



TECHNOLOGICAL AND STYLISTIC-TYPOLOGICAL ANALYSES OF THE COCA BAGS FROM THE YAUCA VALLEY IN SOUTHERN PERU

ANÁLISIS TECNOLÓGICOS Y ESTILÍSTICO-TIPOLÓGICOS DE LAS BOLSAS DE COCA DEL VALLE DE YAUCA EN EL SUR DEL PERÚ

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The paper discusses the results of technological and stylistic analyses of coca bags (*chuspas*; a term derived from the Quechua word *ch'uspa*, the Aymara equivalent is *wallqipu*) – richly decorated and elaborately woven textile pouches – from the San Francisco cemetery in the Yauca valley (Caravelí province). The research results revealed the applied weaving techniques of single S/Z-spun yarns and S(2z) yarns including warp-faced plain weave, complex warp-patterned weaving, complex cylindrical braiding, and the application of square braids. It also enabled us to determine the typology of forms and decorative motifs characteristic of these artefacts. A great variation in the weaving techniques, pouches' shapes and locations of their openings, as well as in the forms and colours of decorative motifs were observed. We found that in most burials containing more than one *chuspa* bag, all pouches were decorated almost identically, and the differences concerned only details. A variety of *chuspas* woven in warp-faced plain weave, recorded in the contexts of San Francisco may suggest that this cemetery was a multi-ethnic burial area. Radiocarbon dating determined the chronology of these materials as the 15th and 16th centuries, i.e., the Late Horizon.

Keywords: *Chuspa* bags, coca leaves, Late Horizon, Inca, Yauca valley, the South Coast of Peru.

En este artículo se presentan los resultados del análisis tecnológico y estilístico de las bolsas de coca (chuspas; término derivado de la palabra quechua ch'uspa, cuyo equivalente aymara es wallqipu) – pequeñas bolsas textiles tejidas de manera intrincada a menudo ricamente decoradas – provienen del Cementerio San Francisco en el Valle de Yauca (Provincia de Caravelí). Los resultados de la investigación revelaron las técnicas de tejido aplicadas de hilos simples S/Z e hilos torcidos S(2z), incluido el tejido llano con faz de urdimbre, tejido con patrones de urdimbre complejos, trenzado complejo cilíndrico y la aplicación de trenzados cuadrados. El análisis permitió también determinar la tipología de formas y motivos decorativos característicos de estos artefactos. Se observó una gran variación en las técnicas de tejido, las formas de las bolsas y las ubicaciones de sus aberturas; como también en las formas y colores de los motivos decorativos. Se encontró que en la mayoría de los entierros que contenían más de una bolsa (chuspa), todas ellas estaban decoradas de manera casi idéntica y las diferencias solo estaban en los detalles. La variedad de chuspas en tejido liso con faz de urdimbre registradas en los contextos de San Francisco, pueden sugerir que este cementerio era un área de entierro multiétnico. La datación por radiocarbono determinó la cronología del material discutido para el siglo XV–XVI, es decir, en el periodo del Horizonte Tardío.

Palabras claves: *chuspas*, hojas de coca, Horizonte Tardío, Inca, Valle de Yauca, costa sur del Perú.

The San Francisco cemetery (15° 38' 54" N; 74° 31' 03" W) is situated approximately 62 masl on the right-bank alluvial terrace of the Yauca river, close to the modern cemetery complex (Walsh 1996:81; Wanot 2021:236). It is located 1.9 km from the settlement of Yauca and about 6.1 km from the Pacific shoreline (Figure 1). The archaeological contexts were recorded in 1985 during the field survey carried out by the California Institute for Peruvian Studies (Riddell 1986:28; Walsh 1996:51). Salvage excavations were

conducted in two short field expeditions, the first in November 1987 and the second in March 1988. They were carried out by Augusto Belan Franco from the Universidad Católica de Santa María in Arequipa and his students, but, during the 1988 field session, they were joined by Francis A. Riddell and other members of the California Institute for Peruvian Studies (Walsh 1996:82). Unfortunately, the documentation of these brief rescue excavations has been lost and the exact provenience of each mummy is unknown

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Figure 1. Location of the San Francisco cemetery within the Yauca valley and the South Coast of Peru (elaborated by Jakub Wanot with the Google Earth software).
Localización del cementerio de San Francisco dentro del Valle de Yauca y costa sur del Perú (elaborado por Jakub Wanot con el software Google Earth).

(Belan Franco and Kent 1990; Fairchild 1999:20; Walsh 1996:81-83; Wanot 2019:289). According to the account given by the archaeologist carrying out the excavations, Augusto Belan Franco, 120 grave contexts were explored then; 79 of these have survived, deposited at the storage facilities of the Universidad Católica de Santa María in Arequipa – the fate of the rest is unknown (Walsh 1996:82; Wanot 2019:286, 2021:246).

The archaeological material excavated in San Francisco is connected with the Late Acarí cultural tradition, defined in 1954 by Francis A. Riddell and Dorothy Menzel during their field survey in the valleys of the Acarí and Yauca rivers within the Caravelí province. Its main distinctive element was the pottery / ceramic style known as Acarí Tardío / Late Acarí or Acarí Policromo / Acarí Polychrome, considered one of the region's more characteristic elements of the Pre-Columbian cultural mosaic in the Late Intermediate and the Late Horizon periods (Bettcher and Valdez 2018:2; Fairchild 1999:30; Menzel 1959, 1976; Menzel and Riddell 1986b; Rowe 1956:137; von Hagen 1955:234-252). The analyses of sepulchral contexts from the San Francisco cemetery, as well as the results of the field survey carried out in the river valleys of the Caravelí province, have allowed the definition of diverse archaeological materials characterizing this regional cultural phenomenon. This applies not only to ceramic wares with specific painted decoration, but also to wooden and bone artefacts, carved and pyroengraved gourd containers, as well as textile, leather, and basketry artefacts. We also characterized a specific complex funeral rite of the local community. Therefore, it seems reasonable to use the term “the Acarí culture” – e.g. similar to the Tiza culture in Southern Nasca Region (cf. Conlee 2016; Vaughn et al. 2006) – in the description of the Late Intermediate and the Late Horizon periods archaeological materials registered within the Acarí valley and neighbouring areas, including finds from the San Francisco cemetery in the Yauca valley (Wanot 2019, 2021; Więckowski 2003:252-253).

