

ANCIENT USE OF COCA LEAVES IN THE PERUVIAN CENTRAL HIGHLANDS

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KEY WORDS: Coca leaves, Peruvian central highlands, Inka state, Wari state, Interaction

Coca, of the genus Erythroxylum, is a stimulant and painkiller that played key roles within the Inka state. As reported by the early Spanish chroniclers, coca was the most important plant offering during public rituals. Likewise, important landmarks within the Inka domain regularly received offerings of this precious leaf. Its high value is indicated by the fact that not only the living chewed the leaves on a regular basis, but also the dead carried coca leaves in their mouths. We still do not know when coca leaves were first used in the Peruvian central highlands. This uncertainty is largely due to the lack of coca leaves recovered from highland archaeological sites. Several leaves recently found at Convento in the northern part of the Ayacucho Valley are the first direct evidence from an archaeological context that, based on ceramic stylistic grounds, dates to sometime between the end of the Early Intermediate Period (ca. 1–550 CE) and the beginning of the Middle Horizon Period (ca. 550–1100 CE). The botanical identification also indicates that the source of the coca was the Pacific coast. This paper reports this unique finding and discusses its implications.

UPON THEIR ARRIVAL INTO TAWANTINSUYO, as the Inka state was called, Spaniards learned that native peoples of the region placed in their mouths the leaves of a highly esteemed plant known as *coca*. The most telling account is found in the writings of Pedro Cieza de León, a Spaniard who travelled across the Andes region shortly after the Spanish conquest. Cieza de León pointed out that “throughout Peru the Indians carry this coca in their mouths; from morning until they lie down to sleep they never take it out. When I asked some of these Indians why they carried these leaves in their mouths, which they do not eat, but merely hold between their teeth, they replied that it prevents them from feeling hungry, and gives them great vigor and strength” (Cieza de León [1552] 1973:221).

Other Spaniards, such as Pedro Sarmiento de Gamboa ([1572] 1999:130), Father Bernabé Cobo ([1653] 1990:63–64), and Juan de Ulloa Mogollón ([1586]

Journal of Anthropological Research, vol. 71, 2015

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<http://dx.doi.org/10.3998/jar.0521004.0071.204>

1965), noted that offerings of coca leaves were made at important landmarks (shrines) across the empire (see Andrien 2001:158, 178; Davis 2009:127). Coca leaves had multiple uses (D'Altroy and Earle 1992a:58; Malpass 2009:99–100; McEwan 2005:150; Menzel 1968:51; Rowe 1946:311), and as pointed out by Cobo ([1653] 1990:116), it was the most “highly esteemed” plant offering (Burger 1998:30; Rowe 1946:307). The central role of this plant within the Inka state is best shown by the fact that not only the living, but also the dead, carried coca leaves in their mouths (Guaman Poma de Ayala [1613] 1980:267; Morris and Von Hagen 2011:74; Murúa [1590] 1946:267; Ramos Gavilán [1621] 1976:26; Salomon 1987:161). Recent archaeological research has confirmed the presence of coca leaves, for instance, on the lips of Inka *capacocha* sacrificial victims (Reinhard 2005:324; Reinhard and Ceruti 2010:123, 156). In addition, bags with coca leaves have been found in association with sacrificial victims (see King 2012: pl. 57; Morris and Von Hagen 2011: fig. 92; Murúa [1590] 1946:267).

The Inka state is said to have provided its laborers with coca leaves for chewing (see Salazar 2004:47). For this and other purposes, supplies of coca leaves were available at the state-controlled storage facilities (see Morris and Von Hagen 2011:126). Coca leaves were of such high value that the Inka state colonized the tropical rainforest east and north of Cuzco, the Inka capital, in order to cultivate their own coca supply (Bowman 1916:73, 77; D'Altroy and Earle 1992b:177; Gade 1999:139–54; Hanna 1974:291; Johnson 2003:28–29; Le Moine and Raymond 1987; Malpass 2009:7; Morris and Von Hagen 2011:186–87; Murra 2002:262; Niles 2004:50). Colonization of the eastern lowlands was necessary because coca is not frost-resistant and hence cannot be cultivated in elevations above 2,600 m. State coca fields in the lowlands were maintained by personnel known as *mitmaqkuna* (Cobo [1653] 1979:189–90; D'Altroy and Earle 1992a:58; see also Von Hagen 1976). Furthermore, when the coca-producing coastal valleys, such as Lurín, Rimac, and Chillón in the central coast (Julien 1998; Marcus and Silva 1988), were eventually incorporated into the Inka domain, one of the first actions of the Inka state was to reorganize the ownership of coca plantations (Rostworowski de Diez Canseco 2002:90).

Despite coca leaves being highly prized by the indigenous peoples, Spaniards deemed the plant unworthy or a “savage means of intoxication” (Mortimer 1974:150; see also Andrien 2001:178; Davis 2009:127; Gagliano 1994). The newcomers' abhorrence of the custom became even stronger with time so that in “1569 the Spanish audience in Lima, composed of bishops of all parts of South America, denounced coca, because, as they asserted, it was a pernicious leaf, the chewing of which the Indians supposed gave them strength” (Mortimer 1974:108).¹ However, coca survived this early bitter persecution despite the cruel treatment of the people who regarded it as sacred. Eventually, those who orchestrated this war against coca profited not only by owning coca plantations (see Marcus and Silva 1988; Murra 2002; Rostworowski de Diez Canseco 1973) but also by trading it to mining centers such as Potosí; the coca trade became so lucrative that it was second only to brandy (Andrien 2001:87; Stern 1982:37; Tandeter et al. 1995:209–10).²

Just how old is this relationship between coca leaves and the peoples of the Peruvian central highlands? This paper reports evidence of the use of coca leaves in the region between the end of the Early Intermediate Period (ca. 1–550 CE) and the beginning of the Middle Horizon Period (ca. 550–1100 CE). The information comes from a site in the northern part of the Ayacucho Valley, in the Peruvian central highlands. Given that organic remains at highland locations seldom survive, this extraordinary finding represents the first direct evidence of the use of coca leaves in the region in a context that is relatively early. In order to contextualize the significance of coca leaves for indigenous peoples of the region, first a short discussion of the ethnographic evidence is provided. This is followed by a general overview of archaeological discussions regarding the use of coca leaves in the Central Andes before the Inka empire. Then the new evidence is presented, followed by a consideration of the genus *Erythroxylum* that is central to the botanical identification of the archaeological samples, as well as the implications of this new finding.

