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ARCHAEOLOGICAL REPORT

An Interdisciplinary Research on the Bedrock Ground Stones For The Bawa Yawan Rockshelter, West-Central Zagros Mountains, Iran

Azar Janati-Mehr[1], Rahmat Abbasnejad Seresti[2], Robert C. Power[3], Nemat Hariri[4], Faramarz Azizi[5], Samran Asiabani[6], Sara Heydari[7], Afshar Sepehri[8], Saman Heydari-Guran[9]

Abstract

The late Pleistocene period witnessed significant shifts in human lifestyle and behaviour across various regions in the Old World, as indicated by prehistoric archaeological evidence. These shifts reflect a transition from hunting to a greater emphasis on activities related to gathering plants. Archaeological findings demonstrate the utilization of plants in diverse forms, including the emergence of Bedrock Ground Stone (BGS) at prehistoric sites. In the realm of archaeological research, these remains are deemed crucial man-made artefacts, shedding light on essential aspects such as nutrition, culture, vegetation, food processing, and the presence of medicinal and toxic substances within ancient human societies. Given the existing research gap and the paramount significance of these artefacts in archaeological and anthropological studies, the Diyarmehr Institute for Paleolithic Research, for the first time in Iran, has committed to undertaking comprehensive and scientific investigations of the BGS in the Nawadrwn valley in the Kermanshah region. Owing to its geographical positioning and environmental abundance, the west-central Zagros range has historically attracted and served as a conducive habitat for diverse human groups across various epochs. This study represents a multidisciplinary research endeavour focused on 24 bedrock groundstones (BGS) discovered in the Prehistoric Bawa Yawan rockshelters within Nawdarwan valley. Detailed morphological and geochemical analyses have unveiled their multifaceted utility, encompassing purposes such as herbal processing and extraction, and their use in three instances as stone lamps.

Keywords: West-Central Zagros; Bawa Yawan; Bedrock Groundstone; Classification, Microfossil.

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Introduction

The prehistoric archeological evidence shows relatively sharp changes in human lifestyle and behavior in many areas of the Old World during the Late Pleistocene period. These changes are mainly point to a tendency from hunting to activities related to gathering plants, much more than in previous periods. This period coincides with the Epipaleolithic phase (MIS late 2 and early 1). The Paleoclimatic reconstruction reveals a shift from late glacial climate to warm phase, and therefore the climatic changes cause these behavioral changes (Coon, 1951; Braidwood, 1960; Shidrang *et al.*, 2016; Biglari *et al.*, 2021; Heydari-Guran *et al.*, 2021a, 2023; Aryamanesh, 2024).

Among the study of ancient human livelihoods, bedrock ground stones (BGS) in southwest Asia have become of much interest to archaeologists and anthropologists since they have been reported in archaeological sites from the Paleolithic to the modern era (Terradas *et al.*, 2013; Power *et al.*, 2014). In general, BGS are defined as the human remains that are created due to repeated beating and grinding of various materials (Wright, 1994; Wright, 2008; Eitam, 2009; Rosenberg & Nadel, 2017). So far, much research has been carried out around the world on BGS, and in some cases, the function of these tools are understood. But since they appear in a wide of types and in different geographical areas, many new questions have been raised. BGS are usually seen in two forms, movable and immovable, in archaeological sites. The emergence of BGS in particular is linked to the use of plants. They are usually small circular structures for grinding materials dug into the surface of the horizontal rocks. Their forms are various shapes, sizes, and depths, and can be divided into three groups of bedrock metate, mortar (Shea, 2013), and lamp stone (Medina-Alcaide *et al.*, 2021). Normally, the immovable BGS are close or attached to the caves and rock shelters. One of the rich regions for BGS is the Zagros Mountains, where a large number of the BGS are reported in the archaeological caves and rockshelters (Heydari-Guran, 2014). However, considering the lack of systematic studies on BGS for this region, the function and use of these tools have not been studied as elsewhere. Our research for this topic is located in the Bawa Yawan rockshelter (34° 38' 23.70" N, 46° 55' 48.36" E, 1330 masl.) in the Nawdarwan valley, west central Zagros Mountains. The West Central Zagros sits between the Mesopotamian lowlands to the west and the high plateau to the east, providing relatively easy passage onto the Iranian Plateau (Heydari-Guran *et al.*, 2015) (Fig. 1). During the archeological surveys in the Kermanshah Region in the west Zagros Mountains, several BGS were reported in the Nawdarwan valley, including the Bawa Yawan Rockshelter (Heydari-Guran & Ghasidian, 2021).

Bawa Yawan Rockshelter

Bawa Yawan was discovered in 2009, during a Paleolithic archaeological survey which was part of "Human evolution in the Zagros Mountains" (HEZM) project. Later on, this place became the target of further research, where excavation from 2016 to 2021 revealed three archaeological occupations, including Middle Paleolithic to Epipaleolithic. The archaeological strata have been dated between >45 to 13 kyr (Heydari-Guran *et al.*, 2021).