The results of the archaeological field survey carried out in the Caravelí province and Río Grande de Nasca area in 2017–2021 seem to suggest that the Taruga riverbed determines the north-eastern border of its occurrence, while the Chala valley constitutes its south-western border (Menzel 1959:130; Menzel and Riddell 1986a; Presbítero Rodríguez 1991:16; Riddell 1985:23, 1987:125; Wanot 2019:287-288; 2021:441-442). It is also assumed that the left bank

of the Las Trancas river, as well as the valleys of the Acarí and Yauca rivers, constitute the area densely inhabited by the population associated with these cultural practices (Wanot 2021:444).

The inventory from the graves in the San Francisco cemetery includes well-preserved funerary bundles (*fardos funerarios*) and diversified grave goods, such as pottery, chiselled gourd containers, wooden and bone artefacts, weaving tools, slingshots, and textile specimens – especially great number of bags, i.e. *chuspas*. These coca bags' differentiation – in terms of the pouches' shapes, forms and colours of decorative motifs, as well as the weaving techniques applied – seems to suggest diversified cultural or geographical provenience (Wanot 2021:243-287).

***Chuspa* Bags from the San Francisco Cemetery**

The analysed material from the San Francisco site in the Yauca valley included 55 coca bags; 36 of them were found in 21 funerary contexts (ca. 27% of burials) from this cemetery and 19 bags, due to the previously mentioned loss of documentation, lack any archaeological context (Table 1). *Chuspa* bags appear as funerary equipment for both children's and adults' burials (Wanot 2021:388, 464). The children, even if they did not consume coca leaves, were nonetheless buried with them. In the inventories from San Francisco, both single specimens of coca bags and sets of four or five *chuspas* placed in a single burial (contexts no. 41, 73, 76) were noted (Socha et al. 2022:10; Wanot 2021:347). All the pouches were filled with coca leaves, while 11 (20%) of them also contained lumps of mineral activator of alkaline substances (powdered calcium and sodium bicarbonate), which reduced the bitter taste of coca leaves, at the same time intensifying the stimulating effect of the substances contained (Bewziuk et al. 2017:145; Indriati and Buikstra 2001:244; Valdez 2023).

Microscopic photography of the surface of the coca bags enabled the analysis of the structure of individual types of yarns. Among the specimens from San Francisco, S-plyed yarns predominate. The pouches made in this technique constitute over 97% of the analysed artefacts, while Z-spun threads are rare – they were used mainly for trimming the edges. The specific direction of the twist was not related to the material from which the threads were spun. Both cotton and camelid fibre were carded, arranged in

Table 1. Coca bags from sepulchral contexts of the San Francisco cemetery (elaborated by Jakub Wanot). Designation of decoration type: Type/Subtype. Group (digit) and Variant (letter).

Bolsas de coca de contextos sepulcrales del cementerio de San Francisco (elaboradas por Jakub Wanot). Designación del tipo de decoración: Tipo/Subtipo. Grupo (dígito) y Variante (letra).

| No. | Inventory no. | Decoration type | Shape type | Burial no. | Age of an individual | Other equipment within burial |
|-----|---------------|-----------------|------------|------------|----------------------|--|
| 1 | 9/SF/002 | 1.1B | 2 | 2 | Infans I | Three gourd vessels, slingshot, loincloth, guinea pig remains |
| 2 | 13/SF/003 | 1.1A | 1 | 3 | Infans I | corn cobs |
| 3 | 22/SF/006 | 1.1D | 2 | 6 | Infans I | string made of plant fibres, manta |
| 4 | 26/SF/007 | 1.1B | 2 | 7 | Infans I/II | leather sandals |
| 5 | 28/SF/008 | 1.1B | 3 | 8 | Infans I | corn cobs |
| 6 | 29/SF/008 | 1.1A | 1 | | | |
| 7 | 37/SF/009 | 1.2A | 4 | 9 | Infans I | slingshot, llama skin bag, two painted gourd vessels, fragments of a painted bowl |
| 8 | 38/SF/009 | – | 1 | | | |
| 9 | 55/SF/021 | 1.1B | 1 | 21 | Infans I/II | – |
| 10 | 67/SF/026 | 2/2.1A | 3 | 26 | Infans I | corn cobs |
| 11 | 69/SF/027 | 2/1.1A | 2 | 27 | Infans I | belt, woolen tassels |
| 12 | 98/SF/038 | 1.1B | 3 | 27 | Adultus | batten wrapped in a reed mat |
| 13 | 108/SF/041 | 2/2.1C | 3 | 41 | Adultus | woolen tassels and string, two slingshots, leather sandals, llama skin bag with corn kernels, shell-encrusted bone container |
| 14 | 109/SF/041 | 2/2.1B | 3 | | | |
| 15 | 110/SF/041 | 2/2.1C | 3 | | | |
| 16 | 111/SF/041 | 2/2.1C | 3 | | | |
| 17 | 112/SF/041 | 2/2.1B | 3 | | | |
| 18 | 148/SF/057 | 2/1.1A | 2 | 57 | Infans I | – |
| 19 | 172/SF/067 | 1.1B | 1 | 67 | Infans I/II | gourd vessel with the guinea pig remains, painted gourd vessel |
| 20 | 179/SF/069 | 2/1.2B | 1 | 69 | Adultus | – |
| 21 | 184/SF/072 | 2/2.2A | 2 | 72 | Adultus | loincloth, bel |
| 22 | 191/SF/073 | 2/1.2A | 3 | 73 | Adultus | spindle with ceramic spindle whorl, painted wooden tool/rod (jaynu), belt, slingshot, cactus spine needles |
| 23 | 192/SF/073 | 2/1.1B | 1 | | | |
| 24 | 193/SF/073 | 2/1.2A | 3 | | | |
| 25 | 194/SF/073 | 2/1.1A | 2 | | | |
| 26 | 195/SF/073 | 2/1.1A | 2 | | | |
| 27 | 201/SF/074 | 1.3A | 2 | 74 | Adultus | loincloth, two slingshots |
| 28 | 202/SF/074 | 1.1A | 3 | | | |
| 29 | 203/SF/074 | 1.2B | 3 | | | |
| 30 | 205/SF/075 | 1.2C | 3 | 75 | Adultus | – |
| 31 | 207/SF/076 | 1.2B | 1 | 76 | Adultus | slingshot, manta |
| 32 | 208/SF/076 | 2/2.1A | 3 | | | |
| 33 | 209/SF/076 | 2/1.3A | 3 | | | |
| 34 | 210/SF/076 | 1.2A | 4 | | | |
| 35 | 213/SF/077 | 2/2.1A | 1 | 77 | Adultus | llama skin bag with corn kernels, bone artefact with drilled holes, woolen tassels, two slingshots |
| 36 | 216/SF/078 | 2/2.1A | 1 | 78 | Infans I | slingshot |

parallel strands, and spun. However, plant fibres were most frequently used in *chuspas*, contrary to shrouds or *unku*-type tunics, made mainly from camelid fibre (Katterman 2007:235; Walsh 1996:125).

