Evidence for the Intensification of Ritual Activity:  
State Strategy at the Tiwanaku Colony of Isla Esteves, Puno, Peru 

A thesis submitted in partial satisfaction 
of the requirements for the degree Master of Arts 
in Archaeology 

by 

Kevin Bassett Hill 

2013
ABSTRACT OF THE THESIS

Evidence for the Intensification of Ritual Activity:
State Strategy at the Tiwanaku Colony of Isla Esteves, Puno, Peru

by

Kevin Bassett Hill

Master of Arts in Archaeology
University of California, Los Angeles, 2013
Professor Charles Stanish, Chair

Ceramic evidence from the island site of Isla Esteves in the Titicaca Basin of southern Peru sheds new light on the expansion of the Tiwanaku state during its regional period of selective colonization (CE 600-1000). As a Tiwanaku colony, Isla Esteves exhibits an intriguing mix of ceramics from the local Huaña tradition as well as both imported and locally manufactured Tiwanaku forms. Kero vessels, which played a central role in Tiwanaku communal ritual, are particularly abundant. While the data from Esteves (and the adjacent, local center, Huajje) suggest an economically strategic colonization, the site was also a community where the elaboration of public architecture over time paralleled an intensification in the production and consumption of ritual wares. This case study provides a deeper understanding of the centrality of ritual as a state strategy in a colonial context
The thesis of Kevin Bassett Hill is approved.

Gregson Schachner

Ioanna Kakoulli

Charles Stanish, Committee Chair

University of California, Los Angeles

2013
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1. The Tiwanaku State and its Colonies

Overview

Tiwanaku, along with Wari in the central highlands and the Moche on the north coast of Peru, was one of three examples of first generation states formation in the ancient Andes. Situated in the Bolivian highlands in the southern Titicaca Basin, the capital of Tiwanaku exerted considerable influence over Middle Horizon what is now Bolivia, Peru, and parts of northern Chile during its expansive period ca. CE 600-1000 (Fig.1.1). At this time, Tiwanaku projected power from an eponymous capital 20 kilometers from the shores of Lake Titicaca in Bolivia and established economic control through a strategy of selective colonization. This study focuses on the strategies of statecraft employed by a primary state in a colonial context. Utilizing data from excavations at a Tiwanaku colony – Isla Esteves – located in the northwestern Titicaca Basin, I will explain how the dynamic interplay between ceremonial architecture and ritual pottery evident during the occupational sequence at the colony is the archaeological manifestation of the strategic deployment of a ritual complex in the service of state economic interests.

The profound social transformations which engage anthropological archaeologists who study the origins and evolution of complex society are the transitions from largely egalitarian forms of social organization to hierarchical societies and the transition from these intermediate societies to the centralized, bureaucratic state. Tiwanaku is a case study in the latter development. Following James Matthews (1997), three prevailing models of Tiwanaku state development and perpetuation can be articulated from the several decades of research on the phenomenon. These models are: 1) the core agricultural development model 2) the vertical archipelago model and 3) the altiplano model.
In the first model, the Tiwanaku state is viewed as the preeminent power of a core-centered hegemony based upon an agriculturally based political economy. The subsidiary colonies in this model are connected to the core through a system of clientism whereby local elites become part of the Tiwanaku system as economic and political subordinates to the centralized power, charged with exploiting the resources and labor of local populations for the benefit of the state. This perspective has been developed extensively by Alan Kolata (1991) in the context of his argument that the organizational purpose of the Tiwanaku state was the creation of agricultural surpluses in the local hinterland to finance wealth in the core. In this scenario, local colonies were charged with creating this surplus through the administration of local labor, and the construction of massive agricultural works, including raised fields, flood
dykes, and irrigation channels. As Matthews notes, a key premise upon which this model rests is the idea that the large populations of the Tiwanaku core could be sustained through the intensive agricultural exploitation of the local *altiplano* environment of the Titicaca Basin (1997:246).

The second model is the vertical archipelago model, a framework for understanding state formation in the Tiwanaku sphere through a consideration of the privileged position of barter exchange and labor relations in Andean economies. At the local level, highland Andean society is composed of *ayllus*, familial clans with land-holding capacities, serving as a basic social unit of labor and production. *Ayllu* communities traditionally (and presently) take advantage of the vertical zonation of the Andean landscape, characterized by micro-environments arranged along a steep elevation gradient, through a strategy of dispersed resource exploitation. This practice was first observed in ethnohistorical narratives about the Lupaka, an Aymara-speaking people residing in much of the territory incorporated into the Tiwanaku core territory, and was described as an archipelago strategy by John Murra (1972). According to the model, individuals from distant *ayllus* will occupy host communities in different ecological zones and participate in resource extraction and exchange in a practice which has been generalized under the term: *vertical complementarity*. Goldstein (2005) more specifically, proposes a diaspora colony model, re-conceptualizing this tradition by designating these archipelagos as, “expatriate *ayllu* communities that disperse across geographic space, yet remain tightly knit by shared identity; [that is] *ayllus* in diaspora” (2005:42). The archaeological manifestation of Andean state colonies is taken in part as evidence for the time-depth of *ayllus*.

The third model, the *altiplano* model of Tiwanaku political economy and expansion, is best espoused through the work of David Browman (1978, 1981). As is similarly stressed in the archipelago model, the *altiplano* model is predicated upon the assumption of a Middle Horizon
Andean world in which the highlands were not agriculturally self-sufficient and thus the large populations in the Tiwanaku core could only be sustained through the exchange of goods across environmental zones. However, unlike the archipelago model, the altiplano model implies that highland people established widespread trade connections with local people living in different ecological zones rather than establishing themselves directly in these zones. The model combines trade and ritual and presents the Tiwanaku phenomenon as a caravan religion, connecting trade partners along the routes of commerce, and periodically uniting the larger community through festivals of pilgrimage to Tiwanaku. In a similar vein, Juan Albarracin-Jordan (1996) develops the idea of Tiwanaku as a confederation of elites united through gift-exchange and shared ideology. Like Goldstein, Albarracin-Jordan utilizes the ethnographically observed ayllu as evidence for the plausibility of the model.

As Axel Nielsen (2009) notes, the models for Tiwanaku discussed above, have profound implications for our understanding of interregional exchange and the interaction between pastoral groups and settled agricultural communities. Of particular relevance, the vertical archipelago model would imply that there was minimal or negligible inter-ethnic exchange and that there were no "specialized pastoralists...political autonomous and culturally differentiated herding communities" (Nielsen 2009:17). Recall that Murra's model describes a cultural landscape in which each kin-based labor group, or ayllu, is spread across the landscape, occupying different resource zones and engaging in each essential economic activity (including pastoralism) in order to fully exploit the potential of the environment. Although modern communities of specialized herders engaged in a pastoral economy at elevations unsuitable to agriculture (described, for instance, by Flores-Ochoa (1968)) are viewed as strong evidence against the vertical archipelago thesis, proponents of Murra's formulation maintain that this
economy is the result of post-colonial fragmentation and has little bearing on the past (2009:18). Interestingly, Browman (1978) sees this same fragmentation as evidence for the existence of trade networks in the past as the remaining pastoralist communities might simply represent the remainder of a much larger network of trading communities.

During the "Early Regional Development Period" (early Middle Horizon in the Southern Andes) Nielsen identifies a trend toward settlement nucleation at elevations most suitable for agriculture. He notes that, "interregional traffic thrived," citing archaeological evidence from "caravan routes and campsites, which frequently includes pottery from multiple 'regional styles'" (Nielsen 2009:24). In contrast to the developments at lower elevations, the communities of the extreme highlands appear to have been much less affected by these broad regional trends as no settlement aggregation is witnessed during this period and the material culture from these areas remains distinct. Nielsen interprets this as evidence of specialized pastoral groups retaining autonomy during the extensive political incorporation and reorganization of agricultural communities in the region. The ability of the pastoral groups to retain their distinct economy was crucial for their role in long distance caravan trade which sustained a regional economy based on the exchange of valuable goods (2009:30).

Archaeological data from the Tiwanaku heartland and relatively nearby areas of Tiwanaku influence also cast doubt upon the vertical archipelago model. Matthews (1997) discovered that key expectations of the archipelago and altiplano models were not supported by data from the Tiwanaku Valley, specifically the expectation of subsistence diversification. Rather than a diversification, there appears to be a restriction of the resource base during the development of Tiwanaku as the economy became more and more focused on the production of camelids and the intensive cultivation of a limited number of crops. Similarly, the archipelago
model was challenged by the limited amount of coastal products present in the highland survey area. While it is possible that a variant of an archipelago strategy may have been undertaken by a complex society like Tiwanaku after its development, this particular model would exclude the possibility that such an economic strategy would have been instrumental in the development of complex society in the first place. It appears as though the social and economic dynamics suggested by the archipelago model can be largely disqualified as a causal factor in the development of the Tiwanaku state.

