Ethnoarchaeology at the Top of the World

New Ceramic Studies Among the Kalinga of Luzon

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Figure 1. The Kalinga area, with its rugged topography, is located in the midst of the Cordillera Mountain range in the Philippines. This mountain chain contains the highest peaks in the country (seemingly, the "top of the world"), and is inhabited by tribal minorities who continue to practice traditional subsistence techniques of rice farming and slash-and-burn agriculture and who share many customs, such as pig liver divination and the institution of peace pacts.

I. History of the Project

The Kalinga are a tribal society inhabiting the high mountains of Luzon in the northern Philippines. Here, on ridges and in valleys overlooking swift flowing rivers, they make their living by growing rice in irrigated, terraced fields. Why, in 1973, did a Southwestern archaeologist leave his dig in Arizona and travel some 10,000 miles to live with and learn from these people? The answer lies in the theoretical climate of the day.

The Kalinga Ethnoarchaeological Project was forged during the era of the "New Archaeology." Reacting against traditional archaeological approaches, proponents of the New Archaeology emphasized explanation over description. One of their aims was to develop the means to infer aspects of past societies that are difficult or impossible to excavate, such as social organization and certain behaviors of interest to the archaeologist. New Archaeologists frequently used excavated pottery in making their inferences. Could the abundant pottery the Kalinga still make and use in their daily lives hold a key? We thought it could.

Over the 18 years that have passed since the Project began, the face of archaeology has changed dramatically. So, too, have the goals of the Project, now encompassing concerns about the formation of the archaeological record, performance characteristics of pottery, experimental studies, production and distribution of pottery, and much more. Reviewing those changes in historical context provides a look at the changing nature of archaeology itself.

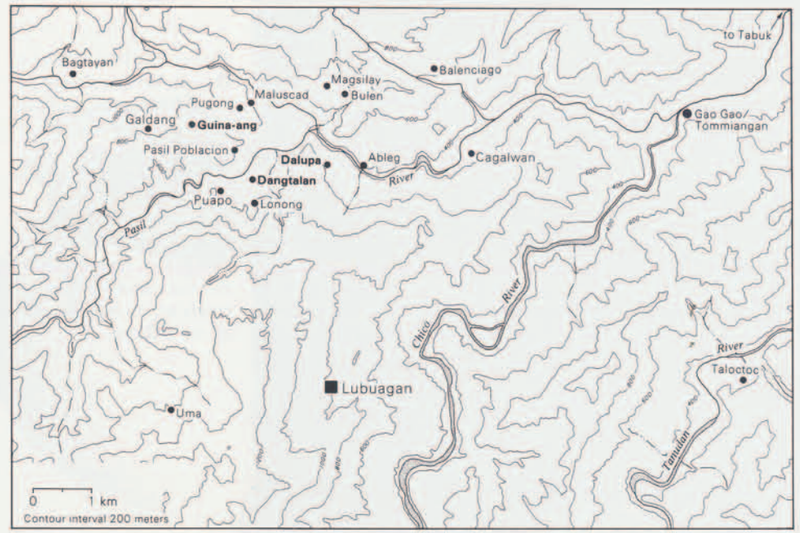

Figure 2. Villages studied during the Kalinga Ethnoarchaeological Project all fall within the political boundaries of the Pasil municipality, whose borders largely coincide with the Pasil River drainage system. Ethnoarchaeological research has been conducted in 7 of the municipality's 13 communities, and efforts have concentrated on the villages of Dangtalan, Dalupa, and Guina-ang.

Selecting an Appropriate Society

Why did we choose the Kalinga? In one of the first case studies of the "New Archaeology," the senior author analyzed the distribution of painted pottery decoration at a prehistoric Pueblo ruin in Arizona called the Carter Ranch Site (Longacre 1970). In that study, he argued that certain aspects of social organization could be inferred through such a distributional study. If pots are made by women, as they are in nearly every known case where pottery is made for domestic consumption, then subtle styles of decoration might develop that reflect the learning of pottery making from one's mother. And if that is so, then micro-traditions of pottery decoration might reflect the making of pots by a group of related women—sisters, for example.

Some societies favor the husband leaving his natal home at the time of marriage and moving in with his wife's family. If that were the rule at the Carter Ranch Pueblo during prehistoric times, then clusters of decorated pottery should be found in architecturally defined groups of rooms. Although Longacre's study found a correlation between pottery designs and architectural units, by 1973 serious doubts were raised about that study and others like it. Concern was expressed about whether or not micro-traditions reflected learning frameworks in such a society.

Also, the study of prehistoric pottery did not unravel factors (other than kinship) that affected the distribution of the pottery as it was excavated from the prehistoric village. Some of these factors include where the pottery was produced, how the pottery was used, and how the pottery was affected by environmental processes after the village was abandoned. It had been assumed in the original study that the distribution reflected directly the locus of use and production of the pots themselves.