The thickness of the threads in the fabric used to make *chuspas* varied from 0.40 mm to 0.70 mm in the case of camelid fibre, and 0.30 mm to 0.60 mm for cotton (Figure 2). Their thickness varied along their lengths in different sections. Microscopic analyses of textiles also confirms a relatively high level of textile production and a proficiency of their manufacturers. The weft yarn is hard-spun to an angle of 40–55 degrees and ranges from 0.25 to 0.40 mm in diameter, while the warp yarn is approximately 0.40 to 0.45 mm. The fabric is quite dense and thus durable; the number of warp yarns sometimes reached 30–40 per cm, while there is usually less than 12 weft yarns per cm (Wanot 2021:395).

The analysis of the structure of the fabric from which the *chuspas* were made revealed that warp-faced plain weave (Figure 2) was used most frequently (over 90% of microscopically analysed artefacts). The fabrics are characterized by a relatively smooth surface, without any typical yarn clusters. The applied weaving techniques, combined with considerably compacted warp yarns distinctly thicker than weft yarns, has caused the weft to be frequently hardly visible (Emery 1966; Laszczka et al. 2017:255; Rowe 1995–1996). Moreover, warp yarns are usually more tightly plied than weft yarns. Quite significantly, a warp-faced plain weave specimens are the most numerous type of textiles from other cultures of the Late Intermediate Period, e.g., Chiribaya, as well as the Late Horizon, e.g. Chuquibamba-Inca (Arnold et al. 2015:72–75; Dransart 2020:140; Frame 1997). This type of weave also predominates among Inca



Figure 2. Macro photos of the multi-coloured S(2z) camelid fibre and cotton threads forming the weave of the *chuspa* bags from the San Francisco cementery (photos by Jakub Wanot).

Macrofotografías de la S(2z) fibra multicolor de camélido y hilos de algodón, integran el tejido de las *chuspas* del cementerio de San Francisco (fotos del Jakub Wanot).

provincial textile products in the South Coast of Peru (Agüero Piwonka 2019:81; Del Risco Gonzalez 1997:128; Katterman 2007:221).

Only three *chuspa* bags (ca. 5%) display a regular twill weave, where each warp yarn passed across multiple weft yarns. The examined specimens included two variants where warp yarns were interwoven with double weft yarns, i.e., the so-called $\frac{1}{2}$ twill weaves, and one where the specimens were made with the use of a regular $\frac{1}{3}$ twill weave.

The *chuspas* from the San Francisco cemetery are rectangular. Their length ranges from 12 to 20 cm and their width is between 9–18 cm. At the same time, a great variation of the observed weaving techniques as well as the forms and colours of decorative motifs were observed (Walsh 1996:82; Wanot 2021:390). Due to the shape and location of the openings, we have distinguished two types of *chuspa* bags. The first includes quadrilateral forms – sometimes

approximating a square – whose width exceeds the length and thus the opening is on the longer side. The other type consists of elongated forms, whose length exceeds the width and the opening is on the shorter side.

Probably all of the examined coca bags were woven as a single unit of rectangular cloth, so we can claim that they were intentionally woven to be *chuspa* bags. Of the 55 bags analysed, in 33 cases a long woven panel was bent weftwise in half, so that the fold forms the bottom of the bag, thus producing rectangular or square pouches. The side edges were joined along their weft selvages with an overcast (19 specimens), interlaced (nine specimens), or running (five specimens) stitch, sometimes with multi-coloured yarns (Figures 3, 4). In those cases warp selvages forming the opening – if observed – were usually folded inside and whip-stitched (Hoces de la Guardia and Brugnoli 2006).



Figure 3. Macro photos of the *chuspa* bags' sewn edges (photos by Jakub Wanot).

Macrofotografías de los bordes cosidos de las *chuspas* (fotos de Jakub Wanot).

