Towards reassessing the Neolithisation process in Western Iran

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ABSTRACT – *The multi-proxy evidence from Lake Zeribar indicates the possible impact of the Younger Dryas on Western Iran. By the end of this episode, the region was affected by rising temperatures and ensuing environmental enrichment, which could have resulted in changes in the settlement pattern from mobility to more sedentism* c. *9500 BC. It is proposed that semi-sedentism led to population growth and ensuing food management in the region, which finally encouraged people to domesticate plants and animals around 8000 BC. This paper will briefly discuss the three 'why', 'how' and 'when' questions in investigating the Neolithisation process in western Iran.*

IZVLEČEK – *Paleookoljski podatki z jezera Zeribar kažejo na možen vpliv mlajšega driasa na dogajanja v zahodnem Iranu. Dvig temperature ob koncu tega obdobja je v regiji povzročil okoljske spremembe, ki so morda vodile v spremembo poselitvenega vzorca. Okoli 9500 BC so stalna naselja nadomestila mobilne tabore. V članku predlagamo, da so občasna stalna naselja omogočila populacijsko rast in upravljanje s prehrambnimi viri, ki je okoli 8000 BC vključevalo kultiviranje rastlin in domestikacijo živali. V članku se sprašujemo zakaj, kako in kje je potekal proces neolitizacije v zahodnem Iranu.*

KEY WORDS – *Younger Dryas; Neolithisation; western Iran; food resource management; early domestication.*

This article is dedicated to Professors
Frank Hole and Peder Mortensen.

Introduction

In 1959–60, western Iran was one of the first regions in the Near East where early domestication was investigated (*Braidwood* et al. *1961*). Robert Braidwood carried out excavations at the Sarab and Asiab sites near Kermanshah, although these were only partially published. Braidwood left the region to southeastern Turkey, but he paved the way for subsequent researchers. In the 1960–70s, Peder Mortesen (*1975*) carried out soundings at Tapeh Guran and Philip Smith (*1976*) and Judith Pullar (*1990*) directed excavations at Tapeh Ganj Dareh and Tapeh Abdul Hosein, respectively. In the Lowlands, Frank Hole devoted his work to Tapeh Ali Kosh (*Hole* et al. *1969*), Chogha Sefid (*Hole 1977*) and Tapeh Tulaii (*Hole 1975*). Helene Kantour also excavated Chogha Bonut in a small area, which was later continued by Abbas Alizadeh (*2003*) in the 1990s. Political problems resulted in a shift in research to the western Fertile Crescent, finally leading to a paucity of information about the early Neolithic in Iran in comparison with other regions. Archaeological research, however, has indicated a gap in time between late Epipaleolithic settlements and those of the early prepottery Neolithic in the highlands of western Iran. There is no absolute date from the Epipaleolithic sites, and based on the chipped stone industries, their relative dates have been attributed to the very long time span of the Zarzian tradition, *c.* 20 000–12 000 BP, although sites such as Warwasi rock shelter, Ghar-i-Khar, Mar Ruz and Mar Gurgalan Sarab date to the more recent stage of the Zarzian industry (*Mortensen 1993.168*). According to absolute dating, the earliest Neolithic sites, including Asiab (*Howe 1983*) and Ganj Dareh (*Smith 1990*), date to the second half of

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the 9^{th} and 8^{th} millennia BC. Worth mentioning are the newly obtained AMS dates from Central Zagros, which push Asiab back to the early 9^{th} millennium (*Zeder 2008.254*). Recent excavations at Sheikhi Abad, Chogha Golan and East Chia Sabz have confirmed settlements from the mid-10^{th} millennium to the early the 7^{th} millennium (Fig. 1). Regarding the lack of absolute chronology from late Epipalaeolithic sites, they may have even been abandoned earlier than the estimated date. If so, we can imagine a long gap between the latest Epipaleolithic and the earliest Neolithic sites in the Zagros highlands, which coincides with the Younger Dryas, *c.* 11 000–9500 BC. Given the main focus of this paper is on the Neolithisation of western Iran, the discussion of the Neolithic period will be beyond its purview. Due to the focus on western Iran, or more precisely, Central Zagros, the evidence from other regions of the Near East cannot be discussed here.