Browman's *altiplano* model is problematic as, ostensibly, the motivation for subsistence diversification on the part of *altiplano* residents was paramount. However, most of the support he provides for his model describes trade oriented about the exchange of craft goods such as pottery and textiles or highly valued raw materials. For example, Browman notes the importation into Tiwanaku of obsidian sourced from Puno to the north and Arequipa to the northwest as well as copper ores from the Northern Chilean desert, a considerable distance to the south (1981:415). Ignoring for a moment the particular expectations of the model, economic exploitation based on the targeted extraction of valuable raw materials corresponds with certain observations of Tiwanaku expansion. As Charles Stanish (2002) points out, the ability of an archaic/primary state to administer the totality of large territories may be limited. Contrasting the provincial strategy of the later Inka Empire with that of the Tiwanaku state, a distinction which is conceptualized as a qualitative difference, rather than just a matter of degree can be made. Stanish argues against models which would suggest Tiwanaku was able to successfully control large "inkblot" (paraphrasing the term used by Carlos Ponce years before) areas of contiguous territory. Instead, "Tiwanaku...appears to have been limited in its capacity to mobilize sufficient resources to control territories outside of its core and heartland territories... [selecting] certain enclaves with
certain criteria” (Stanish 2002:191). This is significant as it hypothesizes a scenario in which preferentially selected areas are chosen for intensive exploitation, but the surrounding area is largely unaffected in terms of archaeologically visible material culture.

These observations are significant when considering the economic activity of Tiwanaku in regions of influence distant from the core. If we grant that Tiwanaku was in fact able to meet the subsistence requirements of a burgeoning population through the extensive agricultural intensification projects in the southern basin, detailed by Kolata (1991), then it is reasonable to suggest that the focus and motivation for long distance trade was for exotic crafts and raw materials rather than foodstuff. It is understandable then, that Matthews reports both agricultural intensification and a paucity of foreign goods or products in the Tiwanaku core area. Craft specialization and craft production in the Tiwanaku capital are well-documented (Janusek 1993, Bermann 1997). If raw materials were coming into Tiwanaku and being transformed into finished goods which were then primarily consumed at the core and minimally distributed back down the line, then the relative scarcity of Tiwanaku material found in peripheral areas (Stanish et al. 2010) and the near absence of non-Tiwanaku material found in the center appears consistent with expectations.

This multiplicity of theoretical orientations is further complicated by what appears to be discordance in the literature; explanations of Tiwanaku that focus on the origin of the state are conflated with theories which focus on the maintenance of that same state. Although the model of native agricultural intensification is the most plausible explanation for the emergence of Tiwanaku based upon the archaeological data (Stanish 1994) there are logical and empirical aspects of the other two models which are not easily dismissed. It is clear that the three models cannot coexist synchronically owing to the theoretical/empirical contradictions noted above and
the inability of the two resource exchange theories to explain the emergence of Tiwanaku as a regional power in the first place. However, from a diachronic perspective, the latter two models may be seen as attempts to explain phenomena associated with emerging economic strategies in the developing relationship between a growing Tiwanaku state and its periphery.

In such a framework, Tiwanaku emerges as a regional power by organizing, incentivizing, or coercing intensive (above subsistence level) agricultural strategies from its local population. The development of this new political economy predicated on staple finance affords the nascent Tiwanaku elite enough wealth to become the new locus of the longstanding interregional economic system of the Southern Andes. The subsequent transition from an economy based largely on local agricultural staple finance to one which develops strategies of wealth finance in the periphery (D'Altroy and Earle 1985) can be understood in light of the limits of an agricultural economy and the advantages of an economy based upon valuables and commodities. Bulk staple goods are dense products which are difficult to move over long distances. There is also the well-documented problem with diminishing returns arising from any project of agricultural intensification (Boserup 1965) as there is only so much productivity that can be squeezed from a given parcel of land.

In contrast, the advent of craft specialization and mass production in a complex society allows for new economic opportunities involving the importation of raw materials for the manufacture of specialized commodities to be traded back down the line. In accordance with this economic activity, religion and iconography create a system of value and thus a demand for certain ritual accoutrements which require manufacture by specialists. This ideological and material ritual complex can then be leveraged strategically for economic gain by state agents in far-flung areas of influence.
This is the stage in the development of the Tiwanaku political economy where the expectations of the *altiplano* model become relevant. The primary Tiwanaku expansion beyond the core area must be understood from a local perspective. Communities positioned at strategic economic locations would have quickly recognized the opportunities presented by a new landscape of commerce dominated by the bartering power of the Tiwanaku center. As the demand for raw materials utilized in craft production at the capital increased, the centers of extraction on the periphery would have recognized the value inherent in adopting certain ritual and iconographic aspects of Tiwanaku culture\(^1\). The "confederation" or "religion" of Tiwanaku describes a system of local elites using their economic power to obtain Tiwanaku products and Tiwanaku ideology. This process is exemplified at sites like San Pedro de Atacama in the interior of Chile where distinguished local individuals accessed prestige and power as they flaunted their participation in a regional trade network coordinated by the locus of economic and political influence at Tiwanaku.

This process continued as Tiwanaku, the only large-scale polity in the south central Andes, occupied a privileged seat within an interregional trade network, and increasingly became powerful enough to attempt to control the network outright. Eliminating the middlemen (local elites) may have brought about the demographic changes postulated by archipelago model. In theory, transaction costs could be minimalized by internalizing the extraction of raw materials (metals, obsidian, narcotics) occurring in emerging peripheral centers (Tainter 2000). Better yet, the peripheral centers themselves could be modeled after the Tiwanaku capital as a center of

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\(^1\) The use of terms such as “core” and “periphery” is not inherently problematic. Trouble arises when these terms are conceptualized as static realities rather than dynamic processes. As such, it important to note the tendency (documented historically back to the early modern period) for the economic terms of trade between the core and the periphery to degrade over time (Harvey et al. 2010). The dialectic of core/periphery can be thought of as system in which the center becomes increasingly powerful compared to the periphery due its position as a trader of finished products for raw materials.]
ritual, political, and economic power which would also function as an intermediate center of materials processing or craft production, including the production of the accoutrements of ritual. As was noted above, the inability of primary states to rely upon administrative and/or ideological infrastructure of predecessors places serious limits on the power which can be exerted outward. Rather than colonization strategies predicated on controlling the economic activity of large territories, Tiwanaku attempted to control a limited number of strategic enclaves and to some degree – the roadways between these sites.

As will be further discussed below, the replication of Tiwanaku architectural forms (Fig.1.2) and the utilization/production of Tiwanaku crafts at the Moquegua and Puno Bay enclaves is a manifestation of this economic strategy. It represents a direct attempt by the center to control extraction and production at strategic economic centers where local elites maybe have already undertaken a conscious process of Tiwanaku acculturation. These client elites would have been replaced or co-opted directly by administrators from the core in an attempt to exercise full control over the economic activity at the peripheral centers. The strontium isotope data from a cemetery at Moquegua is suggestive of this sort of demographic event (Knudson et al. 2004). Rather than being diaspora communities engaging in complementary economic activity, these people were likely administrative elites concerned with managing the economic activities and ritual/political governance of the emerging local centers.
Much has been written about the importance of regional trade in the political cohesion and wealth finance of the early Andean states. Though the roads, store houses, and interregional economic network of the Inka are well-documented in the archaeological and ethno-historical record, the nature of trade relations between the political center of Tiwanaku and the periphery where raw materials and exotic goods were extracted in state colonies is much less understood. Also not well understood is the role pastoralism and trade networks maintained by animal caravans played in the formation of the first expansive states in the region.

In a summary of survey data of a transit region between Tiwanaku and Moquegua published by Stanish et al. (2010) an instructive Middle Horizon counterpoint to the elaborate and extensive trade apparatus of the Inka Empire can be gleaned. The comparatively powerful and organized Inka state which rose to power in the 15th century CE, was able to maintain *tambos* located along a road system connecting important economic nodes along the expansive breadth of the empire. These *tambos* were utilized as way stations for strategic provisioning of both the local peasantry and brigades of troops moving through a given area (see Morris 1986 for historical discussion). Tiwanaku, in contrast, had not engineered a road system beyond traditional byways and no evidence for state-sponsored provisioning infrastructure was found in
the survey. Tiwanaku pottery was indeed discovered on sites along the road, but these sites also had earlier and later materials. As such, Stanish et al. (2010:530) interpret the paucity of Tiwanaku sites in the countryside and the lack of Tiwanaku civil engineering along trade routes as indicative of, "an informal Tiwanaku exchange system characterized by caravan trips made by many disparate people moving goods from the countryside to the centers or intermediate areas". However, Tiwanaku did not establish this system; rather it appears to have tapped into and elaborated traditional exchange networks which had existed long before the Middle Horizon. Matthew Bandy (2005) convincingly details the development of regional trade networks centered on the Southern Titicaca basin during the early and middle Formative period which fostered the emergence of political organization and the elaboration of shared ritual ideology. These networks were ultimately disrupted and co-opted by the emergence of Tiwanaku as a regional power during the transition from the Formative to the Middle Horizon.