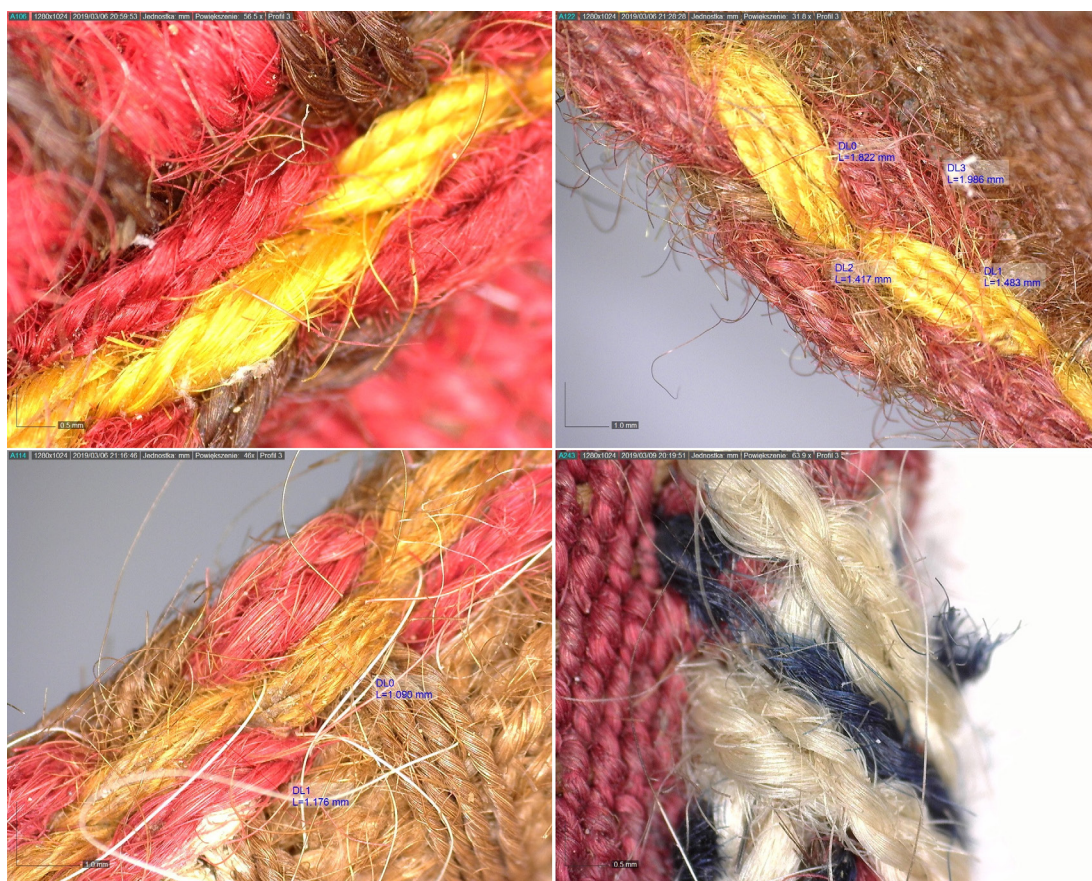


Figure 4. Macro photos of the coca bags' edges sewn together with interlaced stitch (photos by Jakub Wanot).

Macrofotografías de bordes de las bolsas de coca, cosidos mediante puntada entrelazada (fotos de Jakub Wanot).

In 22 cases the orientation of the warp-faced fabric has been turned for the design features to be horizontal. In those specimens, three edges of the bag, forming the side edges (warp selvages) and the bottom (weft selvages), were joined with a complex interlaced stitch (i.e. Figure 5.2e; 5.3d–e) or just a running stitch (Figure 5.3c). Sometimes the edges were trimmed all around with diagonally arranged threads, displaying a characteristic herringbone pattern (Figure 3). Weft selvages forming the bag opening were folded inside and stitched (Figure 5.3c), sewn around using interlaced stitch (i.e. Figure 5.2e; 5.3e), or embroidered with multi-coloured yarns (Figure 5.3d).

The edges of the most richly decorated chuspa bags from San Francisco were sewn together using a variant of the crossed-warp technique with one weft, whose arrangement resembles the so-called *square*

braids (Bjerregaard 2010:8–9); their application has enabled producing convex, geometric patterns of cylindrical or hexagonal cross-section (Figure 6). This type of decoration is especially characteristic of the Bolivian fabrics, where it is referred to as *tubular edging* (Arnold and Espejo 2015; Cahlander et al. 1978:3; Doyon-Bernard 1990:70; Hoces de la Guardia and Brugnoli 2006).

Typological Division of Forms

Analysis of decorative elements – the presence of which may have been related to the status or gender of the wearer – such as straps, fringes, and tassels, has prompted us to divide the bags into four types (Figure 5). The poor condition of two specimens precluded their precise classification



Figure 5. Coca bags from the San Francisco cemetery – typological division of forms (photos by Jakub Wanot, elaborated by Nicole Lenkow).

Bolsas de coca del cementerio de San Francisco – tipología de formas (fotos de Jakub Wanot, elaboradas por Nicole Lenkow).



Figure 6. Macro photos of coca bags' straps woven in square braids with multiple colours (photos by Józef Szykalski and Jakub Wanot).

Macrofotografías de correas de bolsas de coca, tejidas en trenzados cuadrados de múltiples colores (fotos de Józef Szykalski y Jakub Wanot).

(Wanot 2021:393). The first type includes 10 specimens (18%). The straps, which would have made it easier to carry the pouches, are missing, as well as any decorative fringes or tassels (Figure 5.1).

The second type is represented by 21 specimens (ca. 38%). It has a strap attached to the pouch's corners, at each side of the bag's opening (Figure 5.2). In most cases, only fragments of the strap have survived, which makes it impossible to determine the length (i.e., Figure 5.2d). However, the well-preserved specimens suggest considerable variability in strap length, ranging between 12 cm to as long as 50 cm.

The third type is represented by 20 specimens (ca. 36%). Apart from straps attached to upper corners, they display one- or two-coloured fringes or tassels as decorative elements (Figure 5.3). These were made from a bunch of single S-spun yarns of various lengths, relatively loosely spun, with diameters of 0.3–4 mm. They were bound together at one end and then attached to the bottom corners of the *chuspa* bags. In one case the length and form of tassels distinctly differ from those of the remaining ones. Individual threads were made with the use of a 4-strand braid. The tassels, whose length reached 30 cm, were arranged in pairs, their ends being bound with red or cream-coloured yarn (Figure 7).

The fourth type is represented only by two specimens (ca. 4%) with the strap in complementary double cloth made of thick camelid fibre S-plyed yarns (Figure 5.4). The strap's length is about 50 cm and

its width ranges between 2.5 and 3 cm. The edges were trimmed all around with red or orange-coloured yarns. One specimen is decorated with the motifs of X-shaped designs and rhombi (Figure 5.4b), while the other one is decorated with multi-coloured triangles (Figure 5.4a). In both cases, the main parts of the coca bags were prepared using the so-called *ch'imi* (or *ch'imisqa*) techniques, which are interesting Pre-Columbian Central Andean precursors of the colonial *tornasol* or *tornesol* techniques. A thread twisted of two or more colours, where the strands become pixelated in appearance, has been used to generate characteristic shimmering or granulated surfaces in the speckled vertical stripes that are flanked by the groupings of stripes in plain colours (Arnold 2023:227). The use of the *ch'imi* technique has not been observed in the other types of coca bags, although in some cases (cf. Figure 5.2e; central horizontal stripe of this specimen) the uneven colouring of the fibre can result in a relatively similar effect.

Richly decorated *chuspas* with a narrow woven strap, often referred to as *pendant bags*, are usually attributed to the Inca aristocrats. However, *pendant bags* generally consist of two principal pieces, a functional bag (woven in a combination of plain weave and weft tapestry) and a large decorative textile, with standardized iconography (especially camelid depictions and crosses). Thus, the analysed artefacts were most likely not created in the native area of the Inca Empire but rather were produced



Figure 7. *Chuspa* bag with tassels made of 4-strand braid (photos by Jakub Wanot).

Chuspa con borlas elaborada con trenzado de 4 cabos (fotos de Jakub Wanot).

by the communities inhabiting the Peruvian coast (Bird 1964; Carmona 1999:163, Figure 4; Desrosiers 1986:223–225; Rowe 1995–1996; Stone-Miller 1992:178; Hughes 2010:151).