The Younger Dryas and its possible impact

The Younger Dryas (YD), which was first identified in the pollen record of northern Europe, was a global climatic phenomenon with a dry, cold climate (*Moore, Hillman 1992*); it has been identified by spikes in oxygen isotope ratio samples taken from deep waters around the globe (*Munro 2003.51*). During the Late Glacial, as the temperature rose and the glaciers began to retreat, tundra vegetation was replaced by birch and pine woodland; these trends began during the Bölling and Alleröd pollen phases; then in the ensuing YD, the temperature fell sharply, the glaciers advanced again, and the woodlands retreated south, giving way to open tundra characterised by *Dryas Octopetala*, from which the name of the episode is derived. The term YD has been applied not only to the advance of Dryas-dominated tundra in the far north of Europe, but also to other changes in vegetation induced by the episode in regions such as the Pacific and Greenland discovered through core analyses (*Moore, Hillman 1992.482–483*). Although different studies have suggested a more or less varying time span for the YD, it has been placed within 11 000–9500 BC (*Bar- Yosef, Belfer-Cohen 2002.56*). During this interval, relatively arid conditions in central Turkey are also inferred on the basis of sediment records, indicating low lake levels on the Konya plain and high diatom-inferred salinity in Lake Tuz (*Snyde* et al. *2001.743–744*). The pollen analyses from the Ghab cores and Lake Huleh showed a significant impact of the YD on the environment of the Levant (*Moore, Hillman 1992*). These fluctuations are consistent with the interpretation of the records from Lake Van inferred from pollen and sediment geo-chemistry (*Snyde* et al. *2001.744*). In Iran, paleoclimatic information giving some clues from the Younger Dryas came from Lake Zeribar (*Wasylikowa 2005; Wasylikowa* et al. *2006*) in the west, although other studies were undertaken at Lake Urmia (*Djamali* et al. *2008b; 2008c*) and new sediment cores extracted from lakes Almalou (*Djamali* et al. *2009*) and Maharlou (*Djamali* et al. *2008a*). Both the old and new studies on the coring results from Lake Zeribar indicate cold, dry conditions in the transition from late Pleistocene to early Holocene. High values of $\delta^{18}O$ are interpreted as indicators of dryness, which caused low lake-water levels and increased salinity (*Stevens* et al. *2001*).

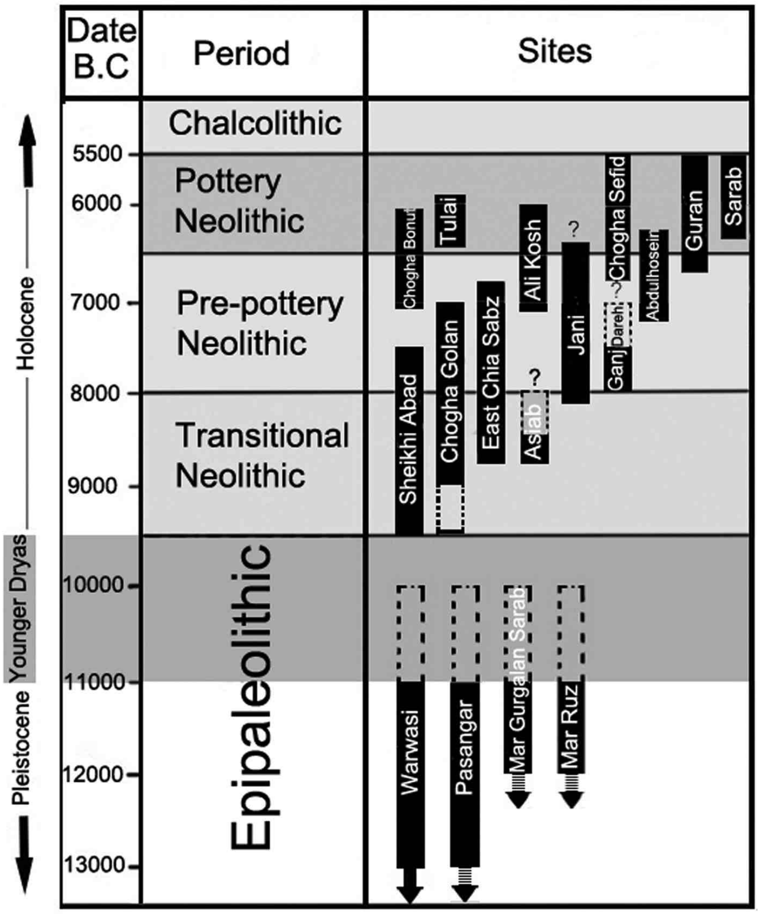

Fig. 1. Chronological chart showing the time span of prominent sites from the late Epipaleolithic to late Neolithic in western Iran.

