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Pucara Hilltop Settlements in the Lupaca and Pacajes Territories, Southern Andean Altiplano, during the Late Intermediate Period (AD 1000–1450)

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Abstract

The quantity of archaeological data for the fortified hilltop settlements of the Late Intermediate period on the Andean altiplano, called pucarás, varies greatly. Some areas, such as the territory of the Colla Aymara chiefdom east of Lake Titicaca, are well documented thanks to recent and exhaustive research. Other areas, such as the territories of the Lupacas and the Pacajes, are much less documented. From comparative spatial analyses of satellite images from these two territories, we obtained new data on pucarás, whose characteristics seem to differ from those proposed in the archaeological literature. Through a combination of fieldwork and spatial analysis of 295 pucarás, we identified 252 unpublished sites and propose a new typology comprising four categories. Based on ethnohistoric data and the results of the architectural and geographical analyses, we discuss the possible motivations for building so many pucarás; we suggest that some reasons are of a symbolic nature.

Resumen

Los datos arqueológicos sobre los pucarás o asentamientos fortificados ubicados sobre cimas de cerros abruptos en el altiplano andino del período Intermedio Tardío, son muy diversos. Algunas zonas están bien documentadas, como el territorio del señorío aimara Colla al este del lago Titicaca, gracias a recientes y exhaustivas investigaciones. Pero otras zonas, como los territorios de Lupacas y Pacajes, lo están mucho menos. En este trabajo se presentan nuevos datos para ambos territorios, a partir de análisis comparativos de imágenes satelitales, cuyas características parecen ser diferentes a las que se describen en la literatura arqueológica. Combinando trabajo de campo y análisis espacial de 295 pucarás, se identificó un total de 252 sitios inéditos, y se propone una nueva tipología compuesta por cuatro categorías. Con base en esta data, discutimos las posibles necesidades que motivaron a las poblaciones lupacas y Pacajes a construir tantos pucarás. Según los datos etnohistóricos y los resultados de los análisis arquitectónicos y geográficos, creemos que algunas de estas razones son de carácter simbólico.

Keywords: South central Andes; altiplano; Late Intermediate period; fortifications; pucara; Aymara polities; spatial analysis; remote sensing; sacred mountains

Palabras clave: Andes centro sur; altiplano; periodo Intermedio Tardío; fortificaciones; pucara; señoríos aimaras; análisis espaciales; teleinterpretación; montañas sagradas

Before the Late Horizon (AD 1450–1532), the Late Intermediate period (LIP; AD 1100–1450) saw the emergence of powerful Aymara polities around the Titicaca Andean altiplano. The Collas, Lupacas, Pacajes, and the Carangas farther south took over the vast and rich territory of the Andean altiplano after the fall of the Tiwanaku culture (Bouysson-Bardet 1978; Hyslop 1976; Michel López 2000; Rydén 1947; Stanish et al. 1997; Villanueva 2013). This unique space in the Andes, which peaks at an average altitude of more than 4,000 m asl, made a deep impression on the first conquistadors, who described

this region as one of the most important centers of human occupation in the Andes (Cieza de León 1984 [1553]:272).

Given that it was at the crossroads of archaeology and ethnohistory, the LIP was frequently described by Spanish chroniclers. Guaman Poma de Ayala (1980 [1615]:64), one of the most eloquent about this period, calls it *Auca Runa*, meaning “the time of war” or “the age of warriors.” Most chroniclers portray a period that was plagued by incessant conflict and was politically divided, as Andean territory was fragmented into a multitude of *señorios* (Cieza de León 1984 [1553]:354; Santillán 1968 [1563]:104). These same chroniclers state that during attacks the populations took refuge in pucararas, fortresses built throughout the Andean territory (Álvarez Larrain and Greco 2018; Housse 2013, 2021; Ruiz and Albeck 1997). The term “pucara” is translated in the main dictionaries—Quechua (Holguín 1989 [1608]:197) and Aymara (Bertonio 2011 [1612]:430)—as “forts, fortresses, or castles.” In addition to these undeniably westernized definitions, we can add the slightly more neutral definition of Santo Tomás (2003 [1560]:18, 162) of pucararas as “walls or barriers.”

In the region of Lake Titicaca, the existence of various chiefdoms and the presence of these numerous pucararas seem to archaeologically corroborate the accounts of the chroniclers. The LIP is therefore considered to be a period of great political instability following the fall of Tiwanaku (Albarracín-Jordán 1996a; Covey 2012; Janusek 2005) and of profound climatic change that affected the Andes between the ninth and eleventh centuries (Abbott et al. 1997; Chepstow-Lusty et al. 2009; Delaere 2016; Shimada et al. 1991; Thompson and Moseley-Thompson 1987; Thompson et al. 1984, 1985). Old sites were abandoned and settlements were scattered, apparently far from the bottom of the valleys and from agricultural areas (Albarracín Jordán 1996a; Stanish et al. 1997). Although most of the population must have lived in small hamlets, which are difficult to recognize archaeologically, some villages were built on top of the mountains and often had what appear to be defensive enclosures. Within the sites, no ceremonial, public, or religious architecture can be observed (Arkush 2011; Frye and de la Vega 2005; Hyslop 1976; Stanish et al. 1997). Some archaeologists speak of a widespread impoverishment of the Andes during this period (Núñez 1991:61). Others question the role and presence of elites, arguing that the simplification of construction techniques should be accompanied by simplification of the social hierarchy (Arkush and Ikehara 2019; DeMarrais et al. 1996; Earle 1997).

The archaeological study of pucararas raises several issues. First, there is the question of dating them. Arkush (2011:26), following her study of the Collas pucararas, was able to refine the chronological contours of the study period based on new dating carried out to the west of the lake. Her results suggest the existence of a subdivision of the LIP around AD 1300, before which populations did not usually build, live, or protect themselves inside the pucararas (Arkush 2011:185; 2012:301). This pivotal period also seems to be found in other Andean regions (Covey 2012:302; D’Altroy and Hastorf 2001:39; Housse 2021:355–356; Nielsen 2002:180). Of all the sites discovered by Arkush (2011:232–233) that could be dated, only three predate the fourteenth century. Thus, the settlement patterns of the altiplano populations during this first phase of the LIP remain little known.

In addition, the functional interpretation of pucara-type settlements is also widely debated. Indeed, archaeologists have wondered about the link to and the role of these sites in the possible Andean conflicts in pre-Inca times (Nielsen 2015:3; Parsons et al. 2013:50). These sites served several functions, including symbolic, defensive, storage, and residential purposes: pucararas on the altiplano cannot be reduced to a simple dichotomy between fortresses or not fortresses. These issues have been debated in recent studies on this topic (Albeck et al. 2018; Anderson 2014; Arkush 2011; Housse 2021; Ikehara and Arkush 2018; Kellett 2010; Kohut 2016; Nielsen 2018). We suggest that using a combined architectural and spatial approach can enable us to better identify the various functions fulfilled by these pucararas. This article’s comparative study of sites in the Lupaca and Pacajes territories provides new perspectives on these functions, as we propose new criteria and a new typology for their characterization and redefinition.

Previous Studies of Pucararas

Mentioned many times by the Spanish chroniclers, the pucararas were studied by the first archaeologists to explore the altiplano at the beginning of the twentieth century (Bandelier 1910); however, they did

not offer precise definitions for those structures. It was not until the middle of the twentieth century that pioneering work was carried out: during his excavations at the site of Pucara Khonkho, Ryden (1947:286, 327) identified a pucara, simply translating it as “fortress,” and Tschopik (1951) did extensive studies of the Aymara populations.