Furthermore, considering the techniques of making and spinning the cotton and camelid fibre yarns, we have distinguished several types of *chuspa* bag strap structures. The most frequently represented are the ones made from a single monochromatic S-plyed yarn, although usually this type of yarn is used for weaving materials, not for forming belts. Sometimes the strap was made from a few unbraided S-plyed yarns. During the analysis of textile materials from San Francisco, no distinction or correlation was observed between the twist and the type of fibre used.

A separate category contains straps employing a two-colour set of yarns composed of two Z-spun threads subsequently plied in the opposite (S) direction (Figure 5.2e). This technique of S-plying of Z-spun yarns is also referred to as the S(2z) thread-spinning (Price et al. 2015:68). Plying yarns in opposite directions increased the cord's diameter and created a dichromatic pattern; it also strengthened the structure of the yarns and prevented their

untwisting. Additionally, the second type includes the straps made from many S(2z) threads braided by hand (without the use of any additional tools) using the so-called *fist braiding* techniques (Bjerregaard 2010:4; Cahlander et al. 1978; Wanot 2021:455). The braids made from four or more yarns usually have a square, hexagonal or cylindrical shape. The simplest technique of braiding threads, referred to as *square braids* (Figure 6), enabled the production of angular cords decorated with rows of rhomboidal elements, while more complex *warp-crossing techniques* (oblique interlacing) yielded a cord of circular cross-section, decorated with checked patterns, wavy lines, zigzags and multi-coloured quadrangles (Bjerregaard 2010:8; Cahlander et al. 1978:6–7).

Typological Division of Decorative Motifs

The *chuspas* from the San Francisco cemetery in the Yauca valley are certainly the most colourful textile products from this archaeological site. They are also the most diversified in terms of their decoration. Especially striking is the contrast between them and the shrouds used in the production of funerary bundles.

Only two undecorated *chuspas* were found; they are small, carelessly made, accessory items, which were attached to bigger coca bags.

The analysed *chuspa* bags were made from cotton and camelid fibre of natural colours: black, brown, cream, white and grey, or a combination yielding the cream-brown colour. In the decoration of *chuspas* from the Yauca valley linear motifs predominated, assuming the form of colourful stripes arranged vertically and horizontally. In Andean symbolism, the direction of the warp and weft threads, as well as the direction of the decorative linear motifs, played an important role (Conklin 1997; Heckman 2003; Rowe 2015). Two main types of decoration motifs were distinguished (Figure 8).

Type 1 includes 31 *chuspa* bags (approximately 56% of the analysed artefacts) decorated with numerous coloured stripes. Those are the most frequently encountered pouches' specimens decorated with rows of vertical warp stripes of varying widths, employing three to seven contrasting colours. The decorative motifs were created by weaving multi-coloured warp yarns across the single-coloured weft (Figure 9). In some cases, we can confirm the presence of complementary-warp pattern stripes (with an uneven warp count).

Apart from warp stripes of various colours, other decorative motifs sometimes appear on the pouches, i.e. complementary-warp squares or rectangles in narrow stripes resembling a two-coloured chequerboard motif (Figure 10a). They were made, employing alternating single-coloured warp yarns in two layers. This type of decoration is also encountered in the products of other Pre-Columbian cultures of Peru and the systemic use of the woven codification in ladder techniques seems to have its origins during the Middle Horizon, most specifically within the sphere of influence of the Tiwanaku culture (Espejo and Arnold 2014:304). When the contrasting colours are in rows, resembling the rungs of a ladder, it is commonly referred to in the literature as the ladder design, *patapata*. When the colours are organized in an intercalated checked pattern, resembling a chequerboard, it is rather called *k'uthu* (Cases 2002:43; Dransart 2020:143; Espejo and Arnold 2014:303–304; Horta Tricallotis and Agüero Piwonka 2009; Paulinyi Horta 2018:36).

More elaborate geometric motifs are rare; they include complementary-warp zigzags, S-shaped figures, a herringbone or an “Inca key” pattern, hexagons and rhomboidal figures in a technique counted in an odd 2/1 pick-up pattern, with a 2-layer

warp (complementary) structure as well as circles with a centrally-placed point or a horizontal line, thus resembling eye pupils. The latter type of decoration occurs in pairs within rhombi or hexagons, thus assuming a form of geometric representation of animal heads (Figure 10b). Only one specimen displayed a non-geometric design; a centrally-placed, vertical warp stripe employs a red, dichromatic representation of birds with long necks (Figure 5.1b). Producing such ornithomorphic decoration in a technique counted in the even 2/2 pick-up pattern, sometimes called “pebble weave” or *paris palla* (Arnold 2023:226; Desrosiers 1986; Heckman 2003), with a two warp layer (complementary) structure, similar to more complex geometric motifs, required the use of more advanced weaving techniques. To maintain the cohesion of the fabric a supplementary interlaced weft was introduced.

Due to such a great diversity of decorations included in type 1, we have been distinguished three additional groups of *chuspa* bags within it. Group 1 includes 17 coca bags decorated with multi-coloured vertical stripes, not accompanied by other iconographic motifs. Variant A of the decoration in this group includes regularly spaced and alternating linear motifs made of two colours (two stripes of one colour and a single stripe of another colour placed between them) of similar widths. Variant B includes regularly spaced stripes of diverse widths. Variant C contains stripes of different colours and widths, appearing regularly on both sides of the central, vertical warp stripe, in a manner that resembles a mirror symmetry. Variant D consists of colouristically diversified stripes arranged without any noticeable order (unlike variant A), which are made using two colours (two stripes of one colour and a single stripe of another colour placed between them).

Group 2 includes eight pouches decorated with stripes and other vertically arranged motifs: checked *k'uthu* pattern and *patapata* ladder design. Variant A contains *chuspas* decorated with a regular, alternating arrangement of vertical motifs consisting of stripes and other geometric figures made with one or two colours. In the case of variant B, the decorations have a form of colourful stripes and vertically arranged geometric figures appearing regularly on both sides of the central motif in mirror symmetry. Variant C of the discussed group includes irregular decorations consisting of multi-coloured stripes, simple motifs and vertical rows of geometric figures of various widths.