The particular Tiwanaku model of selective colonization can be further contrasted with Inka provincial centers which functioned as loci of resource extraction but also as economic centers of large-scale craft production and provincial labor reorganization for the Inka Empire. The mining of metal ore, for example, was often directly under the supervision of state officials who conscripted local labor and made sure that everything that was mined was added directly to the coffers in Cuzco (Berthelot 1986). However, the Inka were also able to exercise greater control of both the infrastructure of the trade networks (roads, *tambos*, local centers) but also the people who carried out the trade - highland pastoral groups. In order to fulfill their labor requirement to the Inkas, high-altitude herding communities were required to assist in raising and maintaining the state-owned herds and occasionally, the task of actually participating in state-sanctioned caravan activity (Nielsen 2009). This level of control ensured that additional
investments in the centralization and intensification of interregional trade would not be squandered due to a corresponding inability or lack of desire for transporting a higher volume of goods on the part of the independent groups. The fact that the pastoral groups were no longer independent, in some sense, but were partially incorporated as attached specialists of the state economic apparatus was a critical development for the Inka. In comparison, the Tiwanaku state exhibited little standardization and a comparably ad hoc approach to the control of the Andean economic trade network – including the traders themselves – a fact which ultimately limited the potential for state economic expansion and integration.

**Tiwanaku Colonies**

The brief theoretical overview provided above is a necessary background to the dynamics involved in the formation and economic expansion of the Tiwanaku state from a macro perspective. In order to better contextualize the archaeological record of Tiwanaku colonies (such as Isla Esteves in Puno Bay – the subject of this study), which are spread over a large area of what is now Bolivia, Peru, and Chile (Fig.1.3), some general principles must be established. What do we see at Tiwanaku colonies? What are the architectural and material hallmarks of colonization? How do we distinguish between colonization and influence? Three examples will be examined more closely below to help clarify these issues: Lukurmata, Moquegua, and San Pedro de Atacama.
Lukurmata

Lukurmata is a large site in Northern Bolivia located northwest of Tiwanaku on the Taraco peninsula which juts out into Lake Titicaca (Fig. 1.3). It is one of the largest sites within the Tiwanaku heartland, falling under the influence of the Tiwanaku sphere during the early expansion period of late Tiwanaku III into Tiwanaku IV (ca. CE 300-400). It was likely an important political center of the Formative period Chripa culture, possibly larger than Tiwanaku itself during that epoch (Plourde and Stanish 2006). The Middle Horizon period architecture at Lukurmata replicates the monumental ceremonial complex of the Tiwanaku capital with a smaller version of the same architectural touchstones (along with residences, cemeteries, and ritual spaces associated with Tiwanaku material (Janusek 1999:116).

According to Bermann (1997) there is an observable shift during the Tiwanaku III period
in the nature of household ceramics found at Lukurmata. During this period, there is increasing vertical integration and homogenization of domestic wares. Increasingly, local products and even exotic items from other, non-Tiwanaku locations became replaced with domestic wares in the Tiwanaku style, a large number of which were probably local products (Janusek 1999:105). This pattern is also evident in large, decorated, labor-intensive serving vessels. These vessels were manufactured in Tiwanaku and subsequently imported to the colony. Over time, different sectors of the site begin to demonstrate varying levels of access to these imported materials, perhaps evidencing the emergence elite and non-elite contexts (Bermann 1997:105). In accordance with these observations, John Janusek's work at Lukurmata also highlights social divisions, with these corresponding to communities of specialized production. A community of specialist panpipe makers, with its own particular and distinct variety of Lukurmata ceramics in Tiwanaku style, demonstrates the degree to which the integration of Tiwanaku material influence at the site was nearly complete at this time, despite the complexity of consumption and production at the site. Janusek maintains that by the transitional period, “at a broad level, Tiwanaku style predominated throughout Lukurmata...and most Tiwanaku ceramic forms were represented in the assemblages” (1999:122).

Moquegua

The Moquegua Valley, located in the desert sierra to the west of Tiwanaku on the Pacific watershed (Fig 1.3), is home to Omo, one of the largest Tiwanaku colonies and the only confirmed site outside of the Titicaca Basin with a Tiwanaku ceremonial temple center complete with a stepped pyramid and sunken court complex (Goldstein 1993). It is an area rich in copper, silver, and gold and provides a useful inroad to coastal resources. Maize, a lowland crop not
viable in the highlands, was cultivated here and its production has been implicated in the relationship between state sponsored ceremonies which featured maize chicha and increasing hierarchy within the state and its colonies (Janusek 2004:162). Just as important, Moquegua served as the contested point of contact between Tiwanaku and its highland state contemporary/competitor, Wari (Williams 2001).

The Tiwanaku colony at Omo, despite its distance (250 km) from Tiwanaku, exhibits, as Goldstein (1993:30) notes, “the correspondence of all aspects of quotidian material culture...with those of the altiplano core area [demonstrating] the maintenance of an explicitly Tiwanaku identity in a territory fully annexed to the Tiwanaku state system”. Strontium isotope ratios can be useful in tracing population movements as the strontium concentration in the bones and teeth enamel of an individual reflects the isotope ratios of the geological environment in which this individual spent the early years of his or her life. Strontium isotope studies conducted by Knudson et al. (2004) for the Moquegua cemetery of Chen Chen revealed that two individuals out of the eight sampled exhibited uncharacteristic strontium isotope ratios. These closely correspond with the population norms for individuals of the Tiwanaku area. Based upon this information, the authors concluded that these individuals are probably, “immigrants from the Tiwanaku heartland” (2004:12). These data are consistent with Goldstein's observation that the mode of “territorial incorporation” at Moquegua was a “sharp counterpoint to the nondemographic characterizations of long-distance elite trade and religious diffusion” predicted by trade models such as Browning's altiplano model (1993:30). For Goldstein, the evidence suggests that the political elite of the Tiwanaku enclave at Moquegua were a type of highland diaspora community engaging in complementary economic activity for the benefit of their ancestral community in the altiplano. It has already been discussed above why theories of
vertical complementarity are problematic when conceived as causal factors in the early development of the Tiwanaku state. While the social and economic roles of the immigrants may not determinable, the facts concerning population movement are clearer and invite further discussion.

San Pedro de Atacama

San Pedro de Atacama (Fig.1.3), at the far reaches of Tiwanaku influence (more than 800 km away), is a distant regional trade center in an oasis within the desert of northern Chile. The site has received great attention due to its excellent preservation and its purported importance as a way station along caravan routes to the south and to the coast (Rodman 1992, Knudson 2007). While there exists good evidence of material such as ceramics and especially textiles produced in the Tiwanaku style, the public and domestic architectural styles associated with Tiwanaku are not present. Tiwanaku artifacts in general are of a limited quantity, heavily biased toward ritual narcotic paraphernalia such as snuff tubes (Torres-Rouff 2002). This material is primarily found in funerary contexts; perhaps evincing its function as a status marker and lending support to the importance of Tiwanaku ritual and religion in maintaining the networks of commerce and trade.

As a counterpoint to the bioarchaeological studies from Moquegua, similar research has been done at San Pedro in an attempt to establish the geographic origin of the local burial population. Osteological studies done on cranial modification are one line of evidence that appear to demonstrate that the residents of San Pedro de Atacama were not people originally from Tiwanaku. In her study of a Tiwanaku period cemetery in San Pedro, Christine Torres-Rouff (2002) links cranial modification techniques with the presence or absence of Tiwanaku material in graves. The Tiwanaku style of cranial deformation - annular, or conical modification is widespread in the Tiwanaku area, but only represented by a few individuals in the sector three
cemetery (2002:165). Interestingly, the results of the comparative study show no relationship between the type of modification and the amount or presence/absence of Tiwanaku material found in the graves of modified individuals graves. Since the individuals whose heads were modified in the Tiwanaku style were not more associated with Tiwanaku material, the presence of Tiwanaku cranial deformation may be better explained through cultural emulation rather than through population movement. Based upon strontium levels observed in a sample of the burial population (Knudson 2007), none of the individuals tested would have spent the first few years of their life in the Tiwanaku area. This evidence is even more convincing than the craniometric data in demonstrating that local populations were in fact the indigenous residents of the San Pedro region. As noted by Browman (1997) this region of northern Chile is a source of metal ore and it is also the natural habitat of the eponymous San Pedro cactus – a species noted for its potent psychoactive properties and heavily utilized in religious ritual. San Pedro de Atacama was apparently an important trade partner with Tiwanaku and was materially and culturally influenced by this contact, but there is scant evidence to suggesting as high a degree of investment as direct colonization at such a great distance.

Theoretical Summary and Premises

From the discussion of Tiwanaku political and economic activity in its large sphere of influence, several aspects of the state strategy can be elucidated. An important distinction can be drawn between the three tiers of influence exemplified in the cases above. Colonies in the core area such as Lukurmata came under Tiwanaku influence early and were almost completely absorbed in terms of material culture. The ceremonial architecture of the capital complex is faithfully replicated. More distant areas of influence, such as Omo in Moquegua are also
examples of colonization as important parts of the architectural and artifactual canon are preserved. On the margins of Tiwanaku influence, distant sites such as San Pedro de Atacama are not actually colonies in any useful sense of the word as they lack Tiwanaku architecture and exhibit a paucity of Tiwanaku material in unusual contexts.

The evidence from the colonies combined with the theoretical discussion of Tiwanaku political economy suggests a number of guiding principles:

(1) Tiwanaku colonization outside of the core area is discrete. It is spatially restricted and targeted. It represents an attempt to bolster or expand a political economy based on agricultural staple finance with a more diverse wealth finance economy based on exotic goods, raw materials, and finished crafts.

