EARTHENWARE PRODUCTION AND TRADE: USING ETHNOGRAPHIC DATA AND PETROGRAPHIC ANALYSES TO COMPARE PREHISTORIC AND CONTEMPORARY POTTERY TRADITIONS FROM THE ISLAND OF BOHOL, PHILIPPINES

Andrea Yankowski

PO Box 13898, Berkeley, CA 94712, USA
Email: ayankow@onebox.com
Keywords: petrographic analysis, pottery production, pottery trade, Bohol, Philippines,

ABSTRACT

This paper presents the results of the petrographic analysis of a small sample of sherds from the island of Bohol. Both archaeological and ethnographic samples were analyzed to determine if similar technologies or clay sources were used in the past and/or among present day potters. The aim of this study is to assess the usefulness of using petrographic analysis and comparative ethnographic data to help us understand early pottery production and trade in the region.

INTRODUCTION

The island of Bohol has a long and rich tradition of using and producing earthenware pottery. Earthenware pottery has been recovered from archaeological sites dating from the Metal Age (500 BC – 960 AD), and earlier, in various regions of the island (Yankowski 2004). Much of this pottery shows similarities in style and form with pottery recovered from neighboring islands in the Central Philippines and beyond. This suggests that there was either an active trade in pottery between the islands, or a movement of people or ideas that manifested itself archaeologically as regional pottery styles.

To date, no attempt has been made to determine the source of prehistoric pottery recovered from archaeological sites in Bohol. In fact, only a handful of pottery samples have been excavated or provenienced to specific archaeological sites. As a result, little is known about the production or use of pottery during prehistoric times.

This paper presents preliminary results on characterizing and sourcing prehistoric earthenware pottery from Bohol. Using petrographic analysis, a small sample of sherds recovered from both archaeological and ethnographic contexts was analyzed and compared to determine if there is a relationship between the prehistoric and/or contemporary production centers and potting techniques. Ethnographic interviews were also conducted to learn more about contemporary clay sources and technologies, as well as to determine if there are similarities or continuities in pottery traditions over time on the island.

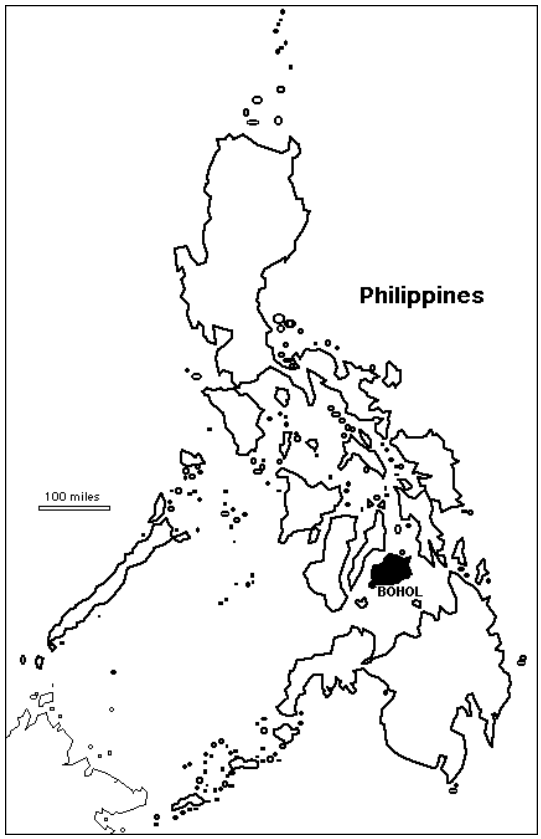

Figure 1: The location of Bohol

BACKGROUND

The island of Bohol is located in the central Philippines, east of the island of Cebu, west of Leyte and north of Mindanao (Fig. 1). It is part of the central group of islands known collectively as the Visayan Islands. The people of the Visayan Islands make up a distinct ethnolinguistic group. This linguistic and cultural relationship is noted in the historical and archaeological record and is believed to be deeply rooted in the past. Archaeological studies have demonstrated close similarities in material culture within the Visayan region (Solheim 2002), with a particularly strong relationship noted among Metal Age pottery forms