Group 3 includes six *chuspas* decorated with vertical stripes, accompanied by other, frequently more



Figure 8. Coca bags from the San Francisco cemetery – typological division of decorative motifs (photos by Jakub Wanot, elaborated by Nicole Lenkow).

Bolsas de coca del cementerio de San Francisco – tipología de los motivos decorativos (fotos de Jakub Wanot, elaboradas por Nicole Lenkow).



Figure 9. Macro photos of the cotton *chuspa* bags' warp-faced decoration in the form of vertical stripes and ladder design (photos by Jakub Wanot).

Macrofotografías de las chuspas en algodón con faz de urdimbre decoración en forma de rayas verticales y diseño de escalera (fotos de Jakub Wanot).



Figure 10. *Chuspa* bags from the San Francisco cemetery decorated with: (a) warp-faced vertical stripes and k'uthu design with an uneven warp count; (b) complementary-warp rhombi or hexagons assuming a form of geometric representations of animal heads; (c) warp-faced horizontal stripes (photos by Jakub Wanot).

Chuspas del cementerio de San Francisco decoradas con: (a) rayas verticales con faz de urdimbre y diseño k'uthu con conteo de urdimbre desigual; (b) rombos o hexágonos con urdimbre complementaria y forman representaciones geométricas de cabezas de animales; (c) rayas horizontales con faz de urdimbre (fotos de Jakub Wanot).

complex motifs: S-shaped figures, complementary-warp hexagons and rhomboidal figures as well as circles with a centrally-placed point or a horizontal line, thus resembling eye pupils, geometric representations of animal heads, ornithomorphic motifs etc. In the case of variant A, within the colourful vertical stripes relatively simple additional motifs, made in one colour and repeated over a larger part of the pouch, are observed. In variant B, additional decorations

appear on the surface of colourful vertical stripes or in the spaces between them, and the observed motifs are more complex and colourful, i.e., made using more than one colour.

The less common type 2 includes 22 *chuspas* (40% of the 55 specimens analysed) decorated with horizontal linear motifs, in which two subtypes are distinguished. In the first of them (11 specimens), the coca bags are decorated with a single, usually

centrally located, wide stripe. In the second subtype (also 11 examples), pouches are decorated with many horizontal stripes in one or – much less often – in many colours.

Within the first subtype, decorations were further divided into three groups. In group 1, consisting of five *chuspas*, a horizontal and wider stripe – sometimes accompanied by one or two much narrower stripes in pairs of the same colour in mirror symmetry – co-occurring with two bands of complementary-warp patterning (below and above the main stripe) creating S-shaped or zigzag motifs. In the case of variant A, the S-shaped figures were made in the same colour as the central stripe, while in variant B, these motifs were created with threads of a different colour than the central stripe.

A single warp stripe 1–3 cm wide is usually arranged horizontally and situated approximately in the middle of the pouch's length. This group includes two variants. One is a dark-brown/black warp stripe with a cream-coloured outline on the light-brown background of the bag's surface. The other is a light cream-coloured or white stripe on a dark brown background; additional decorations sometimes appear along the sides of the horizontal stripe in the form of S-shaped figures or zigzags woven using complementary-warp patterns. In this type of decoration, dyed yarns never appear; instead, yarns in natural shades were used. No more than three colours were ever used in all of the coca bags of the type in question. This stands in stark contrast to the next, multi-coloured type of pouch decoration.

In group 2 (five specimens), the wide stripe appears only in the company of additional, much narrower adjacent horizontal stripes (above and below), which are made in a different colour than the central motif. In the case of variant A, one pair of stripes in a different colour is adjacent to the central motif edges, while in variant B, two or more pairs of stripes in diverse colours adhere to the main motif. In group 3, to which only one bag was assigned, a wider stripe is accompanied by additional horizontal stripes, but they are made in the same colour as the central motif and do not touch it, but are noticeably distant (symmetrical from the top and the bottom).

Within the second subtype of type 2, the decorations were further divided into two groups. In group 1, consisting of nine specimens of the analysed artefacts, the *chuspas* are decorated with many regularly or irregularly spaced horizontal stripes in one colour (other than the background). These horizontally arranged warp motifs usually

employ two colours in the form of four or five red stripes on the cream-coloured or brown surfaces. In the case of variant A, four regularly spaced stripes of similar widths are observed, in variant B there are five regularly spaced stripes of similar widths, and in variant C four irregularly spaced stripes (two visible groupings) of different widths are observed. In the second group, to which only two specimens of pouches were assigned, warp horizontal motifs display colouristically diversified stripes from cotton and camelid fibre yarns of natural hues.

Discussion and Conclusions

Coca is an indigenous plant of South America and one of the oldest cultivated plants of this region, containing numerous alkaloid components. Its leaves have been a staple in the Andean lifestyle, beliefs, and rituals for thousands of years. During the Inca imperial expansion and conquest, coca leaves were not only very important but also had diversified uses. The Inca state established coca fields east and north of Cuzco, to cultivate their coca supply. Likewise, coca was extensively cultivated within the Pacific coastal valleys, at least during the Late Horizon (Murra 2002:262; Niles 2004:49–50; Valdez and Taboada 2016).

The great number of *chuspa* bags recorded in the Acarí culture burials from the San Francisco cemetery testifies to the vital significance of coca for the local community. A rise in the importance of coca during the Late Intermediate Period and the Late Horizon was related to the more extensive distribution of coca leaves on the Peruvian South Coast after the Wari decline (Sharratt 2014; Socha et al. 2022:10). Toxicological analysis of the buried individuals demonstrate that all the examined adults demonstrated high levels of consumption of coca. Even the samples taken from an infant showed a high benzoylecgonine—main metabolite of cocaine—value. The alkaloids were most probably introduced into the infant through maternal milk (Socha et al. 2022:10; Springfield et al. 1993:273).

At the same time, the number of these artefacts placed in the graves suggests that its purpose was not solely equipping the dead with the leaves, indispensable in the afterlife. We cannot forget that coca, playing an exceptionally significant role in the traditions of the central Andes, accompanied practically all religious ceremonies (Bewziuk et al. 2017:143; Sharratt 2014). Thus we should assume that the *chuspas* found in

individual contexts may have had a ritual character, while their number (see Figure 10c) was to highlight the high social position or the function of the dead. This explains why in some burials from San Francisco up to five richly decorated specimens were found. It is possible that coca bags in natural colours were rather utilitarian and intended for everyday use, while bags intended for ritual use were produced of dyed threads (Katterman 2007:226; Minkes 2005; Valdez and Taboada 2016; Wanot 2021:348).

