

A CHANGING SOCIETY?
CRAFT SPECIALIZATION AND COMPLEMENTARITY SYSTEMS DURING THE FORMATIVE PERIOD
IN THE COCHABAMBA VALLEY, BOLIVIA

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INTRODUCTION

The Cochabamba Valley system consists of five separate valleys (the Valle Central or Central Valley, the Valle Alto or High Valley, and the Sacaba, Santivañez, and Capinota Valleys), all located at altitudes between 2400 and 2700 meters above mean sea level (m.a.s.l.) in the eastern slopes of the Bolivian Andes (Figure 1). The valleys have mild temperatures and fertile soils, and were densely populated throughout ancient times. Nevertheless, apart from the sites of Incarracay (Inkaraqay) and Incallajta (Inkallacta)¹ with their Inca architecture, no large monumental sites exist in the greater area, and, thus, many of the scholars and explorers of the late nineteenth and early twentieth centuries neglected them.

The regional Formative Period dates roughly from 1500 B.C. to A.D. 200, and is subdivided into Early, Middle, and Late phases (Brockington *et al.* 1985, 1987, 1995). Until the end of the twentieth century, the Cochabamba societies of the first two millennia B.C. were often depicted as homogeneous, non-stratified agriculturalist groups, as deduced by their use of monochrome pottery and their lack of monumental

architecture. This vision is largely influenced by cultural evolutionists' theories from the last half of the nineteenth century and the first half of the twentieth, and was maintained for decades by many scholars in Bolivia. However, detecting social complexity may be ultimately a matter of selecting the appropriate parameters, as current investigations show. This paper explicitly investigates socio-economic processes through the evidence for early craft specialization and specific systems of social and economic interaction discovered at the archaeological site of Santa Lucía in the High Valley of Cochabamba. Eventually, studies of socio-economic organization during the Formative Period will be key to understanding socio-political and economic mechanisms in subsequent times, such as the Early Intermediate Period and the Middle Horizon.

HISTORY OF FORMATIVE PERIOD RESEARCH IN COCHABAMBA

In the 1930s, Wendell C. Bennett, during excavation at the Colcapirhua mound in the Central Valley (Figure 1), accidentally detected the earliest Formative Period evidence as manifested in monochrome pottery and stone tools (Bennett 1936:381-386). Lacking the existence of a local sequence at that time, he regarded the Formative finds as belonging to a post-Tiwanaku or Guarani Phase. Subsequent research in the early 1950s by Stig Rydén revealed a similar monochrome ceramic style (Rydén 1952, 1961)

¹ Incarracay is in the western hills of the Central Valley 30 kilometers from Cochabamba. Incallajta is approximately 120 kilometers to the east of the Central Valley. For a discussion of the site of Incallajta and a reconstruction on paper of its *kallanka* or great hall, see Lee (1998).

at Chullpapampa. This site is a few kilometers up the valley from Colcapirhua, at the foot of the Cerro Tunari (Figure 1). Contrary to Bennett, Rydén was convinced that the monochrome ceramic style must be older than Tiwanaku, and may have influenced the later period (as in the case of the Grey Ware pottery in Mizque, see Rydén 1961:50).

In the 1950s and 1960s, Dick Edgar Ibarra Grasso, founder and first director of the archaeological museum in Cochabamba (now the Instituto de Investigaciones Antropológicas y Museo Arqueológico Geraldine Byrne de Caballero or INIAM), conducted investigations at numerous sites in the Cliza area, among them Santa Lucía and Chullpa Pata in the High Valley (Figure 1) where he found pottery similar to the Chullpapampa style (e.g. Ibarra 1955, 1956, 1964, 1965:82; Ibarra and Querejazu 1986:150). Even though his publications lack a description of his methodical approach, maps, and other detailed site information, Ibarra Grasso was the first to present an overview of the period of an emerging sedentary society using monochrome pottery. He was also the first to provide absolute radiocarbon dates from Cliza, establishing the end of this early period at around A.D. 280 (Ibarra 1962: Table 1:1).

In view of the stone tools found, he ascribed the economic basis to agriculture. Because these people inhabited mound-like settlements, he named them the *Cultura de los túmulos* (Mound Culture). In agreement with scholars including Carlos Ponce Sanginés and Max Portugal Ortiz, he deduced a common tradition among the contemporary groups of the southern altiplano, subsumed under the name “Wankarani”, whose settlements also consisted of stratified mounds and whose pottery was likewise monochrome (Ponce 1970; Portugal 1998:9-20; cf. Walter 1966). The find of a single large stone stela in Sierra Mokho in the Central Valley (Ibarra 1964) slightly resembling the Wankarani llama effigy heads (cf. Guerra 1994: figure 3-16; Portugal 1998:11-20) supported his hypothesis. It even tempted Ibarra Grasso also to use the term *Cultura megalítica*. Nevertheless, Heinz Walter (1966:118) opposed the idea of a common culture shared by Cochabamba and Wankarani, based solely on the use of monochrome ceramics. In fact, the pottery and artifacts of both groups seemed quite different to him.

	Location	Sample	Lab No.	Radiocarbon Age	Calibrated (1 σ)*	Calibrated (2 σ)*	Published date	Publication
1	Chullpa Pata	Wood charcoal	M-510	1680 $\pm$ 300 B.P.	1-700 A.D.	400 B.C.-1000 A.D.	280 A.D.	Ibarra Grasso 1962
2	Chullpa Pata Mound II	Charred <i>Schinus molle</i> seeds	Hv-116	1850 $\pm$ 90 B.P.	60-260 A.D.	50-330 A.D.	110 $\pm$ 90 A.D.	Walter 1966
3	Sierra Mokho Level 32	Wood charcoal	GX-12134	2850 $\pm$ 245 B.P.	1400-800 B.C.	1700-400 B.C.	1125 B.C.	Brockington <i>et al.</i> 1985, 1987
4	Conchupata Burial 5	?	GX-13883	2625 $\pm$ 85 B.P.	820-540 B.C.	850-410 B.C.	802 B.C.	Pereira <i>et al.</i> 1992
5	Conchupata Burial 15	?	GX-13885	2890 $\pm$ 85 B.P.	1130-890 B.C.	1260-810 B.C.	1187-1080 B.C.	Pereira <i>et al.</i> 1992
6	Choroqollo	Wood charcoal	KN-5374	3108 $\pm$ 55 B.P.	1400-1300 B.C.	1420-1250 B.C.	1327 $\pm$ 56 B.C.	Gabelmann 2001
7	Santa Lucia SL-C24	Wood charcoal	Gd-15964	2670 $\pm$ 85 B.P.	930-770 B.C.	1050-500 B.C.		Gabelmann 2008a Gabelmann <i>et al.</i> 2009
8	Santa Lucia SL-C41	Wood charcoal	Gds-378	2500 $\pm$ 50 B.P.	770-540 B.C.	790-480 B.C.		Gabelmann 2008a Gabelmann <i>et al.</i> 2009
9	Santa Lucia SL-C20	Wood charcoal	Gds-370	2465 $\pm$ 40 B.P.	760-510 B.C.	770-410 B.C.		Gabelmann 2008a Gabelmann <i>et al.</i> 2009
10	Santa Lucia SL-C2	Wood charcoal	Gd-15881	2060 $\pm$ 100 B.P.	200 B.C.-60 A.D.	370 B.C.-130 A.D.		Gabelmann 2008a Gabelmann <i>et al.</i> 2009

Table 1: Radiocarbon dates mentioned in the text (* calibrated with OxCal 3.10).

Heinz Walter formed part of the German Mission, led by Hans Dietrich Disselhoff in 1958, who investigated four sites in Bolivia (Wankarani, Chullpa Pata, Mizque, and Icla) (Walter 1966). With the participation of Ibarra Grasso the team investigated the site of Chullpa Pata near Cliza in the High Valley (Figure 1). On an alluvial terrace to the east of the village they noticed eight mounds. They chose the smallest two for their excavations (*ibid*:122). These produced the first evidence of domestic architecture (house floors) in an early settlement. Walter noted a resemblance between the pottery from the Central Valley and the High Valley and named this style Chullpapampa Monochrome (*ibid*:164). The upper layers of the mounds contained sherds of the polychrome Tupuraya style (*cf.* Rydén 1959) and were dated to the beginning of the second century A.D. (Table 1). Combining the stratigraphic information from Chullpa Pata with the excavations of Bennett and Rydén in Chullpapampa and Colcapirhua enabled Walter to establish a local sequence that placed the Chullpapampa Monochrome Style earlier than the polychrome Tupuraya style (Walter 1966:180). This chronology is still valid. It was only refined in absolute-chronological terms during later investigations.

In the 1980s, Donald Brockington, David Pereira, and other staff members of the Cochabamba archaeological museum launched the Proyecto Formativo, dedicated to a more systematic investigation of previously known sites in the Central and High Valleys. The team changed Ibarra Grasso's terms "Megalithic" or "Tumulus Culture", as well as Walter's "Chullpapampa Monochrome Style", to the more common designation, "Formative Period". Their first excavation took place in the multi-component mound of Sierra Mokho in the Central Valley (Figure 1), which yielded the complete prehistoric occupation sequence. Based on their ceramic analysis and radiocarbon dates, they established an absolute chronology

for the valleys (Brockington *et al.* 1985, 1987, 1995). Their Formative Period was somewhat arbitrarily divided into Early, Middle, and Late Phases; their ceramic types showed hardly any changes throughout the period. Nevertheless, the beginning of their Middle Phase around 500 B.C. (Brockington *et al.*: 1995) was based on the appearance of a new ceramic type in Sierra Mokho (*tipo* 7; Brockington *et al.* 1987:33). In the lower levels, which were dated to approximately 1125 B.C. (Table 1) they found altiplano type pottery, probably of Wankarani origin, indicating long-distance trade between the valleys and the highlands.

Furthermore, the same team found a hint of the existence of public or ceremonial architecture in Chullpa Pata, where they investigated a third mound that had not been excavated by the German Mission. According to Brockington's team, a small trench revealed part of a four-step terraced construction consisting of stones and clay with a sherd paving (*pozo* 1; Brockington *et al.* 1985:4, 1995:11). Unfortunately, this construction was never the subject of further investigation, and, therefore, its size and function remain unknown.

An outstanding initiative of the Proyecto Formativo is the excavation of the Conchupata burial site in the Mizque Valley with its abundant grave goods made from sodalite and Pacific shells, and dating to between 1180 and 800 B.C. (Table 1). Fieldwork in the burial mound took place in 1986 under the leadership of the Proyecto Formativo. It is the first and the only comprehensive study to date of the Formative Period burial pattern in the greater Cochabamba area. Mizque is 140 kilometers to the southeast of Cochabamba, but in terms of access to prestige goods like marine shell, the Cochabamba Valleys may well have played an important role as a corridor for long-distance exchange.

In the late 1990s, excavations conducted by the present author in Choroqollo in the Santivañez Valley (Figure 1) provided the first evidence of pottery production in the Formative Period of Cochabamba (Gabelmann 2001). Tools, over-fired sherds, and clay slag attested to the activity of potters. Even though it was not possible to determine its mode of production and range of distribution, it seems that the pottery was spread over the whole valley, and even into the Capinota Valley as can be deduced by rim forms (*cf.* Higuera 1996; McAndrews and Rivera 2007). Choroqollo was dated to an Early Formative phase (Table 1) and, therefore, is contemporaneous with the lower levels of Sierra Mokho (Levels 29-33; Brockington *et al.* 1985, 1987). In Choroqollo, a small percentage of pottery also appeared that could be assigned to the Wankarani Type, indicating exchange with altiplano groups during an Early Formative phase between 1300 and 1000 B.C.

Also during the 1990s, extensive surveys were conducted in the valleys of Santivañez (Vetters and Sanzeteña 1996), Capinota and Mizque (Higuera 1996, 2001) as well as in the westernmost part of the Central Valley (Gyarmati *et al.* 1999). These investigations contributed to the picture of a rather common land use strategy, as Higuera (1996) suggests, with a settlement preference for poorer soils in the piedmont area in all the valleys. At first sight, this may point to a population engaged primarily in agriculture, which erected their settlements on poorer soils, thus sparing the fertile soils for plant cultivation. However, a closer look at the nature of Formative Period settlements reveals different types that may vary from valley to valley.

The elevated mound sites, depicted by Ibarra Grasso as the main components of his early “Tumulus Culture”, seem to characterize a certain landscape management strategy during the Formative Period. They are not in the piedmont area, but rather appear in valley bottoms

close to rivers or areas with a high ground water table prone to periodic flooding. This includes the zone between Sipe Sipe, Quillacollo, and Colcapirhua in the Central Valley, where various mountain streams cross the bottom of the valley in a north-south direction (Figure 1). Interestingly, these mound settlements always show occupation in later periods. About 48 of such multi-component mound sites have been reported in this area (Céspedes *et al.* 1994:3, map 3). In contrast, the piedmont settlements tend to be occupied only in the Formative Period.

Multi-component mound sites are less frequent in the High Valley. Eight examples have been registered to date, and all are located on the now densely populated alluvial terrace cut by the Cliza River between Chullpa Pata (Figure 2: VA_144) and Cruz Pata. The locations of these mounds share the same geographic characteristics. As in the Central Valley they are close to a river flood plain. In the Cliza area also, these mounds were occupied beyond the Formative Period, maybe even until the Middle Horizon. In contrast, the neighboring site of Santa Lucía shows a different settlement type, because it is not a mound site, and it is not in the foothills (Figures 1, 3). Its location on the slightly elevated edge of a large alluvial fan only three kilometers to the west of the Cliza River may have prevented flooding, and thus made mound construction unnecessary. Also, Santa Lucía is not a multi-component site, and so there may have been insufficient time for mound formation from occupation debris. It was never re-occupied after the Formative Period.

It seems that the settlement types differ from valley to valley according to specific geographic conditions. The amount of flowing water and the water table are (and always were) higher in the Central Valley, necessitating greater mound constructions in prehistory. The High Valley seems to have been drier, because mound constructions appear only in the river area south of

Cliza. However, the Central Valley did not yield multi-component mound sites exclusively. Here single-component, flat Formative Period sites also exist on alluvial cones in the foothill areas (e.g. Chullpapampa; for others see Gyarmati *et al.* 1999:27). Ibarra Grasso did not differentiate between site types, because his focus was on the characteristic mound structures. Meanwhile, even Formative Period hilltop sites have been reported (Higueras 1996). However, the question of whether the different site types represent different functions or ranks in terms of social complexity has not yet been sufficiently investigated, but the construction of mounds represents not only an adaptation to flooding, but also a sign of collective labor.

Thus, the picture of the Formative Period in Cochabamba was far from clear at the end of the 1990s. Because the valleys lacked impressive characteristics like the monumental architecture of Chiripa, or the lithic *camelid* effigy heads of the Wankarani groups, the image of these early groups as local phenomena of emerging sedentary and self-sufficient agriculturalists persisted. Their use and production of monochrome pottery, which differed so much from the subsequent polychrome styles of the Early Intermediate Period like Tupuraya, Sauces, and Mojocoya, did not tempt many scholars to revise the comparatively low socio-economic status associated with the societies in the eastern slopes of the south-central Andes compared to contemporary societies on the Peruvian coast, for example. This vision was deeply rooted in strong concepts of “peripheral” locations as opposed to “core” regions. However, as shown above, the available data do not necessarily support such a negative image.

