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From the Transitional Chalcolithic to the Early Bronze Age 1 in the Central Plateau of Iran: Site Abandonment, Formation, Development, Movement, and Decomposition*

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Abstract: The Central Plateau of Iran, which has been called by various names until now, has special place in terms of Archaeological developments from the fifth millennium BC to the beginning of the third millennium BC. Archaeological evidence indicates the desolation, destruction, displacement, moving, and formation of sites during that period. Despite the dominance of this situation in the field of settlement, the analysis of pottery data in the first place, followed by architecture, metallurgy, and burial, indicates that there was an ongoing cultural continuity. The sites in the area did not have high sustainablity due to environmental factors. Therefore, the analysis of relevant data based on chaos and complexity theories as well as the general theory indicates that the communities in the region followed a particular pattern from the Transitional Cholcolithic to the Early Bronze Age 1. They would survive with a movement. While the continuity of social life was guaranteed by the abandonment of one site and the formation of a new one, technological, architectural, and economic revolution took place at the new site. It is often observed that this life continuity was accompanied by technological developments and innovations. In fact, the aforementioned societies did not collapse but leaving a site ensured their social and economic life. In the Central Plateau of Iran, we encounter with communities that have pursued the process of endogenous development while at the same time expanding inter-regional communication.

Keywords: Central Plateau of Iran; Transitional Chalcolithic; Early Bronze Age 1; Site Abandonment; Site Formations; Site Movement.

Introduction

We used the phrase the Central Plateau of Iran (CPI) to describe the geographical extent of the present study. Various names have been used for this region, such as the Plateau, Central Plateau, Central North, and the Margin of Iranian Central Desert. Different boundaries have been suggested for it too (Roustaei, 2012a). The central plateau of Iran, in this article, is the zone that covers the plains of Kashan, Qazvin, Rey-Tehran, Karaj, Qom, Alborz and Shahroud-Damghan (Fig: 1). Sites such as Zagheh, Qabrestan, Cheshmeh Ali, Pardis, Sialk, Arisman, Ozbaki, Sofalin, Shoghali, Qoli Darvish and Hesar are located

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in these plains (Fig: 2). The timeframe for this research is as follows (Table 1):

A) Early Plateau B, which coincides with Cheshmeh Ali IA, Sialk II and Ozbaki II which are called Transitional Chalcolithic.

B) Middle Plateau A, which matches with Cheshmeh Ali IB, Sialk III_1, Hesar IA, Qabrestan I_{19-14}, and Ozbaki III, constituting the primary phases of the Early Chalcolithic.

C) Middle Plateau B which is simultaneous with Cheshmeh Ali IB, Sialk III_{2-3}, Hesar IB, Qabrestan I_{13-11} and Ozbaki IV and encompasses the final phases of Early Chalcolithic.

D) Middle Plateau C, which accompanies with Sialk III_{4-5}, Hesar IC, Qabrestan II_{10-9}, and Ozbaki V, and called Middle Chalcolithic.

E) Late Plateau A, coincides with Sialk III_{6-7b} and Hesar IIA, Qabrestan IV_{6-4}, Ozbaki VII and Arisman D and B which is called Late Chalcolithic.

(F) Late Plateau B, which coincides with Sialk IV_{1-2}, Hesar IIB, Ozbaki VII and Arisman A, E, and C, which encompasses the final phases of Late Chalcolithic and primary phases of Early Bronze Age 1 (Girshman, 1938, 1939; Malek Shahmirzadi, 1995, 2003; McCown, 1942; Majidzadeh, 1981, 2010b; Fazeli Nashli *et.al.*, 2013; Voigt & Dyson, 1992; Vidale *et.al.*, 2018).

Objectives

The main question of this article is why and how the communities of CPI were formed, expanded, and collapsed or decomposited during the Transitional Chalcolithic to the Early Bronze Age 1. Settlement in the Qazvin plain was suspended at the end of transitional Chalcolithic in Zagheh. Qabrestan was inhabited during the Chalcolithic period but northern Sialk was abandoned. We do not know where the inhabitants headed for. Southern Sialk settled in the Chalcolithic period after an interval. Southern Sialk from III_1 to III_{6-7b} played an important role in the cultural developments of the region. Settlements such as, Arisman, Qoli Darvish, and Sofalin were formed during the final phase of Sialk III and reduced the importance of Sialk.The sane is also noticeable in Ozbaki. Some evidences of these shifts have been revealed in Jeyran Tepe, Yan Tepe, and Maral Tepe. The role of intra-regional and extra-regional impact can be seen in the process of formation and destruction of CPI prehistoric settlements (Table 2; Fig. 3). These factors include cultural, social, commercial, and economic interactions.

Materials and Methods

Analyzing some of the evidence leads to specific functions for these sites. Some of them had manufacturing and industrial functions during the Chalcolithic and Bronze Age. Some others had administrative and residential performance. These applications were shifted from site to site as a result of external interactions such as cultural and trading communications. Although we analyze the architectural styles, burial methods, and types of administrative tools in this article to interpret socio-economic changes, population shifts, and the formation of new sites, but the most important of our analytical data is pottery (Fig. 4). Most cultural changes studies of CPI prehistoric sites have taken place through the analysis of technological developments, migration, and diffusion of innovations.

If we divide archaeological researches of CPI into two stages, we will find that in the first stage, less attention is paid to the anthropological questions. But in the second phase, we see a much improved situation. Although processual archeology approaches (Dyson & Howard, 1982) have emerged in the Shahroud-Damghan Plains since the mid-1970s, but major changes in the archeology of the CPI have occurred since the early third millennium AD (Fazeli Nashli, 2001). Since then, more attention has been paid to interdisciplinary and chronological research.

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In addition, questions were raised about the movements of pre-historic settlements, technological changes, specialized production of goods, socio-economic complexities, and the formation of hierarchical societies. Prehistoric societies of CPI faced rapid changes, transitions, disruptions, and collapses or discomposition. Therefore, we use the chaos and complexity theories to analyze endogenous and exogenous factors and relevant data from the Transitional Chalcolithic to the Early Bronze Age 1.