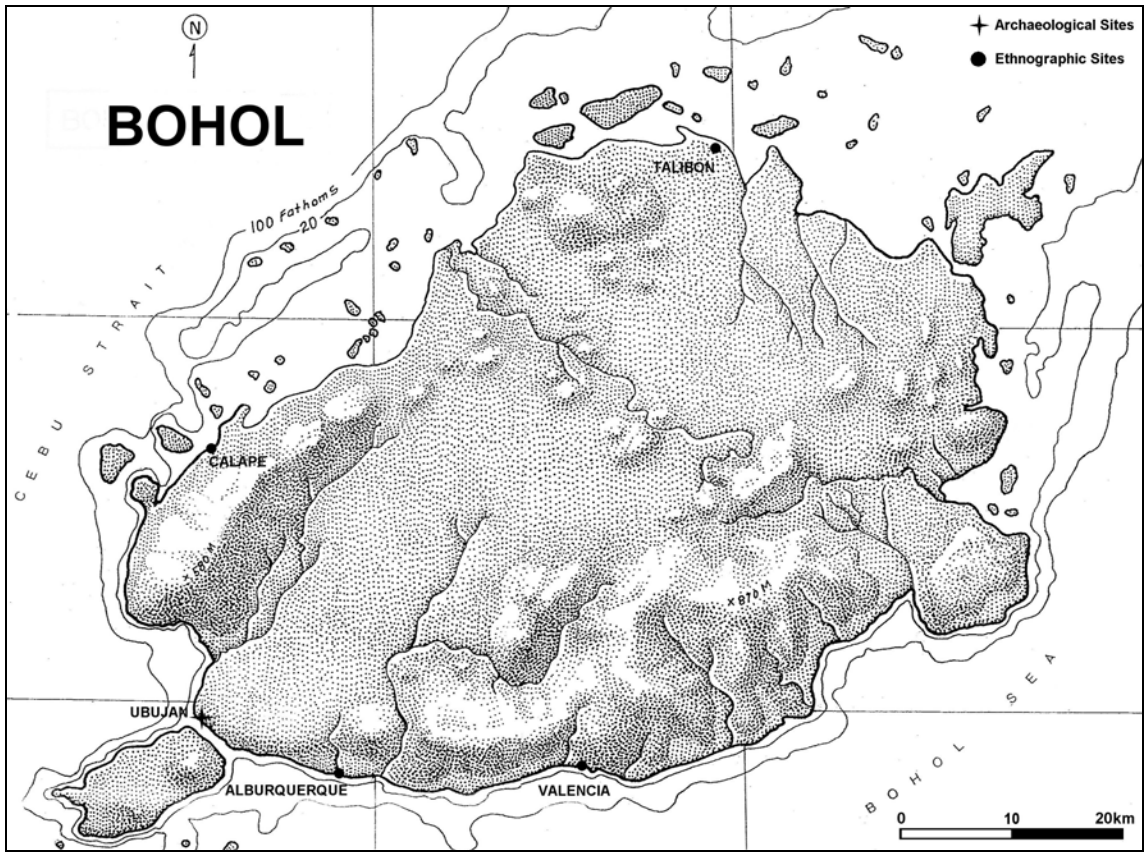

Figure 2: Bohol: archaeological and ethnographic sites mentioned in the text (modified after Santiago, n.d.)

Table 1: List of earthenware samples

	Accession No.[#]		
Sample 1	VII-98-P2-15b	Archaeological/Ubujan	Incised sherd
Sample 2	VII-98-P2-438	Archaeological/Ubujan	Fine Paste ware
Sample 3	N/A	Archaeological/Ubujan	Red slipped ware
Sample 4	N/A	Archaeological/Ubujan	Highly tempered plain sherd
Sample 5	VII-98-P2-280	Archaeological/Ubujan	Plain sherd
Sample 6	N/A	Ethnographic/Valencia	Tempered with river sands
Sample 7	N/A	Ethnographic/Calape	Tempered with river sands
Sample 8	N/A	Ethnographic/Talibon	Mixed fine clay with sandy clay.
Sample 9	N/A	Ethnographic/Alburquerque	Tempered with beach sands

[#]National Museum of the Philippines (if available)

and styles from Bohol, Negros, Siquior and Masbate (Bacus 2003; Yankowski 2005). This suggests that there were direct trade or interactive relationships among these islands. As such, a comparative analysis of the archaeological assemblages and the sourcing of this material culture should provide important data for furthering our understanding of early trade and interaction in the region.