THE ETHNOGRAPHIC EVIDENCE

Ethnographic studies largely corroborate the early Spanish accounts and highlight the role of coca leaves in the life of highland populations (Abercrombie 1998:348; Allen 1988:21–22; Bastien 1978:112; Bolin 1998:15, 222; Bolton 1979; Gade 1999:39; Hanna 1974:283; Hyslop 1984:312; Isbell 1978; Johnson 2003:28–29; Mayer 2002:173; Murra 2002:359; Raymond 1988:290; H. Skar 1981:133; S. Skar 1994:140; Valderrama and Escalante 1996:156; Von Hagen 1976:95). As initially reported by Cieza de León, coca acts as a stimulant and a painkiller (Allen 1988:221–22; Bolin 1998:15, 220; Flannery et al. 1989:43; Hadingham 1987:171; Kendall 1973:92; Mitchell 2006:14–15; Steward and Faron 1959:142). As a result, coca chewing not only continues across the highland regions (Plate 1) but is almost universal (Allen 1988; Bolton 1979; Burchard 1992; Fuchs 1978; Hanna 1970, 1974; Hanna and Hornick 1977; Isbell 1978). Other studies have also discussed the influence of coca chewing on human physiology (Casikar et al. 2010).

Furthermore, throughout the central highlands people continue to make coca offerings to the mountains and other significant spots in the landscape (Arnold 1993:67; Hyslop 1984:312; Núñez del Prado 1974:248). This custom is an integral part of Andean philosophy, which asserts that natural features such as mountains, caves, lakes, and rivers are animate and must be provided with coca leaves (see Andrien 2001:157). Along the web of trails that crosscut the landscape and link distant communities are well-known spots—*qachulagana*—where travelers deposit coca quid as offerings to the ancestors who in the distant past walked the same trails.

Equally significant is the use of coca leaves at every rite of passage. For instance, when a child is born, all kin group members share and chew coca leaves to welcome the newborn. A boy's first hair cutting and a girl's first menstruation are also acknowledged by distributing and chewing coca leaves. When marriage partners are sought, kin of the groom-to-be are obliged to distribute coca leaves before anything else; failure to fulfill this obligation will result in rejection of their offer of marriage.

Likewise, the marriage ceremony involves the exchange of coca leaves by the two involved kin groups (Isbell 1978:155). Finally, mortuary rituals, sometimes lasting for several days, entail the consumption of quantities of coca leaves (Bastien 1978:153; Bolton 1979:419). Therefore, from the perspective of the peoples of the Andes, life itself, from birth to death (Allen 1988:57), is profoundly immersed in the distribution and consumption of coca leaves—*mamacoca*, or mother coca (Silverblatt 1987:25).

Coca is also a greatly valued commodity that is used in the exchange of labor (Arnold 1993:117; Mayer 2002:178; Valdez 2012:77) as well as in the barter of goods (Arnold 1993:132; Burchard 1974:251; Hanna 1974:292; Mayer 2002:176; Stern 1982:36). To secure workers, one is expected to distribute coca leaves; the same product can be used to pay for the labor. In this manner, coca leaves are a substitute for currency. Coca leaves can also be exchanged for foodstuffs. Coca leaves are still used to barter for products in the Sunday market in Huanta (Plate 2) and other neighboring communities in the Ayacucho Valley. These practices allow coca leaves to be distributed across a territory as large as the Peruvian central highlands (Valdez 1997:68). People of the highlands assert that as long as one has coca leaves, everything is under control; in contrast, without the coca leaves, one is helpless. Thus, few would dispute that coca leaves are the most important product in the region.

Other important activities, such as divination and healing (Allen 1988:133; Bastien 1978:14–15; Hadingham 1987:171, 275–76; Mayer 2002:179), sharing and socialization (Allen 1988:17; Davis 2009:128; Mayer 2002:178), adoption, and peacemaking, in addition to rituals associated with animals (known as *herranza*; Hastorf 1993:53; Isbell 1978:155) (Plate 3), require the distribution and consumption of coca leaves (Bolton 1979:419). Thus, from the examples noted here, it is clear that to highland populations coca is unique and unmatched (Mayer 2002:176), with the potential to replace any currency in the Andean context, including credit cards; indeed, in isolated regions, such as the Peruvian central highlands, credit cards do not work whereas coca leaves are readily accepted.

The vital role of coca leaves in the daily life of the Quechua of the Peruvian central highlands is further manifested in their songs, which not only acknowledge the importance of the plant but also describe coca leaves as knowing one's life and future. Songs such as this are echoed among adults and the young, maintaining the centuries-old concept that teaches the vital role of this sacred plant.

| | |
|--|--------------------------------------|
| <i>Coca kintucha sumaq llaqicha</i> | Coca of beautiful leaves |
| <i>Hamchum yachanki ñoqapa vidayta</i> | Is it you who knows my life? |
| <i>Runapa llaqtanpi waqallanayta</i> | That I will cry in foreign lands |
| <i>Hamchum yachanki ñoqapa vidayta</i> | Is it you who knows my future? |
| <i>Runapa llaqtanpi llakillanayta</i> | That I will suffer in distant places |

Despite its undisputed position, coca has received only marginal attention from archaeologists (Indriati 1998; Indriati and Buikstra 2001; Murphy and Boza 2012), which is in sharp contrast to the number of volumes dedicated to fermented

beverages.³ Indeed, no single volume discusses the use of coca leaves from an archaeological perspective, not even for the Inka state. This uneven attention to coca leaves creates a misleading impression wherein fermented beverages (*chicha*) appear to be the most valued, although in the eyes of the people of the Peruvian central highlands coca is the most prized (Burchard 1974; Mayer 2002). The view that fermented beverages are more valued is largely based on the survival of large ceramic vessels—often associated with the production of fermented beverages—in the archaeological record. In contrast, the fragile leaves of coca do not survive, particularly in regions such as the Peruvian central highlands. Indeed, even in the case of the Inka state, coca leaves from highland archaeological sites are rare. This being the case, without the evidence of the Spanish records, it would have been very difficult to surmise the widespread use of coca leaves within Tawantinsuyo. In the following section, a review of the previous evidence of coca leaves in pre-Inka archaeological contexts will serve to highlight the uniqueness of the archaeological find discussed below.