The first complete study of these hilltop sites took place in the 1970s with Hyslop’s (1976) surveys. His objective was to produce an archaeological map of the Lupaca territory, particularly for the late periods (Figure 1). Hyslop (1977:218–219) defined pucaros as having these major features: the existence of large enclosures, the presence of domestic structures and empty spaces (often considered as central places), and the use of natural topographical elements as protection. His surveys have been one of the most important contributions of archaeological knowledge to the Lupaca zone, although he acknowledges that systematic surveys would have led to the discovery of “many more of these sites” (Hyslop 1976:110).

Charles Stanish and his team took over Hyslop’s work during the 1990s. They demonstrated the great diversity in size and probable functions of pucara-type sites on the altiplano (Stanish 2003:209; Stanish et al. 1997:25). Stanish and his team selected vast areas along the lake (Figure 1) in which they carried out systematic surveys, with excavations of some of the major sites, such as the pucaros Juli or Llaquepa; these excavations made it possible to document the uses of these pucaros (Frye 1997; Frye and de la Vega 2005; Stanish et al. 1993, 2005). This work also led to the discovery of several new pucara-type settlements and to the observation of a dispersed pattern of occupation in the LIP, in which residential structures were occupied sporadically and functioned in a network (de la Vega 1990). On the Bolivian side, several archaeological studies used methods similar to those of Stanish, notably Albarracín-Jordán (1996a, 1996b) and Janusek (2003, 2004) in the Tiwanaku region. However, because most of these intensively studied areas were in the river valleys, far from the heights where the pucaros are located, some archaeologists considered the Pacajes territory to be almost devoid of pucaros. Arkush (2011:52–53), based on the work of Albarracín-Jordán and Matthews (1990:279),

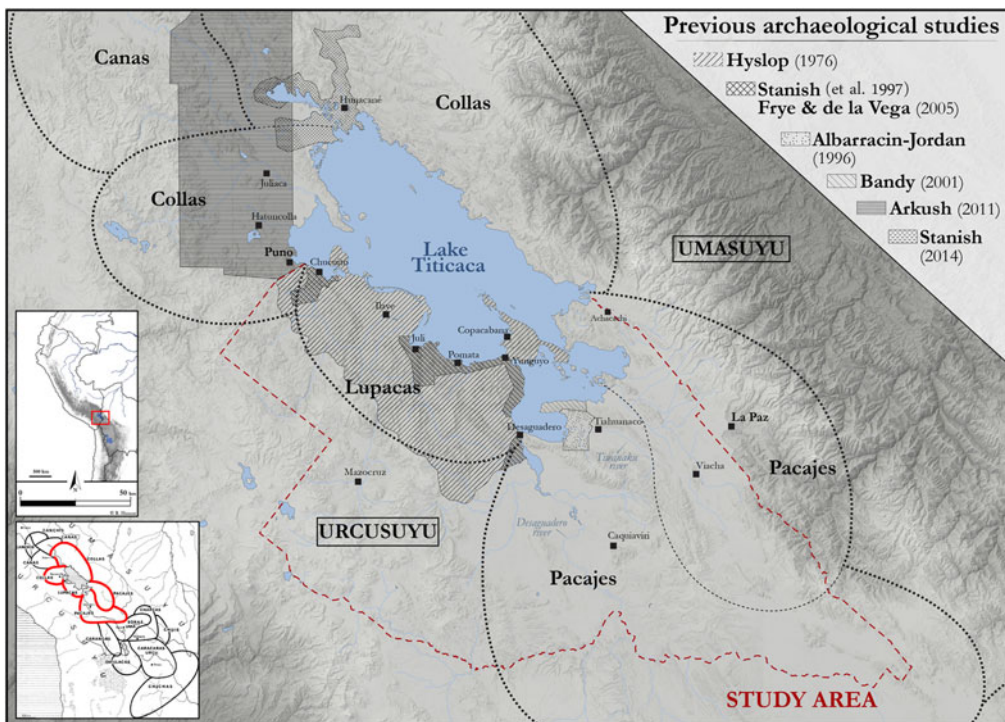


Figure 1. Map of the main previous archaeological research carried out on the Aymara divisions of the circum-Titicaca altiplano (Bouysse Cassagne 1978) and delineation of the present study area.

states, “There is only limited fortification in the Pacajes area of the southeastern basin, with one refuge pukara (with bola stones) in the Tiwanaku river valley.” In the Pacajes area, only five pucarás are identified in the archaeological literature (see Bandy 2001; Villanueva 2015; Zovar 2012).

The work of Elizabeth Arkush in the Colla territory, northwest of the Lake Titicaca basin, has recently yielded more archaeological data of the pucarás. Arkush carried out systematic aerial surveys and drew up an important archaeological map, showing for the first time how numerous and evenly distributed these hilltop settlements are across the Colla territory. Her exhaustive work (2008, 2011) supports the conclusions of previous research on the quantity of fortified settlements on the shores of Lake Titicaca (Stanish 2003) and their organization in a network (de la Vega 1990; Frye and de la Vega 2005). The use of computer techniques for the survey phases and to analyze settlement patterns has highlighted the importance of intervisibility between the pucarás. GIS analyses also show the division of the territory into several subgroups (Arkush 2011). Arkush’s works “I against My Brother” (2014) and “Pukara de los Collas: Guerra y Poder” (2012) have profoundly altered the monolithic image we had of Aymara chiefdoms and have renewed interest in these Andean settlements (Álvarez Larrain and Greco 2018; Anderson 2014; Arkush and Ikehara 2019; Housse 2021; Kohut 2016; Mouquet 2019; Villanueva 2015; Zovar 2012).

These studies have yielded a more nuanced view of the functions of pucarás, going beyond defensive purposes. A fortress can be defined using many criteria (Bischof 2005; Chamussy 2009; Haas 1999; Keeley 1996; Nielsen 2003; Topic and Topic 1987). We use the following definition in our study: a fortress is (1) a site built in a strategic location that is (2) fully protected by a defensive system, whether natural or anthropic, and (3) may or may not have internal structures. If one of the first two criteria is not met, we consider the site to be a defensive settlement and not a fortress. This distinction between defensive and fortified sites is essential because, even if all settlements built on hilltop locations can serve a strategic and defensive function, those that lack walls or natural protections cannot be fortresses. This differentiation was first proposed in the Colca Valley (Arequipa) by Kohut (2016) and then more widely developed in the thesis work of Housse (2021).

Methodology

We set the boundaries of our study area based on archaeological and ethnohistorical data (Capoche 1959 [1589]:136) for the recognized territories of the Lupacas and the Pacajes (Figure 1). To the east, in the Pacajes territory, the boundaries correspond to the Tiwanaku River basin and the plain of the Desaguadero River, bordered by the river to the south (Bouysse Cassagne 1978; Villanueva 2013:26). To the north, in the absence of a share in the *Uma* for the Lupaca chiefdom (Bouysse Cassagne 1978), the boundaries correspond to the southern shores of the lake (including the various islands). To the west the boundaries correspond to the border area between the Lupaca and Colla territories (between Puno and Chucuito).

To carry out a study of this size, it is necessary to set up a rigorous methodological framework, developed and tested by previous relevant research. Our work is largely inspired by the approaches implemented in the Tacna and Arica precordillera (Housse and Huaman Oros 2016; Saintenoy et al. 2016), especially on the shores of Lake Titicaca (Arkush 2008, 2011; Housse 2021; Mouquet 2019). It proceeded in four phases: documentary research of historical and geographical data, inventory of the archaeological evidence, computer analysis of remote imaging of summit sites, and targeted field visits.