(2) Tiwanaku ritual is an important component of the effectively deployed political economy. It is manifested both in the core and the periphery. The ritual life of a Tiwanaku community is visible in both architecture and specialized craft production.

(3) Participation in Tiwanaku ritual life is in some sense, inseparable from participation in the Tiwanaku political economy.

(4) Tiwanaku colonies - as regional centers - appear to adopt many of the political and religious functions of the capital. One of these functions was the replication of the architectural theater of ritual found at the capital. Another function was the
production of products necessary for participation in Tiwanaku ritual life.

(5) These ritual crafts would have functioned as valuables suitable for exchange.

With this model of Tiwanaku colonization in mind we can ask the most pertinent questions:

(1) How does Isla Esteves correspond with this pattern?

(2) What do changes at the site over time reveal about the relationship between Tiwanaku and Isla Esteves?

(3) What is the specific relationship between architecture, objects, ritual, and Tiwanaku political economy and state strategy in this colonial context?
2. Case Study: Tiwanaku Ceramics and Architecture at Isla Esteves

Puno Bay

Puno Bay (Fig. 2.1) is a small inlet of Lake Titicaca located within the Puno Region of southern Peru in the northern Titicaca Basin. Carol Schultze (2008) in her survey of the area demonstrated a Middle Horizon settlement pattern characterized by a smaller number of larger sites concentrated closer to the lake shore than in the previous or subsequent phases of occupation (2008:178). Situated in the bay, approximately one kilometer from the mainland and the modern day city of Puno, Isla Esteves (Fig. 2.2) is a small (18 ha) triangular island which served as the administrative center of the Tiwanaku state presence in Puno Bay during the Middle Horizon.

Figure 2.1: Puno Bay
A contemporaneous site of particular importance is the large, U-shaped mound called Huajje. It is located directly across from Isla Esteves on the southern lakeshore. Due to comparisons with other U-shaped monumental constructions in the Titicaca Basin, the site has been dated to the Upper Formative (500 BCE - 400 BCE) though U-shaped ceremonial architecture in the Andean world has far earlier antecedents on the central coast (Moseley 1985). The mound complex consists of a stack of two platform terraces which encompasses a 150x50 meter footprint and contains an estimated 17,100 cubic meters of fill (Schultze 2008:168).

Excavations at Huajje reveal a deep stratigraphic sequence commencing in the Formative and terminating in the Colonial period. The earliest Tiwanaku diagnostic found at the site – a blackware kero⁡ vessel – serves as the lower bound on Tiwanaku influence, initiating a long archaeological sequence, useful as a comparative reference with excavations from the Tiwanaku colony on Isla Esteves (Schultze 2008:287).

In addition to its proximity to Isla Esteves, Huajje is important due to its status as a locus

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⁡Keros are drinking vessels in the form of a large goblet with a flaring profile and a wide mouth. They appear during the Middle Horizon and persist until the Colonial period. They are associated with Tiwanaku ritual, especially the ceremonial drinking of chicha, a type of maize beer.
of local silver production in the region. Around 100 CE monumental construction at Huajje began in earnest, transforming the small village into a large, ceremonial center. Schultze et al. (2009) present compelling evidence for silver production including crucibles, matte, and slag, artifacts indicative of metallurgy which scanning electron microscopy (SEM) coupled with energy-dispersive X-ray spectroscopy (EDS) analysis demonstrated were the result of silver ore smelting. The deep stratigraphic sequence at the site is a testament to the persistence of this specialized craft technology over a long period of time, continuing despite changes in the political landscape of the region. The importance of Huajje as a center of economic and ceremonial activity prior to Tiwanaku involvement in the bay suggests a targeted colonization by the state order to capitalize on an already thriving, indigenous economic infrastructure. This is an important consideration which will be returned to later.

Isla Esteves

The ten hectare site (Fig. 2.3) consists of a large, artificial, terraced platform mound topped with what would have been a sunken court and temple complex (Nuñez 1977). The site
was excavated by Mario Nuñez and Rolando Paredes in 1976 as part of a salvage project designed to understand as much as possible about the site before it was demolished in order to accommodate the construction of a tourist hotel and its associated access road. The project focused on Terraces 2, 3, and 4 located on the west side of the island.

In 1997, a second project began with the intent to follow up on the work done more than twenty years earlier. More focused, the excavation was confined to a domestic context located on Terrace 2. The excavation was carried out in 2x2 meter test units, dug in natural levels of up to 10 cm. For natural levels beyond 10 cm deep, arbitrary divisions were made in order to increase the precision of contexts. All fill was screened with either a 3mm or 6mm screen. The four main goals of this excavation were to (1) define the archaeological contexts on the interior and exterior of the enclosure (2) register the stratigraphy and depositional contexts which define the levels of occupation and spatial usage (3) identify and define the two main periods of occupation determined by the 1976 excavation and (4) look for any pre-Tiwanaku occupation.

Terrace 2 is associated with a partially exposed wall with rectangular enclosures. The excavation area was designated: Area A, a space of 450 square meters, delimited by profiles from the 1977 excavation (Fig. 2.4). Five excavation units were dug. Units 1-3 were located adjacent to a small wall which enclosed a possible habitation. Unit 1 was explored down to sterile soil, while Units 2 and 3 were used to corroborate the stratigraphy of Unit 1. Unit 4 was placed to the south of Unit 2 and was also pursued down to sterile soil. Unit 5 was opened solely to excavate Feature 18 entirely. For purposes of the present investigation, Units 1 and 4 will be the subject of study as complementary samples of material from Area A. (see Appendix A for a summary of the unpublished excavation report).
From the excavation report it is clear that there are general correspondences in the occupation history established in each unit. Of particular note are the two main architectural events which took place during the stratigraphic sequence in both contexts: the construction of the terrace and the later construction of the wall. Due to the different organizational systems utilized in Unit 1 and Unit 4, it is necessary to devise a new framework for ordering both units under one stratigraphic regime in order to facilitate comparison. Abandoning the language of phases and layers, I devised an arrangement based upon cross-contextual strata made up of the previously defined layers (Fig. 2.5). In both units, there are five discrete strata labeled A through E, earliest to most recent. For each unit the levels encompassed by each strata will be different:

[Unit 1: Stratum A (15), Stratum B (13,14), Stratum C (9-12), Stratum D (3-8), Stratum E (1-2).]
[Unit 4: Stratum A (12,13), Stratum B (10,11), Stratum C (8), Stratum D (6,7), Stratum E (2-5)].
Stratigraphy

What results from this synthesis is a general picture of the similarities and differences between the occupations in each unit during the defined strata. Broadly speaking, Unit 1 is both heavily domestic but also affiliated with agricultural activity – especially in Stratum D. There are two periods of occupation (strata B and E) which are far less substantial and can be thought of as essentially, abandonment. In contrast, Unit 4 exhibits a more varied usage over the occupation history of the site. It appears to have been utilized for both domestic and funerary purposes; the presence of tombs is an unequivocal indication of the latter. It appears less likely that this space was ever utilized as an actual occupation space due to the paucity of floors. Domestic activity in Unit 4 actually increases during the latest two phases where occupation in Unit 1 appears to be minimal.

Figure 2.5: Stratigraphy (Unit 1 and Unit 4)
Ceramic Analysis

The dataset for this study consists of approximately 1,300 diagnostic ceramic sherds, all of which were recovered from two excavation units (Unit 1 and Unit 4) at the Isla Esteves site. All ceramics recovered were fragments; no complete vessels were found. Diagnostic sherds are defined in this study as sherds can be assigned a form (typically rims or bases) or are stylistically distinguishable (due to painted or incised decoration) and thus potentially assignable to a time period or cultural tradition. Of these sherds, most were assigned a cultural affiliation based upon paste type. These paste types were established visually, with the aid of a hand lens, through the examination of fresh cuts in the ceramic specimens. The two salient variables were clay color and temper quality (inclusion color, form, size, density, texture, etc.). There are sixty-three Huaña (a local ceramic tradition found before and after the Tiwanaku period) pastes and fifty Tiwanaku pastes which were the result of local production on the island or in the region of Puno Bay. In addition, there are twenty-five Tiwanaku and thirty-four Huaña specimens which come from elsewhere in the region, both in the northern and southern Titicaca Basin. There are also three Formative period pastes types which represent a small contribution to the sample. These will be excluded from the analysis.

Each paste is defined based upon four criteria. First, the clay was classified based upon color, in this case, variants of orange, red, brown, and gray. Next, these clays were further subdivided based upon the characteristics of their tempers, all of which are inorganic. These tempers were categorized based upon their color, form (round, angular, semi-rounded, or subangular) size (expressed in millimeters), distribution (regular vs. irregular), density (low, medium, heavy, very heavy) visibility (interior, exterior, cut), fracture (regular or irregular), compaction (semi-compact or compact), hardness (semi-soft, soft, semi-hard, hard), and texture
(fine, medium, rough, very rough). Third, the firing of the clay was taken into consideration. The core of the sherd exhibits evidence of an oxidizing firing environment (orange, brown, reddish brown, or cream) or a reducing environment (dark brown, gray, or black). Finally, the specimens were classified based upon the finishing technique utilized: smoothing, burnishing, or polishing. While the material unearthed from the two excavation units on Esteves does exhibit specific paste types unique to the island, these types are easily associated with material from larger typologies developed for the entire basin during the Middle Horizon. In fact, some of the types determined from surveys and excavations in the northern and southern basin appear as non-local types in the Esteves corpus.

