2009, tablet 5, drawings 1 and 2
14	lateritious, mineral, wheel-made, enough firing, lateritious clay coating on inner surfaces, with painted decorations on the outer surface in brown	Mahneshan of Zanjan, Tihale of Khoramabad,	Khosrowzadeh and Ali, drawing 12, fig. 2; Khosravi 2006, fig. 4, drawing 3
15	lateritious, mineral, wheel-made, enough firing, lateritious clay coating on inner surface and buff on the outer, with painted decorations on the outer surface in brown	Mahneshan of Zanjan, Tihale of Khoramabad,	Khosrowzadeh and Ali, drawing 12, fig. 2;Khosravi, 2006, drawing 12, fig. 2;
16	Lateritious red, mineral wheel-made, enough firing, buff clay coating on both surfaces with carved decoration (wavy) on outer surface	Bistoun	Herring, 1997, fig. 16, drawing 19
17	Orange, mineral wheel-made, enough firing, orange clay coating on both surfaces with carved decoration (pectinate) on outer surface	Yazdegerd castle, Kahur Langar chini, Tomb-e Kharak	Keall, 1981, F25, no. 2.34; Khosrowzade et al. 2006, fig. 5, drawing 7; Shahsavari 2009, tablet 4-15, drawing 1-11

relatively large water tributaries in the eastern and western parts of the site leading to La'lvar, which can be used to irrigate more lands. The settlement conditions in this part of La'lvar River are so unique that two large sites, i.e. Mohour Siah and Ham Raz, are also formed in this section. Interestingly, except at the top of La'lvar River in the north, where the 16-hectare site of Gavabad 2 is located, no other large site (a site with an area of more than 10 hectares) is observed on the edge of the main branch of this river. This is the case not only for Khorheh River, but also for the small rivers leading to La'lvar. However, Khorheh River has a different situation. This river, which is the largest tributary leading to La'lvar, is clearly different from other tributaries in the study area because, unlike other tributaries, it flows in a separate environment from La'lvar valley, in a west-east direction, and finally joins it in the end northeastern part of the river. The environment, which is separated from La'lvar valley by

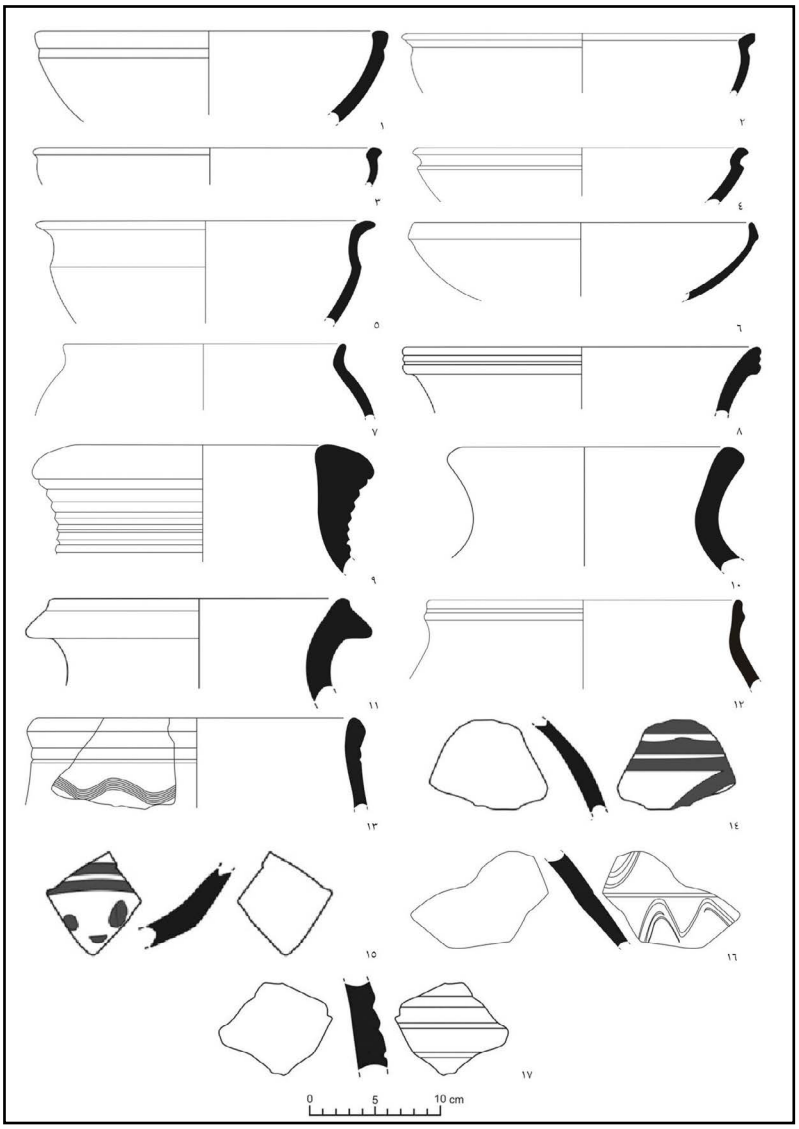


Fig. 3. Drawing examples of the Parthian pottery of La'lvar sites (Alaei Moghadam and Banijamali, 2009). ▶