The third phase was not only the most important but also the most ambitious one. Satellite images covered an area of about 32,000 km². We relied most on the Digital Globe images of NASA (Housse 2021:176–177). These images enabled us to identify 252 new hilltop settlements absent from the archaeological literature (some of these sites were observed in the Pacajes area by Cruz and Joffre [2020] but were not described or studied). Finally, the field observation of a dozen sites, either identified by remote analysis or poorly documented by archaeology, made it possible to verify the soundness of our corpus and of the recording criteria. We also developed a simple but comprehensive registration method for all hilltop settlements. Because some architectural characteristics could not be determined solely by aerial images, we set up three levels of reading of the same anomaly observed

on the images. These three levels enabled us to devise a “reliability index” (Figure 2) ranging from 1 to 3, indicating the number of criteria identified:

- (1) Identification of the topographical reliefs (summit, plateau, spur, etc.) and their intrinsic defensive qualities (slopes, rocks, cliffs, etc.) leading to their selection as an archaeological site of the pucara-type
- (2) Identification of visible human-made fortifications (walls, ditches, bastion, concentric terraces, etc.) and the possible presence of additional facilities (shape of accesses, presence of parapets, etc.)
- (3) Recognition of internal structures, if any

The listed archaeological settlements were divided into five categories according to their total area (i.e., the entire space included within the enclosures or by the natural defenses of the site): very small settlements, pucarás smaller than 1 ha ($n = 15$); small settlements, pucarás 1–5 ha ($n = 98$); medium-sized settlements, pucarás 5–10 ha ($n = 81$); large settlements, pucarás 10–15 ha ($n = 49$); and very large settlements, pucarás greater than 20 ha ($n = 52$). Our approach compared the overall footprints of every site based on the number of structures and the surface area of the inhabited (or constructed) space, without considering their likely functions. We thus avoided characterizing the “empty” sites found in previous archaeological studies as a “refuge” (Arkush 2011:145; Stanish et al. 1997:57). These earlier studies recognize that these settlements often served ceremonial functions that continued from the colonial era to the present day (Arkush 2011:84, 135; Stanish et al. 1997:82).

In addition to this classification by size, we proposed a second typology comprising four categories based on the residential function of the site (with internal domestic structures) or its probable non-residential function (without visible construction inside the enclosures) and whether the sites were fortified or defensive. These four categories are residential fortified (RF), residential defensive (RD), nonresidential fortified (NRF), and nonresidential defensive (NRD). Our study identified 323

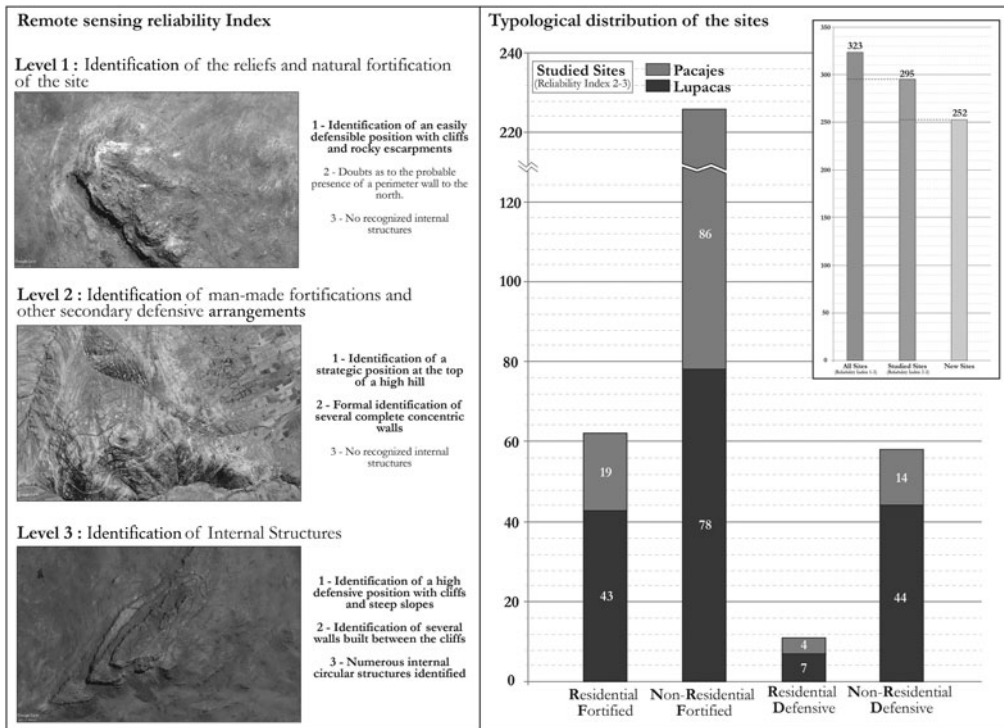


Figure 2. Schematic of the reliability index.

pucara-type settlements, but only 295 had a reliability index greater than 2; therefore, our database includes 295 settlements (Figure 3).

Study Results

The sites are unevenly distributed in the study area (Figure 4), with a clear concentration in the immediate vicinity of the shores of Lake Titicaca or along the main waterways—locations that enabled access to and control of arable land (Arkush 2011:109; Zovar 2012:155). Isolated sites, far from arable land, could reflect the presence of semi-nomadic pastoralist populations who set up settlements close to grazing areas where they could find refuge in case of attack (Housse 2021:462).

More than three-quarters of the sites (nearly 77.6%) are fortified: 226 NRFs and RFs compared to 69 NRDs and RDs (Figure 2). We also identified more than 940 enclosures, indicating the high density of walls built within these settlements. However, many pucarás have no or few walls; when the site is built on top of a mesa (or *tanga* in Aymara: a volcanic plateau), enclosures are not necessary because of the landscape's natural protections. In contrast, some settlements located on low topographical prominences have multiple peripheral enclosures (Figure 5). One of the most noteworthy features of our corpus is the overrepresentation of empty settlements without any obvious internal structures but that are fully fortified (164 NRF sites = 55.6%).

Characteristics of Residential Fortified Sites

The RF sites correspond to the typical image of the fortified villages of the LIP and therefore to the very idea of a pucara. We identified 60 fortified villages built on the tops of mountains, surrounded by one or more walls to protect the site; access to some is extremely difficult. The residential structures are exclusively circular in shape in both territories. However, several models of occupation can be identified; for example, there are residential terraces in L011-Quentorani and closed patios at sites L062-Nuñamarca and L043-Ayuncora (Figure 6).

RF sites have a wide variety of settlement patterns. Many villages are built on the top of volcanic plateaus, including sites L062-Nuñamarca, L061-Cutimbo, L123-Orochillame, and L060-Kapalla. Although this siting seems more common in the Lupaca area where there are more mesas than on the Bolivian side, the P102-Jachaphasa site is located at the top of a mesa but with only chullpas within it (Kesseli and Pärssinen 2005:397). Constructing villages at the top of these plateaus offered very good natural protection because unassailable cliffs protected almost the entire perimeter of the sites. Other villages are built on the top of mountains, with their flanks partly protected by steep slopes or cliffs and then completed by enclosures (such as P045-Calvario Colquencha, L011-Quentorani, and L005-Tanka Tanka). There are also large RF sites located in areas with few natural fortifications. In this case, concentric walls encircle the mountain. This pattern, exemplified by L078-Pucara Juli, is widely documented (de la Vega 1990; Frye 1997; Frye and de la Vega 2005; Hyslop 1976; Stanish et al. 1993) and can also be

RELIABILITY INDEX (R.I.)					
Typological distribution and percentage					
R.I.	NRF	NRD	RF	RD	TOTAL
ALL SITES					
1	26 (8,05 %)	21 (6,30 %)	2 (0,62 %)	2 (0,62 %)	51 (15,79 %)
2	82 (25,39 %)	44 (13,62 %)	17 (5,26 %)	7 (2,17 %)	150 (46,44 %)
3	69 (21,36 %)	6 (1,86 %)	45 (13,93 %)	2 (0,62 %)	122 (37,77 %)
TOTAL ALL SITES	177 (54,80 %)	71 (21,98 %)	64 (19,81 %)	11 (3,41 %)	323 (100 %)
LUPACA SITES					
1	8 (4,30 %)	13 (6,99 %)	1 (0,54 %)	1 (0,54 %)	23 (12,37 %)
2	39 (20,97 %)	36 (19,35 %)	15 (8,06 %)	5 (2,69 %)	95 (51,08 %)
3	34 (18,28 %)	5 (2,69 %)	28 (15,03 %)	1 (0,54 %)	68 (36,36 %)
TOTAL LUPACA	81 (43,55 %)	54 (29,03 %)	44 (23,66 %)	7 (3,76 %)	186 (100 %)
PACAJES SITES					
1	18 (13,14 %)	8 (5,84 %)	1 (0,73 %)	1 (0,73 %)	28 (20,44 %)
2	43 (31,39 %)	8 (5,84 %)	2 (1,46 %)	2 (1,46 %)	55 (40,11 %)
3	35 (25,55 %)	1 (0,73 %)	17 (12,41 %)	1 (0,73 %)	54 (39,42 %)
TOTAL PACAJES	96 (70,07 %)	17 (12,41 %)	20 (14,60 %)	4 (2,92 %)	137 (100 %)

Figure 3. Typological distribution and percentage of the reliability index.