There is clear evidence indicating continuous exchange and communication between different societies in the south-central Andes. Moreover, there was organized access to prestige goods from as far as the altiplano, the lowlands, and even the

Pacific coast; hence, Cochabamba was incorporated in supra-regional trade systems. Unfortunately, the social organization of the valley's inhabitants themselves has never received any systematic assessment. Was agriculture their only economic subsistence? Did they produce pottery only for their own use? Were they really self-sufficient, non-stratified, agrarian societies that persisted in this state until the Early Intermediate Period? The Santa Lucía Project sought to focus this blurred picture, and to conduct research at a pottery production site, to shed light on the socio-economic structures of the Formative Period, such as its specialized manufacturing and organization, and their social and economic interaction spheres.

SANTA LUCÍA

The Valle Alto or High Valley is the largest of the five Cochabamba valleys. It is approximately 40 kilometers long and 15 kilometers wide, at an average altitude of 2700 m.a.s.l. (Figures 1, 3). Santa Lucía is located in the valley bottom. It is an extraordinarily large settlement, not only compared to other Formative Period sites, but also to sites of later periods. It covers 16 hectares, of which only 10.8 hectares were undisturbed and could be investigated (Figure 4). The surface is covered with a dense scatter of ceramics and other artifacts, as well as the remnants of structures (Figures 3, 4, 5). The Santa Lucía Project thus focused on the first systematic intra-site analysis of a Formative Period settlement in the region. A twenty-meter grid was established across the surface, and all architecture was mapped to analyze spatial and functional divisions. Systematic and diagnostic collections were made in 10 by 10 meter units.

Evidence of pottery production was visible in the remnants of more than two hundred heavily eroded firing facilities or kilns, which mainly consisted of a clay platforms (Figures 4, 6). The facilities present circular or oval forms with

diameters between 0.80 to 3.80 meters. Because these features have been eroded, their original forms remain unclear. Fired daub fragments with imprints of cane found in the upper debris layer point to rather sophisticated kiln structures above the platforms. The existence of a closed kiln structure can be ruled out, however, because there was no antechamber for fuel. In addition, the pottery shows quite striking fire-clouds and cracks due to lack of control over the firing temperature and atmosphere, suggesting that the kilns were open (Rice 1987:155). It seems that the firing facilities consisted of a platform with low walls, or a kind of modeled basin. Some facilities presented multiple platforms indicating that they were remodeled after a certain time. One platform even showed depressions, possibly for the firing of large storage vessels with round bases (Figure 6, right). This demonstrates that the potters used quite a sophisticated technology for the “open fire” or “bonfire” method, which was suitable for repetitive application (Gabelmann 2008b).

Additionally, circular stone foundations with diameters of 2 to 6 meters appear on the surface of the site. They consist of either ring-shaped wall foundations or circular pebble layers. The latter may have formed the foundations of now-eroded clay floors. The larger structures may have served as domestic buildings, as is the case with structure C5 that has a clay floor and a central post hole (Figure 5). Smaller ones could be interpreted as huts, sheds, or animal pens.

The mapping of all the structures revealed a surprising picture, with three different functional sectors (Figure 4). The concentration of large and small circular stone structures visible in the center can be interpreted as the domestic sector. This area is surrounded by the production sector, which mainly consists of firing facilities and smaller structures. The periphery shows ash mounds in a semi-circle, which served as a dump site and burial ground.

The artifacts found on the surface were made from stone, semi-precious stone, shell, bone, and ceramics. More evidence of pottery production was present in the form of tools and over-fired sherds. Shaping tools of modified sherds have been used to finish the surface of the raw vessels before applying the slip (Figure 7). Small stone scrapers may have served for cutting the coils and taking off excess clay when shaping the pots. Other important finds that could be linked to pottery production are incised, slightly conical ceramic tubes that may have been used for igniting the combustible materials when firing the vessels (Figure 8). The diameters of the tubes range from 2.8 to 6 centimeters. Unfortunately, only fragments were found in Santa Lucía, hence their original lengths are unknown. However, examples in the INIAM museum show total lengths of between 18 to 38 centimeters. While these lengths may not have been sufficient for a safe approach to the fire, they may be ceramic tips or tuyeres, which were elongated with reed or totora for this purpose.

The mapping of superficial artifacts was seen as problematic because of erosion, mainly due to heavy precipitation during rainy seasons, and the subsequent possibility of water transport. Parts of the site are, indeed, heavily eroded, and with the drain direction towards the northeast one would expect a greater density of artifacts in the northeastern sector of the site. The density of material in that sector was high, but other sectors less affected by possible water transport, such as the southwestern sector, showed high densities, too (Table 2). Though we cannot discard the possibility of a surface pattern formed by erosion, the fact that with every heavy rainfall new artifacts appeared on the surface implies that the pattern may not have drastically changed. Additionally, the inclination of the site is not steep, and in some areas grass may have prevented water transport. Artifacts most prone to water transport are the lightweight beads, shells, and small sherds, rather than stone artifacts and the larger

sherds of storage vessels. Finally, the site was occupied only during the Formative Period, and shows no interference from later periods.

The surface material belongs to a Late Formative phase dating between 500 B.C. and A.D. 60

(Santa Lucía III; Gabelmann 2008a:124-25). Nevertheless, it cannot be ruled out that material of an earlier phase appeared, especially in the lower elevations towards the north and the northeast of the site.

Southwestern Sector			North-Central Sector			Central Sector		
	percentages	counts		percentages	counts		percentages	counts
Type 10	59.1%	120	Type 10	80.5%	172	Type 10	33.3%	16
Type 20	39.9%	81	Type 20	17.8%	38	Type 20	62.5%	30
Others	1.0%	2	Others	1.7%	4	Others	4.2%	2
Total	100.0%	203	Total	100.0%	214	Total	100.0%	48
Northeastern Sector			Western Sector			Total surface sherd count		
	percentages	counts		percentages	counts		percentages	counts
Type 10	54.8%	153	Type 10	96.8%	90	Type 10	52.87%	5194
Type 20	40.9%	114	Type 20	3.2%	3	Type 20	46.12%	4531
Others	4.3%	12	Others	0.0%	0	Others	1.01%	87
Total	100.0%	279	Total	100.0%	93	Total sherd count	100.00%	9824

Table 2: Ceramic type distribution of five systematic collections (see Figure 15) and from total sherd count on surface.

Despite these problems, the mapped tools and artifacts on the surface do perfectly underline the functional spatial division between the working and living areas (Figure 9). Tools used for pottery production, like stone scrapers and shaping tools, amount to a higher percentage in the production area, or even to a total absence in the domestic area. The same is true for the decorated ceramic tubes or tuyeres, which most probably served for igniting fires. On the other hand, grinding and hammer stones appeared in both sectors, because they could be used for either grinding food or temper (Sillar 2000:56). It should be mentioned that many tools could have had multiple functions and may have served household, agricultural, and production purposes equally. Therefore, it may be misleading to

define a functional sector only on the basis of the presence of tools.

Furthermore, the surface showed concentrations of raw materials and objects made of minerals and semi-precious stones like malachite and sodalite, as well as shell from land snails and marine mollusks, which provides evidence of the settlers' activity in making beads and other adornments, in addition to pottery production. According to the distribution of the artifacts, this activity seems to have taken place in both the production and the domestic sectors (Figure 9). However, because lightweight artifacts are most prone to water transport during heavy rains, this evidence should be interpreted with caution.

Judging from the degree of erosion on the surface, the site was not expected to have any deeper levels of occupation. Nevertheless, excavation proved otherwise. A small trench excavated in the production sector showed occupation levels to a depth of 3.65 meters without reaching sterile soil (Figure 10). It yielded floor and fill layers of the Middle Formative (Santa Lucía II, 950-500 B.C.), and the Early Formative phase (Santa Lucía I, before 950 B.C.; Gabelmann *et al.* 2009). Shaping tools for pottery production were present until Layer 19, suggesting that pottery manufacture was always the principal task in the settlement. In contrast with the surface distribution, here many shaping tools were found on house floors, associated with cooking pots, weaving tools, ceramic spoons, and lithic debris, supporting the assumption that pottery production was performed as a household activity during the Early and Middle Formative phases.

Another trench was excavated in the western periphery in one of the ash mounds (Figure 4, coordinates North 480/East 340), where ten burials dating to the Late Formative or Santa Lucía III phase (500 B.C.-A.D. 60) were excavated. The individuals range from about six to about fifty years of age and were deposited in the ash layers as primary or secondary burials. All skulls are modified, and at least two different deformation types are present. Evidence of arthritis is present and there are pronounced muscle attachments in the chest and neck areas, which point to carrying heavy burdens, possibly associated with pottery production (Gabelmann 2008a: 303).

The excavation of a waste pit in the domestic sector close to the circular structure C5 revealed fragments of polychrome painted wall plaster (Figure 11). These fragments seem to come from the interior of a circular house as deduced from a slightly concave curvature. Structure C5, with a diameter of 6.10 meters, and a hole for the central post, is the largest circular stone structure

on the site. The proximity of the finds lets us assume that the plaster once had been part of this structure. Painted wall plaster is otherwise unknown in the Cochabamba Formative Period to date. Thus, we can infer a special function for Structure C5.

POTTERY PRODUCTION AND ORGANIZATION

On the basis of the spatial division between the production and the domestic sectors, as well as of the technological investments, it is apparent that pottery production exceeded the needs of the village population. Indeed, the pottery showed a rather wide distribution sphere; It was found throughout the High Valley, and appeared as a small percentage of total ceramics, even in the Central Valley (Sierra Mokho).

Hence, the existence of specialists may be assumed, although considerable confusion exists about what “specialization” is (Rice 1987:189). The term may refer to potters, who dedicate most of their time to production, and whose income is mainly generated by production (producer specialization *sensu* Longacre 1999:44). Alternately, it may apply to pottery production that developed due to favorable ecological conditions (e.g. presence of clay mines), which may be related, at the same time, to poor agricultural potential (site specialization *sensu* Rice 1987:189; cf. Costin 1991:3). In Santa Lucía, a site specialization is probable on the grounds of the poor and salty soils at the edge of the alluvial fan (soil class V-VI; Gabelmann 2008a) and because of its proximity to clay mines only five kilometers distant in the piedmont zone to the south. Here a number of modern pottery producing villages (e.g. Huayculi and Vilaque; Figure 4) possibly exploit the same clay resources (Gabelmann 2008a:191; Goins 1967:126-127, 153; Sillar 2000:25). The fact that these villages show signs of prehistoric production (see below) underlines site specialization throughout various periods until the present.

The degree or intensity of a producer specialization is far more difficult to estimate for prehistoric contexts. According to Dean Arnold (1985: 18) a full-time specialization occurs, if potters work year round. This is only possible in favorable arid and dry climate zones like the Peruvian coast, or the lower montane thorn steppes, where precipitation is less than 500 millimeters per year (Arnold 1993:224-231). Although precipitation in the High Valley amounts to 420 millimeters in the valley bottom, due to pronounced seasonal changes between rainy and dry periods, such a full-time specialization is not practiced today, even with the existence of canopied kilns (e.g. at Huayculi; Gabelmann 1999: figure 5). Humid conditions and rain complicate production because they cause difficulties in drying and firing the pots.² Not only in Cochabamba, but throughout the Andes, potters have adapted to part-time activity during the months between April/May and October (Arnold 1993:54; Chávez 1992:68; Litto 1976:13; Sillar 2000:73, table 4.6) and may compensate for their shortfall with agricultural activities used as a risk minimization measure (Hagstrum 1989:103).

Certainly, the climate in Cochabamba during the Formative Period may have been different from that of today, even though explicit paleoclimate studies for the valleys are lacking to date. Studies of highland lake levels and Bolivian ice cores suggest a warm and humid climatic optimum between 4500 and 3200 B.P., followed by an arid phase (Argollo 1991; Argollo and Mourguiart 1995, 2000; Seltzer and Wright 1991; Thompson *et al.* 1998). Thus, we may assume a more humid climate until the Early Formative Period. However, weather conditions in the *altiplano* may not necessarily coincide with those of the valleys because the dominant moisture source there comes from the eastern low-

lands. Thus, a more humid climate in the highlands may even have led to a displacement of the sub-tropical humid montane forest belt towards the west into the eastern Cochabamba valleys (Ricardo Céspedes, personal communication). For all the missing details on the paleoclimatic conditions in the valley region that need to be determined in the future, we may cautiously deduce a more humid climate for the Late Formative Period based on the fact that eight of thirty-nine archaeo-botanical samples contained *Cyperaceae* (reeds or totora) from the swampy valley bottom close to Santa Lucía (Gabelmann 2008a:176, table 3.4).

Even in the case of less humid climatic conditions, we should not assume the existence of full time specialists in the Formative Period, but rather potters who produced only during the dry periods.³ Nevertheless, a complementary (or risk-minimizing) activity of the potters in agriculture during rainy periods is difficult to detect. Tools generally associated with agriculture like stone axes and clod breakers may have had multiple functions, and perhaps were also used for crushing temper, or beating clay lumps in pottery production. Neither can agricultural activities be excluded. Until now, there are no explicit data as to whether the potters were also landholders and cultivated crops, or whether they exchanged food products for pottery (and possibly dedicated their time during the rainy season to the fabrication of beads). Still, a producer specialization, or better, a seasonal producer specialization, in the sense of pottery production representing the primary activity, can be deduced from the investment made in tech-

² Pronounced seasons are the case in most areas of the world. This is why a possible full time specialization of prehistoric potters is questionable.

³ In the end, full time specialists can only be expected in centrally organized production centers with a high degree of elite sponsorship, which covers provisioning and possible risks for the potters (cf. Brumfiel and Earle 1978). This situation may have occurred during the Inca Empire, but cannot, as yet, be assumed for any other prehistoric period in the South Central Andes (Gabelmann 2008a:260).

nology (e.g. the construction of firing facilities) and the spatial division between working and living areas in Santa Lucía.

In any case, the production sector in Santa Lucía was not organized as a factory, where potters fulfilled specific steps in a segmented production process. At least, no areas for segmented or sequential activities were observed (cf. Anders *et al.* 1994; Pool and Santley 1992). The distribution of both the firing facilities (Figure 4) and the tools (Figure 9) implies, on the contrary, that all tasks were carried out in all parts of the production sector, without any spatial preference. This suggests individual workshops that were located outside the living area, but still organized at a household level. The involvement of family members in the production process is to be assumed. Several unfired clay objects like crude miniature vessels, or toy-like anthropomorphic figurines (Gabelmann 2008a: plate 25) may indicate the participation and practice of children and denote that pottery making was learned during the parents' activities.

Thus, the individual workshops of Santa Lucía represent a community specialization, which is characterized by "autonomous individuals or household-based production units, aggregated within a single community, producing for unrestricted regional consumption" according to Cathy Costin's typology of specialized production (1991:8). Community specialization may refer to a village or a kin-based *ayllu* that works as part-time or full-time specialists independently for a market of potential customers. In Santa Lucía, all households, or a majority of them, were engaged in manufacturing pottery for a broader consumer population, thus requiring an internal organizational or hierarchic structure for the regulation of production and distribution. At least, there are no hints of centralized, or elite-controlled, production.

Community specialization is a phenomenon that still occurs in the Andes today and it is described in the ethnographic literature. The pottery-producing village of Huayculi in the High Valley (Figure 2; VA_11) provides an example of a present-day production of tableware (Gabelmann 1999; Goins 1967; Sillar 2000). Almost every household is involved and presents devices (e.g. kilns, clay basins) for production during the dry season. Other examples of pottery producing villages in the High Valley today are Vilaque and Paracaya, the first producing cooking pots, and and the latter *wirq'is* for chicha production. Similar examples of modern village pottery production exist in the Ayacucho Basin (Arnold 1993), while manufacturing specialization of other products is known from the Lake Titicaca area (Tschopik 1950).⁴ Costin's community specialization type is probably the most appropriate model for interpreting prehistoric manufacture organization in the south-central Andes.