Results and Discussion

Transitional Chalcolithic began in the region around 5200 BCE (Fazeli Nashli *et al.*, 2009). Paleoclimatological studies suggest that temperature and humidity may have been favorable for establishing permanent settlements and starting agriculture in the CPI since the second quarter of the sixth millennium BCE (Shaikh Baikloo Islam & Chaychi, 2019: 63-64). Archaeological investigations indicate that settlements have increased since the second half of the 6thmillennium BCE (Valipour, 2011, Fazeli Nashli, 2006, Malek Shahmirzadi, 1995, Roustaei, 2012b; Sarlak, 2011). The most important sites of this period include Ozbaki (Jeyran Tepe and Yan Tepe), Pardis, Cheshmeh Ali, Eastern Chachmaq, Qoli Darvish, Zagheh, Shir Ashian and North Sialk. The production of standard, delicate and beautiful pottery was common in most of these settlements. Cheshmeh Ali pottery was the most prominent of this period (Sialk II). Production of local and regional pottery was common in the CPI prior to the manufaturing of this pottery and coincided with Sialk I.

Potteries of Chahar Boneh represent a local tradition and are technically and decorally specific to the same site (Wong *et al.*, 2010), while at the same time Ibrahim Abad and Sialk potteries offer local-regional features. Although the upward process in the production and decoration of pottery in the five layers of sialk I indicates specialized production, the scale of production was domestic. On the other hand, the final phases of the Late Neolithic I and primary layers of the Late Neolithic II in Máy Tepe in Qazvin plain are comparable to Chahar Boneh and Ibrahim Abad, respectively (Rezaei Kolej *etal.*, 2010, Sarlak, 2016). This is also the case in lower layers of the Eastern Chachmaq (Thornton, 2013). The creation of new and combined geometric motifs and the furnace heat control in the Pardis' Late Neolithic layers took place in an evolutionary process (Fazeli Nashli *et al.*, 2010). Thus, at the same time as each of the five layers of Sialk I, the pottery production at CPI sites was intra-settlement, local, and regional. It was produced at a domestic scale. Buff wares with ladder motifs were found in most of the CPI sites during the Sialk I_{3-5}. Thus, in a general assessment it can be said that pottery production was in the form of an intra-regional trend in the CPI during the Late Neolithic.

The specialized production of the Cheshmeh Ali pottery during Sialk II was most likely the result of the same process of progression from the Late Neolithic to the Transitional Chalcolithic. The color of this handmade pottery, which ranges from light red to light brown, makes the surface of the pottery particularly attractive. The designs include geometric, plant, animal, and human that have been executed variously, abstractive, and naturally. Other features of this pottery include high finesse, good baking quality, multiplicity of tempers, variety of patterns, and diversity of forms. The discovery of furnace remains and pottery wheel disc in Tepe Pardis has increased our knowledge of pottery technology during this period (Fazeli Nashli *et al.*, 2007).

The production of local potteries and the Cheshmeh Ali regional pottery in Zagheh indicates inter-regional communication. The discovery of pottery kilns remnants and other related equipments in this site indicate that its residents used Cheshmeh Ali pottery's technology instead of importing it. A

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laboratory study of some samples of pottery from Cheshme-Ali site and a number of sites in Qazvin plain showed that the clay material in each of these sites was different (Wong *et al.*, 2010). These documents indicate the prevalence of a more specialized activity and attest to the production of pottery at a workshop level in the CPI. The gradual process of increasing the beauty, quality and elegance of the Cheshmeh-Ali pottery is visible in the layers of Sialk II, Pardis and Cheshmeh-Ali IA.

Rectangular plans, separation of residential buildings from industrial workshops, designation of some sites as workshop and production centers, use of rectangular typical bricks with surface concavity, preparation of separating walls between building units, and the construction of reinforced supporting walls, are some of the Transitional Chalcolithic architectural characteristics in the CPI (Girshman, 1938; Roustaei, 2009, 2012b; Majidzadeh, 2010a: 63-64; Valipour, 2011). The discovery of spinning wheels' spindle and the evidence of cotton and flax cultivation in most sites indicate that spinning and textile activities were common during this period. Burials were carried out under the floor of the houses, and the bodies were buried with ocher cover and gifts. Significant differences in the quantity and quality of burial gifts indicate the existence of social classes (Majidzadeh, 2010a: 69, 119-124). Counting objects are other important data of this period (Fazeli Nashli & Moghimi, 2013).

The Early Chalcolithic coincides with the Middle Plateau A and B, and Sialk III_{1-3}. According to archeoclimatological studies, the settlements of this period were formed in dry and unfavorable climates. An interruption occurred in most of the northern parts of the CPI between Sialk II and Sialk III. The Rey-Tehran and Qomrud-Qarachai plains were more attractive during this period (Shaikh Baikloo Islam *et al.*, 2019: 21). That is why, the settlements of the Tehran plain did not increase or decrease abruptly. On the other hand, although Qoli Darvish in the Qomrud area was abandoned, a new settlement, Shadqoli Khan, was formed 5 km from it (Sarlak, 2011: 42). In addition, Yan Tepe and Jeyran Tepe disappeared in Ozbaki area and Maral Tepe became inhabited (Majidzadeh, 2010a). The settlements of the Shahroud Plain were also created near the hill and mound landscapes and far from arable lands (Roustaei. 2009: 18-20). Residents of the Northern Sialk left the site between 4960 and 4720 BCE due to adverse climatic conditions and drought (Fazeli Nashli, 2011: 12). New stratigraphy in Sialk (Noukandeh, 2010) has indicated that there was an interval between Sialk II_3 and Sialk III_1. Zagheh was abandoned between 4460 and 4240 BCE and Qabrestan was settled as a metallurgy and pottery center. Therefore, in the Kashan plain between the periods of Sialk II and III it is likely that an interval occurred between 300 and 500 years.

In the lower layers of Qabrestan, in conjunction with the Middle Plateau A and B, which coincided with Sialk III_{1-3}, a dark purple pottery was known, along with other red potteries, which became known as Plum Ware. Plum Wares discovered from Maral Tepe and Ozbaki were attributed to Ozbaki III (Middle Plateau A) and Ozbaki IV (Middle Plateau B) due to a variation in background color and decorative motifs (Majidzadeh, 2010b: 34-39). The discovery of a similar Plum Ware in Sehgabi and Godin convinced Majidzadeh that the invading tribes that Plum Ware was one of their technologies entered to CPI from the west of Iran. They caused the collapse of some settlements, including the Northern Sialk in the middle of the fifth millennium BCE (Majidzadeh, 2010b: 35).

The prehistoric potters of CPI used various clays to make pottery from the primary phases of the Early Chalcolithic (Sialk III_1). At each site, some of the potteries were produced for in-house use and another part for distribution throughout the region (Valipour, 2011: 48). The potteries of this period are delicate,

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imprinted, and well kneaded. Evidence of the use of the slow pottery wheel from Sialk III_2 onwards is visible. The motifs included geometric, animal, and plant designs that appeared in various modes such as combined, symbolic, complex, and narrative. Goats with diverse horns, bird rows, snakes standing on the tail, and plants with petal volute are the most prominent motifs of this period. The designs of the pottery were less dense than those of the previous period, but theirforms were much more varied. A variety of cups, goblets, bowls, legged beakers, conic container, and storage jars were produced during this period. This variety may be considered the beginning of standardization in pottery production.