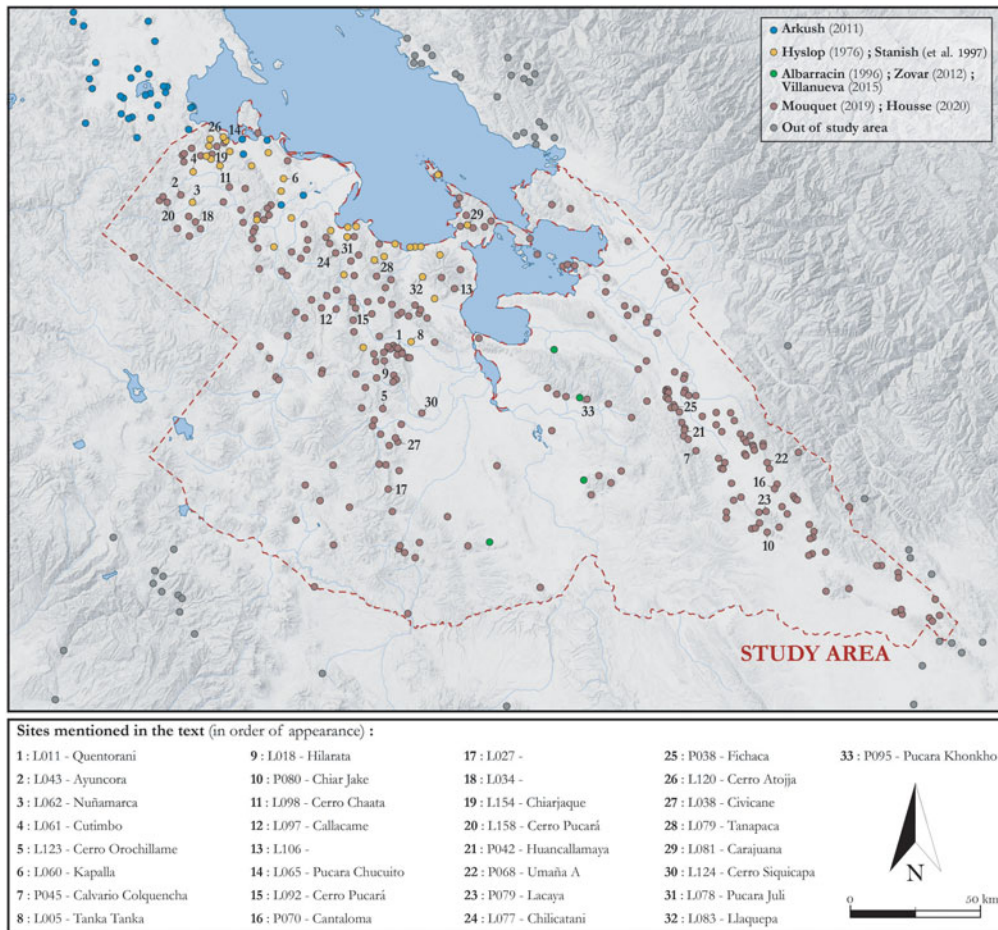


Figure 4. Location of the sites. (Color online)

observed at L094-Callaspucara and P073. In some cases, settlement structures are interspersed between the fortified walls, leaving the tops of the hill empty of structures. Although such patterns may reflect population aggregation in times of crisis within fortified villages (Arkush 2017:9; Birch 2010:42), the absence of structures on the summit of Pucara Juli, for example, seems to indicate instead a willingness on the part of the builders not to occupy the summit (Frye and de la Vega 2005). Some very large sites contain few residential structures, such as L094-Callaspucara, where most of the domestic constructions are located outside the walls. Even its smallest structures, potentially used for storage purposes, are not protected by the defensive system. In this case, we can posit either that there was a later occupation of the outskirts or that the large population of this village proved sufficient to discourage any attacks (Figure 7).

Finally, the number of walls and their organization around a residential village can also vary greatly. Therefore, when the defensive system combines cliffs and walls, the latter tend to have a rectilinear profile and to be built parallel to each other, as at L018-Hilarata or P080-Chiar Jake. For sites located on mesas, the walls often extend only a short distance, being built between the cliffs at the most vulnerable points; yet in some cases concentric walls surround the entire plateau (e.g., L098-Cerro Chaata, L123-Cerro Orochillame, or L097). Villages located at the top of conical reliefs may have as many as 10 concentric walls (e.g., P080-Huancarani).

Characteristics of Residential Defensive Sites

We identified only 11 sites as defensive residential sites (RDs): these have an incomplete defensive system that only protects a portion of the settlement. The internal domestic structures of these settlements

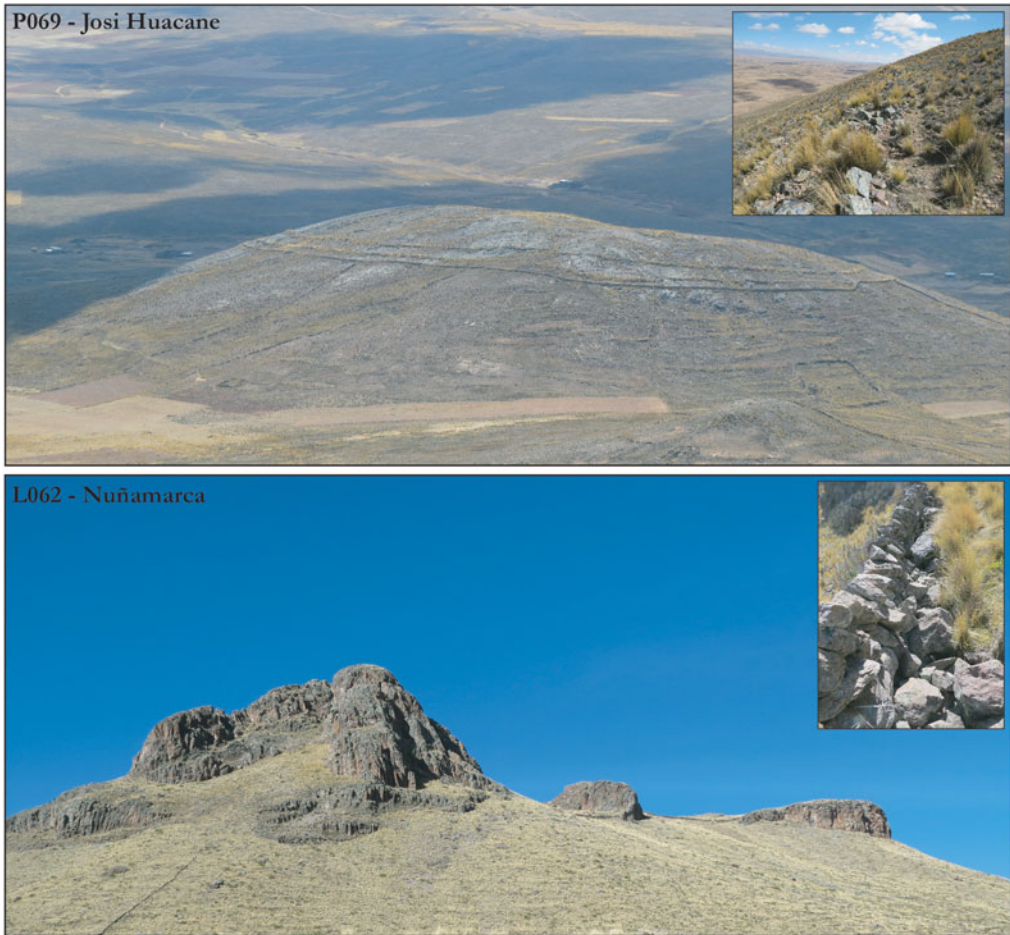


Figure 5. Views of two pucara-type settlements. (Color online)