Chuspa bags filled with coca leaves appear as funerary equipment for both children's and adults' burials within the San Francisco site (the sex of the individuals has not been determined up to date). It is worth mentioning, however, that at other archaeological sites in this region, such as Quebrada de la Vaca in the Chala valley, it was confirmed that pouches with coca leaves were found exclusively within male burials (Katterman 2007:227).

These artefacts were found within 21 funerary contexts of San Francisco (ca. 27% of the local burials). In the local inventories, both single specimens of coca bags and sets of four or five *chuspas* placed in a single burial were noted, constituting both the only offering accompanying the deceased person, or just one of the elements of rich grave goods. It was not possible to confirm that coca bags with a specific form or type of decoration were placed in the burials of individuals belonging to a specific age category (cf. Table 1). However, it was found that in most burials containing more than one *chuspa* bag (except for burial context no. 76), all pouches were assigned to the same type of decorations (cf. Figure 8), and the differences concerned only details.

Quite significantly, examination of the *chuspas* from the San Francisco site has confirmed that in terms of production technique the traditional Pre-Columbian warp-faced plain weave was the most

Table 2. Results of calibration of ^{14}C dates from the San Francisco cemetery (elaborated by Poznan Radiocarbon Laboratory).

Resultados de la calibración de las fechas ^{14}C del cementerio de San Francisco (elaborado por el Laboratorio de Radiocarbono de Poznan).

| Sample lab no. | Burial no. | Obtained ^{14}C age | Calibrated age of the sample | |
|----------------|------------|------------------------------|----------------------------------|-------------------------------|
| | | | IntCal13 (Reimer et al. 2013) | SHCal13 (Hogg et al. 2013) |
| Poz-118366 | 24 | 410 ± 30 BP | <u>Probability 68.2%</u> | <u>Probability 68.2%</u> |
| | | | 1441–1486 AD (68.2%) | 1458–1504 AD (45.4%) |
| | | | <u>Probability 95.4%</u> | 1590–1616 AD (22.8%) |
| | | | 1430–1522 AD (82.8%) | <u>Probability 95.4%</u> |
| | | | 1578–1583 AD (0.5%) | 1451–1517 AD (52.8%) |
| Poz-118367 | 41 | 360 ± 30 BP | 1591–1620 AD (12.1%) | 1539–1626 AD (42.6%) |
| | | | <u>Probability 68.2%</u> | <u>Probability 68.2%</u> |
| | | | 1466–1522 AD (37.4%) | 1504–1590 AD (60.2%) |
| | | | 1575–1625 AD (30.8%) | 1616–1627 AD (8.0%) |
| | | | <u>Probability 95.4%</u> | <u>Probability 95.4%</u> |
| Poz-118368 | 38 | 375 ± 30 BP | 1450–1530 AD (47.7%) | 1482–1642 AD (95.4%) |
| | | | 1540–1635 AD (47.7%) | |
| | | | <u>Probability 68.2%</u> | <u>Probability 68.2%</u> |
| | | | 1453–1516 AD (51.3%) | 1496–1516 AD (13.1%) |
| | | | 1597–1618 AD (16.9%) | 1541–1625 AD (55.1%) |
| Poz-118368 | 38 | 375 ± 30 BP | <u>Probability 95.4%</u> | <u>Probability 95.4%</u> |
| | | | 1446–1526 AD (58.2%) | 1464–1632 AD (95.4%) |
| | | | 1556–1633 AD (37.2%) | |

frequently used, and a number of the bags were produced using warp-patterned weaving – including complementary-warp weave (with an uneven warp count) – which certainly would be considered complex weaving. Microscopic analysis confirms there is no evidence of the use of the Panama weave (basketweave) variants of the plain weave, nor the techniques typical of Spanish textile products from the colonial era, such as folding and sewing together the edges of the fabric nor the presence of so-called *tornesol* or *tornasol* textiles made of camelid fibre warp and imported silk weft (Arnold 2023; Katterman 2007:219; Phipps 1996, 2000:221).

The most frequently encountered motif decorating the *chuspas* from the San Francisco cemetery, i.e. multi-coloured warp stripes, was also recorded on this type of artefact found at many other archaeological sites in the central Andes. The specimens with similar decorations were discovered in, e.g. the Pisco valley within the Central Coast (Peña 2017:317–318, 326), the contexts of the Estuquiña culture from the far south coast of Peru (Bürgi et al. 1989:351; Carmody 2019:28–29; Clark 1993), the region of Guayatayoc in north-western Argentina (Agüero Piwonka 2019:82) and in the Arica region in northern Chile (Carmona 1999:159; Paulinyi Horta 2018:33, 43). In the Caravelí province, similar *chuspas* decorated with multi-coloured warp stripes were recorded, for example, at the Quebrada de la Vaca cemetery in the Chala valley (cf. Katterman 2007:Figures 6 and 7). Analogous textile artefacts, however lacking information on their cultural context and provenance, can be found in many museum collections (Hughes 2010:151; Rowe 1995–1996:7, 30). They are usually dated to the Late Horizon and are connected with the period of the Tawantinsuyu Empire's expansion.

The connection between the textile materials from San Francisco and the Late Horizon is substantiated by the fact that the *chuspas*, similar in their form and use of colour as well as decorated with complementary-warp rhomboidal and hexagonal motifs, have been recorded at numerous Inca sites, such as within the Chancay valley (Rowe 1995–1996:8), the Cerro Esmeralda site in the Iquique region of northern Chile (Cereceda 2010:189), the Azapa 15 cemetery in Arica (Paulinyi Horta 2018:37–38), as well as the artefacts found in the graves of the victims of the *capacocha* ritual on the slopes of the Llullaillaco volcano in Argentina (Reinhard and Ceruti 2010; Gentile 2017:133, 141–143).

Decorative elements, such as colourful warp-patterned stripes or the ladder designs like *k'uthu* or *patapata*, should be interpreted as the fundamental indicator of the so-called Altiplano style (i.e., a provincial decorative tradition of textile products of the Late Horizon). We presume that it emerged in the high mountains – outside the epicenter of the Tawantinsuyu Empire – and, having been adopted by the Incas, it expanded towards the Peruvian coast (Carmona 1999:158–159; Hughes 2010:152–154; Gentile 2017:132; Paulinyi Horta 2018:29). However, in the context of the discussed area we should pay attention to a coca bag found by Valdez (2023:Figure 5) at the Vijoto site in the Acarí valley, which suggests that the ladder design, at least in a basic form, arrived at Caravelí province earlier, perhaps during the Middle Horizon (cf. Espejo and Arnold 2014:303).