USE OF COCA LEAVES BEFORE THE INKA

The recovery of organic remains from archaeological contexts in the Peruvian central highlands is problematic mainly because of poor preservation. Thus, despite the widespread distribution of coca at the time of Spanish conquest, it is not surprising that direct evidence of coca leaves in highland archaeological contexts is almost nonexistent. A rare exception is the site of Hatunmarka in the Mantaro Valley, where Hastorf (1987) found a leaf fragment and two endocarps. The coca leaf was found in an early colonial period context, whereas the two endocarps were in a Late Intermediate Period (ca. 1100–1450 CE) context. The leaf fragment “was found adhering to a large copper *tumi* knife buried with a young adult male” (Hastorf 1987:297).

Despite the lack of concrete archaeological evidence, it has long been suggested that the use of coca leaves in the Peruvian central highlands antedates the Inka state. For example, by the time the Wari state flourished during the Middle Horizon Period (Menzel 1964; Schreiber 1992), several centuries before the rise of the Inka state, coca leaves are argued to have already been in use (Raymond 1973, 1985, 1992). Not only was coca chewed, but based on the identification of Wari settlements in the tropical rainforest valley of Apurimac, east of the Ayacucho Valley (Figure 1) the Wari administration may have cultivated their own coca supply. In 1968 and 1970, Scott Raymond carried out an archaeological survey of the lower Apurimac Valley, locating several archaeological sites, some of which were identified as highland Wari outposts (Raymond 1988). On the basis of those findings, Raymond (1985:42, 1992:30) has argued that the Wari likely colonized the Apurimac Valley in order to secure coca leaves. More important, perhaps, is Raymond’s observation that all known Wari settlements in the Apurimac Valley were found at elevations suitable for coca cultivation.⁴

Moreover, recent archaeological research at Vilcabamba, east of the Apurimac Valley and deep in the tropical forest region, has located a Wari

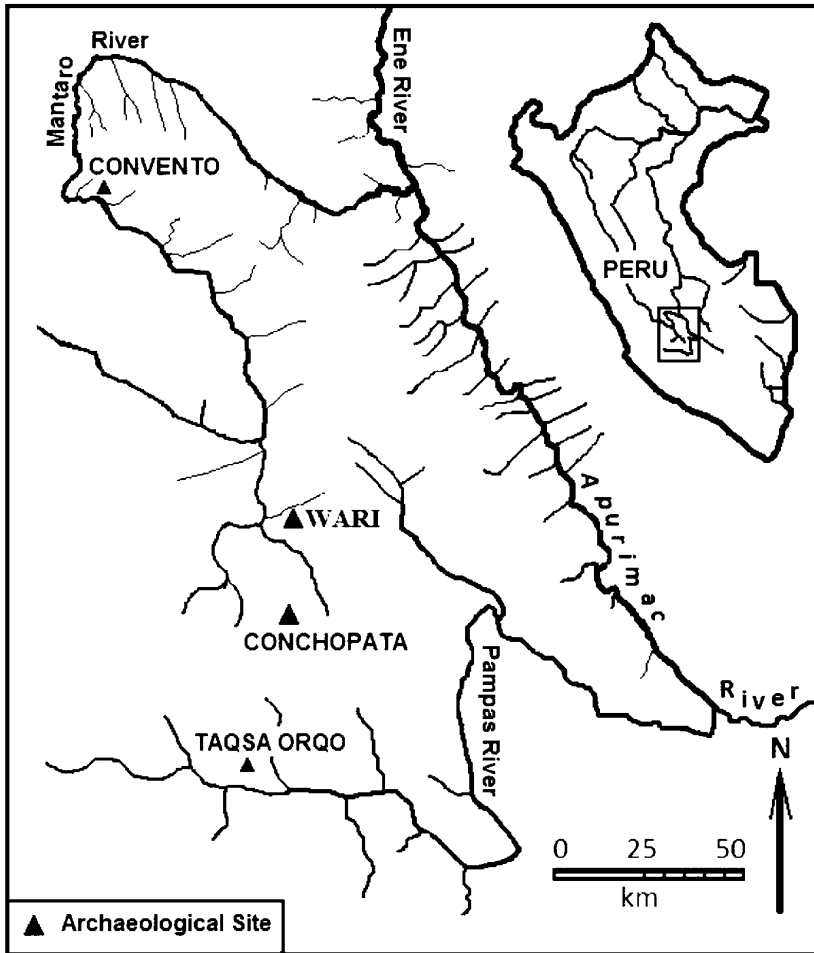


Figure 1. The Ayacucho Valley in relation to the Apurimac Valley; note also the location of Convento and the main Wari center.

settlement and uncovered an elite Wari burial (Fonseca Santa Cruz 2011; Valdez 2011). As initially suggested by Raymond (1985, 1988, 1992), the Wari state's incursion into the eastern lowlands may have been aimed at coca cultivation. Later, the Inka state also maintained coca plantations east and north of the Inka capital, including the area around Vilcabamba (Von Hagen 1976; Morris and Von Hagen 2011:187), a region well known for its association with coca cultivation.

Equally interesting are the Wari miniature figurines found at Pikillaqta (Arriola Tuni 2008:34–36), a Wari provincial center in the Cuzco region (McEwan 2005). The miniature Wari warriors were part of an offering deposit placed at the time Pikillaqta was established. One of the interesting features of

the miniature figurines is their bulging cheeks (see Arriola Tuni and Tesar 2011: figs. 16 and 19; Bergh 2012: fig. 226a). The cheeks of the Pikillaqta miniatures are more pronounced than those of the Inka gold male statue offerings found at Lullaillaco that Reinhard and Ceruti (2010:139, fig. 7.9) interpret as being indicative of coca chewing. Much earlier ceramic figurines from coastal Ecuador exhibit similar features and are also identified as coca chewers (Lathrap 1976). As initially reported by Cieza de León in 1552 (1973:221) and substantiated by ethnographic studies, coca chewers hold the leaves between their gums and their cheeks, resulting in bulging cheeks (Plate 4) (see also Plowman 1979:103). Thus, by the time the Wari state flourished in the Central Andes, coca chewing was apparently already known in the Peruvian central highlands. Perhaps Wari military personnel received coca leaves for chewing, just as the Inka military did several centuries later (Gagliano 1994:16).

