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Analysis of Neolithic Chipped Stones of South Lut and their Comparative Study with Southern Zagros Industries

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(111-132)

Abstract

Artifacts recovered from the Bam surface survey and Tal Atashi excavations, as well as Kerman's discoveries, have sometimes been compared to the Neolithic industries of Balochistan, Pakistan, and have sometimes been described as having local characteristics. In this article, we analyze the artifacts mentioned with the samples found in the South Zagros according to the three variables of raw material, technology and typology. The ancient sites of the South Lut and the South Zagros have followed the same pattern in choosing the type of raw material and how to access it, from the beginning of the Neolithic (aceramic) to the pottery Neolithic. The raw materials were generally local. According to studies, chert and flint were the most important and andesite, sandstone and limestone were the least used raw materials. Bullet cores have been documented in most areas. These cores are few at Tal Atashi, Darestan and Ashkaft Haji Bahrami (Aceramic Neolithic), but at Rahmatabad, Mushki and Hormangan they are relatively numerous. Bullet cores became insignificant from the middle of the Mushki Period, and their numbers declined during the Jari Period. The frequency of geometrics in the Fars region, from the beginning of the Neolithic to the Jari period, has fluctuations in shapes such as backed crescent and trapezoid. Crescent geometrics were one of the most important tools at Tepe Yahya and Tal Atashi across all phases of Neolithic in Fars province. The production process of sickle blades in Yahya was increasing whereas at Tal Atashi, it decreased over the same interval. The frequency of these tools was high at Rahmatabad, and low during the Mushki and Jari periods. This trend may be related to the technological developments of stone artifacts and changes in the type of economy during the Neolithic.

Keywords: Stone Artifacts, Neolithic, South Lut, South Zagros, Tal Atashi, Darestan.

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Introduction and research background

The importance of stone artefacts in archaeological studies is found both in terms of their durability and in terms of providing extensive information about their methods of production, distribution, use, and disposal. The study and analysis of these collections also provides information on the search for and selection of raw materials. On this basis we can discern the level of complexity of the production technique, typological diversity, and regional and trans-regional similarities. Neolithic stone tools are more important than the older and younger periods because of the changes in the livelihoods and social structure of Neolithic communities.

We have Neolithic chipped stone evidence from most parts of Iran (Bigleri, 2002; Fazeli Nashli et al., 2002; Masuda et al., 2013). But we should admit that in western Iran and the Zagros, which has been introduced as the eastern flank of the Fertile Crescent (Kozlowski, 1999), studies in the field of Neolithic stone artefacts have a long history and there are many reports in this field (Neely, 1969; Zeidi & Conard, 2013; Hole, 1994; Nishiaki, 2016; Nishiaki & Darabi, 2018; Hildebrand, 1996). However, the number of Neolithic archaeological studies in the eastern parts of Iran is small (Map 1). We have an incomplete picture of such research in the mentioned areas. The geographical area of Kerman, which is located between the last eastern stretches of the Zagros and Baluchistan of Pakistan, is naturally described as such, and therefore any new information obtained about its Neolithic will be important. Recently, Kerman Neolithic stone industries have been compared with similar industries in Baluchistan, Pakistan, and it has been concluded that Neolithic tools of these two regions, while having general similarities, have local characteristics and traditions (Jayez, 1394, Jayez and Garazhian, 1397). Our aim in this study is to evaluate and compare the findings of the South Lut and Kerman researches with the Neolithic data of the southern parts of the Zagros and the Fars plains (Map 2). In fact, in order to complete the previous studies, we look to the South Zagros, where a large number of Neolithic sites with a set of stone artefacts have been introduced.

Until about a decade ago, the southern Lut region had never been considered because of its remoteness from major Neolithic centre. The area has also been only sparsely visited by archaeologists (Hanslen, 1974; Caldwell, 1967; Adle, 2005). Also, no site was excavated. However, in the last one or two decades, it has a special place in the field of Neolithic studies. Archaeological research in the Darestan began in 2007 under the supervision of Omran Garazhian. Then, Tal Atashi and a number of other sites were excavated (Garazhian and Rahmati, 2012; Garazhian, 2008; Garazhian, 2009). Kerman, which is located in the western part of southern Lut, has a more well-known archaeological background. There, during the last 60 years, several researches have been done (for more information, see: Shakuie, 1389; Pricket, 1986). Of course, the contribution of Neolithic archaeology to these studies has been small. In the lower layers of Tepe Yahya (Lamberg-Karlovsky et al., 1986), Tel Iblis (Caldwell, 1967), Gas Tavileh Tepe (Pricket, 1986) and Gavokshi (Soleimani Alidadi and Fazeli Nashli, 1397), evidence from the Neolithic period has been obtained. If we want to number the study of Neolithic stone artifacts from the total of the aforementioned research, the number of projects will not exceed the fingers

of one hand. The only descriptive and analytical report obtained from the excavation is the studies of Marcello Piperno on the stone artifacts of Tepe Yahya (Piperno, 1973). Although Neolithic sites have been mentioned in a number of archaeological reports (Khosrozadeh, 2004; 2005; Sajjadi, 1987; Sajjadi & Wright, 1990), stone artifacts are only well-documented at Kuhbanan (Hukcriede, 1962) and Fahraj (Henzlen, 1974). Meanwhile, the South Zagros is in a much better position than the South Lut and Kerman in terms of the number of Neolithic sites, survey reports, and analysis of the stone industry. The first steps to study Neolithic sites in the South Zagros was by Louis Vandenberg in the Kur River Basin in 1950 (Vanden Berghe, 1952, 1954). His studies were then followed by William Sumner (Sumner, 1977). Important sites such as Haji Bahrami rock shelter and Hormangan (Khanipour and Niknami, 1397) were explored. In addition, review excavations have been carried out in some areas, such as at Mushki (Alizadeh, 2004, 2006).

