

ENVIRONMENTAL RISK AND POPULATION PRESSURE: CONFLICT OVER FOOD AND RESOURCES IN THE ACARI VALLEY, PERU

By

Lidio M. Valdez

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Abstract

The South Coast of Peru is a hot and dry region with high sand dunes that is relieved only by a series of small rivers that carry water a few months per year and form valleys made fertile by irrigation. One such valley is Acari, a narrow valley with limited arable land and scarce water. Despite such limitations, recent archaeological research carried out in the Acari valley indicates that during the Early Intermediate Period (circa AD 1 – 550) the inhabitants of this valley successfully managed to cultivate a variety of crops. Perhaps as a response to the harsh environmental conditions, food storage was also developed. This research also indicates that guinea pigs were locally raised and constituted a fundamental source of protein. Nonetheless, scarcity of resources, in particular of arable land, appears to have prompted stress manifested in form of conflict. Walled sites, buffer zones, and evidence for human decapitation strongly indicate that during this particular time period violence prevailed in the Acari Valley.

For humans, food has been, and always will be, a major concern. One way or the other, hunger touches every society; and sadly, each time more and more human beings face hunger and starvation in this technology rich global society. Indeed, it is well known that the vast majority of humans have existed – and others exist – acquiring just enough food to survive. Food shortages are due to a variety of factors, the most obvious ones being the lack of arable agricultural land and water resources. This is particularly the case for the peoples who inhabit risk-prone desert regions. Archaeology teaches us that in the past, peoples inhabited desert regions (see Barker and Gilbertson 2000); however, the adaptive strategies developed to cope with such hostile environments have not been fully explored. Consequently, it is critical to investigate how shortage of agricultural arable land and water affected the lives of past societies and what were the immediate consequences. Such an understanding is vital to develop an awareness of possible similar situations that could result from shortage of arable land, water, and ultimately food that is becoming each time very critical as a result of environmental change.

In this paper, first of all, I make an attempt to explain the responses developed by the ancient inhabitants of the Peruvian South coastal valley of Acari in order to deal with

a risk prone dry environment. The focus of this study is the early phases of the so-called Early Intermediate Period (hereafter EIP, ca. AD 1 – 350), a time during which several walled sites were established along the course of the Acari River (Valdez 1998, 2000b). Archaeological excavations carried out at three of these sites provide information for evaluating the strategies developed for coping with the dry environment. In the second part of the paper I discuss the several archaeological indicators that strongly suggest the existence of environmental stress and population pressure – likely due to shortage of arable land, water and food – that precipitated conflict between neighboring settlements.

The South Coast of Peru, a hot and dry region with high dunes in permanent formation, is part of the extensive desert formation that covers about 3,000 km of western South America. The desert condition is due to the drying effects of the Humboldt Current and the presence of the Andes Mountains which block the penetration of moisture from the Amazon region (Santoro, et al., 2005:246). As one moves inland from the shore of the Pacific Ocean, the landscape is a stony desert devoid of plant and animal life. Because most of the landscape is open flat area, strong winds carrying sand are common, and are a major agent of erosion.

This oppressive terrain is relieved only by a number of small rivers that descending from the highlands cut across the desert, thus allowing the formation of irrigable agricultural land. It is along the course of these rivers that one finds several contemporary settlements as well as many archaeological sites that as a whole represent a long and continuous human occupation. It is critical to highlight that the rivers carry water only during the summer months and irrigable land is limited and varies from a valley to the next.

The Acari River has formed one of these coastal valleys. It is located immediately south of the Rio Grande Drainage river system. However, in contrast to the neighboring valleys to the north, such as Nazca, Ingenio, Palpa, and Ica (Clarkson 1990; Conlee and Schreiber 2006; Schreiber and Lancho Rojas 1995), the Acari Valley is small and narrow due in part to the proximity of the Andean foothills to the Pacific Ocean. Indeed, except for the last 25 km of its course, the Acari River flows between mountains that do not allow the formation of much agriculturally irrigable land. In its final course, the river cuts deep into the desert terrain, thus limiting the formation of arable land.

Despite the lack of an adequate and reliable supply of water and the obvious shortage of irrigable arable land, archaeological research carried out in the Acari Valley has shown the presence of several dozens of archaeological sites (Riddell and Valdez 1988) that represent a long and continuous human occupation in the valley (Valdez 2000a). The earliest known occupation is represented by the Initial Period site of Hacha, established in the middle portion of the valley (Riddell and Valdez 1987). Considering the dry conditions of the region and in particular the limited arable land in this valley, the archaeological evidence is a true testimony of the resilience of the ancient inhabitants to face the challenges of such a hostile environment.