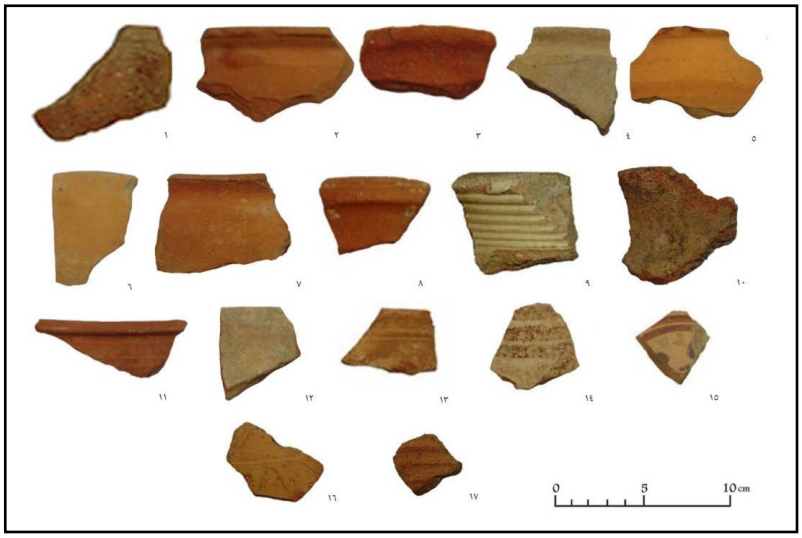
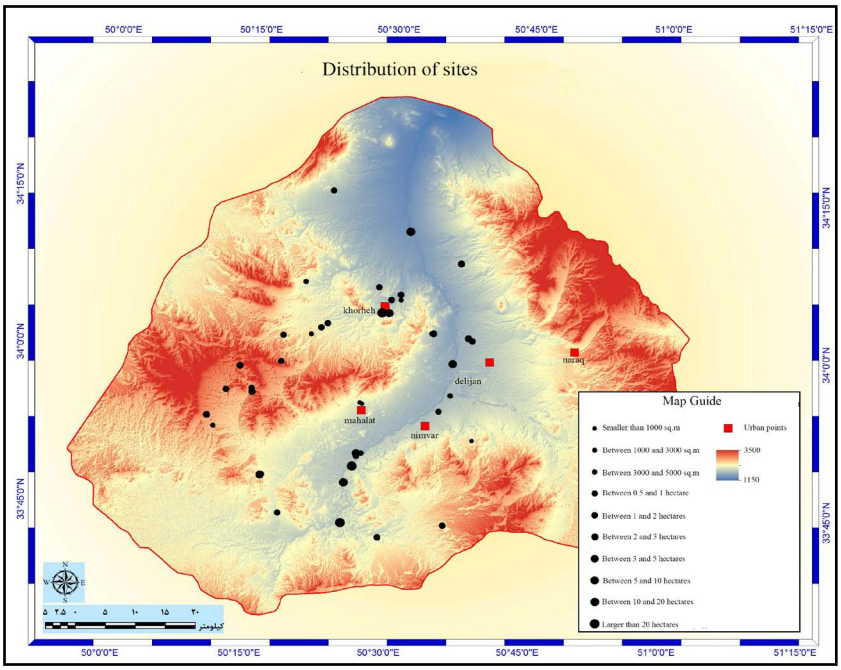


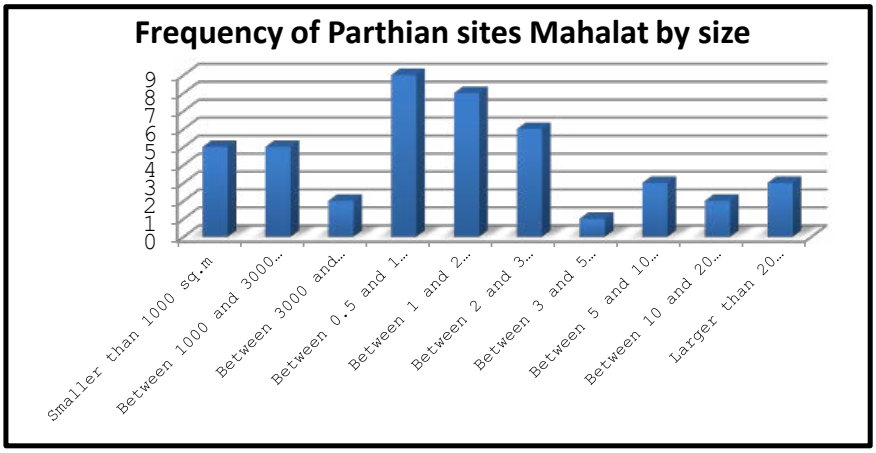
Fig. 4. Image of the Parthian pottery of La'lvar sites (Alaei Moghadam and Banijamali, 2009). ▶



◄ **Map 2. Distribution of sites based on their size (Authors, 2018).**

◄ **Table 5. Classification of the Parthian sites by their area (Authors, 2018).**

Row	Sites by their area	Frequency
1	Larger than 20 hectares	3
2	Between 10 and 20 hectares	2
3	Between 5 and 10 hectares	3
4	Between 3 and 5 hectares	1
5	Between 2 and 3 hectares	6
6	Between 1 and 2 hectares	8
7	Between 0.5 and 1 hectare	9
8	Between 3000 and 5000 sq.m	2
9	Between 1000 and 3000 sq.m	5
10	Smaller than 1000 sq.m	5



◄ **Diagram 1. Distribution of sites by their area (m2) in La'lvar River's Watershed (Authors, 2018).**

Khorzin Mountains, is actually a small valley with only three points in it, namely “Isa Abad”, “Var and Taighan” and “Khorheh”, having a relatively adequate width to create settlements. And from among these three areas, in Khorheh region located on the east, the river has much favorable conditions (more width of valley, more water, more suitable land, etc.). It is in this region that the site known as Khorheh is formed. This site that today about one hectare of it has been excavated and remains of a columned monument (a pavilion of temple) are exposed (Figure A6) does not have a specific scope, but according to the topography and distribution range of the cultural materials, the least extent that can be estimated for it is 50 hectares. This site should be considered as a central place, like Jam that in addition to a high extent, the existence of a huge monument in it is an indication of this fact.

