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A multi-proxy approach to archaeobotanical research: Archaic and Fremont diets, Utah

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ABSTRACT

New analytical techniques in archaeobotany allow researchers to examine human plant use by developing interrelated, yet independent lines of evidence. Here we outline the results of a two-method archaeobotanical approach to investigate Archaic and Fremont Great Basin diets. We conducted both macro- and microbotanical (starch granule) analyses at nine archaeological sites located in central and southwestern Utah. Our results show that in contexts where macrobotanical remains are poorly preserved, the application of microbotanical methods can produce additional sets of information, thus improving interpretations about past human diets. In this study, macrobotanical remains represented seed-based dietary contributions, while microbotanical remains came primarily from geophytes. Results suggest largely overlapping diets for Archaic and Fremont residents of Utah.

1. Introduction

Dietary data for past Great Basin inhabitants are difficult to acquire from excavations of open-air archaeological sites. These sites are more exposed to post-depositional disturbances than caves and rockshelters, and as such, often lack preserved vegetal matter, exhibit highly deflated subsurface deposits, and include only limited assemblages of tools used to process plants. In settings like these, multiple lines of archaeobotanical evidence may be necessary to determine what plants were collected and consumed and how they were processed by people in the past. The most commonly employed method of investigation of past human diets involves studying the macrobotanical remains from archaeological deposits. Such analyses typically focus on seeds (or seed-like reproductive bodies), because they are made up of dense and durable tissues that allow better preservation in the archaeological record.

However, the preservation of other organic tissues is often limited by a complex set of biochemical and natural processes (Gallagher, 2014: and references within). These processes often render softer tissues invisible in the archaeological record. Given these limitations, alternative methods that supplement macrobotanical evidence are increasingly valuable. The study of microbotanical remains (e.g., starch granules) is one such alternative method.

Starch granules are photosynthetic products formed by subcellular amyloplasts and chloroplasts as energy stores. The starches most abundant in seeds, fruits, and underground storage organs (USOs; corms, tubers, rootstocks, etc.) are termed 'storage starches', many of which exhibit species-specific structural characteristics that, when quantified, can be used to make taxonomic determinations (e.g., Louderback et al., 2016a). Released from plant cells during anthropogenic processing (i.e., grinding and cooking) these starches become deposited on archaeological tools and in archaeological sediments. Though vulnerable to damage via organic and chemical processes, the microcrystalline structure of the granules renders them relatively resilient to decay, and as such, are often preserved in archaeological contexts where other macrobotanical remains are not (for reviews see: Barton and Torrence, 2015; Haslam, 2004; Henry, 2014; Piperno, 2006; Torrence and Barton, 2006).

While the application of new methodological approaches in archaeobotany has become increasingly common over the past 20 years, these methods are not often applied jointly. However, the results of recent studies that combine macro- and microbotanical evidence verify the utility of the approach (e.g., Boyd et al., 2006; Delhon et al., 2008; Dickau, 2010; Dickau et al., 2012; García-Granero et al., 2015; Louderback, 2014; Messner, 2008, 2011; Morell-Hart et al., 2014; Perry, 2004). The present