Petrography is a promising method for addressing the relationship of pottery recovered from archaeological sites in the Philippines. Earthenware pottery is widely recovered from prehistoric sites in the region and petrography can provide a complementary methodology in addition to stylistic/typological studies for comparing pottery types. It can also allow us potentially to source pottery samples to specific clay sources and/or production centers, thereby allowing us to trace the origins and movements of pottery in the region. Furthermore, ethnographic data on pottery manufacture, use and trade, when used in combination with archaeological data, can further aid interpretations of the archaeological record.

METHODOLOGY

Pottery samples for this study were selected from both archaeological and ethnographic contexts (Fig. 2). The archaeological samples were selected from a recently documented Metal Age burial site in District Ubujan, Tagbilaran City, Bohol (Yankowski 2004, 2005). The Ubujan burial site contained over 1,800 earthenware sherds, including a number of nearly whole vessels. The variety of styles, forms and visibly distinct clay/temper

matrixes in the collection suggests that the pottery originated from a variety of sources, some brought to the site by trade. In particular, the variation in the body matrixes of the clay suggested that there was variability in clay sources and tempering materials, indicative of different potters using different clay sources, tempers, and potting techniques.

Five archaeological samples were selected (Table 1) to represent *some* of the variability in the collection. They include sherds of plain ware, red slipped ware, decorated ware, highly tempered ware, and Fine Paste (FP) ware. The first four samples are all low-fired earthenwares. The cores are not fully oxidized and there is variation in surface coloration and fire "clouding", characteristic of open-air firing conditions. The FP ware is an exception, and has been recovered from a number of archaeological sites throughout the Southeast Asian region. Some of the distinguishing physical characteristics of FP wares include: 1) very fine, untempered paste; 2) very thin bodies, generally 3-4 mm thick; 3) very smooth body texture; 4) generally a white or pale/light cream to peach uniform color; 5) vessel surface is often chalky or shows signs of exfoliation; and 6) uniformity in form, firing and color indicating that this ware was wheel-thrown and kiln fired (Miksic and Yap 1989-1990). This last point is significant because there is no evidence of prehistoric kiln technology in the Philippines, which would suggest that this ware was imported.

The ethnographic samples were collected from May to October 2000 during a study of the island's contemporary pottery centers. There are four towns on Bohol where potters continue to produce earthenware pottery using traditional techniques (i.e., non-wheel and open-air firing methods), which are sold at local markets throughout the island. Potters were interviewed in each of these towns to learn about their clay sources, tempering materials, forming and firing methods, family histories, and the sale and use of their products. These samples are important because they are provenienced to specific clay sources, and therefore provide data on the composition of the clay as well as specific information on local technologies and traditions.

In April 2003, these nine sherds were sent to David V. Hill at Archaeological Research and Technology Inc. in Austin, Texas, for petrographic analysis. Thin sections were prepared from each of the sherd samples. Some of the most significant findings from this study are as follows:

1) Samples #1 and #3 are compositionally similar to one another. Each is composed of two distinct, birefringent clay matrixes consisting of a reddish-brown clay and a light yellowish-brown clay. The samples also have similar mineral inclusions (e.g., biotite, feldspar and quartz), as well as trace amounts of volcanic rock (e.g., rhyolitic tuff). Hill believes that these two samples were probably derived from the same clay source, and the two matrixes represent the same source materials at different stages of weathering.

   From ethnographic interviews it was noted that Boholano potters commonly mix clays from different levels of the same source, or from two different sources. This was noted in the town of Talibon, where sandy clays from the upper layers of a source were often mixed with finer clays from the lower layers. Likewise, in the town of Valencia, it is common to mix 1 sack of *bonbonon* (sandy clay) with one sack of *hawot* (fine clay) in a 1:1 ratio. This eliminates the need for additional temper.