In the region of Lake Titicaca, in the south-central Andes, a Tiwanaku stone sculpture with bulging cheeks is also interpreted to represent coca chewing (Kolata 1993). Coca leaves consumed at the high-elevation Tiwanaku settlements must have been brought in from the eastern lowlands or the Pacific coast. Indeed, there are Tiwanaku enclaves in the upper Moquegua Valley (Owen 1993), where coca leaves, in addition to other lowland products, may have been cultivated. A dental study of remains from several Tiwanaku sites confirms that coca chewing was common (Indriati 1998). Indriate and Buikstra (2001) provide similar information for the coastal Moquegua Valley. During post-Tiwanaku times (ca. 1000 CE), coca chewing in the Moquegua Valley continued (Owen 1993:450).

For other, earlier highland cultures of the Central Andes there is little evidence regarding the use of coca leaves. One exception is the Early Horizon (ca. 600–1 BCE) site of Chavín de Huántar in the Mosna Valley, north of the Ayacucho Valley. Burger (1992:129) asserts that Chavín de Huántar was established along an important trade route that linked the Pacific coast and the eastern tropical rainforest. As early as the late Initial Period (ca. 700 BCE), inhabitants of Chavín de Huántar likely had access to trade goods from both directions, including coca leaves. However, no tangible remains of coca leaves, or anything signaling coca chewing, have been found.

In contrast, archaeological evidence indicative of the use of coca leaves is well-represented for the dry Pacific coast. As early as the Middle Preceramic (ca. 9000–5000 BCE), coca leaves were already being chewed in the region (Dillehay et al. 2010:939–40; see also Stackelbeck and Dillehay 2011:122; Moore 2014:144–45; Pearsall 2008:109). During the following Late Preceramic (ca. 5000–3600 BCE) and the Initial Period (ca. 3600–800 BCE), the use of coca leaves along the Pacific coast (from northern Peru to northern Chile) appears to have become widespread as the remains of the plant are found more often in archaeological contexts (Cohen 1978a, 1978b; Engel 1957, 1963; Lanning 1967:79; Patterson 1971; Rivera et al. 2005; Towle 1961; see also Bray and Dollery 1983; Moore 2014:136–44; Pearsall 2006:190, 2008:109; Quilter 2014:64).

By the time more complex cultures emerged, such as Moche on the north coast and Lima on the central coast, it appears that coca was cultivated in almost all the coastal valleys. Moche iconography in particular depicts images of coca

chewing (Bawden 1996; Benson 1998:47, 2012:102–3; Donnan 1976:94, 1978; Towle 2007:59, 113), and a more recent dental study demonstrates the occurrence of periodontal disease among the Moche, argued to be the result of coca chewing (Gagnon et al. 2013:202). For the central coast, evidence of coca comes from Early Intermediate Period contexts (Plowman 1984).

In contrast to the case for Moche, tangible evidence for the presence of coca leaves in early Nasca contexts is still lacking (Piacenza 2002:9; Valdez 2009:264; see also Beresford-Jones 2011; Silverman and Proulx 2002). This observation is of particular interest since the preservation of organic remains on the South Coast is excellent. Likewise for the preceding Paracas culture, well-known for its beautiful textiles; indeed, Paul (1990:47) stated that “surprisingly, there were none of the small woven coca bags prevalent in other pre-Hispanic Andean cultures.” Coca bags are also not known for early Nasca times. It was not until late Nasca times (ca. 450–500 CE) that Nasca artisans produced effigy figurines with bulging cheeks that also carry coca bags (Hadingham 1987:171; Proulx 2006:174, pl. 37; Silverman and Proulx 2002:55; see also Shimada et al. 2006: figs. 063 and 064). As in the case of the Pikillaqta miniature figurines, the bulging cheeks of the Nasca effigy figurines strongly suggest the practice of coca chewing on the South Coast. Having concluded this overview, we now present the new archaeological evidence from the Peruvian central highlands.

NEW ARCHAEOLOGICAL EVIDENCE

Recently, at the site of Convento, in the locality of Puerto San Antonio (elevation 3,450 m), in Tayacaja (Huancavelica), north of the Ayacucho Valley (Figure 1), workers building a school unearthed archaeological remains, including human bones and ceramics (Valdez 2014; Valdez and Taboada 2013). As the workers opened trenches for the school’s foundation, they came across several stone-walled burial cists, similar to those uncovered at other Wari sites in the Ayacucho Valley (Valdez et al. 2002:400). Unfortunately, some of the archaeological remains were destroyed, and others were taken away by the work party. We should note that in Peru archaeological sites are not protected, and any time trenches are made there is the possibility of uncovering archaeological remains. As a result, archaeological sites are often destroyed, and valuable information about the past is lost forever.

One burial cist was exposed shortly before the arrival of the second author, who realized the importance of the archaeological find and decided to intervene. The burial was already open and some of its offerings had been destroyed. Among the broken ceramic vessels were fragments of what appeared to be an anthropomorphic vessel. Human skeletal remains, all poorly preserved, had also been crushed. However, an intact ceramic vessel was recovered, a small bottle decorated in the distinctive Cruz Pata style (Plate 5) that dates to the end of the Early Intermediate Period and the beginning of the Middle Horizon Period (Knobloch 1991:248; Lumbreras 1974:137).

As initially identified by Lumbreras (1974:137), Cruz Pata is an indigenous ceramic style of the Ayacucho Valley first manufactured at the end of the

Early Intermediate Period (Lumbreras 1960; Menzel 1964; Valdez 1996). The emergence of this ceramic style is strongly tied to the cultural interaction between the Early Intermediate Period cultures of Huarpa of the Ayacucho Valley and the Nasca of the Peruvian South Coast. In comparison to the ceramics produced in the Ayacucho Valley prior to contact with the Nasca, the Cruz Pata style exhibits more technological sophistication, including better surface finishing. In addition, Cruz Pata is one of the first highland ceramic styles to depict late Nasca designs (Knobloch 1991:248; Menzel 1964:7). The designs include what Proulx (2006:186) identifies as the “flowering staff,” which dates to Nasca phase 7. It seems to be the same design previously identified by Menzel (1964:9) as “black line spirals attached to bars.” The occurrence of late Nasca designs in the Cruz Pata ceramics is indicative of considerable interaction between the residents of these two regions (Proulx 1994; Valdez and Valdez 2013).