Classification of Parthian Sites According to Archaeological Evidence

According to the physical structure, Parthian sites of La’lvar region can be divided into four general groups: sites without regular structure and architectural evidence, sites with regular and specific topographic situation containing little evidence of the original nature of the site, sites with architectural structure and natural and semi-natural places used (Table 6, Figure 2).

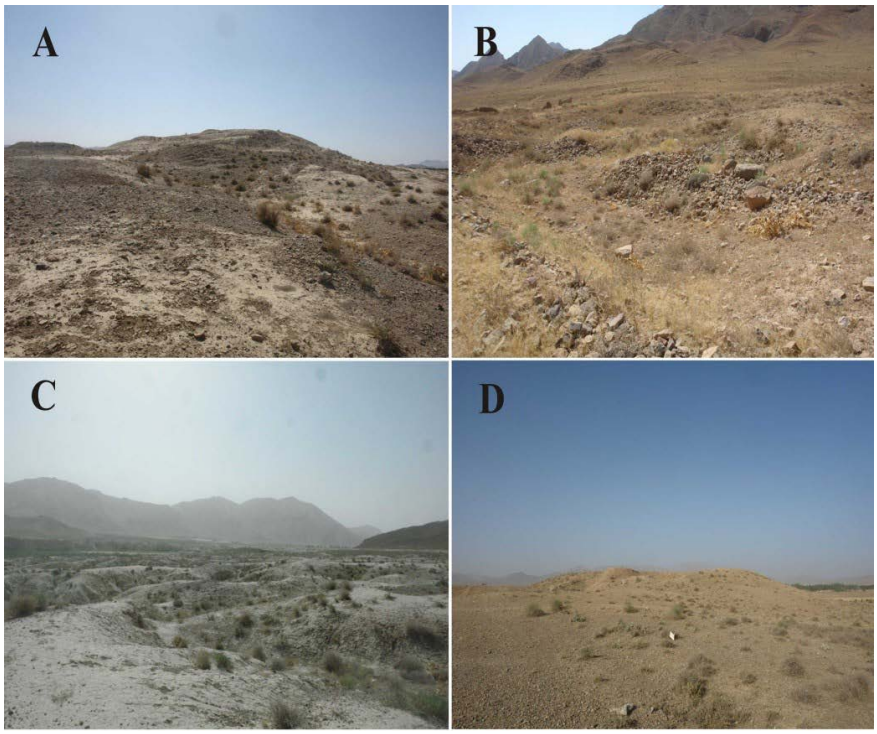


Fig. 5. Examples of Parthian sites in La’lvar r region: Tap-e Jam, Fig. 1), Tap-e Shahriari (Fig. B), Tap-e Mohour Siaha (Fig. C), Tap-e Koupoole Reza (Fig. D) (Alaei Moghadam and Banijamali, 2009). ▶

I. Sites without regular structure and architectural evidence

According to the survey conducted, most of the identified sites in this region are sites without structure and architectural evidence that have an irregular topographic environment and condition, so that it is not possible to observe any regular environment in them even through aerial images. However, it should be noted that the growth and expansion of cities, towns, villages and the development of agricultural lands in most areas have progressed into the arena of the sites, and this has disrupted the topographic order of the site.

II. Sites with regular topographic and specific situation containing little evidence of the original nature of the site

In general, today only five sites have regular topography in the entire area. Of these five sites, four are in the form of relatively circular mounds and one is in the form of a mound with a square environment, which is very similar to the castle mounds in the neighboring areas.

III. Sites with architectural structure

Of the Parthian sites identified, architectural evidence is found only in four sites: Khorheh, Mard Castle, Gabri Castle, and Sangi Castle. Khorheh monument is the remains of a building complex that includes three parts: the main porch (the columned porch), the northern structure that is connected to the main building from the south, this part consists of rooms and corridors that have a large square room considered as a backyard, the western part, which includes a number of rooms and a corridor. The main porch has 12 columns and four half-columns with a square base in two rows, of which only two columns with a height of about 11 meters are still standing. Above the columns are Ionic-style capitals that are shaped like intricate scrolls that are fastened with a ribbon in the middle (Figure 6).

Gabri Castle is a circular mound on top which the remains of an architectural space, including parts of two thick walls with a minimum thickness of 1.7 meters and a maximum thickness of 4 meters are left is seen. According to the angles of these walls, the building in question has been a square-shape building with a side of 20 meters, in which bricks measuring 10 × 44 × 44 cm were used, though a large amount of rubbles are scattered on the surface of this place, which have been most likely materials used in the building in question (Figure C 6). Oghab Castle is also the remains of a castle (?) or a place for observation, located on top of a mountain on the southeastern front of Atash-kouh. This place is severely

damaged. In some points, traces and signs of a stone foundation with limestone mortar are easily visible, and even in the central part, due to unauthorized excavation, the remains of a room have been emerged (Figure D 6). Mard Castle is also a remnant of a historic castle that was rebuilt and used during the Ismaili period. In some parts of this place, located on a cliff that is 200 meters high in the northern mountains of La'lvar valley, there are still traces of walls from the original masonry made of stone and mud bricks of the historical period (Figure B 6).