It was clear that the only place where one could begin to address such concerns was not in the archaeological record, but among a living society. The problem was to find an appropriate society with which to work. Ideally, it should be a group that makes and uses pots on a household basis. That is, each household makes pots for its own use and not for sale in a market. It should also be a culture whose customs and traditions had already been studied by cultural anthropologists (e.g., Barton 1949; Dozier 1966, 1967; Scott 1958, 1960; Takaki 1977, 1984), providing a foundation for ethnoarchaeological research. Finding such a society was

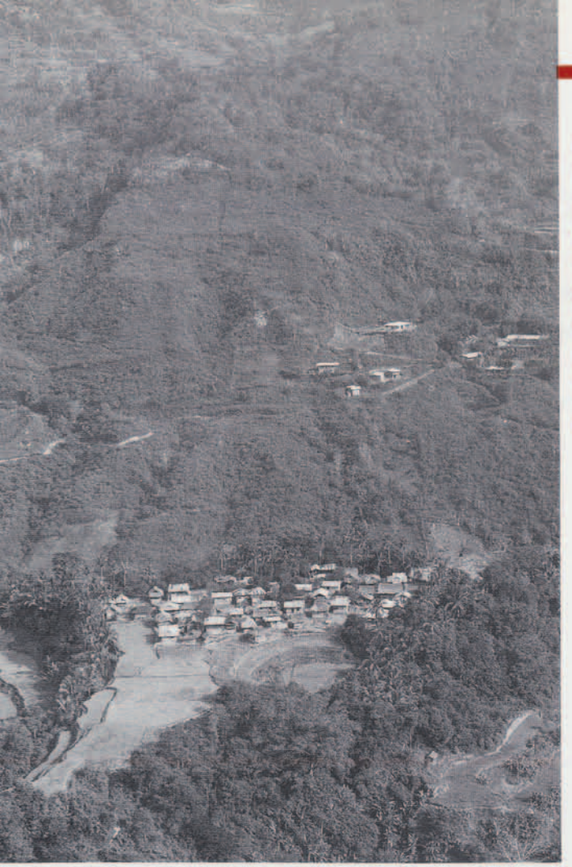

Figure 3a. The village of Dangtalan overlooks the Pasil River and contains two compact clusters of houses: the larger settlement of Dangtalan proper and the associated group of households called Puapo. Dangtalan residents farm the surrounding rice fields off to the far side of the village.

Figure 3b. Typical scene within the village of Dangtalan. Traditionally, Kalinga houses are built several feet above the ground. Construction materials include split bamboo and cogon grass. Galvanized iron roofing has recently become a popular alternative to thatched roofs. Costly to obtain, metal roofing is more resistant to damage during monsoon storms, but it also conducts heat from the tropical sun and makes for warm house interiors.

difficult in the modern world. At the time, the Kalinga, a tribal society living in the rugged mountains of north central Luzon in the Philippines (Fig. 1), seemed the most likely candidate. An initial trip was made to the Kalinga-Apayao province in 1973 to ascertain if the people still made pots on a household basis and to seek their permission to undertake a long-term study if such were the case (Longacre 1974).

The Kalinga Ethnoarchaeological Project focused its efforts on villages within the Pasil municipality (Fig. 2). The village of Dangtalan was the first place visited (Fig. 3a,b). Pottery was in use everywhere: the Kalinga used pottery vessels to cook their rice and their vegetables and meat, as well as to carry and store water from the spring and even to brew *Bayas*, a sugar cane wine. Women made the pots and learned how to do it from their mothers, and virtually every household made its own pottery. This seemed the perfect place for the envisioned study.

After getting to know the senior author over a week and hearing about the planned research, the Kalinga agreed to let him return for a year-long study, and that was carried out during 1975-1976 (Longacre 1981). The main objective was to collect information (and pots) that reflected the learning frameworks in order to test some of the ideas generated in the Carter Ranch study. During the course of the field work it became apparent that the Kalinga potters tended to work in informal groups based upon neighborhoods, so data and pots from particular work groups were also collected to measure the impact of potting together. In addition, information on ceramic decorative style was collected for each Dangtalan potter.

Virtually all Dangtalan pots are decorated with incised designs that are known as *gili* around the vessel neck (Fig. 4a,b). The number of gili bands on a particular vessel ranges from one to four or more. Many gili designs have names, and bands may be combined in a variety of patterns. After the Kalinga field work was completed and a large collection of pots made, analysis of the gili decoration was undertaken by Michael Graves as part of his dissertation research (Graves 1981). Combinations of gili designs were analyzed using multivariate techniques to see whether micro-traditions reflected the Kalinga potter's learning frameworks, as had been hypothesized. Graves found only weak support for that hypothesis, but discovered a strong link between the age of the potter and the degree of complexity of decoration: the older potters tended to make far more complex decorations than their younger counterparts.