To familiarize the reader, first a brief reference is made to the EIP occupation of Acari, with a focus on the archaeological site of Huarato. Then, the archaeological evidence regarding local subsistence and the strategies developed to deal with risk are considered. Finally, I provide with data regarding stress manifested in the form of settlement structure, settlement spatial placement, and ultimately human decapitation that together strongly indicate that during the early EIP violence prevailed in this valley.

The Early Intermediate occupation of Acari

The EIP is a time when several walled sites were established along the course of the Acari River (Valdez 1998, 2000a, 2000b, 2006). In the vicinity of each of these settlements there is, although limited, irrigable arable land that probably was cultivated by the local inhabitants. However, it appears that some sites had access to a relatively larger arable land, while others only managed access to small patches of cultivable land.

Huarato was one of the walled settlements, established further inland than any other contemporary site and therefore in a section where the valley is narrower. Because of its location, Huarato had access only to a limited irrigable arable land. Currently, the largest amount of arable land at this location is the area between the site and the course of the river. However, a good portion of that land was previously part of the archaeological site, indicating that the agriculturally productive land available to the EIP inhabitants of Huarato was certainly more limited than it is currently (1).

In spite of the earlier intensive and extensive looting at the site, and that most of the site has already been destroyed, recent archaeological excavation carried out at Huarato resulted in the finding of several undisturbed contexts (Valdez 2005, 2006). Some of those contexts are relevant for assessing and discussing food production and food management strategies developed by the inhabitants of this site. The first clear evidence of food management at Huarato is the finding of four pits directly excavated into the natural ground and plastered with clay. The pits were uncovered in the northern central section of the site, enclosed by a rectangular adobe wall structure, and established on the highest section of a naturally elevated formation. The rectangular structure was relatively well preserved, with clean floor, suggesting that access to this location was perhaps restricted.

The pits, three of which were round and one of oval shape, were established in a single row and were uncovered completely filled with dirt and sand. Although in the first two round pits no organic remains were found, the other two contained many organic remains in the form of seeds, particularly beans and canavalia. In addition, in the fourth pit there were roots of achira (*Canna indica*) and sweet potatoes (*Ipomoea batatas*). The finding of the pits and in particular of the organic remains in the form of seeds and roots clearly indicate that these were the food storage systems established by the inhabitants of the site.

Excavation at the site also resulted in the finding of many cultivated plant remains. Table 1 summarizes the plant species uncovered from Huarato. With very few exceptions, the remains included the non-edible parts of the plants, such as stalks, leaves, roots, suggesting that these plants were grown in the vicinity of the site. Weeds that normally grow near cultivated fields and / or in the fields themselves were also found at the site, indicating again that the limited arable land found at the vicinity of the site was cultivated.

The finding of a variety of plant remains at Huarato is the best archaeological evidence that strongly indicates that despite the environmental constraints of this arid region, its inhabitants successfully cultivated a good selection of plants that appears to have been their main source of subsistence. The presence of these plant remains is also indicative of a well developed agriculture in spite of the shortage of irrigable arable land

and water. Meanwhile, the finding of the storage pits indicates that food management was a critical strategy, developed perhaps to deal with uncertainties of the harsh-prone arid environment. A storage system, combined with a well developed agriculture, could have provided food security at times when crop failure and poor harvest occurred due to drought.

Table 1: Cultivated plant remains identified for the EIP site of Huarato

Maíze (<i>Zea mays L.</i>)	Hot pepper (<i>Capsicum frutescens L.</i>)
Peanuts (<i>Arachis hypogaea</i>)	Pacae (<i>Inga feuillei DC</i>)
Beans (<i>Phaseolus vulgaris L.</i>)	Lúcuma (<i>Pouteria lucuma</i>)
Lima beans (<i>Phaseolus lunatus L.</i>)	Palillo (<i>Campomanesia lineatifolia</i>)
Sweet potatoes (<i>Ipomoea batatas</i>)	Manioc (<i>Manihot esculenta</i>)
Achira (<i>Canna edulis</i>)	Jícama (<i>Pachyrrhizus tuberosus</i>)
Canavalia (<i>Canavalia plamosperma</i>)	Guayaba (<i>Psidium guajava L.</i>)
Squash (<i>Cucúrbita sp.</i>)	

It is important to stress that all the cultivated plant remains identified at Huarato have a long history in the region. Indeed, similar remains are already present at earlier sites in the valley (Riddell and Valdez 1987) and also are found at other EIP sites of the region (Drusini 1991; Piacenza 2002). This evidence indicates that a selection of cultigens that included grains, tubers, spices, and fruits – already widely cultivated by the time pottery making technology was introduced to the region – constituted the subsistence base of the EIP inhabitants of the Peruvian South Coast in general.