Some of the architectural evidences of this period, which indicate the continuation of the Transitional Chalcolithic architectural characteristics are:Single rooms with skewed walls and rectangular doors with clay wall cheeksfrom Hesar IA-B (Roustaei, 2004: 225; Schmidt, 1937); Egg-shaped pottery kilns discovered from Sialk III_1; arranged and geometrical structures, erected and 90 degree angles walls, and storehouse and closet-form structures discovered from Sialk III_2; Enclosed courtyards for cattle detected from Sialk III_3 (Girshman, 1938); and Multi-room and cluster-shaped units around the courtyard discovered from Maral Tepe II_{1-3} (Majidzadeh, 2010a: 142-156).

Copper pieces, furnace welding, copper ore fragments, and casting molds illustrate the prevalence of melting techniques during this period (Girshman, 1938; Roustaei, 2004; Majidzadeh, 2010a: 160). Flat and annular seals engraved motifs such as geometric patterns of clay, bitumen, gypsum and serpentine have reported from Hesar IA-B. The burials were done under floors of the residential homes in Sialk III_{2-3} and in the non-residential areas and alleys in Hesar IA-B. Gifts were placed alongside the deads.

Important Middle Chalcolithic sites in CPI include Sialk (III_{4-5}), Hesar (IB), Ozbaki (V) and Qabrestan (II_{10-9}). The most important pottery technology of this period was Black on Buff Wares. Animal motifs include animal sideview, rows of birds, and crawling and coiled snakes. Human motifs were also common. The use of pottery wheels that had begun in the earlier period became more common in this period. At some sites in the CPI, such as Ozbaki V, red potteries contains 40% of all potteries (Majidzadeh, 2010a: 269).

The body color of Hesar IC pottery is light gray or grayish white. Goats, cats and dancing humans have been painted on them (Roustaei, 2004: 225). Another interesting pottery produced during this period is gray pottery. The pottery was discovered in Ozbaki VI and Qabrestan II_9, especially III_{8-7}too. Majidzadeh attributed these potteries to an independent culture. According to him this time, aliens also entered into the CPI, whose two souvenirs were the expansion of the gray pottery and the reduction of Sialk III_5 settlements. Analyzing this event, he assumes that an interval between the Middle Plateau C and the Late Plateau A is certain. He also cited the discovery of intense fire evidence and the formation of non-archaeological layers about half a meter thick between the Hesar IB and IC as further documents to support his own claim. Majidzadeh has filled the gap between Qabrestan II_9 (Sialk III_5) and Qabrestan IV_6 (Sialk III_6) with Qabrestan III_{8-7} containing gray pottery. He has described the perpetrators of the massive devastations and fires in Sialk, Qabrestan and Hesar as groups that promoted the production of gray pottery in the CPI (Majidzadeh, 2010a: 269).

Although some studies, such as archaeological surveys in Rey-Tehran Plain, have shown that the settlements of this plain (Table 2) decreased during the Middle plateau C (Middle Chalcolithic), But according to some data, this cannot be attributed to population decline or external factors such as

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the invasion of aliens. Archaeological excavations have shown that part of the cultural remnants of Sialk III_{4-5} in Mafinabad is under relatively thick sediments. Paleoclimatological studies also indicate climate change in the northern part of the CPI in the middle of the second half of the fourth millennium BCE (Shaikh Baikloo Islam & Chaychi Amirkhiz, 2019). Therefore, the technology of gray pottery production due to the internal evolution of culture might be achieved.

The architecture of the Middle Chalcolithic became more complex than before. Some of the architectural evidences of Sialk III_{4-5} include remain of large structures, the passage between buildings, numerous corridors in structures, and stone materials. The remains of a number of multi-rooms buildings have been discovered in Hesar IC with elements such as reinforced supporting walls, niches and stoves. A large building was discovered in Qabrestan II_9 associated with activities such as mtallurgy and pottery. The Middle Chalcolithic in CPI is characterized by features such as the creation of new storage facilities, public buildings, copper ore smelting, advanced metallurgy, and specialized pottery production.

Round, button and square flat seals of bitumen, gypsum, mud, serpentine and copper containing geometric, human and animal designs have been discovered from some sites in the region. The burial evidence in this period is interesting. Majidzadeh has spoken of the possibility of a cemetery in Ozbaki (Majidzadeh, 2010a: 270). Some burials in Sialk indicate that the dead were laid in the south-north and east-west directions. Gifts were also placed beside the dead. About 90 burials have been reported in an area called Tappeh (mound) in Hesar. The dead were buried on the left side in these burials (Roustaei, 2004: 225).

As stated earlier, in final phases of the Middle Chalcolithic that coincided with the end of Sialk III_5, Hesar IB, and Qabrestan II_9, there was an interruption in settlements that Majidzadeh has related it extending the gray pottery in the northern part of the CPI. Thus, the primary phases of the Late Chalcolithic can be analyzed with these developments. Following this event, periods of Sialk III_{6-7b}, Hesar IC, and Qabrestan IV_{6-4} emerged. On the other hand, some scholars believe that the native culture of Sialk III persisted in CPI until the arrival of the Cora-araxes culture at the end of the fourth millennium BCE (Alizadeh *et al.*, 2013; Pollard *etal.*, 2013). The most important pottery of this period are:

A) Painted Pottery: Painted containers of Hesar IC and early phases of Hesar IIA that contain the pattern of long neck gazelles and cats fall into this group. The finer performances of the motifs than before and loss of empty space between motifs were important features of Ozbaki pottery. Potteries with abstract motifs of animals and tubular containers were produced on most sites of the period. Production of painted buffwares decreased in Sialk III_6 and completely disappeared in Sialk III_{7b}. The animal designs in terms of ambiguous patterns and lines around their bodies were consistent with Susa II potteries.

B) Gray Pottery: Production of this pottery, which had begun from Qabrestan III_{8-7}, continued in Hesar IC, IIA and Arisman B with variations in form and technique.

C) Urukian Potteries such as Bevelled Rim Bowls and Nose-shaped Hands Cubs: Some scholars believe that the discovery of these potteries at some sites indicates that the area began to establish cultural contactswith southwestern Iranian lowlands of Susa II (Helwing, 2005: 45). Implementation of barbed wire, comb, butterfly and cheked motifs is the latest features of Sialk $_{III6-7b}$ potteries in Arisman B (Helwing, 2013). ShadQolikhan I_3pottery (Sarlak, 2011: 47-50) and Ozbaki VII (Majidzadeh, 2010b: 46-49) are similar to Sialk III_6 pottery.