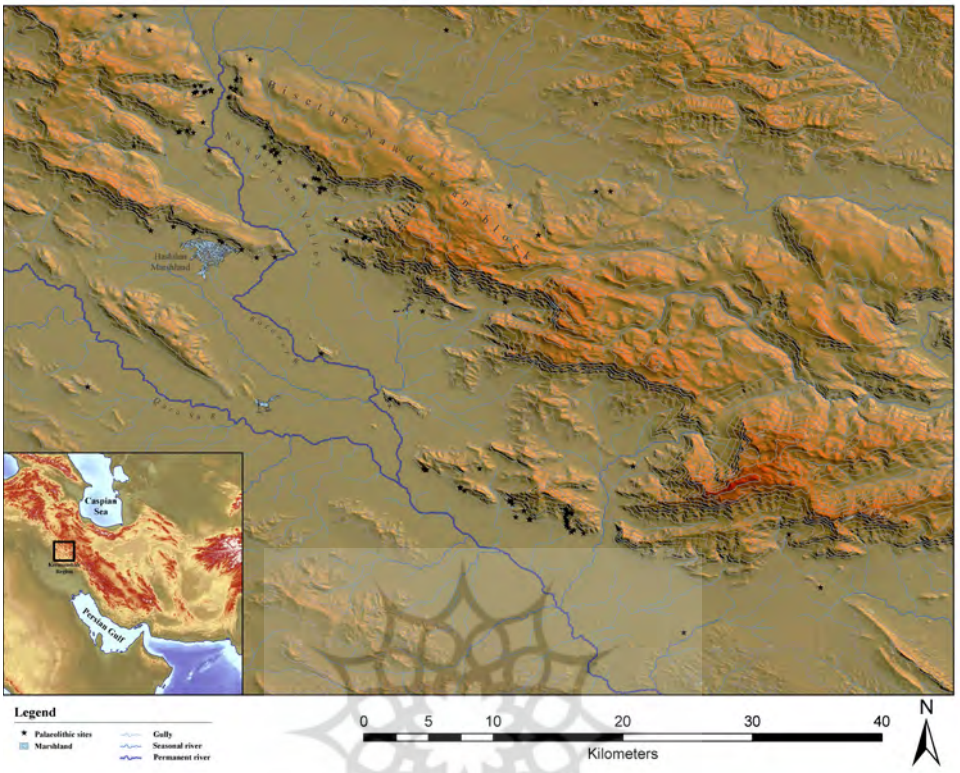

Fig. 1. Map Shows Nawdarwan Valley and the Bawa Yawan Rockshelter in the west-central Zagros Mountains (Heydari-Guran et al., 2023).

Fig. 2. Picture Shows the Bawa Yawan Cliff and Excavation Area (Heydari Guran et al., 2021).

The Rockshelter of Bawa Yawan is 250m long and around 50m high and is composed of Cretaceous limestone. The site is located on the edge of the plain where a karstic pond sits 50m away and the permanent river of Razawar runs for about

Fig. 3. The Process of Sampling for Chemical Analyses. A. Cleaned with a Toothbrush with Distilled Water; B. Transfer Residues to the Falcon™ Tube; C. Wash with an Ultrasonic Brush; D. Add EDTA; E. Put Them in a Centrifuge; F. Study Analyzed with a Polarized Microscope (Photo By F. Azizi & A. Janati-Mehr).

3km southwest of it. 24 BGS are seen on the south and southeast of the Bawa Yawan rock wall in different sizes and forms, where 21 cases are located in the open-air places on the rock and three cases are situated under roof areas. In this short study, we report our investigations on the Bawa Yawan rockshelter BGS for this research, aimed at understanding the function of these human-made features (Fig. 2).