Saline diatom and halophytic species *Ruppia maritima*, *Salicornia europaea* and *Suaeda* sp. also appeared. The limitation on the growth of the relatively thermophilous aquatics *N. marina* and *C. demersum* suggests a reduction in temperature (*Wasylikowa* et al. *2006.482*). Falling water levels have also been recognised in the frequent occurrence of *Chenopodium Rubrum* and the spectacular reduction in cereal pollen (*Hole 1996.264*). The occurrence of *Gyraulus crista* in the mollusc assemblage may suggest falling temperatures, while the presence of the land snail *Oxyloma elegans* is accordance with the reconstructed fall in water levels (*Wasylikowa* et al. *2006.489*). Previous studies found no arboreal pollen in the lakes (*van Zeist 1967; van Zeist, Bottema 1977*). Palaeo-limnology shows that the climate was stabilised by the rising temperature and the occurrence of arboreal and plants at *c.* 11 700 BP (*Wasylikowa* et al. *2006*), which is relatively synchronous with the end of the YD (Fig. 2).

Thus, the appearance of YD in western Iran is proposed, which affected people life's as coincided with the identified settling gap in the highlands. In the Levant, late Natufian societies returned to greater mobility during the episode (*Goring-Morris, Belfer-Cohen 1997; Bar-Yosef, Meadow 1995*), and some scholars believe that the first farming began in this period (*Bar-Yosef 1998; Bar-Yosef, Meadow 1995; Moore, Hillman 1992*). The C3 plants such as cereals were affected by the reduction in CO_2, which resulted in the low growth of emmer, einkorn, barley and rye in their natural habitats. Therefore, in Bar-Yosef's opinion, the three different responses of more mobility, movement to the northern Levant and farming fertile land such as riverbanks might have occurred (*Bar-Yosef 2002.116*). In western Iran, archaeological evidence suggests the abandonment of highland sites such as Warwasi, Mar Gurgalan Sarab, Pasangar in the late Epipaleolithic, and it seems that the populations living at these sites were faced with shrinking resource productivity during the YD, and therefore moved to the more favourable lowlands. Hole states that the severe conditions in the YD may have stimulated more intensive utilisation of food sources, which probably resulted in new modes of food management such as increasing the ability to harvest, store and process plant foods, as well stimulating the growth of desired species and perhaps control and protection of caprine herds (*Hole 1996.271*). However, apart from in the Levant no evidence has yet been discovered to indicate lowland occupation in western Iran during the YD, and we need to wait for further research.

Transition to the Neolithic

As discussed above, little doubt remains that the YD was a powerful climatic phenomenon that affected southwest Asia, both in the Levant and the Zagros.