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Although the study of the settlement pattern in the Rey-Tehran Plain indicates the persistence of some sites and new sites such as Meymanatabad in this plain and Arisman in the Natanz Plain, however, an overall assessment indicates that the number of sites decreased. Another Investigation of settlement analysis in Shahroud plain indicates that there is a connection between the formation of the sites and alluvial fans (Rustaei, 2012b). A new Paleoclimatological study in Lake Mirabad has shown that CPI has experienced severe and long-term drought in the late phases of Sialk III_{7b} (Berberian *et al.*, 2012: 2857).

Architectural structures in South Sialk represent a new form of distribution of spaces. Buildings consisted of large rooms that were connected to narrower storage spaces. Hesar architecture consists of a row of rectangular chambers made of raw clay and mud-brick (Roustaei, 2004). Excavation in Arisman B led to the discovery of the remains of three pottery kilns dating from 3600 to 3400 BCE and evidence of five phases of architecture dating from 4050 to 3600 BCE (Helwing, 2013). Girshman (1938) believes that Sialk village was conquered by invaders in Sialk III_{7b}.It is not currently possible to determine whether the establishment in Arisman B ended or continued during this period. This important issue can be solved only by new radiocarbon dating in the corresponding layers in Arisman B (Broffka & Parizinger, 2011: 134-136).

The settlement took place in Arisman D when residence in Area B continued. Barbara Helwing has suggested evidence of the discovery of Arisman D (3500-3100 BCE) and remnants of pottery furnaces and token of Arisman B revealing the possibility of a transition phase from Sialk III_{7b} to IV_1 in the region (Helwing, 2011a). The transitional phase in the time range 3400 to 3100 BCE probably also occurred in Meymoon Abad (Helwing, 2006). She has described the existence of this phase as a compelling reason to reject being non-native of Susa III culture hypothesis in Sialk and has analyzed the similarity of cultural material between two these sites within commercial contacts and cultural interactions.

Discovery of smelting, melting and molding of copper findings, evidence of silver molding, and the discovery of gold pieces in Arisman illustrate the prevalence of advanced techniques for the extraction of various metals during this period (Helwing, 2013). The evidence of the technological development and the formation of trans-regional exchanges indicate changes in the social and economic structures of the CPI during this period. If we consider the region's metallurgical capacity as a major factor in this structural change, we take a step to justify the endogenous process of the Late Chalcolithic developments in the CPI. Based on C14 (Vatandoust *et al.*, 2011; Noukandeh, 2010; Sarlak *et al.*, 2013), Sialk IV_{1-2}, has been identified with the Early Bronze Age I and the Proto-Elamite period, and it is determined between 3300-2900 BCE (Fazeli Nashli *et al.*, 2013; Pollard *et al.*, 2013) as well as between 3400-2900 BCE (Vidale *et al.*, 2018). The distinguishing feature of this period from Sialk III_{6-7b} is the abrupt change in pottery species. The new potteries of Sialk IV_1include lobulated crock, and gray-green spherical pitchers, and two-pitched jars. Late painted potteries of Hesar IIB are distinguished from gray potteries of Hesar IA. Most pottery of this period include bevelled rim bowls of Ozbaki (Majidzadeh, 2010b: 50-51), Shoghali and Sofalin (Hesari & Akbari, 2007). Tubular containers have also been discovered in two recent sites.

Architectural remains of the Early Bronze Age 1 include a large clay platform, rooms, walls, and other architectural spaces from Maral Tepe III (Majidzadeh, 2010a: 138-139), structures with stone foundation, and rooms with non-level doorway from South Sialk (Girshman, 1938), and four buildings with stairs and supporter wall from Hesar IIB (Schmidt, 1937). Remains of tabulated urban

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settlements and houses designed along the streets and alleys in Arisman C_6 and remnants of copper smelting workshop in Arisman C_4 are other architectural evidences of this period (Helwing, 2006: 37; 2013). Significant architectural remains from shoghali and Sofalinhave not been recovered, but the discovery of furnace weld and burnt pottery from Shoghali suggests existence of the pottery kilns structure in it (Hesari &Akbari, 2007).

Molds, kiln residues, and lead and silver melting slags have been discovered from the surface of Hesar (Roustaei, 2004). This evidence in Arisman C_4 confirms the prevalence of similar activities at this site (Helwing, 2006: 37; 2011: 216; 2013; Chegini *et al.*, 2011: 40-68). The use of cylindrical seals was common at the same with the Sialk IV_1. Patterns on these seals include eye-like motifs, goat rows, bird rows, animals' conflicts, and kneeling humans against annular handle pots. Sialk IV_1 seals are similar to Acropolis I_{18-17} seals. Pierre Amiet has dated these seals during the transition between Susa II and Susa III.

Another prominent finding of this period is the counting mud tablets that have been reported only from Sialk IV_1. These tablets, like other materials, show the association of Sialk IV_1 with the late Susa II (Acropolis I_{17}). Some Sialk IV_1 tablets are comparable to the Godin V and VI_2 specimens (Helwing, 2011b; Pittman, 2013; Rothman & Badler, 2011; Young & Weiss, 1974). Although the similarity between counting tablets of Sofalin and Qoli Darvish with the Sialk IV_1 and Acropolis I_{17} tablets is striking but this comparative study is not possible because of the imprecise classification of Sofalin and Qoli Darvish potteries.The seals of Hesar IIB were made of copper, relatively large and decorated with simple scallops and crosses.

The remains of two graves were recovered from Sialk IV_1. The bodies of two women were discovered in the form of a chump in the graves with gifts including copper mirrors, potteries and gold and azure jewelry. The artistic style of these gifts reflects a combination of Sialk III_{6-7b} and IV_1 traditions. Amidst the ash in the sialk, parts of the human skeletons have been discovered in turbulence, which has been interpreted as a consequence of the invasion of aliens by Girshman. However, in the mentioned layer, a well-reserved skeleton of a man was found that his hands were tightly closed. Arisman C_3, which is dated to the Sialk IV, is divided into two substrates.

Simple graves and infants' jar burials were obtained from Arisman C_{3A} and C_{3B}, respectively (Chegini *et al.*, 2011). Arisman C_{3A} probably coincided with Sialk IV_1 period. All burials from Ozbaki include children's graves. Adultsare most likely to be buried outside settlements (Majidzadeh, 2010a: 141-142). The study of Hesar IIB burials has shown that women have a longer life expectancy than men. Burial of the dead was carried out in the residential and non-residential sectors. A special burial type known as chamber burial has been reported in Hesar IIB (Schmidt, 1937).

