

Recent Obsidian Provenance Studies in Baja California

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Introduction

This paper reports on one of the most comprehensive studies to date of sources of archaeological obsidian in Baja California, totaling over 50 obsidian samples from some 20 archaeological sites. Antonio Porcayo provided samples from prehistoric archaeological sites ranging from the border region near Mexicali down the eastern half of the peninsula as far as the southern border of the state of Baja California. Julia Bendimez contributed samples from prehistoric sites in the Sierra Juárez, and Lee Panich provided samples from the site of Mission Santa Catalina, also in the Sierra Juárez. Except for the obsidian from the mission site, all samples appear to be from the late prehistoric period, ranging from approximately A.D. 1000 to 1800. The trace element analyses were performed by Steven Shackley of the Archaeological XRF Laboratory, El Cerrito, California, using a Thermo Scientific Quant'X energy dispersive x-ray fluorescence spectrometer (Shackley 2009a, 2009b).

Our results offer a number of insights into the prehistoric and colonial period use of obsidian in Baja California, including new evidence for north-south distribution of prehistoric archaeological obsidian as well as apparent shifts in obsidian procurement and/or trade during the early historic period. These results are somewhat clouded, however, by the presence of multiple, as-yet-unlocated sources of obsidian in the region. These unknown sources appear to be similar in chemical composition to known sources in the Puertecitos volcanic province of northern Baja California, which includes the “San Felipe” or Arroyo Matomí source. One new geological source was also identified in the field, although its use for the production of obsidian artifacts has not been confirmed.

Geological sources of obsidian in northern Baja California

For over 50 years, anthropologists have been aware of geological sources of obsidian in the northern region of Baja California; however, the exact locations and nature of some of these sources have yet to be definitively settled. Homer Aschmann (1959:105), for instance, was one of the first to mention that obsidian artifacts occurred in sites in the San Felipe region. In 1971, Tom Banks published a short note on the geological sources of obsidian in Baja California, focused just on the San Felipe area, and noted a source “50 miles south of San Felipe ... at an elevation [of] 2500 feet in rough volcanic mountains” (Banks 1971:25). Ron Douglas followed in 1981, reporting

on a reconnaissance in Arroyo Matomí (Douglas 1981:68). In 1984 Paul Bouey provided a qualitative EDXRF analysis of “San Felipe” obsidian, the first relatively systematic attempt to chemically characterize Baja California obsidian with XRF. The data, however, are not comparable to quantitative data today. Interestingly, while not discussed in the article, Bouey’s map shows a location for both the San Felipe and Arroyo Matomí obsidian sources (Bouey 1984:56).

In the 1960s, Steven Shackley collected some small marekanites from secondary deposits in the outwash plain from Arroyo Matomí south of San Felipe. For 20 years, these have been used as the data for assigning obsidian artifacts to the San Felipe source, although the primary source locality for these marekanites was unknown. In 1993, Joann Stock was conducting geological research in the Puertecitos volcanic province and sent Shackley a number of mapped marekanite samples from three localities on a dome complex near Puerto el Parral rancho just south of Arroyo Matomí (Martin-Barajas et al. 1995; Stock et al. 1999). She describes the source as having abundant marekanites.

With the discovery of the Puerto el Parral source, however, the composition of what constitutes “San Felipe” obsidian became more complicated. Shackley’s elemental analysis of samples from Puerto el Parral and the secondary deposits collected downstream indicate that there are likely at least two chemical groups that exist in the Puertecitos volcanic province. The elemental composition does suggest that these groups are probably magmatically related, but the only eruptive event that is known is that of Puerto el Parral. Although previous researchers, such as Bouey (1984), have postulated that San Felipe and Arroyo Matomí obsidians represent distinct geological sources, the two are treated as the same source in this analysis due to their geochemical similarities.

Furthermore, analysis of obsidian collected by Lee Panich at Mission Santa Catalina revealed another as-yet-unlocated obsidian source that appears to be chemically related to obsidian from the Puertecitos field. Several additional artifacts in the study, collected from two distinct archaeological sites in the Sierra Juárez by Julia Bendímez, exhibited elemental concentrations that do not match any known source in the peninsula or adjoining regions of Alta California. One of these samples (PJ-MU) has an elemental composition similar to the Puertecitos obsidian and could therefore be another source in the northern peninsula. Additional artifacts from sites at Isla San Luis and Laguna Seca Chapala, in the southern portion of the study area, also exhibited elemental concentrations that failed to match known obsidian sources in the region.

Lastly, a newly discovered geological source of obsidian, identified by Antonio Porcayo, further complicates the already murky picture of obsidian sources in Baja California. This new source, called Lágrimas de Apache (Apache Tears), is located farther north, near the mouth of the Colorado River, but it is also chemically similar to other obsidian sources in the Puertecitos volcanic province. In sum, there are at least four distinct sources of artifact-quality obsidian located in the northern region of Baja California. Two are known: Puerto el Parral and Lágrimas del Apache. The locations of the other sources are unknown; these include “San Felipe” or Arroyo Matomí, as well as the Mission Santa Catalina obsidian and at least one other potential source. An intensive geoarchaeological survey of the Puertecitos volcanic field is needed in order to define the geological relationships between these glasses and to locate the geological source of these materials (Shackley and Hendrickson 2009).