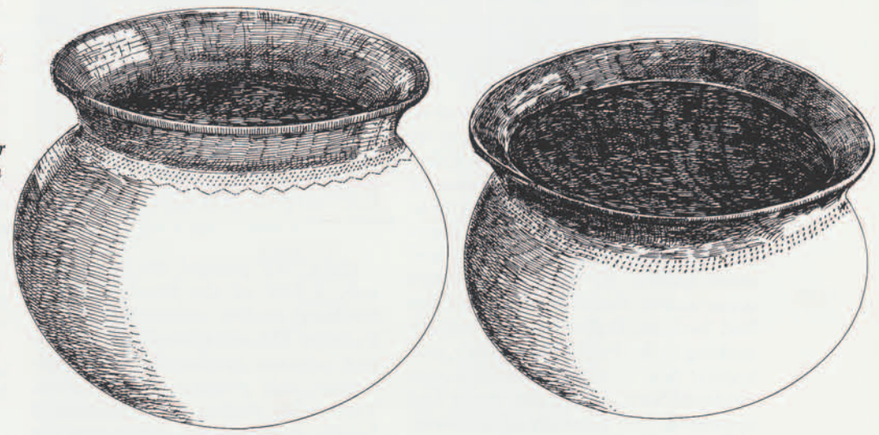

*Figure 4a,b. (a) This rice cooking vessel (*ittoyom*) contains two lines of decorative bands incised with a bamboo stylus (*gili*). The upper decoration of diagonal broken lines is called* tinuchuk *(skewer) or* pinattoc *(ellipses). The lower band is called* sinaggikao *(no translation available) and refers to any alternate diagonal or zigzag pattern. The* sinaggikao *design is extremely common in Kalinga decoration, and may consist of dots, dashes, broken or solid lines in vertical or horizontal orientation. Kalinga pots may also be decorated with parallel lines, interlocking diamond shapes, and circular impressions made with the cap of a ballpoint pen. (b) This meat and vegetable cooking pot (*oppaya*), about 20 cm in height, has a single decorative band.*

a b

New Research Goals

By 1975, new concerns and questions were being raised about the "formation processes" responsible for the archaeological record. What types of processes transform artifacts after they are discarded within a living system and before archaeologists excavate the artifacts centuries or millennia later? The Kalinga setting offered an appropriate research venue for investigating such issues, and they were added to the research plan that guided the field work that year.

One of the new concerns involved the general question of how long items last before they are discarded. Thus, the use-life of different types of pots among the Kalinga became of interest. But how could we measure the use-life of pottery? In 1975 and 1976, all the pots in use in two Kalinga villages, Dangtalan and Dalupa, were inventoried. The type of pot, the name of the potter, and the year the pot was made were recorded for each household; in all, data on over 2,000 pots in use were collected.

By 1980, political turmoil caused by Kalinga resistance to a government-sponsored hydroelectric project made the Kalinga area too dangerous to continue the study. In 1979 and 1980, the senior author's principal Kalinga assistants re-inventoried each household. New and replacement pots were added to the inventory, and information about each pot missing from the original inventory was collected. Many of these vessels had been broken or had simply worn out, and the dates of their departure from the ceramic assemblage were noted.

This information formed the basis for detailed estimates of the use-life of the various types of Kalinga pots (Longacre 1985). A general principle emerged that seems to hold true for other pottery-using societies as well: the large pots last longer than do the smaller-sized vessels in regular use. This principle has important implications for the prehistorian trying to draw chronological inferences from pieces of pottery recovered from an archaeological site. The archaeologist has a better chance of defining chronological differences by focusing upon the pieces from the smaller pots. Smaller pots likely broke more often and required replacement more frequently, promoting faster stylistic change, change that could be observed archaeologically.

Return to the Kalinga

By 1986, problems in the Kalinga subprovince had subsided and conditions were sufficiently peaceful to resume the project. A major ethnoarchaeological project was planned, and in the summer of 1987 the senior author, along with six University of Arizona graduate students and several more from the University of the Philippines, began 12 months of field work.

By the late 1980s archaeology had changed a great deal, and the new research plans reflected some of those changes. But the main theme continued to be the investigation of the relationships between variation in material culture and variation in behavior and organization. Some of the questions that guided the earlier research continued to be addressed. Thus, collecting data and pots from younger potters was planned to test the Graves hypothesis, that design complexity was decreasing among

the younger Dangtalan potters. We also planned to continue the detailed inventory to pursue the use-life study.

Of course, over the years the Kalinga had been changing as well. The entry of government forces and of commercial mining and logging interests introduced outsiders to Kalingas and brought various forms of progress. In addition, Dangtalan ceased to be a major pottery-producing community for the Pasil municipality. By 1987 few potters were active there. Instead, Dalupa had become the center for pottery making in the Pasil River Valley, and a great deal of experimentation was evident. New decorative styles had appeared, and a variety of nontraditional ceramic forms were being made.

A number of new studies were undertaken by the 1987-1988 Kalinga Ethnoarchaeological Project. The first ethnoarchaeological study of basketry was undertaken. Kalinga baskets are made by men; thus this research formed a parallel study to that of the pottery produced by women. Additional studies focused on vessel breakage, refuse disposal behaviors, ceramic production and distribution, and ceramic use-alteration. Still other projects focused upon the material correlates of wealth and status and the ecology of irrigation rice agriculture.