Despite the overlap in the types of clay and temper, there are clear differences distinction between Huaña and Tiwanaku ceramics. The most important diagnostic feature is surface treatment. Almost all of the Tiwanaku sherds are highly polished, while most Huaña sherds exhibit limited surface treatment, and almost none are polished. Very few Huaña sherds are decorated. Additionally, Tiwanaku sherds almost always have a low density of mineral tempers and these fragments tend to be very small in size.

In analyzing the ceramics in the dataset, several important questions will be considered. The first question is fundamental for the goals of this comparative project. That question is: whether or not it is prudent to treat Unit 1 and Unit 4 as two samples from the same cultural-depositional phenomenon. The relative number of Huaña vs. Tiwanaku specimens found in each unit along with a consideration of local vs. non-local material will help to resolve this issue. The second question concerns the strata delineated from the levels, layers, and phases described by the excavators. How are these strata different from one another materially? How do these differences contribute to a narrative of Tiwanaku presence and ritual activity over time?
Attention should be paid not only to the absolute number of specimens of each type, but also to the relative amount of material present in relation to expected amounts. A third inquiry will be made into vessel form and the importance of different types of vessels. What can be learned from analyzing the relative proportion of vaso, olla, and jarra in each depositional context? What is the significance of the classic Tiwanaku kero and its presence in this collection? How are these vessels associated with cultural affiliation and paste types? A related question concerns the size of vessels and the indication size has for uniformity of production and usage. Finally, the fourth question: what is the significance of the great variety of paste types found throughout the occupational sequence? Do increases in the number of pastes represented in a certain time period have implications for patterns of production and consumption? Or, likewise: does the intensification of the production of certain choice pastes have similar significance?

If Unit 1 and Unit 4 are to be taken as samples from the same intrasite, cultural-depositional phenomenon, there is a need to establish sufficient grounds upon which to make that claim. The most broad and basic comparison that can be made will utilize the relative number of Tiwanaku and Huaña specimens found in each unit. Although Unit 1 contains more than twice the amount of material as Unit 4, it is possible to assess the relative contribution of each type of ceramic to the relative totals of both samples by using the Fisher's Exact Test (Fig. 2.6).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Tiwanaku</th>
<th>Huaña</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>429</td>
<td>471</td>
<td>900</td>
</tr>
<tr>
<td>4</td>
<td>183</td>
<td>236</td>
<td>419</td>
</tr>
<tr>
<td>Total</td>
<td>612</td>
<td>707</td>
<td>1319</td>
</tr>
</tbody>
</table>

Fishers Exact = 0.192

Figure 2.6: Fisher's Exact Test (All: Tiwanaku, Huaña, Unit 1, Unit 4)
This test (p-value = 0.192) demonstrates that the two distributions are statistically equivalent. There is no statistical difference in the proportion of Tiwanaku and Huaña ceramics between the two units. Any differences (if any) will be seen in changes contingent upon the stratum in question. It is important to note that these figures only record the amount of diagnostic sherds from each tradition. They do not represent the total amount of Tiwanaku ceramics relative to Huaña ceramics at the site. As will be discussed further, surface decoration – including painting and incising – is quite biased toward Tiwanaku style sherds, which greatly increases the relative diagnostic representation of Tiwanaku material. There is a comparatively large amount of non-diagnostic material (primarily body sherds) which is probably mostly Huaña and was not analyzed in this study.

Rather than just characterizing the Tiwanaku and Huaña material in bulk, it is also possible to determine the similarity between both samples based upon the relative amount of non-local material in each sample. As was discussed above, the large majority of the material found at Isla Esteves is locally produced pottery. Though non-local types previously identified though excavation and survey in surrounding areas do appear in the assemblage, this manifestation is a rare and possibly significant development over time. However, in order to make meaningful diachronic statements about the quantity of imported material, it is necessary to determine whether or not there is consistency in the amount of non-local ceramics between the two excavation units, by use of another Fishers Exact Test (Fig. 2.7). If there is a suitable deviation, we might speculate that any general trends we try to analyze may be indistinguishable from statistical noise.
The result of this test (p-value = 0.363) is not demonstrative of a statistical difference between properties of Huaña and Tiwanaku imports in Unit and in Unit 4. Given a satisfactory indication that the samples from Unit 1 and Unit 4 are not statistically dissimilar, it will be useful to first look at the vessel types represented by the excavated sherds. Identifying the types of vessels used at the site and their association with either Huaña or Tiwanaku pastes can provide information about materially-oriented activity at the site and its changes over time.

There were four primary vessel types identified based upon morphologically diagnostic sherds (Fig. 2.8). These types include *vasos*, *ollas*, *jarras*, and *tazones* as defined by Cécilia Chávez. A *vaso* or cup is as a type of closed vessel – a category which subsumes those vessels which have a mouth diameter that is less than its height. A *vaso*, specifically, is a closed vessel with concave walls and a typically cylindrical form, which has a height proportionally greater than half the diameter of the mouth. A second type of closed vessel is the *olla*, or cooking pot. An *olla* is a large closed vessel with a wide mouth, neck (though some have none), and body and a thin base. They display a concave profile and often have handles. The height of an *olla* is proportionately greater than half of the diameter of its mouth. The third class of vessels is the *jarra*, or jar, another type of closed vessel. *Jarras* are small to medium sized vessels with a wide mouth, neck, and body, with a concave profile and a thin base. Like *ollas, jarras* also have a height proportionately greater than half the diameter of the mouth. In fact, *jarras* are essentially
smaller ollas, being morphologically indistinguishable aside from the fact that jarras necessarily have necks and ollas may not. The final vessel type, the tazón, is the lone representative of the open vessel class which includes vessels which have a mouth diameter which is proportionately greater or equal to their height. Tazones are vessels with slightly divergent, straight walls, which have a height proportionately greater than half the diameter of the mouth.

![Vessel Types](image)

*Figure 2.8: Vessel Types (from left to right) jarras x4, ollas x2, tazones x2, keros x4 (from Janusek 1999)*

Functionally, it is possible to establish what these vessel types represent as utilitarian items. The ollas are generally assumed to be used for cooking, jarras for storage, transportation, and use in burial, and vasos and tazones for serving and consumption. It is interesting to note in this regard that the sample of sherds with burn marks (most likely from cooking fires) is almost exclusively confined to ollas.

<table>
<thead>
<tr>
<th>Vessel Form</th>
<th>Tiwanaku</th>
<th>Huaña</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ollas</td>
<td>16</td>
<td>290</td>
</tr>
<tr>
<td>Jarras</td>
<td>31</td>
<td>9</td>
</tr>
<tr>
<td>Vasos</td>
<td>184</td>
<td>4</td>
</tr>
<tr>
<td>Tazones</td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

*Figure 2.9: Vessel Form Counts (Rims)*

In the complete assemblage from both Unit 1 and Unit 4 a total of 188 vasos, 306 ollas, 40 jarras, and 12 tazones were identified on the basis of the rim morphology of diagnostic sherds. The vessels types are highly segregated based on cultural affiliation (Fig. 2.9). 290 of the ollas are Huaña, while 184 vasos, 31 jarras, and all of the tazones are made from Tiwanaku paste.
types. (An additional 189 of the Huaña sherds are handles from unidentified closed vessels – likely also from *ollas* but possibly from *jarras* as well). Using the data recorded for the rim diameter of each diagnostic fragment, the size distribution of the two predominate vessel types can be more closely examined to see if uniformity in size was desired in vessel production.

As is made clear by the figure above (Fig. 2.10), the distribution of rim diameters for Huaña *ollas* is at 18 cm with values ranging from very small (less than 5 cm) up to 30 cm and larger. This is the pattern that might be expected for relatively ad hoc, non-standardized production with the range of values reflecting utilitarian or personal preferences or, simple, random variation.
In opposition to the pattern displayed by the Huaña ollas, the Tiwanaku vasos exhibit a highly standardized distribution for rim diameters (Fig. 2.11). Almost every Tiwanaku vaso has a rim diameter of 17cm. This cannot be accidental and such a high level of regularity demands an explanation. As mentioned earlier, keros are a type of drinking vessel central to the communal rituals of Tiwanaku society. They thus serve as a useful, material proxy for Tiwanaku ritual activity. Morphologically, keros are a type of vaso since they are closed vessels with concave walls. They are further distinguished by specific morphological features such as a distinctive flaring mouth, decorated, painted or incised exteriors, and commonly, the presence of banded molding around the waist, shoulder, and/or base of the vessel. On the basis of strictly decorative indicators, 233 kero sherds were identified with certainty based on their polished, painted exteriors or specific morphological features associated with the rim or base of the specimen. However, keros are difficult to identify on the basis of their rims alone and only a single vaso was identified with certainty as a kero based on a rim sherd. Given that keros are a type of vaso it likely that most, if not all, of the high quality, fine ware rims measured in this study belong to keros. For example, keros which have banded collar molding will often not exhibit a painted rim above this physical border, rendering a positive identification difficult. Despite this difficulty,
almost all of the 184 vasos were cataloged as keros in the original excavation notes from 1997.