While food storage systems appear to have been an important strategy for dealing with the constraints of a risk-prone environment, it is important to note that for the entire South Coast region only a few EIP storage facilities have been identified so far. One comes from the early Nasca site of Marcaya, where Vaughn (2000:261-262) has excavated stone walled, circular cists. These structures, named *collamas*, are said to be found in the patio areas and in the interior of domestic structures, but never in groups. Although no plant remains were uncovered inside the structures, Vaughn (2000) argues that these functioned as storage facilities. Likewise, Silverman (2002:63) identifies a square shaped stone walled structure, found at an early Nasca site in the Ingenio Valley, as storage. Just as in the previous case, however, no plant remains were found inside the assumed storage facility.

At the early Nasca ceremonial center of Cahuachi, there are structures similar to those recently uncovered at Huarato. The structures were also excavated into the ground and placed over an elevation and established in rows. Unfortunately these were looted long ago, making it difficult to determine their function (Carmichael 1988:419-420). Considering that the storage pits from Huarato are structurally identical to those from Cahuachi, there can be little doubt that the structures from the latter site played a similar role.

If the above identifications are correct, it appears that during the EIP several types of storage facilities existed on the South Coast of Peru. For reasons that remain unknown, only those from Huarato and Cahuachi were morphologically similar, while the other two types were clearly different not only from these two, but also from each other (2). Nonetheless, considering that the entire region is dry, there can be little doubt that its ancient inhabitants faced similar environmental risks that prompted the establishment of adaptive responses to

deal with uncertainties. Food storage facilities were evidently part of such adaptive responses.

Additional evidence for food management at Huarato is represented by three small rectangular enclosures uncovered in the vicinity of the storage pits, also in the northern central section of the site. Two of the structures, although divided by a small wall, were connected by a narrow access established in the middle section, while the third structure was built a few meters apart. Inside the structures were uncovered large accumulations of guinea pig droppings, clearly suggesting that these were hutches for the cavies. The accumulations also suggest that the cavies likely were housed in these structures for a considerable period of time. A variety of weed plants that normally grow near the agricultural fields were also found inside the hutches, indicating that the weeds were brought to feed the cavies. This finding shows that the food for the guinea pigs likely came from the same fields cultivated and irrigated by the residents of the site.

For the entire Peruvian South Coast region, this is the first concrete evidence for breeding guinea pigs at an EIP site. There is evidence for guinea pig consumption at other EIP sites of the region (Valdez 1988), but until recently no tangible evidence for the raising of these small animals was found. In a wider context, guinea pig remains are present at almost every single site, including the Initial Period site of Hacha (Riddell and Valdez 1987), but the only evidence for raising guinea pig comes from a pre-ceramic site of the Central Coast (Lanning 1967:18).

The finding of the three separate small hutches is also of particular interest. Indeed, considering the behavior of these animals (Bolton 1979; Valdez 2000c; Valdez and Valdez 1997), it becomes evident that guinea pig management was also critical at Huarato. Male guinea pigs are well-known to be territorial (Brothwell 1983:117); indeed, in their attempt to maintain control over the females, adult males are engaged in violent fights that often are deadly. To avoid such losses, adult males are often kept apart, leaving a single dominant male with a large group of adult females. Pregnant females and the young are also kept apart and so is the group of adult males. It must be noted that without female guinea pigs around, male guinea pigs do not fight. Therefore, the finding of three separated hutches at Huarato suggest that the ancient inhabitants of the site were familiar with guinea pig behavior and opted for establishing different units of residence likely as a measure to avoid losses.

Equally critical is to stress the reproductive ability of the guinea pigs, particularly for a society inhabiting a region with limited food resources. A three-month-old female guinea pig is capable of becoming pregnant and the gestation period lasts only 63-74 days (Bolton and Calvin 1981:275; Gade 1967:214). More importantly, the number of newborns varies from three to four, implying that a small family of guinea pigs can easily increase their numbers in a very short period of time. Because these animals reproduce easily and do not require much attention (Gade 1967), for many current highland Andean communities, guinea pigs continue to represent an important source of proteins. The evidence from Huarato, particularly the structures for guinea pig breeding, reveals that these small animals were an important source of meat for the ancient community of Huarato. The archaeological record coming from Huarato also reveals the use of additional sources as a means to complement the local diet. These include the remains of fish, shellfish, and river crawfish. All in all, the available evidence shows that every available resource was used at Huarato.