Materials and research methods

Stone artifacts discovered from the sites selected for comparative study include Haji Bahrami Caves 1 and 2 in Tang-e Bolaghi, Rahmatabad, Mushki, Hormangan, and Jari, i.e., the most significant excavated sites in the South Zagros. In Southern Lut and Kerman, Tal Atashi and Tepe Yahya have a similar situation. In what follows, the data obtained from the studies of Darestan [Southern Lut] and Kuhbanan [Kerman] will be used for analysis. The chronological relations and technological characteristics of Fars Neolithic stone industries with the traditions of the Middle and Western Zagros will also be evaluated. Therefore, the Fars Neolithic has been considered in the Zagros tradition. Although comparisons of archaeological data between Kerman and Fars have been made by archaeologists (Weeks, 2010; Caldwell, 1968; Mutin, 2012; Petrie, 2012), these comparisons are often made on topics such as pottery and related traditions, and have not been made on Neolithic chipped stone.

In the rest of this research, while presenting a picture of the formation of Neolithic stone industries in the southern Lut, with emphasis on the findings of the Tall Atashi, we perform a comparative study of stone artifacts from Fars and Kerman. This study is based on alignment with the theory of Neolithic delay in the eastern and south-eastern regions of Iran. We will analyse the relevant stone tools based on characteristics such as raw material, technology and typology of formal tools. Of course, in order to perform this comparative analysis, it is necessary to pay attention to the following facts: first, the Neolithic data of Kerman are limited to the findings of excavation of Tal Atashi and Tepe Yahya and the data of comprehensive surveys of Darestan, Kuhbanan and Fahraj. Although these data are suitable for drawing a picture of the Neolithic situation in this area and to understand the technologies of stone tools, but they will not be enough for comprehensive studies. Second, chronological sequences from the Pre-Pottery to Pottery Neolithic have not been reported in either of the two excavated sites. Therefore, a detailed study of the transition period of the two mentioned cultures is not possible at present. Third, although there is a relative correlation between the beginning of the Neolithic period of Tepe Yahya and the Neolithic of Fars (Beale & Lamberg-Karlovsky, 1986), the chronology of Tall Atashi shows that Neolithic in this region began about two millennia later than in Fars. Of

course, this issue has similarities, for example, in the record from Tapeh Sang-e Chakhmaq [Shahroud] in north-eastern Iran, where a slight delay has been reported compared to the Zagros (Roustaei et al., 2015).

Most studies in the eastern and south-eastern regions of Iran have studied the issue of delay through the Pottery Neolithic period and less attention has been paid to this issue through Aceramic Neolithic (Mutin, 2012; Weeks, 2010). Again, for example, the comparison of the Neolithic layers of Tepe Yahya and Iblis to Mehrgarh is an example of such a study (Petrie, 2011; Petrie & Weeks, 2019; Weeks, 2013). Archaeologists have always spoken about this delay. Some archaeologists in Pakistan's Baluchistan Basin have ignored Carbon-14 chronologies to justify the time difference (Jarrige, 1984). Joseph Caldwell, while accepting the precedence and delay of cultural progress in the Iranian plateau, divided it into the western plateau (i.e., the western lands of the Zagros Mountains) and the eastern plateau (i.e., the southern part of the Alborz Mountains, the southern and south-eastern lands of the Zagros Mountains, and the margins of the Lut plain and salt desert). Caldwell said that early sedentary agriculture and animal husbandry on the Western Plateau began more than a thousand years later than in Mesopotamia, Anatolia, the Levant, and Turkmenistan. The Eastern Plateau of Iran also achieved these cultural developments about a thousand years later than the Western Plateau of Iran. He called a large part of the eastern plateau of Iran Kerman province (Caldwell, 1967: 25). The latest study (Petrie & Weeks, 2018), which also refers to the Tall Atashi and the Kerman region, attributes the reason for this delay to geographical factors. The authors of this article, despite the aforementioned research issues, which is due to lack of information in the field of the Southern Lut Neolithic, have shown that the possibility of comparative study of Southern Lut Neolithic findings with Kerman and Fars data will be a major step forward in the analysis of the Neolithic stone industries of the eastern Iranian Plateau.

Analytical description of the findings

The first findings of Kerman region are Kuhbanan assemblage, which was first introduced as an industry based on microlith production and was attributed to the Middle Stone Age. The assemblage was also associated with the Natufian industry (Huckriede, 1962). Then, Lamberg-Karlovsky evaluated them as similar to Yahya Neolithic industry (Lamberg-Karlovsky, 1970). Backed blades, geometric microliths, scrapers, perforators and drills are reported in the formal tools group of this collection. In recent years, Mozhgan Jayez has acknowledged that Huckriede may have made a mistake in attributing the Kuhbanan industry to the Middle Stone Age. She referred to the core from which small blades had been removed by the pressure technique. The parallel ridges on the blades and the presence of polished traces on many of them indicate standardization in production, which emphasizes the Neolithic character of the Kuhbanan assemblage (Jayez, 2017).

The main feature of the Yahya Neolithic stone industries is blade production. Due to the presence of almost regular bladelet cores as well as blades/bladelets with parallel edges in Yahya VC, the use of pressure technique in the production of fine blades can be cautiously considered for Tepe Yahya. Formal tools include sickle blades, notched-denticulated blade and a small number of burin and end-scrapers. Geometrics are also present in the Yahya

Neolithic layers but gradually disappear in the higher layers. These artifacts are made of flint stone and a small number of obsidian. Obsidian instruments were imported as manufactured goods in older periods, but were produced in site in more recent periods (Piperno, 1973).

