

Author Response: SE-2010-17 Native American Lithic Procurement Along the International Border ...

February 14, 2011

Below we respond to the reviewers' specific concerns directly.

Dr. F. Arakawa:

Introductory paragraph: "... these authors need to explore human behavior and sociopolitical organization..."

Response: Again, our exploration of human behavior was necessarily limited given the preliminary nature of the data set. Our first objective was to assess the availability and quality of lithic raw materials in the Bootheel area to provide baseline data for this and future studies of lithic procurement activities and mobility strategies. Second, the Average Minimum Distance statistic was formulated by CH to assess the relative mobility of resident groups during the Archaic, Formative, and Protohistoric time periods. The relative mobility of Formative groups was of particular interest as some groups in southern New Mexico were sedentary agriculturalists, while others continued to derive a significant proportion of their diet from hunting and gathering. Our preliminary results suggest that Formative populations in the Bootheel area fall into the latter category. A third objective was to use the AMD figures and raw material proportions for the individual site clusters to begin tracking the movements of groups during the different time periods. This last objective was not achieved, in large part because it appears that the groups were predominantly using the local sources of tool stone and carrying little with them as they moved from one site cluster to another. These results are consistent with other observations suggesting that lithic procurement strategies will vary depending on the availability of lithic raw materials (e.g., Andrefsky 1994) but the behavior could not have been anticipated until we had mapped potential lithic sources in the study area.

These tentative conclusions were reported in the article but, given the reviewer comments, it is clear that they were lost in the geological descriptions. Again, we will try to clarify and emphasize the behavioral interpretations in revising the text.

Point 1: explain why minimum distance was used in the analysis and consider energy expenditure ... important to consider physiological aspects such as slope and aspect.

Response: Dr. Arakawa has effectively employed minimum-energy pathways (which takes into account the differences in energy expended in traversing varying terrain) in his analysis of lithic procurement patterns and territoriality in the central Mesa Verde region. We opted to use simple straight-line distances partly because this was a preliminary study but largely because the energetic of lithic procurement among mobile hunter-gatherers is fundamentally different from that of the sedentary agriculturalists.

As Dr. Arakawa noted in his study (Arakawa and Nicholson 2010), agriculturalists tend to reduce their mobility and the cost of travelling to procure resources. Consequently, we would expect them to follow a least-energy pathway in transporting lithic raw materials between the quarry site and their habitation, as well as to exploit the closest source of suitable lithic material. In contrast, mobility is fundamental to hunter-gatherer adaptations – groups and individuals move among food resource locations, to monitor resources in their environment, to visit other groups, and to find mates. Movements are generally conditioned by the distribution of water and food resources in their environment, and only rarely are trips made specifically to procure lithic resources. Most often, lithic procurement is “embedded” in subsistence activities (Binford 1979); that is, lithic raw materials are collected as encountered during the search for food resources if there is a perceived need for such materials. Only small quantities of material (probably no more than a few kilograms) tend to be collected at a time, and the transport costs are difficult to separate from the search costs for subsistence resources. The pathway by which the material is transported is also determined primarily by the distribution of food resources.

Point 2: toolstone procurement patterns vs. behavior and sociopolitical, add a table including time, period, subsistence pattern, etc.

Response: Text will be modified as noted in previous responses. We will also incorporate a table of time, period and subsistence patterns as suggested by Dr. Arakawa.

Anonymous Reviewer:

Introductory paragraph: “...by virtue of being fairly low tech and opportunistic, the design of the study is not what it could have been.”

Response: While it is true that we were not allowed to conduct as thorough an investigation as we would have preferred, we are grateful to have an opportunity to present this (limited) data set to the rest of the community. We were bound by the constraints of the project and could do no more than what we present. Therefore, this study must be preliminary and incomplete by its very nature. As noted above, we also will try to put our results into a better cultural context.

Point 1a: Maps are referred to as Figs 3-5 in correctly

Response: This will be corrected.

Point 1b: Trouble relating Fig. 1 to the following maps.

Response: We chose to show the broader regional lay-out in Figure 1 so that we could show the positions of all relevant sources for obsidian that are far away from the study area. If we were to have kept that scale for the following maps, they would be illegible. We prefer to leave the scale of these figures as they are, as we feel the broader regional view is instructive.

Point 1c: Figure 1, locating sources vs. cities

Response: We will alter portions of the figure for clarity.

Point 1d: “... paper could be helped greatly by an inclusion of the “anthropological” data in graphic form”

Response: We are happy to add appropriate histograms of percentages of lithologies.

Point 2: "...refer to radiocarbon dates obtained from "thermal features". They need to explain what they mean by this."

Response: We will replace "thermal features" with the term "hearth".

Point 3: "Discussion of site cluster localities would be improved by citing specific figures ..."

Response: We will add appropriate figure call-outs.

Point 4: "... authors refer to "aerially associated sites." This term also needs to be explained."

Response: We will clarify this language.

Point 5: "Did they mean "hand samples"?"

Response: We will clarify, although it is appropriate language among geologists as written.

Point 6: "Ditto with "in photograph" ..."

Response: We will correct this language.

Point 7: "...describing local geology, could also be improved with ... citations to specific figures."

Response: We will add the appropriate citations throughout this section.

Point 8: "... was "AFT" defined at some point?"

Response: We will add the appropriate definition.

Point 9: "...grammatical hiccup"

Response: We will correct the grammar appropriately.

Point 10: "... Could AMD be redefined here?"

Response: We will add the definition here as well.

Point 11: "... is it really fair to report so many significant figures on the AMDs?"

Response: This point is well taken and we will reduce the number of significant figures.

Point 12: "It would be nice to have the AMD data presented together in a table ..."

Response: We will add an AMD value table.

Point 13: "...closer source of obsidian would have significantly lowered the AMDs of the Protohistoric assemblage. By how much?"

Response: we will consider this suggestion although one of the reasons that the AMD formula and data tables were included in the article was to allow the reader to make this sort of assessment independently.

Point 14: "...authors present a difference as insignificant and then discuss its "meaning" anyways ... what is the point of testing for significance if insignificance isn't going to stop speculation?"

Response: We will review our results again and try to eliminate any rampant speculation but given the limitations of the data set and the preliminary nature of the study, we tried to identify patterns that might be culturally if not statistically significant that can be tested by future research. The statistics give us and the reader a sense of the strength of similarity and difference at a given significance level.

Point 15: "... the authors briefly note some of the weaknesses of the study ... I think they should have gone somewhat further with this ..."

Response: We agree with this comment and we will add language throughout the paper to clarify the preliminary nature of this data set, as well as the artificial nature of the survey site choices. We regret that we were not allowed to undertake broader scale surveys or excavations, but we still believe that this data set is relevant, even in such a limited form.

Point 16: “Can a little bit more be said in terms of what procurement entailed and why anyone bothered to procure specific materials ...?”

Response: Good point! We will add text to better define what we are talking about – something in the vein of our responses to Dr. Arakawa’s comments. It is sometimes difficult to gauge how much people in other fields know about archaeology.

We are currently revising our manuscript in light of these very helpful comments and we hope that Solid Earth will further consider our manuscript for publication. We are most happy to answer any further questions or concerns regarding this research.

Sincerely yours,

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