<table>
<thead>
<tr>
<th>Vessel Form</th>
<th>Tiwanaku</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed Vessels</td>
<td>62</td>
</tr>
<tr>
<td>Keros</td>
<td>23</td>
</tr>
<tr>
<td>Jarras</td>
<td>31</td>
</tr>
</tbody>
</table>

*Figure 2.12: Tiwanaku Vessel Form Counts (Bases)*

A useful way to confirm this intuition requires the use of measurements obtained for Tiwanaku specimens which are not rims, but bases (Fig. 2.12). Some of these base sherds (n=23) were determined to keros based upon morphological or decorative information. Even more of these bases (n=62) were identified as Tiwanaku closed vessels of unknown secondary morphology. If it is correct that base diameter is at least generally correlated with rim diameter on a given vessel and if most of the Tiwanaku closed vessels in the sample are vasos (instead of ollas or jarras) and more specifically – if they are keros, then there should be a reasonable correspondence between the measurements for the sample of kero bases and the measurements for the sample of Tiwanaku closed vessel bases. Two procedures reveal that this is in fact the case.

*Figure 2.13: Tiwanaku Kero Base Diameters (cm) n=23*
While the range of base sizes for *keros* is much larger than that for Tiwanaku closed vessels (owing to a number of specimens with uncommonly large bases) both distributions have a mode at 7 cm (Fig. 2.13; Fig. 2.14). What is intuitively grasped through the histogram is the fact that the base sizes for the relatively small sample of *kero* bases and the much larger sample of Tiwanaku closed vessel bases are essentially the same. There is no comparison to be made with the highly varied distribution for the base diameter of the next most common Tiwanaku vessel – *jarras*, despite a relatively small sample size (Fig. 2.15). Therefore, it is reasonable to propose that almost the entirety of the sample of material with Tiwanaku affiliation consists of rims, painted body sherds and bases from *keros*. It will be useful to think of Tiwanaku material as consisting almost exclusively of these vessels.
Recall, we are dealing with diagnostic sherds in this study so the relatively equivalent amount of Huaña and Tiwanaku material does not reflect the actual ratios due to the fact that Tiwanaku sherds are far more likely to be diagnostic based on decorated body sherds. There are bags and bags of plainware body sherds which were not included in this study and which probably come from Huaña ollas.

Pursuant to the broader goals of this analysis, a principal task will be to trace the relative frequencies of Tiwanaku versus non-Tiwanaku material over time in order to better establish a diachronic narrative of Tiwanaku colonization at Isla Esteves. A way to approach this issue is to ask: does the proportion of Tiwanaku material versus non-Tiwanaku material for each stratum in both units match expected proportions based upon sample size? If not, are these deviations meaningful? This question can be answered through the use of a goodness-of-fit chi-square test. The procedure is illustrated below (Fig. 2.16).

The first test table shown above includes all of the Tiwanaku material from both Unit 1 and Unit 4. For each stratum, the number of total Tiwanaku (local and imported) sherds is listed in the first column. The second column calculates the percentage (or proportion) of the total sample of Tiwanaku material (n = 612) that is represented by a given stratum. The next column calculates the expected value for each stratum based upon the proportion of the total sample
(Tiwanaku and Huaña) which is represented by that stratum. What this particular statistical procedure tests is whether or not the deviations from the expected values are statistically significant. Significance, at the .05 level for a chi-square test with four degrees of freedom is 9.488. Since 24.82 is considerably larger, the null hypothesis of equal distribution can be rejected, and it becomes reasonable to suggest that the relative frequency of Tiwanaku versus Huaña specimens vary based upon the strata.

Although it is essentially redundant to repeat the procedure for Huaña (since it is the inverse case of the test performed above) it is illustrative insofar as the specific deviations from expected values can be better understood when presented in this format (Fig. 2.17). As in the example above, the chi-square value 20.78 exceeds the .05 significance value of 9.488 for data with four degrees of freedom.

<table>
<thead>
<tr>
<th>Huaña Stratum</th>
<th>Observed</th>
<th>% of Sample</th>
<th>Expected</th>
<th>Obs-Exp</th>
<th>Squared</th>
<th>Divided Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>95</td>
<td>0.16</td>
<td>113.10</td>
<td>-18.10</td>
<td>327.61</td>
<td>2.90</td>
</tr>
<tr>
<td>D</td>
<td>244</td>
<td>0.40</td>
<td>284.09</td>
<td>-40.09</td>
<td>1607.21</td>
<td>5.66</td>
</tr>
<tr>
<td>C</td>
<td>174</td>
<td>0.22</td>
<td>154.91</td>
<td>19.09</td>
<td>364.52</td>
<td>2.35</td>
</tr>
<tr>
<td>B</td>
<td>68</td>
<td>0.08</td>
<td>54.67</td>
<td>13.33</td>
<td>177.69</td>
<td>3.25</td>
</tr>
<tr>
<td>A</td>
<td>126</td>
<td>0.14</td>
<td>100.23</td>
<td>25.77</td>
<td>664.09</td>
<td>6.63</td>
</tr>
<tr>
<td>Total</td>
<td>707</td>
<td>1.00</td>
<td>707</td>
<td></td>
<td></td>
<td>20.78</td>
</tr>
</tbody>
</table>

Figure 2.17: Huaña Chi-Square Goodness-of-fit Contingency Table

This statistical procedure illuminates interesting trends in the relative abundance of Tiwanaku ceramics at the site over time (Fig. 2.18). During the earliest three periods at the site (strata A-C) Huaña material is more abundant than expected with a corresponding, and proportional under-representation for the Tiwanaku sample. This trend is reversed in Stratum D. At this point in the occupation of the site, there are far more Tiwanaku ceramics found than expected. This sudden, relative bounty abates somewhat in the final period (Stratum E) but there still remains a surfeit of Tiwanaku material compared to the contemporary Huaña sample.
Similar to the procedure detailed above for the total sample of material at the site, it is also useful to assess the relative frequency of Tiwanaku and Huaña imports over time in order to see if these particular changes are a relevant feature in the history of Isla Esteves (Fig. 2.19). Overall, a total of 123 imported sherds were found during the course of the excavation. 71 of these sherds were assigned a Huaña affiliation, while the remaining 52 are Tiwanaku. It is worth noting that the majority of Huaña imports were assigned a north basin affiliation suggesting that they were non-local, but from the same general region as the site. Tiwanaku imports are more evenly divided between north basin and more distant south basin types.

<table>
<thead>
<tr>
<th>Imports Stratum</th>
<th>Observed</th>
<th>% of Sample</th>
<th>Expected</th>
<th>Obs-Exp</th>
<th>Squared</th>
<th>Divded Exp</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>32</td>
<td>0.16</td>
<td>19.68</td>
<td>12.32</td>
<td>151.78</td>
<td>7.71</td>
</tr>
<tr>
<td>D</td>
<td>37</td>
<td>0.40</td>
<td>49.2</td>
<td>-12.2</td>
<td>148.84</td>
<td>3.03</td>
</tr>
<tr>
<td>C</td>
<td>34</td>
<td>0.22</td>
<td>27.06</td>
<td>6.94</td>
<td>48.16</td>
<td>1.78</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>0.08</td>
<td>9.84</td>
<td>1.16</td>
<td>1.35</td>
<td>0.14</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
<td>0.14</td>
<td>17.22</td>
<td>-8.22</td>
<td>67.57</td>
<td>3.92</td>
</tr>
<tr>
<td>Total</td>
<td>123</td>
<td>1.00</td>
<td>123</td>
<td>-8.22</td>
<td>67.57</td>
<td>3.92</td>
</tr>
</tbody>
</table>

Figure 2.19: Imports Chi-Square Goodness-of-fit Contingency Table
The goodness of fit table for the imported sample across the five periods of occupation at the site is presented above. Despite the relatively small sample size (n = 123) the chi-square value of 17.73 is still much higher than the 9.488 threshold value for four degrees of freedom. Similar to the pattern seen for the sample of all material found, at the period of Stratum D there is a distinct decrease in the relative abundance of imports, which exhibit an increasing prevalence prior to this point (Fig. 2.20). However, due to the small size of the imports, this manifestation is likely directly related to the sudden increase in local (specifically, Tiwanaku) material at this time. An interesting divergence from the general trend can be seen in the terminal period, Stratum E, when there is a marked and possibly significant increase in the relative proportion of imports.

![Figure 2.20: Observed minus Expected Imports by Strata](image-url)

It is clear from the above procedures that Tiwanaku material, a large majority of which is composed of *keros*, increases both absolutely and in relation to the relative amount of Huaña material over time. This also means that relatively, the ritual serving vessels became increasingly abundant at the site during the course of its occupation, culminating in a peak time frame represented by Stratum D. These ritual wares are an effective proxy for the intensity of Tiwanaku
ritual and allow for the avoidance of problematic associations of pottery types with ethnicity or as a proxy for the number of people at the site. The large amount of *kero* sherds found in the domestic refuse represented by Unit 1 and (to a lesser extent) Unit 4 is indicative of consumptive events related to feasting ritual.