Another strategy employed by the residents of Huarato involved accessing non-local resources, particularly meat, in order to supplement their diet cultivated plants. This was the particular case of Andean camelids, whose bone remains have been uncovered at Huarato. The bones include all skeletal parts, suggesting that animals were brought live to the site in order to be slaughtered. As discussed by Crabtree (1990:166), when consumers obtain whole animals from somewhere else, under normal circumstances all body parts are present at the consumption site. The possibility that these animals were locally managed appears to be remote because no remains of infant / new born animals have been uncovered. Camelid herding implies high infant mortality. Therefore, camelids consumed at Huarato probably came from some highland (*puna*) community, a region usually associated with camelid herding. Similar result has been observed for the early Nasca ceremonial center of Cahuachi, (Valdez 1988) which in general suggests that EIP South Coast populations interacted with their highland neighbors. On the basis of available evidence I argue that the EIP inhabitants of Huarato maintained a product exchange network with some highland community of herders (3).

It is important to add that in 1954 the late Francis A. Riddell witnessed a llama caravan crossing the sandy fields near the archaeological site of Tambo Viejo in the Acari Valley. This evidence is of particular interest because it provides with a concrete example of the interaction between highland and coastal populations. Such practice appears to go back at least to the time the walled sites of Acari were established.

In summary, the evidence presented here indicates that the EIP inhabitants of Huarato relied on a variety of resources, perhaps being the most important the cultivation of a selection of crops. Other valley resources were equally used. Despite its distant location from the sea, the residents of Huarato still managed to use some sea resources, but it was clearly less important than for other settlements located closer to the sea. In the following section, I provide with data regarding stress likely provoked by the shortage of food resources.

Environmental stress and population pressure

As noted in the previous sections, at the time Huarato was established and inhabited, there were other settlements along the course of the Acari River. For the standards of the South Coast region, these are relatively large sites. One of the intriguing aspects of the settlements is the presence of large walls that totally enclose the sites (Valdez 2006), that according to Rowe (1963) played a defensive role. In addition to the walls, each site is separated from its nearest neighbor by a vacant or buffer zone (DeBoer 1981), the shortest distance between sites being about 5 km. Furthermore, neighboring sites are located controlling the opposite banks of the river, thus increasing the distance between two adjacent sites.

In order to assess the function of these walls, recently sections of the structures were excavated at three different sites. Such evaluation reveals that although similar construction materials were used, there is some variation from site to site. At the same time, it is apparent that some of the sites were provided with a more sophisticated wall, which clearly required a major investment of human labor. For instance, stones needed to be transported from the course of the river to build the walls. In addition, the process of making adobes would have been time consuming. More importantly, most of the walls consist of several adobe and stone alignments that likely exceeded the 3 meters of height. Such investment of labor and

energy strongly suggests that defense and security were critical during this particular time. Important is to stress that settlements were not only walled and aggregated, but also were separated from their nearest neighbor by vacant zones that further indicates that violence prevailed in Acari.

A considerable amount of anthropological theory argues that warfare was a fundamental factor in the formation of early civilizations. In particular, Carneiro (1970) developed a very influential theory on the origin of the state and argued that population pressure in regions such as the arid Peruvian coastal valleys (with limited arable land and scarce water) led to the increasing importance of warfare. More precisely, Carneiro (1970:735) states that a coastal valley in Peru is “backed by the mountains, fronted by the sea, and flanked on either side by desert as dry as any in the world. Nowhere else, perhaps, can one find agricultural valleys more sharply circumscribed than these.”

In such an environment, the desire to control more arable land would have been permanent, with any likely move carrying enough potential to provoke conflict. Indeed, due to the circumscribed nature of the region, escape for a defeated settlement was blocked by “the mountains, the desert, and the sea – to say nothing of neighboring villages” (Carneiro 1970:735). Having nowhere to escape, the residents of attacked settlements had no other alternative but to confront the attackers, thus creating conflict within the valley. Such a scenario likely led to the takeover of less defensive and less organized societies, while those able to utilize force expanded their territories. As warfare intensified and became more sophisticated, prisoners of war may have been also taken, while others were decapitated and their heads carried as war “trophies.” Other scholars (Haas 1982; Wilson 1988) have assessed the role of warfare and conflict during pre-Columbian times in some Peruvian coastal valleys. Wilson in particular has documented the presence of fortified and defensive settlements in the Santa Valley and argued that such evidence is indicative of conflict and warfare in ancient times.