Cruz Pata ceramics were still being manufactured during the Middle Horizon Period (ca 550–1100 CE); indeed, Knobloch (1991:248) reports that this ceramic style occurs at the Wari urban capital in Middle Horizon 1A contexts. Furthermore, Knobloch argues that Cruz Pata ceramics were the source of other Wari styles (Okros and Chakipampa) that gained widespread use in the valley during Middle Horizon 1A and Middle Horizon 1B (Menzel 1964). Thus, the Cruz Pata style overlaps the late Early Intermediate Period and the early Middle Horizon Period. In the absence of absolute dates, this time frame is of particular importance in our attempt to contextualize the findings described here.

In association with the Cruz Pata bottle, and as part of the burial offering, were two metal *tupu* pins (Plate 6A), one placed over the other. *Tupus* have a strong gender association, as they were used to fasten women’s clothing, in particular during Inka times (Kendall 1973:36–37, 170; Malpass 2009:78). However, *tupus* are also known from the Middle Horizon Period (Lechtman 1997:157; Williams et al. 2005: fig. 8) and have been found in association with the remains of female individuals (Tung and Cook 2006:79). Therefore, the artifacts noted here likely represent the grave goods of a female.

Most noteworthy is that between these two *tupu* pins were coca leaves (Plate 6B). Since plant remains seldom survive in highland archaeological contexts, this extraordinary find represents the first tangible evidence of coca in a relatively early context. The finding from Convento is the earliest known direct evidence of coca leaves for the Peruvian central highlands. In order to identify the coca remains from Convento, in the following section a closer look is given to the genus *Erythroxylum*.

THE GENUS *ERYTHROXYLUM*

The coca plant belongs to the genus *Erythroxylum* (Mortimer 1901:227; Plowman 1979:103–4; Towle 2007:58). *Erythroxylum* encompasses between 230 and 250 species of tropical trees and shrubs, most of which are indigenous to the American tropics (Plowman 1979:104; Plowman and Hensold 2004:1). Most of the wild species are found below 1,000 m elevation, but cultivated species can be found as high as 2,000 m above sea level; above this elevation the plant does not

grow because it does not tolerate frost (Plowman 1979:104). In South America, members of the genus *Erythroxylum* are scattered across the continent, although the majority of the species are in present-day Brazil (Plowman and Hensold 2004). Some also grow in the eastern slopes of the Andes and others along the Pacific coast. The latter species tolerate drought.

According to Plowman, many of the species of *Erythroxylum* are difficult to distinguish owing to their small, inconspicuous flowers; a lack of well-defined taxonomic characteristics; and the great variability observed in certain traits (1979:104). An additional challenge in identifying the species is their enormous variety. It is even more complicated for archaeologists, who often work with small specimens or only with the quid.

His decades-long studies of the South American members of the genus, paying particular attention to the Andean and cultivated species, allowed Plowman to determine that the cultivated cocas belong to two closely related species of *Erythroxylum*: first, *Erythroxylum coca* var. *coca* Lam. and its variety, *Erythroxylum coca* var. *ipadu* Plowman (Plowman and Hensold 2004:12), and second, *Erythroxylum novogranatense* var. *novogranatense* (Morris) Hieron (Plowman 1979:104) and its variety, *Erythroxylum novogranatense* var. *truxillense* (Rusby) Machado (Plowman 1979:111; Plowman and Hensold 2004:56; see also Johnson et al. 2005:601). Only the *ipadu* variety reproduces asexually; all the others propagate from seeds. Plowman (1979) asserts that the ancestral form of *E. coca* occurs on the eastern slopes of the Andes; therefore, initial cultivation of this plant must have occurred in that region. When this domesticated species was brought to the western side of the Andes and eventually to the Pacific coast, it developed into a distinct variety that is better adapted to drier conditions. Finally, according to Plowman (1979), northward spread of *E. novogranatense* var. *truxillense* resulted in *E. novogranatense*. More recent studies by Johnson, Zhang, and Emche (2005:604–5, 607, fig. 2; Emche et al. 2011:126; Johnson et al. 2003) show that genetically these two coca species are indeed very similar and that the “rationale of recognizing *E. n.* var. *truxillense* as a different variety is questionable.”

E. coca Lam. (also known as Huánuco or Bolivian coca) is native to the eastern slopes of the Andes (Peru and Bolivia) and grows in wet conditions between 500 and 1,500 m elevation (Mortimer 1901:228; Plowman 1979:114). Outside of South America this species is not cultivated. *E. novogranatense* (also known as Colombian coca) is mainly found in northern South America, but since the end of the nineteenth century it has been widely cultivated around the world (Plowman 1979:109–10). One of the main differences between these two coca species is that *E. coca* leaves fall within three months, whereas *E. novogranatense* is not deciduous. *E. novogranatense* var. *truxillense* (also known as Trujillo coca) (Mortimer 1901:252; Plowman and Hensold 2004:48) is the species used by the pharmaceutical industry as well as in the manufacture of Coca Cola (Plowman 1979:111–12; Moore 2014:145). This drought-resistant species is cultivated along the Pacific coast. It was also extensively cultivated in the coastal valleys in late prehispanic times (Rostworowski de Diez Canseco 1973, 2002; Murra 1986; Julien



Plate 1.
Highlander with his
coca bag (piska) (Photo
courtesy Moner Lizana).



Plate 2.
Coca leaves used in
the barter of foodstuff
in the Huanta market
(Photo L. M. Valdez).



Plate 3. Coca leaf offering during herranza (Photo L. M. Valdez).



Plate 4. Bulging cheek of a workman, indicating coca chewing (Photo courtesy Moner Lizana).



Plate 5. Cruz Pata ceramic vessel found at Convento (Photo L. M. Valdez).



Plate 6(A) left. Tupu pins found in association with the Cruz Pata ceramic vessel shown in Plate 5. (B) right Coca leaves found between the two pins of Plate 6(A) (Photos L. M. Valdez).