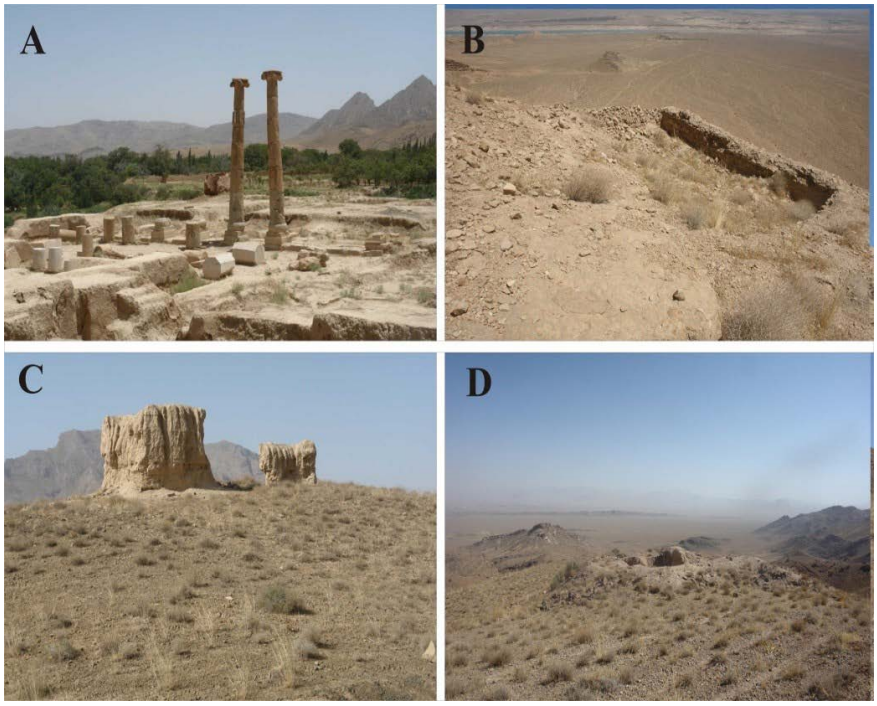


Fig. 6. Sites with architectural monuments (Khorheh building (Fig. A), Mard Castle (Fig. B), Qala Gabri Mound (Fig. C), Oghab Castle (Fig. D) (Alaei Moghadam and Banijamali, 2009). ►

IV. Natural and semi-natural places used

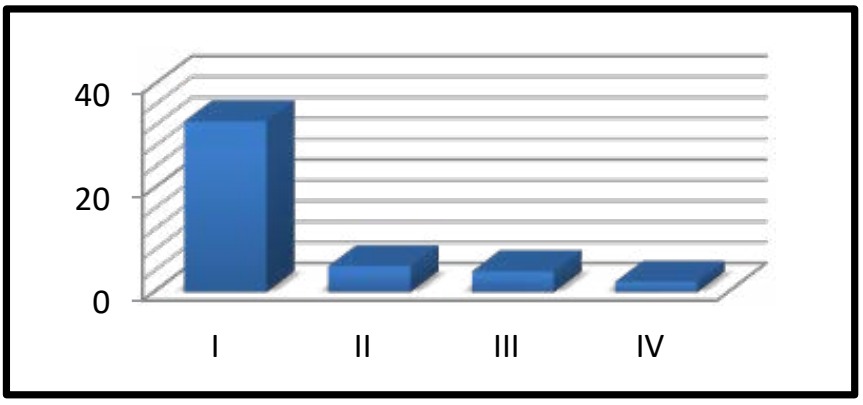
In the study area, at two points of the natural features and structures, settlement evidence of the Parthian period is seen. The first case includes San -eik Cave, which is located in the northern part of the explored area, and the second one includes caves and rocky shelters located in Mount Shah Bolbol in the northern highlands of La'lvar valley that pottery fragments of the Parthian period, scattered inside the site or around its surrounding space, are visible.

The Role of Height and Unevenness in Locating Parthian Settlements:

Laalvar region consists of three parts: the intermountain plain (La'lvar and Khoreh valleys), the northern and southern foothills, and the highlands, which are 1, 400-3, 000 meters above sea level.

Row	Type of site	Frequency
1	sites without regular structure and architectural evidence	33
2	sites with regular and specific topographic situation	5
3	sites with architectural structure	4
4	Natural places	2

◄ Table 6. Structure study of the Parthian sites in La'lvar River's Watershed (Authors, 2018).



◄ Diagram 2. Structural frequency of the Parthian sites in La'lvar River's Watershed (Authors, 2018).

This region has a southwest-northeast slope and according to the measurement conducted, during the archeological survey of the region- except for the highlands and foothills –the south westernmost part of the intermountain plain of La'lvar is about 150 meters higher than the end part. On the other hand, the foothills and pastures have also a relatively steep slope towards the riverbed, sometimes reaching 43 degrees in the northern part.