II. The Kalinga Ceramic Studies

Here, we present the results of only a few of the timely and interesting studies conducted by the Kalinga Ethnoarchaeological Project: ceramic production and distribution, and pottery use-alteration. Two other studies are summarized briefly in boxes accompanying the text: a study of technological change and a study of the development of a new decorative ceramic tradition.

Ceramic Production and Distribution

One hallmark of "Neolithic" communities that archaeologists study worldwide has been pottery making. Pottery is ubiquitous in the archaeological record and constitutes one indicator of prehistoric economy. Many archaeologists believe that economic factors are vital in the emergence of prehistoric states. Examining how the organization of pottery production is related to social and political aspects of prehistoric societies, then, sheds light on broader archaeological issues, such as the nature and development of social complexity.

Pottery-making systems worldwide vary greatly in their organization and scale. At one end of the continuum lie those tribal societies in which pottery is produced at the household level for household use. At the other end of the continuum are large-scale ceramic industries, such as the Wedgwood manufactories of 18th century England. This continuum in the organization of ceramic production is also present in the archaeological record, where pottery making among simple agriculturalists stands in stark contrast to ceramic production in the state-controlled craft industries of early Mesoamerican and Mesopotamian civilizations.

The Switch to Metal Pots: A Case Study of Technological Change

A unique feature of the archaeological record is that it can document long-term change. But what are the factors that govern technological change and how do alterations in material items relate to other aspects of society? These questions, though important to archaeologists, cannot be answered by looking at the prehistoric record alone; the process of technological change must be addressed through research such as experimental archaeology and ethnoarchaeology. As part of the pottery use-alteration study, information was collected on one component of change in Kalinga society: the replacement of ceramic with metal cooking pots.

Nearly all households in the village of Guina-ang have enough metal pots for all their cooking needs, but as Figure 9 illustrates, ceramic vessels are still widely used. Metal pots are used most frequently for cooking rice, but ceramic vessels are still used for cooking vegetables and meat. Interviews with Kalinga pottery users, as well as laboratory experiments, demonstrated that the performance of the two types of pots is important in the transition from ceramic to metal vessels. Pots, or any technology, can have performance characteristics that relate to the actual use of the pot as a tool (i.e., techno-functions), but also social or ideological functions.

Metal pots are now used to cook rice because they boil the rice faster and are more durable. Ceramic vessels are still used for cooking vegetables and meat because the food can boil without boiling over, and they are easier to wash than metal vessels. Durability and heating properties of the vessels relate to techno-functions, but ease of washing is a performance characteristic that relates to non-techno-functional factors. Metal pots are more difficult to wash because the Kalinga insist upon making them shine by removing all of the soot that adheres to and has penetrated the metal surface. Wealthier households have more metal vessels, and they appear to be a sign of modernization. Metal pots of all sizes are usually stored in conspicuous locations, whereas ceramic vessels are often stored out of sight.

Thus, it was found that the performance characteristics important in the transition from ceramic to metal vessels relate primarily to techno-functions but that social functions also play a role.

The Kalinga Case Study

Within the Kalinga-Apayao province, the Kalinga section has been divided into eight municipalities that roughly coincide with the valleys that encase major rivers and tributaries. That pottery making—and the pots themselves—continues to be an integral part of Kalinga life is evidenced by the fact that pottery-making centers were to be found in each of these municipalities during the 1980s (Fig. 5). Even the provincial capital of Tabuk, where many homes have electricity and running water, contained at least three pottery-making neighborhoods, where emigrant potters from rural areas have continued to make and sell their products.

The Kalinga Ethnoarchaeological Project focused its research on several communities along the Pasil River. These villages were initially selected for study because pottery making there represented a traditional, small-scale industry in which pots were produced and used primarily for the potters' own households. During the Project's most recent field study, two villages were engaged in production of earthenware goods and formed the focus of research on ceramic production and distribution: Dalupa and Dangtalan.

Kalinga pottery making is a combination of coil-and-scrape manufacture, which yields the initial shape of the vessel, and paddle-and-anvil techniques, which produce the final shape of the even globular vessel bodies (Fig. 6a-h). Although the initial vessel-forming sequence lasts just 15-25 minutes, the entire pottery-making process involves clay preparation, vessel forming, drying, and firing. An active Kalinga potter can finish between 10 and 15 vessels in a week; this number varies according to other household and farming demands that the potter may confront, including childcare and cooking, along with rice farming activities such as transplanting, weeding, or harvesting (Fig. 7).