are similar to those described for RF sites. In most cases, these villages are built on top of conical hills and are easily accessible. In only one case, L046-Isla Quijata, is the village built on top of a small volcanic plateau and lacks built fortifications. Stanish and others (1997:92) nevertheless consider it to be in a very favorable position, because its surrounding cliffs and insular position make it both highly strategic and easily defended. Nevertheless, the work of Delaere and others (2019) on the evolution of the lake level seems to indicate that the site would not have benefited from this insular advantage during the LIP.

The construction of RD villages may reflect different decisions made by the inhabitants. In fact, we may assume from the presence of walls on only one part of a site that only this access point was once considered vulnerable and needed to be protected (as may have been the case on the L065-Pucara Chucuito site). It is also possible that the purpose of these constructions was to mark the main access points to the site, thus physically manifesting the boundaries of the village on the landscape. Generally, the RD sites represent the least imposing settlements in our corpus in terms of size, altitude, and the number of internal residential structures and of walls, with an average of three defensive walls per site.

Characteristics of Nonresidential Fortified Sites

NRF sites may correspond to the sites defined as “pucas minors or refuges” (Stanish 2003:209; Stanish et al. 1997:57), which provided temporary protection to populations regularly threatened by

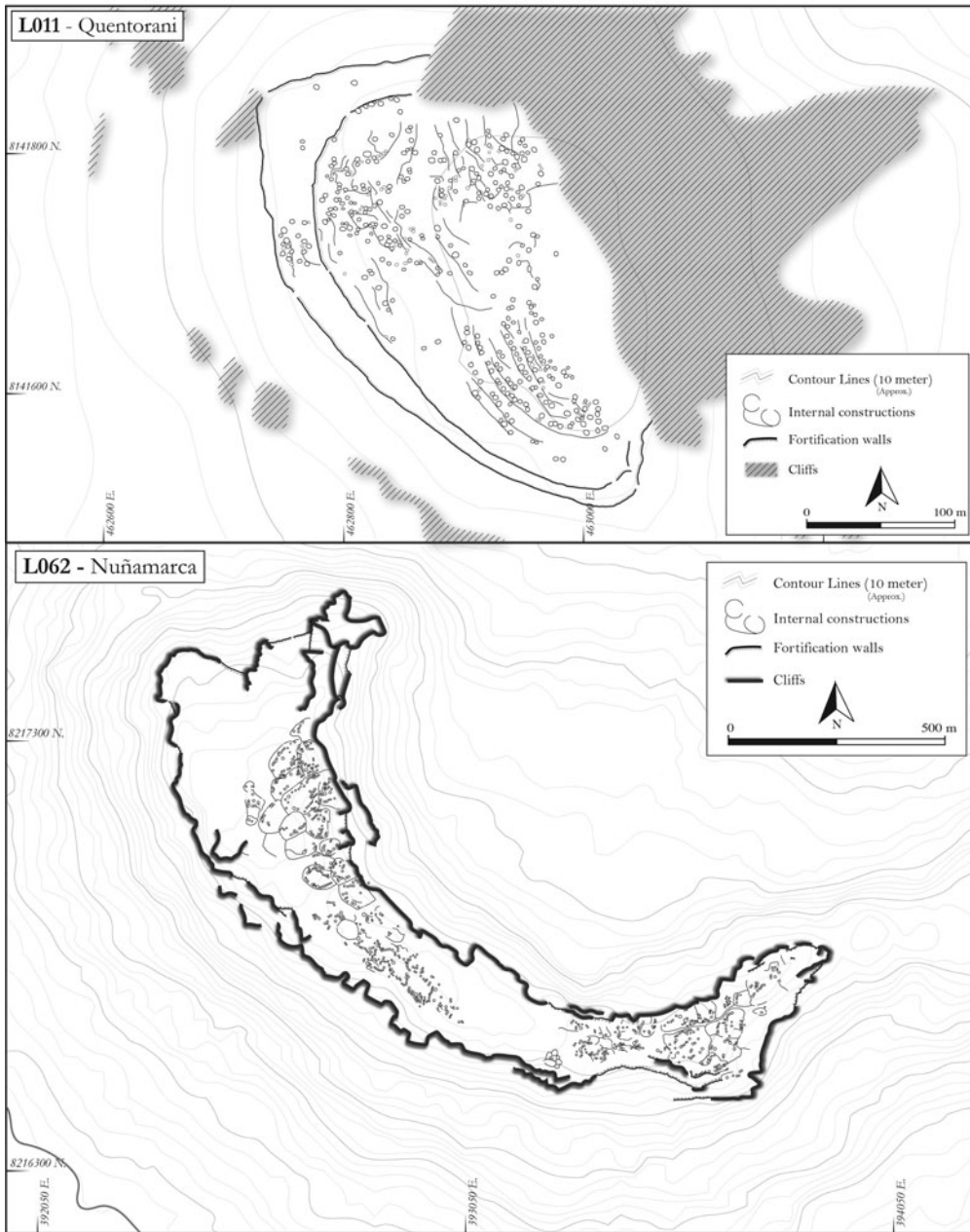


Figure 6. Maps of L011-Quentorani and L062-Nuñamarca.

enemy incursions. As can be expected with such a large database, there is a great diversity of NRF settlements. Some sites have massive fortifications and would be considered “major pucarás,” but they lack residential elements.

This is particularly the case of L092-Cerro Pucará, which does not have any structures large enough to be interpreted as residential spaces (Figure 8). Yet its seven walls make this pucara-type settlement one of the most heavily fortified in our corpus. The layout of the walls and the presence of staggered access points probably reflect sophisticated defensive strategies, devised by the builders to protect the summit where the most vulnerable members would have taken refuge. As observed farther north in the

