Journal of Archaeological Science: Reports 29 (2020) 102091

Contents lists available at ScienceDirect

Journal of Archaeological Science: Reports

journal homepage: www.elsevier.com/locate/jasrep

Exploring Mid-Late Pleistocene lithic procurement strategies at Shishan Marsh 1: Preliminary geochemical characterization of chert sources around the Greater Azraq Oasis Area, Jordan

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ARTICLE INFO

Keywords:
Chert
Near East
Azraq
Provenance
Lithics
Paleolithic
Levant

ABSTRACT

Recent excavations at the site of Shishan Marsh 1 in the Azraq basin, Jordan have uncovered several artifact-bearing layers that date within the Middle (266 ± 40 kya) and Late (125 ± 12 kya) Pleistocene. A paleoecological assessment of sediments from this period indicates predominantly warm and dry conditions in the region, similar to those of the present. Hominins living under these hot and dry conditions contracted around a receding spring- and wadi-fed water source for subsistence. As such, they were limited to the distances they could venture to acquire raw material resources. Consequently, Shishan Marsh 1 presents an opportunity to investigate lithic procurement strategies practiced by Paleolithic hominins in an arid environment. This paper presents the preliminary results of an on-going provenance study of lithic sources in the region and a sample of chert artifacts using LA-ICP-MS. The preliminary results indicate that predominantly local procurement was practiced. However, some artifacts were geochemically more consistent with distant sources and still others did not correlate with any sampled source. This latter group indicates that more sources need to be included, as there is greater variability within the Azraq basin than what is documented in this study.

1. Introduction

Lithic artifacts are an excellent source of data for procurement studies (Adams and Blades, 2009; Montet-White and Holen, 1991), as they were a much-needed resource and are nearly ubiquitous at hunter-gatherer sites due to their geological durability. Searching for and exploiting resources across the landscape was a daily requirement for Pleistocene hunter-gatherers. The procurement of lithic raw material for the manufacture of and provisioning with tools is one aspect of this daily resource exploitation (Kuhn, 1995; Potts, 1991; Torrence, 1989). Procurement encompasses the suite of decisions and activities involved in the acquisition of raw material (Andrefsky, 2009; Odell, 2000; Wilson, 2007). The selection of raw material during lithic procurement is an important step in production, as the decisions involved impact the reduction mechanics, transport, use, and longevity of the tool (McAnany, 1988; Newman, 1994; Odell, 2000).

The expansion of hominins across Afro-Eurasia during the Middle (781–126 kya) and Late (126–12 kya) Pleistocene exposed these populations to a variety of environments and climates. These new and varied environments are notable during dispersal events out of Africa and through the Levantine corridor into Eurasia (Bar-Yosef and Belfer-Cohen, 2013; Bar-Yosef and Belmaker, 2011; Shea, 2008). The Levant underwent fluctuating cycles of wet and dry conditions, the latter of which may have presented challenges to the survival of hominin populations (Jones and Richter, 2011). However, various locales within the Levant may have operated as desert refugia during these regionally dry periods, such as the Greater Azraq Oasis Area (hereafter GAOA) in Jordan (Fig. 1), around which hominin populations may have aggregated (Ames and Cordova, 2015; Cordova et al., 2013; Nowell et al., 2016; Stewart and Stringer, 2012). For foragers occupying such desert refugia, the procurement of raw materials for the manufacture and use of lithic tools was a central part of their daily lives and ultimately vital to their successful subsistence (Andrefsky, 1994, 2009; Potts, 1991). However, systematic investigation into the procurement strategies of Middle-Late Pleistocene hominins of the Levant has only recently begun (e.g., Boaretto et al., 2009; Delage, 2007a; Ekshtain et al., 2014, 2016; Finkel et al., 2019; Wilson et al., 2016). Recent archaeological excavations at the site of Shishan Marsh 1 (SM1) in the GAOA of Jordan provide the opportunity to investigate issues of hominin subsistence and raw material procurement during warm and arid periods in the

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https://doi.org/10.1016/j.jasrep.2019.102091
Received 31 March 2019; Received in revised form 23 July 2019; Accepted 11 November 2019