Systematic study of the B1 area in Darestan, has led to the identification and documentation of tools related to pottery Neolithic in this area (Garazhian, 2008). Finds show that the stone industry of this area was based on the production of bladelets. Flakes and chips that were made in the process of producing bladelets are very common. Bladelet cores, which are probably the product of the pressure technique, is also significantly present in the collection. Of course, it seems that the indirect percussion technique was still used in producing the blades. The blades were also removed in this method by an indirect blow in the early phases and when the cores had larger dimensions. It seems that in the continuation of the process, as the dimensions of the core became smaller, bladelets were removed using the pressure technique. As a result, the formal tools of this area include a large number of geometric microliths that were made not by retouching but by fracture (Jayez and Garazhian, 1397)

Chipped stone from systematic sampling (Shakuie, 2010; Shakuie & Garazhian, 2013) and excavations at Tall Atashi (Jayez, 1394; Jayez and Garazhian, 1392; Jayez & Garazhian, 2013) indicate the industrial prevalence based on the production of bladelets in this area. In addition, blades, crescent-shaped microliths, and notched-denticulated flakes are very common. The shine on some of these specimens confirms their use as sickle blades. Scrapers, burin and drills are also available in small numbers in the collection. As a result, the familiarity of instrument makers with the pressure technique is confirmed by studying a number of cores from which bladelets has been extracted. Of course, most bladelet core does not have a parallel and regular shape due to the use of indirect impact. This issue shows that the pressure technique was not widespread in the Tall Atashi (Jayez and Garazhian, 1397). In the collection of Tall Atashi, despite the existence of a few tools whose raw material is andesite and sandstone, the raw material of most tools is local material.

The oldest Neolithic chipped stone of the South Zagros region has been collected from the excavations of Ashkaft Haji Bahrami 1 and 2. At Ashkaft Haji Bahrami five settlement phases have been identified: Epipaleolithic (phases one and two), beginning of the Neolithic (phases three and four) and the final phase of the proto-Neolithic or Aceramic Neolithic (phase five). The raw material of the artifacts is a variety of flint. The first signs of using the pressure technique are seen in phase three, but at this time the cores did not yet have a standard shape. Backed bladelets, thumbnail, side and round scrapers as well as a small number of trapezoidal geometric microliths are present in the Neolithic assemblage. The use of the pressure technique became more advanced and pervasive during the fourth phase, and gradually, bullet-like cores emerged, albeit in less abundance. The technique of pressure and production of crescent and trapezoidal microlith was still the same as in the previous phase during phase five. Also in this phase, as in phase four, the blades and chips were produced by indirect impact, but the micro-blades were produced using the pressure technique. The presence of scrapers and a small number of arrowheads is also recorded in the collection (Tsuneki, 2013).

The Aceramic Neolithic at Tepe Rahmatabad dates from the late eighth millennium BCE to the middle of the seventh millennium BCE (Azizi Kharanaghi et al., 2013). This phase is the continuation of the final phase of the beginning of the Neolithic period of Haji Bahrami 1 and 2 in Tang-e Bolaghi. The chipped stone found in Rahmatabad is mostly made of local chert and a small amount of obsidian and limestone. Cores show the removal of regular blade/lets with the pressure technique. The presence of very small bullet cores in this collection shows the development of pressure technique and its standardization. Scrapers that were abundant in Eshkafte Haji Bahrami are rare here, but sickle blades are an important part of the collection. The existence of these blades in the Neolithic sequence of Fars has been confirmed in the pre pottery phase of Rahmatabad. Also, micro burin technique has been used in making backed blade/lets (Nishiaki et al., 2013). The pattern of raw material use in the first layer of Rahmatabad is basalt-based, which is also called the Mushki formative period, is quite similar to the previous period. The presence of standard bullet cores, the prevalence of the pressure technique, and the reproduction of crescents, trapezoids, and scrapers have been reported during this period. At the same time, sickle blades were still an important part of formal tools (Abe & Azizi Kharanaghi, 2014).

During the Mushki period, the raw materials are flint and a limited number are obsidian. No obsidian cores were excavated from the site, but the site yielded obsidian blades, flakes and retouched tools. Sickle blades and scrapers are moderately present and no burins have been reported in the collection (Furuyama, 1983). It seems that the importance of bullet cores has diminished and they constitute only 30% of the total cores (Nishiaki et al., 2013). Also, a large number of geometric microliths have been recorded in the collection, and it has been suggested that their application must be analyzed along with zoological data (Abe, 2011).

With the exception of a single thin blade of obsidian, the rest of the raw material in Hormangan is from a local chert. The stone industry of this site is based on the production of blades made using the pressure technique. In the production process, this pressure technique continues so long that only a very small bullet core remains. This maximum usage can be considered as a sign of the advancement in pressure technique. From this area, a large number of backed and geometric microliths have been discovered which have been attributed to being hunting tools. Of course, the large number of hunting tools, along with the medium number of sickle blades, is considered as a sign of the importance of hunting over agricultural activity (Abe & Khanipour, 2019). Unlike Hormangan, the raw materials of the Jari period (late seventh millennium BCE) were of chert, tuff, and rarely, limestone. The number of bladelet cores is greater and generally after producing pressure blades, the flakes were produced in the next phase using a hard hammer (Nishiaki et. al, 2013). The stone industry of this period was based on the production of blades. The use of bullet cores and the production of backed bladelets were significantly reduced. The frequency of sickle blades increased and geometrics decreased (Hori, 1989).