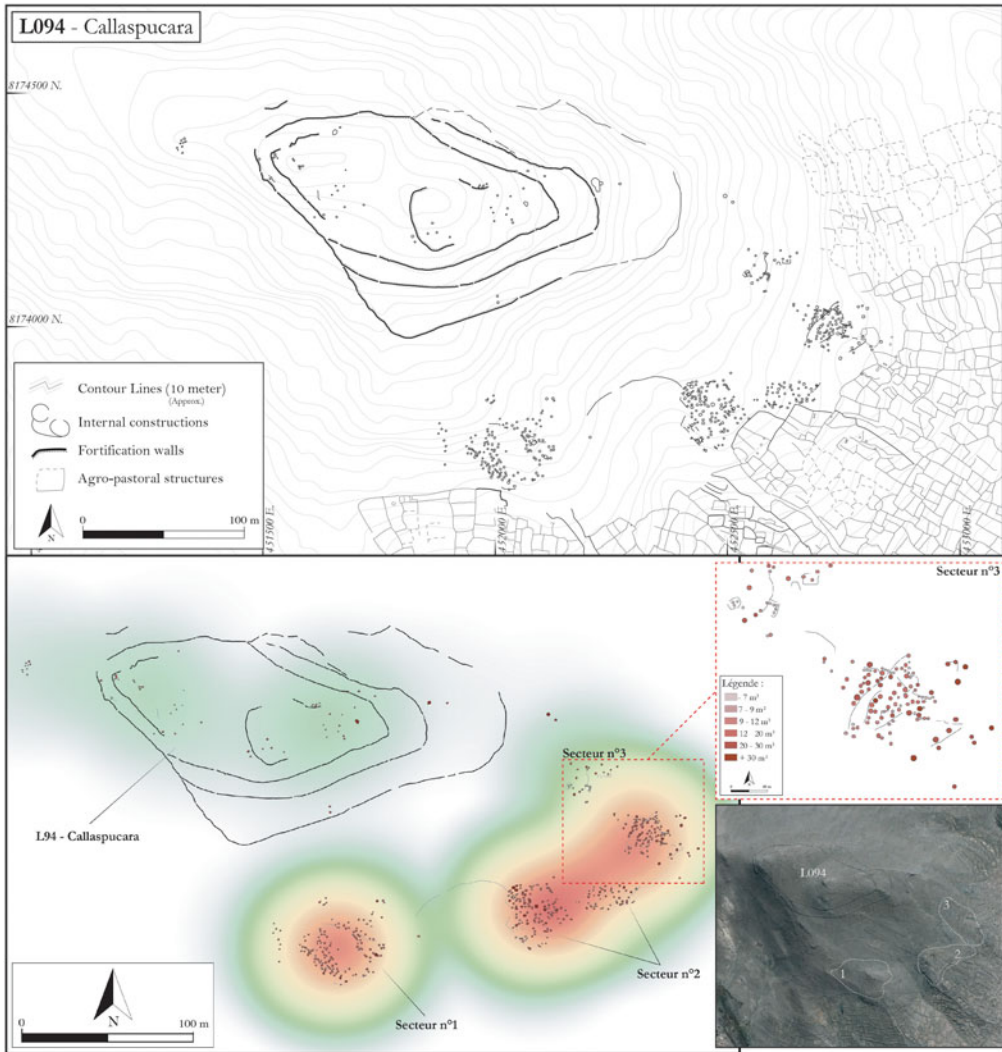


Figure 7. Maps of L094-Callaspucara showing the structure density. (Color online)

Colla area, the presence of agricultural terraces on the steepest flanks of the mountain may also reflect a defensive strategy that greatly slowed the progress of the attackers (Langlie 2018:2).

However, not all sites have such defensive features, and a large percentage of the NRF settlements in our corpus are actually very small sites of only a few hectares, surrounded by one or two walls at most. These ones are found most frequently in the Pacajes area where we can observe extensive concentrated areas of NRF sites, extremely close to one another. In several field visits, we noted the irregular height and thickness of some walls. At P070-Cantalloma, a massive wall with a maximum height of 1.5 m protects the southern access; yet to the north of the site, the height of the wall gradually decreases to only 50 cm. The absence of visibly demolished blocks to the north of the site leads us to conclude that the wall was not damaged in this sector. In addition, the site is encircled by a single enclosure that is 5,100 m long, which winds around itself three times (Figure 9). This wall is interrupted only on its western part, where it seems to have been disturbed and partially duplicates itself at the level of the intermediate wall. To our knowledge, this very peculiar shape has never been documented in the altiplano for pucara-type sites (Housse 2021:511–513). We identified this “caracol” pattern in nine settlements in our study area (L027, L034, L096, L154, L158, P042, P068, P070, and P079; Figure 9).

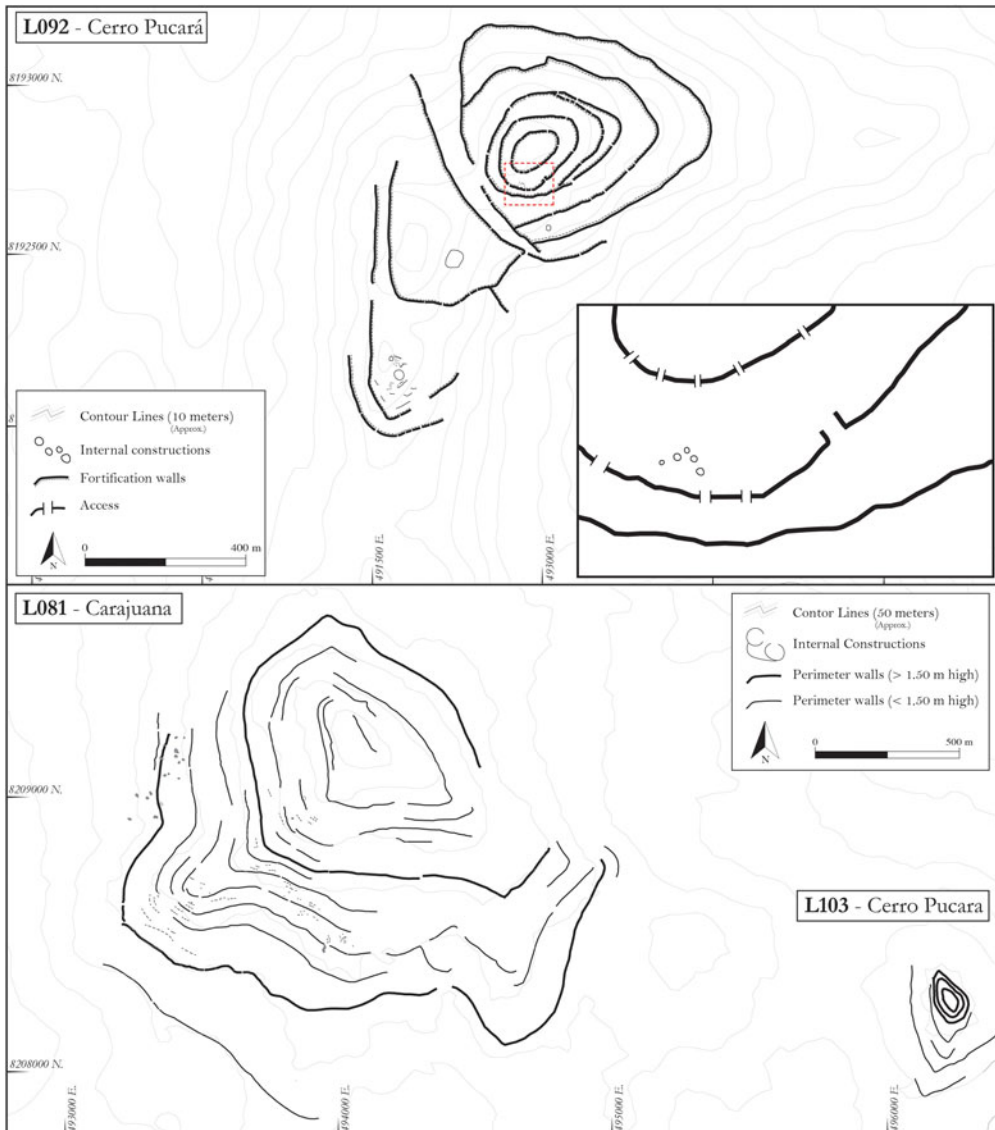


Figure 8. Maps of L092-Cerro-Pucará and L081-Carajuana.

Characteristics of Nonresidential Defensive Sites

NRD sites—those that do not meet the criteria to be defined as fortresses—represent 18.5% (58 sites) of our corpus. The relatively large number of these sites raises questions about the pucara phenomenon and the construction of walls during the LIP. Yet, it is important to point out that these settlements also have the lowest average reliability index in our corpus (13 NRD sites with a reliability index equal to 1 were thus excluded from our database).

Given not only their advantageous topographical positions—for example, L120 is located atop a small mesa—but also the presence of numerous walls (sometimes up to six concentric walls, as at L038), these settlements may have had military uses despite having incomplete defensive systems. However, these sites do not seem to have been the hypothesized refuge sites. It is necessary to consider other functions than those related to warfare to understand the nature of NRD sites and, more generally, the need to build walls in the LIP.