While conclusive evidence for warfare is still fragmentary for the Acari Valley and the South Coast in general, scholars have long argued that the so-called “trophy heads” (see Drusini and Baraybar 1999; Proulx 2001; Silverman and Proulx 2002; Verano 1995, 2003) are the outcome of warfare. In the context of the ongoing discussion and recent discoveries made at the EIP site of Amato, it appears evident that some sort of violent conflict, though not necessarily warfare, was relatively prevalent in the Acari Valley during the time the site walled sites were inhabited.

Recent excavations carried out at the EIP site of Amato uncovered the remains of several dozens of human skeletons with unmistakable evidence of having been decapitated. The remains represent male and female individuals of all age groups. These individuals were either residents of some neighboring settlements, or the inhabitants of Amato were taken captive in their own settlement by outsiders. In either case, they were violently captured following what appears a fierce fight that included face-to-face combat. It appears that during such confrontations many individuals sustained considerable physical abuse as indicated by parry-fractures and other unhealed broken bones.

Subsequently the hands and feet of the captives were bound so that they could not offer further resistance or attempt to escape. Perhaps it was during this process the victims’ clothing was also removed because in spite of the excellent preservation of the remains, that include partially mummified bodies, textiles are scarce. Finally, once the victims were brought to the central room of Amato, the horrifying process of decapitation was carried out.

Most of the skeletal remains were uncovered well articulated, except for the missing heads. In addition, the atlas, axis and some other cervical vertebrae are also missing. The remaining cervical vertebrae present several cut marks, indicating decapitation and the use of a sharp instrument to separate the heads from the bodies. Once decapitated, the headless bodies were left in the same locations and positions where the victims had died (Valdez et al., 2006). The bones of the decapitated individuals show no signs of sun bleaching or scavenging, suggesting that burial took place shortly after sacrifice.

Considering the walled nature of the EIP sites, the buffer zones established between the sites, and the new evidence of multiple human decapitation coming from Amato, there can be little doubt that the social conditions in the valley were stressful and definitely violent. The relatively extensive size of the settlements seems to have been a defensive measure to deter potential sudden attacks. Such tense conditions in the valley may have resulted from the need of additional arable land and the pressing urgency to overtake the agricultural resources of neighboring settlements. In a narrow valley such as Acari such a desire may have been accentuated particularly during periods of drought and poor harvests. Surrounded by desert, arid mountains, and the sea, in Acari defeat was not a choice. The only option would have been to defend local resources – no matter how limited – by building settlements provided with human made defensive barriers that could provide security to its inhabitants and deter possible attacks.

Discussion and concluding remarks

In this paper I assessed the food management strategies developed by the EIP inhabitants of the site of Huarato. The available archaeological evidence shows that the local subsistence was based on agricultural products, complemented by other resources locally available as well as secured from the highlands. While the planting of a variety of cultigens was indeed critical, the adoption of storage appears to be a strategy developed directly to deal with the risks of living in an arid region.

However, life in a desert region was not without its difficulties. Perhaps due to the environmental constraints, it appears that population pressure was constant in Acari. Such pressure, resulting more likely from the desire to overtake the limited arable land resources of neighboring settlements resulted not only in the establishment of the necessary and vital strategies for defense and protection, but also in the capture and decapitation of the members of neighboring settlements.

To conclude, for desert regions such as the Acari Valley, water, arable land and food have been limited resources for a long time. Such limitations touched the lives of men, women, and children, some of whom saw their lives coming to an end prematurely. The many cases of hunger within contemporary societies are calls for immediate action and responses to alleviate the life of those suffering. It is argued that over one third of the world's population inhabit desert environments, with living conditions assessed as being desperately poor in most cases (Barker and Gilbertson 2000:3). In such locations, arable land and water are the primary flashpoints for disputes between neighboring communities. Making matters worse, desert environments are expanding, thus increasing not only the need for arable land, water, and ultimately food, but also the potential to trigger conflict.

Notes:

1. Huarato is an intensively looted archaeological site. Sometime in the 1920s, Peruvian archaeologist Julio C. Tello visited the site and already noticed looting (Valdez 1998). About three decades later the site was visited by John H. Rowe, who described the site as a “Nazca cemetery” (Rowe 1956:140), due to the presence of human remains on the site’s surface. The establishment of new agricultural fields, irrigation canals, and a dirt road contributed in the destruction of a significant section of the site. Therefore, what is left appears to be a small portion of an originally larger settlement.
2. Structures similar to those identified by Silverman (2002) and Vaughn (2000) are present at other later sites of the Chala region, south of Acari. However, those structures are associated with human remains, indicating that these were burial cists.
3. Camelid remains are present at the early Nasca ceremonial center of Cahuachi, but remains of infants / new-born have not been found (Valdez 1988, 2001), leaving open the possibility that the animals consumed at that site may have being secured from some highland community as well.

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