CERAMIC TYPES

The archaeological picture in Santa Lucía, however, is more complex. Two ceramic types appear on the surface. These differ remarkably from each other in vessel form, temper, wall construction technique, and surface treatment. This points to the existence of at least two different manufacturing centers.

Type 20 comprises a variety of vessel forms such as hemispherical bowls, small globular jars with short necks, and medium-to-large cooking vessels with rounded bottoms (Figures 12, 13). Most characteristic are the highly pronounced lips in multitudinous variations, either everted or

⁴ The town of Ichu on the Peruvian side of the lake specializes in the production of sandals made from tires; Chucuito produces felt hats, llave wool and yarns, and Juli textiles (Tschopik 1950:215). Prehistoric community specialization may thus be conceivable in other production areas, too.

bulging. These may have served as a substitute for handles. The surfaces of the vessels are coated with a thin bright-to-dark red slip after the production of striation marks with a hard-edged tool. The striation marks sometimes form simple patterns. The temper consists of fine, rounded river gravel with the addition of grog.

Type 10, by contrast, is composed of a more limited variety of vessel forms, mostly large oval storage or fermentation vessels and straight-sided bowls, but also small oval jars (Figures 13, 14). The rim forms are very simple, angular or oval, but mostly rounded down and slightly thickened. The vessels are always coated with a thick red-brown self-slip, and then burnished with pebbles to a silky luster, obtaining a compact, less permeable, and abrasion-resistant surface at the same time. Crushed river gravel and quartz were added as temper; grog is less common than in Type 20.

Although forms and treatment of the two types clearly point to a functional difference, a distinction between serving and utility pottery for either one cannot be observed, because both types show vessel forms for pure household activities (e.g. cooking, storage) as well as for serving (Figure 13). The producers of Type 10 were primarily specialized in large storage vessels that can hold liquids, while Type 20 mainly presents cooking pots with rounded bases. Both ceramic types present tableware like flat or deep bowls and jars. Also, a small percentage of vessels with incised decoration or applications appear in both ceramic types (see below). Here, the existence of highly decorated ceramic tubes needs to be mentioned. These were made exclusively from a variety of ceramic Type 10 (Figure 8).

The differences between the two types are considerable and raise the question of their production location. Over-fired sherds, as well as vessels left on the firing platforms verify the production of Type 10 pottery on the spot. Because of this, and for other reasons explained

below, it seems appropriate to assume that only one type was produced in Santa Lucía. However, interestingly, only 53 percent of the total sherds on the surface consist of Type 10 (Table 2). This is a rather low figure for a production site. One would expect the rate of the produced ware to be higher.

Nonetheless, the distribution ratio differs according to sectors. There is a rather high concentration (80 to 97 percent) of Type 10 sherds visible in the North-Central and Western production sectors as compared to a rate of 63 percent of Type 20 sherds in the center, the residential area (Figure 15; Table 2). This corroborates the identification of the production sector, and identifies the products as belonging to Type 10. Second, it seems that Type 20 vessels are more common in pure household activities than Type 10 vessels, with the ratio being almost 2:1 with Type 20 predominant. Type 10 vessels represent only about one-third of pottery in households. An explanation for the relatively low percentage of Type 10 in the residential area is that large storage jars with thick walls have a longer life span and break less often than the thinner serving or cooking vessels of Type 20. Additionally, if thick vessels break, they may produce a lower number of fragments than a thin vessel, even though they may be larger.

The exclusive production of Type 10 in Santa Lucía represents a specialization in storage vessels, which were objects of commerce. The explanation that presents itself is that Type 10 vessels were exchanged for those of Type 20. But where did Type 20 come from? The high percentage of Type 20 vessels in Santa Lucía suggests a valley-specific production in close proximity. This assumption is supported by the crystallographic structure (XRD) and the elemental analysis (XRF) of the pottery types (Table 3 and Figure 16). Both ceramic types exhibit similar mineral and chemical components, indicating the exploi-

tation of vicinal clay resources (Gabelmann 2008a).

Sherd No.	Laboratory No.	Ceramic type		
SL-01	SL-01	20		
SL-208/054	SL-208-054	10		
SL-Nº Bolsa 224	SL (Bolsa 224)	clay slag		
SL-Nº Bolsa 161	SL (Bolsa 161)	clay slag		

Element	Samples			
	SL-01	SL-208-054	SL Bol 224	SL Bol 161
<i>Majority presence</i>				
Silicon	xx	xx	xx	xxx
Potassium	xx	xx	xx	xxx
Aluminium	xxx	xxx	xx	-
Iron	xxx	xxx	xx	x
Calcium	-	x	xxx	xx
Titanium	xx	xxx	x	-
<i>Minority presence</i>				
Calcium	xxx	-	-	-
Phosphorus	-	-	-	xxx
Titanium	-	-	-	xxx
Aluminium	-	-	-	xxx
Zirconium	-	xxx	xx	x
Strontium	-	xxx	-	xxx
<i>Trace presence</i>				
Zirconium	xxx	-	-	-
Rubidium	xxx	xx	xx	x
Strontium	xx	-	xxx	-
Phosphorus	x	x	xxx	-
Magnesium	xx	xx	x	xxx
Barium	xxx	xxx	xx	x
Zinc	xxx	xx	xx	x
Copper	x	x	x	x
Niobium	x	xx	x	xxx
Lead	x	x	x	-
Sodium	x	xx	x	xx
Nickel	x	x	x	-
Gallium	x	x	x	-

Table 3: XRF results of four samples (ceramic and clay slag) from Santa Lucía (Instituto de Investigaciones Geológicas y del Medio Ambiente, Universidad Mayor de San Andres, La Paz). The number of x's indicates the relative abundance of the element in relation to other elements in the sample with x representing a low percentage and xxx representing a high percentage of the element.

SETTLEMENT PATTERN IN THE HIGH VALLEY

As part of the Santa Lucía Project, a survey was conducted in the southwestern area of the High Valley. The survey area ranged over 150 square kilometers, and included all ecological levels, such as the valley bottom, foothills, slopes, and mountaintops within 500 vertical meters (Figure 2). The results basically confirm the Formative Period settlement patterns already observed in the neighboring Capinota Valley (Higueras 1996), coinciding with a general preference for locations in the upper valley, piedmont levels, or alluvial fans, and mostly alongside the major rivers.⁵ Among the 48 Formative Period sites we registered, some are outside the survey area like the previously known site of Chullpa Pata near Cliza (Figure 2: VA_144). No new mound-like settlements were encountered. Nevertheless, three multi-component sites were noted on natural hills or slopes (Figure 2: VA_49, 64, 127),⁶ which exhibit the whole occupation sequence from the Formative to the Late Intermediate Period, while the Formative Period usually occupies slopes and bottoms. Most of the other 44 sites were reoccupied at least once (mostly during the Late Intermediate Period), and only a few sites are small single-component sites. The latter may be interpreted as sites dedicated to agrarian activities, because

⁵ The absence of sites in the valley bottom may be due to the existence of an extensive marsh district until the first Spanish settlers drained it in the sixteenth century. On the other hand, if there were any prehistoric sites in the valley bottom, they probably have been destroyed by the extensive agrarian activities that have taken place since colonial times. This may be the reason why sites close to the artificial modern lake are very small (see Figure 2; VA_3, 68, 72).

⁶ At Convento Tarata (Figure 2; VA_127) we did not see any Formative Period pottery, but the collection of Padre Mauricio Valcanover includes Formative type pottery said to come from the site. It is very likely that the site had a Formative Period occupation, as this is the case with VA_122 and 123 (see Figure 2).

they occupied the fertile soils of class I-III close to the valley bottom (Gabelmann 2008a: map A.4).

Interestingly, we encountered three additional pottery production sites within the survey area and one lying only slightly outside it (Figure 2: VA_11, 64, 107, and 139). These sites are aligned in regular distances from each other in the southern piedmont area, within a distance of 5.8 to 12 kilometers from Santa Lucía (Figure 2: VA_10). All four sites show the same homogeneous distribution of Type 10 and Type 20 ceramics on the surface. Because Type 10 was produced in Santa Lucía, it is likely that one, or even all four, of these sites produced Type 20 vessels. The existence of four production sites of Type 20 is feasible, because it would explain the presence of the broad variety of vessel and rim forms (Figure 13). Hypothetically, we may interpret specific rim form groups as characteristic of a certain production site. However, this assumption will require further comparisons with the pottery from each of the four sites.

Not only the production sites, but also almost all Formative Period sites, revealed sherds of Types 10 and 20 on the surface, a fact that is even valid for sites outside the survey zone (Gabelmann 2008a). Both types seem to be more or less evenly spread throughout the valley. Such a diffusion points to a certain distributive system, where all settlements had unlimited access to the products from either manufacturing center to complete their ceramic inventory. The investigation of the nature of and the motivation for such a system is indeed challenging.

COMPLEMENTARITY ON THE MICRO-SCALE LEVEL OR INTRA-VALLEY INTERACTION

First, the question arises as to why the vessel forms of Type 20 were not produced locally in Santa Lucía. No doubt, the potters had the skills to produce additional forms in order to cover the

functional needs of activities like cooking. Instead, they preferred to trade in pots from other production sites in the valley that specialized in heat-resistant forms, tempering, and surface treatment. Thus, they created a kind of volitional interdependency, because it does not result from the lack of appropriate raw materials, or from the lack of technological skills. The thought behind this principle is not competition but complementarity. But what were the reasons for an artificially created complementarity operating on a horizontal level?

The following conclusion is based on analogy with ethnographic data from the High Valley, which shows that a similar specialization system still existed in the twentieth century, and in some villages persists up to the present. The principal production area extends over nine neighboring villages on the southwestern edge of the valley. These villages specialize in certain forms, like small cooking pots in Vilaque and serving dishes and toys in Huayculi.⁷ Another modern production site lies outside of this area. Paracaya in the northeastern slopes of the valley (Figure 1) specializes in giant open vessels used for chicha production (Litto 1976:61-63; Sillar 2000:27, 160-161). Here we observe a complementarity system with a restriction on certain forms for the different villages. In Huayculi, the number of vessel forms produced is even divided into the number of producing households in the village. Each household manufactures only two or three objects of the whole spectrum (flower pots, plates, soup dishes, cups, piggy banks, etc.), which add up to the complete set that is then exchanged at local markets (Gabelmann 1999). Thus, each household has a fair chance to partic-

⁷ The location of these villages coincides with the prehistoric production sites (Figure 2). Modern Vilaque is close to VA_139, the prehistoric site of Huayculi is VA_11). This continuity in production is due to the presence of the best clay resources in the valley (see discussion about site specialization above; see also Arnold 1993).

ipate in the production as a whole. Here, the complementarity system is even more complex because it operates down to the household level.

The similarities to the prehistoric production model are quite apparent, even though we should be cautious with analogies over such a large time span. However, I have detected continuity between prehistoric and modern vessel forms (Gabelmann 2008a), so why should established economical principles not have survived changes during different societal orders?⁸ It is feasible to think of the organization of today's pottery production in the High Valley as a tradition that has been passed down from prehistoric times. The concept of keeping the product range down to only one, or a few, categories leaves space for other local production sites, and creates demand on a local level. Additionally, a specialization (or rather a restriction) on particular products of the whole range (e.g. vessel forms) for each household would prevent competition between the potters of one production site. However, in Santa Lucía there is no evidence to date for complementarity of forms on a household level. Nonetheless, the complementarity system on a community level in the prehistoric High Valley seems a feasible explanation for the existence of the two ceramic types.

For a better understanding of this principle, it is useful to examine the spatial arrangement of the Formative Period production sites. The four sites assumed to produce Type 20 are all at the southwestern edge of the valley in the foothills of the mountain ridge, with altitudes of up to 3500 m.a.s.l. (Figure 2). There people had easier access to resource goods from puna or pre-puna regions (e.g. *camelid* products like wool and meat). Santa Lucía, by contrast, is close to the swampy soils in the center of the valley. The exchange of pottery

may, therefore, not have been the only interest of the valley population. Rather, pottery exchange points to a complementary system on a micro-scale, or valley level, which also covered the exchange of food products, raw materials, and other goods from different (micro) ecozones and, therefore, worked horizontally as well as vertically.

An example of such a vertical complementary model is reported from the Vilcanota Valley in southern Peru in the twentieth century. Karen Mohr Chávez (1984-85:183; 1992:79-83) described a complementarity of functional pottery forms that corresponds to two eco-zones within the region. The inhabitants of the puna villages specialize in the production of cooking and roasting vessels, braziers, and incense burners, while the potters in Raq'chi, in the valley, produce storage and fermentation vessels, as well as serving and carrying containers. In order to complete the functional vessel inventory, exchange between the two eco-zones is necessary. Storage vessels (*urpus*) from the valleys are exchanged in the highlands for quinoa. Therefore, the interdependency of this exchange system also provides a balanced circulation of agrarian (and other?) goods between the valley bottom and the puna region.

For the prehistoric High Valley, we may formulate a similar artificial interdependency, where a limitation of forms in pottery production triggers exchange of other goods. Archaeobotanical analyses in Santa Lucía revealed mainly quinoa as a staple crop, which may have been cultivated in the foothill areas. At least, the swampy valley bottom to the north of Santa Lucía was probably not suitable for agriculture in prehistoric times, but instead for the exploitation of reed or totora. Reed was used for the roofing of houses, as forage for animals, and probably as combustible material for firing facilities. It may well have represented a resource for an intra-valley exchange system, along with the Type 10

⁸ The principle itself may not have changed during the prehistoric and colonial periods, but the degree of organization and control of production may have shifted.

vessels. Thus, an artificial interdependency shows certain advantages. An eco-zonal complementarity with specialized production provides equitable participation of all valley inhabitants at an intra-valley level, and guaranteed access to resource goods from different ecological levels.

Thus, the principle of product or community specialization triggered exchange, contact, and communication. Not only was this principle relevant for access to and distribution of specific goods, but also in terms of reproduction (Hagstrum 1989:2-3; Sillar 2000:46). Contact between different groups and settlements was necessary and it was kept up through artificial production limitations and the subsequent necessity of exchange.⁹ Hence, households and/or settlements were neither self-sufficient, nor did they aim for complete self-sufficiency. This is one key mechanism for understanding the social and economic behavior not only of the Formative Period, but also of later societies.

What is still unclear is the nature of the distributive system that was responsible for an even diffusion of the products. What would be an appropriate distributive system if every settlement acts as an independent productive agent? A redistributive system can be ruled out due to the lack of a centralized power represented by an elite class living in a regional center from where the goods were allocated. Reciprocity, in comparison, is usually a bilateral exchange between two agents, and cannot be responsible for an even distribution of goods in a whole valley. Rather, exchange must have taken place in various locations with a broad coverage for production centers and the population. We can only speculate about prehistoric market and distributive systems but it would not be implausible to think of periodical, inter-communal gatherings com-

bined with product exchange, possibly related to an ideological or ritual agrarian cycle (Hagstrum 1989; cf. Vranich 2006).

Exchange at an intra-valley or a micro-scale level is also observable in the neighboring valleys of Cochabamba. Choroqollo in the Santivañez Valley likewise displays pottery production of large vessel types that were distributed throughout the valley (Gabelmann 2001) and even seem to have reached the neighboring Capinota Valley (Higueras 1996:209; McAndrews and Rivera 2007). Here at least two other ceramic types existed that were possibly produced in the valley. Unfortunately, there is insufficient data for locating the other production sites, but it is very likely that the principle of complementarity and, hence, specialized communities, is also applicable here.