Sialk IV_2 coincides with the Proto-Elamite / Susa III (Acropolis I_{16-14}). For this reason, Sialk IV_2, Arisman C_{3A-E}, Maral Tepe (Ozbaki VIII), Qoli Darvish II_{5-1} and Sofalin have been designated as Proto-Elamite sites. The motifs on pottery reappeared in this period. These motifs include checkered and quadruple. Although polychrome and burial vats are standard potteries of Sialk IV_2, but bevelled rim bowls, trays, open and half open mouth containers, stemwares, and nose handle jars are other forms of Sialk IV2 potteries. Local gray, scathing black, and brown wares were discovered in Qoli Darvish and Sofalin (Helwing, 2011b: 196; Sarlak, *etal.*, 2013).

Architectural structures known from Sialk IV_2period include distressed debris and jar burials in southern Sialk and Arisman C_{3B} (Helwing, 2013), rectangular chambers, metal and stone workshops, storerooms, and a platformfrom Qoli Darvish II_5 (Sarlak *etal.*,

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2013; Pollard, *etal.*, 2013; Aghili, 2012), and 17 cluster-shaped architectural spaces around a courtyard in Maral Tepe III (Majidzadeh, 2010a: 136-137).

During the Early Bronze Age 1, the scale of the metallurgical activities changed effectively in Arisman, so that the remains of new and large smelting and slags centers were identified at this site. Between Sialk IV metal production and the previous period, there were significant differences in terms of innovation in the methods and process of specialization. The study of slags showed that copper and silver were produced in Arisman (Steinger, 2011: 69-99; Helwing, 2013; Fahimi & Helwing, 2006: 11). Since many metal artifacts have not been discovered in Arisman, it seems that metal production on this site has been undertaken for commercial purposes and external demands (Helwing, 2006: 1-40; 2011c: 530). Evidences of furnaces, casting, melting, clay molds, and copper and bronze manufactures have been reported from Qoli Darvish (Sarlak *etal.*, 2013; Aghili, 2012).

The usage of cylindrical seals in Sialk IV_2 was the same as before. Of course, in addition to the geometric and animal motifs, the design of birds, butterflies and flowers were also added (Helwing, 2006: 46, 2011b: 57; 2013;Hesari & Akbari, 2007: 177; Fahimi &Helwing, 2006: 16). Administrative tools of Sofalin and Qoli Darvish include clay hubs for store houses doors and jars' mouth sealing off, clay seals, and counting objects resembling Acropolis $I_{20\text{-}18}$ and Acropolis type I_{17}counting tablets (Aghili, 2012; Hesari &Yousefi Zoshk, 2009; Dahl, *etal.*, 2013b). Clay tablets similar to the types discovered from Acropolis $II_{14\text{-}6}$ have been reported from Sialk IV_2 (Girshman, 1938; Dahl, *et al.*, 2013a), Maral Tepe (Majidzadeh, 2010a: 140-141), and Sofaline (Hesari and Yousefi Zoshk, 2009: 10-9). The texts on these tablets relate to the accounts of one or more animal herds (Dahl, *et al.*, 2013a). Jar burial was common in Sialk IV_2. This type of burial has reported from the all Early Bronze Age 1 settlements in Sialk IV_2, Arisman C_{3B}, Qoli Darvish II_3, Maral Tepe III, Shoghali and Sofalin (Girshman, 1938; Hesari & Akbari, 2007; Chegini, *et al.*, 2011; Sarlak, *et al.*, 2013; Majidzadeh, 2010a).

Based on the above evidence, we believe that CPI communities exhibited a pattern of a dynamic, yet disorderly, complex adaptive system from the Transitional Chalcolithic to the Early Bronze Age 1. Irregularity is algebraic, and it is difficult and perhaps impossible to predict it. But since disorder creates complex patterns and it is possible to study the complexities scientifically, it is possible to analyze the patterns of disorder through Complexity and Chaos Theories. According to these theories, small variables can expose nonlinear systems to large, unpredictable outcomes. However, understanding the initial conditions of the formation of nonlinear systems are facing increasing uncertainty and naturally, all predictions about the future behavior of those systems would be false. As nonlinear systems become more complex, the probability of their disorder and turbulence goes higher (Renfrew, 1978; Gerding & Ingemark, 1997).

The CPI prehistoric communities may have followed this pattern. Archaeologists have always been confused in the study of the formation and evolution of the pre-historic cultures in this region, but on the basis of Complexity and Chaos Theories there is a systematic order in the region. That is, the formation, development, and collapse or breakdown of pre-historic settlements in the region were primarily influenced by their interactions based on their manufacturing and distribution functions and their residential functions, and then by climatic conditions. The sudden formation of some sites such as Pardis, Qabrestan, Hesar, Arisman, and Ozbaki indicates a non-linear system and the discovery of rich and interesting evidence of pottery, metalwork and architecture indicate the prevalence of a dynamic system. So far, we

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have a system in CPI that exhibits endogenous developments.

Let us now analyze some developments in CPI based on systems theory (Binford, 1965; Clarke, 1968; Renfrew, 1984; Peregrine, 1996). Economic, social, administrative, political, religious, and environmental data from the prehistoric sites of the region reveals intra-regional and extra-regional systematic links. The analysis of the above data has shown that the subsystems of the pre-historic societies of the region sometimes resisted internal and external changes and phenomena, and sometimes showed synergy and adapted to them. Thus, the occurrence of phenomena such as Plum Ware in the middle plateau A (between Sialk II_3 and III_1), gray pottery after Sialk III_{4-5} and the beginning of the Late plateau A (LateChalcolithic), Urukian pottery in Sialk III_{7b} and Sialk $IV_1$and the Proto-Elamite Pottery (Sialk IV2) in CPI indicate that the subsystems of this region are adapted to external phenomena.

The continuation of some cultural traditions and developments and the acceptance of some foreign determinants were among the major factors of pre-historic social change. These factors were probably endogenous, exogenous, mono-causal, and multi-causal. They were sometimes coming due to intra-regional and extra-regional interactions.The study of synchronic and diachronic of prehistoric societies is used to analyze their formation, development, complexity, and collapse (Renfrew & Bahn, 2005). This study includes items such as the size of a community, the number of social units, the spatial differentiation of the settlements, the number and variety of specialized social roles, social identities, and the variety of organized mechanisms (Blau, 1977; McGuire, 1983).