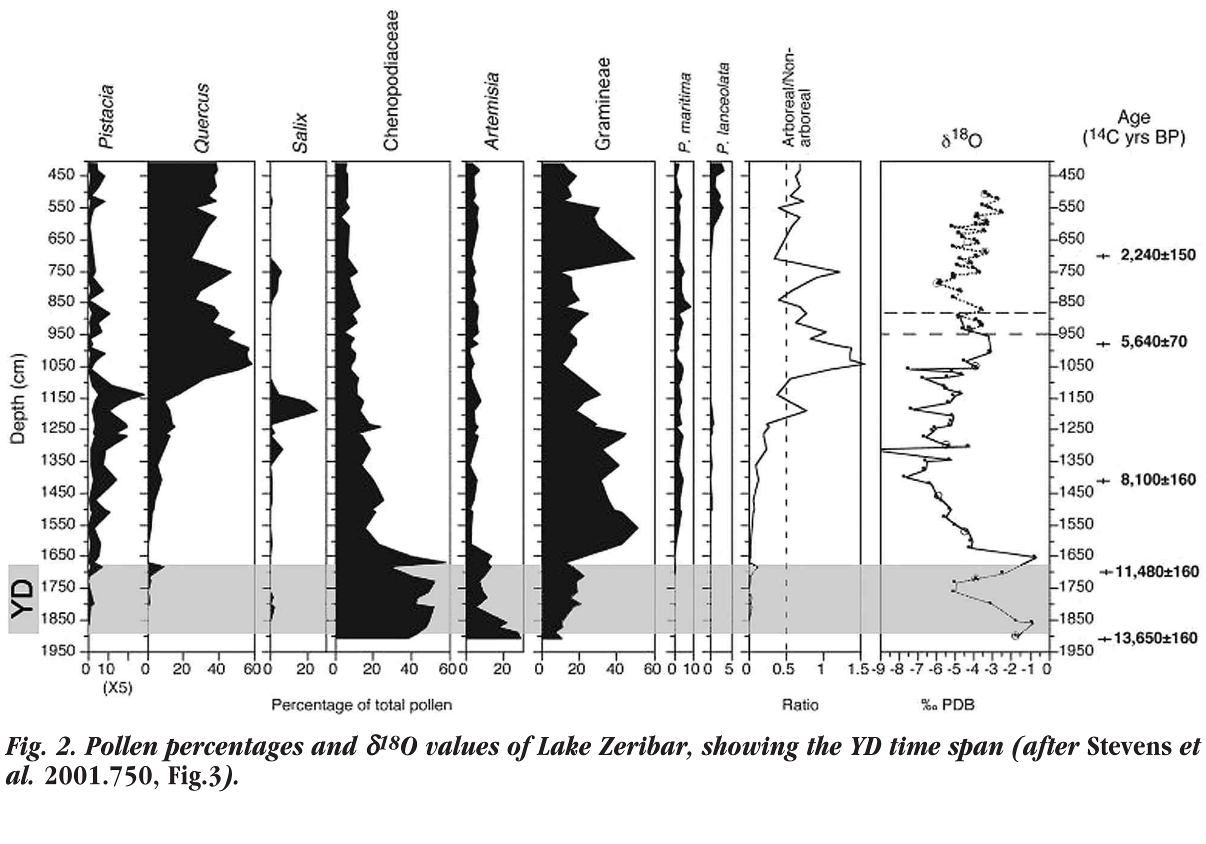

Fig. 2. Pollen percentages and $\delta^{18}O$ values of Lake Zeribar, showing the YD time span (after* Stevens et *al.* 2001.750, Fig.3*).

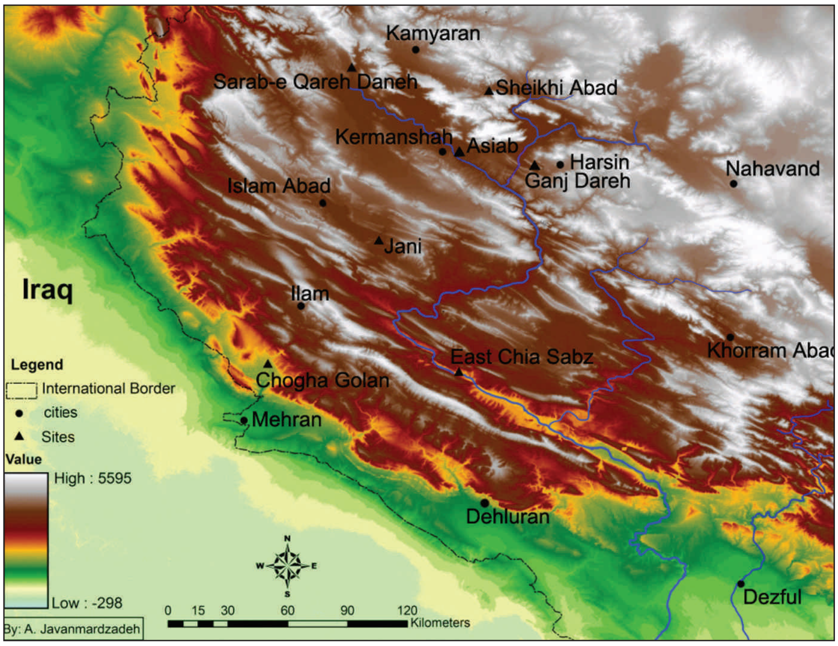

Fig. 3. Map showing the distribution of transitional Neolithic sites in western Iran, 9500–8000 BC.