In what follows we will analyze the common features and differences of the South Lut, Kerman and South Zagros assemblages based on the three variables of raw material, technology and typology. The type of raw material and

the methods of access show almost the same pattern in all the studied areas. The raw material was generally local. Obsidian was the only raw material that probably came from distant lands. The first presence of obsidian in the southern Zagros has been reported in the pre-pottery layer of Rahmatabad in the form of small blades and through the Pottery Neolithic in the form of cores (Abe & Azizi Kharanaghi, 2014). In the southern Lut and Kerman, notwithstanding the surface assemblage of Kuhbanan, obsidian has been reported only at Tepe Yahya, albeit in very small quantities. Also, an obsidian backed bladelet was reported in Yahya VII (in the form of finished tools), though no obsidian core has been discovered at Yahya and out of the ten obsidian specimens discovered, seven belong to Yahya V. The discovery of evidence of obsidian retouching in Yahya V is perhaps a sign of the introduction of unworked obsidian which were worked on site (Lamberg-Karlovsky et al., 1986). Local chert and flint are abundant and andesite, sandstone and limestone were rarely used. Limestone that has been discovered from the Pre-Pottery and Pottery Neolithic layers of Rahmatabad are all unretouched flakes. The absence of limestone cores suggests that those flakes were produced in the process of the manufacture or maintenance of limestone ground-stone tools which often involved flaking prior to grinding (Nishiaki et al., 2013). Limestone at Jari B was also used to make ground-stone and unretouched flakes (Nishiaki, 2013). From Tal Atashi, only andesite and sandstone tools have been recovered, but no core of this type of rock has been obtained (Jayez, 1394). In all of the areas described, a better raw material was used to produce the blade/lets and formal tools, and a lower substandard material was used to make unretouched flakes. As a result, the technique of making tools for substandard raw materials has been impact, not pressure.

What brings the Neolithic sites of the Southern Lut, Kerman and the South Zagros closer together are the characteristics and variables of the second (technology of production of fine blades and stone artifacts) and third domains (typology of formal tools). The use of pressure flaking, which is one of the most important factors in differentiating the Neolithic from the Epipalolithic era can be seen in these areas (Olszewski, 1996). Chronological factors are found among the formal tools of the South Zagros; for example, the microliths, backed, scrapers, and notched-denticulated. these are among the formal tools of the Epipalelitic (Zarzi) Zagros, which have continued until the Neolithic period. Stefan Kozlowski introduces the microlith in early Neolithic sites as a sign of the continuation of the Zarzi tradition (Kozlowski, 1994), but the most important sign of the distinction between Zarzi and the Neolithic is the use of a pressure technique (regular, thin blade/let from bullet core).

One of reflection of the technology of Zarzi are single platform cores and pyramidal forms and they are not necessarily highly standardized or regular in appearance. In their exhausted state although there are some examples of well fashioned pyramidal bladelet cores, the pressure technique is absent (Kozlowski, 1996). But through the Neolithic period, cores were multidirectional, regular and reflect the emphasis on balde/let production. They show some standardization and yielding bullet cores. Of course, recognizing the prevalence of pressure technique requires recognizing other factors such as crested blades and core tablet (Pelegrin, 2012). The prevalence of this technique in the Southern Lut has been studied and

has been identified based on the similarity of tools related to the samples found in Balochistan, Pakistan (Jayez and Garazhian, 1397). Therefore, it seems that the pressure technique at Tal Atashi was used in the early phases because bullet cores in this site are less common than unidirectional pyramidal and conical cores. Discovery of a bullet core in the highest layer in the first season of excavation of Tal Atashi and a number of others in a pottery Neolithic site adjacent to the Tal Atashi (Jayez and Shakuie, 1396; Jayez and Garazhian, 1397), indicate the evolution of pressure technique from pre-pottery neolithic to pottery neolithic in south Lut. This technique has been common in all Neolithic areas of the South Zagros. In phases four (onset of Neolithic) and five (Pre-Pottery Neolithic) at Eshkafat Haji Bahrami, the initial process of using this technique is documented in some finds (Tsuneki et al., 2007). Although bullet cores discovered from Rahmatabad, Hormangan, and Mushki are very small exhausted cores, the evolution of the pressure technique has not been a very complex situation in these areas. It is likely that the decline of this technique began during the Neolithic period, when only 30% of the bladelet cores in this area were bullet-shaped (Nishiaki et al., 2013). This trend declined in the Neolithic layers of Jari B (during the first half of the sixth millennium BCE) and the number of bullet cores (Figure 1) decreased significantly (Nishiaki, 2013). Formal tools discovered from most of these sites can be divided to eight main groups: 1) Geometric microliths, 2) sickle blades, 3) scrapers, 4) perforators, 5) notched-denticulated flakes, 6) backed flakes, 7) arrowheads, and 8) burins and truncated blades. In the continuation of this analytical description of the findings, we will make a comparative analysis of some of these tools (Table 1).

Discussion

Although geometric microliths were obtained in small numbers from phase three in Eshkaft Haji Bahrami (Proto-Neolithic), but from phase five, we see their significant presence in the form of crescents and trapezoids (Tsuneki et al., 2007). The abundance of microliths in varied across sites in Fars, but their production continued until Jari B. Microliths have not been reported from the Pre-Pottery layer of Rahmatabad, however, they do comprise a small percentage of the chipped stone assemblage during the Pottery Neolithic (Nishiaki et al., 2013; Abe & Azizi Kharanaghi, 2014). Significant increases in the number of microliths have been reported in Mushki and Hormangan (Abe, 2011; Abe & Khanipour, 2019). In Tal Jari B, however, we encounter only a few of them in the form of simple trapezoids.

Geometrics from Tal Atashi are an important group of formal tools. Of course, their production method was different from the geometrics discovered from Fars during the Neolithic such as at Rahmatabad, which were often made using the micro-burin technique (Abe & Azizi Kharanaghi, 2014). Microliths at Tal Atashi were obtained by fracturing regular bladelets (Jayez, 2015). Also, four crescent, two triangular, and one trapezoidal microliths were obtained from Yahya VI and VC and completely disappeared in the higher layers, especially Yahya IV. Yahya crescents are classified into two groups including simple crescents (microlith subset) and Backed crescents (sickle subset). The crescent-shaped backed flakes discovered from the lowest layers of Yahya gradually lost their crescent shape over the Post-Neolithic periods (Piperno, 1973). Crescents, which

are considered to be one of the most important tools at Tal Atashi and Yahya, had a high frequency in the Neolithic areas of Fars. Also, these tools have been reported from the second phase in Eshkaft Haji Bahrami (Late Zarzian) and their production has continued in the next phases, although with less frequency (Ohnuma, 2008). In Rahmatabad, in addition to the widespread use of the pressure technique, the backed microliths also comprise a large component of formal tools (Nishiaki et al., 2013). Accordingly, technological similarities between South Zagros and South Lut can be examined. In addition, we know that the production of backed (Figure 2) was a continuous process in the Mushki and Hormangan, but their importance was greatly reduced in the Jari B (Abe, 2011; Abe & Khanipour, 2019; Nishiaki, 2013).