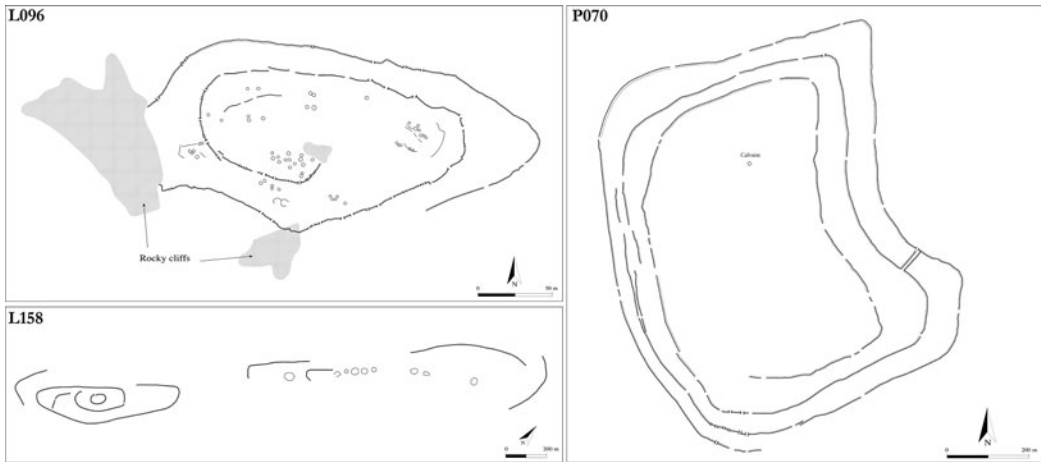


Figure 9. Maps of some “caracols” pucas.

Initial Interpretations

Our study of pucara-type sites on the altiplano shows the importance and omnipresence of these settlements along the shores of Lake Titicaca, including on the previously little-documented Pacajes territory. There are no significant differences in the types of sites between the Lupaca and Pacajes territories, although the percentages of NR and especially NRF sites are higher in the latter. The same implementation strategies therefore seem to have been applied in these two territories. The settlements adopt two distinctive—a priori defensive—systems. Residential settlements are based mostly on natural fortifications (such as L123-Orochillame or L079-Tanapaca) that are occasionally supplemented by a few large walls (Stanish et al. 1997:134). In the other system, there are “ring pucas” consisting of long hilltop concentric walls without internal constructions and with walls of lower quality than those of residential settlements (Arkush 2011:151).

Our analysis therefore shows a clear distinction in the choice of these two forms of settlement in pucara-type sites. The residential settlements (RF) of the altiplano are mostly built at the top of topographical prominences, where natural defenses play a key role in their fortification. These positions are naturally defended by cliffs or steep slopes, requiring only few additional anthropic fortifications to complete the defensive system; they seem to have been favored sites for settlements. In contrast, non-residential settlements (NRD and NRF sites) present a variety of peripheral and limited natural defensive elements. If we consider that these sites really served the role of temporary refuges, why did populations invest so much energy in the construction of these walls for sporadic occupation and limited defensive advantages? Such choices can also be observed in many other archaeological contexts where natural fortifications play a more important role than defensive constructions (Arkush and Stanish 2005:7). Keeley and others (2007:83) go further and consider that artificial fortifications are not always necessary at naturally defended sites and that enclosures at strategic locales may serve no military function.

Our findings led us to reconsider the refuge role of a large majority of the pucara-type sites in the Lupaca and Pacajes territories. The examples of L081-Carajuana, which has 13 walls (Figure 8), L077 with seven walls, or the six walls of L124-Cerro Siquicapa illustrate these points well, with cumulative defensive wall lengths that double, triple, or even quadruple the length of the total perimeter of the site. In L081, the presence within 1 km to the east of L103 (Figure 8) seems to strengthen our argument. It is difficult to find logical defensive reasons to explain the construction of two so-called fortresses so close to each other.

Computer analyses enabled us to determine the visual connections between sites, identifying those that could be observed from another settlement within a precise perimeter; in our case, 20 km. These visual connections are often cited as proof of a defensive network (Arkush 2011) or possibly alliance or

cooperation networks for the protection of a territory. Arkush (2011:173) shows that her cluster model is compatible with the differentiated distribution of ceramic substyles throughout the Collas territory. We did not conduct ceramic studies of the visited sites and so cannot propose such a precise model, but previous analyses point in this direction (Mouquet 2019; Portugal Loayza 2011; Zovar 2012). On the basis of Housse's (2021) work in the Lupaca territory, it is possible to observe a slight distinction in the location of the sites and the visual importance of the reliefs on which they are established: the sites with the most visual connections are the RF settlements. Similarly, the calculation of site accessibility zones shows different trends: the RF sites are less accessible than the NRF ones, which are located, on average, at less steep and lower elevations.

Moreover, the settlement pattern can be particularly useful in understanding these NRF and NRD settlements, which are difficult to define. The grouping of several sites near each other, sometimes on several peaks of the same relief and only a few hundred meters apart, can potentially be one of these clues. On the Lupaca altiplano, there is one zone in which pucararas are densely clustered: the sites around L011-Quentorani, where the density reaches nearly 0.5 pucara per km² (Figure 10). These areas of high density have already been identified in other areas of the circum-Titicaca altiplano (Arkush 2011:160) but remain poorly understood. Do they represent an accumulation of several fortresses over time or an intentional multiplication of refuges in densely populated areas for the protection of populations, or are they settlements that do not serve the function of protection? At the level of the Juli sector, Housse's (2021) spatial analysis shows that all the nonresidential pucara-type sites organized around L078-Pucara Juli were inaccessible within an hour's walk from the farmland. This finding challenges the theory that refuges were strategically placed for the protection of populations engaged in agricultural activities, but these sites could still have been used by pastoral populations as shelter in times of crisis. Nevertheless, we cannot ignore the possibility that smoke or fire signals were used in wartime within pucararas (Stanish 2003:220), mainly because of the settlement pattern in which sites are linked by important visual connections (Arkush 2011:157–158; Housse 2021:462–464). However, to answer these issues, more research is necessary.

Conversely, within our study area, some areas stand out for the absence of pucara-type sites. Thus, the vast region corresponding to the Desaguadero Valley has less than 10 sites identified as pucararas on an area of almost 4,000 km² (Figure 10). It differs from the rest of the study area by having less rugged

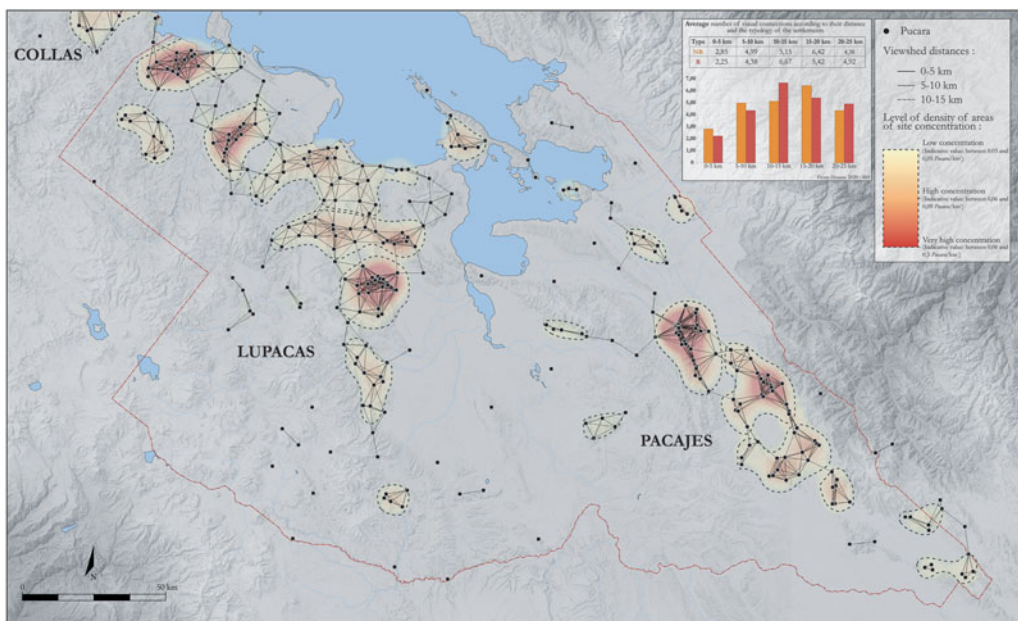


Figure 10. Density and viewshed analysis of the settlements. (Color online)