**Discussion**

The excavation data indicate that Isla Esteves had no significant pre- or post-Tiwanaku occupation (see Appendix A for details). The abundance of Tiwanaku fine ware ceramics collected during excavation confirms the idea that Area A of Terrace 2 represents an elite domestic context. Unit 1 exhibits ample domestic refuse, ritual wares, agricultural implements, and habitation surfaces. Unit 4 also contains abundant ceramics, animal bone, and clear mortuary contexts. Both excavation units contain trash pits filled with charcoal, animal bones, and abundant ceramic sherds. These contexts appear to represent refuse from single consumption events such as ritual or feasting.

The key architectural event in the occupational sequence of the excavated units was the construction of the terrace, one of several which constitute the platform mound Isla Esteves site. This architectural event represents a turning point in the nature of the material culture found at the site. After this construction, Huaña sherds become substantially less prevalent and Tiwanaku sherds come to dominate in relative abundance. Additionally, Unit 1 becomes established as a domestic context and Unit 4 as a funerary context. Stratum E appears to represent a period of decline and abandonment at the terminal end of the Tiwanaku presence in the region.

Almost all of the ceramics found during excavation belong to local paste types. Imports are rare; Huaña non-local types from the larger region – the northern Titicaca Basin – are more
common, while Tiwanaku imports are more or less evenly divided between northern and more distant southern basin forms.

Possibly the most significant finding is the observation that a large majority of the Tiwanaku corpus (71%) consists of kero fragments. The rims of these vessels demonstrate a remarkable uniformity in their size (rim diameter = 17cm) suggesting a standardization of production. Additionally, the 16 or the 31 Tiwanaku jarras rims were identified as miniatures, likely associated with ritual or burial activity. In contrast, it appears as though the site inhabitants were utilizing the local Huaña tradition in order to produce strictly utilitarian vessels for cooking. This fact is reflected in the vessels created with Huaña pastes: almost all of these are pots or pot handles, many with surface burning from cooking fires. Unlike the Tiwanaku keros, Huaña ollas do not demonstrate uniformity in production based on size. Given this information, the Stratum C to Stratum D transition in material culture is even more profound. If Huaña material is almost all cooking pots, the absolute amount of these sherds might serve as a reasonable proxy for the population at the site during a given time period. What is interesting is the fact that Tiwanaku sherds, which are primarily keros, increase in relative density compared to Huaña pot sherds during a period of time in which both types of material exhibit the highest representation in absolute terms (even at the resolution of levels within strata) out of any other period at the site. What this means is that the relative increase in the amount of keros is not simply due to an increase or decrease in population, it necessarily represents an intensification of ritual activity at the site.

A comparison with finds from the adjacent site of Huajje is instructive at this point. Based on a ceramic typology developed for excavation at Huajje, Schultze divided her stratigraphic sequence into six broad chronological periods recognized throughout the Andes. Of
particular relevance are the three phases which correspond roughly to the eras before, during, and after Tiwanaku occupation at Isla Esteves: the Upper Formative, the Middle Horizon, and the Late Intermediate. In the 50cm layers associated with Upper Formative deposits, no *keros* were found. This is expected given the fact that *keros* are an intrusive, Tiwanaku form diagnostic of the Middle Horizon in southern Andean chronology. As mentioned above, Schultze utilizes the *kero* found at the greatest stratigraphic depth – a black polished *kero* – as a border between the Upper Formative below and the Middle Horizon above. What is intriguing about this Middle Horizon context is the relative paucity of *keros* found. Only five *kero* sherds were found out of a sample of close to 200 diagnostic sherds. Although a paste analysis of comparable depth was not undertaken for the ceramics at Huajje, the pastes used for the *keros* found at the site were noted as being distinct from the pastes used for other vessels (Schultze 2008:317). This is a relevant observation as it eliminates the possibility that *keros* were simply misidentified as other Tiwanaku vessel types.

The situation becomes even more interesting in the subsequent era. The Late Intermediate period is generally understood (in the Titicaca Basin) as a chronological designation for the period of time subsequent to the collapse of the Tiwanaku system and prior to the colonization of the region by the Inca Empire in the 15th century. While the lower bound of this period is arbitrary and subject to site by site variation, it is generally thought of as beginning after 1150 CE. During this period, the number of *keros* found at Huajje increases. While this is surprising, it is not without precedent. Although not explicitly tied to Tiwanaku state ritual, “the kero form continues into later periods with clearly identifiable aesthetic and material changes” (Schultze 2008:178).

What these data may suggest is that the usage context of *keros* was largely restricted to
the exclusive Tiwanaku enclave of Isla Esteves during the Middle Horizon period. Subsequent to
the collapse of the Tiwanaku system, the *kero* ritual tradition may have become more accessible
to the larger population of Puno Bay, including Huajje. The *kero* may have taken on new ritual
significance divorced from an immediate connection with Tiwanaku. This observation is clarified
by the existence of a vessel form – bowls – at Huajje which were not found during the Esteves
excavation. Bowls, a personal drinking or consumption vessel, may have been the quotidian or
low-status functional equivalent of *keros* used outside of the Tiwanaku ceremonial architectural
complex.

To summarize, Isla Esteves fits the model of specific, targeted colonization with an
abundance of evidence concerning the interplay between architecture and object based ritual. As
was mentioned earlier, the big question was the proper interpretation of this dynamic. It is
important to keep in mind that the ceramic data recorded at Isla Esteves is a catalog of
consumption rather than production or ownership. The context of the finds – domestic refuse,
fill, and discrete deposition events – are direct physical evidence of the spatial area in which
*keros* and other ceramic vessels were used and eventually discarded. This point is significant as
Tiwanaku chose to colonize an island which sits directly across from Huajje and yet, as noted
above, very few *keros* were found in Middle Horizon levels at this site. This demonstrates an
exclusivity of use context for these vessels, and it is fitting that the site is located on an island as
it is both practically and symbolically very exclusive.

The evidence provided in this case allows an informed revisit to the diachronic view of
Tiwanaku state expansion and its economic phase of wealth finance. The wealth finance of
“primitive valuables” in the Tiwanaku economy could refer either to rare or useful raw materials
or specialized, finished crafts. It is important to note that the value of certain crafts, such as
*keros*, is not actually based on intrinsic materiality or fiat but on ritual. They are ritual commodities. They share integral connection with a ritual apparatus which utilizes ceremonial architecture as its theater. It is in this theater that ritual drinking vessels are obtained, used, displayed, and discarded. This is where they become an essential tool of social engagement and communal structuring.

The system of value in which the *kero* is embedded is directly linked to the economic power of the Tiwanaku state. This power is manifested in the architecture of the colonies which replicates the architecture of the core in order to facilitate a direct translation of authority from capital to colony. It is no accident that these areas of Tiwanaku corporate architecture are the spaces where ritual consumption is the most intense. The political, social, and economic stakes of contesting or appeasing the power of the state are increased dramatically when a Tiwanaku in miniature is in the immediate vicinity.

Utilizing the models of Tiwanaku colonization developed in the first section, it is apparent that Isla Esteves is a colony similar to the second example, Omo in Moquegua. Like Omo, Isla Esteves replicates the corporate, ceremonial architecture of the capital and is discretely located in an area where access to certain valuable resources appears to be a primary consideration. Schultze echoes this view, privileging the rich silver resources and skilled silversmiths as well as the extant social complexity at Huajje as most attractive features of Puno Bay for Tiwanaku colonizers (Schultze 2008:445). The latter point is especially relevant when considering the economic logistics of providing a staple base for artisans and the political logistics of convincing a client population to buy into a hierarchical system of ritual power. However, this is not to suggest an exclusively top-down view of this economic transaction, which was probably not possible outside of the Tiwanaku core area. As Janusek astutely
observes: “state culture was promoted not just by rulers but, to varying degrees, by everyone,” as “widespread acceptance and internalization of Tiwanaku state culture…in turn fortified local group identity and power” (2004:164). Both local and non-local interests benefited from the strategic intensification of ritual activity over time at Isla Esteves as evidenced by increased consumption of *keros*, especially, after the construction of ceremonial architecture. This social and ritual relationship facilitated the economic activity and ultimately, the extractive goals of the Tiwanaku state at the Puno Bay colony.
Appendix A: Summary of Excavation

Unit 1

Unit 1 was excavated to a depth of 2.3 meters. Fifteen levels were demarcated, with seven different phases of occupation – all but the latest containing Tiwanaku material. The first phase of occupation (the oldest context at the greatest depth) was labeled “domestic” by the excavators. This phase is represented by a single level – Level 15. Within this level, four features were identified: Feature 11, a hole with ceramic and animal bones, Feature 12, another hole, Feature 13, consisting of fill, a storage hole and a trash pit containing ceramic and animal bones, and Feature 14, a hole with domestic trash and what appears to be another storage pit. It is important to note that the two C14 samples obtained from this unit were taken from this last particular feature. The samples (258) and (302) returned calibrated dates of 1243+/−43 BP and 1317+/−43 BP, respectively. This places the initial occupation of this sector of the site at around 650-700 CE. This is a reasonable date for Tiwanaku IV period activity.