In the iconography of the *chuspa* bags from San Francisco site, we can also observe motifs associated with the Inca Empire, such as the rhombus design or the so-called “Inca key” (*llave inca* or *inca andina*) pattern (Figure 5.1b), which consists of a thick diagonal line enclosed in a square that alternates in directionality to form a continuous zigzag pattern (Rowe 1979:248–251; Bray 2018:129).

Radiocarbon dating of three grave contexts from the San Francisco cemetery confirmed the conclusions concerning the chronology of the analyzed materials (Table 2). The analysis revealed a relatively broad date range. A piece of camelid fibre from grave no. 24 yielded the result of 410 ± 30 BP, which after calibration in the 2σ interval from the central value (95.4%) indicates the range between 1430–1522 AD. The dating of camelid fibre from grave no. 41 gave the result of 360 ± 30 BP, which after calibration determined a very broad range between 1450 and 1635 AD. The third sample, collected from the layer of cotton constituting a funeral bundle no. 38, yielded the result of 375 ± 30 BP (range of 1446–1526 AD). The obtained chronological ranges allowed us to conclude that the San Francisco cemetery in the Yauca valley functioned mainly between the second half of the 15th century and the third decade of the 16th century, i.e., during the Late Horizon (1438–1532 AD).

A variety of *chuspas* woven in warp-faced plain weave, recorded in the contexts of San Francisco may suggest that this cemetery was a multi-ethnic burial area. Analysing the decorations in detail, we can distinguish local-style (Acarí) Late Horizon pouches (Figure 8, type 1/1), *chuspas* (Figure 5,

group 4) similar to coca bags found at the Inca site of Tambo Viejo in the Acarí valley (Valdez and Bettcher 2023:Figure 21), provincial highland style wares, as well as the hybrid *chuspa* bags (Figure 5.1b) combining probably local components and Inca elements (or *Acarí-Inca*), like aforementioned “Inca key” pattern. It is also undoubtedly an interesting issue that accessory items such as coca bags have acquired a kind of importance during the Late Horizon, turning into objects that fuse styles and becoming a significant part of the local visual communication system.

In this context, simple *chuspas* in natural colours decorated with a single warp-patterned stripe arranged horizontally are the most typical of the Acarí culture area. Artefacts of this type have not been recorded, for example, at the nearby Quebrada de la Vaca site in the Chala valley (cf. Katterman 2007; Menzel and Riddell 1986a). Additional research is certainly needed to confirm whether the coca bags from the San Francisco site were made locally or rather represent different weaving traditions outside of the area in question and whether their occurrence could be related to the intensification of trade with the highland communities under Inca rule or migration of human groups during the Late Horizon.

When analysing local branches of craft production, we can conclude that, mainly in the case of textile specimens, the influence of the Tawantinsuyu is noticeable. But overall, interference from the Inca state was rather insignificant. This may be due to the fact, that weaving was subject to additional regulations or restrictions resulting from the nature of Inca imperial control over the region in question (cf. Costin 1998; Meddens and Schreiber 2010). It is implied that the Inca *mit'a* system – a reciprocal labour rotating system – probably functioned within the Acarí valley, and was organizing the weaving of textiles, their collection, and storage. Some sources suggest that people from the Acarí valley continued to pay tax in the form of cotton textiles during the Early Colonial Period (Cook 1975:249–251; Katterman and Riddell 1994:149).

It is also important to note that ethnohistorical references suggest that the populations of the southern valleys of Peru, namely Ica, Nasca, and from Acarí to Ocoña, were closely connected during the Late Horizon. It is assumed that *ayllus* (Andean corporate descent groups) originating from Nasca used agricultural areas not only in the Río Grande de Nasca drainage, but also in the Ica and Acarí valleys. Probably members of one *ayllu* were also

spread across different settlements in various valleys between Ica and Acarí, and they likely visited their relatives regularly. This high mobility of local populations in the valleys of the South Coast should have inevitably left its mark in the archaeological record. It is possible, that the diversity of bag types from the San Francisco site is an archaeological correlate of this phenomenon (Espinoza Soriano 1976; Rostworowski de Diez Canseco 1982; Siveroni 2017:299, 2022, 2024:312–313).

It is especially worth emphasizing that the examined cultural contexts from the San Francisco cemetery did not contain any pottery in forms inseparably inherent to the period of Inca rule, e.g. aríbalos, keros as well as characteristic plates with domed bottoms (Bray 2003:13; Valdez et al. 2014:238). All ceramic wares registered within the site should be described as the Late Acarí pottery style (Wanot 2019:293, 2021:366–369). It is also striking that no funerary bundles formed in the typical Inca manner were found in the cemetery, especially those fastened with metal pins *tupus* (Acuto 2008; Murra 1962:719; Rowe 1995–1996:22).

This may prove that the influence of the Tawantinsuyu Empire’s material culture on the local communities from the Caravelí province – apart from the establishment of administrative centres like Tambo Viejo (Acarí valley) or Tambo de Jaqui (Yaca valley), as well as production centres such as Quebrada de la Vaca (Chala valley), in areas that had not previously been subject to centralized administration – was quite limited or fairly ephemeral (Dransart 2020:142; Menzel 1959:128; Valdez 2000, 2018:11, 2022; Valdez and Bettcher 2023; Valdez et al. 2020:1571). It is also possible that the cultural influences reaching the Caravelí region after it had been incorporated into the state administration of the Inca Empire were limited to specific branches of crafts.

It is worth emphasizing, however, that – apart from brief rescue archaeological research carried out in the San Francisco cemetery – no professional archaeological studies has ever been carried out in the Yauca valley. It would be reckless to draw far-reaching conclusions – e.g. regarding the relations between the Inca Empire and the local communities of the Yauca valley at the turn of the Late Intermediate Period and the Late Horizon – based on such a limited amount of data. Undoubtedly, only long-term and interdisciplinary archaeological research carried out within the Yauca valley catchment area could allow for the reconstruction of complex cultural processes

that took place in this area in the past and their comparison with analogous social transformations and other phenomena that took place in neighbouring valleys, such as Acarí or Chala.

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