The principle seems to be valid first and foremost for the Central Valley, based upon the ceramic variety in Sierra Mokho. Sierra Mokho presents two ceramic types (Type 2, Type 6; Brockington *et al.* 1985, 1987) that closely resemble the two types in Santa Lucía, or the High Valley, respectively, but are clearly of local production. The production sites in the Central Valley have not been located either, but in view of the situation in the High Valley, they may coincide with today's production areas. Therefore, Colcapirhua may have been an important prehistoric pottery production site for one of the types (Figure 1). The strikingly dense distribution of mounds in the fertile area north of Colcapirhua (Céspedes *et al.* 1994: map 3) also points to settlements specialized in agriculture. Despite the as yet incomplete settlement pattern in the Central Valley, sites existed in the northern (Chullapampa) and in the western foothills (Gyarmati *et al.* 1999), which may have fulfilled special roles and responsibilities in intra-valley interaction because of their easy access to puna resources. As a matter of course, the nature of the described intra-valley complementarity system

⁹ The question arises whether we can conceive of different ethnic groups or *ayllus* behind the producers of the two different ceramic types.

in this paper should be examined in more detail (and in more valleys).¹⁰ There may be community specialized activities other than pottery production subsumable in this model.

It is, therefore, likely that each valley maintained a similar complementarity system, and that the valleys acted as autonomous entities concerning the procurement of resources for daily life. Despite a difference in altitude of 300 meters, the valleys basically provide the same agricultural resources. Hence, exchange between the valleys is expected to be more frequent in the case of ritual or exotic goods like sodalite, malachite, and marine shell, which came from outside. Such goods passed the corridor through the valleys as in the example of Conchupata, Mizque (see below) and may surely be found in several important sites throughout the valleys.

MACRO-SCALE LEVEL OR SUPRA-REGIONAL INTERACTION

For all the autonomy given with the procurement of basic local resources, the valleys maintained ties to other regions for access to prestige or exotic goods from other ecological niches. Wankarani pottery was found in the layers of the Early Formative phase in Sierra Mokho as well as in Choroqollo, and points to a certain interaction of the Central and the Santivañez Valley with the southern *altiplano*. It seems that one of the three Formative Period sites discovered by Gyarmati *et al.* (1999:27) in the western Central Valley also exhibits Wankarani pottery, because the authors note mica temper in the sherds, which is generally an indicator of ceramics from the southern highlands.

Santa Lucía has not revealed any highland pottery to date. Conversely, a ceramic type with a distinct style of incised decoration appears here, which is characteristic of the southeastern valleys of Aiquile, Mizque, and Khopi (Brockington *et al.* 1995). The decoration often shows fine-line incisions of long narrow triangles, ribbons, or other geometric designs filled with hatching or grids. These motifs are found above all on ceramic tubes and a few sherds (Figures 8 and 17), which are of local production in Santa Lucía and belong to a variety of Type 10 ceramics. Incision was always accomplished either on the completely dry surface after slipping and burnishing, or after firing with a hard-edged tool.

In contrast, incised pottery is rather scarce in the Central Valley (Brockington *et al.* 1985, 1995), or even absent at some sites (Céspedes *et al.* 1994:13). If incision appears, the motifs are rather simple lines, dots or dashes, which also appear in a small percentage of Wankarani pottery (Ayala and Uribe 2003; Walter 1966:109, 114). Interestingly, Type 20 pottery in Santa Lucía is sometimes decorated with sloppy triangles filled with dots or dashes (Figure 17), indicating a relationship with the decorative style of the Central Valley. These incisions are always carried out on the wet or leather-hard surface before slipping and firing and, therefore, contrast also in technology with the more complex style of the southeastern valleys. Furthermore, they underline the distinctions between the two ceramic types in Santa Lucía.

On this basis, we can delineate two spheres of long-distance interaction that divide the Cochabamba valleys. While the westernmost valleys preferred to interact with the southern highlands or the Wankarani region, the High Valley exhibits closer contact with the lower southeastern valleys. On the one hand, this may be a result of the geographical location of the respective valleys and the shorter distance to the next eco-zone. On the other hand, there is the

¹⁰ A recent survey directed in 2011 by the author in the Sacaba Valley corroborates the hypothesis of the intra-valley complementary systems. Here, two ceramic types were observed that closely resemble the two types of Santa Lucía, as well as those of Sierra Mokho, but seem to be local.

pending question of an affiliation of the two ceramic types with different ethnic groups that may have inhabited the valleys. The pottery of Santa Lucía shows a strong influence from the Mizque-Aiquile region, based on the particular incised motifs, and the vessel forms of Type 10. Can we thus conceive of a population from the lower valleys in Santa Lucía? This hypothesis may be too audacious for the Formative Period, but there is a strong relationship for whatever reasons. Certainly, this issue will require detailed analysis in the future.

Nevertheless, because of their strategic location in the corridor between the highlands and the lowlands, the Cochabamba valleys played an important role as a “port of trade” for the long-distance distribution of goods. Prestige goods like malachite, sodalite, and Pacific shell entered the valleys via the highlands to the west, or the cordillera to the north. Thus, the marine shells found as offerings in the Conchupata burial site dating between 1180 and 800 B.C. (Pereira *et al.* 1992, Table 1) must have passed through the Cochabamba valleys on their way to Mizque. The shell specimens were assigned to the family of *Pectenidae* coming from the cold Pacific waters (Brockington *et al.* 1986:38). Shells of this family (*Argopecten purpuratus*) and others (*Trachycardium procerum*) have been found in Santa Lucía, originating from the southern Peruvian or Chilean coast. However, Santa Lucía even yielded shell fragments of *Pteriidae*, which come from as far as the Peruvian north coast,¹¹ indicating a considerable operating distance of Formative Period trade systems.

Naturally, there were also goods from the lowlands, mostly of an organic kind like wood, fruits, herbs, and feathers, which were most interesting to people in the highlands and on the

Pacific coast and triggered interaction in both directions. Cochabamba was not only a major passageway to the lowlands, but possibly also the junction for pre-hispanic routes along the Cordillera. Artifacts made of gold, sodalite, and basalt indicate exchange between Santa Lucía and Ayopaya or Independencia to the north, while fossils from Apillabamba across the Caine River point to a route to Chuquisaca and the northern part of Potosí department (Norte Potosí) further south. Sodalite from Independencia, and malachite, were also found in Conchupata, indicating a trade route intersection in the valleys, thus Sierra Mokho or Santa Lucía may have acted as a port of trade.

Certainly, more investigation concerning long distance interaction and the nature of the economic participation of the Cochabamba valleys is necessary. We do not have a clear picture of prehistoric trade routes in the region, but there are several Inca road sections known to date. A direct route from highlands to the lowlands leads from Paria to Tapacarí and possibly to Incarracay (Hyslop 1984:142) and from Vacas to the east of the High Valley to Pocona, Khopi and Chimboata (Pereira 1982). The Paria-Tapacarí road probably dates back to the Middle Horizon (Gutiérrez 2005) and the question arises whether it may have already been in use during the Formative Period, because it would have been the most direct route between the Wankarani region and Cochabamba (*cf.* Condarco 2002). Nevertheless, in view of archaeological evidence and the extent of interactions, there may have been several routes to the highlands (see Hyslop 1984:139,149). Fragments of Inca roads have been found in Ayopaya (*e.g.* Cocapata to Cotacajes and Independencia), which may have led directly to Tapacarí and Quillacollo in the Central Valley (Pereira 1982), indicating the possibility of an older route for gold and sodalite exchange in the Formative Period.

¹¹ The analysis of mollusks from Santa Lucía was done by Victor F. Vásquez Sánchez, Director of ARQUEOBIOs, Trujillo, Perú (www.arqueobios.org).

INTER-VALLEY CONSOLIDATION AND INCREASE OF LONG-DISTANCE TRADE

The above-described situation on the surface of Santa Lucía features a clear division between the production and domestic sectors, although this may not have been the case in earlier occupation levels. In the layers of the Middle Formative phase dating between 930 and 770 B.C. (Table 1:7; see Figure 10) there was evidence of an activity area for cooking, weaving, and pottery production, indicating that pottery production took place in the household realm. Towards the end of the Middle Formative the site was at least partly intentionally restructured, and these layers were covered and leveled with a thick stratum of rubbish for the new architectural layout (Figure 10, layer 4). The end of this event dates to the beginning of the Late Formative I phase around 540/500 B.C. (Table 1:8, 9; Gabelmann *et al.* 2009). The spatial division and the displacement of pottery production outside the household area is not only evidence of collective labor, but also presents a clear shift in the socio-economic pattern with a different organizational level.

Around 500 B.C. pottery of Type 10 from Santa Lucía also appears in Sierra Mokho in the Central Valley. The appearance of their *Tipo* 7, which coincides with ceramic Type 10, prompted the excavators to determine the beginning of their Middle Formative phase (Brockington *et al.* 1987:33). As a result of the shift in the organization of production, the distribution radius of Santa Lucía increased to more than fifty kilometers, and thus to an exchange of pottery between the valleys. More precisely, there were closer interactions and relational bonds among the five valleys along with a dissolution of their earlier autonomies.

This indicates a concentration of political and economic power in the valleys around 500 B.C., which may be seen as an answer to dynamics created from outside. An increasing demand

may have developed in the highlands for goods from the lowlands (or vice versa?), which finally triggered an inter-valley consolidation and a stronger economic position of the Cochabamba Valleys as an entity. At least Santa Lucía seems to have benefited from this new situation. Prestige goods are far more numerous than before. Objects of Pacific shell (*Pteriidae*) from as far as the Peruvian north coast and gold from Ayopaya indicate the coverage of long distance trade. Raw material and artifacts made of malachite and sodalite point to a new or increasing activity of the settlers in the fabrication of beads made of non-local resources. It still remains unclear whether the activity in bead fabrication in Santa Lucía can be traced back to the fact of a labor division between potters and non-potters or whether we can conceive of a compensating rainy period activity of the potters themselves. However, it illustrates an active participation of the population in Santa Lucía in long-distance trade.

The eco-zonal complementarity of each valley was not affected by this consolidation. Quite the opposite, it increased with an extension of the distributive system. Products like local pottery could, therefore, cross the valleys as a side effect (e.g. packaging of goods) to the progressive participation in long-distance trade with prestige goods.

The question arises as to whether this new situation arose due to a shift in the highland interaction from the southern *altiplano* (Wankarani) towards the Titicaca area, which may have triggered this development in the valleys. Chiripa at the southern tip of Lake Titicaca gained power around 500 B.C. and extended its economic ties towards the eastern valleys (Larecacha, Muñecas). The corridor via the Cochabamba valleys may have been interesting to Chiripa, as were the valleys themselves with their attractive climate and fertile arable soils. It would not be illogical to suppose that an increased supra-regional trade system enhanced the socio-

economic environment in the valleys and, consequently, the development of more dominant settlements like Santa Lucía in the High Valley and Sierra Mokho in the Central Valley.

Contrary to the evidence of Wankarani interactions, no Chiripa sherds have been discovered to date in the Cochabamba area, which would confirm such a relationship. However, there exists a collection of small “portable” stone stelae in the INIAM museum, some of which closely resemble the Yayamama iconography (*cf.* Chávez and Chávez 1975) characteristic of the Late Formative phase in the circum-Titicaca area (Figure 18). Unfortunately, neither the sites nor the original contexts of these objects is known, although Ibarra Grasso points out that most of them came from the area of Cliza¹² (Ibarra 1955, 1958). If this is true and the stone artifacts can be assigned to the Late Formative Period, it would emphasize the inter-valley consolidation and the powerful position of Santa Lucía and Chullpa Pata after 500 B.C.

TRANSITION TO THE EARLY INTERMEDIATE PERIOD

The end of occupation at Santa Lucía is not clear, because the surface is completely eroded. The youngest radiocarbon sample dates to an interval between 200 B.C. and 60 A.D. (Table 1:10). Tupuraya pottery was not found. Therefore, occupation must have ended, for unknown reasons, during the Late Formative phase. It may be assumed that a dislocation of the settlers of Santa Lucía took place, possibly to the neighbor-

ing site of Chullpa Pata.¹³ Chullpa Pata indicates a longer occupation, because some of the mounds yielded Tupuraya sherds (Walter 1966, Brockington *et al.* 1985), and thus were still occupied during the Early Intermediate Period. However, we still lack information about the transition from the Late Formative phase to the subsequent Early Intermediate Period.

During the survey we found the site of Wakapuñuni that is outstanding due to its settlement type. It is situated upon a terraced mountain spur on the southern limits of the survey zone (Figure 2: VA_59). The pottery is monochrome, but lacks both the red slip and the burnished luster of the two ceramic types from Santa Lucía described in this paper. Instead, it exhibits a rough sandy surface and a higher percentage of zoomorphic applications. Interestingly, this ceramic type was not found in any of the other Formative Period sites, making cross-dating difficult. Hilltop sites are reported from the Capinota Valley (Higueras 1996)¹⁴ and seem to exist in the Santivañez Valley (Vetters and Sanzetenia 1996), but the topic has not been fully investigated. The question arises as to whether we can conceive of a Late Formative II phase combined with a dislocation of settlements from the valley to hilltops for whatever reasons. On the one hand, the location of Wakapuñuni marks the entrance to a corridor to the Caine River and a possible trade route to Norte Potosí and the Chuquisaca area and may have served

¹² Ibarra Grasso almost never specified finds and sites; therefore when he mentions Cliza, he may refer to Chullpa Pata, Cruz Pata, or even Santa Lucía, all sites lying within a distance of 1 to 3 kilometers from Cliza (see Figure 2).

¹³ The ceramic material of the upper layers of the 1984 Chullpa Pata excavation (Brockington *et al.* 1985, 1987) does display a ceramic type that is very close to Santa Lucía pottery and perhaps represents a posterior occupation.

¹⁴ The site of Pirque Alto (CP 11), on a prominent bluff, may now appear as a strategic hilltop site, but this may not have been the case in prehistoric times. Its geographical situation today is due to post-occupational erosion by the Tapacarí River (McAndrews and Rivera 2007). Other Formative Period hilltop sites mentioned are CP 15, 43, and 45 (Higueras 1996:58).

economic purposes. On the other hand, we may assume climate changes forced people to leave the fertile valley bottoms. As a third reason, the occupation of strategic hilltop settlements may point to increased territorial concerns and times of crisis during this phase. For a better understanding of this phenomenon, we need more investigation of monochrome ceramic styles as well as radiocarbon dating of hilltop sites in the future.

The appearance of the polychrome Tupuraya pottery, which characterizes the Early Intermediate Period, was hypothetically connected with the invasion of ethnic groups from the southeastern valleys of Mizque and Aiquile where the style seems to have originated (Rydén 1959:117; Walter 1966:269). The polychrome style enters the Cochabamba Valleys with no antecedents, and appears to replace the monochrome pottery. However, the question of whether the monochrome pottery of the Formative Period still existed contemporaneously or disappeared completely with the presence of the Tupuraya style has never really been investigated. This also holds true with regard to social development, that is, the question as to whether the bearers of the Tupuraya style pottery replaced the Formative Period society, or whether the Formative Period people simply adopted the new fashion.

A clue to this phenomenon was found in Santa Lucía in the form of fragments of polychrome-painted wall plaster (Figure 11). Besides the typical red-brown color of the Santa Lucía pottery in the background, it displays designs of the Tupuraya color range with dark red, off-white, and dark brown. The fragments date to the latest occupation of the Santa Lucía III phase between 200 B.C. and A.D. 60, that is about 200 to 150 years before the appearance of the polychrome Tupuraya style. It is, of course, puzzling to note the existence of painted wall plaster, when the pottery is still clearly monochrome. On the one hand, it shows that the use

of monochrome pottery is not necessarily a consequence of the lack of ability. On the other hand, we see that the painted Early Intermediate Period style may not have appeared so suddenly. It was well known and employed, but on a medium about which we have no knowledge as yet. Again, this gives room for interpretation about the existence of an affiliation with a different ethnic group, who may have slowly provided access to the fashion of the new polychrome Tupuraya style in Cochabamba. The new style was then adopted and ultimately dissolved the traits of Formative Period style. Naturally, this hypothesis needs more investigation in the future.