It seems that this interval ended just after the beginning of a period of solar insolation resulting from changes in the earth's orbital parameters (*Hole 1996. 267*). According to paleoclimatic reconstructions, by the end of the YD, temperature and precipitation ratios had increased and CO_2 levels had risen from 190ppm to 250ppm, which all resulted in the growth of vegetation and the ensuing environmental enrichment (*Richerson* et al. *2001*). The climatic improvement is also indicated by the replacement of steppe with woodland at the onset of the Holocene (*van Zeist, Bottema 1991*), which created conditions under which plants were grown, and finally encouraged a more sedentary settlement pattern in western Iran than that suggested for the Levant (*Bar-Yosef, Belfer-Cohen 1992*). The recent archaeological fieldwork in the Central Zagros has shown the beginning of new settlements just after the end of the YD at *c.* 9500 BC. The basal layers of Tapeh Sheikhi Abad indicate seasonal occupations (*Matthews* et al. *2010*). It seems that the availability of resources prompted a gradual change from mobility to semi-sedentism and, finally, sedentism in the region, which could have resulted in population growth. An increase in the degree of sedentism encouraged population growth, via shorter birth intervals, which put pressure on food supplies and other resources in the immediate vicinity of semi-permanent or permanent settlements (*Bellwood 2005.23*). Based on the evidence from Central Zagros, more settlements appeared around the early 9^{th} millennium BC, such as Chogha Golan, East Chia Sabz and possibly Asiab and Sarab-e Qareh Daneh[1] (Fig. 3), which could be an indication of population growth. It should be noted that these sites yielded deposits of ashy layers which could be a sign of seasonal occupation, but indicates a greater tendency to sedentism than before (*Darabi* et al. *2011*).

By the mid-9^{th} millennium BC, permanent settlements might have appeared, which resulted in the appearance of architecture, although some people were still living semi-permanently (Fig. 4). The pressure on resources that we can infer, was caused by population growth that led to the management of nearby species, which are called 'animal management' and 'cultivation'.

It has been generally believed that domestication occurred over a long period (*Bar-Yosef 1998; Tanno, Wilcox 2006*) which finally resulted in morphological changes in species. Melinda Zeder placed the beginning of plant and animal domestication at the same time, around 9500 BC (*Zeder 2011*). Also, a genetic analysis of the modern wild ancestor of goat has shown that western Iran was one the earliest areas in which goat domestication took place (*Naderi* et al. *2008*). It seems that during the transitional Neolithic, caprines changed behaviourally, not morphologically, which led to changes in their gene pool (*McCarter 2007*) around 8000 BC at the beginning of the Neolithic period. Animal remains from Tapeh Asiab show a kind of animal management at the site (*Zeder 2001.68*). This could also be the case at Ganj Dareh E, where Brian Hesse identified a high concentration of young male goats (*Hesse 1978*). Moreover, such concentration is also visible among the animal remains from Sheikh-e Abad and East Chia Sabz. Other sites have not yet

1 Sarab-e Qareh Daneh was sounded by the late A. M. Khalilian in 1996, which indicated a less than 50cm of ashy deposit (*Khalilian 1996*); the materials have not yet been studied but techno-typologically the chipped stones have mainly been based on flake production, which suggests a transition to blade production as the main character of M'lefatian tradition.

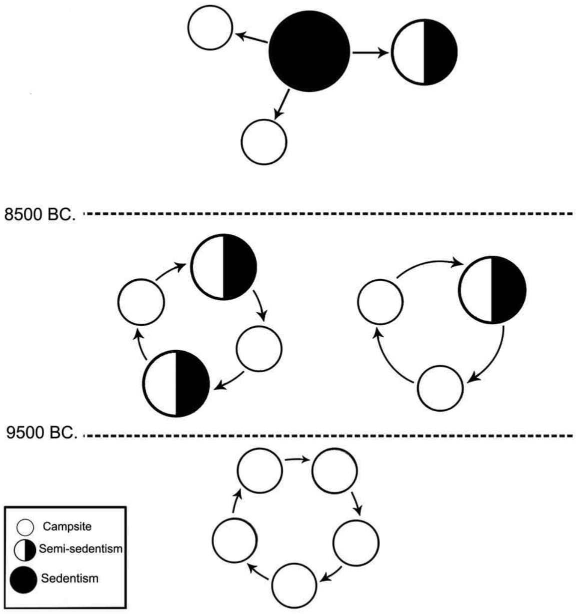

Fig. 4. An explanatory model illustrating settlement patterns from the late Epipaleolithic to the beginning of the Neolithic in western Iran (redrawn from* Mortensen 1972.294, Fig. 1*; modified).