   Sample #1 is incised and #3 red-slipped. From this we can infer that incised and slipped wares were being made by the same potters and/or potters using the same clay sources. It appears that village potters did not specialize in the production of only one particular style of ware.

2) Sample #5 is similar to #1 and #3, but has added temper sand derived from micritic limestone and lacks volcanic tuff. Sample #4 (the highly tempered ware) is significantly different from #1, #3 and #5. The matrix is a gray clay, only weakly birefringent. It is highly tempered with well-sorted carbonate sand derived from biomicritic limestone.

   The ethnographic study revealed that Boholano potters commonly use a variety of tempers, including river sands, beach sands and crushed limestone as temper, depending on what is readily available.

   Sample #4 has an excessive amount of temper. One hypothesis is that prehistoric potters were using additional temper for plain, utilitarian cooking wares. Research has demonstrated that particular types of temper can increase the thermal shock resistance of a vessel (Rye 1976:116-117; Bronitsky 1986). This would include tempers whose coefficients of thermal expansion are similar to or less than those of the clay, such as calcites and crushed burned shell. This is acknowledged by modern potters in Talibon, who often add crushed fine-grained limestone as temper for their cooking wares. However, there is no evidence to indicate that this particular sherd was from a cooking vessel.

3) Sample #2 is Fine Paste ware, with a completely different ceramic fabric from the other samples. Mineral inclusions consist of plagioclase, green-brown hornblende, and trace amounts of brown biotite. Studies on FP ware suggest that this ware was made at multiple, but probably limited, production centers in Southeast Asia (Miksic and Yap 1989-1990, 1992; Naranjo 1993). The clay is a relatively pure kaolin, which has a limited occurrence in the region. Furthermore, XRF studies on samples from Malaysia, Singapore, Brunei and Sarawak indicate several trace element groupings indicative of different sources (Miksic and Yap 1989-1992, Yap 1992). Comparative studies on samples from the Philippines (Butuan, Mindanao) indicate a closer relationship with samples from Brunei and Sarawak than with Singapore and Malaysia (Naranjo 1993). It would be interesting to do a comparative test of the Bohol sample in relation to the

Butuan and Indonesian/Malaysian XRF samples to determine its most likely origin.

4) Each of the ethnographic samples is compositionally distinct, as expected since they use different clay sources. Furthermore, they are each distinct from the archaeological samples, indicating that the pottery recovered from the archaeological site in Ubujan did not originate from any of these modern sources. Some key characteristics of these samples include (Hill 2003):

   Sample #6 (Valencia): Opaque black color with isolated mineral grains and volcanic rock fragments in roughly equal amounts. There are two types of volcanic inclusion - basaltic andesite and trace amounts of light brown volcanic tuff. The mineral grains are primarily andesite plagioclase with trace amounts of untwined alkali feldspar, quartz and augite.

   Sample #7 (Calape): Medium brown color with fragments of volcanic rock and isolated mineral grains. The most common volcanic rock inclusion is rhyolithic tuff. There are also trace amounts of andesitic basalt. The predominant mineral grains are sanidine, plagioclase and weathered brown biotite.

   Sample #8 (Talibon): Medium reddish-brown clay matrix that is highly birefringent. The clay appears to have been weathered from a plutonic source, most likely granite. Mineral inclusions consist of quartz, untwined alkali feldspar and some traces of plagioclase and brown biotite.

   Sample #9 (Alburquerque): Medium brown color. Mineral inclusions consist of quartz and untwinned alkali feldspar. Sand grains account for about 35% of the clay matrix.

DISCUSSION

The main goals of this project were: 1) to test the potential of using petrography as a methodology to compare and source earthenware sherds recovered from archaeological sites in the Philippines; 2) to collect petrographic data for comparative research; and 3) to learn more about early clay sources, production methods, and the trade and use of pottery in the region.

The petrographic analysis provided promising results, especially when considered with respect to the ethnographic data. The archaeological data demonstrate that there were multiple pottery production centers on the island during the Metal Age, as well as some inter-island exchange of pottery. The variation in paste/temper composition among the archaeological samples is significant, indicating that the clays originated from distinct geological contexts. This diversity was also noted among the ethnographic samples, as would be expected since they were sourced to four different localities.