Although many microliths and backed were used as sickles, longer blades (with luster) were also made, which were usually truncated blade or notched-denticulated and we should therefore place them in a separate group of sickles (Figure 3). Thus, sickle blades are another important type of formal tool for Neolithic analysis in southern and southeastern Iran. These blades are few in the lower layers Tal Atashi and have not been seen at all in the upper layers (Jayez, 2015). They appeared in more recent periods in Yahya (e.g., layers of the V period) not in a crescent-shaped and backed form but in a notched-denticulated form. luster is reported to be one of the oldest periods of Yahya, but its number gradually increased so that their number doubled in John IV; This seems to be a sign of the importance of agriculture or population growth (Piperno, 1973). Luster is not recorded at the beginning of the Fars Neolithic sequence (in Ashkaft Haji Bahrami) (Tsuneki et al., 2007), but this is an important part of the chipped stones assemblage in Tepe Rahmatabad, and from the pre-pottery to pottery layer. Their number increased (Abe & Azizi Kharanaghi, 2014). Although the production of sickle blades was still important in the Mushki and Hormangan assemblages, we encounter a decrease in their number relative to microliths (Abe & Khanipour, 2019). In Jari B, however, the number of sickle blades has increased dramatically (Nishiaki, 2013). It can now be concluded that in both the southern Lut and Kerman, as well as in Fars, during the Rahmatabad period, the frequency of agricultural tools such as sickles was higher, but during the Mushki period (probably simultaneously with the drought and the climatic event of 8200 years ago) has been less and hunting tools have increased. The production of such tools increased from the Jari period, which was the transition period from 8.2 ka event[5] and the beginning of irrigation agriculture. Their deficiency in Tall Atashi and Darestan can also be analyzed and evaluated with the environmental perspective of this region.

In the early phases of Neolithic in the Fars area, we see the increasing presence of scrapers, especially in small sizes that are indicative of the Zarzi period (Tsuneki et al., 2007), but their overall number declined in later Neolithic periods. This change can also be seen in the typology of the tools, so that the thumbnail scrapers disappeared and the production of side and end scraper continued until the end of the period. The number of scrapers at Tal Atashi (Jayez,

[5] The 8.2 ka event is a pan-global abrupt cooling and drying event, which occurred between ca. 6200 BCE and ca. 6000 BCE. Recent paleo-environmental studies reveal that the cold and dry climate had already started around ca. 6600 BCE (8.6 ka event) (Abe & Khanipour, 2019).

1394), the Pre-Pottery layer of Rahmatabad (Nishiaki et al., 2013) and Hormangan (Abe & Khanipour, 2019) constitute about 5% of the total formal tools, however, their number reached 13% of all tools during the Pottery Neolithic layer at Rahmatabad (Abe & Azizi Kharanaghi, 2014). The number of scrapers in Tepe Yahya (Piperno, 1973), Mushki (Fukai et al., 1973) and Jari (Nishiaki, 2013) has been decreasing from older to newer layers. Therefore, the frequency of scrapers in most areas of the southern Lut and South Zagros regions (Kerman and Fars), with the exception of Rahmatabad, has been declining. This is an important indicator of technological developments during cultural processes, of course with different chronologies and similar sequences in the two regions of the South Zagros and southern Lut.

Conclusion

Based on what has been presented and discussed, there are many similarities between the collections of Neolithic stone artifacts in the southern Lut, Kerman and Fars regions. It seems that the Neolithic cannot be called a period for such studies because this term has a time burden in archaeology and chronological differences between the two regions will prevent the use of comparative methods. However, this comparative study has helped to provide a descriptive and analytical, albeit preliminary, examination of a collection of Neolithic chipped stone artifacts from the southern Lut. Investigation of raw materials in the study areas indicates that they are local and were collected from the surrounding areas. In the lower and upper layers of the Neolithic at most prehistoric sites, evidence of obsidian and obsidian artifacts has been obtained, albeit in small quantities. Access to obsidian in Kerman (Kuhbanan and Tepe Yahya) came a little later than in Fars and no examples of it have been discovered at Tal Atashi. This is exactly what indicates local raw materials and the exploitation of ecological resources. The use of pressure technique in the production of blade/lets, which is the distinguishing indicator of the Epipaleolithic from the Neolithic, has been observed in most areas. This technique appeared later in the Lut basin and Kerman than in Fars. The very small amount of bullet cores at Tal Atashi and the not-so-complex evolution of the pressure technique at Tepe B1 in Darestan are evidence of this claim.

Significant types such as microliths, backed flakes, sickle blades, and scrapers were produced in all areas with only slight technological differences. An important result obtained from the evaluation of microliths, backed and sickle blades is the analysis of the economic livelihood of the study areas in different phases of the Neolithic. Their application in simultaneous periods with Rahmatabad, Mushki and Jari can be considered in the form of primary agricultural tools, hunting-gathering, and re-irrigation-based agriculture, respectively. In this article, we habe used the term southern Lut to refer to the eastern part of Kerman, which until a decade or two ago had no information about its Neolithic phase. The current data have been used to draw a basic image of the Neolithic cultures in this region and a comparative study with Neolithic data of Kerman and Fars. Thus, this article represents the first time that the similarities and differences between the technologies and typologies of the chipped stone assemblages of the mentioned areas have been studied and analysed.