yielded detailed information on animal bones, although the preliminary reports indicate a concentration of *ovicaprids* in comparison with other species. The recent evidence of barley from Chogha Golan and hulled wheat from East Chia Sabz suggests intensive cultivation, with the first signs of morphological change towards domestication by 8100 BC (*Riehl* et al. *2011*). At Ganj Dareh, domesticated barley rachis remains became more numerous later than at the Chogah Golan and Chia Sabz settlements. Based on these newly found domesticated plant remains, it would be reasonable to place the beginning of the Neolithic at around 8000 BC, although further data are required. Indeed, the main difference between the Neolithic and Transitional Neolithic is the appearance of morphological changes in species which are known as fully domesticated species. These new results of recent excavations have significant roles in reassessing the Neolithisation process in western Iran – they could push back the earliest settlement formation to the mid-10th millennium BC, a fact which undermines the assumption that "… *because of the seasonal stress the people who were living during the YD on the resource, they began to rise the agriculture in southern Levant (*McCorriston, Hole 1991*) and then when better climate arrived and shifted toward the north and east, people followed and eventually arrived in Iran, where the land had apparently been essentially abandoned for some millennia, and Ganj Dareh, Ali Kosh and other similar sites are evidence of this movement into Iran*" (*Hole 1999.22*). On the basis of the newly found domesticated plants in the Central Zagros from *c.* 8000 BC, as the result of a long period of cultivation within the region, an independent origin for the beginning of agriculture could be proposed. Genetic studies have also shown multiple origins of domestication throughout the entire Near East (*Naderi* et al. *2008; Salamini* et al. *2002; Zeder 2006; 2011*) which could lead us to assume a Neolithisation process of local origin in western Iran, although the earliest area for species management and then domestication was probably a wider region extending from western Iran to southeastern Turkey, the 'eastern wing' of the Fertile Crescent.

Lastly, the occurrence of different cultures in the Near East is reflected in different Neolithic cultural materials (*Kozłowski, Aurenche 2005*) and each regional culture had its own characteristics (*Kozłowski 1994.143–144*). In terms of chipped stone, the Neolithic industries originated from the Zarzian tradition in western Iran (*Kozłowski 1999; Olszewski 1994*), while the PPNA chipped stone industry is believed to derive from an earlier Natufian culture (*Bar-Yosef 1996.208; Simmons 2007*). Considered together, the new materials from Central Zagros undermine the notional primacy of the Levant which places the origin of agriculture in the Levant and regards other eastern and northern regions as the outcome of this process.

Conclusions

Archaeological evidence has already suggested a relatively long gap between the late Epipaleolithic and the earliest Neolithic sites; the main reason for investigating this gap is the occurrence of the YD in West-

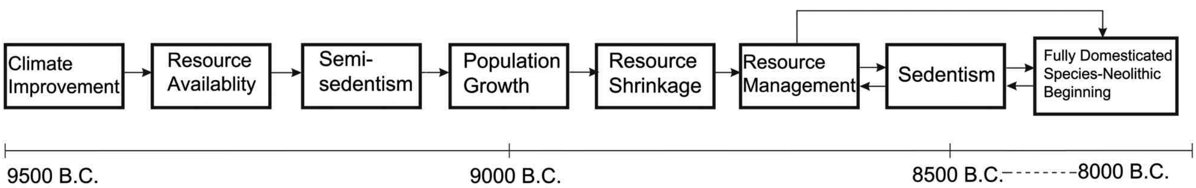

Fig. 5. An explanatory model illustrating the Neolithisation process in western Iran.

ern Iran, which resulted in the abandonment of late Epipaleolithic sites and forced people to move to the lowlands. Recent research in the Central Zagros shows that by the end of YD the region had been reoccupied as the result of climate improvement and the ensuing availability of resources. The increasing number of settlements indicates population growth and a gradual change from mobility to sedentism, which finally led to the establishment of permanent societies at *c.* 8500 BC. It seems that during the 9th millennium BC, the societies of Central Zagros began to manage food supplies to feed their growing numbers, which finally resulted in the full domestication of species such as caprines and cereals at *c.* 8000 BC (Fig. 5). Although this sequence needs further evidence, it shows that the Neolithisation process occurred within a time span of 1500 years and was the result of internal forces.

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