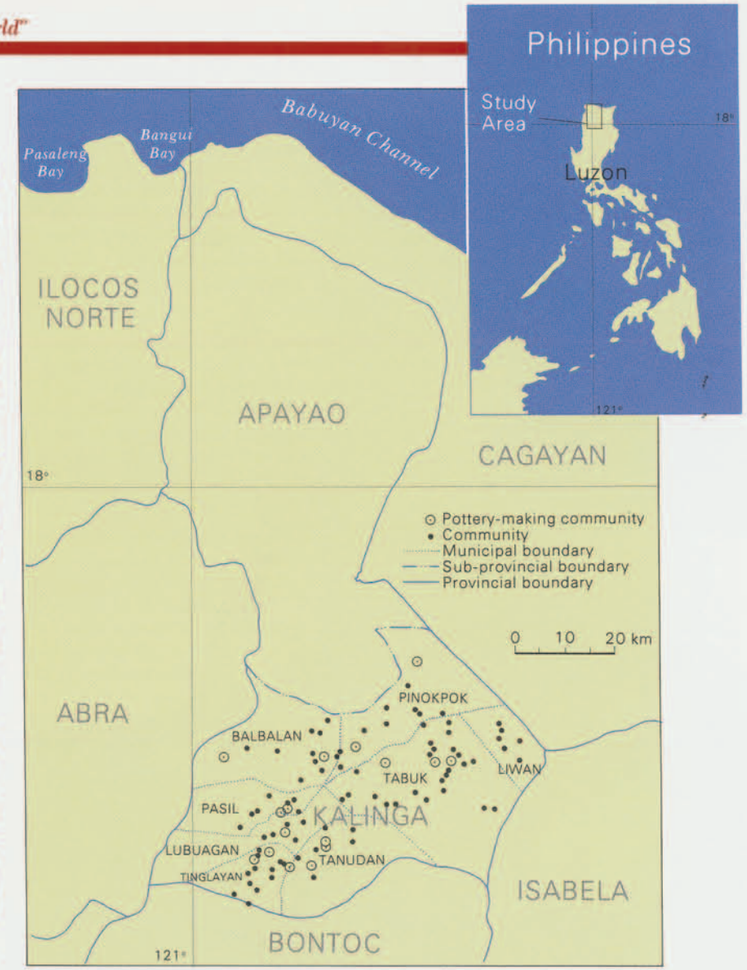

Figure 5. Because archaeologists frequently analyze the distribution of particular ceramic types, understanding the relationship between Kalinga ceramic production and distribution provides a comparison with archaeological cases. In the Kalinga area of Kalinga-Apayao province, each municipality (or river valley) contains one or several pottery production centers that service the needs of the surrounding population. Population density, topographic relief, and the reliance on non-ceramic alternatives all help to determine the placement of Kalinga pottery production centers, as seen in this illustration.

Adapted from Kalinga-Apayao Census, 1970 (National Census and Statistics Office, Manila)

An Historical Perspective on Kalinga Pottery Making

Changes in the location and activity levels of pottery-making villages can be seen at the regional and local levels. Three decades ago, villages to the east (Cagalwan) and west (Balatoc) of Dalupa and Dangtalan also made and traded pots (Fig. 2). In the last 20 years, several changes in the local environment and economic structure have discouraged pottery production in areas where alternative modes of subsistence can be pursued. These changes include the reactivation of gold mines, the establishment of major logging operations and subsequent deforestation of neighboring areas, and the developing importance of coffee as a cash crop for villages having access to suitable crop land. Dalupa and Dangtalan, then, have only recently emerged as the only pottery-making centers for the Pasil River Valley.

Changes have also been observed in the communities of Dalupa and Dangtalan during the 16-year history of the Kalinga Ethnoarchaeological Project. What was once a thriving

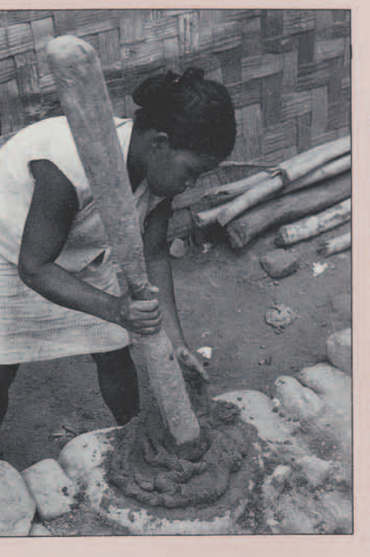

*Figure 6a. Clay (*soka*) is collected from sources that are located in the walls of ricefields or in the midst of swidden plots, generally within 45 minutes' walk from the village. To prepare the clay, the potter removes large pebbles from the fabric and pounds the clay thoroughly. The clay is then shaped into a cylinder in preparation for the forming process.*

Figure 6b. The potter first places the cylinder onto a base (either a wooden or an enamel plate), then punches a hole in the center to begin the shaping process. She gradually pulls the vessel walls upward until they have reached about half of the vessel's final height. Sausage-like coils are then added to the walls, as the potter uses both hands to gently prod the clay into its proper shape.