Thus, prehistoric societies were fixed and independent systems in which the above items existed in different ways at each time point (Tainter, 1988: 36). Therefore, each of CPI communities such as Zagheh, Qabrestan, Sialk III, Arisman, Qoli Darvish, Hesar, and Sofalin were probably central and independent settlements. Some of them had manufacturing, distributional, and administrative functions. Each of them may have had several small peripheral settlements under their protection and guidance. Each of these communities was abandoned at the height of development and complexity. We will explain below that the collapse here does not mean complete destruction. Occasionally "the collapse would lead societies to withdraw from the path of complexity and provide them with a breakdown" (Tainter, 1988: 36; Simon, 1962, 1965).

The collapse of a complex society is meant to make it smaller and simpler here. The social classes of this disintegrating society are naturally smaller and fewer (Tainter, 1988: 193). The collapse of a socio-political system should never be assumed to be the same as the disappearance of certain civilizations or social groups (Zovar, 2012: 40-43). This means that we must distinguish between the collapse of a civilization and its end. Some scholars see collapse as a cultural revolution in some societies because of the invention, adoption of new production strategies, and the acceptance of new cultural traditions. (Janusek, 2005).Some experts also consider environmental mismanagement to be a disaster (Diamond, 2005: 490), and others believe that it should not be generalized to all societies (Yofee, 1988, 2010: 177; McNeill, 2010). In other words, although they adhere to the Disaster Theory, they do not prioritize the impact of sudden natural causes such as climate change on human societal changes and divergences. They believe that natural disasters alone do not disintegrate societies but they destroy critical and basic foundations of communities, create dispersed societies, make decentralized social systems, and slice productive strategies (Janusek, 2005: 202). They believe that sudden changes in societies are primarily caused by changes in the

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influential variables in a region's settlement patterns. In fact, intra-settling factors are involved in sudden change, not external factors (Renfrew, 1978: 204).

Complex societies were not passive societies that were merely observing events such as resource depletion and did not take any preventive or corrective actions.Complex societies tackle problems such as resource depletion through the development of technologies (Moll, 2008: 171-173). It is very unlikely that natural disasters will lead to the complete destruction of an urban or rural settlement. In other words, these catastrophes do not cause the complete demise of all aspects of societies. In fact, declining ecosystems and natural and vital resourcesoften lead to the development of technologies and subsequently to increased levels of complexity.

Conclusion

Evidence suggests that desolation, displacement and decomposition of settlements are one of the major archaeological features of the CPI during the 5thand 4thMillennium BCE. Zagheh, North Sialk, Shoghali, Shad Qolikhan, Shir Asian, and Ozbaki Tepes (Jeyran Tepe and Yan Tepe) are examples of abandoned settlements. Near them, new settlements such as Qabrestan, South Sialk, Arisman, Sofalin, Qoli Darvish, Hesar, and other Tepes of Ozbaki (Maral Tepe) were formed. The consequences of these abandonments, relocations and formations include the emergence of new productive capabilities and specific complexities of pottery, metallurgy, architecture, and new burial traditions.These characteristics and events can be interpreted as the settlement, social, technological, and cultural revolution.

Although these settlements were deserted and destroyed, but the internal process of cultural develoments was ongoing. For this reason it cannot be said that the cultures in question have collapsed. Therefore, the disappearance of sites in the Central Plateau of Iran, even if caused by environmental factors, does not mean the collapse of the cultural system and the disappearance of social groups, but rather, it has meant more social, settlement, technological, and cultural development and increased complexity in new sites.

The destruction, disintegration, collapse, and decomposition of CPI sites and cultures from the Transional Chalcolithic to the Early Bronze Age 1 have a particular meaning. These events were influenced by a particular pattern. The Central Plateau of Iran, from the second half of the fifth millennium BCE to the early third millennium BCE, has cultivated specimens of indigenous communities that did not have high sustainable survival. They guaranteed their survival with a move. The aforementioned communities have made local progress while at the same time gradually developing regional and trans-regional interactions.

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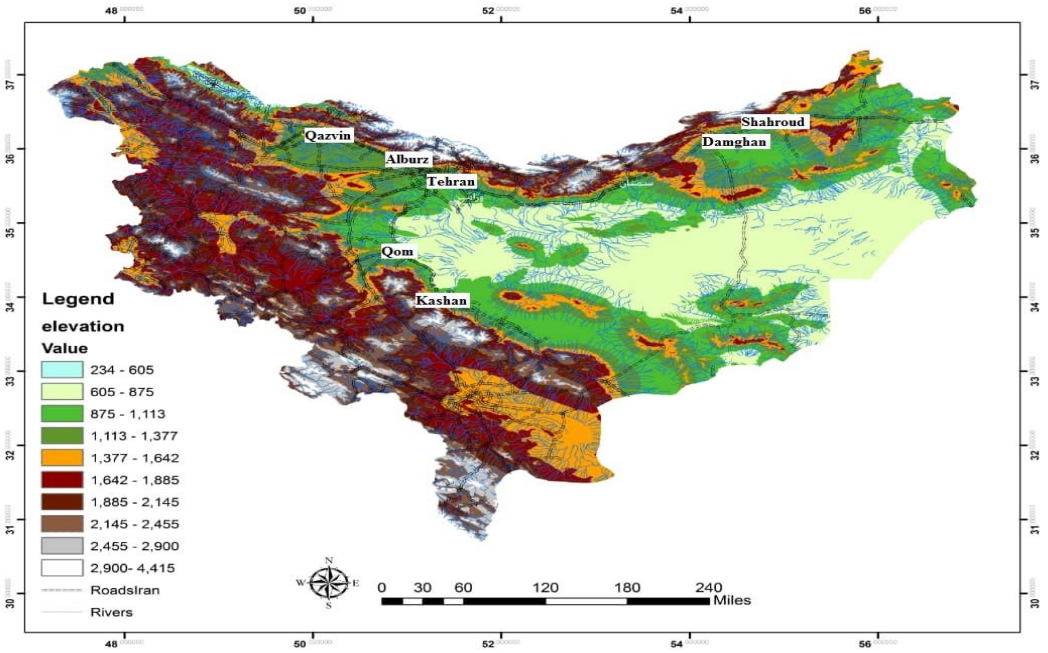