The second phase of occupation is a period of domestic abandonment. The amount of material found in this phase is significantly less than that which was associated with the previous and subsequent phases of occupation. This phase encompasses Levels 13 and 14.

Phase 3 is the phase during which the terrace was first constructed. The oldest level in this phase, Level 12, is characterized by notable surface activity. There appears to be a level floor made from highly compacted crushed rocks and clay as well as a quantity of ceramics and bone. Subsequent levels in this phase also contain evidence of renewed occupational intensity. Level 11 contains compacted refuse with pieces of carbon and animal bone and Level 10 is mostly fill with a large amount of charcoal as well as ceramic, bone, and lithics. The most recent level in this phase, Level 9, is divided up into two lots. Lot 1 exhibits surface activity with ceramic and
bone as well as well-compacted earth which may be part of an ancient pathway. Lot 2 consists of fill, primarily ceramic and animal bones.

The fourth phase identified by the excavators was described as the “agricultural” phase. This phase consisted of six levels of intensive occupation. Level 8, the oldest, consists of a very compact floor free of large rocks with in situ ceramic, animal bones, and carbon. Root disturbances from higher levels continue down to this level. Level 7 is another floor with ceramics and bones. Level 6 consists of fill – primarily, ceramic, bones, and charcoal. There is also evidence of agriculture in the form of broken pieces of stone mattocks. The root disturbances seen in lower levels are also present here. Level 5 is another layer of fill containing abundant charcoal and a continuation of plant root disturbance. The next level, Level 4, is yet another layer of fill. Along with more charcoal, there are also ceramics and animal bones, both from mammals and from fish. The final (most recent) level of Phase 4 is Level 3. This level exhibits a great amount of ceramic, obsidian flakes, an obsidian projectile point, and more pieces of charcoal. This level also exhibits post-depositional invasion from plant roots.

The fifth and most recent phase, named “wall construction and occupation”, consists of the final two levels of excavation and as the name implies is the period during which the wall was constructed. Level 2 is likely a floor, containing a feature (Feature 2) with two excavated lots. Lot 1 contains ceramic, charcoal, lithics, mattock fragments, and a large amount of plant roots. Lot 2 is primarily fill. The final level, Level 1, is defined as the unit surface where the existence of a possible floor and irregular amounts of cultural material were noted.
Unit 4

Unit 4 was excavated down to a depth of 1.5 meters. Five phases of occupation were determined which correspond to thirteen arbitrary levels and six natural levels. These phases are identified as: two domestic periods, two periods of funerary usage, and a final period of terrace construction. Complicating matters, the discussion of excavation levels in Unit 4 is oriented around a system of layers, seven of which encompass the five phases and thirteen levels of Unit 4. The earliest layer identified by the excavators is Layer 7. This layer consists of the arbitrary Level 14 and is a sterile phase devoid of cultural material.

Layer 6 is the earliest cultural phase excavated in Unit 4. This layer includes the arbitrary levels 12 and 13. The layer is designated as a “domestic occupation” phase by the excavators. Found in this level are features 28 and 29, both trash pits containing ceramic, fish and mammal bones, and lithics. This level corresponds to the first phase of occupation in Unit 1.

The third layer in reverse chronological order is Layer 5. This phase of occupation was also referred to as a “domestic occupation” and includes levels 10 and 11. Like Layer 6, Layer 5 contains a large amount of ceramic – both utilitarian and decorated, as well as mammal and fish bones. Layer 6 includes the features 25, 26, and 27, all of which are believed to be trash pits. The majority of ceramics found in situ (and the majority in general) were utilitarian fragments, though some decorated specimens were found as well. This phase is likely contemporaneous with the abandonment episode of the second phase in Unit 1.

The fourth layer, called the mortuary layer or layer 4 does not display correspondence with the occupational sequence of Unit 1. This layer is synonymous with Level 9 in Unit 4 and contains features 19 through 24. Feature 19 is an ash deposit with no cultural material. Feature 20 is a hole dug into the preceding levels at a depth of 13 cm. Within the fill of the hole, ceramic
borders (both utilitarian and fineware) were found along with burned mammal bones and fish bones. Feature 21 is of indeterminate function, but also produced a good quantity of ceramic as well as faunal specimens.

The third layer in Unit 4 is defined by the episode of terrace construction. This phase corresponds to Phase 3 in Unit 1. It consists solely of what was defined as Level 8 in this unit. The depth of this natural deposit is 13 cm. A good amount of domestic and fine ware ceramics were found in this context as well as animal bone. Within this layer, three features (16, 17, and 18) were delineated by the excavators. Feature 16 is a thin compact surface of red clay, devoid of cultural material, which is probably too limited in extent to have been a floor. Feature 17 is particularly interesting. It is referred to by the excavators as a "trash pit" but it is notable that the refuse is limited exclusively to Tiwanaku ceramics – both kero borders and decorated body sherds – placed in a horizontal orientation. Along with these sherds, animal bones and charcoal as well as a zoomorphic figurine were found. The feature most likely represents a ritual deposit or offering. Feature 18 was identified as a circular tomb with a variable diameter of 40-50 centimeters which contained the bodies of two individuals (one adult and one child) in a poor state of preservation. Along with the bodies, grave goods including ceramics and a miniature model of a "house" were found.

The second layer in Unit 4 is also called a mortuary layer. It is defined by arbitrary levels 6 and 7 and has a depth of 15 cm. The excavation uncovered an abundance of ceramic in these two layers as well as animal bone, fish bones and scales, and chunks of charcoal. One interesting find was a small copper plaque which was likely part of a larger pendant or chest adornment. This layer also contained Feature 15, an ash deposit 3 cm deep with no cultural material.

The first and most recent layer in Unit 4 is the final domestic occupation and the period
during which the wall was constructed as in the corresponding stratigraphic context in Unit 1. Four arbitrary levels (2, 3, 4, and 5) were excavated to a depth of 23 cm. Three features: 5, 7, and 10 were noted. Feature 3 is a trash fill 9 cm deep, which contained a number of ceramics, including a kero border. Feature 7 is a large, invasive tomb which was originally constructed earlier in the occupational sequence, but appears on the surface as cave-in due to disturbance from the construction of the terrace. The tomb produced a great wealth of material including fine ware Tiwanaku ceramics, ceramic polishers, and a ritual incense burner or incensario. Also found in the tomb fill were animal bones, lithic debris, and abundant charcoal. A possible human vertebrae was also recovered. Feature 10 is a fire pit which had no associated cultural material.

From the excavation report it is clear that there are general correspondences in the occupation history established in each unit. Of particular note are the two main architectural events which took place during the stratigraphic sequence in both contexts: the construction of the terrace and the later construction of the wall. Due to the disparate systems of layers and chronology utilized in Unit 1 and Unit 4, it is necessary to devise a new framework for ordering both units under one stratigraphic regime. Abandoning the language of phases and layers, I devised an arrangement based upon cross-contextual strata made up of the previously defined layers. In both units, there are five discrete strata labeled A through E, earliest to most recent. For each unit the levels encompassed by each strata will be different: [Unit 1: Stratum A (15), Stratum B (13,14), Stratum C (9-12), Stratum D (3-8), Stratum E (1-2).] [Unit 4: Stratum A (12,13), Stratum B (10,11), Stratum C (8), Stratum D (6,7), Stratum E (2-5)].
Appendix B: Paste Type Photographs

Huaña Pastes

(1) (2) (3)

(4) (6) (7)

(10) (11) (12)

(13) (14) (15)
Tiwanaku Pastes

(1) (2) (3)

(4) (5) (6)

(7) (8) (9)

(10) (11) (12)
Appendix C: Carbon Dates

1243: 1243±43BP
- 68.2% probability
  - 690AD (59.0%) 830AD
  - 840AD (9.2%) 870AD
- 95.4% probability
  - 680AD (95.4%) 890AD

1317: 1317±43BP
- 68.2% probability
  - 660AD (50.0%) 720AD
  - 740AD (18.2%) 770AD
- 95.4% probability
  - 640AD (95.4%) 780AD
References

Albarracin-Jordan, Juan

Bandy, Matthew S.

Bermann, Marc

Berthelot, Jean

Boserup, Esther

Browman, David L.
1978 Toward the Development of the Tiwanaku State. In Advances in Andean Archaeology. David L


D'Altroy, Terrence and Timothy K. Earle.


de la Vega Macicao, Edmundo.


Flores-Ochoa, Jorge A.


Goldstein, Paul.


Goñalons, Guillermo L.M.

Harvey, David I., N.M. Kellard, J.B. Madsen, and M.E. Wohar

Janusek, John


Knudson, Kelly

Kolata, Alan L.

Manzanilla, Linda.
63

Matthews, James E.

Moseley, Michael E.

Morris, Craig.

Murra, John.

Nielsen, Axel E.
2009 Pastoralism and the Non-Pastoral World in the Late Pre-Columbian History of the Southern

Plourde, Aimeé and Stanish, Charles.

Rodman, Amy

Schultze, Carol A.


Stanish, Charles

Stanish, Charles, E. de la Vega, M. Moseley, P.R. Williams, C.J. Chávez, B. Vining, and K. LaFavre.

Tainter, Joseph A.


Torres-Rouff, Christina


Williams, Ryan