*Figure 6c. The potter uses a bamboo wand (*gilgil*) to smooth the vessel walls and with a circular motion begins to form the vessel rim. A wet rag is used for the final rim-shaping process. After the vessel has attained its basic shape and the surfaces have been smoothed, the potter places the vessel in a shaded area to undergo its first drying phase. The length of the initial drying depends on the weather; it can last between six hours (during the dry season) and a few days (during the monsoons).*

*Figure 6d. When the vessel has dried to a leather-hard state, the potter removes it from its base. Pressing a stone anvil against the interior wall, the potter uses a wooden paddle (*pikpik*) to pat the base into a globular shape. A stripe of ocher (red mineral pigment, or* pula*) is painted around the perimeter of the vessel's upper body.*

pottery industry in Dangtalan has now become a sporadic practice, while Dalupa potters have accelerated their activity since the early 1980s. One goal of the 1987-1988 research was to document this change in Dalupa from household production to a household industry.

The Development of Part-time Craft Specialization

Upon the Kalinga Ethnoarchaeological Project's return in 1988 it was no small surprise to find that the organization of Kalinga pottery production had undergone major changes. At least half of the Dangtalan potters had virtually ceased to make pottery at all, while their Dalupa neighbors had joined the potter ranks in full force. Dalupa potters had become semi-specialists, and the organization of production had shifted from production for household consumption to pottery making for exchange (Stark 1991).

Changes in pottery production can first be examined from an ethnographic perspective. Through the ethnographic lens, household and village-level economic structures can be compared and contrasted. Labor outputs by family members, as well as the number of household members to support, can be assessed. Regarding the potters themselves, rates of pottery production and of exchange may be recorded and correlated with patterns of household affluence. Analysis is currently underway regarding the scale of pottery production and exchange, using this holistic approach.

Taken as a whole, the ethnographic data reveal that the development of Dalupa pottery specialization may be largely explained through diminishing resources, insufficient rice field landholdings, and a population boom, all of which have collectively strained the ability of Dalupa households to sustain themselves. Pottery production for exchange in nearby communities and farflung villages garners rice to feed family members, as well as clothing, lumber to construct new homes, and, occasionally, cash that pays for children's educational fees while attending high school or college in the provincial capital of Tabuk.

Changes in Kalinga ceramic production can be examined through an archaeological perspective as well by focusing on Kalinga material culture. Previously mentioned influences include the reactivation of gold mines and the establishment of logging companies in the area. Perhaps the most profound impact on the general Pasil area occurred as a result of the Marcos government's efforts regarding the Chico River Dam Project. Governmental employees were unsuccessful in their efforts to woo the Kalinga into accepting the hydroelectric project that would displace 10,000 Kalingas from their land to provide electricity for Cagayan Valley residents living 40 miles to the northeast. Massive resistance to the project by the Kalinga and the neighboring Bontoc groups prevailed, and the project was cancelled.

During this period, however, non-Kalinga customs and values were introduced that had an impact on traditional lifeways. Governmental employees (including the military) sought Dalupa ceramic "souvenirs"; figurines and religious plaques (Fig. 8) were developed that have now become a standard part of the Dalupa potter's repertoire. One means by which the Marcos government attempted to curry favor with the Kalingas was through the establishment of centralized workshops to promote and revitalize traditional crafts such as backstrap-loom weaving. Interaction between Dalupa potters and weavers in the center of Lubuagan during the Chico River Project encouraged Dalupa potters to modify both the shape and the decoration of their water jars (*immosso*). Dalupa-produced water jars now sport festive ocher decorations of floral motifs, geometric designs, and an occasional anthropomorphic depiction.

Pottery Use-Alteration

Since the work of the Russian archaeologist Semenov (1964) was introduced to the west, lithic use-wear analysis has become commonplace. From the polish and microchips on the edges of stone tools

*Figure 6e. The body of the vessel is burnished with a small rounded stone (*idjidj*) until the surface is smooth. The potter then incises lines of decoration around the vessel's neck with a bamboo stylus. The vessel then dries for a few days.*

Figure 6f,g. Firing is done during the early morning or early evening hours, and takes place when several pots have been completed. Potters frequently pool their efforts and fire 10 to 20 pots together (6f). Large vessels are stacked at the base of the pile, while smaller pots are placed on top to ensure even heat distribution. Firing materials, including split bamboo, grasses, and rice stalks, are stacked in and over the pile (6g). The firing process lasts between 20 and 35 minutes, depending on the size and number of vessels.

*Figure 6h. A common method of waterproofing pottery in Southeast Asia involves the application of organic materials to the vessel while it is still hot from the firing process. In Kalinga, resin (*lebu*) from the Almaciga tree is used; this is obtained from traders who harvest resin-bearing trees in forests to the north and west of the Pasil communities. Potters coat vessel interiors with resin immediately after removing them from the still smoldering fire. Before using the pottery for cooking, water is boiled in each vessel to remove excess resin and create a watertight seal.*

Figure 7. Terraced wet-rice cultivation provides Kalingas with their dietary staple. Labor investment in rice farming involves individuals of all ages in the form of communal work parties. Men construct the terraced fields, maintain irrigation canals, and use water buffalo to plow fields prior to each planting. Women transplant rice seedlings from their nurseries and weed the fields during the growing season. Children help adults to harvest the rice, collect snails from the inundated fields for family consumption, and help in processing the dried grain. Kalinga agriculture is supplemented by swidden (slash-and-burn) farming, and the increasingly common cultivation of coffee trees.

archaeologists are now able to infer how a tool was actually used. Though it has been several decades since the first lithic use-wear analyses, comparable studies with pottery have not been done. This is not for lack of need. Ceramic data are often employed to determine things such as prehistoric exchange patterns, diet, population size, and social organization. Many of these inferences rely on a fundamental but often unresolved question: How was pottery used?