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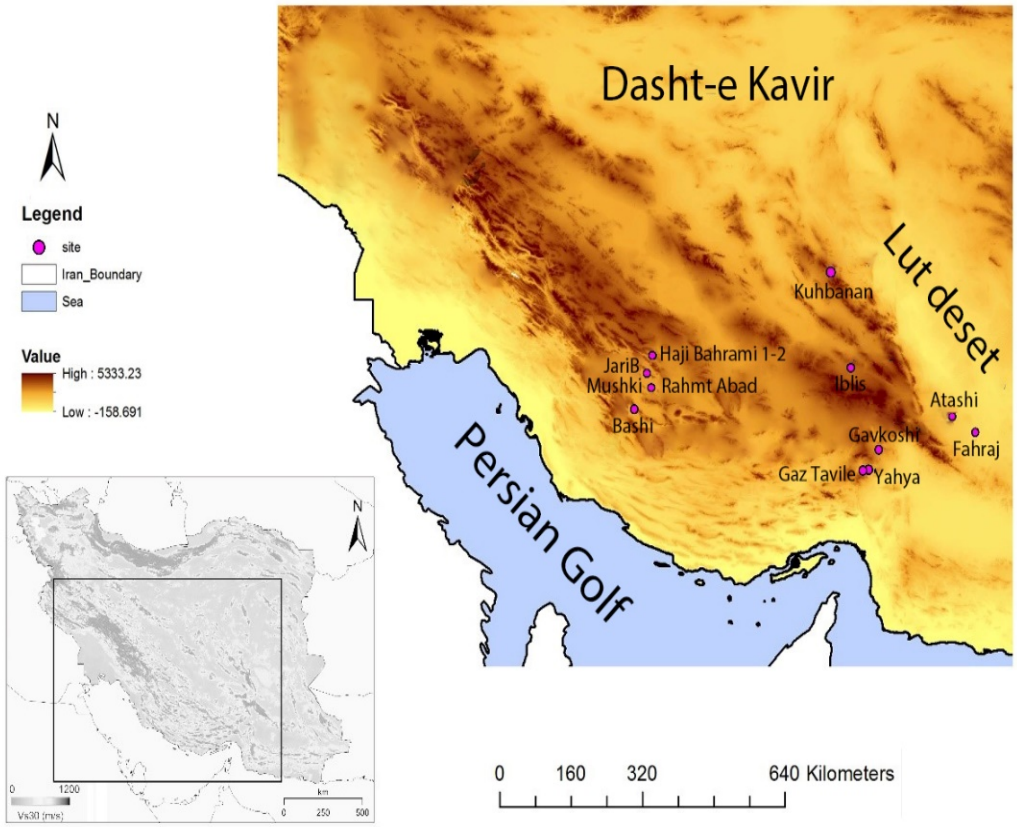

Map 1: Neolithic sites of South Lut, Kerman, South Zagros

Map 2: Neolithic sites of South Lut, Kerman and Pakistan

Table 1: Formal tools discovered from South Lut, Kerman and South Zagros

منبع	Attributed period	Chronology	Abundance of formal tools	Area	Altitude (meters)	Site
Garazhian and Rahmati, (2012):144	Aceramic Neolithic	5200-4600 BC	Backed, Geometric, Scraper (high),Notched/ Denticulated(medium),Sickle, Burin, Drill, Truncated(low)	South Lut	700	**Atashi**
Lamberg-Karlovski and Beale, 1986: 11	Neolithic-Yahya	3700-3900 BC (not calibrated)	Notched/ Denticulated(high), sickle (medium), Scraper, Burin, Backed, Geometric, Truncated(low), drill (disappear)	Kerman	1200	**Yahya VI**
			Notched/ Denticulated, sickle (high), Backed, Burin(medium), Scraper, Drill, geometric, Truncated(disappear)			**Yahya VC**
Tsuneki, 2013: 74	Proto-Neolithic	10000-8300 BC	Scrapers, Notched/ Denticulated (High) geometric (Low), sickle (Disappear)	South Zagros	1875 and 1848	**Haji Bahrami,3**
	Proto-Neolithic	7600-7400 BC	Scrapers (high), Notched/ Denticulated and non-geometric microlites such as backed and side Scrapers (medium), drill (low), sickle (disappear)			**Haji Bahrami,4**
	Proto-Neolithic/ Aceramic Neolithic	?	scrapers (high), geometric microliths (medium), sickle (disappear)			**Haji Bahrami,5**
Azizi Kharanaghi *et al.*, 2012	Pre-pottery Neolithic Rahmat Abad phase	7047-6744 BC	Sickle, Notched/ Denticulated(high), Scrapers, Burins and backed (Medium), Blade and drill (low), Geometries (disappear)		1774	**Rahmat Abad-Pre-Pottery Neolithic**
	Pottery Neolithic Befor Mushki phase	6218-6028 BC	Sickle, Notched/ Denticulated(high), Scrapers(medium), Drill, Burin, Backed and geometric (low), Truncated (disappear)			**Rahmat Abad-Pottery Neolithic**
Nishiaki, 2010	Pottery Neolithic Mushki phase	6400-5981 BC	Geometries (high), scrapers (medium), sickle and drill (low), Burins (disappear)		1800	**Mushki**
Khanipou and Niknami (2019)	Pottery Neolithic	6373-6000 BC	Geometric, Sickle, Notched/ Denticulated (high), Backed (Medium), Scraper, Perforator (low), truncated, Burin (Disappeared)		2364	**Hormangan**
Nishiaki, 2010	Neolithic	6177-5730 BC	Sickle (high), Notched/ Denticulated(medium), Scraper, Geometric (low), Drill, backed, Burin, truncated (Disappear)		1800	**JariB**