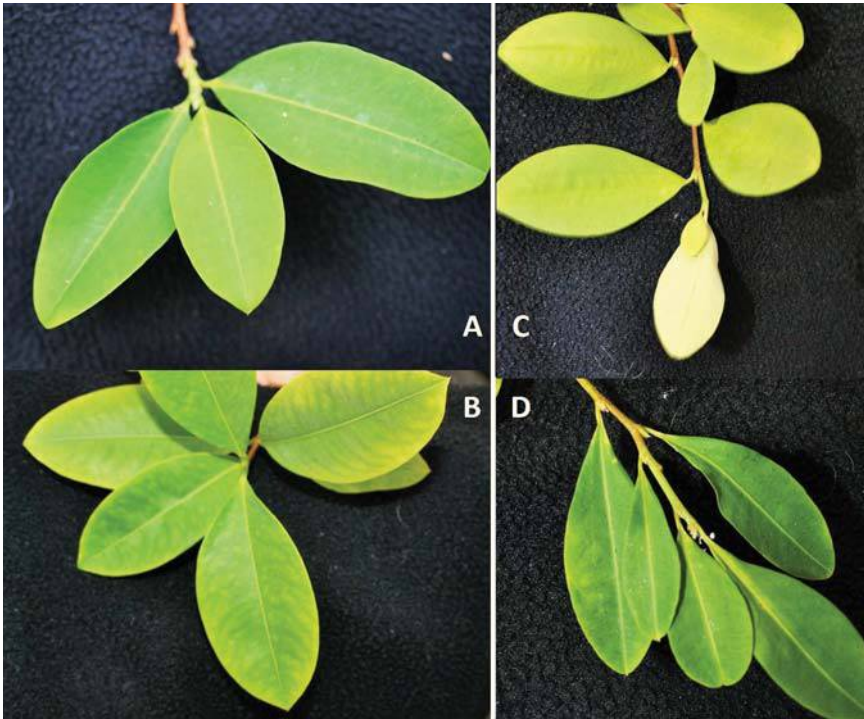


Plate 7. The four varieties of cultivated coca from South America: (A) *E. coca*; (B) *E. coca* var. *ipadu*; (C) *E. novogranatense*; (D) *E. novogranatense* var. *truxillense* (Photo courtesy Lyndel W. Meinhardt).



Plate 8. The coca leaves from Convento and a modern leaf (Photo L. M. Valdez).



Plate 9. Wari coca bag found by the late Junius Bird at Pacheco, in the Nasca Valley, currently housed at the Cleveland Museum of Art (Photo courtesy Susan Bergh).

1998; Marcus and Silva 1988); Plowman (1979:112; see also Pearsall 2006:196) asserts that all coca samples from archaeological contexts from northern Peru to northern Chile belong to this species. This coca species was likely accessible across over much of the Pacific coast since very early times.

Despite the challenges in differentiating species, the shape of their leaves is quite different (Plate 7). The leaves of *E. coca* (Plate 7A) are “characteristically large and thick, broadly elliptic in shape, more or less pointed at the apex and dark green in color” (Plowman 1979:106; see also Mortimer 1901:258);⁵ this species is the main source of cocaine (Plowman 1979:105; Johnson and Emche 1994:645). The leaves of *E. ipadu* (Plate 7B) are “apically rounded” (Plowman 1979:108). The leaves of *E. novogranatense* (Plate 7C) tend to be “smaller, thinner, bright yellowish-green,” and are usually rounded at the apex (Plowman 1979:110). As this species is not deciduous, the plants are bushier than *E. coca*. In contrast to *E. coca*, which grows in wet environments, *E. novogranatense* is more drought-resistant and can also grow in cooler climates. Finally, *E. novogranatense* var. *truxillense* (Plate 7D) is similar to *E. novogranatense*, but its leaves are smaller and narrower although slightly thicker, and once mature they turn green (Plowman 1979:113); reportedly this variety has a better flavor than *E. coca* (Mortimer 1901:258; Moore 2014:145). In comparison to *E. novogranatense*, *E. novogranatense* var. *truxillense* is even more drought-resistant, which explains its successful cultivation in desert environments such as the Peruvian coast. However, in those areas, the plant requires irrigation and tending by humans (Plowman 1979:114).

As discussed by Rostworowski de Diez Canseco (1973), at the height of the Inka empire two varieties of coca were known in the region: *mamacoca*, from the eastern slopes of the Andes and characterized by its larger, dark leaves, and *tupa*, which came from the *llanos*, the Pacific coastal valleys, and was highly valued for its flavor. Plowman (1979) asserts that *mamacoca* was *E. coca* whereas *tupa* was *E. novogranatense* var. *truxillense*. Coca plantations in such coastal valleys as Chillón, Rimac, Lurín, and Cañete (Murra 2002:368; Murphy and Boza 2012:171), known since pre-Inka times, declined after the Spanish conquest as a consequence of efforts to eradicate the plant and curb coca chewing practices among the indigenous peoples (Rostworowski de Diez Canseco 1973; also see Mortimer 1901:148). There are no longer any coca plants in the central coast valleys (Carlos Farfán, personal communication 2014).

THE COCA LEAVES FROM CONVENTO

The preceding overview of the genus *Erythroxylum*, in particular the variation in leaf shape and their geographical distributions, help us to identify the coca remains found at Convento. This will help us determine which coca species was available to the inhabitants of the Peruvian central highlands. However, according to Plowman (1979:111) this is not a straightforward task since positive identification is possible “only by considering a number of characters together, since no single morphological character is sufficiently diagnostic to separate them.”

Because the coca leaves found at Convento are in a surprisingly good state of preservation (Plate 8), we can readily distinguish them from *E. coca* Lam. (Huánuco or Bolivian coca) because the latter are much larger and “broadly elliptic,” and more or less pointed at the apex (Plowman 1979:106). The leaves from Convento are lanceolate (or narrow obovate) and more or less rounded at the apex, with two well-pronounced lines parallel to the midrib. These are some of the salient characteristics of *E. novogranatense* var. *truxillense* (Trujillo coca) (Plowman 1979:113; Mortimer 1901:258). Although the leaves of *E. novogranatense* var. *truxillense* and *E. novogranatense* are morphologically similar (Plowman 1979:113), *E. novogranatense* is found mainly (or only) in northern South America (Plowman 1979:109). Thus, *E. novogranatense* var. *truxillense*, the species adapted to the drier Pacific coast, is the only candidate for the coca leaves from Convento. Until now, no archaeological coca of the species *E. novogranatense* var. *truxillense* has been reported in the highlands.⁶ The single coca leaf fragment found by Hastorf (1987:197) has been positively identified as *E. coca* (Huánuco or Bolivian coca) from the eastern lowlands.