Accurate estimates about household size from pottery, for example, require that one can determine which pots were used for daily cooking, water storage, and serving, and which pots were not in use. Similarly, before one can determine that a type of pottery was controlled and distributed by elites in an elaborate exchange network, it is necessary to understand the way pottery functioned in everyday life. Nearly all inferences about past society that employ pottery must rely ultimately on assumptions about how the pottery functioned. The purpose of this component of the Kalinga Ethnoarchaeological Project is to link pottery use with alterations to the vessel. This will help prehistorians determine how pottery was used in the past.

The data for this project were collected from March through May 1988 in the Kalinga village of Guina-ang; Masashi Kobayashi was the co-director of the pottery use-alteration study. Guina-ang is across the river and about an hour's walk from Dangtalan. It is the largest village in the Pasil Valley and is thought to be the oldest. Guina-ang consists of slightly over 100 houses that cluster atop a ridge overlooking the Pasil river.

The data for the pottery use-alteration study were collected in two phases. The first phase involved inventorying all the vessels in the 102 households. This information was collected by Kalinga assistants and it included not only data about each pot, such as the age, the dimensions, and the maker of the pot, but also information about pottery use. For all 2481 vessels in the village of Guina-ang we know things such as what each pot is used for, when it was last used, whether it is ever used to cook other foods, and some basic

New Kalinga Ceramic Traditions

Early ethnoarchaeological research indicated that Kalinga pottery was made for use within the potter's own household, and that pottery making occupied the slack periods in the farming cycle. Potters produced a narrow range of items to be used in daily activities: cooking pots (*oppaya*, *ittoyom*), water jars (*immosso*), pot lids (*sukong*), and basins used for feeding domestic animals (*kannogan*). When the Kalinga Ethnoarchaeological Project resumed field work in 1987, a metamorphosis had occurred in pottery production. Activity in Dalupa had escalated in the late 1970s as the village emerged as the heartland of ceramic innovation. Once uniformly red water jars (*immosso*) now sported festive incised and painted decorations and pronounced shoulders, while a dazzling array of non-traditional forms appeared in the Dalupa potter's repertoire.

A wide range of decorative items were now in demand, from flower pots and religious plaques (Fig. 8) to money banks in the shape of water buffalos. To the Kalinga, these non-traditional forms are known as *ay-ayam* or toys. Ay-ayam are the embodiment of individual creativity and provide a needed source of cash. Ideas for new designs are found in elementary school textbooks, the rare Manila magazine that winds its way into the remote Kalinga highlands, and in orders placed by customers for flower vases and plaques emblazoned with the words "God Bless Our Home."

Explaining *why* this new ceramic tradition developed requires attention to political, ecological, and economic processes during the late 1970s and early 1980s. The failed Chico River Dam Project brought non-Kalingas into the region with non-Kalinga values and a desire for "souvenirs." Regular motor transport was also begun that made travel between communities easier and encouraged Dalupa potters to expand their regional exchange network and diversify their products. Wage labor trickled into the traditional barter economy through the reactivation of gold mines and dam-related construction efforts. The introduction of new ideas and values, the access to motor transport, and the availability of cash in the Kalinga economy all contributed to the development of the Dalupa ay-ayam tradition.

Fascinating as the birth of the ay-ayam tradition may be, its future is equally intriguing for anthropologists. Increasing contact between the industrial world and tribal societies often stimulates the development of ethnic and tourist art forms. Carved Eskimo ivory, North American Pueblo pottery, and African wood carvings have all found a firm niche in an international ethnic art market. Is the Kalinga ay-ayam tradition a passing fancy or a nascent ethnic art tradition? Kalingas often express a desire for "progress," and such progress means improved transportation, increased wage labor opportunities, better health care, and population increases. With "progress" will come rapid culture change, and this change will in part be reflected in the Kalinga ceramic traditions. How, and in what ways, Kalinga ceramic traditions will change can only be examined with the long-term approach that characterizes the Kalinga Ethnoarchaeological Project. As archaeologists, we concern ourselves with the past; as ethnoarchaeologists, we also look toward the future.

information about use-alteration traces.

The second phase of data collection involved day-long observations of pottery use. In 40 households the use of pottery was carefully documented from before the first meal until after the final meal of the day (Fig. 9). Any activity that involved pottery, such as cooking, cleaning, and storing, was recorded (Fig. 10). In these households new vessels were exchanged for the old ones in order to create a use-alteration study collection of about 200 vessels. These vessels were wrapped carefully to avoid further alterations to the surfaces and then shipped to Tucson where they now reside in the Arizona State Museum.