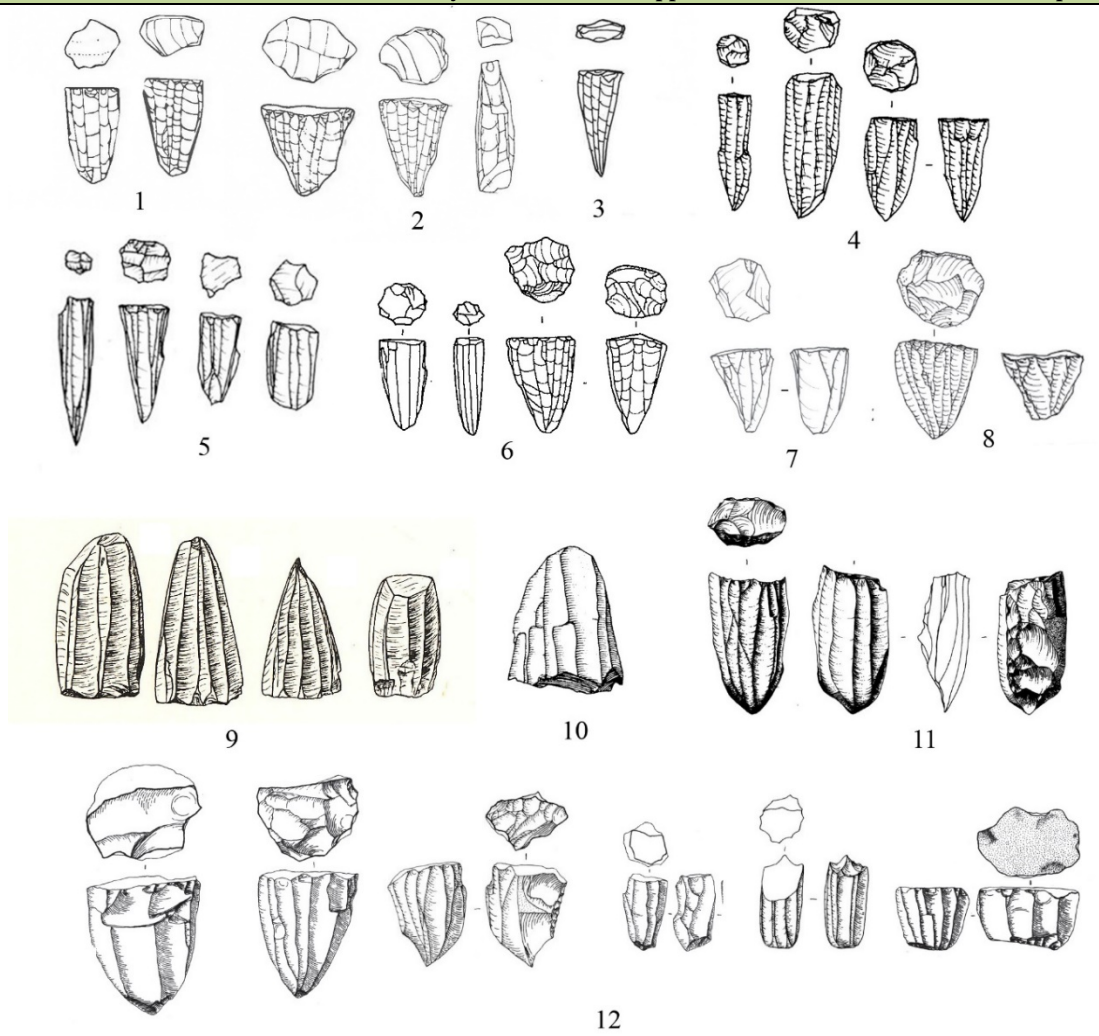

Figure 1: unidirectional bladelet core no.1: Haji Bahrami3, no. 2: Haji Bahrami 4, no.3: Haji Bahrami5, no.4: Pre pottery Rahmatabad, no.5: Pottery Neolithic Rahmatabad, no. 6: Mushki, no.7: Hermangan, no. 8: Jerr B, no. 9: Kuhbanan, no.10Yahya, Ash. No.11: B 1 Derstan, no. 12: Atashi. The scales are different