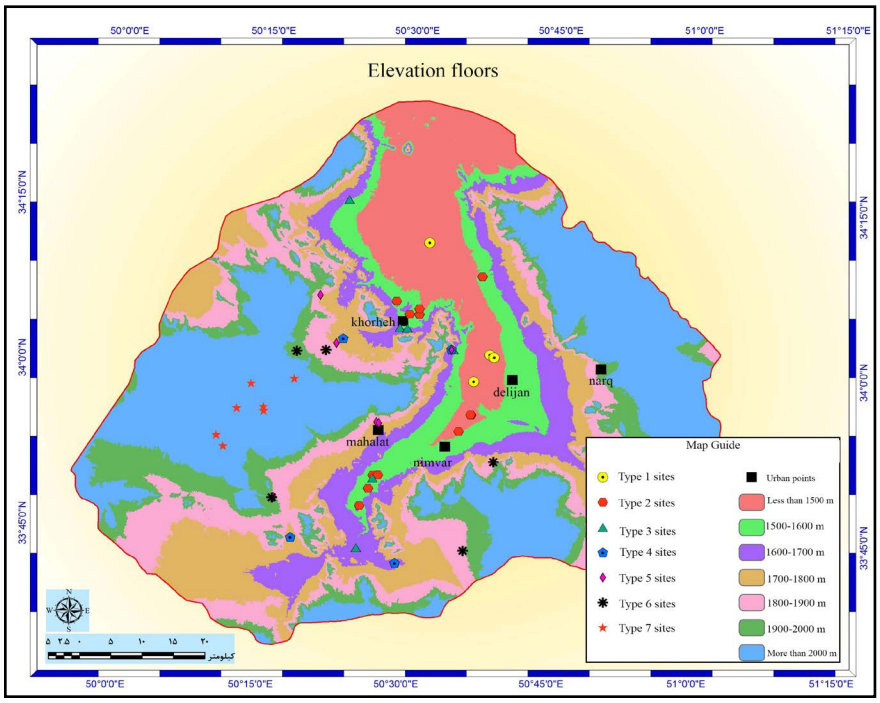
In general, the Parthian sites identified in La'lvar area can be divided into eight different groups according to the unevenness variable (height above sea level) as described in Table 7:

According to the geographical and environmental situation of the study area and the existing natural features, the unevenness groups, listed in Table 6, can be divided into three general categories. The first category, which can be called the riverside areas of La'lvar and the large tributary of Khorheh, includes areas with an altitude of 1450 to 1700 meters that in terms of density, by containing 22 sites, has the largest number of Parthian settlements. The second category includes mountainous areas, including the areas located between the riverside lands and the highlands, with a height range between 1700 and 1900 meters. In these regions, which mostly include the vast pastures of Mahallat city, there are only 10 Parthian sites, including areas with an extent of less than 4 hectares. The third category can

Table 7. Division of the sites identified in La'lvar region according to the unevenness (elevation) variable (height above sea level) (Authors, 2018). ▶

Row	Elevation Range	No. of sites
1	Less than 1500 m	4
2	1500-1600 m	12
3	1600-1700 m	6
4	1700-1800 m	4
5	1800-1900 m	6
6	1900-2000 m	5
7	2000-2200 m	4
8	2200-2400 m	3
9	More than 2400 m	-

be divided into highlands of La'lvar r region, covering areas with an altitude of more than 1900 meters, and can be divided into three levels: relatively high areas, caves and rocky shelters, mountains and peaks. (Map 3).



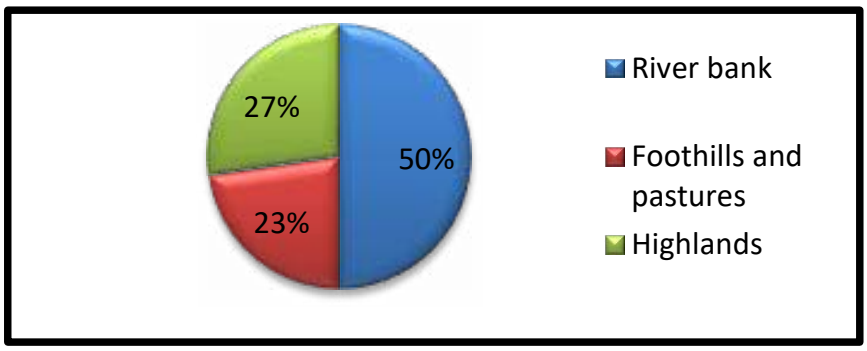
Map 3. Location of the area in unevenness levels (Authors, 2018). ▶

During the survey conducted in the region, 10 sites such as Mard and Oghab castles in relatively high areas and 2 caves with evidence of the Parthian period were identified.

As can be seen in Table 8, fifty percent of the Parthian sites in La'lvar region, including the sites along La'lvar and Khorheh rivers, are located in fertile land, where it is easy to irrigate the land, and they can be considered as the remains of settlements based on agricultural livelihoods. Twenty three percent of Parthian sites are also the sites

Row	Location of Sites		No. of Sites
1	On river margins		22
2	Foothill and pastures		10
3	Highlands	Relatively high	10
		Caves	2
		High mountains and peaks	-

◄ Table 8. Division of sites by unevenness level (Authors, 2018).