topography and therefore being less conducive to the establishment of defensive/fortified sites. However, it could also have been a buffer zone between the Lupaca populations in the west and the Pacajes inhabitants in the east. This zone is also particularly uncultivated, potentially indicating a low level of occupation. The inability to manage this territory and therefore exploit it could explain why it was a buffer zone in which no group was in a position, politically or geographically, to control it; this seems to be confirmed by the architecture of the chullpas on either side of the Desaguadero Valley (Kesseli and Pärssinen 2005; Mouquet 2019).

Beyond Militaristic Definitions of the Pucara

There was great variability in the construction techniques used and the layout schemes adopted for pucara-type sites on the altiplano around Titicaca. Further research is now needed on the nature and function of these settlements, some of which may have been mistakenly considered as military sites. We hope that this preliminary study will enable the establishment of new frameworks that reflect the multiplicity and complexity of pucara-type sites and will guide how we approach the LIP and its conflictual nature.

This study neither disputes the reality of conflicts and tensions during the LIP nor of the pucara phenomenon. The existence of settlements undoubtedly fortified and occupied by many inhabitants (such as L083-Llaquepa, L062-Nuñamarca, L011-Quentorani, or P095-Pucara Khonkho) shows that there was a real need for people to protect themselves and to gather in vast fortresses. The existence of numerous empty sites on the altiplano could be explained through a diachronic evolution of the settlement model, in which the refuge-type sites (NRD and NRF), both easily accessible and distributed across the altiplano, could correspond to older architectural forms that were intended for the occasional protection of populations. These settlements would then have been gradually abandoned by the population for fewer but larger and better-defended sites (RF), initiating a process of aggregation in the highlands in the face of increasing threats (Arkush 2011:108, 2017:9; Valdez and Valdez 2017:8). These new RF settlements, powerfully defended by cliffs and walls, would shelter a population that would be large enough to discourage direct attacks on these villages (Leblanc 1999:62–68). The pivotal period in this scheme could correspond to the fourteenth century, as the work of Nielsen (2002) and Arkush (2011) suggests.

A second hypothesis posits a parallel evolution of residential and nonresidential settlements in the area in response to a climate of increasing stress and violence. The multiplication of pucara-type sites in the area could indeed be the consequence of a “snowball effect” in which each community would build more and more defensive structures to maintain a balance of power (Housse 2021:517). The construction and organization of the walls could have been conditioned by earlier residential structures. Therefore, we propose that the fortified sites (RF) built during the LIP are the result of a tense political situation, brought about by a significant fragmentation of the Andean populations at that time and therefore increased competition between them (Arkush 2014:211; Bauer and Covey 2002:851; Earle 1987:289; Trigger 1985:99). Birch (2010:38) even considers that in such a stressful climate, fortress building can be a form of competition between groups and not reflect the actual degree of violence.

A third hypothesis to consider is that some settlements never served a military purpose and were not linked to increased conflict. Some of the examples discussed in this work from both the Lupaca and Pacajes territories are difficult to integrate into the model of defensive settlement commonly recognized on the altiplano. In fact, many pucararas never seemed to have a military use, given their non-strategic construction choices. These sites, like L081 or P070, that are indefensible must therefore be rethought based on new hypotheses, such as their probable link with certain deities. Some ethnohistorical and toponymic clues allow us to propose that certain sites considered to be pucararas never had any other use than that of being places of worship. On the altiplano, as Martínez (1983) explains, a great number of mountains called *pukara* were the seats of powerful deities linked to water and potato cultivation. The construction of concentric walls at the top of these mountains, unconsciously or not reproducing the characteristics of the fortresses of the LIP (Martínez 1983, 1989), may have led to confusion, both historically and archaeologically, between two conflicting yet similar functions (Housse

2021). Moreover, two of the most important huacas of the Lupaca territory present a compelling pattern in the link between sacred mountains and the pucas (Cruz and Joffre 2020). Indeed, in L081-Carajuana, the largest and most imposing site in our corpus, there seems to have been interest on the part of the ancient inhabitants in building—perhaps over generations—a dozen walls atop one of the major huacas of the Lupacas as proof of their respect and veneration toward this divinity (Housse 2021). In contrast, the presence of eight settlements surrounding the Ccapia volcano, another major huaca, allows us to hypothesize the existence of a settlement pattern for rituals in areas such as the Juli or Huantapata plains.

Therefore, far from seeking to protect a space or a population in the event of conflict, these settlements would have assumed different symbolic roles as pilgrimage centers, places of devotion, or, more generally, markers of the appropriation of a territory by a community, which expressed its power and control. The construction of walls extending several kilometers around a mountain (more than 21 km for L081) could therefore convey a strong and intimidating message to the exogenous populations: here was a powerful group, united and organized and supported by powerful huacas. This hypothesis leads to a theoretical framework for the construction of many pucara-type sites. The costly signaling theory (see Quinn 2019:276) seems particularly relevant, where walls can be seen archaeologically as signals to outside communities but may also be used for other purposes, such as defensive. We could envisage, for example, that L078-Pucara Juli and the sites surrounding it constitute a clever blend of the two schemes observable in Juana and Ccapia, with a central site consisting of several long walls that symbolically “dress” the sacred mountain and several smaller sites that surround it, providing symbolic protection (Cruz and Joffre 2020:70–71). The whole then constitutes a powerful signal as much for the external populations as for the members of the community.

One fact remains certain when analyzing all the sites discovered in this study: the wide variety of settlements grouped together under the concept of “pucara.” Future research must address this variety of sites to verify the existence of a link between their typological category and functions.

Conclusion

We assume that the automatic association between a pucara and a fortress with a military function initially stemmed from a confusion in colonial sources that later was continued by historians and archaeologists. The ambiguity of the term “pucara” led to this confusion: it not only defines fortified settlements but also sacred mountains, the worship of which involved the construction of several walls whose purpose would have been to symbolically clothe the divinity (Housse 2021). We can even assume that there was a semantic shift between these two notions with ritual settlements, which were potentially established as early as the end of the Middle Horizon and whose construction patterns were gradually adapted by the populations for fortified and military settlements. Therefore, the numerous nonresidential sites with concentric walls could reflect the collective manifestation of religious beliefs. These sites therefore call into question the absence of large-scale ceremonial and religious architecture during the LIP (Covey 2008).

The confusion that has long existed between these two forms of settlements thus stems from two factors:

- (1) A homonymy between the two types of sites, with the term “pucara” referring to the construction of walls around a village to ensure its protection—as defined by Santo Tomás (2003 [1560])—and the term “pukara” referring to a cult of sacred mountains, linked to water and potato farming on the altiplano (Martínez 1989)
- (2) An architectural tradition, in which sacred spaces in the Andes were demarcated through the construction of walls (Anderson 2014:344; Bauer and Stanish 2001:179–181; Topic 2015:386–387)—reinforcing the confusion between closed ceremonial sites located on top of sacred mountains and fortified sites, defended by enclosures and strategically built on top of important reliefs.

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