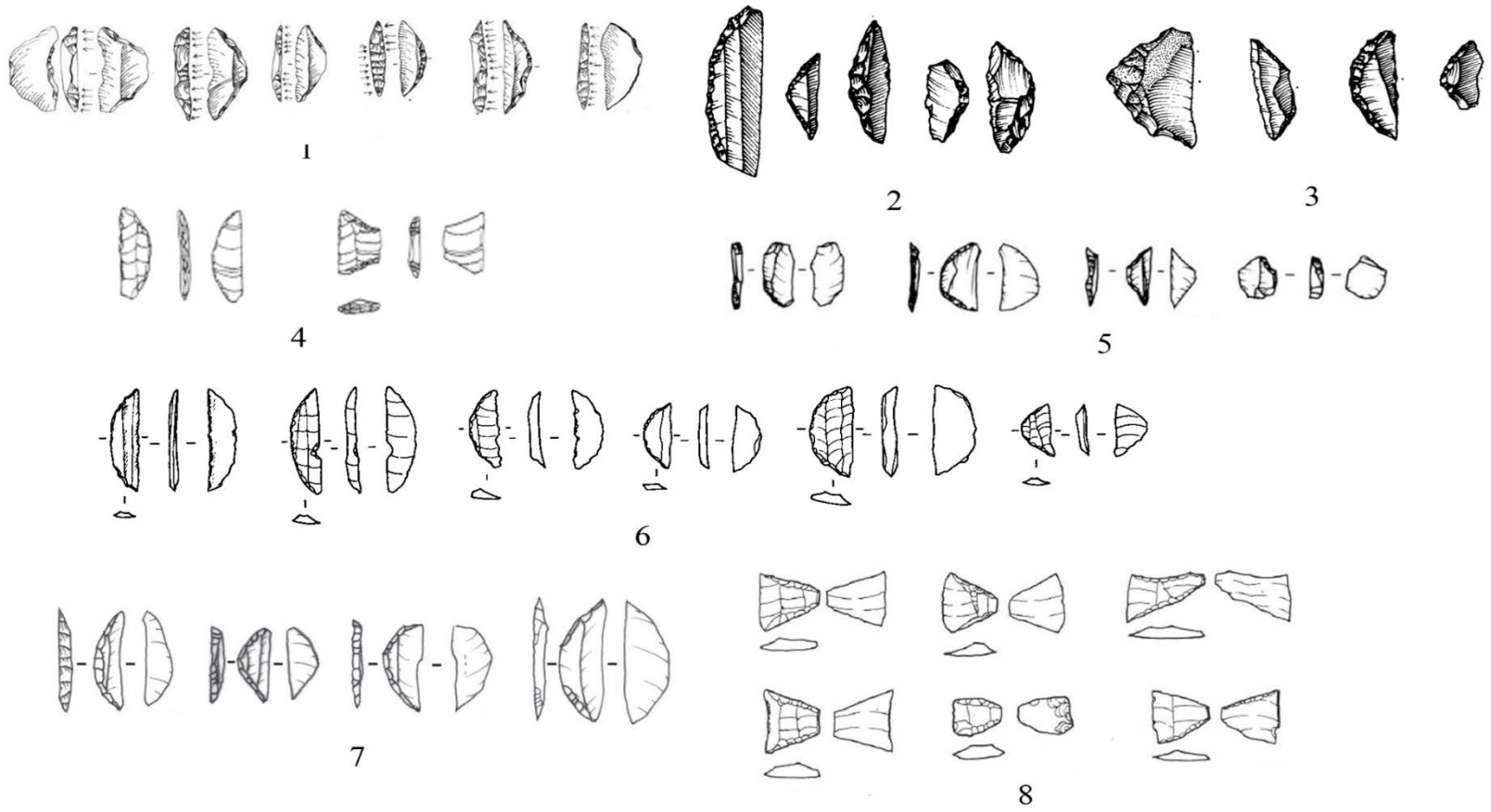

Figure 2: Backed, Crescent and Geometric tools: no. 1: Atashi, no.. 2: Yahya VI, no. 3: Yahya VC, no. 4: Haji Bahrami, no. 5: Pottery Neolithic Rahmatabad, no. 6: Mushki, no. 7: Hormangan, no. 8: Jerry B (scales are different)

Figure 3: chipped stones with sickle elements: no. 1: Atashi, no. 2: Yahya VI, no. 3: Yahya VC, no. 4: Pre pottery Neolithic Rahmatabad, no. 5: Pottery Neolithic Rahmatabad, no. 6: Mushki, no. 7: Hormangan, no. 8: Jerry B

تحلیل صنایع سنگی نوسنگی لوت جنوبی و مطالعهٔ تطبیقی آنها با صنایع زاگرس جنوبی

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چکیده

مصنوعات مکشوفه از بررسی‌های دارستان بم و کاوش تل آتشی، به‌همراه یافته‌های کرمان، گاهی با صنایع نوسنگی بلوچستان پاکستان هم‌سنجی شده و زمانی هم، واجد ویژگی‌های محلی، توصیف گردیده‌اند. در این مقاله، مصنوعات مذکور را با نمونه-های مکشوفه از زاگرس جنوبی طبق متغیرهای سه‌گانه‌ی ماده‌ی خام، فناوری و گونه‌شناسی مورد تحلیل و مطالعه‌ی تطبیقی قرار داده‌ایم.محوطه‌های باستانی لوت جنوبی و زاگرس جنوبی از الگوی یکسانی در انتخاب نوع ماده‌ی خام و چگونگی دسترسی به آن، از آغاز نوسنگی تا نوسنگی باسفال پیروی می‌کرده‌اند. مواد خام، عموما بومی، بودند. براساس مطالعات انجام-شده چرت و فلینت، مهم‌ترین و آندزیت، ماسه‌سنگ و سنگ آهک، کم‌اهمیت‌ترین مواد خام بودند. سنگ‌مادرهای فشنگی که محصول فن فشاری هستند در اغلب محوطه‌ها به‌دست آمده‌اند. این سنگ‌مادرها در تل آتشی، محوطه‌های دارستان و اشکفت حاجی بهرامی (نوسنگی بی‌سفال)، کم‌تعداد ولی در رحمت‌آباد، موشکی و هرمنگان، نسبتا پرتعداد هستند. سنگ‌مادرهای فشنگی از اواسط دوره‌ی موشکی، کم‌اهمیت شدند و شمار آنها در دوره‌ی جری، کاهش یافت. فراوانی هندسی‌ها در منطقه فارس اگرچه از آغاز نوسنگی تا دوره‌ی جری، دارای نوساناتی بوده است ولی در اشکالی نظیر هلالی، کول‌دار و ذوذنقه‌ای تولید شدند. هندسی‌های هلالی از مهم‌ترین ابزارهای رسمی در تپه یحیی، تل آتشی و نیز تمامیِ مراحل نوسنگی فارس بودند. روند تولید تیغه‌های داس در تپه یحیی، افزایشی ولی در تل آتشی، کاهشی بوده است. فراوانی این ابزارها در دوره‌های رحمت‌آباد، کم، موشکی و جری، زیاد بوده است. این روند فراوانی را می‌توان با تحولات فنآوری مصنوعات سنگی و تحولات در نوع اقتصاد معیشتی در نوسنگی مرتبط دانست.

واژه‌های کلیدی: مصنوعات سنگی، نوسنگی، لوت جنوبی، زاگرس جنوبی، تل آتشی، دارستان.

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