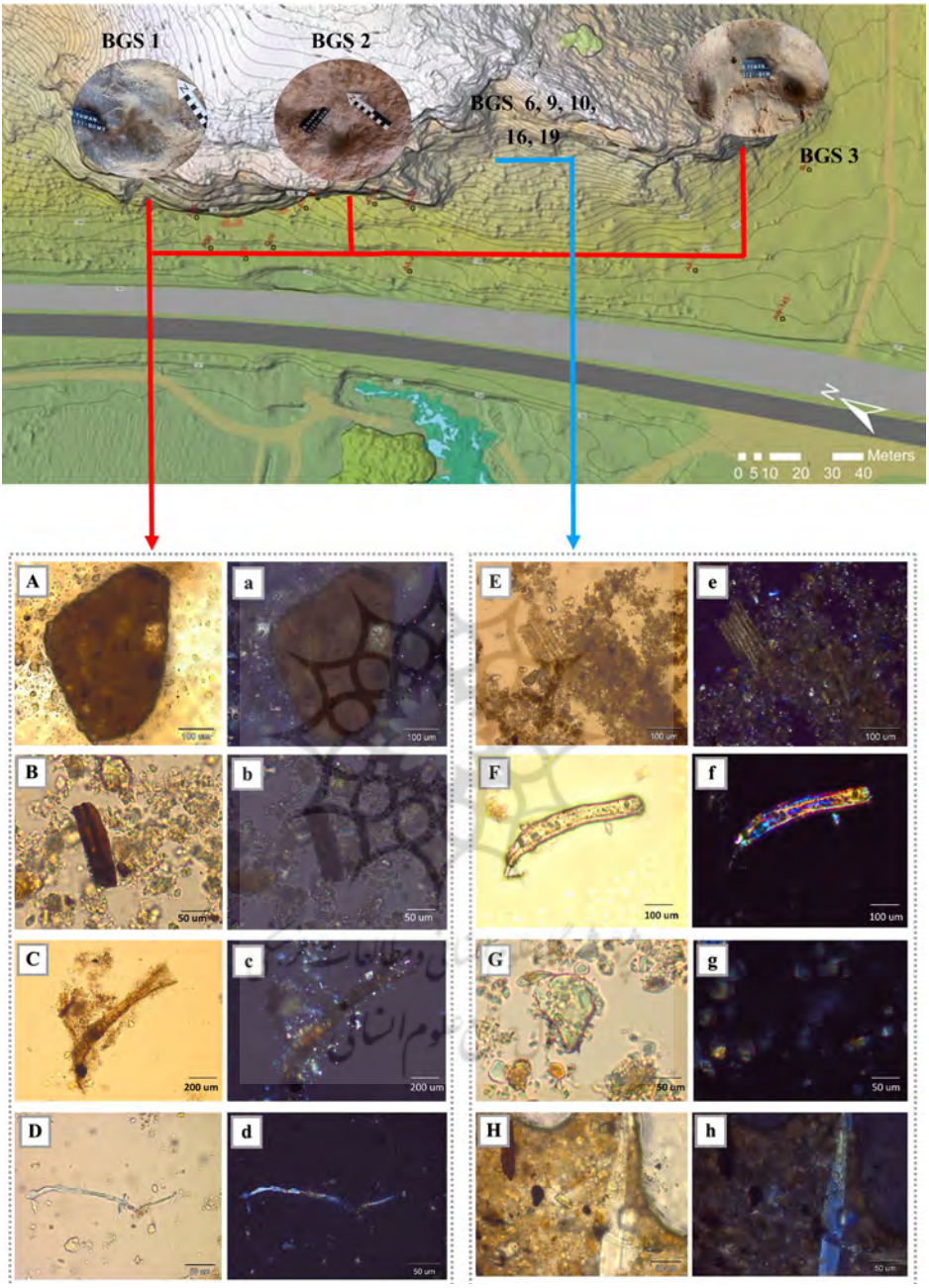

Fig. 4. Eight Samples for Geochemical Analyses in the Bawa Yawan Rockshelter. BGS 1, 2, 3 (A- D) A, a (Ochre). B, b (Charcoal). C, c (Wood Tissue). D, d (Fiber). BGS 6, 9, 10, 16, 19 (E- H) E, e (Epiderm Plant). F, f (Fiber). G, g (Phytolith). H, h (Silica Vascular) (Photo By A. Janati-Mehr).

Methodology

The study was first concentrated on the documentation of morphological parameters, such as from, size, depth, sheltered

or open air. Based on the previous studies, they are classified into three types. In addition, we have applied several laboratories' examinations, including geochemical studies of the residue collection and microfossil identifications analysis (RCMIA) introduced by Li Liu from eight BGS. We have also collected and examined microbotanical residues and use traces as well (Liu *et al.*, 2018). We collected and examined microfossil residues and use traces on the BGS in 2021. Each BGS was first cleaned with a toothbrush to remove surface particles. We washed each BGS with distilled water and then transferred residues to the Falcon™ tube using a pipette and a pipette filler, and the next step is to wash with an ultrasonic brush or an electric brush. In the Kermanshah pharmaceutical laboratory, we added EDTA (Ethylenediaminetetraacetic acid) to the remaining ingredients and put them in a centrifuge at a certain speed. Analysis of microfossils was conducted in the Geology Laboratory of Tehran University in Karaj. Extractions obtained from residue samples were mounted in 50 % (vol/vol) glycerol and 50 % (vol/vol) distilled water on glass slides and analysed with a Polarized Microscope (Fig. 3).

Conclusion

Our morphological study has shown that the BGS in Bawa Yawan are seen in several forms, a. round and regular BGS with around 12 cm diameter, V shape and irregular, Circle Semicircular, U shape, and twin. From eight samples for geochemical analyses, the three cases with U and V-shape and irregular diameter the remains of charcoal, fiber, and ocher were found. All three cases are located in the roofed area in the Bawa Yawan Rockshelter. In the other five BGS we have found remains of plant fibers, charcoal, phytoliths, starch, plant vascular tissue, epidermis, and ochers (Fig. 4).

These remains suggest that some of the BGS, e.g., numbers 1, 2, and 3, have been used as a stone lamp. Similar cases have been reported in the European Paleolithic sites (Medina-Alcaide *et al.*, 2021). In addition, at this stage, based on the available evidence, we hypothesize that the use of BGS in the Bawa Yawan was not used for threshing seeds and food processing. Probably non-food items have been produced in some of BGS in this site. Since the Bawa Yawan Rockshelter is a Palaeolithic occupation area, people may have produced extracts for the procurement of poison or medicines.

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