Although *E. novogranatense* var. *truxillense* is cultivated at higher elevations, at this point we do not know whether this coca species was cultivated anywhere in the Peruvian central highlands. The more likely scenario, however, is that the coca leaves were brought to the region from the Pacific coast following the cultural interaction established between the highland Huarpa culture and the South Coast Nasca culture. As already pointed out, by the late Early Intermediate Period these two neighboring cultures were in contact (Lumbreras 1960:156; Menzel 1964:7; Rowe et al. 1950:128). Following this interaction, the ceramic technology of the Ayacucho Valley witnessed significant change, including the incorporation of new shapes that resemble late Nasca vessels, the use of more colors, and the incorporation of late Nasca designs (Lumbreras 1980:30; Schreiber 2012:38). Cruz Pata is one such ceramic style that at times appears to have been manufactured by Nasca potters and, at the same time, stands apart from the ceramics produced in the region prior to the interaction with the South Coast.

Scholars working in southern Peru have recently pointed out that the number and size of late Nasca settlements in such valleys as Palpa and Ingenio decreased significantly (Sossna 2014:184, 230). Reportedly, these changes took place in the midst of a severe drought (Conlee 2014:245; Eitel and Mächtle 2009:27), forcing at least some of the inhabitants to migrate (Sossna 2014:231). About the same time, the population in the Ayacucho Valley increased (Lumbreras 1980:30), indicating that newcomers may have entered the region. Consequently, the increased technological sophistication shown by local Ayacucho Valley ceramics may be the result of the migration of people from the South Coast into the highland valley of Ayacucho. Bioarchaeological and biochemical analysis may be able to determine whether immigrants from the South Coast had actually moved to the Ayacucho Valley.

As stated in the preceding section, no coca leaves (or coca bags) are known from early Nasca contexts. However, by late Nasca times, coca chewers who also carry coca bags are depicted on Nasca ceramics (Proulx 2006:174, pl. 37; Shimada et al. 2006: figs. 063 & 064; Silverman and Proulx 2002:55). As was the case for

the Moche of the North Coast, such depictions are suggestive of coca chewing. Therefore, the likely scenario is that by late Nasca times coca leaves were already known on the South Coast and subsequently introduced to the highland valley of Ayacucho by Nasca immigrants.

When the Wari state began expanding from its Ayacucho Valley heartland, the South Coast was one of the first regions it incorporated. Moreover, throughout the florescence of the Wari state, the South Coast maintained a privileged position (Menzel 1968:68). In light of recent archaeological finds, it can be argued that Wari's early expansion to the South Coast was likely facilitated by the existing link between the two regions, but the driving force may have been to gain direct access to a region associated with coca cultivation. Schreiber (1999) and colleagues (Conlee 2010:98; Conlee and Schreiber 2006:101; D'Altroy and Schreiber 2004:277) have suggested that the Wari site of Pataraya in the upper Nasca Valley likely was established to cultivate coca. However, recent site research has failed to confirm this suggestion (see Edwards 2010; Edwards and Schreiber 2014).

Archaeological studies in the lower Ica Valley of the South Coast have recently uncovered remains of coca leaves from Middle Horizon Wari contexts (Beresford-Jones 2011:97, fig. 5.5A). In addition, a Wari coca bag (Plate 9) housed at the Cleveland Museum of Art (see Bergh and Jennings 2012: fig. 18) was reportedly found by the late Junius Bird at the site of Pacheco in the Nasca Valley. Susan Bergh (personal communication, 2014) notes that the bag contained coca leaves.

Given that Convento is only a two-day walk from the tropical rainforest valley of Apurimac, it is surprising that the coca leaves found there are not from the eastern lowlands. Of course, the presence of coastal coca leaves in the highlands does not necessarily imply that *E. coca* from the eastern lowlands was unavailable to highland inhabitants, including those of the Ayacucho Valley. Since there are Wari settlements in the Apurimac Valley (Raymond 1992), perhaps the Wari state accessed coca leaves from the eastern lowlands as well as from the Pacific coast, in a similar manner to what the Inka state did centuries later. The Wari outposts in the Apurimac Valley may have been part of the "vertical archipelago" (see Murra 1985:17–19) that enabled highland populations to access locally unavailable resources, coca leaves being one of them. As demonstrated by the findings from Hatunmarka in the Mantaro Valley, by the Late Intermediate Period coca leaves from the eastern lowlands were certainly being consumed by highland inhabitants (Hastorf 1987). Determining when this exploitation began is an interesting problem that only additional research can resolve.

Coca does occur in coastal archaeological contexts relatively early, in many instances indicating the practice of chewing the leaves. Since the highlanders were in contact with people of the Pacific coast (Burger 1992), perhaps highland populations also used coca leaves about the same time. According to Plowman (1979), the coca plant was likely brought to the coast from the eastern lowlands by humans. Many other cultigens, such as manioc (*Manihot esculenta*), chili peppers (*Capiscum* spp.), sweet potatoes (*Ipomoea batatas*), and peanuts (*Arachis hypogaea*), which are found at coastal sites in very early contexts, are also said to be from the eastern lowlands. These species likely arrived on the Pacific coast as

a result of the long-established interaction between the people of the two regions. This interaction would also have enabled the spread of cultural practices over a large territory. Even if coca chewing occurred earlier on the Pacific coast, the practice would have become familiar to highland populations shortly thereafter. In the absence of direct botanical evidence, analysis of human hair for cocaine metabolites has been successful in the southern portion of the Central Andes (see Cartmell et al. 1991; Rivera et al. 2005). As shown by Indriati and Buikstra (2001) and Murphy and Boza (2012), dental analysis is another method of discerning whether coca chewing occurred in the distant past.