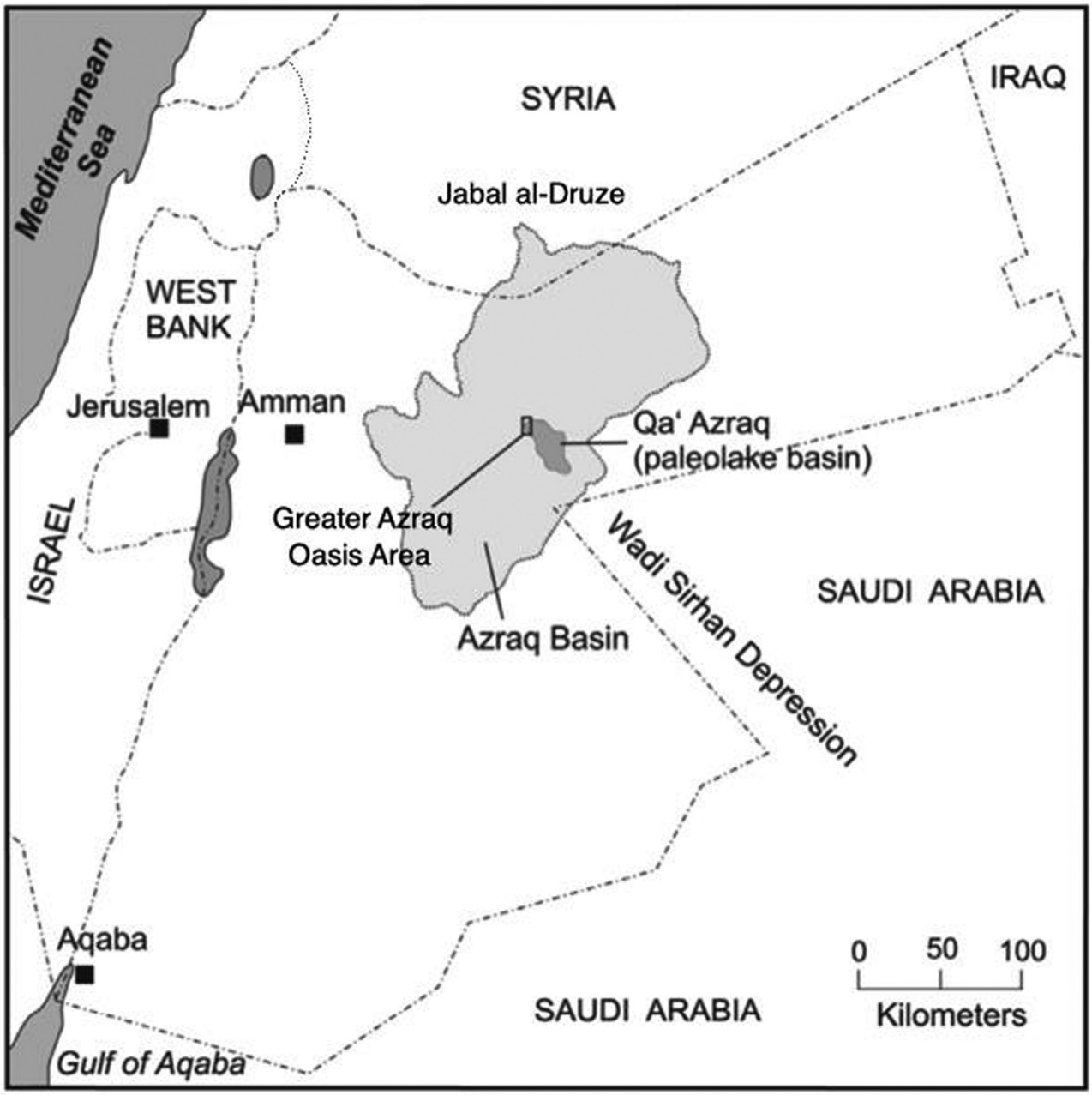

Fig. 1. Location of the Greater Azraq Oasis Area in Jordan (image modified from Ames et al., 2014:61).

Levant, and more specifically at a refugium in the Syro-Arabian desert.

This study presents the preliminary results of a provenance analysis in order to reconstruct the nature of lithic procurement at SM1. Multiple sources of chert are situated within and around the GAOA, making such analyses a daunting endeavor. Furthermore, chert is notoriously difficult to characterize, due to the extreme heterogeneity that is possible within a single bed (Luedtke, 1992). Hence, this study is undertaken with three primary aims: 1) conduct preliminary geochemical characterization of chert sources within the Azraq basin, 2) determine if chert sources can be discriminated from one another based on their geochemical profiles, and 3) apply the results of the first two aims to the archaeological assemblage from SM1. The geochemical dataset is obtained through the application of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). The initial patterns from this study indicate a primarily local procurement. Consequently, the high availability of suitable lithic sources proximate to SM1 allowed hominins to remain largely contracted around the desert refugium.

2. Background of study area

2.1. Modern setting of the GAOA

The Azraq basin is a large (~13,000 km^2) endorheic basin located in northeast Jordan. The basin encompasses a small portion of Jabal al-Druze in southern Syria, as well as a very small portion of northwest Saudi Arabia (Fig. 1). Situated along the northwest portion of the basin's central mudflat are the historic Druze Marsh and the rehabilitated Shishan Marsh. Here we refer to this spring-fed wetland complex and the immediate surroundings as the Greater Azraq Oasis Area (Cordova et al., 2013; El-Naqqa, 2010). The central salty mudflat, or Qa' in Arabic, is 75 km^2 and is the lowest elevation of the Azraq basin (Ames and Cordova, 2015). Qa' Azraq provides a large catchment for a series of springs and several large seasonal rivers—known locally as *wadis*—namely the Butm, Rattama, Rajil, and Usaykhim channels (Cordova, 2007) (Fig. 2). As the interior Levant is subject to warm and