Another topic should be mentioned concerning the polychrome wall plaster. We can assume that painted decoration, scarce as it is, had a certain importance and meaning to the inhabitants of Santa Lucía. Painted interior rooms may point to either a ceremonial structure, or the residence of a local chief. The latter may be deduced as a consequent development from the new organization of the pottery production and the increased participation in long-distance trade. Though we can discard the idea of a strong hierarchy in Santa Lucía, it is possible to think of a *supra*-household organization, with the potters themselves acting as rotating “chiefs”.

CONCLUSIONS AND FUTURE PERSPECTIVES

The example of the pottery-producing settlement of Santa Lucía presents an independent production center organized at a community level, with separate individual workshops, and intricately elaborated firing facilities. Furthermore, we are able to recognize that systems like eco-zonal complementarity created an artificial interdependency between horizontal and vertical zones in the valley. This indicates that a static auto-sufficiency was not the goal of this society. Instead, the population preferred to limit themselves in the production of crafts and agrarian

goods to create demand and to be compelled to enter dynamic interactions with other groups, not only to gain access to specific products, but also for reasons of reproduction. We may even detect hints of the existence of a tiered society for the organization of pottery production through the evidence of painted wall plaster of a chiefly building, or ceremonial structure. Actually, the investigations revealed a rather complex socio-economic system representing an innovation for the Formative Period of the Cochabamba region.

Coming back to the title of this paper, it is not my concern to refer to changes during the Formative Period, if social change is seen within a framework of unilinear development from emerging sedentary to complex stratified societies (*cf.* Sánchez 2003). The creation of a framework for the classification of historical or prehistorical events may be necessary for a better overview, but at the same time, it is responsible for a simplification of social processes. This led to a picture of the societies in the Cochabamba region as playing only a marginal role in the Formative Period in the Andes. Nevertheless, socio-economic or socio-political development is not unilinear but multifaceted. The dynamics of such processes can have diverse expressions, and require a detailed investigation and careful interpretation of the archaeological material because “changes” may or may not be visible depending on the parameters one applies.

The question does not concern the detection of the chronology of complex societal, economic, and political development, but an appreciation of their different facets. Their expression in the archaeological material may change according to shifts of the socio-economic organization. A centralized production is easier to detect than an independent household production with a lower output. Thus, wealth accumulations are not as clearly expressed in the Formative Period as they are in more centralized societies with elite structures. This does not mean that an organized

economic structure is absent (just as it does not necessarily imply the existence of a state-like society when there is evidence of a centralized power). Centralized power may develop if more efficiency or security in production, or control over the production of specific items is needed (Brumfiel and Earle 1987). Pottery, if it is not highly symbolic or politically charged, does not require production controlled by an elite. Economic principles are not dependent on centralized power, because a shift in political organization would not change the economic structure. Thus, it seems possible to deduce a certain traditionalism that conserved such principles over a long time span.

However, the Formative Period developments described in this article can only be preliminary, because many aspects still are not well investigated in the Cochabamba region, as has been stated. There are several open questions, which should be given closer consideration in the future, but the idea of this paper is to present a different view of so-called “peripheral” regions.

ACKNOWLEDGMENTS

The Santa Lucía Project was possible due to grants awarded by the NaFöG-Commission of the Free University of Berlin and the DAAD (German Academic Exchange Service). I am very grateful to the staff at the INIAM museum in Cochabamba, especially David Pereira H. and Ramón Sanzetenea R. for their great help and support during the research. Thanks also go to the project staff in the field and the lab, but first and foremost, to the late Marcos Veizaga Arevalo from Huasa Rancho to whom I dedicate this paper. A preliminary version was presented in 2010 at the seventy-fifth annual meeting of the Society for American Archaeology in St. Louis, Missouri, at the sponsored symposium, “Archaeology in the Valleys of Cochabamba: A Session in Memory of Craig Morris”. For help with the text I thank Emily Schalk.

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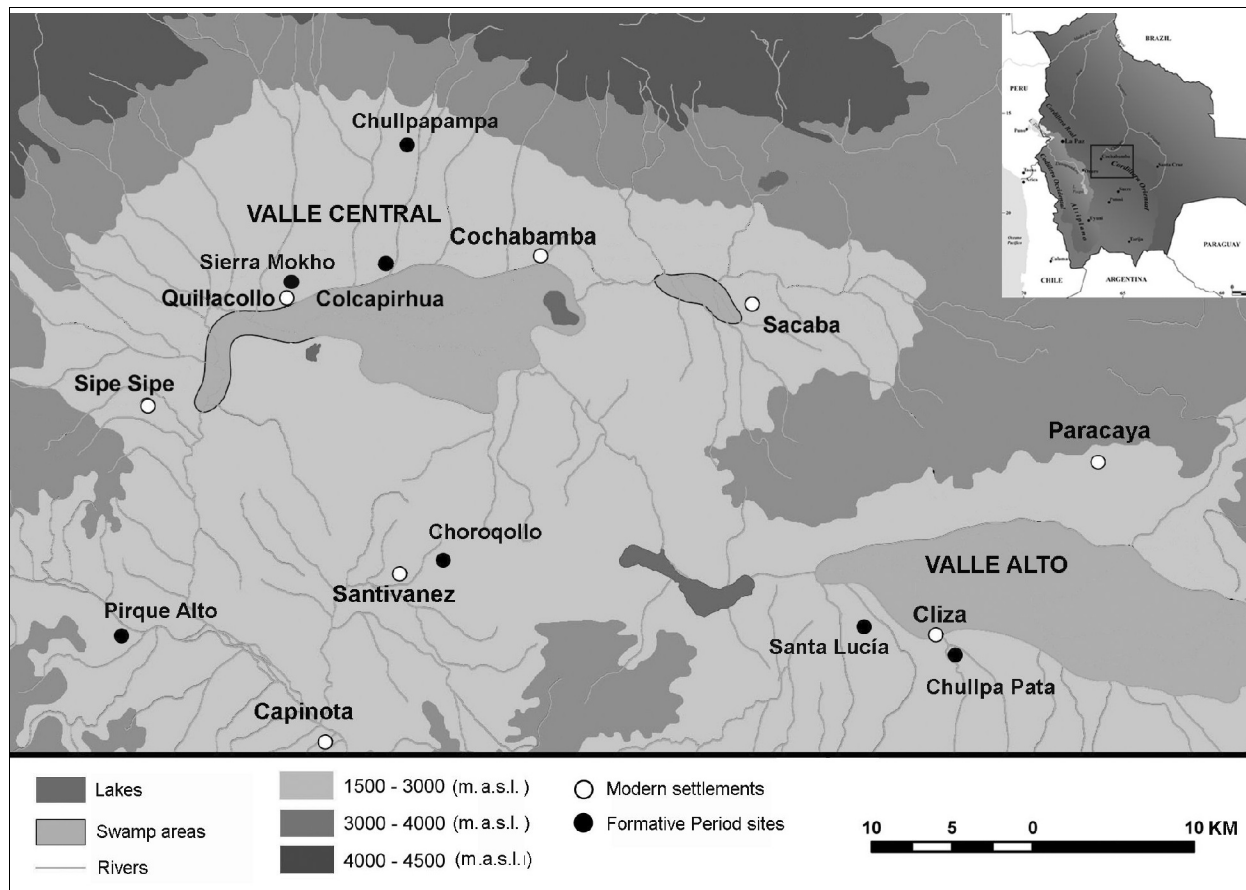


Figure 1: The Cochabamba Valley system indicating the Formative Period sites studied (after Montaña's map in Sánchez 2008: figure 3.1 and an unpublished map by János Gyarmati).

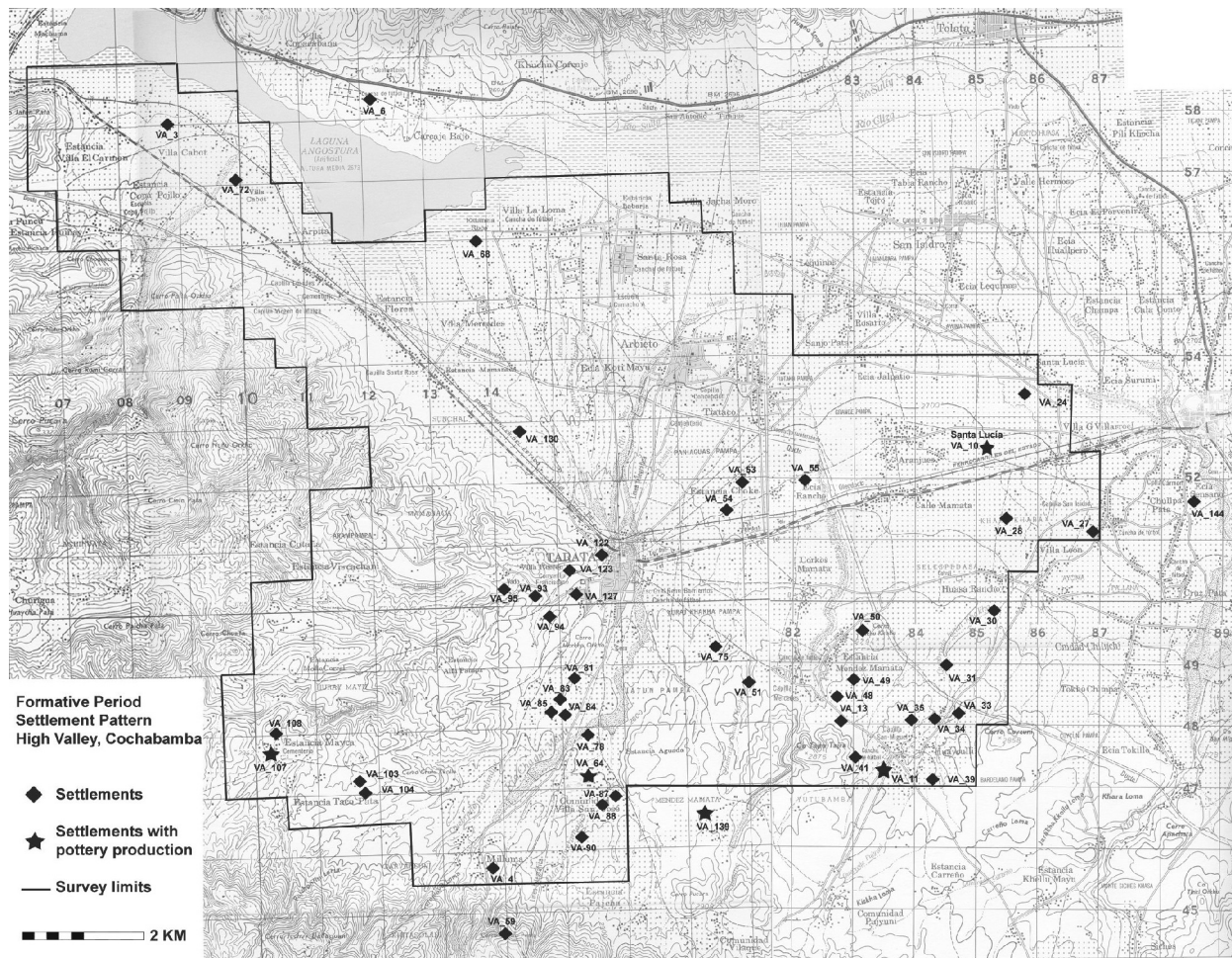


Figure 2: Formative Period settlement pattern in the south-western part of the High Valley (after a map prepared by the Instituto Geográfico Militar [IGM], Bolivia).



Figure 3: The Santa Lucía site looking northeast over sherd clusters and eroded firing facilities.

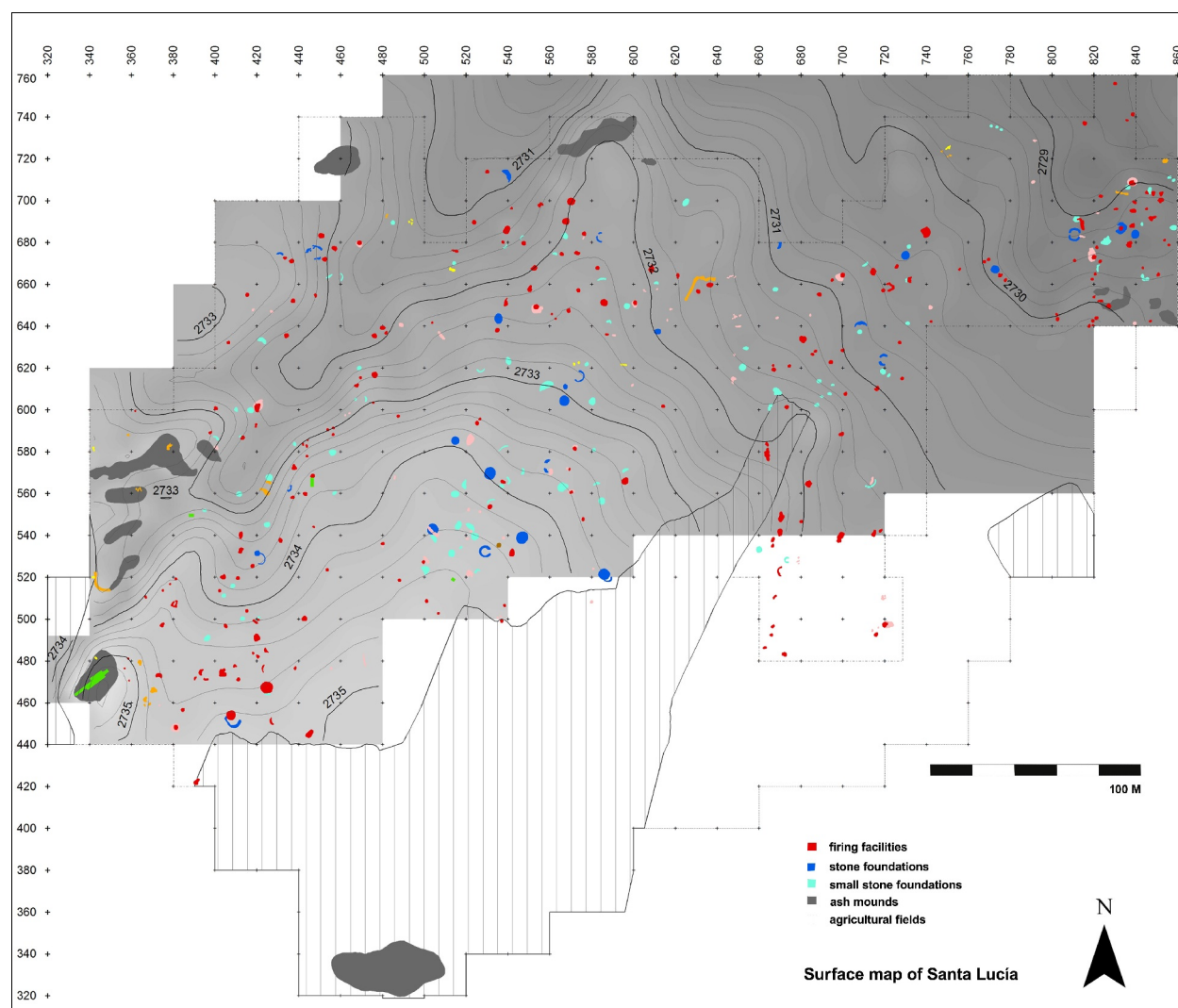


Figure 4: The Santa Lucía site: topographic map with domestic structures, household rubbish, firing facilities, and agricultural fields indicated. The left coordinates represent north and the top coordinates represent east.