The analysis of pottery use-alteration concentrated on three lines of evidence: absorbed residues, attrition, and carbon deposition. The analysis focused on the two forms of

Figure 8. Ceramic plaques are often given as gifts. Dalupa potters consider them more time-consuming and difficult to make than pots, since plaque-making requires a different manufacturing technology.

*Figure 9. A women sits next to the cooking hearth (*charpong*) in a Kalinga kitchen. The vegetable pot (*oppaya*) sits on the fire, while the metal rice cooking vessel (*caldero*) rests next to the cooking fire as the rice is in its final stage of cooking. Note the tattoo designs on the arms and neck of the woman. Tattooing was traditionally done on male Kalinga warriors and on female relatives (wives and daughters) as a sign of social status.*

Kalinga cooking pots (Fig. 4a,b): *ittoyom*, used to cook rice, and *oppaya*, used to cook vegetables and meat. The rice and vegetable/meat pots provide a good contrast because they are used to cook different foods, and there are a different set of activities associated with each vessel type.

The analysis of absorbed residues concentrated on fatty acids. All plant and animal species have different combinations of fatty acids, which can, potentially, survive long periods in the depositional environment. Fatty acids were extracted from a sample of vessels and a set of Kalinga foods and then identified with gas chromatography/mass spectrometry. The results demonstrated that fatty acids can be used to discriminate pots used to cook different items. The residue absorbed into the vessel wall of the rice cooking pots could be clearly linked to rice. Although the vegetable/meat cooking pots were more problematic because they were used to cook a variety of foods (e.g., chicken, pork, dog, and various forms of garden-grown vegetables and wild plants), the residue analysis did determine that a variety of both plant and animal foods were prepared in the vessels.

To determine how well the fatty acids survive in the depositional environment, a sample of sherds excavated from a Kalinga midden were also analyzed. Fatty acids were still present in the walls of the sherds but there was some evidence of fatty acid decomposition. Research in this area is ongoing.

Attrition to the vessel surfaces as a result of use is also an instructive trace. There are nine areas on the Kalinga cooking pots that have evidence of distinct activities, such as stirring, methods of heating the contents, and washing. The use-attrition traces were identified with the help of low-power optical and scanning electron microscopy. It was found that the exterior surfaces of the rice and vegetable/meat cooking pots have similar use-attrition patterns, but that the interiors have distinct use traces that reflect different cooking activities. For example, the vegetable/meat cooking pots have evidence of stirring and manipulation of the contents during cooking, but the rice cooking vessels do not. Moreover, the rice cooking pots have thermal spalls on the interior mid-section suggesting that they were placed next to the fire. The attritional data are so patterned that it is even possible to identify the pottery users in the community that are left-handed.

The final form of use-alteration analyzed in this study is interior and exterior carbon deposits. Interior patches of carbonized food provide information on what the food was and how it was cooked. Exterior carbon, or soot, can demonstrate how the vessel was positioned over the fire. The rice and vegetable/meat cooking pots have different patterns of carbon deposition that represent different ways of cooking. For example, the rice cooking pots often have a carbonized patch on the interior mid-section from being placed next to the fire in the final stage of rice cooking. The Kalinga pots offered firsthand evidence of pottery carbon deposition, and this has led to a more complete description of the factors that control both interior and exterior carbon formation.

This is the first ethnoarchaeological study to concentrate exclusively on pottery use-alteration. It was demonstrated that all three forms of use-alteration—residues, carbon deposits, and surface attrition—do reflect pottery use activities. The rice and vegetable/meat pots could be discriminated based on all three forms of use-alteration traces (Skibo n.d.). This has led to a more general discussion of the factors that control the ways in which pottery can reflect activities. The ultimate objective of this research was to provide the means for the prehistorian to make more refined inferences about pottery use. This component of the Kalinga Project demonstrates that patterned activities of pottery use alter the vessels in ways that can be interpreted by the archaeologist, leading to better inferences of pottery use and therefore to more accurate reconstructions of the past.

III. Conclusions

Change is a unifying theme in the history of the Kalinga Ethnoarchaeological Project. During the last 18 years, much has changed in both the types of research topics pursued on this project, and in the nature of Kalinga society. The project was initiated in the 1970s as an attempt to explore ceramic styles and residence, but has been sensitive to changing trends in archaeology. Research within the Kalinga project today ranges in focus from pottery use-life, use-alteration, and refuse disposal to regional studies of ceramic production and distribution. One of the major strengths of the Kalinga Project lies in its efforts to integrate experimental, ethnoarchaeological, and archaeological approaches to ceramic analysis. The other strength is its long-term perspective, enabling us to track material culture change, a uniquely archaeological concern. Kalinga research continues, and the next two decades promise to provide even greater contributions for archaeologists.

Figure 10. Kalinga girls scrub the exteriors of ceramic and metal cooking pots as part of their daily chores. During the washing process, pots are rotated on the ground and scrubbed by hand with a mixture of sand and, occasionally, leaves or rice chaff.

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