It is clear the use of coca leaves in the Peruvian central highlands began much earlier than what is indicated by the evidence at Convento. Indeed, the fact that coca leaves were part of the offering paraphernalia to the dead by the time the Cruz Pata ceramic style was manufactured strongly indicates that highlanders were already familiar with the unique properties of coca leaves. Such familiarity would have emerged from past experience and the long interaction between the people of the highlands and the coca leaves.⁷

CONCLUDING COMMENTS

Today, when men and women meet on a trail, they exchange *k'intus* of coca, three perfect leaves aligned to form a cross. Turning to face the nearest apu, they bring the leaves to their mouths and blow softly, a ritual invocation that sends the essence of the plant back to the earth, the community, the sacred places, and the souls of the ancestors. The exchange of leaves is a social gesture, a means of acknowledging a human connection (Davis 2009:128).

Since plant remains do not survive well in archaeological contexts, particularly in the Peruvian central highlands, which registers heavy rainfall about 5 months per year, it is a serious challenge to determine by archaeological means which plant species were used in the distant past. The case of coca leaves is an excellent example; despite the fact that *Erythroxylum* is present at coastal archaeological sites in very early cultural contexts, evidence for it remains elusive in highland settlements. As noted, early Spanish documents acknowledge the prominent role of coca leaves within the Inka empire; however, with some rare exceptions (Reinhard and Ceruti 2010), coca leaves are seldom mentioned in archaeological discussions of the Inka state. For other, much earlier Andean civilizations, such as the Middle Horizon Wari state, coca leaves are almost never part of the discussions.

As archaeologists we build our discussions on the basis of tangible material remains found at the sites. Since coca leaves are seldom part of the material remains we find, we have little scope for arguments regarding the likely use of the plant in the distant past. However, during the past two decades or so, archaeological techniques have become much more sophisticated, enabling scholars to explore other avenues in order to determine whether, for instance, coca leaves were of widespread use before the Inka state (Cartmell et al. 1991; Indriati and Buikstra 2001; Rivera et al. 2005). Once studies similar to the ones noted here are carried out, our understanding of the extent of coca leaf use in the Peruvian central highlands will improve. Such

studies also have the potential to determine when coca chewing began in the region.

Without assuming cultural continuity or projecting the ethnographic present onto the distant past, the fact that coca chewing is central to all activities, both ritual and everyday, across the Peruvian central highlands is indicative, in our view, that this practice is rooted deep in the Andean culture and antedates the Inka state. We also believe that the survival of coca chewing, despite all attempts at eradication, is a sign that coca has been part of the Andean people's culture for a long time. Therefore, the fact that coca leaves were placed as part of the offering paraphernalia to the dead as early as the beginning of the Middle Horizon—if not earlier—informs us that this was a special product. Such a consideration likely emerged from a long-established human-plant interaction. According to Andean beliefs, only special goods are offered to the ancestors; thus, it is apparent that by the late Early Intermediate Period and the Early Middle Horizon coca leaves were highly esteemed, in a manner similar to that during Inka times (Cobo [1653] 1990:116) and as they are in the present.

To conclude, the fortuitous finding of coca leaves at the Convento site reveals that an important component of Andean culture has thus far only been marginally discussed within the discipline of archaeology. Researchers conducting investigations in the central highlands have been busy working with ceramics in their attempt to reconstruct past Andean cultures and their institutions. More recently, human remains have also been analyzed to learn more about the people who built those pots and created those institutions. Archaeological research in the region is currently taking a direction that will enable us to learn more not only about the people whose labor built the monumental structures that still endure today, but also about the role that coca leaves played in the process.

NOTES

We would like to express our sincere gratitude to Katrina J. Bettcher for reading several drafts of this paper and for providing valuable comments and editorial assistance. Our thanks also go to Patricia J. Knobloch for identifying the style of the ceramic vessel from Convento. Our appreciation is extended to Basilio Cárdenas and Fortunato Hinostriza for their assistance during the recovery of the archaeological finds from Convento. Enrique Mayer, Scott Raymond, Theresa Topic, John Topic, and Donald Proulx critically read an earlier version of the paper and provided constructive comments and suggestions. Likewise, three anonymous *JAR* reviewers and its editor offered valuable comments and suggestions to improve the original manuscript. We, the authors, are responsible for any shortcomings. Moner Lizana shared the images in Plates 1 and 4, Lyndel W. Meinhardt kindly provided Plate 7, and Susan Bergh shared the image of the coca bag in Plate 9. Many other colleagues responded to our inquiry with their assistance, which we greatly appreciate.

1. From the onset, coca leaves have been a problem for people not related to the Andes (see Gagliano 1994). However, for the people of the Andes, coca is not a problem; in their hands it means life, hope, and future.

2. The legal prosecution of growers and users of the coca plant continues (see Davis 2009:125–27).

3. In our experience, coca leaves are the first product to be passed around in any social circumstance. Chicha certainly is used, but not as often as coca leaves. In the

absence of chicha, activities can still be carried out. In contrast, in the absence of coca leaves, nothing can be accomplished.

4. The archaeological evidence indicates that during the time the Wari state flourished, the people of the central highlands were familiar with the tropical forest and thus probably with the use of coca leaves. For instance, a Wari ceramic drinking cup molded in the shape of a tapir foot was found at the Wari settlement of Taqsa Orqo in the Pampas Valley, south of the Ayacucho Valley (Raymond 1979:81). The tapir (*Tapirus terrestris*) is the largest mammal in the tropical forests of South America (Gade 1999:123; Raymond 1979:82).

5. The assumption that the leaves of specific coca species have unique endings is false. At least in the case of *E. coca* (coca leaves from the Apurimac Valley), we have noticed some leaves with a pointed apex whereas others are rounded.

6. For Cerro Baúl, the Wari enclave in the Moquegua Valley, Williams and colleagues (2005:226) list *Erythoxylon coca* among the plant species identified at the site; if so, this may be the only coca type from the eastern tropical forest found at a Wari site near the Pacific coast.

7. Andean highland cultures such as Chavín, Wari, and Tiwanaku are known to have used psychoactive substances. For instance, Chavín iconography depicts San Pedro cactus (*Trichocereus pachanoi*) and the vilca plant (*Anadenanthera colubrine* var.), both of which have hallucinogenic properties (Burger 2011). Wari (Knobloch 2000) and Tiwanaku (Zuidema 2009) iconography likewise depicts *A. colubrine*. With the exception of one Tiwanaku sculpture depicting coca chewing, coca leaves have not been identified in the art of any of these three cultures.

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