Figure 5: The Santa Lucía site: circular structure C5 with entrance, clay floor, and central post.

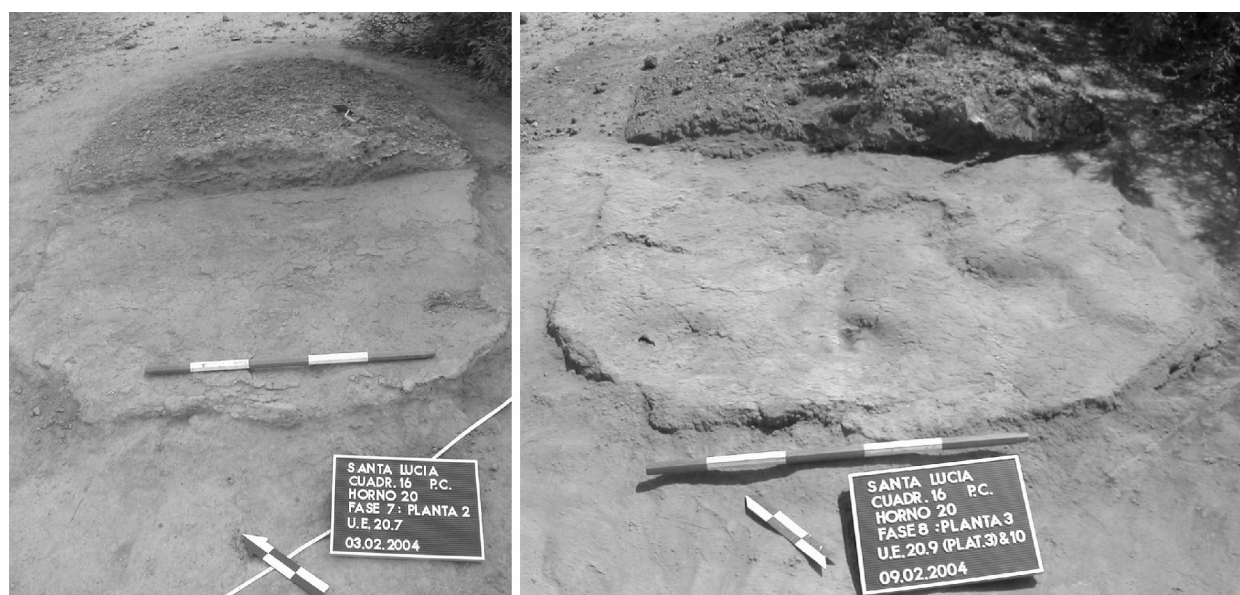


Figure 6: The Santa Lucía site. Firing facility H20 at different stages of excavation.

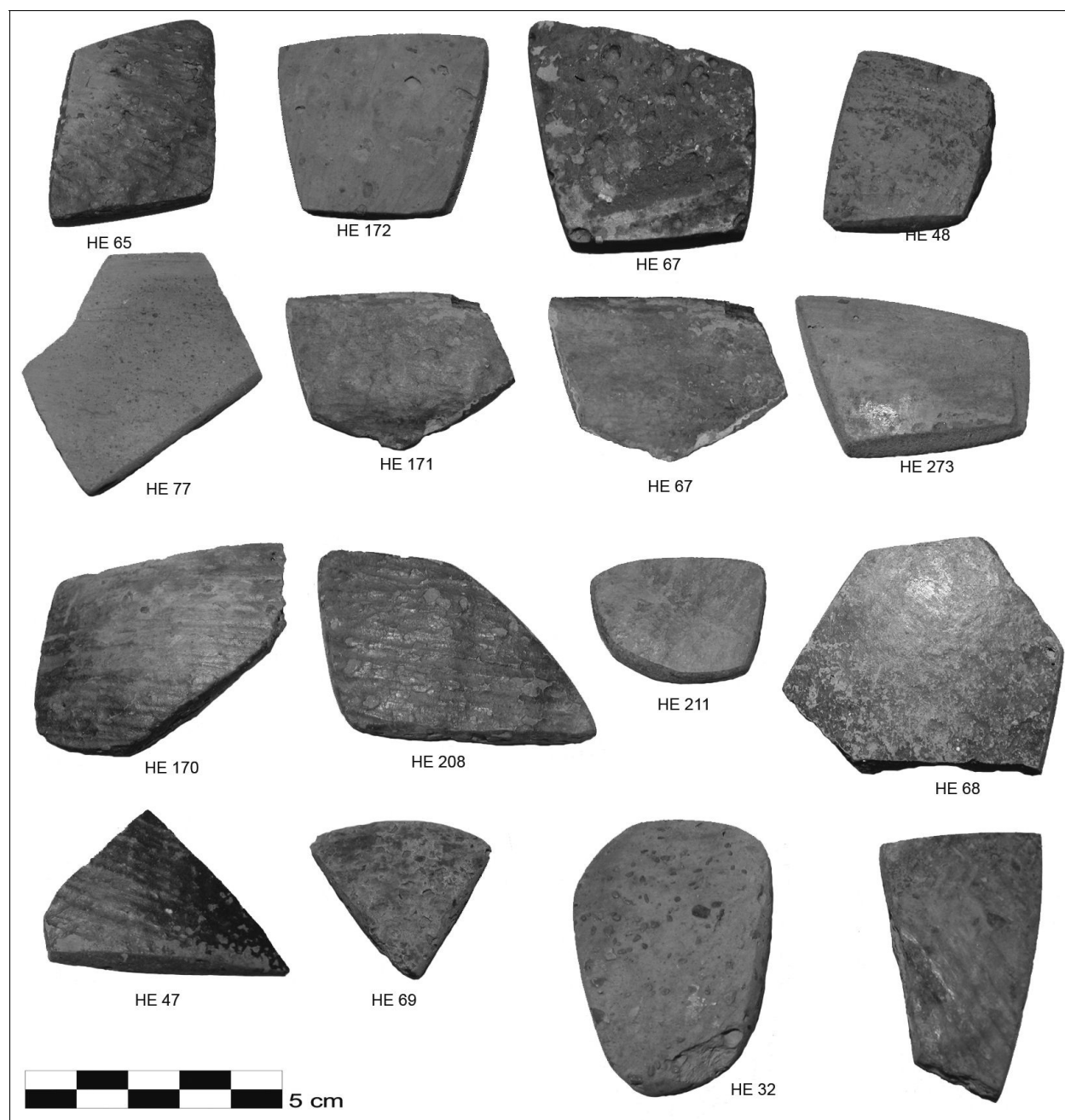


Figure 7: Shaping tools from the surface of the Santa Lucía site.



Figure 8.: Five fragments of ceramic tubes or tuyeres from the Santa Lucía site (above) and two specimens from the INIAM museum, Cochabamba, Bolivia (below) 542-4308 from the Colección Guillén- Mercado and 03080101 from Cliza.

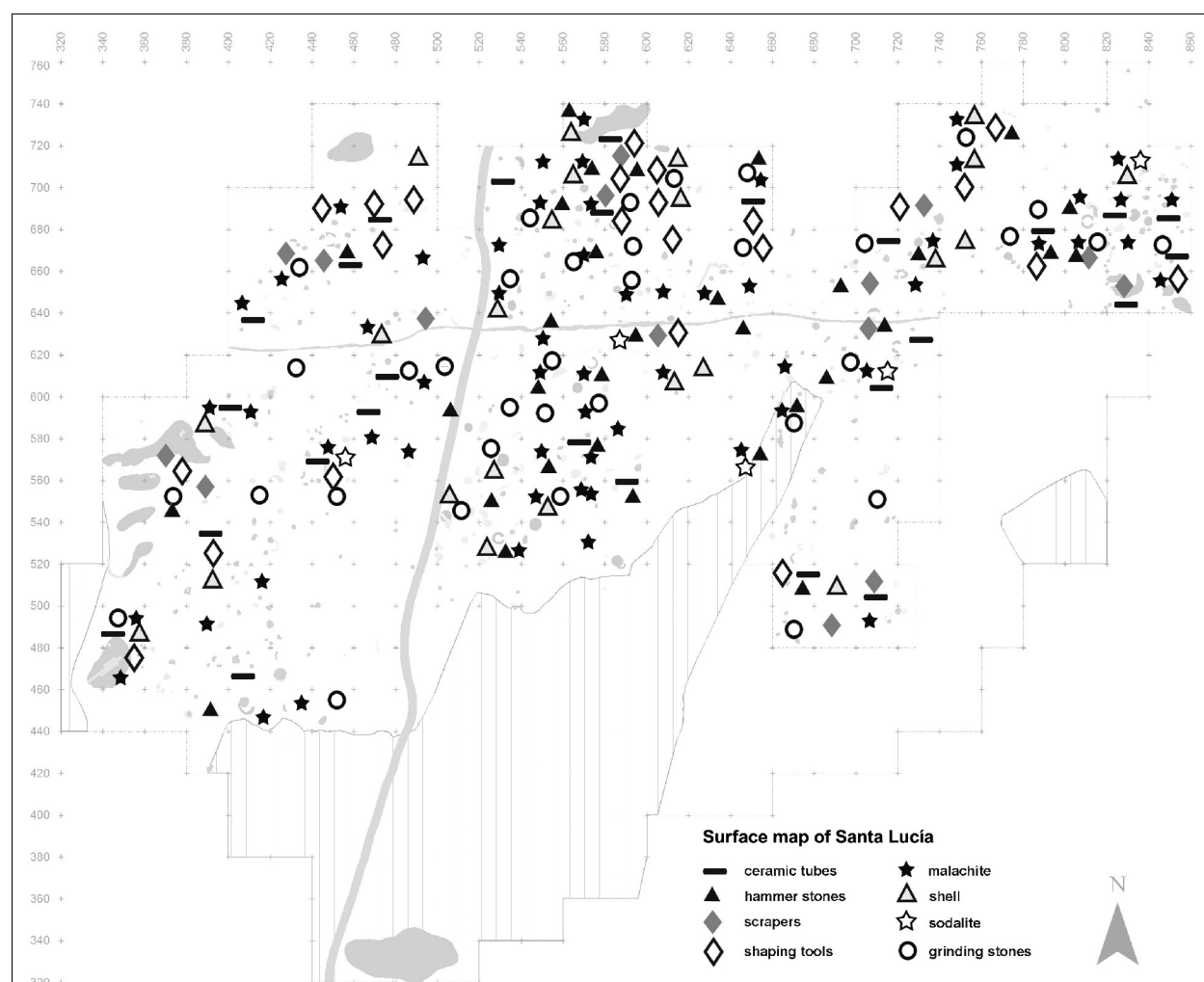


Figure 9: The Santa Lucía site: plan of tools and artifacts found on the surface.

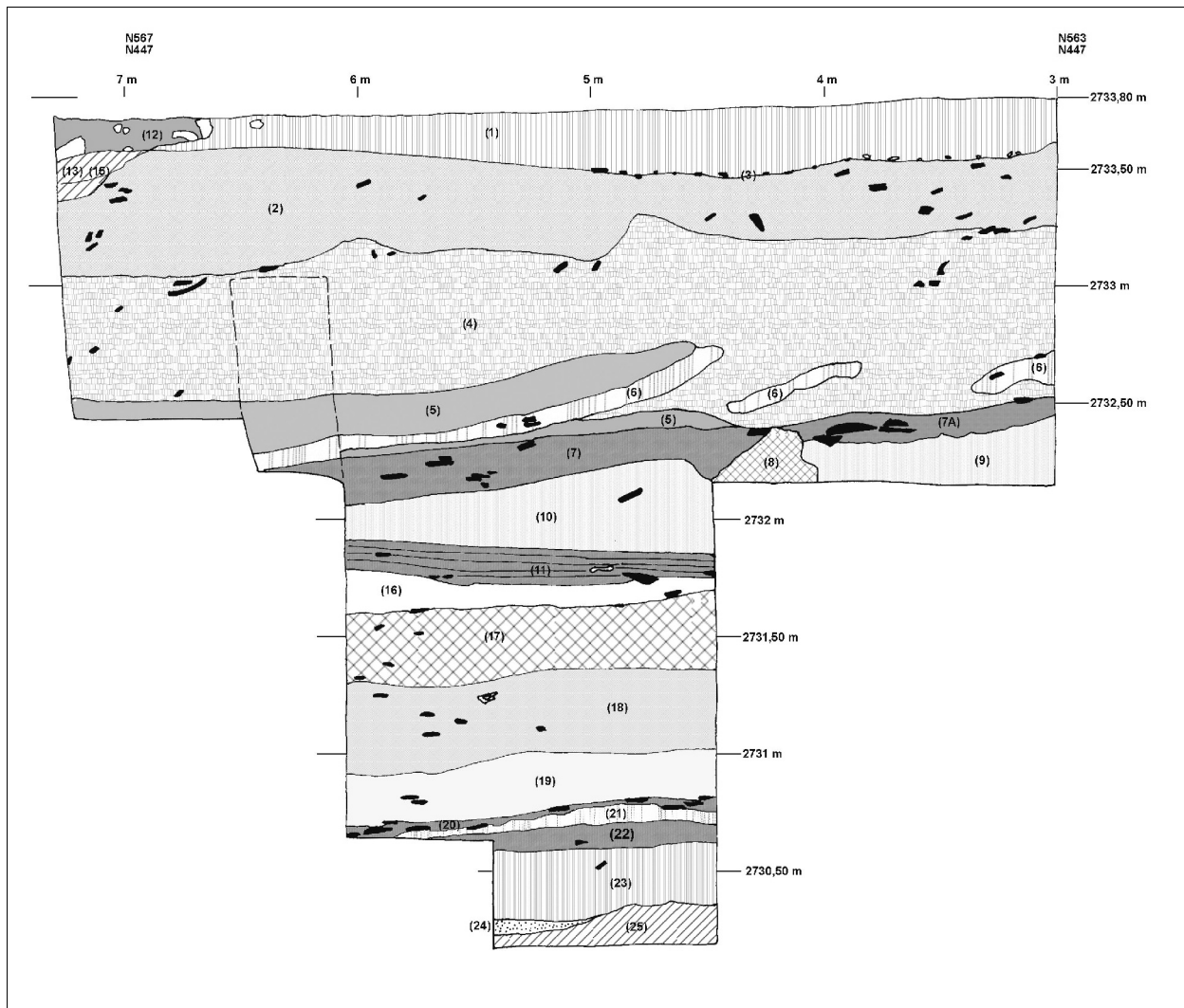


Figure 10: Santa Lucia. Trench 5, East Profile. Layers 7 and 11 are Middle Formative phase floor levels; 20 and 22 are Early Formative phase floor levels. Key: (1) gray-brown compact clay; (2) yellowish-gray compact clay; (3) sherd paving; (4) loose sand with raw and burnt clay; (5) dark brown, soft, ashy sand; (6) brown brittle clay; (7, 7A) grayish-green clay floor; (8) yellowish-gray argil; (9, 10) brittle clay and sand with burnt clay and carbon; (11) layered grayish-green clay floor; (12) burnt clay platform; (13, 15) reddish-gray burnt clay = firing facility 99; (14) not visible on this profile; (16) brown sandy clay; (17) light gray-brown brittle clay with animal bones; (18) alternating clay and sand layers; (19) compact-to-brittle clay with carbon; (20) grayish-green clay floor with carbon; (21) grayish-green brittle clay; (22) layered grayish-green clay floor; (23) compact-to-brittle clay; (24) brown clay with carbon; (25) reddish compact clay, black sherds.