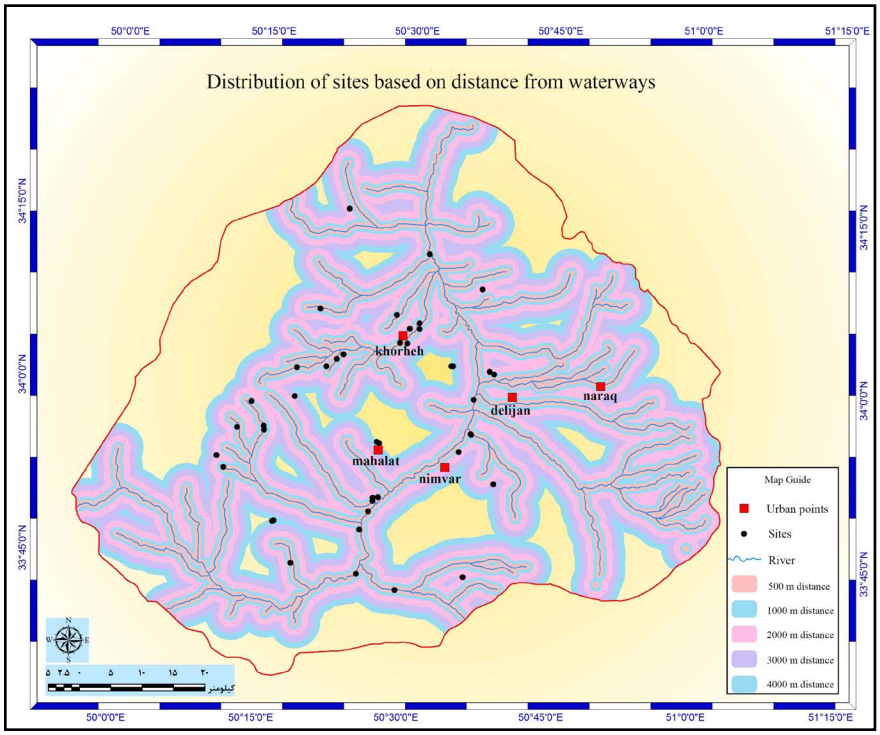
◄ Diagram 3. Frequency of sites in Different geographical parts of Laalvar region (Authors, 2018).

situated on foothills. In terms of location, (i.e. being located in rangelands with seasonal or near-spring tributaries), this site most likely included villages relying on agricultural and livestock life. It is interesting to note that at the present time, the villages in these regions are based on the same way of livelihood. Sites in high areas can also be divided into two categories: those with the remains of castles and military buildings, or those containing evidence of small limited settlements, which have relied on livestock and hunting practices. However, it is not possible to give any precise comment regarding the caves.

The Status of Water Resources in the Formation of Parthian Sites

As mentioned above, water resources in the Laalvar river basin include the main branch of La'lvar River, Khorheh branch, Bazijan, Sefid Darreh, Siah Darreh, Darband Shour and Azna catchments, springs, aqueducts and wells that the two latter cases relate to later settlements. According to the archeological study, it can be stated that most of the settlements in the study area are formed in direct connection with the river. Given the analysis of data from field surveys and the obtained digital maps, it can be argued that 48% of the sites, i.e. 21 cases of the Parthian sites, are located at a distance of 500 meters from rivers (main or subsidiary). Fifteen percent of the sites, amounting to 7 sites, are located at a distance of 500 to 1000 meters from the rivers. In

total, these two categories of sites, in terms of extent, include the largest Parthian sites in the region, about 10 of which are directly situated on the shores of La'lvar, 9 sites are on the banks of Khorheh River and 5 sites are on the banks of Bazijan River. Of the remaining sites, that is 16 Parthian sites, only 5 sites are located between 1, 000 and 2, 000 meters from the river or La'lvar catchment area, and the rest are either affected by big springs in the area, such as Mahallat spring, the hot spring and Chah -Farrokh spring or are constructed on top of mountains and lack any natural water resource like Oghab castle and or Shahneshin castle (Map 4).



Map 4. Distribution of sites according to their distance from waterways (Authors, 2018). ▶

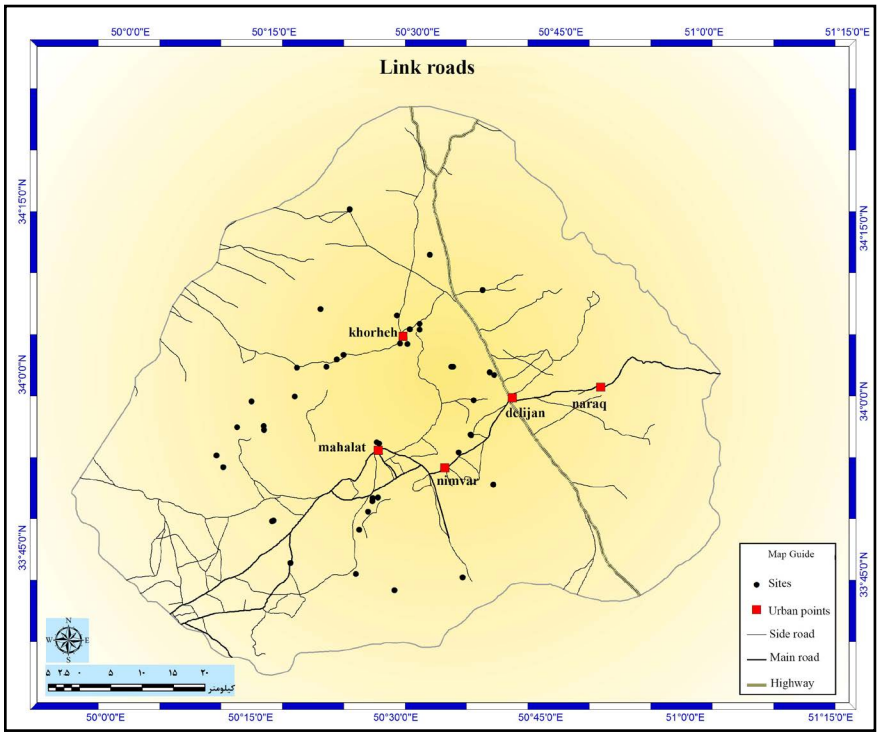
According to what mentioned above, it can be argued that although in terms of quantity, about 65% of the Parthian sites in La'lvar region have been formed along the river and its main catchments, relying on the extent variable of the settlement sites that has a direct relationship with the population of a period, it can be stated that about 85% of the settlement area of the Parthian period have most likely formed by farming communities. Interestingly, this result is also in accordance with to the results of the study on the relationship between settlements and uneven lands and use of land.