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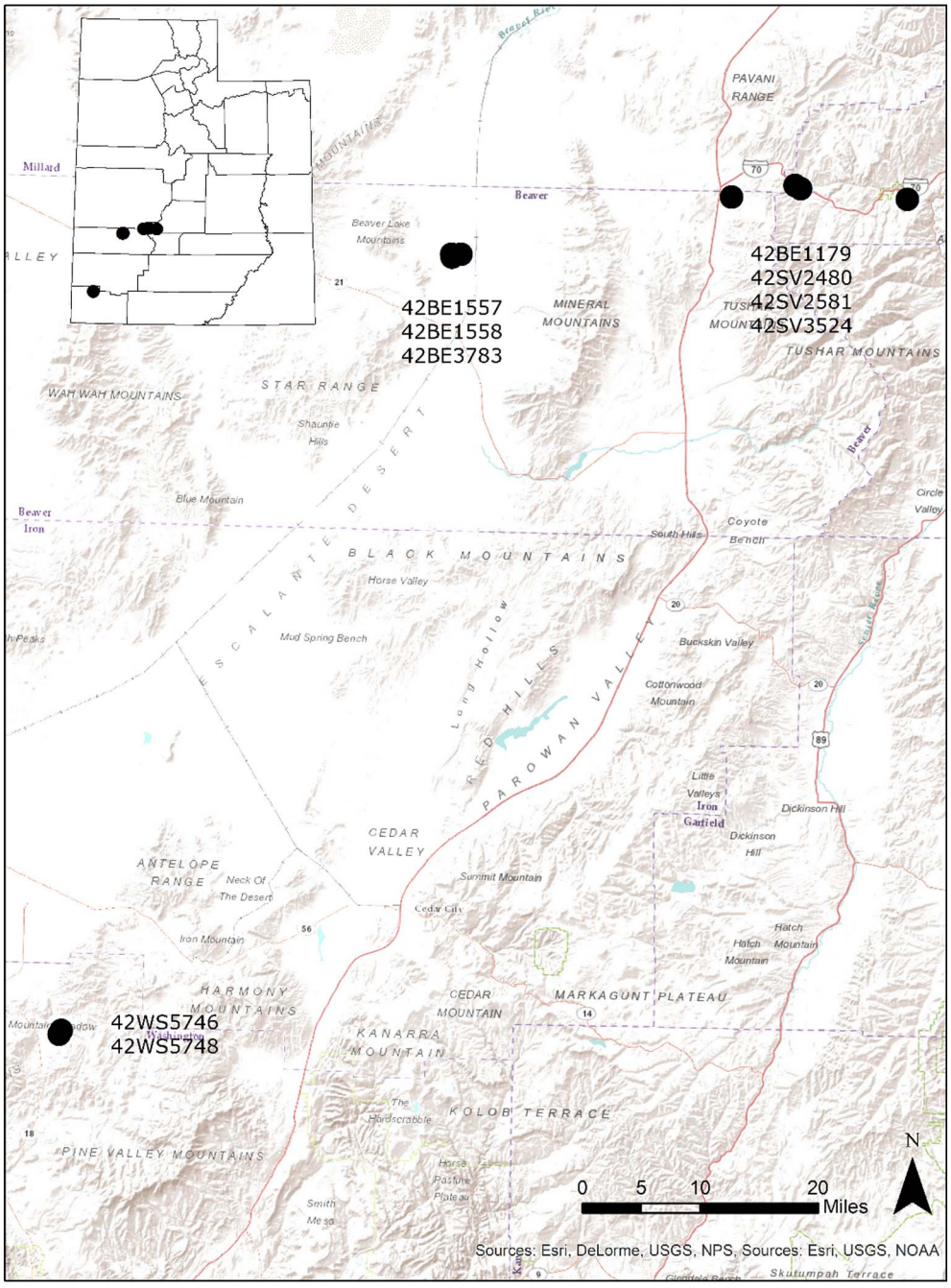

Fig. 1. Locations of the nine sites analyzed for archaeobotanical remains.

study investigates the dietary practices of Fremont and Archaic Great Basin peoples by conducting macro- and microbotanical (starch granule) analyses on hearth and roasting pit sediments and ground stone tools from nine excavated open-air sites in central and southwestern Utah. This research contributes to the growing body of knowledge regarding past diets using multi-proxy investigations. Results provide not only new data regarding the breadth of dietary components, but also novel insights into similarities and differences between Fremont and Archaic subsistence strategies in the Great Basin.

2. Methods

2.1. Site locations and sampling history

We conducted archaeobotanical analyses (macrobotanical and starch granule analysis) on sediments and ground stone tools from nine sites located in central and southwestern Utah (Fig. 1; Louderback et al., 2016b). These sites were investigated as part of a large-scale transmission line project that began in 2010 (for survey methods see Yentsch et al., 2013) and culminating with completion of a technical report in 2017 (Beck et al., 2017). The 277.32-kilometer (172.32-mile) transmission line is located in southwestern Utah, passing through portions of Sevier, Beaver, Iron, and Washington counties. During the project, 81 archaeological sites were investigated through some combination of limited archaeological testing, full archaeological excavation, or historic documentation. Prehistoric sites investigated during the project exhibit variable artifact assemblage diversity and contain evidence of human occupations dating from the terminal Pleistocene through Late Prehistoric periods. Most of the sites examined likely represent short-term occupations, although some sites represent fairly extensive occupations and contain data relevant to address Archaic and Formative period research issues.