Fig 1. Plains and Boundaries of Central Plateau of Iran

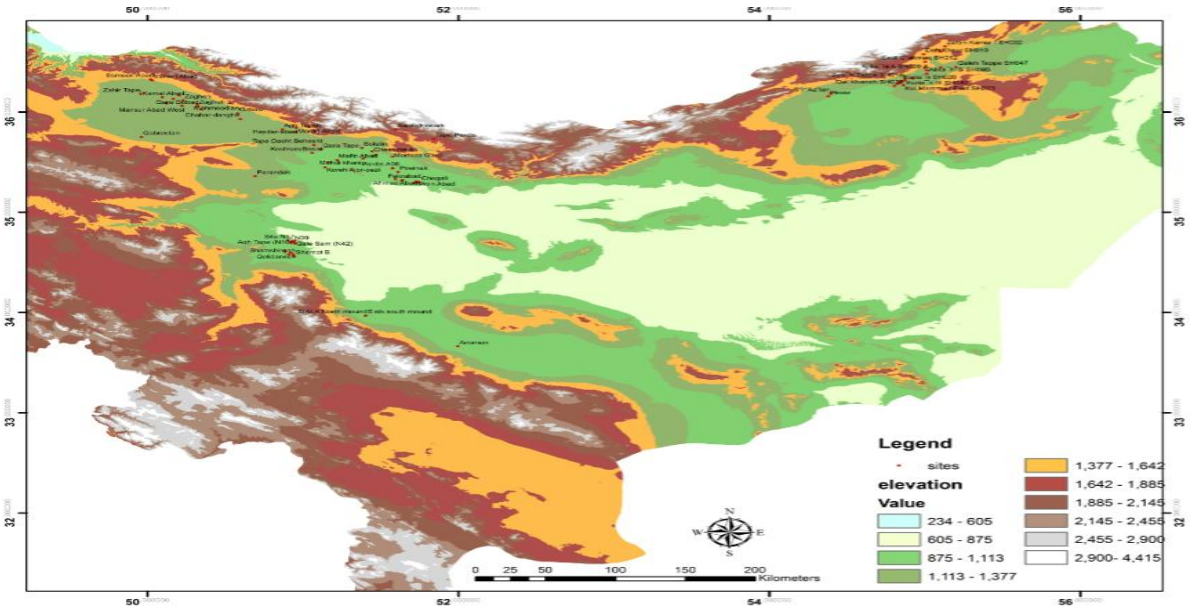

Fig 2. Settlement Density of Central Plateau of Iran from Transitional Chalcolithic to Early Bronze 1

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Table 1. Archaeological Chronologies of the Central Plateau of Iran

Majidzadeh, 1981		Vidale, Fazeli Nashli & Desset, 2018		Dyson, 1991	Voigt & Dyson, 1992	Malek Shahmirzadi, 1995		Type Sites and Phases
--	--	Proto-Elamite-Early Bronze Age 1	3400-2900 BC (?)	Sialk IV (Approx. 3000)	--	--		Sialk IV, Hesar IIB, Arisman C, Qoli Darvish, Sofalin, Shoghali
Late Plateau	B (Sialk: Gap, Hesar IIB & Qabrestan IV_{3-1})							Sialk (Gap), Hesar IC-IIA, Qabrestan IV_{3-1}, Arisman D, Gudin IV-V
	A (Sialk III_{6-7b} Hesar IIA & Qabrestan IV_{6-4})	Late Chalcolithic	3700-3400 BC	Sialk III_{6-7b} (Approx. 3500)		Sialk (Sialk III)	Late	Sialk III_{6-7b}, Hesar IC, Qabrestan IV_{6-4}, Arisman B, Meymanat Abad, Gudin VI
Gray Ware (Qabrestan III_{8-7}; Sialk & Hesar: Gap)								Qabrestan III_{8-7}, Sialk & Hesar (Gap)
Middle Plateau	C (Sialk III_{4-5}, Hesar IB & II_{10-9})	Middle Chalcolithic	4000-3700 BC	Sialk III_{4-5} (Approx. 3700)				Sialk III_{4-5}, Hesar IB, Qabrestan II_{10-9}, Ozbaki V, Gudin VII
	B (Sialk III_{2-3}, Cheshmeh Ali IB & Hesar IA)	Early Chalcolithic	4300-4000 BC	Sialk III_{1-3} (Approx. 4000) Sialk II (4600-4100 BC) Sialk I (5400-4600 BC)			Early	Sialk III_{2-3}, Cheshmeh Ali IB, Qabrestan I_{13-11}, Hesar IA, Qareh Tappeh, Moushelan Tappeh, Maral Tappeh II_{1-3}, Shad Qolikhan
	A (Plum Ware & Sialk III_1)					Cheshmeh Ali (Sialk I & II)		Upper Cheshmeh Ali IA & IB, Interval Between Sialk II & III, Sialk III_1, Qabrestan I_{19-14}, Hesar IA, Maral Tappeh II_{1-3}, Shad Qolikhan
Early Plateau	B(Sialk II & Upper Cheshmeh Ali IA)	Transitional Chalcolithic	5200-4300 BC		Lower Cheshmeh Ali IA (5500 BC) Sialk I (?) Zagheh (?)			Upper Cheshmeh Ali IA, Sialk II, Eastern Chachmaq II-I, Zagheh III-I, Ebrahim Abad, Yan Tappeh, Jeyran Tappeh, Pardis
	A(Sialk I&Lower Cheshmeh Ali IA)	Pottery Neolithic	6200-5200 BC			Zagheh		Lower Cheshmeh Ali IA, Sialk I, Eastern Chachmaq IV-III, Chahar Boneh, Ebrahim Abad, Zagheh XII-IV

Table 1. The Number of Settlements in Central Plateau Iran from TCH to EBA1

Early Bronze Age 1	Late Chalcolithic	Middle Chalcolithic	Early Chalcolithic	Transitional chalcolitic	Plain
2	2	1	1	1	kashan
6	6	4	5	8	Qom/Qomroud
3	10	15	17	21	Tehran
1	1	2	5	6	Alborz
0	6	2	5	11	Qazvin
8	8	8	8	13	Damghan/ Shahroud
20	33	32	41	60	Total

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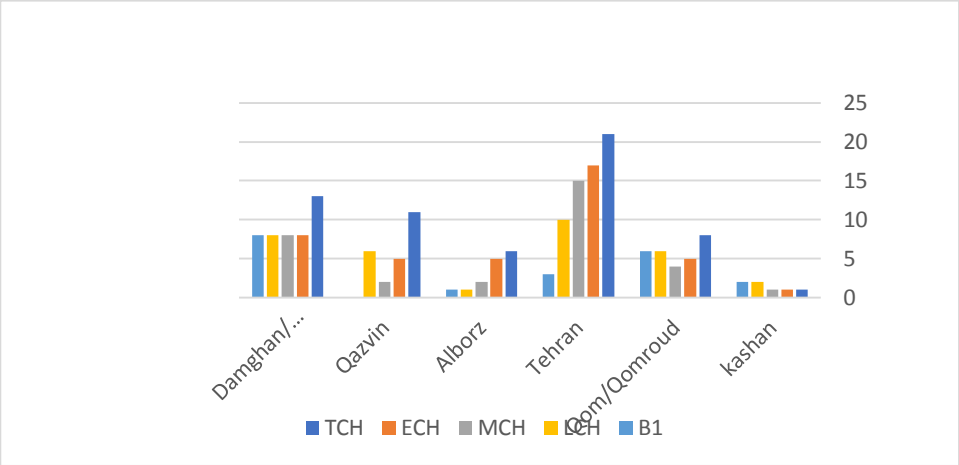