The Role of Connecting Routes in Locating the Parthian Sites

Archaeological survey and studies conducted in this region indicate

that over the centuries, the main connecting routes of La'lvar region, including the route connecting Khomein to Delijan and Qom (southwest to northeast along La'lvar river) and the route from Isaabad to Delijan and Qom, which passes through Khorheh (west-east and north of La'lvar region), have not changed very much (Alaei Moghadam and Bani Jamali, 2009). On the other hand, the natural geography of La'lvar catchment basin confirms this finding, so that due to the existence of high mountains that are stretched in two parallel southwest-northeast lines on both sides of La'lvar valley and also because of the valley structure of two main tributaries of Khorheh (east to west) and Bazijan (northwest to southeast), the operational space for connecting route is limited. Therefore, even today, despite the presence of many facilities, due to the existence of these mountains, there is no road connecting this area with Arak, which is located in the west of it; and in order to connect these two points, one must first go to the southwestern part of La'lvar region (the city of Khomein) and then enters the region through the valley path of La'lvar However, changes have been made in the main passing route in the region during the last two centuries, so that the old Qajar road, which was located near the northern front of La'lvar River, is currently directed towards north in the southwestern part about 7 km and on the eastern front it is directed towards the south with a 3 km redirection. With reference to what mentioned earlier, it is highly probable that the connecting and road ways during the historical period were almost in accordance with the old routes and included a main road on the river bank in the southwest-northeast direction, two subsidiary paths of Khorheh road (in the north of the region and with the west-east direction that reached the main road at the southeastern end), Bazijan road (in the west of the region and with a northwest-northeast direction which ended to the main road in southeast end) and several subsidiary rural roads. An overview of the distribution maps of Parthian sites in relation to the roads (which are based on the integration of current routes with the main routes of the past) shows that although it is not very reliable to compare and analyze the sites with reference to the current main road, the ancient and historical road of the region, which was used until the Qajar period, is more referable, and remains of the existing bridges and bridge-dams from different historical and Islamic periods in the region, such as Nimvar (Sassanid) and Hassanabad bridge-dam (Middle to late Islamic period), Bagher Abad Bridge (Safavid and Qajar) and various caravanserais (such as Kahak and Dodehak caravanserai), can confirm this assumption (Map 5). Based on the

above-mentioned issues, it can be stated that more than 22.7% of the sites, which mostly include large Parthian sites in the region, are located along the historical connecting route of La'lvar region. Another 20.5 percent of the Parthian sites are on the margin of Khorheh road and 9 percent are on the margin of the Bazijan road. Of the remaining sites, only 25 can be adapted to the current rural roads, and the other 10 sites, some of which are forts and fortifications, have no significant connection to the recognizable roads.



Map 5. Location of sites in relation to the roads (Authors, 2018). ▶

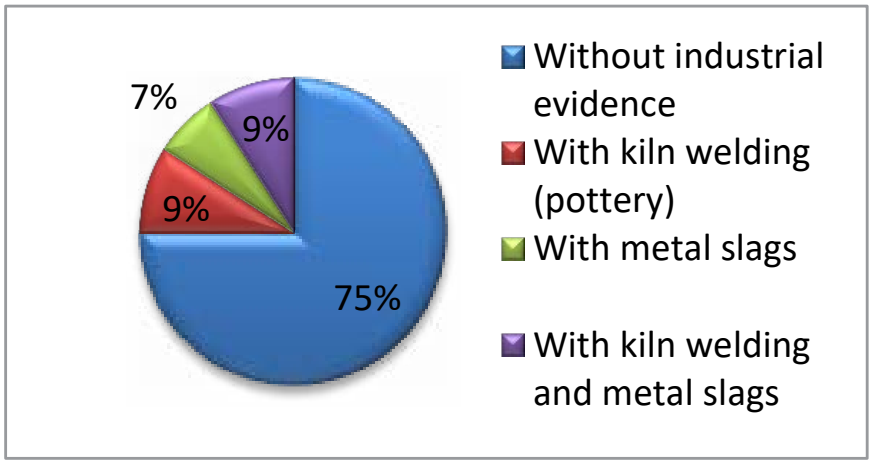
Industrial Evidence in Parthian Sites of La'lvar Basin

According to the studies conducted in the Parthian sites of La'lvar region, only in 11 sites, i.e. 25% of the total sites, evidence of industrial activities including the welding of kilns and metal slags can be observed.

However, sites with industrial evidence are divided into three categories according to the type of surface cultural materials: sites with industrial evidence of pottery, sites with industrial evidence of metal slags, and sites with industrial evidence of metal slags and pottery. On the other hand, based on the surface density level of cultural materials related to industrial activity, Parthian sites can be divided into three groups: non-industrial sites (without surface evidence and data of industrial activities), semi-industrial sites (sites with evidence pf industrial activity in limited points of them) and industrial sites (sites that are small in size and generally have

Row	Type of Site	No.
1	Without industrial evidence	33
2	With kiln welding (pottery)	4
3	With metal slags	3
4	With kiln welding and metal slags	4

◄ Table 9. Classification of the Parthian sites based on the industrial material variable (Authors, 2018).