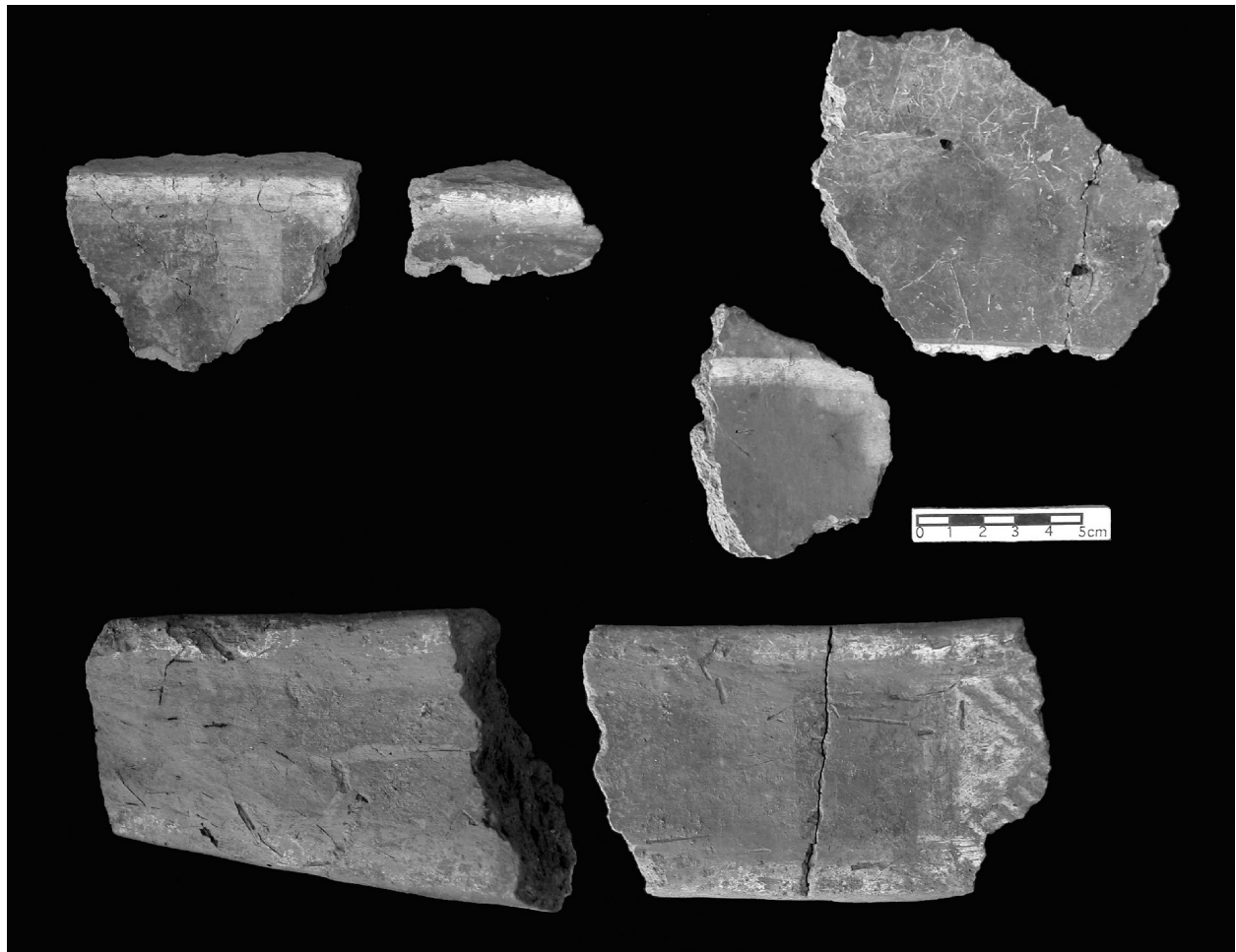


Figure 11: Painted wall plaster from Santa Lucía.

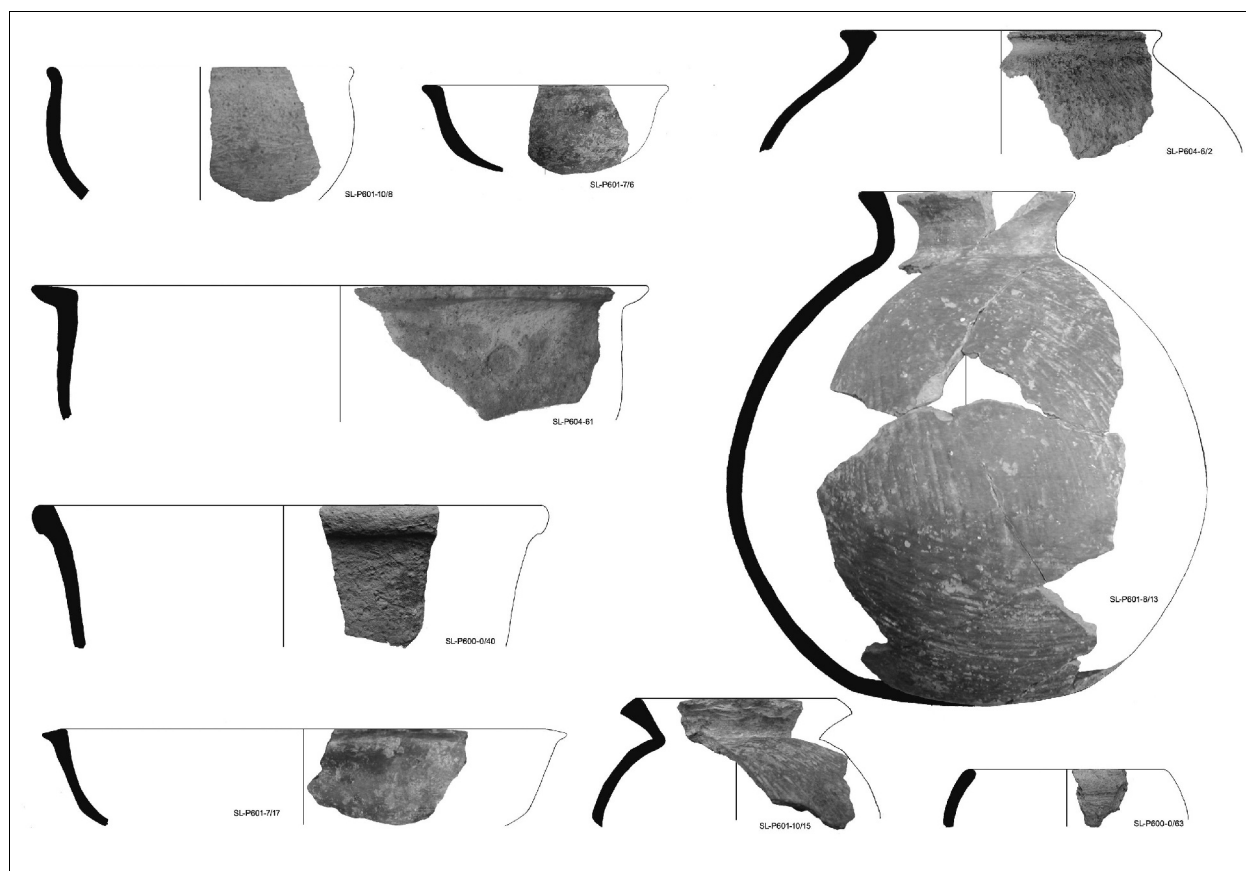


Figure 12: Ceramic Type 20 vessels (not to scale).

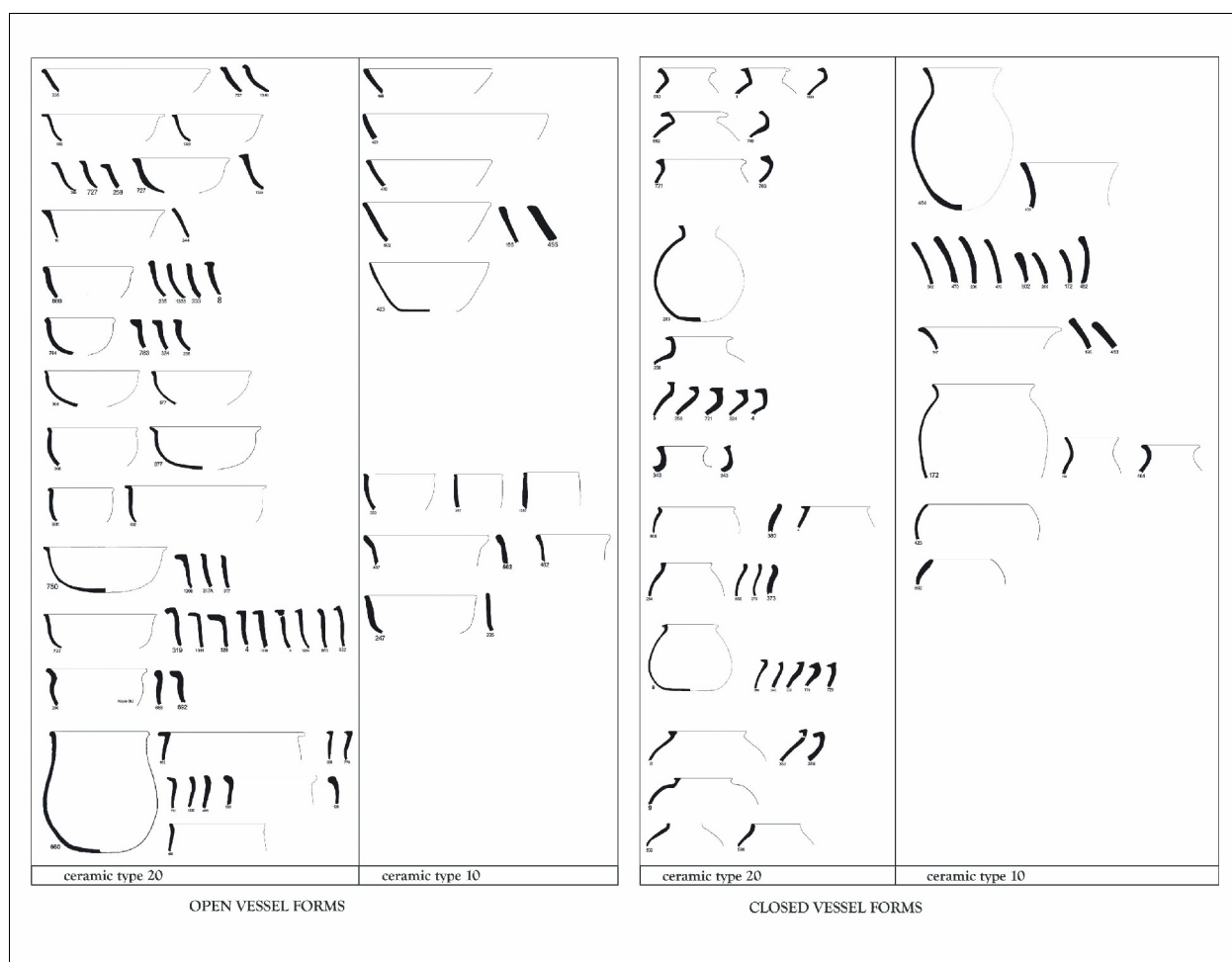


Figure 13: Open and closed vessel and rim forms of the ceramic Types 10 and 20 from Santa Lucía (not to scale).

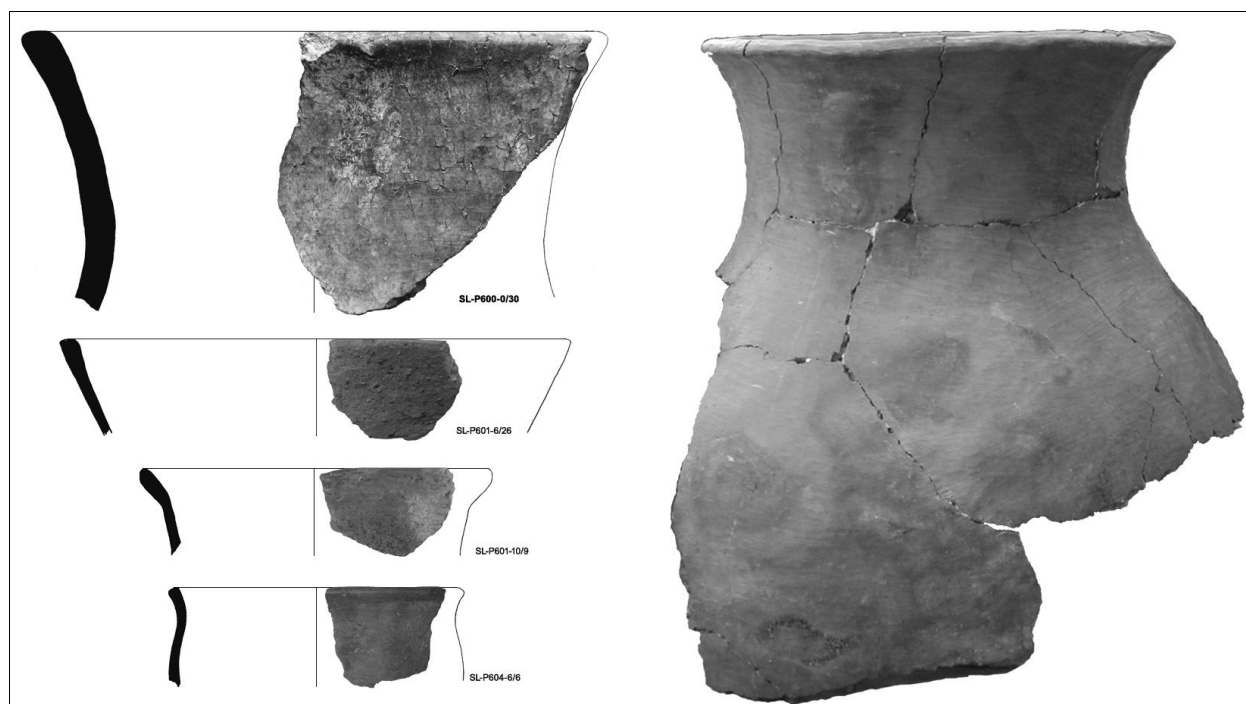


Figure 14: Ceramic Type 10 vessels (not to scale). Note cracks from over-firing on upper left vessel.