The sourcing of sherds to specific clay sources presents a more daunting challenge. To be able to source pottery to specific clay sources it is necessary to identify the specific mineral inclusions ("signatures") in the clay matrixes and/or distinct properties of the clay. This requires extensive knowledge about local clay sources, and a good understanding of the local geology of the region, which is currently lacking. However, the identification of specific types of geological anomaly may assist in identifying clay sources to general geographic regions. For example, two types of volcanic inclusion were noted in the samples from the town of Valencia, whereas the samples from Talibon were weathered from a plutonic source, most likely granite. This provides some basic geological information that may be useful if prehistoric potters were using clay sources from the same general regions as modern potters use today.

Furthermore, researchers from the Philippines and elsewhere have noted that potters generally procure clay within close proximity to their homes. This means that if we can identify prehistoric village sites, we might be able to narrow down the likely sources of clay.

This limited study demonstrates the potential uses of and problems with petrographic methods to study earthenwares recovered from archaeological sites in the Philippines. Additional studies are needed to expand the quantity and diversity of samples. Ideally, this would include some samples from neighboring islands, as well as some compositional/elemental analyses of the samples to complement the petrographic data.

ACKNOWLEDGEMENTS

This research was made possible by a Fulbright Scholarship administered through the Philippine-American Educational Foundation, Makati City, Philippines. Institutional support for this research was provided by the Archaeological Studies Program, U.P. Diliman, and the National Museum of the Philippines. Funding for the petrographic analysis was made possible through a research grant from the Kiana Dressendorf Scholarship for Archaeology, administered through San Francisco State University. I would like to acknowledge David V. Hill at Archaeological Research and Technology Inc. for his analysis of the thin sections, Joselito Alipala of Bohol for his assistance with the ethnographic interviews, and the potters of Bohol for sharing their history and know-how about their craft with me.

REFERENCES

Bacus, Elizabeth A. 2003. Styles of allliance? decorated earthenwares in late prehistoric and protohistoric Philippine polities. In John N. Miksic (ed.), *Earthenware in Southeast Asia – Proceedings of the Singapore Symposium on Premodern Southeast Asian Earthenwares*, pp. 39-51. Singapore: Singapore University Press.

Bronitsky, Gordon. 1986. Experiments in ceramic technology: the effects of various tempering materials on impact and thermal-shock resistence. *American Antiquity* 51: 89-101.

Hill, David V. 2003. Petrographic analysis of selected ceramics from the Philippines. Unpublished report.

Miksic, John H. and C.T. Yap. 1992. Compositional analysis of pottery from Kota Cina, North Sumatra: implications for regional trade during the twelth to fourteenth centuries AD. *Asian Perspectives* 31,1: 57-76.

1989-90 Fine-bodied white earthenwares of Southeast Asia: some x-ray fluorescence tests. *Asian Perspectives* v28,1: 45-60.

Naranjo, Susan Sr. 1993. Mineralogical characterization of archaeological pottery: preliminary study of the Butuan potsherds. Unpublished report for the UNESCO Hirayama Silk Roads Project.

Rye, O.S. 1976. Keeping your temper under control. *Archaeology and Physcial Anthropology in Oceania* 11,2:106-137.

Santiago, Rey, n.d. Unpublished map from the National Museum of the Philippines, Manila.

Solheim, Wilhelm II. 2002. *The Archaeology of the Central Philippines: A Study Chiefly of the Iron Age and its Relationships (Revised Edition)*. Manila: University of the Philippines.

Yankowski, Andrea. 2004. Trade, technology and tradition: analysis of a Metal Age buirial from Bohol, central Philippines. *Bulletin of the Indo-Pacific Prehistory Assn.* 24: 51-6.

Yankowski, Andrea. 2005. Trade, Technologies & Traditions – The Analysis of Artifacts Recovered from a Metal Age Burial Site in District Ubujan, Tagbilaran City, Bohol. Unpublished M.A. Thesis, Department of Anthropology, San Francisco State University, San Francisco.