Fig 3. Settlement Density in Plains of Central Plateau of Iran from Transitional Chalcolithic to Early Bronze Age 1

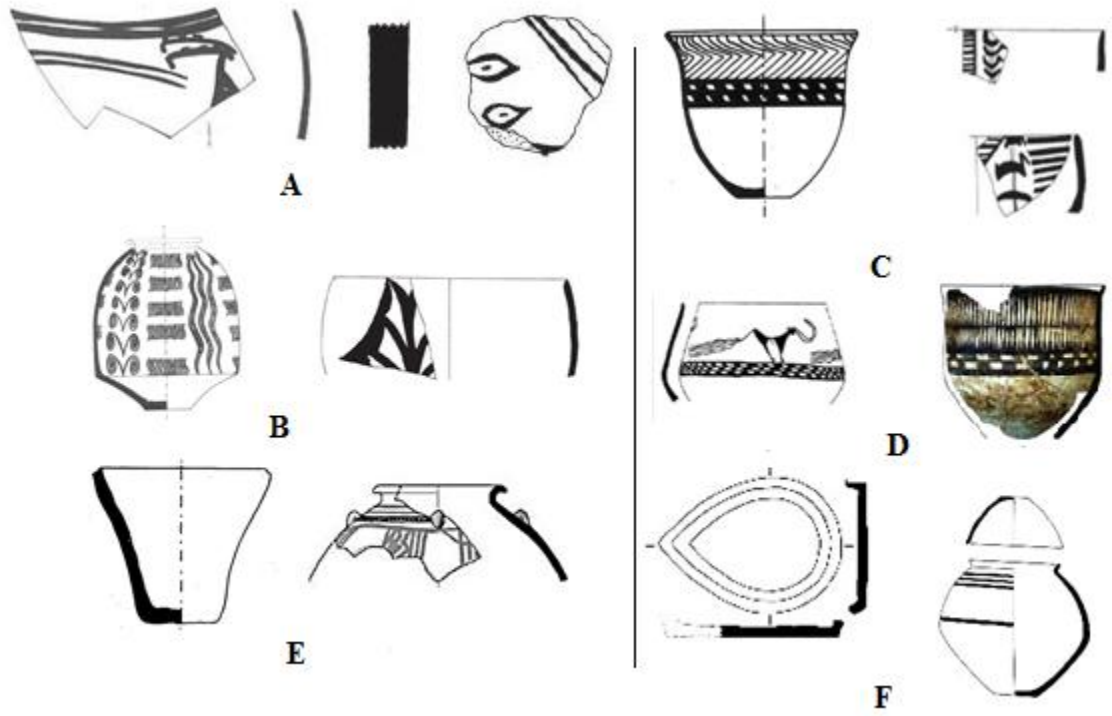

Fig 4. Potteries of Central Plateau of Iran: A: Sialk II; B: Silak III$_{1-3}$; C: Sialk III$_{4-5}$ (Ghrishman,1938; Fazeli Nashli *et.al.*, 2005); D: Sialk III$_{6-7}$ (Broffka & Parzinger, 2011; Fazeli Nashli, 2013); E: Sialk IV$_1$; F:Silak IV$_2$ (Ghrishman, 1938; Helwing, 2013; Abbasnejad Seresti & Asadi Tashvigh, 2016; Helwing, 2011b; Majidzadeh, 2010)

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تحلیل شکل‌گیری، توسعه و فروپاشی از دوران مس‌وسنگ انتقالی تا مفرغ قدیم ۱ در فلات مرکزی ایران

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چکیده: فلات مرکزی ایران که تاکنون به نام‌های مختلفی خوانده شده است، دارای ویژگی‌های خاصی از نظر تحولات باستان‌شناختی از هزاره پنجم تا ابتدای هزاره سوم پ‌م است. شواهد باستان‌شناختی نشان می‌دهد که محوطه‌ها در خلال این مدت دچار تجزیه، فروپاشی، جایگزینی، جابه‌جایی و شکل‌گیری شده‌اند. با وجوداین وضعیت، تحلیل سفال‌ها در وهله اول و تحلیل شواهد معماری، فلزکاری و تدفین در مرتبه بعدی، نشان‌دهنده یک استمرار پیش‌رونده در زمینه مؤلفه‌های فرهنگی در این منطقه است. استقرارهای این منطقه از نظر عوامل زیست‌محیطی دارای حیات پایدار نیستند. بنابراین، تحلیل داده‌های مربوطه براساس نظریه‌های آشوب و پیچیدگی و نظریه عمومی سیستم‌ها نشان می‌دهد که استقرارهای انسانی این منطقه از الگوی ویژه‌ای از دوران انتقالی مس‌وسنگ تا دوران مفرغ قدیم ۱ پیروی می‌کرده‌اند. آنها از طریق جابه‌جاشدن ادامه حیات می‌دادند. درحالی‌که استمرار حیات اجتماعی و استقراری از طریق ترک یک محوطه و شکل‌گیری یک محوطه جدید تضمین می‌شد، تحولات و انقلاب‌های فناوری، اقتصادی و معماری در آن محوطه جدید رخ می‌داده است. اغلب مشاهده شده است که استمرار حیات انسانی با تحولاتی در زمینه ظرفیت‌ها و نوآوری‌های فناوری در محوطه‌های جدید همراه بوده است. درواقع، جوامع مذکور دچار فروپاشی نمی‌شدند. ترک یک محل باعث تضمین حیات اجتماعی و اقتصادی ساکنان آن می‌شد. در فلات مرکزی ایران با جوامعی محلی روبه‌رو می‌شویم که درحالی‌که یک فرآیند توسعه درونزا را پیگیری می‌کردند، ارتباطات فرامنطقه‌ای را نیز گسترش می‌دادند.

واژه‌های کلیدی: فلات مرکزی ایران، انتقالی مس‌وسنگ تا مفرغ قدیم ۱، شکل‌گیری محوطه، جابه‌جایی محوطه، متروکیت محوطه.

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