◄ Diagram 4. Frequency of Parthian sites based on industrial material variable (Authors, 2018).

evidence of industrial activity) (Table 9-Diagram. 4). Accordingly, it can be concluded that the industry (relying on pottery production activities and melting metals) took place during the Parthian period in La'lvar basin or in parts of some large sites such as Jam or Shahriari mounds, or places dedicated to industrial activities have been created during this period that the site in Chah-Farrokh is one of these places (Figure 7).

◄ Fig. 7. Evidence of slag and kiln welding distribution in Parthian sites in La'lvar River's Watershed (Alaei Moghadam and Banijamali, 2009).

Conclusion

As stated at the beginning of this paper, this study seeks to answer the following two fundamental questions in order to reconstruct the status of Parthian period in La'lvar River's Watershed:

1. How has been the settlement period of La'lvar River's Watershed during the Parthian period?

2. What were the factors affecting the settlement patterns and changes in La'lvar River's Watershed during the Parthian period and what effect did these factors have on the changes in settlement patterns during the Parthian period?

Therefore, extensive and systematic studies were conducted in the form of field surveys and settlement analyses based on the preparation of digital maps, each of which was designed separately and continuously to answer the above-said questions.

As mentioned earlier, during the archaeological excavations, 185 archeological sites were identified in La'lvar River catchment basin, each with one or more settlements. Of these sites, 44 archeological sites contain settlement evidence of the Parthian periods, indicating a high population growth in the region compared to previous periods; in other words, the importance of settlement in the region increased and continued in the next period that is, Sassanid era. More than 50 percent of the Parthian sites in the region are located in lowlands of La'lvar, Bazijan, and Khoreh rivers, and 10 percent, despite being located on foothills and rangelands, given the existence of springs, have limited agricultural potential along with animal husbandry, although this lifestyle has extensively been observed in these areas for decades. In terms of area (extent), most large sites are located on the margins of rivers, and as the unevenness and distance from fertile lands increase, not only the number of sites decreases, but also their size significantly reduces. On the other hand, according to a study on the location of the region's historical routes, it is found that more than half of the region's sites, including the largest ones, are located near these routes, and there is no more than 3 hectare site which is formed at a farther distance from these routes.

According to what discussed above, it can be concluded that the region was more increasingly considered and occupied by a considerable population in the Parthian period, due to its favorable environmental conditions, especially the flowing of high-water river of La'lvar and two sub-rivers, namely, Khorheh and Bazijan, as wells as the existence of numerous springs, suitable and fertile land, rich pastures and abundant hunting opportunities. A population that according to the studies relied more on agricultural livelihoods than anything else, so that in locating their settlements, on the one hand, they not only established settlements along the margins of the main river and its two tributaries, but also in the same place, they paid their full attention to the topographic condition of the land, its slope

and quality. Hence, they established large settlements in a place along the river margin (in places where the river path turns and water can flow easily by simply digging creeks). In this way they made it possible to irrigate the fields easily and also to provide fertile soil. Agriculture in the region has become so important that even in later periods, in order to extend its domain, they started to control the water by building Nimvar Dam. However, it should be noted that animal husbandry has been also one of the livelihood methods of the region, which can be considered very important because in many places, the inhabitants of the Parthian period of the region in their locating practices paid more attention to having access to pastures and foothills with forage plants, rather than paying attention to the main river, and since the area in question has abundant springs, they enjoyed great freedom of action in doing so. Another livelihood method that has always been considered in the region is hunting, so that the study area, even now, is one of the most famous hunting grounds in the Central Plateau of Iran, and evidence of private hunting grounds from the Qajar period have still survived in it. Some of the region's Parthian sites on the foothills and highlands can be considered as places whose inhabitants engaged in hunting more than any other livelihood practice. Finding the remains of several metal arrowheads in these regions is a testament to this claim.

Regarding the settlement pattern of the region in the Parthian period, although it is easy to imagine a longitudinal structure for the region with reference to rivers and catchments, the status of uneven lands in the region has created an interesting situation in the division of settlement areas: The interconnected mountains north of La'lvar valley, as a wall, have separated the northern part, Khorheh region, from the main area, La'lvar plain, and their only connecting way is through a place where Khorheh river joins La'lvar river in the northeast. This made the communication between the two regions difficult and also caused more difficulties in monitoring this region due to movement restrictions in ancient times. Most likely, this has led to the creation of two central locations in the region, one in the main area of La'lvar and another in Khorheh valley. The main area, i.e. La'lvar valley, by containing 23 sites that are directly or indirectly affected by La'lvar river, has the highest density in the region, where an extensive site such as Tap-e Jam can be considered as the central place. A place that on the one hand, is located on the best margin of La'lvar River, and on the other hand, its location (being situated in the center of the region and also on the edge of the historical road) is in such a way that it can be accessed from all

satellite sites. The northern region, i.e. Khorheh valley, which has a direct connection problem with the central part, is very likely to have a relatively independent settlement structure that has formed by having a minimum area of 50 hectares, with the centrality of Khorheh site. It is possible that the region may have been ruled by a powerful ruler or lord independent of the central part, where the remains of a huge (possibly governmental-religious) monument indicate the importance of this area in the political structure of the region. However, there is another possibility that the ruler of the central region may have been the same ruler or lord of Khorheh area, who had a residence and governance place in both regions. Investigating these possibilities requires scientific research in large Parthian sites such as Jam, Mohour Siaha, and Ham Raz, which is hoped to be conducted in the near future.

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