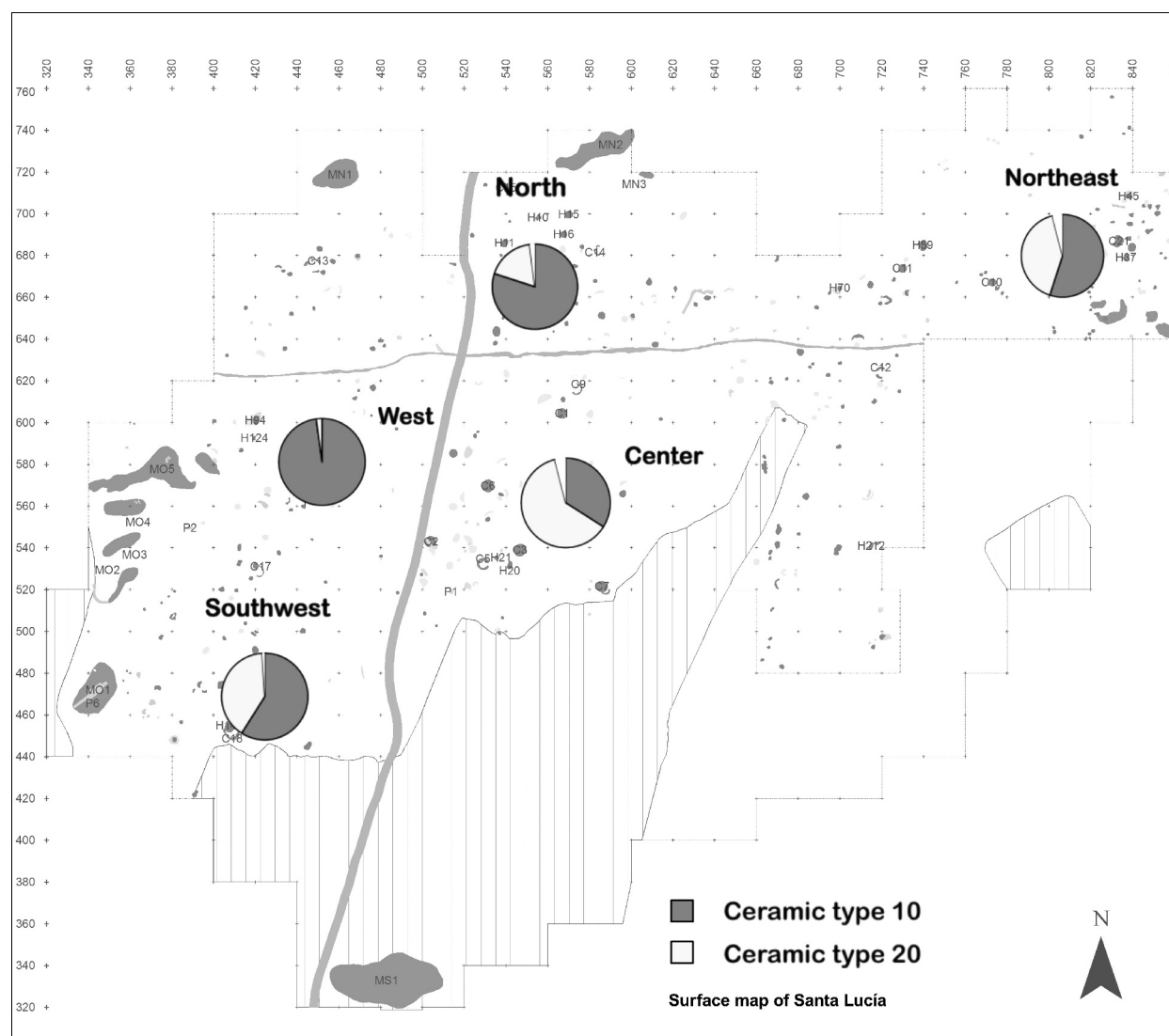
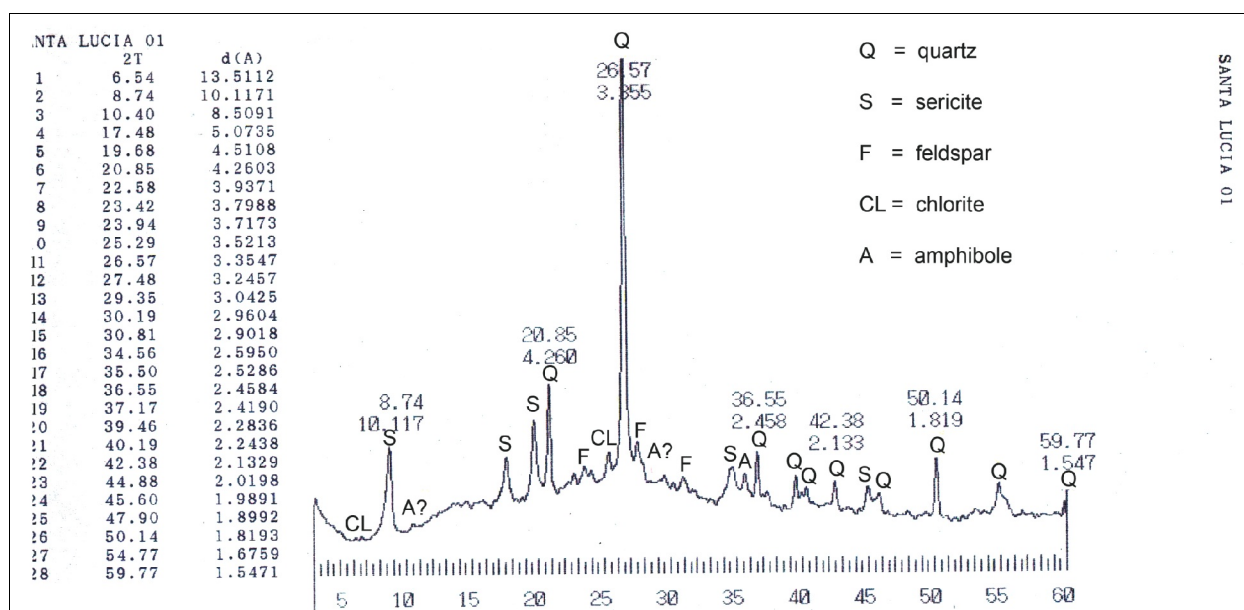
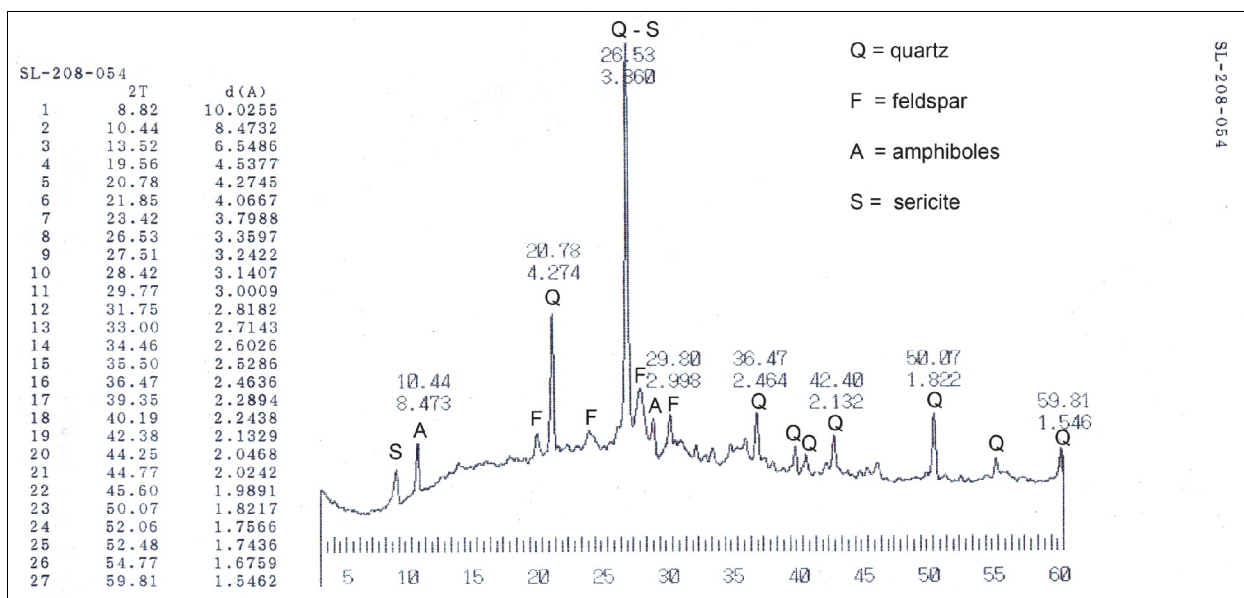


Figure 15: Santa Lucía, distribution of sherds found on the surface expressed in percentages (for sample sizes, see Table 2).



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Figure 16: XRD results of two ceramic types from Santa Lucía (Instituto de Investigaciones Geológicas y del Medio Ambiente, Universidad Mayor de San Andrés, La Paz)

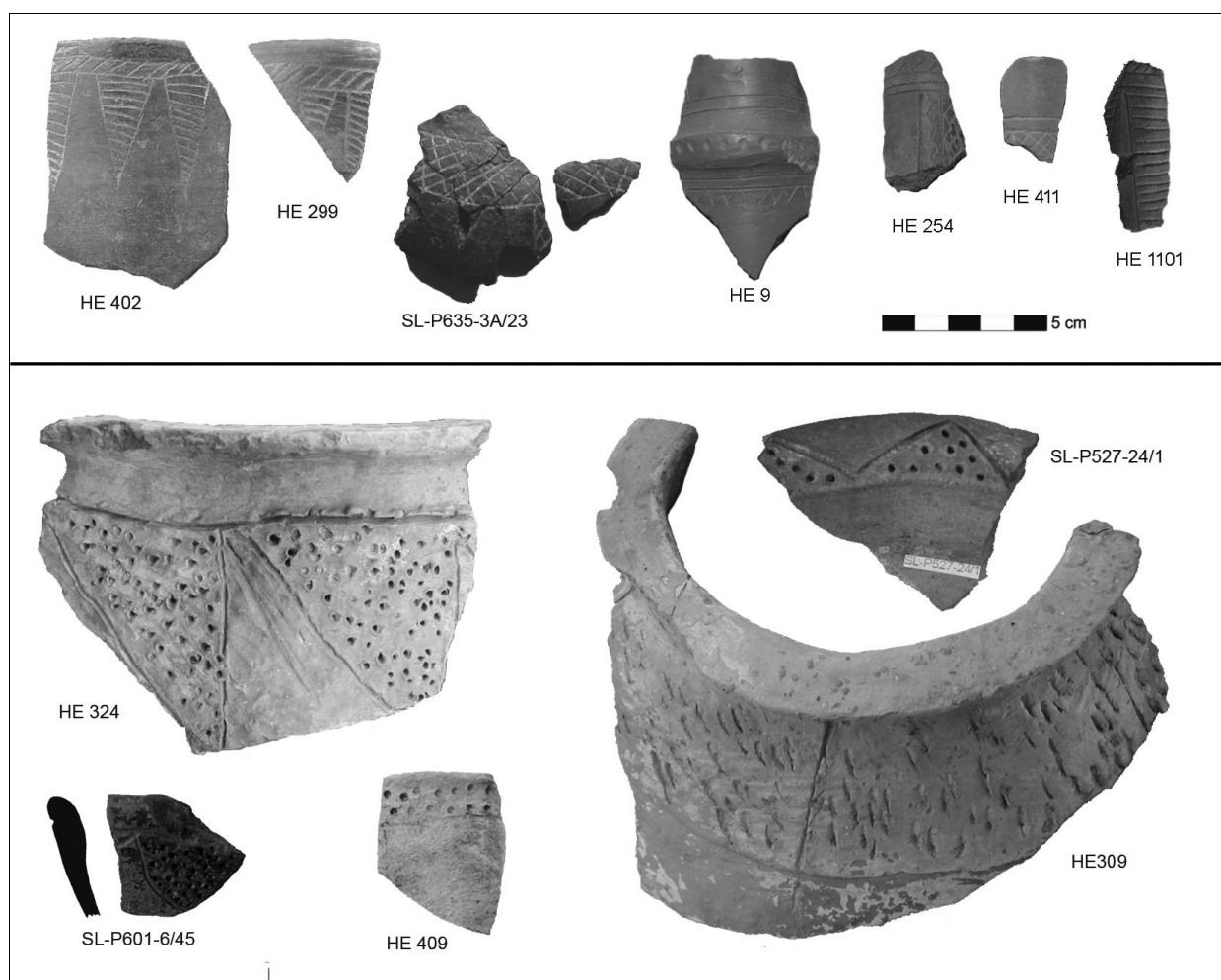


Figure 17: Incised pottery from Santa Lucía
 (above: four sherds and four tube fragments of ceramic Type 10; below: sherds of ceramic Type 20).

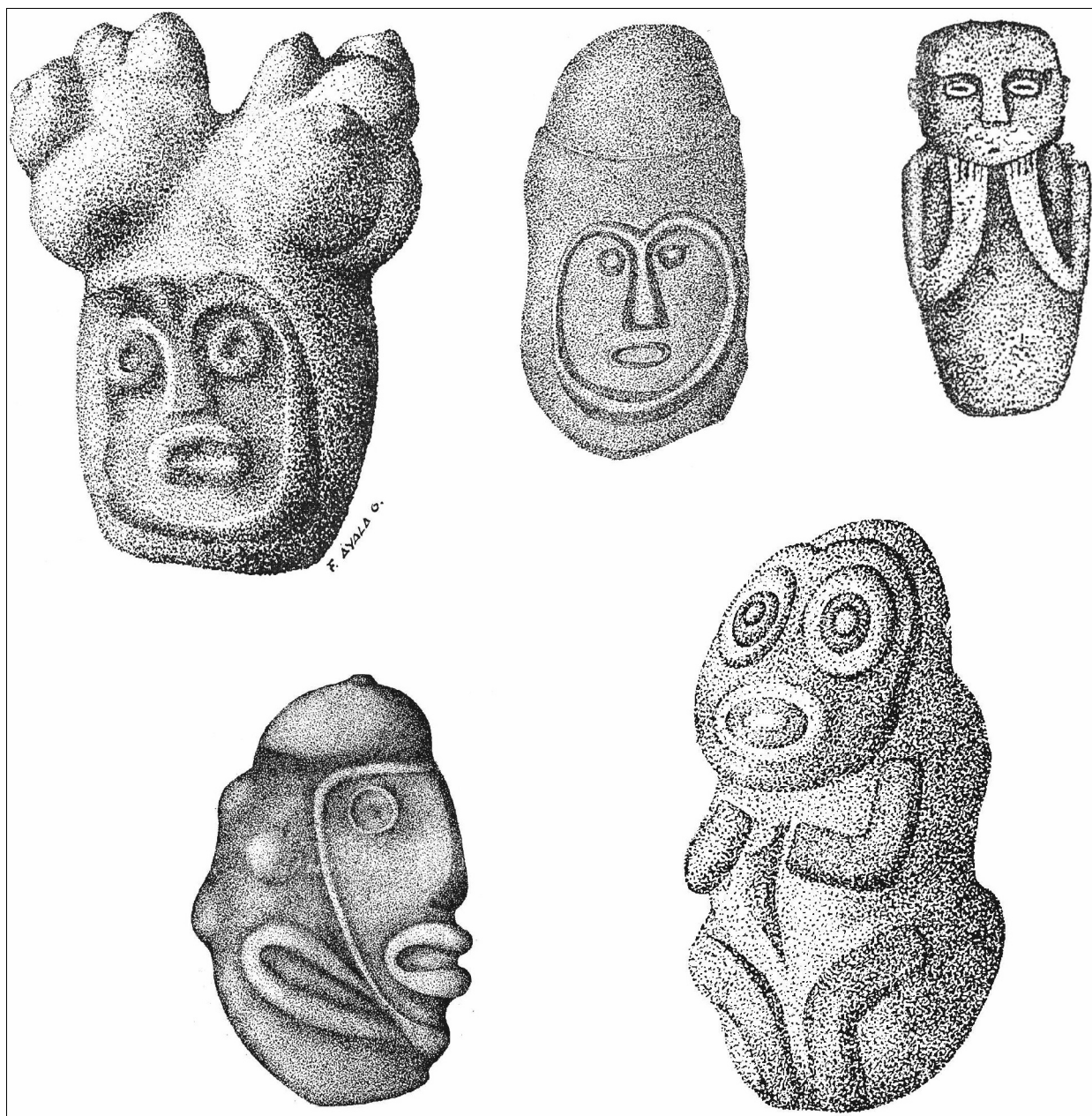


Figure 18: Lithic sculptures in Cochabamba (after Ibarra Grasso 1955).