Patterns of distribution

In addition to adding to our developing knowledge of obsidian sources in northern Baja California, these findings shed new light on the distribution of archaeological obsidian throughout the region. Scholars have noted that obsidian from particular sources found in archaeological sites in Baja California appears to have a distinct east-to-west pattern, leading many to speculate that it may be possible to reconstruct pre-contact linguistic or ethnic boundaries based on the distribution of obsidian from particular sources (Laylander 2005; Ritter 2001).

The available ethnographic and historic records, while limited, do support the idea that the territories of ethnolinguistic groups in the northern peninsula stretched from the Pacific coast across the sierras to the coast of the Gulf of California (Hohenthal 2001; Meigs 1939; Owen 1969). A previous archaeological study by Jerry Moore (2001) recovered obsidian from Puerto el Parral and San Felipe from prehistoric sites on the Pacific coast, in the San Quintin/El Rosario region. While rare in this region, Moore sees the obsidian as evidence of east-west trans-peninsular procurement ranges.

As noted by Laylander (2005), however, there is increasing evidence for the north-south distribution of obsidian on the peninsula. The overall picture derived from obsidian provenance analysis in Baja California does not necessarily reflect cultural or linguistic boundaries; rather, as Laylander points out, it is likely that at any given site the most common obsidian would be from the closest available source.

The results of this study suggest that during the prehistoric period the general pattern of obsidian distribution was one of proximity to the geological source. For instance, obsidian artifacts from Kumeyaay and Kamia sites close to the international border were predominantly from Obsidian Butte, located near the present-day Salton Sea. Sites farther down the peninsula, from approximately 31° to 29° latitude, contained mostly obsidian from the San Felipe and Puerto el Parral sources. Farther south, along the 28th parallel, three sites all produced Valle del Azufre obsidian.

Yet some interesting exceptions were noted. In the far northern region, a single piece of Coso obsidian from Alta California was collected from the Alamo Mocho site east of Mexicali. Two different sites in the eastern Sierra Juárez contained obsidian from unknown sources, one of which (from the Murillo site) appears to be chemically similar to obsidian from the Puertecitos volcanic field. Lastly, two pieces of obsidian from Agua Caliente at the eastern base of the Sierra San Pedro Mártir are from the Obsidian Butte source in Alta California, despite the fact that the site is located less than 40 km from Puerto el Parral and Arroyo Matomí.

These anomalies offer further evidence of north-south distribution of obsidian in the region, including Obsidian Butte glass some 175 km south of the source, as well as numerous instances of Puerto el Parral obsidian occurring commonly up to about 100 km south of the source. While its exact geological source is unknown, San Felipe obsidian also occurs well north of its suspected source in Arroyo Matomí, including sites along the gulf coast. San Felipe glass has previously been noted as far north as Riverside and San Diego Counties and as far south as Bahía de Los Ángeles (Laylander 2005; McFarland 2000; Shackley 2009a). While most of the obsidian provenance data collected in this study conform to expected least-distance principles, these data also suggest that linguistic or cultural differences were likely not significant barriers to obsidian procurement and/or trade in the late prehistoric period.

Despite the growing evidence for north-south distribution of obsidian in the northern region, certain questions about the prehistoric use of obsidian in the region remain. The first is the

discovery of the Lágrimas del Apache obsidian source southeast of Mexicali. None of the archaeological obsidian analyzed in this study was from this particular geological source, despite its proximity to several of the sites sampled. While further studies may identify artifacts made from this glass, its absence in the current study is intriguing.

Lastly, it appears that significant changes in obsidian procurement and trade took place during the colonial period. Of the 35 obsidian samples analyzed from Mission Santa Catalina, located in the southern Sierra Juárez, all were from an as-yet-unknown geological source that exhibits strong similarities to the San Felipe obsidian source. Two things make this pattern especially interesting. The first is that none of the prehistoric artifacts analyzed in this study match the unknown Santa Catalina obsidian, opening the possibility that new sources of obsidian began to be exploited as Spanish and later Mexican colonial expansion disrupted pre-contact trade and social relationships. Secondly, if the Santa Catalina obsidian did originate in the general Arroyo Matomí/Puerto el Parral area, then it would have been obtained from a distance of roughly 100 km from the mission site. This area is also in the ethnographic territory of Kiliwa-speaking groups, none of whom are known to have lived at Mission Santa Catalina (Panich 2009). This obsidian may then be evidence of trade connections between mission Indians and those living outside of colonial control.

Discussion

While the data presented here offer intriguing clues into the use and trade of obsidian artifacts in northern Baja California, more research is clearly needed to resolve the social and cultural implications of obsidian distribution in the northern region. First, a more detailed technological study of obsidian artifacts is needed. For example, are there common attributes that characterize the most exotic obsidian artifacts? Does debitage decrease as distance from the source increases? Further provenance studies will also help to clarify the picture of obsidian distribution across the region, and with time and more studies, we will be able to put questions of sample size to rest. Lastly, more detailed survey and mapping of geological obsidian sources will clarify the picture of where obsidian originated in the landscape, and by extension we can begin to answer the question of who was trading with whom. Although far from conclusive, this study is a step forward in untangling the complex patterns of obsidian use, procurement, and related social relationships in Baja California.

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